

# Emergency Medical Services Communications Plan

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Volume 1  
Third Edition



Jeb Bush  
Governor

John O. Agwunobi, M.D., M.B.A.  
Secretary

BUREAU OF EMERGENCY MEDICAL SERVICES COMMUNICATIONS  
EMS COMMUNICATIONS PLAN

MEMORANDUM

March 25, 2004

**TO:** Recipients of the Florida Emergency Medical Services  
Communications Plan

**SUBJECT:** Volume I of the Emergency Medical Services  
Communications Plan – 3<sup>rd</sup> Edition

Attached with this memorandum is the 3<sup>rd</sup> Edition of Volume I of the Emergency Medical Services (EMS) Communications Plan (Plan). This edition of the Plan adopts the rules to promote the transition to narrowband technology on the MED Channels (463-468 MHz). Specifically, the amended EMS Plan shall impose a deadline for migration to 12.5 kHz technology for every Emergency Medical Program systems to December 31, 2004. This action will effect a transition to a narrowband channel plan and the resulting gain in efficiency will ease congestion to the existing MED channels. Further, this migration shall limit the difficulties in maintaining operating compatibility between all EMS MED Channels and the high potential for negative impacts to patients in a “mixed mode” RF environment. These changes are in concert with the Federal Communications Commission, Second Report and Order and Second Further Notice of Proposed Rule Making. A copy of this report has been provided in the Appendix F for your review.

Accordingly, this edition includes updates, clarifications, and new text. On each revised page, a vertical bar (“|”) in the left margin identifies lines of text that have been modified since the previous issue of that page. Specifically, the changes include; but are not limited to the following:

- Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended; Promotion of Spectrum Efficient Technologies on Certain Part 90 Frequencies; Establishment of Public Service Radio Pool in the Private Mobile Frequencies Below 800 MHz
- Modified Frequency Tables for UHF Band in accordance with FCC 03-34 second report and order and second further notice of proposed rule making.
- Modified Appendices for an excerpt of the Region 9 Plan for Public Safety Radio Communications, an excerpt of the State Implementation Plan for Communications Services, and Aircraft Equipment
- Modified Approval Process Flow Chart
- Added Appendix F – FCC-03-34 Establishment of Public Service Radio Pool in the Private Mobile Frequencies Below 800 MHz
- Modified Sample Sharing Agreement
- Removed Communications Requirements for Interfacility Transport Vehicles
- Modified Communications Reliability Sections for VDR
- Modified Statewide Medical Coordination (MED-8) Requirements for EMS Dispatch Centers and Reduced Rear Compartment Requirements

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Recipients of the Florida EMS Communications Plan

Page Two

March 25, 2004

- Modified Medical Resource Coordination Requirements for EMS Dispatch Centers
- Added Digital Concepts of Mobile Data Communications
- Added Minimum Performance Standards for Digital Radios
- Added Air Ambulance Communications (Air Secondary for Rotor wing)
- Added Countywide Medical Coordination Channels
- Added Statewide Medical Coordination (SMC) Channel and the implementation of DTMF signaling.
- Added Florida UHF MED Channel Allotments for Florida Acute Care Centers

This edition is being made available to all organizations and individuals identified per Section 1.3 of the Plan. To ensure that future revisions for Volume I and Volume II are received by you at the proper address, please verify that the name and email address on file with the Bureau of Emergency Medical Services is correct. If not, notify us for appropriate corrective action.

I thank the personnel in the State Technology Office, the Bureau of Emergency Medical Services, and the EMS Technical Advisory Panel that provided input toward this revision. If you have any comments or questions, please call EMS Engineering at (850) 922-7424.

Randy Pierce  
Communications Engineer

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APPENDIX A

FLORIDA - REGION 9 PLAN FOR PUBLIC SAFETY RADIO COMMUNICATIONS

APPENDIX B

PUBLIC SAFETY MUTUAL-AID CHANNEL

APPENDIX C

PUBLIC SAFETY RADIOS FOR AIRCRAFT UTILIZATION

APPENDIX D

ACRONYMS FOR EMERGENCY MEDICAL SERVICES COMMUNICATIONS

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GLOSSARY OF COMMUNICATIONS TERMS

APPENDIX F

FEDERAL COMMUNICATIONS COMMISSION SECOND REPORT AND ORDER AND  
SECOND FURTHER NOTICE OF PROPOSED RULE MAKING

## **1.0 INTRODUCTION**

### **1.1 Executive Summary**

The State Technology Office (STO) is mandated by Chapter 401.015, Florida Statutes, (F.S.) "to develop a statewide system of regional emergency medical telecommunications." Further, Chapter 401.024, F.S., requires further that "no emergency medical telecommunications system shall be established or present systems expanded without prior approval from the STO".

In 1975, the first Emergency Medical Services (EMS) Communications Plan was implemented and the approval system necessary to fulfill these statutory obligations was established. In conjunction with Federal funding made available from 1973 through 1981 by the United States Congress through the EMS Systems Act, the first Communications Plan enabled implementation of many EMS radio systems throughout the state in the Ultra High Frequency (UHF) radio frequency band. Experience gained during the intervening years, changes in technological approaches, and changes in EMS operational needs have necessitated EMS Communications Plan revisions to that end, the Plan is kept current through an active change program. Any corrections, additions, or constructive suggestions for improvement of its content should be submitted as appropriate.

By means of this Plan, and funding made available through the State EMS Grants Program, new directions and enhancements in the statewide EMS telecommunications system have been established. In an effort to maintain these improvements each user of this Plan is encouraged to send questions and comments on any matter that this Plan does or should contain to:

EMS Section  
State Technology Office  
4030 Esplanade Way  
Tallahassee, FL 32399-0950  
Phone (850) 922-7424 or SUNCOM 994-7424  
FAX (850) 414-8324 or SUNCOM 994-8324

The Plan is organized into two volumes. Volume I contains the general, administrative, and regulatory information needed by the managers of organizations involved in EMS operations. It further defines the broad concepts and goals of EMS communications within Florida.

Volume II contains the statewide radio frequency allocations as well as operational information for day-to-day EMS communications system operations. Volume II is formatted as a field manual to be carried as standard equipment on each permitted vehicle.

Within Volume I, the "Administrative Information" section includes general information on the STO, the Federal Communications Commission (FCC) Rules, radio frequencies, and frequency coordination requirements; the Florida Region 9 Plan for Public Safety Radio Communications; and the STO EMS communications approval procedures. The "Concepts" section defines the fundamental modes of EMS communications and system capabilities referred to throughout both volumes. The "Frequency Plan" section defines the methodology controlling the use of radio frequencies within the statewide EMS system. Within the "System Requirements" and "Equipment Requirements" sections are the specific requirements by which the approval of EMS communications system implementation or expansion will be determined. Lastly, is the section pertaining to "Mobile Data Communications," this section provides an outline in the design and/or implementation of a mobile data system employed in an EMS communications system.



Volume II includes an "Operations" section which provides FCC operational rules, recommended operating practices, a user-oriented description of radio theory with consideration in Public Safety radio bands and concepts established in EMS communications. The remainder of Volume II is devoted to the detailed radio frequencies and/or specific numerical allocations for EMS agencies or hospital Emergency Departments within Florida. Additionally, interstate allocations for adjacent counties in Georgia and Alabama are included and the geographic coordinates for hospitals within Florida.

Throughout the development of this Plan, we have attempted to keep the new editions as short and as straightforward as possible. We believe this approach will improve the Plan's usefulness and facilitate future revisions. We have accordingly limited the statewide requirements on EMS communications systems and equipment to the minimum level that we believe necessary to insure the effectiveness of essential modes of EMS communications.

We wish to acknowledge that preparation, publication, and distribution of this Plan has been in cooperation with the Department of Health, Bureau of Emergency Medical Services, which has provided the substantial portion of funding for this project. We believe this mutual effort has been and will continue to be highly successful in improving EMS throughout Florida.

We further express our appreciation to the many individuals both within and outside the STO, particularly, the EMS Communications Technical Advisory Panel, who have contributed their time, effort, and ideas toward making this Plan a meaningful and useful document. It is only through such interaction and exchange of ideas on a continuing basis that this Plan will serve to satisfy the original legislative intent "that a statewide system of regional emergency medical telecommunications be developed whereby maximum use of existing radio channels is achieved in order to more effectively and rapidly provide emergency medical service to the general population."

State of Florida  
State Technology Office  
EMS Section

## **1.2 Legislative Background**

The STO, previously the Division of Communications, Department of Management Services, was established by the 1969 Florida Legislature for the purpose of planning and coordinating all telecommunications services for State agencies and political subdivisions, as specified in Section 282.102, F.S. The STO is charged to provide the state of Florida and its operating agencies with an integrated, effective, and efficient statewide telecommunications system(s) that will satisfy operational needs. Since its inception in 1970, this office has received additional responsibilities and authority that specifically relate to Public Safety telecommunications at the local level.

Section 282.111, Florida Statutes, originally enacted by the legislature in 1972, mandated the STO to develop a statewide system of regional law enforcement communications "whereby maximum efficiency in the use of existing radio channels is achieved in order to more effectively deal with the apprehension of criminals and the prevention of crime generally". This statute requires approval by the STO prior to implementation of new systems or expansion of existing systems. This additional authority includes the law enforcement community at county and municipal levels.

In 1973, the Florida Legislature enacted Chapter 401, Part I, F.S., the EMS Telecommunications Act, relating to emergency medical service telecommunications; providing for the establishment and regulation of EMS telecommunications; mandating the STO to formulate and implement a Plan encompassing each medical

service entity within the state; and listing those items to be included in such a plan. Like Section 282.111, F.S., this statute requires approval by the STO prior to implementation of new communications systems or the expansion of existing systems.

In 1992, the Florida Legislature amended Chapter 395 (Hospital Licensing and Regulation) that created Section 395.1031, F.S. This section specifically addresses EMS communications at licensed hospitals with an emergency department. The requirements of Section 395.1031, F.S., and the STO authority therein is consistent with that specified under Chapter 401, Part I, F.S., the EMS Telecommunications Act.

In 1974, the Florida Legislature enacted the Florida Emergency Telephone Act. The act states that "it is the intent of the legislature to establish and implement a cohesive statewide emergency telephone number 9-1-1 plan..." and directs the STO to prepare such a plan. Included is a mandate to all public agencies to assist in the preparation of the plan and to comply with the requirements of the developed plan. Further, the act directs that no 9-1-1 systems be established or expanded without prior approval of the STO.

Since all aspects of the 9-1-1 system development, implementation, and approval are provided for in the 9-1-1 Emergency Telephone Number Plan, this EMS Communications Plan does not include, other than conceptually, provisions for the 9-1-1 "citizen access" portion of emergency medical services operations.

### **1.3 Wording**

The concept of word usage and intended meaning that has been adhered to in preparing this Plan is as follows:

A "Shall" has been used only when application of a procedure is mandatory.

A "Should" has been used only when application of a procedure is recommended.

A "May" and "need not" have been used only when application of a procedure is optional.

A "Will" has been used only to indicate futurity, never to indicate any degree of requirement for application of a procedure.

### **1.4 Plan Revision Procedure**

A major goal in the development and distribution of this Plan has been to establish an effective revision procedure to ensure that all necessary information and requirements regarding EMS Communications are promptly made available to affected EMS organizations. This section defines the revision transmittal procedure, and formatting style for both new and revised pages.

A copy of Volume I and accompanying copy of Volume II is made available and/or distributed to each EMS agency licensed by the Department of Health, Bureau of Emergency Medical Services, and each hospital licensed by the Agency for Health Care Administration that has an emergency department within the state of Florida. Additionally, where appropriate other Public Safety agencies and radio vendors affecting EMS may also obtain a copy.

#### **1.4.1 Revision Transmittal Procedure**

New or revised information to both Volumes I and II will be prepared by the STO following appropriate changes to the Plan and/or affected database information. With each edition of either Volume will be transmitted with a REVISION MEMORANDUM that defines the essence of the revisions included in the new edition.

## 1.4.2 Revision Format

- A. Contents Page: With any revision to Volume I the first page of the TABLE OF CONTENTS (page i) will be replaced with a new page showing the date of the most recent revision in the upper right-hand corner of that page. This page will be replaced regardless of whether there have been any other specific changes to page i.
- B. Revised Pages: On each page, a vertical bar (" | ") in the left margin will be used to identify any lines of text that have been modified since the previous edition. Subsequent editions will use the vertical bar for only the most recent change affecting the new edition.
- C. New Pages: Similar to revised pages; new pages will be indicated by a vertical bar (" | ") in the left margin from the top to the bottom of the page. Only on rare occasions will revising every line of an existing page cause this indication.
- D. Deleted Pages: If substantive, all deleted pages or major sections will be recognized by the REVISION MEMORANDUM and will have been removed from the respective Plan completely.

## 2.0 ADMINISTRATIVE INFORMATION

### 2.1 State Technology Office

In fulfilling a wide range of telecommunications services and regulatory responsibilities, the STO is organized into several sections that encompass a multitude of disciplines associated with the telecommunications systems throughout the state. Some examples of these responsibilities are to oversee activities related to the statewide telephone system (SUNCOM), directory assistance, telephone services invoicing, the 9-1-1 emergency telephone number system, wire line data communications, and publication of the State of Florida Telephone Directory. Other areas within the STO are primarily involved with activities related to land mobile, microwave, satellite radio systems, and radio frequency coordination, as well as closed circuit television, audio, and security/surveillance systems. These responsibilities include the overall engineering and regulation of all state agency telecommunications in the above areas, and for law enforcement telecommunications at the county, municipal and non-government organization levels.

Specifically with respect to EMS communications<sup>1</sup>, the EMS section of the STO is mandated in accordance with the interagency agreement by the Florida Department of Health, Bureau of Emergency Medical Services. The EMS section is responsible for regulatory direction and communications engineering services to county, municipal, and non-government EMS organizations that encompass the following wide range of disciplines:

- A. Communications System Analysis: Includes the survey and analysis for new or existing communications systems to determine specific requirements in the engineering and operational aspects of system performance, system recommendations, procurement schedules, and preliminary budgetary estimates.
- B. Communications Planning: Closely related to communication system analysis, planning services include formal planning on state, regional, county, municipal and non-government levels. Within the planning framework, engineering and operational system requirements are defined and translated into present and future equipment and system needs.

C. Grant Writing Assistance: Assistance in the preparation of grant applications is provided when requested by the EMS agency. For larger communications systems analysis and planning prior to detailed system design must be utilized before a application is submitted. Smaller and/or simpler communications systems may request a budgetary estimate. A budgetary estimate is a “quick look” at an agencies communications system. By designed it is to provide the requester with monetary figure for the grant application to meet the deadline. With out detailed system designs these budgetary estimates may or may not provide meet the requester’s communications needs. Agencies should contact the STO six (6) months prior to the grant deadlines to determine what assistance is necessary to complete its grant request.

D. Communications System Design: Following effective analysis and planning, detailed system requirement parameters are incorporated into a formal design process to establish new or modified system configurations. This process involves the use of computerized engineering models, topographical terrain profile analysis, spectrum management database information, and other engineering tools.

E. Procurement Specification Development: System configurations determined through the design process are developed into specifications suitable for contractual procurement, tailored to the organization's purchasing procedures, and enabling implementation of the required system equipment and services.

F. Bid Evaluation: Responses to procurement specifications are evaluated to determine compliance with the specified requirements.

G. Performance Verification Evaluation: After system installation and prior to system acceptance by the purchaser, evaluation of system performance tests is completed to ensure conformance to specifications.

H. Radio Frequency Coordination and Licensing Assistance: Assistance in the preparation of radio frequency coordination forms and FCC license applications is provided.

Timely requests for project assistance in the above areas, or for any other information or assistance that the STO may provide should be directed in writing to:

EMS Section  
State Technology Office  
4030 Esplanade Way  
Tallahassee, FL 32399-0950

Telephone inquiries may be made to (850) 922-7424, or SUNCOM 292-7424. Our FAX number is (850) 994-8324 or SUNCOM 994-8324. FAX transmittal is encouraged for routine or expeditious activities. Requests for assistance will be accepted via E-mail at [randy.pierce@myflorida.com](mailto:randy.pierce@myflorida.com).

## **2.2 Federal Communications Commission**

### **2.2.1 General**

All non-federal government radio telecommunications systems in the United States are subject to the rules and regulations of the FCC. Such radio communications are allowed under FCC Rules and Regulations, Title 47, Code of Federal Regulations, Private Land Mobile Radio Services, (PLMR) Public Safety Radio Services. In the event of inconsistencies between this Plan and the FCC Rules and Regulations, the FCC Rules and Regulations shall take precedence.

FCC Report and Order of Private Radio Docket No. 91-72, effective April 2, 1993, created the Emergency Medical Radio Service (EMRS). EMS is now clearly separate and independent of Special Emergency Radio Service eligibles. In summary, "this action was taken to redress the adverse consequences on public health and safety resulting from current crowding on emergency medical channels. The rule changes will establish a discrete radio service category dedicated strictly to eligibles providing basic or advanced life support services on an ongoing basis and thereby ensure the reliability of emergency medical communications. ...In this Report and Order, we establish the EMRS as a new Public Safety Radio Service under the FCC Rules."

FCC Report and Order of Private Radio Docket No. 92-235, effective August 18, 1995, affected the 150-170 MHz VHF band and the 421-430, 450-470, and 470-512 MHz UHF bands. It established a new channeling plan, provided technical flexibility, and mandated consolidation and suggested an initial framework for PLMR services.<sup>1</sup> This rule making essentially affected all PLMR services in the FCC Rules. Further rule making<sup>2</sup> as contained in FCC Report and Order 03-34 continues; as such Revision 3 to this Plan was determined necessary.

### **2.2.2 Radio Frequencies for EMS Communications Eligibility**

The current FCC Rules clearly distinguish between EMS communications and other medical and administrative health care communications. Per the FCC Rules, the eligible users of radio frequency spectrum allocated by the FCC for the EMRS are:

A. "Persons or entities engaged in the provision of basic or advanced life support services on an ongoing basis are eligible... to operate stations for transmission of communications essential for the delivery or rendition of emergency medical services for the provisions of basic or advanced life support."

B. EMRS applicants are also eligible for frequencies in the Special Emergency Radio Service (SERS) "in order to interface with other entities using SERS channels and to conduct necessary non-emergency communications."<sup>3</sup>

Additionally, FCC Rules states, "Entities eligible in the Public Safety Radio Service governed by this rule part may apply to use any of the 150-174 and 450-470 MHz frequencies allocated to the services. Applicants are required to make a showing set forth in paragraph (c) of this section." The Public Safety Radio Services include Police, Local Government, Fire, Highway Maintenance, Forestry-Conservation, and Emergency Medical Radio Services.

### **2.2.3 Emergency Medical Radio Service Frequencies**

In the EMRS, there are several VHF High Band frequencies, 220 MHz Band frequency pairs, and UHF Band frequency pairs. Many of these frequencies are restricted for specific uses such as crew alert paging, inter-system use, medical coordination, vehicle coordination, or are shared with other Public Safety Radio Services.

There are no 800 MHz Band frequencies specifically allocated to EMS, but all EMS eligibles may license 800 MHz frequencies allocated for Public Safety eligibles. Refer to current FCC Rules for actual channels, uses, and limitations for each frequency band.

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<sup>1</sup> Summary of FCC Report & Order, PR Docket No. 92-235, Federal Register, July 19, 1995, p. 37152.

<sup>2</sup> Adopted Second Report and Order and Second Further Notice of Proposed Rulemaking. (Dkt No. 99-87). Action by: the Commission. Adopted: 02/12/2003 by R&O. (FCC No. 03-34). Implementation of Sections 309(J) and 337 of the Communications Act of 1934 as amended; Promotion of Spectrum Efficient Technologies on certain Part 90 Frequencies.

<sup>3</sup> Summary of FCC Report & Order, PR Docket No. 91-72, Federal Register, March 3, 1993, p. 12177.

## 2.2.4 UHF Radio Equipment Channelization Requirements

A. Base Station Facilities: Under FCC Rules, all radio base stations operating on MED channels are no longer required to be equipped to operate more than one channel each. Accordingly, these frequency pairs are assigned and/or licensed in a block (MED-1 to MED-102) for shared operation. The State of Florida, EMS Communications Plan shall establish the specific channels requirements per Tables listed under “Florida Countywide MED Channel & CTCSS Allotments” and “Specific MED Channel Assignments for Florida Acute Care Facilities”.

B. Mobile and Portable Equipment: Under FCC Rules mobile and portable radios operating on the MED channels shall be both wired and equipped for operation on each of the MED channels. However, portable radios operating with a maximum power output of 2.5 watts are exempt from this multi-channel requirement but shall as a minimum have MED-8 SMC and SSC channels.

C. Paging and Crew Alerting: The secondary, one-way paging frequencies for EMRS are assignable only to organizations eligible under FCC Rules for the transmission of one-way tone and/or voice paging messages that are necessary for the rendition of medical services.

## 2.2.5 Radio Frequency Coordination and Licensing

All requests for radio frequency coordination and licensing must be directed to the appropriate FCC-certified frequency coordinator. Listed below are the FCC-certified coordinators for each associated radio service. All applicants in the EMRS shall obtain approval from the STO that shall be included with the application submitted to the FCC-certified frequency coordinator for EMRS frequencies. Emergency Medical and Fire Radio Service, except 800 MHz:

International Municipal Signal Association/  
International Association of Fire Chiefs (IMSA/IAFC)  
P.O. Box 1513  
Providence, RI 02901  
(401) 738-2220  
FAX (401) 738-7336

Special Emergency Radio Service (SERS), except 800 MHz:

International Municipal Signal Association/International  
Association of Fire Chiefs (IMSA/IAFC)/Personal Communications  
Industry Association (PCIA)

### For school districts

PCIA  
Attn: Frequency Coordination  
500 Montgomery St., Suite 700  
Alexandria, VA 22314-1515  
(703) 739-0300 or  
(800) 759-0300

### For other government or non-government agencies

IMSA/IAFC  
P.O. Box 1513  
Providence, RI 02901  
(401) 738-2220  
Fax (401) 738-7336

Local Government, Police, and 800 MHz Public Safety Radio Services:

Associated Public-Safety Communications Officials-International, Inc. (APCO)  
Attn: Frequency Coordination Department  
2040 S. Ridgewood Avenue, Suite 200  
South Daytona, FL 32119  
(904) 322-2500  
FAX (904) 322-2502

Business Radio Service:

Personal Communications Industry Association (PCIA)  
Attn: Frequency Coordination  
500 Montgomery St., Suite 700  
Alexandria, VA 22314-1516  
(703) 739-0300 or (800) 759-0300

Frequency coordination usually requires a coordination fee. Contact the appropriate coordinating organization to determine the current processing requirements and fee schedule prior to submitting applications.

### **2.2.6 Copy of FCC Rules**

Licenses are required to have a current copy of the Commission's Land Mobile Rules governing the radio service in which authorization is granted. By signing FCC 601 Form, the applicant certifies to have access to a current copy of the applicable radio service's rules. Rules for the Part 90 PLMR services are contained in a paperback volume entitled "Code of Federal Regulations, Title 47, Part 80 to END", published after October 1 of each year. The FCC Rules are currently available via the Internet.

### **2.3 Florida - Region 9 Plan For Public Safety Radio Communications**

The FCC has established a National Public Safety Plan that specifies requirements governing the Public Safety and Special Emergency Radio Services' use of the new 821-824/866-869 MHz Band. The National Public Safety Plan was developed to satisfy the two broad objectives of interoperability between communications systems and efficient use of the spectrum. The National Public Safety Plan became effective on

February 16, 1988, and established local planning regions for all parts of the United States, Puerto Rico, and the U.S. Virgin Islands, Florida is Region 9.

The Florida - Region 9 Plan for Public Safety Radio Communications was subsequently prepared by the Florida Region and Sub-region Plan Committees, which represent a cross-section of public safety communications interests throughout the state of Florida. The Florida - Region 9 Plan was adopted by the FCC on May 10, 1990. Requests for copies of the Florida - Region 9 Plan should be directed to the chairperson of the appropriate Sub-region Committee.

The Florida - Region 9 Plan contains procedures and criteria for the selection and assignment of, applications for, as well as utilization and protection of the 821-824/866-869 MHz frequencies. It specifies explicit channel allotments for planned and projected use throughout the state. A major component of the Florida - Region 9 Plan establishes implementation and use requirements for five new national mutual-aid channels. Refer to Appendix A.





## **2.4 State Implementation Plan for Communications Services**

The State of Florida has established a State Implementation Plan for Communications Services that specifies requirements governing the Public Safety agencies' including EMS use of the 808/853.3875 MHz channel. This makes available to eligible agencies a Public Safety mutual-aid channel authorized for use during situations requiring inter-service communications necessary toward safeguarding life, or property within the state of Florida. Refer to Appendix B.

## **2.5 Federal Aviation Administration**

Installation and operation of land mobile radio equipment on board aircraft is subject to Federal Aviation Administration (FAA) and FCC rules and regulations. For the purpose of this Plan, Appendix C is provided for implementing radio systems in aircraft that use frequencies in the land-mobile radio services.

## **2.6 Communications Approvals**

### **2.6.1 General**

Chapter 401.024, Florida Statutes, requires that “no emergency medical services telecommunications system shall be established or present systems expanded without prior approval from the State Technology Office.” This requirement applies to all EMS telecommunications systems, regardless of funding source. All requests for approval shall be submitted in writing to:

EMS Section  
State Technology Office  
4030 Esplanade Way  
Tallahassee, Florida 32399-0950

### **2.6.2 Submittal Requirements**

All submittals for approval shall comply with the following requirements:

A. Showing of Professional Engineering: Each submittal which proposes an establishment or expansion of systems, where such establishment or expansion involves "engineering" as defined by Section 471.005(6), F.S., shall include a showing that such engineering has been accomplished by a registered individual or certified firm qualified and authorized pursuant to Chapter 471, Florida Statutes, to practice engineering within the state of Florida.

B. Complete Description: Each submittal shall include a complete description of the proposed communications system, compliant with Section 5.0, and/or equipment compliant with Section 6.0, to include:

1. Type of equipment (mobile, portable, base station, antenna tower, control console, switching matrix, telemetry, etc.).
2. Frequency band, number of channels, channel frequencies, and channel descriptions (i.e., type of talk-groups such as VDR, LMC, mutual aid, etc.).
3. Location of equipment.
4. System diagram (if fixed station equipment is proposed).
5. Transmitter power output, antenna height, antenna type/directivity, and coverage reliability contour(s) per Section 5.2.

6. Special options (tone-controlled squelch, channel scan, selective call, telemetry (if required), etc.).
7. Line item budget delineating equipment quantities and unit pricing.
8. Any other information or documentation that the requesting organization deems pertinent to the project.

C. Statement of Need: A statement as to how the proposed system/equipment will benefit the proposing organization and the intended recipients of EMS care, and whether the communications project will be integrated into an existing system of EMS communications. If an existing system is involved, indicate expected improvements and enhancements to present operations.

D. Copies of or Applications for FCC Licenses: Copies of FCC licenses or applications, or an indication of commitment to apply, which indicate whether the project requires radio frequency coordination, license modifications, or FCC Rule waivers. All applicants in the EMRS shall obtain an approval letter of eligibility from the STO that shall be included with the application submitted to the FCC-certified frequency coordinator for EMRS frequencies. Figure-1 depicts how this approval fits in the radio station license process.

### **2.6.3 Approval Procedure**

A. Final Approval: Implementation of new or expansion of existing telecommunications systems, regardless of whether purchased with grant funds or not, require a written Final Approval **prior** to a commitment to purchase. Furthermore, Final Approval for EMS Grants Program projects must occur **after** the date of grant award. A commitment to purchase is considered to be a purchase order or award of a contract to purchase. It is in the best interest of each agency to obtain Final Approval prior to commencing formal or binding competitive processes such as an Invitation to Bid or Request for Proposals. Allow at least 30 days for the STO to process the Final Approval request. Figure-1 depicts how this final approval fits in the implementation or expansion process.

B. Additional Quantities: Procurement of additional quantities of either mobile radio equipment, hand-held portable radio equipment, paging receivers, and associated accessories which previously received Final Approval, shall not require a subsequent approval for the additional quantity provided that such procurement is for the same equipment, is for use by the same organization, and which is purchased within one year of the date of the original Final Approval. However, each County or Matching Grant requires a separate and associated Final Approval.

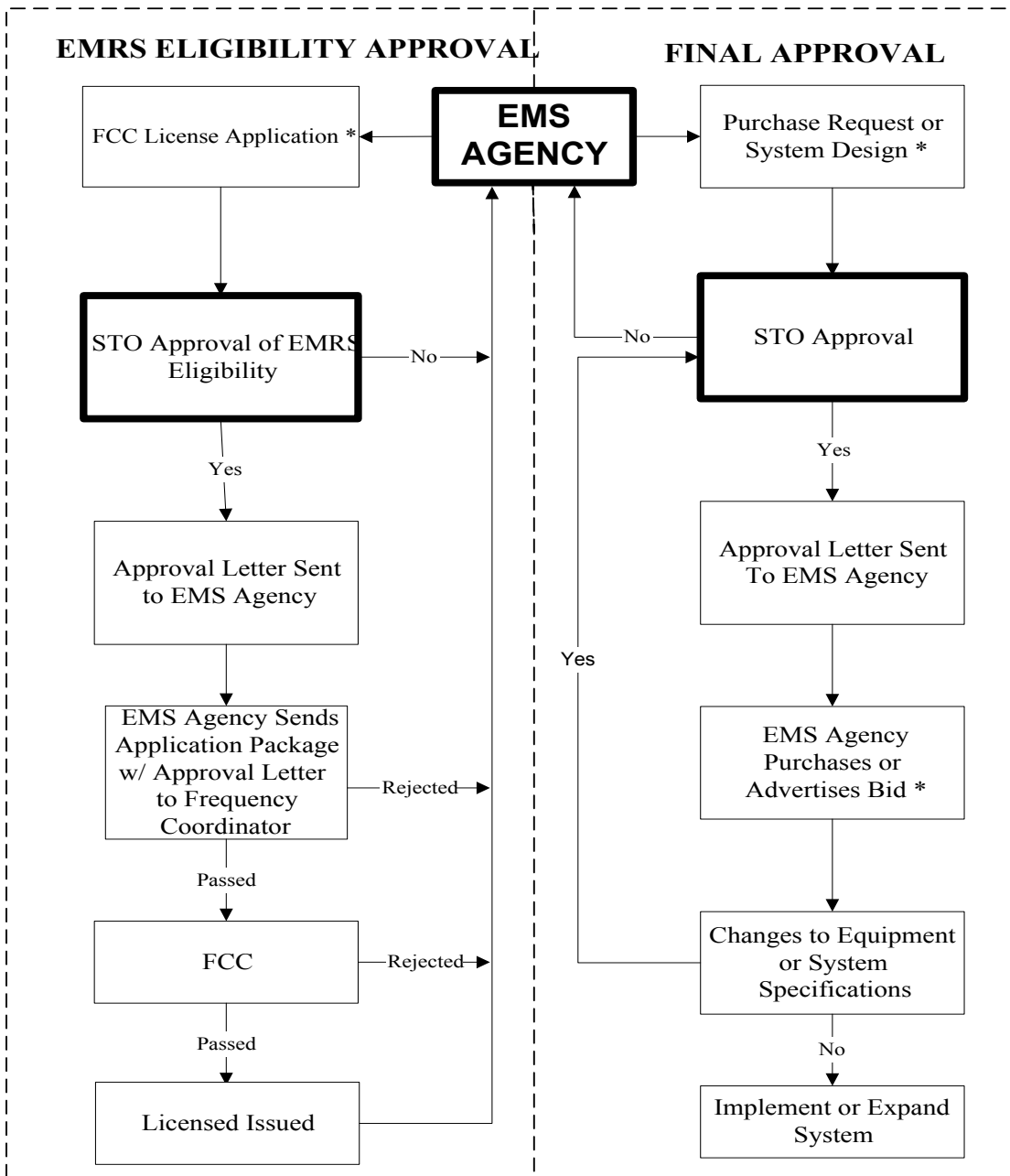
### **STO Review & Approval of Mobile Data Systems & Expansion of WLANs**

Information Needed for Approval of Communications Upgrades:

The STO highly recommends agencies to receive approval of any mobile data system or an extended WLAN before implementation. The below information is helpful for the approval process.

- A. Provide a request letter.
- B. Provide information on the type of network (i.e., mobile data system, integrated voice & data systems, or extended WLAN).
- C. Provide a design diagram and proposed coverage reliability probability (i.e., 95%, 90% area reliability, etc.).

- D. For mobile data networks, provide the type and specifications of mobile data or extended WLAN system.
- E. Provide an itemized costs estimate for the system and installation, including MDC, routers, modems, software, base stations



\* Assistance from STO may be requested.

Figure 1 – State Technology Office (STO) Approval Process

## **3.0 DESIGN CRITERIA FOR EMS COMMUNICATIONS**

### **3.1 General**

An EMS Communications system must provide the means by which emergency medical resources can be accessed, mobilized, managed, and coordinated in both normal and adverse situations. An EMS communications system must therefore employ sufficient communications paths and operational capabilities among all participants to facilitate the functional EMS communications designs described in the remainder of this section.

### **3.2 Citizen Access**

The EMS communications system must have the ability to receive and process any incoming requests that report emergencies and/or require emergency medical assistance. Individual citizens should have the ability to summon help rapidly in an emergency situation whether for medical, police, fire, rescue, or other emergency needs. Local, statewide, and national uniformity is required to fully enable this concept.

The State of Florida 9-1-1 Emergency Telephone Number Plan has provided for a cohesive statewide emergency telephone number "9-1-1" system to provide citizens with this rapid direct access to public safety agencies. The 9-1-1 Plan was developed in response to the Florida Emergency Telephone Act of 1974.

### **3.3 Vehicle Dispatch and Response (VDR)**

On notification of need for emergency medical assistance, the communications system shall enable prompt dispatch of all required EMS vehicles to the location of the emergency. The communications system must further enable dispatchers to communicate with responding vehicles while en route to the scene, while at the scene, while en route to hospital emergency department facilities, and during their return to availability for further assignment.

#### **3.3.1 Automatic Vehicle Location (AVL)**

Use of AVL systems can provide real-time geographic location of vehicles to ensure the nearest available vehicle is dispatched to the scene of an incident. Additionally, an AVL system can display vehicle positions to dispatchers on either tabular and/or graphic displays as well as providing the information necessary to a Computer-Aided Dispatch (CAD) program when utilized in a "System Status Management" structure. Consequently, these capabilities are considered an integral component of VDR.

#### **3.3.2 Crew Alert Paging**

In addition to Vehicle Dispatch and Response (VDR), some EMS communications systems may require the direct alerting of EMS personnel either individually or in groups. This can be accomplished through the use of either a monitor or paging receivers, or by means of portable radios with selective call capability. This concept is limited only to such alert paging required to facilitate the immediate response and action of personnel resulting from a request for emergency medical services.

### **3.4 Local Medical Coordination (LMC)**

The EMS communications system shall provide EMS field personnel with a communications system and/or channel that permits the exchange of vital information between EMS, emergency departments and/or medical directors. Minimally, the LMC channel shall have the capability to provide communications capability to

emergency department personnel with a five (5) minute notification while enroute to an emergency department facility.

### **3.4.1 Proprietary Local Medical Coordination (800 MHz Trunked Radio Systems)**

EMS communications systems may migrate to specialized radio “trunked” systems that will shift LMC communications to a proprietary radio infrastructure. Radio systems that employ this technology will meet those agencies requirements for LMC communications that provide EMS field personnel with a communications system that permits the exchange of vital information between EMS, emergency departments and/or medical directors. In that these systems are proprietary in nature they will not meet the requirements specified within this plan required for emergency departments, per Section 3.4.2.

### **3.4.2 Geographical Assigned Hospital LMC**

To meet the demands associated with isolated critical situations, Mass Casualty Incidents, MCIs, and to provide a “stand alone” radio system, hospitals will be assigned a specific UHF MED channel. Minimally, the LMC channel shall have the capability to provide communications capability to emergency department personnel with a five (5) minute notification while an EMS transport unit is enroute to an emergency department facility. In accordance with FCC rules the repeater, FB2, channel will and/or shall be 12.5 KHz capable.

### **3.5 Countywide Medical Coordination (CMC)**

In addition to VDR capability, the EMS communications system within a county should provide a secondary CMC communications channel to enable dispatch and response between EMS field personnel, hospital emergency departments and dispatch center personnel during isolated critical situations MCIs during which prolonged use of the VDR channel would not be feasible due to normal and/or other VDR communications traffic. Such uses of the Countywide Medical Coordination (CMC) channel must be limited only to the temporary duration of such situations. Ideally this channel should provide communications while the units are at the scene of the medical emergency. In addition to LMC capability, the EMS communications system can utilize the CMC channel to provide a communications channel to enable medical coordination between EMS field personnel and emergency department personnel during situations in which a vehicle is unable to access an emergency department LMC channel in isolated critical situations during which prolonged use of the LMC channel would not be feasible due to other LMC communications traffic. Such uses of the CMC channel must be limited only to the temporary duration of such situations.

### **3.6 Statewide Medical Coordination (SMC) MED-8**

In addition to VDR capability, the EMS communications system shall provide a communications channel to enable dispatch and response between EMS units, dispatch centers and emergency departments during situations in which a vehicle is out of its prime area and unable to access a dispatch center using the VDR channel of that area, mutual-aid communications, and in isolated critical situations MCIs during which prolonged use of the VDR channel would not be feasible due to normal and/or other VDR communications traffic. Such uses of the SMC channel must be limited only to the temporary duration of such situations.

In addition to LMC and/or CMC capability, the EMS communications system must provide a communications channel to enable medical coordination between EMS field personnel and emergency department personnel during situations in which a vehicle is out of its prime area and unable to access an emergency department using the LMC or CMC channels of that area, mutual-aid communications, and in

isolated critical situations during which prolonged use of the LMC or CMC channel would not be feasible due to other LMC communications traffic. Such uses of the SMC channel must be limited only to the temporary duration of such situations.

### **3.7 Local Scene Coordination (LSC)**

The EMS communications system should have the capability for mobile and portable radios of the same local area to communicate directly unit-to-unit while on the scene of an emergency requiring multiple vehicle response. The LSC channel shall be the “talk-around” channel assigned with the CMC for that county.

### **3.8 Statewide-Scene Coordination (SSC)**

The EMS communications system should have the capability for mobile and portable radios from different local areas to communicate directly unit-to-unit while on the scene of an emergency requiring multiple vehicle response. The SSC channel within the state of Florida is the “talk-around” channel associated with MED-8, 463.1750 simplex PL 167.9.

### **3.9 Medical Resource Coordination (MRC)**

The EMS communications system must provide a direct wireless coordination of EMS resources between hospitals, providers, and dispatch centers for response to a disaster or mass casualty incident. Telephone lines between dispatch centers can be used for resource coordination during normal operations; however, radio communications are needed during situations following hurricanes, tornadoes, floods, fires, etc., when telephone lines, including cellular systems, are inoperative, or when telephone central office switching facilities are jammed or disabled. Typical MRC communications shall be provided by the SMC, MED-8, system unless otherwise approved by the STO.

### **3.10 Biomedical Telemetry**

Biomedical telemetry is the process through which data relating to one or more biological functions of a patient are transmitted by radio or other means, and which are then remotely received, displayed and/or printed for use by emergency department personnel. Requirements for biomedical telemetry are subject to the determination of the provider's medical director in accordance with the Administrative Rules of the Florida Department of Health.

### **3.11 Interagency/Mutual Aid Coordination**

Medical emergencies often involve the response of other public safety services, most commonly police and fire. Interagency communications are needed to support daily EMS operations and mutual aid agreements, for the cooperative action of all emergency response units during disaster situations and at those times when the county Emergency Operations Center (EOC) is involved. Although the various services generally operate on different radio frequencies, interagency radio communications can be provided by use of such mechanisms such as radio and/or voice over internet protocols (RoIP or VoIP), mobile relay control stations, cross-band operations, and inter-service use of common radio frequencies. Telephone lines between dispatch centers can be used for interagency coordination during normal operations; however, radio communications are needed during disaster situations following hurricanes, tornadoes, floods, fires, etc., when telephone lines are inoperative, or when telephone central office switching facilities are jammed or disabled. Table 4-1 provides a list of wide-area and statewide interservice and/or mutual aid frequencies currently in use.

### **3.12 Back-up Communications**

The concept of back-up communications is in general, the provision of sufficient equipment and procedures to enable an overall improvement in system reliability over time, through either redundancy or the provision of alternate means. With regard to EMS communications specifically, the concept of back-up communications is applied to base station or other fixed radio equipment and is to:

- A. Enable VDR communications to continue despite outage of the primary VDR radio base station.
- B. Enable CMC communications to continue despite outage of a primary CMC radio base station.
- C. Enable LMC communications to continue despite outage of the primary LMC radio base station.

In this plan, the back-up communications concept includes only fixed station radio equipment, and does not include any communications other than VDR, CMC, LMC and SMC.

### **3.13 Telephone Interconnection**

The EMS communications system may provide interconnection with specialty information and treatment centers for hazardous material spills, burn, hyperbaric oxygen, spinal cord injury, and neonatal centers. In addition, the required level of confidentiality may exceed what is typically available within land-mobile radio systems. This concept includes the ability for EMS personnel to exchange information directly with sources located outside their EMS communications system and at diverse locations only accessible via the public switched telephone network.

## **4.0 FREQUENCY PLAN**

### **4.1 Background**

The FCC created the EMRS out of the SERS. Effective April 2, 1993, FCC Rules designated International Municipal Signal Association/International Association of Fire Chiefs (IMSA/IAFC) as the certified frequency coordinator for EMRS. The FCC concluded with their discussion in the Report & Order of PR Docket No. 91-72 that the IMSA/IAFC is expected "...to verify that all applicants are compatible with existing regional and local emergency medical plans."

This change in FCC Rules was not intended to displace local and state planning efforts, but rather to ensure a single point of contact to the Commission for matters relating to applications for coordination and licensing as well as to provide a nationally uniform and efficient procedure for such applications.

In view of this FCC requirement, it is apparent that any successful local or state radio frequency planning effort must be consistent with the FCC-certified coordinating organization procedures. The STO will maintain liaison with the certified coordinator toward the mutual goal of effective and efficient use of the radio spectrum by EMS agencies within Florida.

### **4.2 Channel Allotment Principles**

Within the domain of the PLMR services, CFR 47, and the limits of frequency modulation (FM) radio technology, there are two basic approaches to the assignment of radio channels consistent with the principles of spectrum efficiency and effectiveness. They are the Geographic Allotment method and the Real-Time

Allotment method. Of these, the Geographic method is simpler and less costly to implement, particularly for small systems in less frequency-congested areas. The Real-Time method results in considerable improvement in spectrum efficiency and freedom from harmful interference in more congested areas.

Spectrum efficiency is the extent to which radio traffic occupies radio channels over a large geographic area. Greater spectrum efficiency demands that channel bandwidth be minimized, channels be re-assigned as closely as possible, and that traffic loading on each channel be maximized. Application of this principle is of critical importance in most areas of the state.

Spectrum effectiveness, on the other hand, is the extent to which the necessary channel is available when and where needed, and is free from harmful interference. The fundamental goal in any radio channel allotment scheme is, therefore, to achieve the necessary effectiveness, while maintaining the greatest efficiency.

#### **4.2.1 Harmful Interference**

A. Co-channel Interference: For frequencies below 470 MHz, harmful interference is defined by this Plan as an "undesired" signal received instead of the "desired" signal. Technically, the undesired signal must have greater than a 5% probability of exceeding a power level of 12 dB, 6dB in base-to-base situations, less than a desired signal power level, when the desired signal has a 95% probability of achieving a power level required to produce either 20 dB quieting or 17 dB SINAD per the Telecommunications Industry Association/Electronics Industries Association (TIA/EIA). For channels in the 470 and 806 MHz bands, channel allocation principles and interference criteria are governed by FCC Rules. For channels in the 821 MHz band, channel allocations principles and interference criteria are governed by the Florida - Region 9 Plan for Public Safety Radio Communications.

B. Adjacent-Channel Interference: Adjacent-channel interference is defined as "harmful" when a desired 95% reliability signal is degraded by an undesired 5% reliability adjacent channel signal by more than the criteria established by TIA/EIA standards. Channel assignments are based on an analytical showing of no harmful interference. Adjacent channel interference is not normally considered in other frequency bands except for the criteria established in the Florida - Region 9 Plan for Public Safety Radio Communications.

#### **4.2.2 Geographic Allotment**

Geographic Allotment is the assignment of a channel such that a licensee has generally full-time and exclusive use of that channel within an agreed geographic area. Once assigned, the channel is dedicated to that user and is not available for others even when the channel is not in use. In practice, channel sharing agreements, or primary/alternate schemes, will further improve channel efficiency in such a system, but only to a limited extent. As channel loading for any user increases, the benefits of channel sharing and alternate channel agreements decrease.

The Geographic Allotment method is both successful and practical in those areas where the radio traffic is either sufficiently low, and/or that the available spectrum satisfies all user needs within a "channel re-use distance" of roughly 70 miles. Within the state of Florida, application of the Geographic Allotment concept presents special difficulties since the majority of the state, from the panhandle through the peninsula, is scarcely more, and often less, than 100 miles in width.

The Geographic Allotment method is normally applied on all VHF channels, both Low and High Bands, and 800 MHz conventional, non-trunked, channels. The 450-470 MHz (UHF) Band utilizes both Geographic and Real-Time Allotment in the case of EMS Communications.



### **4.2.3 Real-Time Allotment**

Real-Time Allotment is the process through which each available radio channel is assigned to a particular communications path by the dispatch center, mobile/base link, on an as-needed incident-by-incident basis, and such that the same channel may be assigned to many different users, at different times, all within the same geographic area. The Real-Time Allotment method requires that each mobile radio and the base station system be capable of transmitting and receiving on all of the radio channels to be allocated.

In practice, mobile radios are normally equipped with all necessary channels, while fixed control points operate via direct control, wireline or other link through a central base station facility, which is also equipped to transmit and receive on all necessary channels. A fundamental requirement for fully successful operation of a Real-Time Allotment system is that the reliable radio coverage area of each base station channel be very nearly the same.

The "trunking" concept is similar to Real-Time Allotment in that channel assignments vary with respect to time rather than with respect to geography. However, computer-controlled trunking systems still require approximately 70-mile minimum separation between systems using the same frequencies, whereas Real-Time Allotment systems when properly designed and dispatcher-controlled normally do not. This difference is due to the ability of the Real-Time system to acknowledge channel usage in adjacent systems, whereas trunking technology to date does not provide this capability.

The Real-Time Allotment method, within Florida Emergency Medical Services communications, is normally applied only on MED channels 1 through 72 of the UHF Band portion of the Emergency Medical Radio service.

## **4.3 Vehicle Dispatch and Response Channels**

### **4.3.1 Ground Vehicle Communications**

Any radio frequency or frequencies for which the applicant is eligible under FCC Rules, and meets the requirements of this Plan and FCC limitations, may be used for Dispatch and Response communications with EMS ground vehicles. This includes VHF Low Band, 30-50 MHz, VHF High Band, 150-160 MHz, 220 MHz Band, UHF Band, 450-473 MHz, including UHF TV channel sharing frequencies in Florida, and the 800 MHz Band, in both conventional and trunked modes.

The use of MED channels 9, 92, 10 or 102 for VDR shall be in accordance with the Plans statewide allotment plan for these frequencies. Currently approved frequency and CTCSS tone allotments of MED-9 92, 10 or 102 are shown on Table 4-1, Florida MED Channel Allotments.

The use of any of MED channels 1 through 72 for VDR shall also be in accordance with the Plan's statewide allotment plan, and such allotments are subject to no harmful interference to LMC and/or CMC operations on these channels. MED-8 shall not be used for primary VDR communications except to satisfy the SMC and/or back-up requirements defined in Section 5.0.

### **4.3.2 Air Ambulance Communications**

Communications for aeromedical services may utilize certain radio frequencies within the Aviation Services of FCC Rules Part 87, "Aeronautical Enroute and Aeronautical Fixed Stations." The scope for Aeronautical Enroute stations is limited to the necessities of safety and primary operation of the aircraft. Sub-part I does

not allow for medical communications. These channels are associated with Air-traffic Control Centers, Airport Control Towers and “Unicom” communications systems. By design these radio systems are limited in the communications coverage capabilities they would provide for low flying rotorwing aircraft. Given the limitations, by rule and/or design, associated with these radio channels their use by prehospital for flight following is not recommended for flight following.

Frequencies within the applicable PLMR services of FCC Rules Part 90 may be utilized for Air Ambulance Dispatch and Response and/or Medical Coordination on a secondary basis to land-based systems. Licensing for implementation or expansion of air ambulance communications on any frequencies within the Public Safety or Special Emergency Radio Services requires prior approval by the STO.

STO has established specific radio frequency allotments both “Air Primary” and “Air Secondary” within Florida for aeromedical Dispatch and Response Communications. Rotor-winged aircraft that are licensed for prehospital will be assigned specific UHF pair within the 453/458 MHz band as Air Primary for VDR. Rotor-winged aircraft, which provide inter-facility transports only, will be licensed in the VHF-Lo Band, 47 MHz. STO will assist these agencies with waivers to the FCC rules to increase the output power of the radio from the aircraft to facilitate the longer transports associated with these aircraft.

All licensed rotor-winged aircraft and dispatch centers within the state of Florida shall have the ability to communicate on the Air Secondary frequency 155.340 MHz with a CTCSS, PL tone, of 167.9 Hz. This provides continued flight following with the aircraft while medical crews utilize their UHF, MED Channel radio to provide medical reports (LMC, SMC or MRC). Secondly this circuit provides a “Statewide” radio system for MCI coordination with aircraft that would necessitate communications with the various aircraft, dispatch centers and/or landing zone management. Further, this frequency shall provide EMS helicopter personnel with continued safety of flight situations in which a vehicle is out of its prime area an unable to access its dispatch center. Such use of the Air Secondary channel shall be limited only to the temporary duration of such situations unless otherwise approved in writing by the STO. This VHF radio circuit is also in concert with the Mutual Aid channels “Red, White and Blue” recommended by the State.

#### **4.4 Countywide Medical Coordination Channels**

MED channels 1 through 72 shall normally be used for primary CMC for both ground and air ambulance vehicles. Use of these channels shall be in accordance with the Plan's statewide allotment plan. Currently approved frequency and CTCSS tone allotments for MED-1 through MED-72 are shown on Table 4-2, Florida MED Channel Allotments.

If the primary CMC channel to be implemented or expanded would cause harmful interference to or from the primary LMC channel of another user, then the STO will analyze the channel allotments of all affected systems and establish an appropriate plan that may require the reconfiguration of existing systems.

The use of any radio frequencies other than MED-1 through MED-72 for primary CMC shall be only as specifically approved by the STO.

MED-8, 82 MED-9, 92 and MED-10, 102 shall not be used for primary LMC except for MED-8, which may be used to satisfy the SMC and/or back-up requirements defined in Section 5.0.

#### **4.5 Local Medical Coordination (LMC) Channels**

The primary requirements of the EMS Communications Plan are for every permitted vehicle to have the capability for two-way radio communications with a higher level of medical care “Medical Control.”

Specifically, this capability should exist for radio communications should the EMT/firefighter/paramedic need to deviate from established medical protocols and/or request additional medical assistance from the medical director and/or hospital. Accordingly, every hospital emergency department shall have the capability to reliably communicate to at a least 5-mile radius of its facility on the LMC UHF channel approved or assigned by the STO in accordance with Section-5 of this Plan.

#### **4.6 Medical Resource Coordination (MRC) Channels**

Historically, two primary channels for Medical Resource Coordination within Florida have been MED-8, simplex on 463.175 MHz with CTCSS of 167.9 Hz, and 155.340 MHz. Each of these channels is used for MRC communications in parts of the state, and each has advantages and disadvantages depending on both geographic location and technical considerations.

In northern Florida, MED-8 is generally used due to other uses of 155.340 MHz within Georgia and Alabama. MED-8 is used in many other parts of Florida where 155.340 MHz is in use for land-mobile communications.

155.340 MHz is used in some areas where MED-8 point-to-point use has been determined unfeasible. In some of the more congested areas of the state, neither channel is in use for either technical problems with interference, or simply the lack of a wireless MRC system. Microwave and 800 MHz communications are other systems that may potentially qualify as the MRC channel for a geographic region.

The establishment of a cohesive network of MRC systems within Florida is a goal of the STO. Until such a plan is established, the implementation or expansion of MRC systems will be determined on a case-by-case basis.

#### **4.7 Statewide Medical Coordination (SMC) Channel**

MED-8, 463.175 MHz base transmit, 468.175 MHz base receive, with CTCSS of 167.9 Hz, shall be used for primary SMC for permitted vehicles during times the vehicles are used outside their normal operating area, and CMC, LMC or VDR channels are not available. MED-8 was segregated by the Plan and established as the only UHF MED channel for SMC. The capabilities of the SMC channel are designed to provide two objectives within the EMS community. Primarily, every licensed EMS transport, regardless of other frequencies radio systems employed within their primary region, could communicate with a hospital in an adjacent city or county if necessary. Additionally, EMS systems in the state have established MED-8 SMC capabilities within their communications/dispatch centers to provide assistance for out-of-county EMS units while in transit through the county and backup to the EMS Dispatch Channel. Simply put, MED-8 has been established to maintain radio communications with emergency departments and/or other EMS communications systems throughout the state while transporting patients. The intent of the Plan is to establish a common medical communications system, channel, which would provide the EMT/paramedic the ability to communicate within a county and/or municipality regardless of that agency's primary communications infrastructure.

##### **4.7.1 SMC (MED-8) System Standard**

A. Design Specifications: This plan provides for a statewide system for selective activation of regional MED 8/SMC repeater stations and secondary addressing of local emergency departments and county EMS dispatch centers to satisfy the SMC requirements of the EMS Communications Plan. The end user accomplishes all necessary selective signaling. Other than the initiating party and the receiving party, no additional human intervention will be necessary to establish or maintain two-way radio communication via this addressing system.

These signaling aspects of this plan anticipate the use of Dual-Tone Multi-Frequency (DTMF) for selective access to repeaters and selective addressing of individual stations. The DTMF is an industry standard tone scheme used for audio signaling and control purposes and is generally defined as the simultaneous generation of two specific audio tones, such as when any one button of a standard DTMF keypad is depressed. DTMF is compatible with the original AT&T “Touch-Tone®” system initially used in telephone systems.

The overall architecture of the proposed MED 8 statewide radio system will provide for extended-range, vehicle-to-base communication by virtue of at least one wide-area SMC repeater in each county. Note that all SMC repeaters employ the identical MED 8 frequency and CTCSS tone in accordance with the state EMS Communications Plan regardless of their geographic separation. Consequently, it is essential that all MED 8 repeaters must remain in the repeat disable mode unless actually being used to relay a communication between two radio stations. Otherwise, it is likely that nearby repeaters will interfere with one another and disrupt or altogether prevent any associated radio communications.

Another feature of the radio system is the continued ability to operate, within normal range limits, even if repeaters are not available due to equipment failure, severe weather, or other reasons. This capability, applies to both mobile and control, base, stations, is typically known as repeater talk-around (SSC). When operating in talk-around mode, the DTMF signaling aspects of the system are fully preserved subject, of course, to the native range of the radios involved in any particular exchange. If extended talk-around range is required for any particular hospital or dispatch facility, consideration should be given for use of an omni-directional antenna for the MED 8 control station, rather than the directional antenna typically provided.

B. Procedures: In a typical MED 8 communication in fictitious Paradise County, county code 68, a mobile radio user would activate the appropriate regional MED 8 repeater by sending DTMF codes “6”, “8” and “1”, designating the first and only repeater in county 68, immediately followed by a “\*”, wake-up, code if required. Once the repeater is activated, the mobile user would address the desired control station and these signals would be re-transmitted and heard by all monitoring MED 8 stations. If necessary, a DTMF re-generator could be installed in the repeater station to improve the purity of the re-transmitted tones.

In this example, the mobile unit would transmit “6827” to activate the control station decoder at the emergency department of County General Hospital. Upon hearing the correct DTMF sequence, the control station at the hospital would decode, wake up, and the staff could hear the subsequent voice call. If desired, the hospital decoder could also activate some type of attention-getting device to ensure that the emergency department staff is made aware of an incoming call. Once the staff answers the radio call, the radio exchange will continue until completed, at which time the staff could manually reset the decoder, or the decoder could be set to reset automatically after a pre-determined time-out period.

At the same time, the mobile unit crew would deactivate the regional repeater by sending DTMF codes “6”, “8”, and “1”, followed by a “#”, knock-down, code if required. The repeater would then revert to the repeat-disable mode and monitor the receive frequency for any subsequent calls.

NOTE: Should a regional repeater be out-of-service for whatever reason, the same basic calling procedures would apply after first switching to the repeater-talk-around, simplex, mode of operation.

C. Requirements: Each MED 8-capable mobile radio will be equipped with a relatively inexpensive DTMF encoder microphone.

Each regional MED 8 repeater station will be equipped with a DTMF decoder, set to respond to at least two groups of DTMF tones, and an internal DTMF re-generator.

Each MED 8 control station will be equipped with a DTMF decoder, set to respond to the assigned sequences of DTMF tones, as well as a DTMF encoder keypad for addressing other SMC stations.

Both control stations and mobile radios will have repeater-talk-around, simplex, capabilities.

Each county will install at least one wide-area coverage MED 8 repeater, which will be kept in the repeat-disabled mode by default, until activated via the appropriate over-the-air DTMF tone sequence. The MED-8 repeater will automatically revert to the repeat-disable mode if no activity on the repeater is utilized after 5 minutes.

Additional MED 8 repeaters can be installed, as required, to provide adequate mobile communications access throughout the particular coverage area.

Each county will be assigned a unique two-digit county code, example: 68, each regional repeater will be assigned a related three-digit address, example: 681, and each control station will be assigned a unique four-digit address, subordinate to the county code, example: 6815.

This scheme will allow for up to 99 counties with up to nine regional repeaters and nearly 100 uniquely addressed control stations per county. In addition, all DTMF decoders will respond to a two-digit code (00) as a statewide ALL-CALL address, within radio range, a four-digit common address as a countywide call, example: 6899, and a unique four-digit individual address, example: 6842.

D. Statewide DTMF Addresses:

The following list of primary county DTMF addresses was derived from an alphabetical list of Florida counties compiled by the state EMS office for reporting purposes:

01 ALACHUA	19 FRANKLIN	37 LEON	55 ST. JOHNS
02 BAKER	20 GADSDEN	38 LEVY	56 ST. LUCIE
03 BAY	21 GILCHRIST	39 LIBERTY	57 SANTA ROSA
04 BRADFORD	22 GLADES	40 MADISON	58 SARASOTA
05 BREVARD	23 GULF	41 MANATEE	59 SEMINOLE
06 BROWARD	24 HAMILTON	42 MARION	60 SUMTER
07 CALHOUN	25 HARDEE	43 MARTIN	61 SUWANNEE
08 CHARLOTTE	26 HENDRY	44 MONROE	62 TAYLOR
09 CITRUS	27 HERNANDO	45 NASSAU	63 UNION
10 CLAY	28 HIGHLANDS	46 OKALOOSA	64 VOLUSIA
11 COLLIER	29 HILLSBOROUGH	47 OKEECHOBEE	65 WAKULLA
12 COLUMBIA	30 HOLMES	48 ORANGE	66 WALTON
13 DADE	31 INDIAN RIVER	49 OSCEOLA	67 WASHINGTON
14 DESOTO	32 JACKSON	50 PALM BEACH	70 KENNEDY SPACE CENTER
15 DIXIE	33 JEFFERSON	51 PASCO	71 PENSACOLA NAVAL AIR STATION
16 DUVAL	34 LAFAYETTE	52 PINELLAS	72 TYNDALL AIR FORCE BASE
17 ESCAMBIA	35 LAKE	53 POLK	73 MACDILL AIR FORCE BASE
18 FLAGLER	36 LEE	54 PUTNAM	74 PATRICK AIR FORCE BASE
			75 JACKSONVILLE NAVAL AIR STATION
99 COUNTYWIDE ALL CALL SUFFIX			
00 STATEWIDE ALL CALL PREFIX			

E. In-County DTMF Addresses:

Each individual county will be responsible for assigning DTMF codes to repeaters and control stations within their respective area in strict accordance with the addressing scheme noted in this plan. The following is an example addressing the scheme for “Paradise County”:

NORTH (primary) MED 8 repeater access—681  
SOUTH (secondary) MED 8 repeater access—682  
Countywide ALL-CALL code—6899  
County EMS dispatch center—6801  
Hospital A—6823  
Hospital B—6834  
Hospital C—6838  
Hospital D—6842  
Hospital J—6859  
City A EMS dispatch center—6863  
City B EMS dispatch center—6867  
County Emergency Management/EOC—6874  
Private ambulance dispatch center—886

NOTE: in this example that the first two digits are always 68 or the county code, while the second two digits can be randomly assigned, but must result in a number that is not assigned to any other station within the County.

F. Equipment Considerations:

1. Mobile Units: All MED 8-equipped mobile radios are essentially capable of operation on the new system. Additional programming may be required to add talk-around capability. DTMF replacement microphones are readily available from numerous sources and can be attached to most mobile radios with little difficulty.
2. Repeaters: DTMF decoding and re-generating devices are generally available for LMR fixed equipment. The STO has identified an appropriate, readily available product that can be attached to most typical MED 8 repeater stations by local technicians.
3. Hospitals: If a hospital or dispatch center currently has a separate MED 8 station, it may be possible to convert the existing equipment to the new configuration. However, those medical facilities that currently operate primary or backup repeater stations that function on one or more of the standard MED channels may wish to leave that equipment undisturbed. Rather than attempting to integrate the new MED 8 functionality into existing radio equipment, it may ultimately be more cost-effective for hospitals and dispatch centers to purchase a small UHF RF control station specifically configured for remote control, talk-around, and built-in DTMF signaling.
4. DTMF Devices: As noted above, the necessary DTMF functionality could be incorporated into the RF control station itself. Alternatively, a separate customized remote control device with DTMF encode and decode capabilities could be utilized in concert with a standard RF control station. A compatible desktop DTMF remote control device that has already been tested on a similar radio system in Florida is available from Zetron. DTMF decoding devices from other manufacturers may also be compatible with the proposed MED 8 system signaling parameters.

G. Mobile Radio Configurations: In order to realize the most utility and flexibility for a common statewide EMS radio system, all associated mobile radios should be configured in essentially the same way, that is standardized configuration.

## 4.7.2 Interservice/Mutual Aid Channels

Radio channels for interservice and mutual-aid operations may be utilized only within the provisions of FCC Rules and Regulations, Part 90, "Operating Requirements". The portions of those rules applicable to EMS organizations are summarized in Section 4.7.1 below. Contingent on eligibility or licensee concurrence, specific wide-area and statewide channels may be used for Interservice/Mutual Aid. Such operations are discussed in Section 4.7.2.

## 4.7.3 FCC Rules

FCC Rules relating to interservice and mutual aid communications can be classified into the following General Rules, and rules for Base Station Communications, and Mobile Unit Communications:

A. General Rules are established for:

1. Interstation Communications in Part 90.417(a) & (b).
2. Civil Defense Communications in Part 90.411.

B. Base Station Communications are established for:

1. Frequencies Below 450 MHz in Part 90.419(a).
2. Frequencies Above 450 MHz in 90.419(b).

C. Mobile Unit Communications are established in Part 90.421 for the operation of mobile units in vehicles not under the control of the licensee. Arrangements for such use are normally made by means of written agreement between the licensee and user. Refer to the sample sharing agreement below. The written agreement should include the following:

1. Typed on the agency's letterhead granting the sharing agreement.
2. State the quantity of mobile, or portable radios covered in the agreement.
3. State the call sign, frequency(ies), and maximum power output associated with the written agreement, and other technical parameters authorized on the granting agency's radio station license.
4. State the written agreement applies to operations in cooperation and coordination with the activities of the licensee per FCC Rule Part 90.421.
5. State the granting agency's reserved right to effectively eliminate the possibility of unauthorized operation that ultimately could result in terminating the written agreement.

Overall, FCC Rules '90.421 does not specifically provide for interservice mobile operation by emergency medical eligibles on frequencies in the Fire, Highway Maintenance, or Forestry-Conservation Radio Services, or on any non-Public Safety frequencies. Part 90.421(k) however, provides a general rule regarding mobile unit communications such that "...frequencies assigned to licensees in the PLMR services may be installed in the facilities of those who assist the licensee in emergencies and with whom the licensee must communicate in situations involving *imminent safety to life or property.*"

**4.7.4 Example of a written agreement**

\_\_\_\_\_ (grantor) authorizes \_\_\_\_\_ (grantee) to operate \_\_\_\_\_ (quality) mobile (or portable) radios. Such operation shall be per the following parameters.

<u>Call Sign</u>	<u>Frequency(ies)</u>	<u>Max. Power</u>	<u>Other Technical Parameters</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

(Use additional attachments as necessary for more frequencies/channels)

This written agreement applies to operations in cooperation and coordination with activities of the licensee per FCC Rule Part 90.421. Furthermore, grantor reserves the right to effectively eliminate the possibility of unauthorized operation that ultimately could result in terminating this written agreement.

\_\_\_\_\_ (authorized signor)

\_\_\_\_\_ (typed signor's name)

\_\_\_\_\_ (authorizing agency)

\_\_\_\_\_ (date)

**4.7.5 Florida UHF MED Channel Allocations**

Within FCC Rules Part 90, many frequencies may be used for interservice and mutual-aid operations on a local basis by EMS organizations consistent with the FCC limitations summarized in Section 4.7.1. On a wide-area or statewide basis however, only a small number of channels are available for such use, and are listed in Table 4-1.

The use of these or any other frequencies for interservice/mutual-aid use for which the user is not directly eligible, must be in accordance with the applicable FCC Rules.



**TABLE 4-1  
WIDE-AREA AND STATEWIDE  
INTERSERVICE/MUTUAL-AID FREQUENCIES**

<u>FREQUENCY</u> Base Tx/Rx (MHz)	<u>CTCSS</u> (Hz)	<u>RADIO</u> <u>SVC</u>	<u>PRIMARY USE</u>	<u>AREA</u>
39.10/39.10	156.7	PL	Emergency Management (Civil Defense)	Statewide
39.18/39.18	156.7	PL	Emergency Management (Civil Defense)	Statewide
45.86/45.86	None	PP	Law Enforcement Emergency	Wide-Area
154.950/154.950	None	PP	Law Enforcement Emergency	Wide-Area
460.275/465.275	None	PP	Law Enforcement Emergency	Wide-Area
155.370/155.370	None	PP	Law Enforcement Intercity	Statewide
154.265/154.265	None	PF	Fire Mutual-Aid "Red" (Mobile Only)	Statewide
154.280/154.280	None	PF	Fire Mutual-Aid "White" (Base Only)	Statewide
154.295/154.295	None	PF	Fire Mutual-Aid "Blue" (Mobile Only)	Statewide
155.340/155.340	None	PM	EMS Intersystem Mutual Assistance	Statewide
	167.9	PM	EMS Helicopter Air Secondary	Statewide
463.175/463.175	167.9	PM	Statewide Scene Coordination	Statewide
463.175/468.175	167.9	PM	EMS Statewide Medical Coordination and EMS Medical Resource Coordination	Statewide
853.3875/808.3875	210.7	GP	Public Safety/Special Emergency Mutual- Aid Channel (FCC Channel 96) <sup>4</sup>	Statewide
866.0125/821.0125	156.7	GF	National Public Safety Calling Channel (FCC Channel 601) <sup>5</sup>	Nationwide
866.5125/821.5125	156.7	GF	National Public Safety Tactical Channel #1 (FCC Channel 639) <sup>5</sup>	Nationwide
867.0125/822.0125	156.7	GF	National Public Safety Tactical Channel #2 (FCC Channel 677) <sup>5</sup>	Nationwide
867.5125/822.5125	156.7	GF	National Public Safety Tactical Channel #3 (FCC Channel 715) <sup>5</sup>	Nationwide
868.0125/823.0125	156.7	GF	National Public Safety Tactical Channel #4 (FCC Channel 753) <sup>5</sup>	Nationwide

<sup>4</sup> See Section 4.7.

<sup>5</sup> See Section 2.3.

**Florida Countywide MED Channel & CTCSS Allotments**

COUNTY STATE IDNT	MED CHANNEL NUMBERS										
	1	2	3	4	5	6	7	9	92	10	102
Alachua-ALC			118.8					118.8			
Baker-BAC	167.9										
Bay-BAO						167.9					
Bradford-BRD		94.8									
Brevard-BRV						127.3					
Broward-BRW					173.8					173.8	
Calhoun-CLN							156.7				
Charlotte-CHA			167.9					167.9			
Citrus-CIR			167.9					167.9			
Clay-CLA					167.9						
Collier-COL							192.8	192.8			
Columbia-CLA							131.8				
Dade-MDC								203.5			
Desoto-DEU							131.8				
Dixie-DIX							118.8				
Duval-DVL						146.2				146.2	
Escambia-ESC		110.9						36.5		10.9	
Flagler-FLR						136.5					
Franklin-FRN			156.7/167.9								
Gadsden-GAD						203.5		203.5			
Gilchrist-GIL										94.8	
Glades-GLA											
Gulf-GLF		167.9								167.9	
Hamilton-HLN		210.7									
Hardee-HAR					127.3						
Hendry-HEN							107.3				
Hernando-HER	146.2			146.2			146.2				
Highlands-HIG	123.0									123.0	
Hillsborough-HIC							127.3			110.9	
Holmes-HMS			167.9								
Indian River-IRC				118.8						118.8	
Jackson-JAC					146.2						
Jefferson-JEF										156.7	
Lafayette-LAF				110.9							

COUNTY STATE IDNT	MED CHANNEL NUMBERS										
	1	2	3	4	5	6	7	9	92	10	102
Lake-LKC			32-192.8						192.8		
Lee-LEE				110.9						110.9	
Leon-LEO		156.7						156.7			
Levy-LVY					127.3						
Liberty-LBE							156.7				
Madison-MAD			146.2								
Manatee-MNT				167.9							
Marion-MAO						127.3	127.3			127.3	
Martin-MTC							146.2			146.2	
Monroe-MON							156.7				
Nassau-NAS		136.5									
Okaloosa-OKA		156.7									
Okeechobee-OKC						167.9					
Orange-ORA							156.7			156.7	
Osceola-OSC				114.8						114.8	
Palm Beach-PBC	127.3		127.3	127.3				127.3			
Pasco-PSC				110.9							
Pinellas-PIN			203.5								
Polk-POL			103.5					203.5		203.5	
Putnam-PUT				103.5				103.5			
St. Johns-SAJ		167.9									
St. Lucie-SLU	136.5										
Santa Rosa-SRC	136.5										
Seminole-SEM		110.9									
Sumter-SUM							72-192.8		192.8		
Suwannee-SUW						110.9					
Taylor-TAY	118.8										
Union-UNC				156.7							
Volusia-VOL	136.5							136.5			
Wakulla-WAK						156.7					
Walton-WTN				167.9							
Washington-WSN		146.2									

## **5.0 SYSTEM REQUIREMENTS**

### **5.1 General**

The primary requirements of the EMS Communications Plan are for every permitted vehicle to have the capability for two-way radio communications with a higher level of medical care "Medical Control." Specifically, this capability should exist for radio communications should the EMT/firefighter/paramedic need to deviate from established medical protocols and/or request additional medical assistance from the medical director and/or hospital.

The system requirements defined in the following sections are the requirements by which STO, EMS Communications approval or disapproval will be determined for implementation of new EMS communications systems or for expansion of existing systems.

These requirements relate only to "system level" attributes of communications systems; requirements for individual equipment items are defined in Section 6.0, EQUIPMENT REQUIREMENTS.

These system requirements make reference to specific EMS communications system concepts that are defined in Section 3.0.

For aspects of system configurations not explicitly included in the following sections, their approval will be determined on a case-by-case basis by STO.

As these system requirements are subject to change at the determination of the STO, EMS Communications section, please verify the most current requirements as may apply to a particular system application prior to a request for approval.

### **5.2 Communications Coverage Contour**

#### **5.2.1 Communications Reliability**

The area of reliable communications is defined as having been engineered for a 95% probability of communications at the defined coverage contour, or 98.3% probability of communications over the defined coverage area, based on a received signal level of either 20 dB quieting or 17 dB SINAD, EIA, for the worst case of either talk-out, base to mobile, or talk-back, mobile to base. The defined contour of reliable radio coverage shall normally be the boundary of the operating area for which the provider routinely operates unless the STO, EMS Communications has approved a different boundary for a particular system. This provides for reliable communications at 95% of the locations along the contour, 95% of the time. The probability improves as the associated radio transmitter/receiver site is approached, thus achieving a 98.3% probability across the area within the contour.

The coverage contour shall be the normal calculated coverage recommended and/or designed by the STO for stations established for primary use of VDR; stations serving only as a back-up to the primary station SMC and/or CMC may have a lesser coverage contour as approved by STO.

#### **5.2.2 VDR Channels**

VDR communications is the primary responsibility of an EMS agency. As such, each EMS agency has the sole responsibility and/or liability to provide the capability to rapidly dispatch an emergency response vehicle. Issues regarding the ability of an agency to meet the specifications associated with VDR communications will be determined based on Section 5.2.1, Communications Reliability.

Accordingly, at a minimum, each base and/or repeater station facility established for primary operation on VDR channels should be designed to enable reliable communications to and from *mobile* radio equipment. Further, should primary communications to and from *portable* radio equipment, system calculated for portable coverage, be utilized for communications then the system should be designed to enable reliable communications from inside the patient compartment.

### **5.2.3 SMC and/or CMC Channels**

Each base or repeater station facility established for primary operation on the SMC and the CMC channel shall be designed to enable at a minimum reliable communications to and from *mobile* radio equipment. The defined area of reliable radio coverage shall be such that:

- A. For counties having only one primary SMC station, the area shall be the boundary of the county for which the system operates.
- B. For counties having more than one primary SMC and/or CMC station, each station shall have a coverage area such that, at a minimum, the combined aggregate coverage areas of all such stations provides continuous reliable coverage within the boundary of the county for which the systems operate.

### **5.2.4 Radio Frequency Control Stations**

Communications reliability for Radio Frequency (RF) Control Stations is engineered for 99% probability of wireless communications point-to-point. This probability is based on a received signal level of either 20 dB quieting or 17 dB SINAD, EIA, for the worst case of either talk-out, Base to RF Control station, or talk-back, RF Control to Base station. If extended talk-around range is required for any particular hospital or dispatch facility, consideration should be given for use of an omni-directional antenna for the MED 8 SMC and/or CMC control station, rather than the directional antenna typically utilized.

### **5.2.5 Automatic Vehicle Location Channel**

Each base station facility established for primary operation on an AVL system for "System Status Management" shall be designed to enable reliable communications to and from radio equipment in permitted vehicles.

## **5.3 Statewide Medical Coordination (SMC)**

This procedure provides for a statewide system for selective activation of regional MED 8/SMC repeater stations and secondary addressing of local emergency departments and county EMS dispatch centers to satisfy the SMC and/or MRC requirements of the EMS Communications Plan. The end user accomplishes all necessary selective signaling. Other than the initiating party and the receiving party, no additional human intervention will be necessary to establish or maintain two-way radio communication via this addressing system. These signaling aspects of this plan shall utilize DTMF for selective access to repeaters and selective addressing of individual stations. The DTMF is an industry standard tone scheme used for audio signaling and control purposes and is generally defined as the simultaneous generation of two specific audio tones, such as when any one button of a standard DTMF keypad is depressed. DTMF is compatible with the original AT&T "Touch-Tone®" arrangement used in telephone systems throughout the world.

The overall architecture of the MED 8 statewide radio system will provide for extended-range, vehicle-to-base communication by virtue of at least one wide-area SMC repeater in each county, per Section 5.2.3. Note

that all SMC repeaters employ the identical MED 8 frequency and CTCSS tone in accordance with the state EMS communications plan regardless of their geographic separation. Consequently, it is essential that all MED 8 repeaters shall remain in the *repeat disable* mode unless actually being used to relay a communication between two radio stations. Otherwise, nearby repeaters will interfere with one another and disrupt or altogether prevent any associated radio communications.

Another feature of the radio system is the continued ability to operate, within normal range limits, even if repeaters are not available due to equipment failure, severe weather, or other reasons. This capability, which applies to both mobile and control base stations, is typically known as repeater *talk-around*. When operating in *talk-around* mode, the DTMF signaling aspects of the system are fully preserved subject, of course, to the range of the radios involved in any particular exchange. If extended talk-around range is required for any particular hospital or dispatch facility, consideration should be given for use of an omni-directional antenna for the MED 8 control station, rather than the directional antenna typically provided.

### **5.3.1 Concept and/or Procedures**

In a typical MED 8 communication in fictitious Paradise County, county code 68, a mobile radio user would activate the appropriate regional MED 8 repeater by sending DTMF codes “6”, “8” and “1”, designating the first and only repeater in county 68, immediately followed by a “\*”, wake-up, code if required. Once the repeater is activated, the mobile user would address the desired control station and these signals would be re-transmitted and heard by all monitoring MED 8 stations. If necessary, a DTMF re-generator could be installed in the repeater station to improve the purity of the re-transmitted tones.

In this example, the mobile unit would transmit “6827” to activate the control station decoder at the emergency department of County General Hospital. Upon hearing the correct DTMF sequence, the control station at the hospital would decode, wake up, and the staff could hear the subsequent voice call. If desired, the hospital decoder could also activate some type of attention-getting device to ensure that the emergency department staff is made aware of an incoming call. Once the staff answers the radio call, the radio exchange will continue until completed, at which time the staff could manually reset the decoder, or the decoder could be set to reset automatically after a five- minute time-out period.

At the same time, the mobile unit crew would deactivate the regional repeater by sending DTMF codes “6”, “8”, and “1”, followed by a “#”, knock-down, code if required. The repeater would then revert to the repeat-disable mode and monitor the receive frequency for any subsequent call. Should the crew not deactivate the repeater then an automatic 5-minute “no activity” limit would be met and the repeater would deactivate.

NOTE: Should a regional repeater be out-of-service for whatever reason, the same basic calling procedures would apply after first switching to the repeater-talk-around, simplex, mode of operation.

### **5.3.2 Requirements**

Each MED 8-capable mobile radio will be equipped with a DTMF encoder microphone.

Each regional MED 8 repeater station will be equipped with a DTMF decoder, set to respond to at least two groups of DTMF tones.

Each MED 8 control station will be equipped with a DTMF decoder, set to respond to the assigned sequences of DTMF tones, as well as a DTMF encoder keypad for addressing other SMC stations.

Both control stations and mobile radios will have repeater-talk-around, simplex, capabilities.

Each county will install at least one wide-area coverage MED 8 repeater, which will be kept in the repeat-disabled mode by default, until activated via the appropriate over-the-air DTMF tone sequence.

Additional MED 8 repeaters can be installed, as required, to provide adequate mobile communications access throughout the particular coverage area.

Each county has been assigned a unique two-digit county code per Section 5.3.2.1, each regional repeater will be assigned a related three-digit address, and each control station will be assigned a unique four-digit address, subordinate to the county code.

This will allow for up to 99 counties with up to nine regional repeaters and nearly 100 uniquely addressed control stations per county. In addition, all DTMF decoders will respond to a two-digit code (00) as a statewide ALL-CALL address, within radio range, a four-digit common address as a countywide call, example 6899, and a unique four-digit individual address, example 6842.

### 5.3.2.1 Statewide DTMF Addresses

The following list of primary county DTMF addresses was derived from an alphabetical list of Florida counties compiled by the state EMS Office for reporting purposes:

01 ALACHUA	37 LEON
02 BAKER	38 LEVY
03 BAY	39 LIBERTY
04 BRADFORD	40 MADISON
05 BREVARD	41 MANATEE
06 BROWARD	42 MARION
07 CALHOUN	43 MARTIN
08 CHARLOTTE	44 MONROE
09 CITRUS	45 NASSAU
10 CLAY	46 OKALOOSA
11 COLLIER	47 OKEECHOBEE
12 COLUMBIA	48 ORANGE
13 DADE	49 OSCEOLA
14 DESOTO	50 PALM BEACH
15 DIXIE	51 PASCO
16 DUVAL	52 PINELLAS
17 ESCAMBIA	53 POLK
18 FLAGLER	54 PUTNAM
19 FRANKLIN	55 ST. JOHNS
20 GADSDEN	56 ST. LUCIE
21 GILCHRIST	57 SANTA ROSA
22 GLADES	58 SARASOTA
23 GULF	59 SEMINOLE
24 HAMILTON	60 SUMTER
25 HARDEE	61 SUWANNEE
26 HENDRY	62 TAYLOR
27 HERNANDO	63 UNION
28 HIGHLANDS	64 VOLUSIA
29 HILLSBOROUGH	65 WAKULLA
30 HOLMES	66 WALTON
31 INDIAN RIVER	67 WASHINGTON
32 JACKSON	70 KENNEDY SPACE CENTER
33 JEFFERSON	71 PENSACOLA NAVAL AIR STATION
34 LAFAYETTE	72 TYNDALL AIR FORCE BASE
35 LAKE	73 MACDILL AIR FORCE BASE
36 LEE	74 PATRICK AIR FORCE BASE
	75 JACKSONVILLE NAVAL AIR STATION
99 COUNTYWIDE ALL CALL SUFFIX	
00 STATEWIDE ALL CALL PREFIX	

### 5.3.2.2 In-County DTMF Addresses

Each individual county will be responsible for assigning DTMF codes to repeaters and control stations within their respective area in strict accordance with the addressing scheme noted in this plan. Following is an example addressing the scheme for “Paradise County”:

NORTH (primary) MED 8 repeater access -	681
SOUTH (secondary) MED 8 repeater access -	682
Countywide ALL-CALL code -	6899
County EMS dispatch center -	6801
Hospital A -	6823
Hospital B -	6834
Hospital C -	6838
Hospital D -	6842
Hospital J -	6859
City A EMS dispatch center -	6863
City B EMS dispatch center -	6867
County Emergency Management/EOC -	6874
Private ambulance dispatch center -	6886

NOTE: In this example that the first two digits are always 68 or the county code, while the second two digits can be randomly assigned, but must result in a number that is not assigned to any other station within the County.

### 5.3.3 Equipment Considerations

*Mobile Units:* Every STO approved MED 8-equipped mobile radios are essentially capable of operation on the new system. Additional programming may be required to add talk-around capability. DTMF replacement microphones are readily available from numerous sources and can be attached to most mobile radios with little difficulty.

*Repeaters:* DTMF decoding and re-generating devices are generally available for LMR fixed equipment. The STO has identified an appropriate, readily available product that can be attached to most typical MED 8 repeater stations by local technicians.

*Hospitals:* If a hospital or dispatch center currently has a separate MED 8 station, 12.5 KHz, it may be possible to convert the existing equipment to the new configuration. However, those medical facilities that currently operate primary or backup repeater stations that function on one or more of the standard MED 8 channels may wish to leave that equipment undisturbed. Rather than attempting to integrate the new MED 8 functionality into existing radio equipment, it may ultimately be more cost-effective for hospitals and dispatch centers to purchase a small UHF RF control station specifically configured for remote control, talk-around, and built-in DTMF signaling.

*DTMF Devices:* The necessary DTMF functionality shall be incorporated into the RF control station itself. Alternatively, a separate customized remote control device with DTMF encode and decode capabilities could be utilized in concert with a standard RF control station. A compatible desktop DTMF/remote control device, which has already been tested on a similar radio system in Florida is available from Zetron. DTMF decoding devices from other manufacturers may also be compatible with the MED 8 system signaling parameters.



### **5.3.3.1 Mobile Radio Configurations**

In order to realize the most utility and flexibility for a common statewide EMS radio system, all associated mobile radios shall be configured in a standardized configuration. In determining which UHF channels should be included in such a statewide configuration, the STO has considered the following:

Federal regulations relating to radio licensing, 47 CFR 90:

At a minimum, the current FCC regulations mandate that mobile radios must be *wired and equipped* for operation on all authorized MED channels. The original intent was to include the eight, or ten, original MED channels. This now includes the newly created 12.5 and 6.25 kHz split channels as well.

*Intended usage patterns:* Since one of the TAP goals is to also expand the availability of simplex frequencies for statewide scene coordination (SSC), the EMS Plan has established mobile talk-around capability on at least the original MED channels plus the 12.5 kHz split versions of the expanded MED channel group. This has provided a significant increase in the number of simplex SSC channels useable for on-scene coordination purposes and minimized the likelihood of direct on-channel interference with MED 8.

*Equipment capabilities:* Every mobile EMS UHF radio should be capable of DTMF encode and talk-around, simplex, operation. Due to the numbers of channels in the mobile radios, which are mandated by the FCC, the preferred approach for talk-around would be a single button for activation of the talk-around function, rather than having to duplicate all or most of the mobile MED frequencies into additional, and excessive, channel positions. With the mobile radios configured with the required numbers of channels and one-button selectable talk-around capability, and perhaps even independently-selectable CTCSS tones, EMS vehicles will be able to communicate to virtually any other EMS vehicle or EMS base station anywhere in the state, even in the event that additional UHF base stations are added in congested areas.

## **5.4 SMC Base Station Facilities**

Every hospital emergency department and EMS dispatch center shall have the capability to access and reliably communicate on the MED-8, SMC channel, via RF Control, 468.175 MHz base transmit/463.175 MHz base receive, CTCSS of 167.9 Hz, in accordance with Section 5.2.4, with similarly equipped mobile or portable radios. Every EMS dispatch center shall have the responsibility to monitor it continuously, 24-hours a day.

If primary SMC communications are enabled by means of leased wireline control, then every such hospital and dispatch center shall have as a minimum, a backup communications capability by means of a base station or RF control station equipped on the SMC channel that is not dependent on leased wireline control.

## **5.5 Mobile Radios in Permitted Vehicles**

Every permitted transport vehicle shall provide the capability for reliable two-way communications on the MED-8, SMC channel, 468.175 MHz mobile transmit/463.175 MHz mobile receive, CTCSS of 167.9 Hz. *Mobile radio equipment* shall be the minimum requirement for SMC communications.

## **5.6 Local Medical Coordination (LMC)**

### **5.6.1 LMC Base Station (UHF Repeater) Facilities**

Per Chapter 395, F.S., every hospital emergency department shall have the capability to reliably communicate

to at least a 5-mile radius of its facility on the LMC UHF channel approved or assigned by the STO for that hospital on a geographic allotment basis, and/or for that area on a real-time allocation basis.

### **5.6.2 Proprietary Local Medical Coordination (800 MHz Trunked Radio Systems)**

EMS communications systems may migrate to specialized radio “trunked” systems that will shift LMC communications to a proprietary radio infrastructure. Radio systems that employ this technology will meet those agencies requirements for LMC communications that provide EMS field personnel with a communications system that permits the exchange of vital information between EMS, emergency departments and/or medical directors. In that these systems are proprietary in nature they will *not* meet the requirements specified within this Plan under Chapter 395, F.S., for hospital emergency departments.

## **5.7 Radios in Permitted Vehicles**

### **5.7.1 Permitted Transport Vehicles**

Every permitted transport vehicle shall be equipped with an UHF radio that will provide access to each LMC, CMC and SMC channel necessary to enable reliable communications with each hospital emergency department in the county or larger area in which it primarily operates, and others with whom it can be expected to communicate under normal situations.

### **5.7.2 Permitted Non-Transport Vehicles**

The requirement of the EMS Communications Plan is that every permitted vehicle shall have the capability for two-way radio communications with a higher level of medical care. Specifically, this capability shall exist for radio communications should the firefighter/paramedic need to deviate from established medical protocols and/or request additional medical assistance from the medical director and/or hospital. If an EMS agency has established medical control via an 800 MHz “Public Safety” radio system, per Section 5.6.2, within their organization then, per the Plan, that agency has met the requirements for “Medical Control” and accordingly not required to establish a MED-8, UHF, radio in the permitted non-transport fire engines.

In an effort to clarify any misunderstandings regarding this issue the UHF radio, MED-8 requirements remain mandatory in every EMS permitted transport vehicle regardless of that system's routine and/or day-to-day primary medical communications, Medical Control. MED-8 has been established to maintain radio communications with emergency departments and/or other EMS communications systems throughout the state while transporting patients. The requirement of the Plan is to establish a common medical communications system, channel, which will provide the EMT/paramedic the ability to communicate within a county and/or municipality regardless of that agencies primary communications infrastructure.

## **5.8 Vehicle Dispatch and Response (VDR)**

### **5.8.1 VDR Base Station Facilities**

Every EMS vehicle dispatch facility shall have the capability to reliably communicate on each VDR channel designated for that facility, and configured to enable continuous reception of all local mobile VDR transmissions on each of those channels.

The local VDR channel shall be a different channel than the CMC channel(s) unless specifically allowed by the STO, EMS Communications.

### **5.8.2 Radios in EMS Vehicles**

Every permitted EMS and recognized First Responder<sup>6</sup> vehicle shall be equipped for reliable communications on at least one local VDR channel, as well as the VDR channel(s) of each facility by which it is regularly dispatched or to which it regularly responds. This can be accomplished by mobile with either front & rear control heads, dash mount radio front or rear and/or portable radios.

### **5.8.3 Automatic Vehicle Location**

Automatic Vehicle Location systems utilized in a System Status Management configuration, intended to reduce EMS response times, shall include a statement attesting "the Polling/Update rate will not exceed the capacity of the primary functions of the radio communications system." This statement is in addition to the submittal requirements of Section 2.6.2 of this Plan. The AVL system shall demonstrate location accuracy 100 meters and comply with the minimum mobile radio requirements of Section 6.3.

### **5.9 Medical Resource Coordination (MRC)**

Every hospital emergency department and dispatch center, communicating with permitted EMS and recognized First Responder vehicles, shall be equipped with a control, base, or repeater station system dedicated to MRC communications which is not dependent on leased wireline control. Dispatch centers shall have MRC equipment configured to enable continuous, 24-hour reception of the MRC channel of that region of the state.

### **5.10 Crew Alert Paging**

A Crew Alert Paging system, where implemented to alert EMS personnel as a *primary* component of the EMS VDR system, may be established on any channel consistent with FCC rules, except that crew alert paging shall not be approved for LMC channels, CMC channels the SMC channel, or MRC channels.

### **5.11 Telephone Interconnection**

EMS voice and/or data communications to and from points not accessible by means of the two-way land mobile radio communications system, and which require interconnection through the public switched telephone network by EMS field personnel, may utilize the cellular telephone system for such communications. The use of cellular telephones shall be *supplementary* to the other System Requirements of this Plan. The use of telephone interconnections does not meet the requirements outlined in 5.6 Local Medical Coordination.

### **5.12 Biomedical Telemetry**

Providers whose medical director has established the requirement for transmission of biomedical telemetry may utilize the cellular telephone system for such communications. The use of cellular telephones shall be *supplementary* to the other System Requirements of this Plan.

### **5.13 Radio Frequency Control Stations**

Radio frequency control stations, FCC Station Class FX1, shall not be approved for use on FCC designated

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<sup>6</sup> For First Responders - only if the "Memorandum of Understanding" between the EMS Provider and the First Responder requires or implies two-way radio communications to occur between the EMS Provider and the First Responder.

"MED" channels except upon an acceptable submittal of all of the following:

- A. A showing of need.
- B. A showing that alternative solutions within existing plans and rules are not in the best interest of the public safety and welfare.
- C. An engineering study showing no harmful interference to existing systems. Harmful interference for this study is defined in Section 4.2.1 of this Plan.

Following such acceptable submittals, any approval for operation of radio frequency control stations on "MED" channels shall have the stipulation that the *approval is continually contingent upon no substantiated complaints of interference to either present or future systems*. Upon the confirmation of any such complaints, operation of such radio frequency control stations shall be modified to mitigate the harmful interference or discontinued.

#### **5.14 FCC Narrowband Mandate Below 512 MHz**

The FCC has issued a ruling regarding narrowband applications. The Second Report and Order and Second Further Notice of Proposed Rule Making under Docket 99-87, FCC document number 03-34 was adopted on February 12, 2003 and released on February 25, 2003. Public Safety will have until January 1, 2018, for existing systems, to migrate to 12.5 kHz technology. Additionally, and more urgent, new applications for frequencies below 512 MHz will for bandwidths above 12.5 kHz will not be accepted 6 months after publication in the Federal Register. Below is an excerpt from the ruling. Specifically, the amended rules will:

- A. Beginning six months after publication of the 2nd R&O in the Federal Register, prohibit any applications for new operations using 25 kHz channels, for any system operating in the 150-174 MHz or 421-512 MHz bands.
- B. Beginning six months after publication of the 2nd R&O in the Federal Register, allow incumbent 25 kHz Part 90 licensees in the 150-174 MHz and 421-512 MHz bands to make modifications to their systems provided their respective authorized interference contours are not expanded as a result thereof.
- C. Beginning January 1, 2005, prohibit the certification of any equipment capable of operating at one voice path per 25 kHz of spectrum, i.e., multi-mode equipment that includes a 25 kHz mode.
- D. Beginning January 1, 2008, prohibit the manufacture and importation of any 25 kHz equipment, including multi-mode equipment that can operate on a 25 kHz bandwidth.
- E. Beginning January 1, 2018, require public safety licensees using channels in these bands to deploy technology that achieves the equivalent of one voice path per 12.5 kHz of spectrum. After January 1, 2005, the FCC will prohibit the certification of new equipment that includes a 25 kHz mode. Equipment certified at previous date will continue to be available allowing system users to amortize their investment in existing wideband equipment. The FCC gave public safety an additional 5 years beyond the migration mandate for business users recognizing the difficulty in obtaining funding and conversion for the public sector. *The move to prevent licensing of new systems or expansion of coverage for modifying existing systems starting in 6 months will have a major impact on public safety and public safety coordinators. The FCC believes that continuing to accept new wideband applications would result in continued and expanded proliferation of wide band technologies counter to their intent.* Additions to existing systems, additional frequencies, or new sites will be limited to operation within the interference contour of the existing system. No expansion of

coverage area will be allowed using an excess of 12.5 kHz bandwidth.

### 5.15.1 MED Channel Frequencies

As a result of the FCC issued ruling regarding narrowband applications; MED Channel numbers 1 through 103 are prescribed by FCC Rules, as corresponding to the following radio transmit frequencies in MHz:

NOTE: The 6.25 KHz channels, MED 11, 21, 31 etc., will not be utilized at this time.

MED CHANNEL	FREQUENCY (Base & Mobile)	FREQUENCY (Mobile Only)	MED CHANNEL	FREQUENCY (Base & Mobile)	FREQUENCY (Mobile Only)
1	463.000	468.000	6	463.125	468.125
11	463.00625		61	463.13125	
12	463.0125	468.0125	62	463.1375	468.1375
13	463.01875		63	463.14375	
2	463.025	468.025	7	463.150	468.150
21	463.03125		71	463.15625	
22	463.0375	468.0375	72	463.1625	468.1625
23	463.04375		73	463.16875	
3	463.050	468.050	8	463.175	468.175
31	463.05625		81	463.18125	
32	463.0625	468.0625	82	463.1875	468.1875
33	463.06875		83	463.19375	
4	463.075	468.075	9	462.950	467.950
41	463.08125		91	462.95625	
42	463.0875	468.0875	92	462.9625	467.9625
43	463.09375		93	462.96875	
5	463.100	468.100	10	462.975	467.975
51	463.10625		101	462.98125	
52	463.1125	468.1125	102	462.9875	467.9875
53	463.11875		103	462.99375	

### CTCSS Frequencies

Continuous Tone-Controlled Squelch (CTCSS) systems provide a reduction of nuisance interference in FM radio systems by incorporating a sub-audible tone onto the radio carrier information such that only a similarly equipped radio receiver will open its squelch circuit to receive the transmission. Systems equipped with CTCSS will eliminate much interference from distant sources, although CTCSS by itself cannot prevent undesired "FM capture" from occurring due to nearby simultaneous co-channel transmissions. The TIA/EIA Standard 603 designates CTCSS frequencies. Volume II contains a table that is a portion of those CTCSS frequencies above 90 Hz and below 211 Hz that are approved for EMS radio communications in Florida.

### 5.15.2 Specific MED Channel Assignments for Florida Acute Care Facilities

FACILITY NAME	STREET ADDRESS	CITY, STATE	COUNTY	CMC	LMC
North Florida Regional Medical Center	6500 Newberry Road	Gainesville, FL	Alachua	3-118.8	42-118.8
Shands at AGH	801 SW 2nd Avenue	Gainesville, FL	Alachua	3-118.8	32-118.8
Shands Hospital at University of Florida	1600 SW Archer Road	Gainesville, FL	Alachua	3-118.8	62-118.8
Ed Fraser Memorial Hospital	159 N Third Street	Macclenny, FL	Baker	1-156.7	12-156.7
Bay Medical Center	615 N Bonita Avenue	Panama City, FL	Bay	6-167.9	12-167.9
Gulf Coast Medical Center	449 West 23rd Street	Panama City, FL	Bay	6-167.9	52-167.9
Tyndall AFB		Panama City, FL	Bay	6-167.9	42-127.3
Shands at Starke	922 East Call Street	Starke, FL	Bradford	2-94.8	72-94.8
Cape Canaveral Hospital	701 W Cocoa Beach Causeway	Cocoa Beach, FL	Brevard	6-127.3	22-173.8
Holmes Regional Medical Center	1350 S Hickory Street	Melbourne, FL	Brevard	6-127.3	52-131.8
Kennedy Space Center (KSC)			Brevard	6-127.3	62-146.2
Palm Bay Community Hospital	1425 Malabar Road, NE	Melbourne, FL	Brevard	6-127.3	12-173.8
Parrish Medical Center	951 N Washington Avenue	Titusville, FL	Brevard	6-127.3	42-127.3
Wuesthoff Medical Center/Melbourne	250 N Wickham Road	Melbourne, FL	Brevard	6-127.3	72-146.2
Wuesthoff Memorial Hospital	110 Longwood Avenue	Rockledge, FL	Brevard	6-127.3	32-146.2
Broward General Medical Center	1600 S Andrews Avenue	Fort Lauderdale, FL	Broward	5-173.8	72-167.9
Cleveland Clinic Hospital	3100 Weston Road	Weston, FL	Broward	5-173.8	72-107.2
Coral Springs Medical Center	3000 Coral Hills Drive	Coral Springs, FL	Broward	5-173.8	52-192.8
Florida Medical Center	5000 West Oakland Park Blvd.	Lauderdale Lakes, FL	Broward	5-173.8	52-110.9
Hollywood Memorial Center	3600 Washington Street	Hollywood, FL	Broward	5-173.8	22-107.2
Holy Cross Hospital, Inc	4725 N Federal Highway	Fort Lauderdale, FL	Broward	5-173.8	72-192.8
Imperial Point Medical Center	6401 N Federal Highway	Fort Lauderdale, FL	Broward	5-173.8	72-156.7
Memorial Hospital Pembroke	7800 Sheridan Street	Pembroke Pines, FL	Broward	5-173.8	22-103.5
Memorial Hospital West	703 N Flamingo Road	Pembroke Pines, FL	Broward	5-173.8	62-123.0
Memorial Regional Hospital	3501 Johnson Street	Hollywood, FL	Broward	5-173.8	52-103.5
North Broward Medical Center	201 East Sample Road	Pompano Beach, FL	Broward	5-173.8	72-103.5
North Ridge Medical Center	5757 North Dixie Highway	Fort Lauderdale, FL	Broward	5-173.8	72-110.9
Northwest Medical Center	2801 N State Road 7	Margate, FL	Broward	5-173.8	22-110.9
Plantation General Hospital	401 NW 42nd Avenue	Plantation FL	Broward	5-173.8	52-107.2
University Hospital and Medical Center	7201 N University Drive	Tamarac, FL	Broward	5-173.8	22-192.8
Westside Regional Medical Center	8201 W Broward Blvd.	Plantation, FL	Broward	5-173.8	52-167.9
Calhoun Liberty Hospital	20370 NE Burns Avenue	Blountstown, FL	Calhoun	7-156.7	72-156.7
Bon Secours/St. Joseph Hospital	2500 Harbour Blvd.	Port Charlotte, FL	Charlotte	3-167.9	52-167.9
Charlotte Regional Medical Center	809 E Marion Avenue	Punta Gorda, FL	Charlotte	3-167.9	62-167.9
Fawcett Memorial Hospital	21298 Olean Blvd	Port Charlotte, FL	Charlotte	3-167.9	72-167.9
Citrus Memorial Hospital	502 Highland Blvd	Inverness, FL	Citrus	3-167.9	12-167.9
Seven Rivers Community Hospital	6201 N Suncoast Blvd.	Crystal River, FL	Citrus	3-167.9	72-167.9
Orange Park Medical Center	2001 Kingsley Avenue	Orange Park, FL	Clay	5-167.9	12-167.9
Cleveland Clinic Florida Hospital/Naples	855 Napa Blvd	Naples, FL	Collier	7-192.8	12-192.8
Naples Community Hospital	350 7th Street North	Naples, FL	Collier	7-192.8	22-192.8
North Collier Hospital	11190 Healthpark Blvd	Naples, FL	Collier	7-192.8	32-192.8
Lake City Medical Center	340 NW Commerce Blvd.	Lake City, FL	Columbia	7-131.8	52-131.8
Shands at Lake Shore	560 E Franklin Street	Lake City, FL	Columbia	7-131.8	72-131.8
Lake City Veterans Hospital			Columbia	7-131.8	42-131.8
Aventura Hospital and Medical Center	20900 Biscayne Blvd	Aventura, FL	Dade	2-210.7	12-107.2
Baptist Hospital of Miami	8900 North Kendall Drive	Miami, FL	Dade	6-210.7	32-167.9
Cedars Medical Center	1400 NW 12th Avenue	Miami, FL	Dade	4-210.7	3-114.8
Coral Gables Hospital	3100 Douglas Road	Coral Gables, FL	Dade	4-210.7	62-123.0
Healthsouth Doctors' Hospital	5000 University Drive	Coral Gables, FL	Dade	6-210.7	22-131.8
Hialeah Hospital	651 East 25th Street	Hialeah, FL	Dade	2-210.7	72-141.3

<b>FACILITY NAME</b>	<b>STREET ADDRESS</b>	<b>CITY, STATE</b>	<b>COUNTY</b>	<b>CMC</b>	<b>LMC</b>
Homestead Hospital	160 NW 13th Street	Homestead, FL	Dade	6-210.7	12-151.4
Jackson Memorial Hospital	1611 NW. 12th Avenue	Miami, FL	Dade	4-210.7	42-162.2
Jackson Nouth Community Hospital	9333 SW. 152nd Street	Miami, FL	Dade	2-210.7	1-173.8
Kendall Medical Center	11750 Bird Road	Miami, FL	Dade	6-210.7	1-186.2
Larkin Community Hospital	7031 SW 62nd Avenue	South Miami, FL	Dade	6-210.7	3-203.5
Mercy Hospital Inc	3663 South Miami Avenue	Miami, FL	Dade	4-210.7	5-103.5
Miami Children's Hospital	3100 SW 62nd Avenue	Miami, FL	Dade	4-210.7	7-110.9
Mount Sinai Medical Center	4300 Alton Road	Miami Beach, FL	Dade	2-210.7	32-127.3
Mount Sinai Medical Ctr/Miami Heart Institute	4701 North Meridian Avenue	Miami Beach, FL	Dade	2-210.7	22-136.5
North Shore Medical Center	1100 NW 95th Street	Miami, FL	Dade	2-210.7	52-146.2
Palm Springs General Hospital	1475 West 49th Street	Hialeah, FL	Dade	2-210.7	12-156.7
Palmetto General Hospital	2001 W 68th Street	Hialeah, FL	Dade	2-210.7	22-192.8
Pan American Hospital	5959 NW 7th Street	Miami, FL	Dade	4-210.7	52-107.2
Parkway Regional Medical Center	160 NW 170th Street	North Miami Beach, FL	Dade	2-210.7	62-114.8
South Miami Hospital	6200 S.W. 73rd Street	South Miami, FL	Dade	6-210.7	72-123.0
Veterans Hospital			Dade	4-210.7	12-131.8
South Shore Hospital and Medical Center	630 Alton Road	Miami Beach, FL	Dade	4-210.7	72-192.8
Desoto Memorial Hospital	900 North Robert Avenue	Arcadia, FL	Desoto	7-131.8	72-131.8
No Hospital facilities			Dixie		
Baptist Medical Center	800 Prudential Drive	Jacksonville, FL	Duval	6-146.2	32-151.4
Baptist Medical Center/Beaches	1350 13th Avenue South	Jacksonville Beach FL	Duval	6-146.2	42-162.2
Baptist Medical Center South		Jacksonville, FL	Duval	6-146.2	62-173.8
Memorial Hospital Jacksonville	3625 University Blvd South	Jacksonville, FL	Duval	6-146.2	52-186.2
Naval Air Station (NAS) JAX Medical Center	NAS Jax	Jacksonville, FL	Duval	6-146.2	7-203.5
Saint Luke's Hospital	4201 Belfort Road	Jacksonville, FL	Duval	6-146.2	72-103.5
Saint Vincent's Medical Center	1800 Barrs Street	Jacksonville, FL	Duval	6-146.2	22-110.9
Shands Jacksonville Medical Center	655 West 8th Street	Jacksonville, FL	Duval	6-146.2	4-127.3
Wolfsan's/Baptist Children's Hospital	4901 Richard Street	Jacksonville, FL	Duval	6-146.2	12-136.5
Baptist Hospital	1000 West Moreno Street	Pensacola, FL	Escambia	2-110.9	72-110.9
Medical Clinic NAS Pensacola	NAS Pensacola	Pensacola, FL	Escambia	2-110.9	12-110.9
Sacred Heart Hospital	5151 N 9th Avenue	Pensacola, FL	Escambia	2-110.9	32-110.9
West Florida Hospital	8383 North Davis Highway	Pensacola, FL	Escambia	2-110.9	62-110.9
Florida Hospital/Flagler	60 Memorial Medical Parkway	Palm Coast, FL	Flagler	6-136.5	62-136.5
George E. Weems Memorial Hospital	135 Avenue G	Apalachicola, FL	Franklin	3-156.7	72-156.7
Gadsden Community Hospital	90 East US Highway	Quincy, FL	Gadsden	6-203.5	12-203.5
No Hospital facilities			Gilchrist		
No Hospital facilities			Glades		
Gulf Pines Hospital	102 20th Street	Port St Joe, FL	Gulf	2-167.9	62-167.9
Trinity Community Hospital	506 NW 4th Street	Jasper, FL	Hamilton	2-210.7	52-210.7
Florida Hospital/Wauchula	533 West Carlton Street	Wauchula, FL	Hardee	5-127.3	12-127.3
Hendry Regional Medical Center	500 West Sugarland Highway	Clewiston, FL	Hendry	7-107.3	22-107.3
Brooksville Regional Hospital	55 Ponce De Leon Blvd.	Brooksville, FL	Hernando	4-146.2	32-146.2
Oak Hill Hospital	11375 Cortez Blvd.	Spring Hill, FL	Hernando	4-146.2	12-146.2
Spring Hill Regional Hospital	10461 Quality Drive	Spring Hill, FL	Hernando	4-146.2	72-146.2
Florida Hospital Heartland Medical Center	4200 Sun 'N Lake Blvd	Sebring, FL	Highlands	1-123.0	22-123.0
Florida Hospital-Lake Placid	1210 US 27 North	Lake Placid, FL	Highlands	1-123.0	72-123.0
Highlands Regional Medical Center	3600 S Highlands Avenue	Sebring, FL	Highlands	1-123.0	62-123.0
Brandon Regional Hospital	119 Oakfield Drive	Brandon, FL	Hillsborough	7-127.3	1-127.3
H. Lee Moffitt Cancer Ctr/Research Institute Hospital	12902 Magnolia Drive	Tampa, FL	Hillsborough	7-127.3	3-127.3
Kindred Hospital-Bay Area/Tampa	4555 S Manhattan Avenue	Tampa, FL	Hillsborough	7-127.3	4-127.3
Kindred Hospital/Central Tampa	4801 N Howard Avenue	Tampa, FL	Hillsborough	7-127.3	42-127.3

<b>FACILITY NAME</b>	<b>STREET ADDRESS</b>	<b>CITY, STATE</b>	<b>COUNTY</b>	<b>CMC</b>	<b>LMC</b>
Memorial Hospital/Tampa	2901 Swann Avenue	Tampa, FL	Hillsborough	7-127.3	5-127.3
Saint Joseph's Hospital	3001 Martin Luther King Blvd	Tampa, FL	Hillsborough	7-127.3	2-127.3
South Bay Hospital	4016 State Road 674	Sun City Center, FL	Hillsborough	7-127.3	12-127.3
South Florida Baptist Hospital	301 N Alexander Street	Plant City, FL	Hillsborough	7-127.3	52-127.3
Tampa General Hospital The	2 Columbia Drive	Tampa, FL	Hillsborough	7-127.3	72-127.3
Town & Country Hospital	6001 Webb Road	Tampa, FL	Hillsborough	7-127.3	62-127.3
University Community Hospital	3100 E Fletcher Avenue	Tampa, FL	Hillsborough	7-127.3	12-127.3
University Community Hospital/Carrollwood	7171 North Dale Mabry	Tampa, FL	Hillsborough	7-127.3	6-127.3
Doctor's Memorial Hospital/Bonifay	401 East Byrd	Bonifay, FL	Holmes	3-167.9	22-167.9
Indian River Memorial Hospital	1000 36th Street	Vero Beach, FL	Indian River	4-118.8	42-118.8
Sebastian River Medical Center	13695 US Highway 1	Sebastian, FL	Indian River	4-118.8	72-118.8
Campbellton/Graceville Hospital	5429 College Drive	Graceville, FL	Jackson	5-146.2	12-146.2
Jackson Hospital	4250 Hospital Drive	Marianna, FL	Jackson	5-146.2	52-146.2
No Hospital facilities			Jefferson		
No Hospital facilities			Lafayette		
Florida Hospital Waterman	201 North Eustis Street	Eustis, FL	Lake	32-192.8	12-192.8
Leesburg Regional Medical Center	600 East Dixie Avenue	Leesburg, FL	Lake	32-192.8	22-192.8
South Lake Hospital	1099 Citrus Tower Blvd	Clermont, FL	Lake	32-192.8	62-192.8
Cape Coral Hospital	636 Del Prado Blvd	Cape Coral, FL	Lee	4-110.9	32-110.9
Gulf Coast Hospital	13681 Doctor's Way	Fort Myers, FL	Lee	4-110.9	62-110.9
Healthpark Medical Ctr/Lee Memorial Hospital	9981 Healthpark Circle	Fort Myers, FL	Lee	4-110.9	3-110.9
Lee Memorial Hospital	2776 Cleveland Avenue	Fort Myers, FL	Lee	4-110.9	42-110.9
Lehigh Regional Medical Center	1500 Lee Blvd	Lehigh Acres, FL	Lee	4-110.9	52-110.9
Southwest Florida Regional Medical Center	2727 Winkler Avenue	Fort Myers, FL	Lee	4-110.9	6-110.9
Capital Regional Medical Center	2626 Capital Medical Blvd	Tallahassee, FL	Leon	2-156.7	42-156.7
Tallahassee Memorial Hospital	1300 Miccosukee Road	Tallahassee, FL	Leon	2-156.7	22-156.7
Nature Coast Regional Hospital	125 SW 7th Street	Williston, FL	Levy	5-127.3	52-127.3
No Hospital facilities			Liberty		
Madison County Memorial Hospital	201 East Marion Street	Madison, FL	Madison	3-146.2	32-146.2
Blake Medical Center	2020 59th Street West	Bradenton, FL	Manatee	4-167.9	42-167.9
Manatee Memorial Hospital	206 2nd Street E	Bradenton, FL	Manatee	4-167.9	22-167.9
Munroe Regional Medical Center	131 SW 15th Street	Ocala, FL	Marion	7-127.3	12-127.3
Ocala Regional Medical Center	1431 SW 1st Avenue	Ocala, FL	Marion	7-127.3	32-127.3
West Marion Community Hospital	4600 SW 46th Court	Ocala, FL	Marion	7-127.3	22-127.3
Timber Ridge Medical Center	State Road 200	Ocala, FL	Marion	7-127.3	62-127.3
Martin Memorial Hospital South	2100 SE Salerno Blvd	Stuart, FL	Martin	7-146.2	42-146.2
Martin Memorial Medical Center	300 Hospital Avenue	Stuart, FL	Martin	7-146.2	72-146.2
Fishermen's Hospital	3301 Overseas Highway	Marathon, FL	Monroe	7-156.7	62-156.7
Lower Keys Medical Center	5900 College Road	Key West, FL	Monroe	7-156.7	72-156.7
Mariners Hospital	91500 Overseas Highway	Tavernier, FL	Monroe	7-156.7	42-156.7
Baptist Medical Center/Nassau	1250 South 18th Street	Fernandina Beach, FL	Nassau	2-136.7	32-136.5
Eglin Air Force Base	Air Force Sys Comnd Reg Hosp	Valparaiso, FL	Okaloosa	2-156.7	32-156.7
Fort Walton Beach Medical Center	1000 Mar-Walt Drive	Fort Walton Beach, FL	Okaloosa	2-156.7	52-156.7
North Okaloosa Medical Center	151 Redstone Avenue SE	Crestview, FL	Okaloosa	2-156.7	22-156.7
Twin Cities Hospital	2190 Highway 85 North	Niceville, FL	Okaloosa	2-156.7	72-156.7
Raulerson Hospital	1796 Highway 441 North	Okeechobee, FL	Okeechobee	6-167.9	72-167.9
Arnold Palmer Hospital (NO E/R)	92 West Miller Street	Orlando, FL	Orange	7-156.7	12-107.2
Florida Hospital	601 East Rollins	Orlando, FL	Orange	7-156.7	22-123.0
Florida Hospital/Apopka	201 North Park Avenue	Apopka, FL	Orange	7-156.7	52-131.8
Florida Hospital/East Orlando	7727 Lake Underhill Road	Orlando, FL	Orange	7-156.7	42-141.3
Health Central	10000 West Colonial Drive	Ocoee, FL	Orange	7-156.7	52-151.4



<b>FACILITY NAME</b>	<b>STREET ADDRESS</b>	<b>CITY, STATE</b>	<b>COUNTY</b>	<b>CMC</b>	<b>LMC</b>
Orlando Regional Medical Center	1414 Kuhl Avenue	Orlando, FL	Orange	7-156.7	72-173.8
Sand Lake Hospital	9400 Turkey Lake Road	Orlando, FL	Orange	7-156.7	32-186.2
Florida Hospital Winter	200 N Lakemont Avenue	Winter Park, FL	Orange	7-156.7	62-123.0
Florida Hospital/Celebration Health	400 Celebration Place	Celebration, FL	Osceola	4-114.8	22-114.8
Florida Hospital/Kissimmee	2450 N Orange Blossom Trail	Kissimmee, FL	Osceola	4-114.8	5-114.8
Osceola Regional Medical Center	700 W Oak Street	Kissimmee, FL	Osceola	4-114.8	52-114.8
St Cloud Hospital	2906 17th Street	Saint Cloud, FL	Osceola	4-114.8	42-114.8
A.G. Holley State Hospital	1199 W Lantana Road	Lantana, FL	Palm Beach	3-127.3	52-146.2
Bethesda Memorial Hospital	2815 S Seacrest Blvd	Boynton Beach, FL	Palm Beach	3-127.3	5-114.8
Boca Raton Community Hospital	800 Meadows Road	Boca Raton, FL	Palm Beach	3-127.3	12-131.8
Columbia Hospital	2201 45th Street	West Palm Beach, FL	Palm Beach	1-127.3	42-151.4
Delray Medical Center	5352 Linton Blvd	Delray Beach, FL	Palm Beach	3-127.3	6-173.8
Glades General Hospital	1201 S Main Street	Belle Glade, FL	Palm Beach	4-127.3	3-203.5
Good Samaritan Medical Center	1300 North Flagler Drive	West Palm Beach, FL	Palm Beach	1-127.3	62-103.5
JFK Medical Center	5301 S Congress Avenue	Atlantis, FL	Palm Beach	3-127.3	5-146.2
Jupiter Medical Center	1210 South Old Dixie Highway	Jupiter, FL	Palm Beach	1-127.3	22-210.7
Palm Beach Gardens Medical Center	3360 Burns Road	Palm Beach Gardens FL	Palm Beach	1-127.3	32-107.2
Palms West Hospital	13001 State Road 80	Loxahatchee, FL	Palm Beach	1-127.3	1-123.0
Saint Mary's Medical Center	901 45th Street	West Palm Beach, FL	Palm Beach	4-127.3	52-141.3
V.A. Medical Center	7305 North Military Trail	West Palm Beach, FL	Palm Beach	1-127.3	7-162.2
Wellington Regional Medical Center	10101 Forest Hill Blvd	West Palm Beach, FL	Palm Beach	4-127.3	2-186.2
West Boca Medical Center	21644 State Road 7	Boca Raton, FL	Palm Beach	3-127.3	7-192.8
Pasco Regional Medical Center	13100 Fort King Road	Dade City, FL	Pasco	4-110.9	42-103.5
Community Hospital	5637 Marine Parkway	New Port Richey, FL	Pasco	4-110.9	32-127.3
East Pasco Medical Center Inc	7050 Gall Blvd	Zephyrhills, FL	Pasco	4-110.9	52-136.5
North Bay Hospital	6600 Madison Street	New Port Richey, FL	Pasco	4-110.9	22-146.2
Regional Medical Center/Bayonet Point	14000 Fivay Road	Hudson, FL	Pasco	4-110.9	12-156.7
All Children's Hospital	801 Sixth Street South	Saint Petersburg, FL	Pinellas	3-203.5	1-203.5
Bayfront Medical Center	701 Sixth Street South	Saint Petersburg, FL	Pinellas	3-203.5	7-203.5
Edward White Hospital	2323 9th Avenue North	Saint Petersburg, FL	Pinellas	3-203.5	5-203.5
Helen Ellis Memorial Hospital	1395 South Pinellas Avenue	Tarpon Springs, FL	Pinellas	3-203.5	4-203.5
Kindred Hospital/Bay Area-St Petersburg	3030 6th Street South	Saint Petersburg, FL	Pinellas	3-203.5	22-203.5
Largo Medical Center	201 14th Street, SW	Largo, FL	Pinellas	3-203.5	6-203.5
Mease Hospital/Dunedin	601 Main Street	Dunedin, FL	Pinellas	3-203.5	52-203.5
Mease Hospital/Countryside	3231 McMullen Booth Road	Safety Harbor, FL	Pinellas	3-203.5	32-203.5
Morton Plant Hospital	300 Pinellas Street	Clearwater, FL	Pinellas	3-203.5	72-203.5
Northside Hospital	6000 49th Street North	Saint Petersburg, FL	Pinellas	3-203.5	62-203.5
Palms/Pasadena Hospital	1501 Pasadena Avenue South	Saint Petersburg, FL	Pinellas	3-203.5	42-203.5
Saint Anthony's Hospital	1200 7th Avenue North	Saint Petersburg, FL	Pinellas	3-203.5	12-123.0
St Petersburg General Hospital	6500 38th Avenue North	Saint Petersburg, FL	Pinellas	3-203.5	2-203.5
Sun Coast Hospital	2025 Indian Rocks Road	Largo, FL	Pinellas	3-203.5	12-203.5
Bartow Memorial Hospital	2200 Osprey Blvd	Bartow, FL	Polk	3-103.5	72-103.5
Heart of Florida Regional Medical Center	1615 U S Highway 27 North	Davenport, FL	Polk	3-103.5	7-103.5
Lake Wales Medical Center	410 South 11th Street	Lake Wales, FL	Polk	3-103.5	32-103.5
Lakeland Regional Medical Center	1324 Lakeland Hills Blvd	Lakeland, FL	Polk	3-103.5	52-103.5
Winter Haven Hospital	200 Avenue F NE	Winter Haven, FL	Polk	3-103.5	42-103.5
Winter Haven Hospital/Regency	101 Avenue O, Southeast	Winter Haven, FL	Polk	3-103.5	62-167.9
Putnam Community Medical Center	20 West, PO Box 778	Palatka, FL	Putnam	4-167.9	42-167.9
Gulf Breeze Hospital	1110 Gulf Breeze Parkway	Gulf Breeze, FL	Santa Rosa	1-136.5	42-110.9

<b>FACILITY NAME</b>	<b>STREET ADDRESS</b>	<b>CITY, STATE</b>	<b>COUNTY</b>	<b>CMC</b>	<b>LMC</b>
Jay Hospital	221 South Alabama Street	Jay, FL	Santa Rosa	1-136.5	22-136.5
Santa Rosa Medical Center	6002 Berryhill Road	Milton, FL	Santa Rosa	1-136.5	32-136.5
Bon Secours/Venice Hospital	540 The Rialto	Venice, FL	Sarasota	6-110.9	12-110.9
Doctors Hospital/Sarasota	5731 Bee Ridge Road	Sarasota, FL	Sarasota	6-110.9	42-110.9
Englewood Community Hospital	700 Medical Blvd	Englewood, FL	Sarasota	6-110.9	52-110.9
Sarasota Memorial Hospital	1700 S Tamiami Trail	Sarasota, FL	Sarasota	6-110.9	1-110.9
Central Florida Regional Hospital	1401 W Seminole Blvd	Sanford, FL	Seminole	2-110.9	32-110.9
Florida Hospital-Altamonte	601 East Altamonte Drive	Altamonte Springs, FL	Seminole	2-110.9	22-110.9
South Seminole Hospital	555 W State Road 434	Longwood, FL	Seminole	2-110.9	52-110.9
Flagler Hospital	400 Health Park Blvd	Saint Augustine, FL	St Johns	2-167.9	32-167.9
Lawnwood Regional Medical Center	1700 S. 23rd Street	Fort Pierce, FL	St Lucie	1-136.5	12-136.5
Saint Lucie Medical Center	1800 SE Tiffany Avenue	Port Saint Lucie, FL	St Lucie	1-136.5	62-136.5
Villages Regional Hospital The	1451 El Camino Real	The Villages, FL	Sumter	72-192.8	52-192.8
Shands/Live Oak	1100 SW 11th Street	Live Oak, FL	Suwannee	6-156.7	72-156.7
Doctors' Memorial Hospital Inc	407 East Ash Street	Perry, FL	Taylor	1-118.8	12-118.8
North Florida Reception Center Hospital	231 State Road South	Lake Butler, FL	Union	2-94.8	22-94.8
Ramadan Hand Institute/Lake Butler Hospital	850 East Main Street	Lake Butler, FL	Union	4-94.8	32-94.8
Bert Fish Medical Center	401 Palmetto Street	New Smyrna Beach, FL	Volusia	1-136.5	22-136.5
Florida Hospital/Oceanside	264 South Atlantic Avenue	Ormond Beach, FL	Volusia	1-136.5	42-136.5
Florida Hospital/Ormond Memorial	875 Sterthous Avenue	Ormond Beach, FL	Volusia	1-136.5	52-136.5
Florida Hospital/Deland	701 W Plymouth Avenue	Deland, FL	Volusia	1-136.5	2-136.5
Florida Hospital Fish Memorial	1055 Saxon Blvd	Orange City, FL	Volusia	1-136.5	4-136.5
Halifax Medical Center	303 N Clyde Morris Blvd	Daytona Beach, FL	Volusia	1-136.5	5-136.5
No Hospital facilities			Wakulla		
Healthmark Regional Medical Center	4413 US Highway 331 S	Defunick Springs, FL	Walton	4-167.9	1-167.9
Sacred Heart Hospital	7800 US 98 West	San Destin, FL	Walton	4-167.9	12-167.9
Northwest Florida Community Hospital	1360 Brickyard Road	Chipley, FL	Washington	2-146.2	22-146.2

## 6.0 EQUIPMENT REQUIREMENTS

### 6.1 Minimum Performance Standards

The minimum performance standards defined in the following sections are the standards by which STO, EMS Communications approval or disapproval will be determined for individual equipment items for use within EMS communications systems. These minimum performance standards apply to equipment type-accepted for 12.5kHz operational bandwidths unless noted otherwise.

These standards have been developed by the STO, EMS Communications through research, engineering modeling, and analysis of communications equipment parameters that affect radio coverage, interference, audio quality, channel capacity and environmental performance. Development of these standards has been with the objectives of ensuring that radio equipment used for EMS communications is competitively available, enables necessary system performance, and achieves certain technical standards necessary to spectrum effectiveness and efficiency within the overall radio environment of the state of Florida.

For all other equipment items not explicitly included in the following sections, their approval will be determined on a case-by-case basis by the STO, EMS Communications Section.

## 6.2 Base/Repeater Station Equipment

### 6.2.1 TIA/EIA Standards

The radio equipment shall meet or exceed the following standards and test procedures of the current issue on the date of this revision. In the event of inconsistencies between the specifications in this Plan and the publications and standards listed below, the requirements of this Plan shall take precedence.

#### Telecommunications Industry Association/Electronics Industries Association Standards

TIA/EIA-603 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards. NOTE: EIA-152, EIA/TIA-204, EIA-220, and EIA/TIA-316 are rescinded by TIA/EIA-603.

#### **MINIMUM PERFORMANCE STANDARDS**

##### **Base/Repeater Station Equipment**

### 6.2.2 Transmitter Parameters

	<u>VHF-LB</u> 25 KHz	<u>VHF-HB</u> 25 KHz	<u>VHF-HB</u> 12.5 KHz	<u>UHF</u> 25 KHz	<u>UHF</u> 12.5 KHz	<u>800</u>
Power Output (Watts) <sup>7</sup>	90	90	60	90	50	75
FM Hum and Noise (dB)	50	50	45	50	45	45
Continuous Duty Cycle	Yes	Yes	Yes	Yes	Yes	Yes

### 6.2.3 Receiver Parameters

	<u>VHF-LB</u> 25 KHz	<u>VHF-HB</u> 25 KHz	<u>VHF-HB</u> 12.5 KHz	<u>UHF</u> 25 KHz	<u>UHF</u> 12.5 KHz	<u>800</u>
Usable Sensitivity, 12 dB SINAD (uV)	.35	.35	.35	.35	.35	.35
Adjacent Channel Selectivity (dB)	80	85	80	80	70	70 <sup>8</sup>
Intermodulation Spurious Response Attenuation (dB)	75	85	75	80	75	70
Spurious Response Attenuation (dB)	90	90	100	90	100	90

<sup>7</sup> Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or Federal Communications Commission (FCC) Rules

<sup>8</sup> -70 dB @ 25KHz and -20 dB @ 12.5 KHz.

### 6.3 Mobile Radio Equipment

The mobile radio shall be state-of-the-art and all RF frequencies and CTCSS tones shall be generated electronically (synthesized).

#### 6.3.1 TIA/EIA and Military Standards

The radio equipment shall meet or exceed the following standards and test procedures of the current issue on the date of this revision. In the event of inconsistencies between the specifications in this Plan and the publications and standards listed below, the requirements of this Plan shall take precedence.

##### Telecommunications Industry Association/Electronics Industries Association Standards

TIA/EIA-603 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

##### MIL-STD-810D or 810-E

The transmitter/receiver unit shall meet or exceed MIL-STD-810D, 810E or 810F utilizing the following test methods and procedures:

<u>D</u>	<u>E</u>	<u>F</u>	
506.2	506.3	506.4	Rain, Procedure I, (blowing rain)
509.2	509.3	509.4	Salt Fog, Procedure I (aggravated screening)
510.2	510.3	510.4	Sand and Dust, Procedure I (blowing dust)
514.3	514.4	514.5	Vibration, Procedure I, Category 1 (3 Axes)
516.3	516.4	516.5	Shock, Procedure I, (functional)

#### **MINIMUM PERFORMANCE STANDARDS Mobile Radio Equipment**

#### 6.3.2 Transmitter Parameters

	<u>VHF-LB</u> 25 KHz	<u>VHF-HB</u> 25 KHz	<u>VHF-HB</u> 12.5 KHz	<u>UHF</u> 25 KHz	<u>UHF</u> 12.5 KHz	<u>800</u>
Number of Channels	A/N <sup>10</sup>	A/N <sup>10</sup>	A/N <sup>10</sup>	20 <sup>11</sup>	20 <sup>11</sup>	10 <sup>12</sup>
Frequency Separation (MHz)	1	17	24	10	20	18 <sup>13</sup>
Power Output (Watts) <sup>9</sup>	90	90	50	90	50	30
FM Hum and Noise (dB)	45	45	44	40	39	40

<sup>9</sup> Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering (for VDR, CMC, SMC and LMC) and/or FCC Rules.

<sup>10</sup> A/N = As Needed.

<sup>11</sup> The 20-channel requirement is for UHF mobile radios equipped with any of the first 16 MED channels; otherwise as needed. Also see Section 6.5.1.

<sup>12</sup> This requirement allows for a minimum of one agency-specific channel and applicable mutual aid channel(s) for that band of operation; otherwise, as needed.

<sup>13</sup> No degradation, simultaneously for 806-824 MHz and 851-869 MHz Band.

**MINIMUM PERFORMANCE STANDARDS**  
**Mobile Radio Equipment**

**6.3.3 Receiver Parameters**

	<u>VHF-LB</u> 25 KHz	<u>VHF-HB</u> 25 KHz	<u>VHF-HB</u> 12.5 KHz	<u>UHF</u> 25 KHz	<u>UHF</u> 12.5 KHz	<u>800</u>
Number of Channels	A/N <sup>14</sup>	A/N <sup>14</sup>	A/N <sup>14</sup>	20 <sup>16</sup>	20 <sup>16</sup>	10 <sup>17</sup>
Frequency Separation	A/N <sup>14</sup>	A/N <sup>14</sup>	A/N <sup>14</sup>	10	20	18 <sup>18</sup>
Usable Sensitivity, 12 dB SINAD (uV)	.35	.35	.35	.35	.35	.35
Adjacent Channel Selectivity (dB)	80	85	65	80	65	70 <sup>19</sup>
Intermodulation Spurious Response Attenuation (dB)	80	85	70	80	70	70
Spurious Response Attenuation (dB)	80	85 <sup>15</sup>	75	85 <sup>15</sup>	70	75
Audio Power Output (Watts)	10	10	10	10	10	10
Audio Distortion (%)	5	5	5	5	5	5

**6.4 Portable Radio Equipment**

The portable radio shall be state-of-the-art and all RF frequencies and CTCSS tones shall be generated electronically, synthesized. The portable radio shall be equipped with a battery of sufficient capacity to provide a 5% transmit, 5% receive, and 90% standby (5/5/90) duty cycle.

**6.4.1 TIA/EIA and Military Standards**

The radio equipment shall meet or exceed the following standards and test procedures of the current issue on the date of this revision. In the event of inconsistencies between the specifications in this Plan and the publications and standards listed below, the requirements of this Plan shall take precedence.

Telecommunications Industry Association/Electronics Industries Association Standards

TIA/EIA-603 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

NOTE: EIA-152, EIA/TIA-204, EIA-220, and EIA/TIA-316 are rescinded by TIA/EIA-603.

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<sup>14</sup> As Needed.  
<sup>15</sup> Except one (1) spurious response at -80 dB allowed.  
<sup>16</sup> The 20-channel requirement is for UHF mobile radios equipped with any of the first 16 MED channels; otherwise as needed. Also see Section 6.5.1.  
<sup>17</sup> This requirement allows for a minimum of one agency-specific channel and applicable mutual aid channel(s) for that band of operation; otherwise, as needed.  
<sup>18</sup> No degradation, simultaneously for 806-824 MHz and 851-869 MHz Band.  
<sup>19</sup> -70 dB @ 25 KHz and , mutual-aid channels exempted, -20 dB @ 12.5 KHz.

MIL-STD-810D or 810E

The transmitter/receiver unit shall meet or exceed MIL-STD-810D or 810E the following test methods and procedures:

<u>D</u>	<u>E</u>	
506.2	506.3	Rain, Procedure I, (blowing rain)
509.2	509.3	Salt Fog, Procedure I (aggravated screening)
510.2	510.3	Sand and Dust, Procedure I (blowing dust)
514.3	514.4	Vibration, Procedure I, Category 1 (3 Axes)
516.3	516.4	Shock, Procedure I, (functional)

MINIMUM PERFORMANCE STANDARDS  
**Portable Radio Equipment**

**6.4.2 Transmitter Parameters**

	<u>VHF-LB</u> 25 KHz	<u>VHF-HB</u> 25 KHz	<u>VHF-HB</u> 12.5 KHz	<u>UHF</u> 25 KHz	<u>UHF</u> 12.5 KHz	<u>800</u>
Number of Channels	A/N <sup>21</sup>	A/N <sup>21</sup>	A/N <sup>21</sup>	20 <sup>22</sup>	20 <sup>22</sup>	10 <sup>23</sup>
Frequency Separation (MHz)	A/N <sup>21</sup>	A/N <sup>21</sup>	A/N <sup>21</sup>	8	20	18 <sup>24</sup>
Power Output (Watts) <sup>20</sup>	4	4	4	4	4	3
FM Hum and Noise (dB)	45	45	38	40	38	40

<sup>20</sup> Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering (for VDR, CMC, SMC and LMC) and/or FCC Rules.

<sup>21</sup> As Needed.

<sup>22</sup> The 20-channel requirement is for UHF portable radios equipped with any of the first 16 MED channels; otherwise as needed. Also see Section 6.5.1.

<sup>23</sup> This requirement allows for a minimum of one agency-specific channel and applicable mutual aid channel(s) for that band of operation; otherwise, as needed.

<sup>24</sup> No degradation, simultaneously for 806-824 MHz and 851-869 MHz Band.

MINIMUM PERFORMANCE STANDARDS

**Portable Radio Equipment**

**6.4.3 Receiver Parameters**

	<u>VHF-LB</u> 25 KHz	<u>VHF-HB</u> 25 KHz	<u>VHF-HB</u> 12.5 KHz	<u>UHF</u> 25 KHz	<u>UHF</u> 12.5 KHz	<u>800</u>
Number of Channels	A/N <sup>25</sup>	A/N <sup>25</sup>	A/N <sup>25</sup>	20 <sup>26</sup>	20 <sup>26</sup>	10 <sup>27</sup>
Frequency Separation	A/N <sup>25</sup>	A/N <sup>25</sup>	A/N <sup>25</sup>	8	20	18 <sup>28</sup>
Usable Sensitivity, 12 dB SINAD (uV)	.35	.35	.35	.35	.35	.35
Adjacent Channel Selectivity (dB)	70	70	70	70	70	65 <sup>29</sup>
Intermodulation Spurious Response Attenuation (dB)	70	70	70	70	70	60
Spurious Response Attenuation (dB)	70	65	65	70	65	60
Audio Power Output (Watts)	0.5	0.5	0.5	0.5	0.5	0.5
Audio Distortion (%)	5	5	5	5	5	5

MINIMUM PERFORMANCE STANDARDS

**Digital Base/Repeater Station Equipment**

**6.5.1 Transmitter Parameters**

	<u>VHF-HB</u>	<u>UHF</u>	<u>800</u>
Power Output (Watts) <sup>30</sup>	90	90	75
FM Hum and Noise (dB)	-45	-45	-45
Continuous Duty Cycle	Yes	Yes	Yes

<sup>25</sup> As Needed.

<sup>26</sup> The 20-channel requirement is for UHF portable radios equipped with any of the first 16 MED channels; otherwise as needed. Also see Section 6.5.1.

<sup>27</sup> This requirement allows for a minimum of one agency-specific channel and applicable mutual aid channel(s) for that band of operation; otherwise, as needed.

<sup>28</sup> No degradation, simultaneously for 806-824 MHz and 851-869 MHz Band.

<sup>29</sup> -65 dB @ "25 KHz and, mutual-aid channels exempted, -20 dB @ "12.5 KHz.

<sup>30</sup> Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or Federal Communications Commission (FCC) Rules.

### 6.5.2 Receiver Parameters

	<u>VHF-HB</u>	<u>UHF</u>	<u>800</u>
Digital Sensitivity, 5% BER uV	.35	.35	.35
Adjacent Channel Selectivity (dB)	60	60	60
Intermodulation Spurious Response Attenuation (dB)	80	80	75
Spurious Response Attenuation (dB)	90	90	100

### MINIMUM PERFORMANCE STANDARDS Digital Mobile Radio Equipment

### 6.5.3 Transmitter Parameters

	<u>VHF-HB</u>	<u>UHF</u>	<u>800</u>
Number of Channels <sup>31</sup>	3	3	10
Frequency Separation (MHz)	17	10	18
Power Output (Watts) <sup>32</sup>	50	50	30
FM Hum and Noise (dB)	40	40	40

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<sup>31</sup> This requirement allows for a minimum of any Primary Dispatch channels and applicable Mutual Aid channels for that band of operations; otherwise, as needed.

<sup>32</sup> Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC Rules.



**MINIMUM PERFORMANCE STANDARDS**  
**Digital Mobile Radio Equipment**

**6.5.4 Receiver Parameters**

	<u>VHF-HB</u>	<u>UHF</u>	<u>800</u>
Number of Channels <sup>33</sup>	3	3	10
Frequency Separation	17	10	18
Digital Sensitivity 5% BER uV	.35	.35	.35
Adjacent Channel Selectivity (dB)	70	70	65
Intermodulation Spurious Response Attenuation (dB)	75	85	65
Spurious Response Attenuation (dB)	75	85	65
Audio Power Output (Watts)	10	10	10
Audio Distortion (%)	5	5	5

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<sup>33</sup> This requirement allows for a minimum of any Primary Dispatch channels and applicable Mutual Aid channels for that band of operations; otherwise, as needed.

**MINIMUM PERFORMANCE STANDARDS**  
**Digital Portable Radio Equipment**

**6.5.5 Transmitter Parameters**

	<u>VHF-HB</u>	<u>UHF</u>	<u>800</u>
Number of Channels <sup>34</sup>	3	3	10
Frequency Separation (MHz)	17	10	18
Power Output (Watts) <sup>35</sup>	5	4	3
FM Hum and Noise (dB)	42	42	42

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<sup>34</sup> This requirement allows for a minimum of any Primary Dispatch channels and applicable Mutual Aid channels for that band of operations; otherwise, as needed.

<sup>35</sup> Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC Rules.

**MINIMUM PERFORMANCE STANDARDS  
Digital Portable Radio Equipment**

**6.5.6 Receiver Parameters**

	<u>VHF-HB</u>	<u>UHF</u>	<u>800</u>
Number of Channels <sup>36</sup>	3	3	10
Frequency Separation	17	10	18
Digital Sensitivity 5% BER uV	.28	.25	.3
Adjacent Channel Selectivity (dB)	60	68	63
Intermodulation Spurious Response Attenuation (dB)	74	77.5	75
Spurious Response Attenuation (dB)	75	75	75
Audio Power Output (Watts)	.5	.5	.5
Audio Distortion (%)	3	3	3

**6.6 Mobile/Portable Channelization**

**6.6.1 UHF Band**

A. FCC Requirements: FCC Rules and Regulations require that all mobile radios, and portable radios exceeding 2.5 watts transmitter power output, which operate on MED channels, must employ equipment which is both wired and equipped to transmit/receive, respectively, on each of the eight frequency pairs designated in the EMR Service as MED-1 through MED-8.

B. MED-8 Statewide Medical Coordination (SMC) Channel: All UHF EMS mobile and portable radios shall be configured with frequencies 468.175 MHz transmit, 463.175 MHz receive, and CTCSS of 167.9 Hz. This frequency pair is designated as MED-8 by the FCC and is utilized throughout Florida as the SMC Channel.

C. MED-8 Statewide-Scene Coordination (SSC) Channel: A MED-8 "talk-around" channel shall be incorporated into all UHF non-duplex mobile radios, and all non-duplex portable radios having transmitter power output exceeding 2.5 watts. This simplex channel, operating as 463.175 MHz transmit and receive, with statewide CTCSS of 167.9 Hz, will provide intra- and inter-agency "scene of action" communications on a statewide basis.

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<sup>36</sup> This requirement allows for a minimum of any Primary Dispatch channels and applicable Mutual Aid channels for that band of operations; otherwise, as needed.

## 6.6.2 800 MHz Band

EMS mobile and portable radio equipment operating in the 800 MHz Band shall be equipped with the National Public Safety Calling Channel operating in the duplex mode and the four National Public Safety Tactical Channels for both duplex and "talk-around" operation. See Appendix A.

Additionally, the radio equipment may be equipped with the Florida Public Safety/Special Emergency Mutual-Aid Channel, 853.3875 MHz - Tx, 808.3875 MHz - Rx, CTCSS 210.7 Hz, per Appendix B.

## 7.0 CONCEPTS OF MOBILE DATA COMMUNICATIONS

### 7.1 General

Voice communications should remain the primary means of coordinating EMS activities. Mobile data would be considered as an upgrade and/or expansion, in a secondary role, to the voice communications system. EMS agencies may operate mobile data systems over current voice networks, such as 150, 450, 700 and 800 MHz frequency bands, on a secondary basis, subject to bandwidth constraints. The use of the term "mobile data" means packet-switched networks as outlined in this section. Mobile data systems provide a means for EMS personnel to instantly access local, state and national databases, locator mapping, and record management. The plan to extend WLAN into vehicles laptops is discussed in Section 7.7.3.

### 7.2 General Mobile Data Design

Wireless data technologies are evolving from second-generation (2G) to third-generation (3G) digital standards. A summary of the evolving technologies is listed below.

Cellular Digital Packet Data (CDPD): CDPD is a second-generation, analog, data transmission system, which uses idle cellular channels, in the 800- to 900-MHz range, to transmit data in packets. This technology offers data transfer rates of up to 19.2 Kbps although the actual throughput is much less. CDPD is being replaced by GPRS. CDPD services might be phased out by June 2004.

General Packet Radio Service (GPRS): GPRS is also a second-generation, digital, network based on Global System for Mobile Communications (GSM) networks. This technology offers higher data capacity of 56 – 115 Kbps. It is the standards-based packet overlay for existing GSM, and it enables the deployment of next-generation mobile data applications, including enhanced Voice over IP (VoIP), Radio over IP and video communications and continuous, always-on, connection to the Internet. The GPRS uses the same technology foundation as Universal Mobile Telecommunications System described below.

Enhanced Data for GSM Evolution (EDGE): EDGE is a third-generation data system, and it will deliver data rates up to 384 Kbps on a broadband.

Universal Mobile Telecommunications System (UMTS): UMTS is also a third-generation data system, and it will deliver broadband information at speeds up to 2 Mbps. Besides voice and data, UMTS will deliver audio and video to wireless devices anywhere in the world through fixed, wireless and satellite systems.

Wideband Code-Division Multiple Access (WCDMA): WCDMA is a third-generation mobile wireless technology that supports mobile/portable voice, images, data, and video communications at up to 2 Mbps, local area access, or 384 Kbps, wide area access.

Code-Division Multiple Access 2000 (CDMA2000): Another mobile data system is CDMA2000, which is similar in UMTS and WCDMA data speeds. The first phase of CDMA2000 is 1xRTT, 1x stands for a single carrier and RTT stands for Radio Transmission Technology, and the network features between 115-307 Kbps data transmission speed. Other CDMA initiatives include CDMA 1xEV-DO and CDMA 1xEV-DV. 1xEV-DO stands for one carrier Evolution-Data Optimized, up to 2.4 Mbps, while 1xEV-DV stands for one carrier Evolution-Data and Voice (up to 2.4 Mbps).

## Mobile Data Design

### A. Mobile Data Computer (MDC) System

Mobile data network design consists of three basic modules. The first module in the design is the MDCs or dismantled wireless devices, including wireless laptops or PDAs capable of communicating with the vehicles wireless systems. The MDC system contains the computer module, power supply, keyboard, monitor, modem, RF amplifier, software, and antenna. Section 7.2.5 of this plan provides the recommended specifications of the MDC. A ruggedized mobile computer is recommended for law enforcement. Section 7.2.4 addresses the security requirements of the MDC.

### B. Wireless Data Base Station

Non-GPRS Base Station: The wireless data base station is the second module in the mobile data network design. The base station includes the radio, antenna, router/modem, authentication server, and leased communications lines. The coverage reliability of the radio system is discussed in Section 7.2.3, and the security requirements are listed in Section 7.2.4.

GPRS Base Station: In a GPRS network, the base station is known as Base Station Subsystem (BSS). This normally includes a software upgrade to the radio transceivers and base station control nodes. A Packet Control Unit (PCU) is also added to the BSS to manage the packet data transfer between user devices and the GPRS core network. In addition, GPRS would have two more components to the network: the Serving GPRS Support Node (SGSN) and the Gateway GPRS Support Node (GGSN). These nodes interact with the Home Location Register (HLR) node to obtain subscriber profile and authentication. The SGSN is connected directly to the base station network and controls access, tracks user mobility, and implements various security functions. The GGSN is a gateway to external data networks and provides services such as authenticating external network access, quality of service (QoS), and tunneling. External networks may include the Internet, private Intranets, or legacy X.25 networks. The GGSN also supports roaming by routing incoming traffic to the appropriate SGSN where the user is located.

Authentication Server: An authentication server is located either at the base station, EMS dispatch center or at both locations.

### C. Mobile Data Ethernet LAN Connectivity

The third module in the mobile data network design is the Ethernet LAN at the EMS agency, including a terminal server, computer-aided dispatch (CAD) system, information network, voice and message switches, data radio controller or multi-site controller, authentication server, and Internet access. A detailed plan to extend a WLAN is discussed in Section 7.3.3, including specifications, 802.11 standards, access points, network protocols, design concerns, and security.

### **7.3 Mobile Data Communication Coverage Reliability**

It is recommended that the minimum system design for a mobile data system (MDS) be engineered at 90% area coverage for reliable data communications. This will be a requirement if the local agency is building its own MDS. However, if the agency is relying on a wireless data service provider, it will be prudent to check the coverage area of the MDS service provider before designing and subscribing in the network.

### **7.4 Mobile Data Security**

If an agency uses a mobile data system, i.e., CDPD, GPRS, EDGE, UMTS, WCDMA, CDMA2000 or a proprietary system, a minimum standard of end-to-end encryption methods and authentication procedures is required. Digital data networks access, authentication and authorization, to the network is controlled at the SGSN or similar node. The encryption should be at least a 128-bit encryption scheme with an Extensible Authentication Protocol (EAP). A Subscriber Identity Module (SIM) is required at the user's terminal, which connects with HLR Network Node to validate a subscriber. Additional authentication is also recommended by use of a Remote Authentication Dial In User Service (RADIUS) server. Because mobile data security is evolving, law enforcement agencies should integrate the latest developments in security technology.

### **7.5 Mobile Data Computer Minimum Recommended Specifications**

Although an off-the-shelf mobile computer will work, a ruggedized MDC is recommended for law enforcement. The ruggedized mobile computer should be in compliance with RS-374/EIA 204 or Military Standard-810F standards for salt, fog, temperature, dust/sand, rain, vibration, humidity and shock based on the following test methods and procedures:

- A. Rain, Procedure I (blowing rain)
- B. Salt Fog, Procedure I (aggravated screening)
- C. Sand and Dust, Procedure I (blowing dust)
- D. Vibration, Procedure I, Category 10 (3 Axes)
- E. Shock, Procedure I (functional)

NOTE: Altitude testing is not required.

#### Minimum Recommended Specifications

Processor Pentium-class/equivalent with 128 MB RAM or higher, 8 MB video RAM, 6 GB hard drive or higher, RS-232 serial ports, and USB ports, PCMCIA slot, 10Base-T network connector

Software Windows-based mobile data software or equivalent

Display SVGA, integral touch-screen and sunlight viewable

Keyboard Detachable, 82-key QWERTY layout, integrated glide pad and water-resistant

Operating Temperature 32 to 150 degrees Fahrenheit

Power Supply	12-volt system, regulated, with protection against reboots due to low power spikes
Battery Life	2 hours (minimum)
Mount	Moveable and user-friendly
Options	Fingerprint scanning station and Barcode and magnetic strip readers

Although PDAs or handheld computers specifications are not listed, ruggedized PDAs and handheld computers are recommended in compliance with RS-374/EIA 204 standards.

## **7.6 Software and Hardware**

EMS agencies can wirelessly access their network through several connectivity schemes, which are Secured Socket Layer (SSL), Virtual Private Network (VPN), or Frame Relay (FR) connectivity. All the connectivity schemes must have some type of encryption and security embedded in the software. The approved encryption algorithms are Data Encryption Standard (DES), Triple DES, and Advanced Encryption Standard (AES). The latter is recommended.

## **7.7 Wireless LAN Technologies & Standards**

### **7.7.1 General**

If an agency uses or wishes to use wireless technology, its WLAN should comply with the minimum requirements of the Institute of Electrical and Electronic Engineers (IEEE) 802.11, which is the standard for WLANs. 802.11a wireless uses the FCC 5 GHz unlicensed National Information Infrastructure (U-NII) band and transfers data up to five times faster than 802.11b. However, 802.11a is not backward compatible to 802.11b. 802.11b specifies the unlicensed high-speed RF data communications in the 2.4 GHz Industry, Scientific, and Medical (ISM) band, including infrared and spread spectrum. 802.11b is backward compatible to 802.11. 802.11g, multimode, uses the same technologies as 802.11a and is backward compatible with 802.11b. Section 7.3.3 outlines the plan to extend WLAN into vehicles.

### **7.7.2 Overview of 802.11 Technologies**

802.11 technologies are evolving. As newer 802.11 standards are adopted, it is recommended that the new standard be backward compatible with the standard currently used by the law enforcement agency. For planning purposes, as standards change and you adopt these new standards, components in your extended WLAN may have to be replaced. The key is to ensure that the new change is 802.11-compliant, including access points, etc. In summary, 802.11 supports speeds up to 2 Mbps in 2.4 GHz radio range, unlicensed. 802.11a supports higher speed up to 54 Mbps and works in unlicensed 5 GHz radio band; it is not backward compatible to the older 802.11b standard. 802.11b is backward compatible to 802.11, and supports up to 11 Mbps in unlicensed 2.4 GHz radio band. Today, most agencies use this standard. 802.11g supports both 802.11a and 802.11b standards. An overview of 802.11 technologies is listed below:

#### **A. Frequency Hopping Spread Spectrum (FHSS) – 802.11**

FHSS technology under the 802.11 is the standard for WLANs. It operates primarily at 2.4 GHz with a throughput of 1-2 Mbps. The physical layer, which actually handles the transmission of data between nodes, can use either direct sequence spread spectrum, frequency hopping spread spectrum, or infrared (IR) pulse position modulation. 802.11 makes provisions for data rates of either 1Mbps or 2 Mbps, and calls for

operation in the 2.4 - 2.4835 GHz frequency band, in the case of spread-spectrum transmission, which is an unlicensed band for ISM applications.

B. Orthogonal Frequency Division Multiplexing (OFDM) – 802.11a

802.11a standard specifies an OFDM physical layer that splits an information signal across 52 separate sub-carriers to provide transmission of data with eight non-overlapping frequencies at a rate of 6, 9, 12, 18, 24, 36, 48, or 54 Mbps. In the 802.11a standard the 6, 12, and 24 Mbps data rates are mandatory, and the standard requires receivers to have a minimum sensitivity ranging from –82 to –65 dBm, depending on the chosen data rate. Operating frequencies for the 802.11a OFDM layer fall into the following three 100 MHz unlicensed U-NII bands: 5.15 to 5.25 GHz, 5.25 to 5.35 GHz, and 5.725 to 5.825 GHz. The first 100 MHz is the lower section and is restricted to a maximum power output of 50 milliwatts (mW). The second 100 MHz is limited to 250 mW, and the third 100 MHz is delegated for outdoor applications with a maximum of 1-watt power output. Note: The 802.11a 5 GHz frequency range will lead to shorter transmission distances compared to 802.11b 2.4 GHz frequency range.

C. Direct Sequence Spread Spectrum (DSSS) - 802-11b

DSSS technology operates under 802.11b. This 802.11b specification allows DSSS to operate at 2.4 GHz with three non-overlapping frequencies at variable throughput of 1, 2, 5.5 and 11 Mbps. The benefit of the DSSS 802.11b is higher bandwidth capabilities than offered by 802.11. Most law enforcement WLANs use spread spectrum technologies, which operate in unlicensed radio bands to include 902-928 MHz, 2.4 GHz and 5.725-5.85 GHz. There are two forms of spread spectrum under 802.11b: Frequency Hopping Spread Spectrum and Direct Sequence Spread Spectrum.

D. 802.11g (Multimode)

802.11g standard, not yet ratified, uses the same technologies as 802.11a and is backward compatible with 802.11b. For 802.11b compatibility, 802.11g incorporates 802.11b's Complementary Code Keying (CCK) to achieve bit transfer rates of 5.5 and 11 Mbps in the 2.4 GHz band. In addition, 802.11g adopts 802.11a's OFDM for 54 Mbps speeds but in the 2.4 GHz range. Please note that users in the 2.4 GHz band will have to deal with interference from satellites to microwave ovens to high-end wireless phones. This can result in lower throughput.

### **7.7.3 Extension of WLAN System/Access Points (APs)**

A. Access Points (APs)/Wireless Bridges

To extend the WLAN, a network of fixed APs is engineered over a designated area. The wireless bridges are engineered for line-of-sight (LOS) with directional antennas, point-to-point and/or point-to-multipoint configurations. The planning range of wireless bridges varies with manufacturers, 1,000 feet to 25 miles, but most installations are less than 3 miles. The wireless bridges will be configured to communicate directly with vehicles that are roaming within LOS signal range of the sites. The wireless bridges should also be at least Ethernet Category 5 cabled to the sites "wired" network hub, switch, or router for connectivity into the WLAN infrastructure. It is recommended that the wireless bridges broadcast Service Set Identifiers (SSIDs) be disabled, and the default password be changed.

B. Building Antenna System

The external building antenna system may consist of a Bi-directional Programmable Amplifier, 1-Watt



maximum, with DC-Injector mode, low loss antenna cable, an antenna mast assembly, and an omni-directional antenna for each fixed AP site. The antenna system should be TIA/EIA 607 grounded and provided with lightning arrestor protection. In addition, the antenna signal strength shall not be more than +36 dBm, +25.21 dBu, with any given omni-directional antenna, 4 Watts ERP.

### C. Roaming Vehicles

It is recommended that the law enforcement wireless laptops be ruggedized, See Section 7.2.5. The APs allow roaming vehicles with laptop, personal digital assistants (PDAs) or pocket personal computer, pocket PC, with wireless capabilities to operate within LOS of the antenna system, Section 7.3.3B. The law enforcement agency may want to consider equipping vehicles with workgroup bridge units, which would allow dismounted wireless devices to communicate with the vehicles' wireless systems.

### Data Rate Throughput Limits

For planning purposes, wireless bandwidth decreases as distance increases; that is, the farther the coverage distance, the slower the speed. In addition, the overall throughput is limited by the slowest link in the network. Note: 802.11b wireless bridges are half-duplex, meaning they only transmit in one direction at a time.

### Severe Weather/Interference

Severe weather, such as torrential rains, can adversely affect signal transmission and temporarily down the extended WLAN. Similarly, the link is susceptible to other radio frequency interference. Unlicensed band users have no protection against interference, and if their networks affect licensed users in the same band, then the WLAN would have to cease operation. Out of band emissions from high-power paging stations co-located or near one of the wireless database stations or accesses points could also affect the reliability of the network. In addition, a growing number of users within the unlicensed band could potentially raise noise and interference in the future.

### **7.7.4 Network Layer Protocol**

In the Open Systems Interconnect (OSI) communications mode, the network layer protocol should be IP-based (TCP/IP stack).

### **7.7.5 WLAN Security**

If an agency uses wireless technology, IEEE 802.11i standard addresses the security requirements of WLANs, APs, vehicle wireless laptops, and dismounted wireless devices. These systems should have the minimum standard of encryption methods and authentication procedures to include firmware that uses the Temporal Key Integrity Protocol (TKIP), Advanced Encryption Standard (AES) of at least 128-bit encryption, and Extensible Authentication Protocol (EAP) that is enabled. To ensure only authorized users have access to the WLAN, it is also recommended that user IDs and passwords be used for authentication and double security. In addition, access points installed within firewalls are not recommended. All APs should be outside firewalls so as to avoid compromising the wired segments of the network. Wireless laptops are also recommended to have a firewall, such as device management software, to help prevent rogue access to your data. The management software also allows host server to deploy virus fixes and patches, to enforce machine settings, and to remove unauthorized software to protect wireless laptops or PDAs. Because security requirements are evolving, law enforcement agencies should integrate the latest developments in security technology based on 802.11 series.

## **APPENDIX A**

### **FLORIDA - REGION 9 PLAN FOR PUBLIC SAFETY RADIO COMMUNICATIONS**

#### **MUTUAL-AID CHANNEL IMPLEMENTATION REQUIREMENTS**

This excerpt is copied from the Florida - Region 9 Plan for Public Safety Radio Communications, Amendment #9, administered by the Florida - Region 9 Committee in concert with the Federal Communications Commission. Emergency Medical Services agencies utilizing frequencies in the 800 MHz Band should obtain a copy of the complete Florida - Region 9 Plan for Public Safety Radio Communications, see Section 2.3, to ensure the most current amendment and a more complete understanding of it

## 5.3 Mutual Aid Channel Implementation Requirements

### 5.3.1 General Implementation and Use

**A.** Region Mobile Relay Coverage - Mutual Aid Channel stations will be designed to provide wide-area mobile relay coverage and geographically assigned to provide continuous mobile coverage throughout the Region. It is anticipated that mobile relay stations on the Calling Channel and at least one Tactical Channel will be established to provide continuous mobile relay coverage throughout the Region. The establishment of Mutual Aid Channel stations is subject to Region Committee approval to ensure sufficient coverage and minimum of interference between stations.

**B.** Coverage Equivalency - Agencies using or implementing systems in the 806-824/851-869 MHz bands and who are implementing one or more mobile relay Mutual Aid Channel stations shall provide coverage on Mutual Aid Channels at least equivalent to the mobile and portable coverage on their non-Mutual Aid 800 MHz system. This requirement exists for reasons of safety to officers in the field.

An agency which plans to utilize a Mutual Aid Channel system which has been, or will be, implemented by others, e.g., a city utilizing an existing county-wide Mutual Aid system, must be aware that the system may not provide coverage equivalency. For example a county-wide Mutual Aid channel system designed for rural mobile coverage may not provide coverage equivalent to that of a city which plans a system designed for in-building portable coverage. In such cases, an agency must either modify or supplement the mobile relay system to achieve equivalency, or else acknowledge the lack of coverage equivalency in its license application.

**C.** Calling Channel (Channel #601) - A watch will be maintained on this channel on a 24 hours per day, 7 days per week basis. Any agency operating one or more fixed stations on 821-824/866-869 MHz in the Florida Region is required to have the capability to both monitor and transmit on a Calling Channel mobile relay station from its dispatch center. Agencies who do not serve as the Network Control Center, See Section 5.3.4., for a Calling Channel mobile relay station shall satisfy this requirement by means of an RF control station dedicated to the Calling Channel, or a dedicated wireline, or other approved link, through the Network Control Center. All agencies with Calling Channel capability are required to monitor and be prepared to render assistance on the channel.

**D.** Tactical Channels (Channels #639, 677, 715, and 753) - Each major user, 5 channels or more, of the 821-824/866-869 MHz spectrum will be required to sponsor, individually or jointly, one or more Tactical Channel mobile relay stations, unless all Tactical Channels have been or will be implemented by others in the same area. Depending upon the needs in an area, it is encouraged that multiple channels be implemented. Talk-around on all four tactical channels will provide on-scene communications to supplement the local mobile relay and for use in areas where no mobile relay exists.

Any agency operating one or more fixed stations on 821-824/866-869 MHz in the Florida Region is required to have the capability to both monitor and transmit on all four Mutual Aid Tactical Channels from its dispatch center. Agencies who do not serve as the Network Control Center for one or more of these mobile relay stations shall satisfy this requirement by means of separate single-channel RF control stations, a multi-channel RF control station, dedicated wirelines, or other approved links, through the Network Control Center, or some combination of these.

### 5.3.2 State Agency/Local Agency Implementation

The Joint Task Force on State Agency Law Enforcement Communications (JTF) plans to implement the Calling Channel and 1st Tactical Channel throughout the state. In areas where these have not yet been constructed, local agencies will implement the Calling Channel and 2nd Tactical Channel. When the JTF

does construct systems in those areas, the local agency Calling Channel station shall be reprogrammed to the 3rd Tactical Channel. In all cases, the State prefers that the day-to-day control of the channels be done at the local level, normally by the major public safety agency such as a County Sheriff's Office.

### **5.3.3 Allowable Communications**

**A.** General Limitations - The five Mutual Aid Channels are to be reserved for intercommunication in situations requiring the coordination of multiple public safety entities. They shall not be used for administrative or intra-agency communications unless so directed during a major emergency or disaster situation. They are designed for use between agencies, which have no other common radio communications paths to enable joint operations in emergency or tactical situations. The Mutual Aid Channels are primarily for extraordinary communications between disparate agencies. When a communications function can be considered as routine, repetitive, or covered by an administrative mutual aid agreement, the five channels should not be considered as the primary link between the agencies.

**B.** Eligible Users - Primary participants using the Mutual Aid Channels include local, state, and federal disaster management agencies, as well as providers of law enforcement, fire, and emergency medical services. If sufficient channels are available, other eligibles in the Public Safety and Special Emergency Radio Services may also participate to the extent required to insure the safety of life and property. In a major emergency or disaster situation, use of the Mutual Aid Channels may be extended to private volunteer organizations whose functions are in coordination with the local disaster management agency.

**C.** Use of the Calling Channel - The Calling Channel shall be used only for initial contact with other entities in the Region who can render mutual assistance during an emergency situation. This channel shall not be utilized as an ongoing working channel. Once contact is made between entities, an agreed upon Tactical or other mutual-aid channel shall be used for continued communications. Talk-around is not allowed on the Calling Channel.

**D.** Use of the Tactical Channels - The four Tactical Channels are reserved for use by entities requiring continuing interagency mutual-aid communications. Incidents requiring multi-agency participation will utilize these frequencies as directed by the controlling agency having the responsibility for an incident or area of concern. The Tactical Channels may be further subdivided into groups for separate use by various public safety services as needed. In a major emergency or disaster situation, one or more of the Tactical Channels may be designated as an intra-agency communications channel.

#### **E. Examples of Proper Use of the Mutual Aid Channels**

1. As working channels for multiple fire departments fighting a fire together.
2. For coordination during a police chase through multiple jurisdictions where the agencies have no other communications link with each other.
3. For communications during extended joint operations between multiple police agencies such as drug operations, riots, etc.
4. For coordination during recovery operations after a disaster such as a hurricane when local, state, and federal officials require a common communications link.

## **F. Examples of Improper Use of the Mutual Aid Channels**

- 1.** To support the administrative functions of a fire department which has a mutual aid agreement with an adjacent fire department to provide "move up" capability when a fire unit leaves its own coverage area.
- 2.** To provide an extra working channel for a public safety agency supporting a special event.
- 3.** To provide a surveillance channel for use between members of the same public safety agency.

### **5.3.4 Network Control Centers**

Each Mutual Aid Channel mobile relay station shall be directly controlled by a local Network Control Center under the jurisdiction of the primary Public Safety agency of that county or area. The primary Public Safety agency in each county or area shall be the County Sheriff's Department or Public Safety Department, unless another agency has been designated as a Network Control Center by the Florida Region Committee. The responsibilities of these centers include ensuring responses to calls for assistance from any vehicle or dispatch point within their coverage area. Network Control Centers will coordinate assignments for subsequent use of the Tactical Channels for ongoing emergency operations, consistent with the geographic vicinity of the emergency.

### **5.3.5 Assignment of Control**

In a major emergency or disaster situation, the use of one or more Tactical Channels may be dedicated by the local Network Control Center to a specific function determined necessary for management of the immediate situation. Dedicated assignment of Mutual Aid Channels is subject to the approval of the local Emergency Operations Center, the State of Florida Division of Emergency Management of the Department of Community Affairs, or the State of Florida State Technology Office of the Department of Management Services, as determined by statutory authority.<sup>37</sup>

### **5.3.6 Use of Encryption on Mutual Aid Channels**

Within the Florida Region, transmissions on the Calling Channel shall not use any means of encryption or other selective signaling techniques.

Due to the nature of communications on the four Tactical Channels, the ability to operate securely on these channels would both protect and enhance such operations in some circumstances. Since there is no common standard for encryption among manufacturers however, this Plan does not require that any equipment on the four tactical channels be capable or otherwise equipped for secure speech communications. Those agencies who do require secure voice interoperability with other agencies outside their normal channel operations will be expected to provide the compatible equipment necessary for their mutual needs, but such that non-encrypted communications from either fixed or mobile stations of other agencies are not restricted.

During a major emergency or disaster situation, communications on the Mutual Aid Channels designated for disaster relief operations shall not be encrypted.

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<sup>37</sup> Florida Statutes, Chapter 252, entitled "Emergency Management" defines the emergency management powers and duties of the State and political subdivisions.

### **5.3.7 Mutual Aid Channel Equipment Requirements**

- A.** All mobile and portable radios shall be equipped to operate on all five Mutual Aid Channels.
- B.** All fixed and mobile/portable equipment operating on the Mutual Aid Channels shall use continuous tone-controlled squelch (CTCSS) tone of 156.7 Hz.
- C.** Base stations shall be equipped to operate as mobile-relay stations, repeaters, but shall normally operate in the repeat-disable mode until a request for mobile-relay service is received. Each Network Control Center shall be equipped to control the repeatenable/disable function of all Mutual Aid Channel repeaters for which it serves as the primary control center.

### **5.3.8 Operating Requirements**

On all Mutual Aid Channels, plain ENGLISH will be used at all times; the use of unfamiliar terms, phrases, or codes is not allowed. Users will be from different agencies, each having their own procedure and protocols. Any attempt to introduce codes would cause confusion, increase risk, and possibly even rejection of the Mutual Aid Channel concept.

**APPENDIX B**

**PUBLIC SAFETY MUTUAL-AID CHANNEL**

This excerpt is copied from the State of Florida, State Implementation Plan for Communications Services, dated February 1995, administered by the Department of Management Services, State Technology Office, Tallahassee, Florida.

### **2.4.3 PUBLIC SAFETY MUTUAL AID CHANNEL**

#### **2.4.3.1 General**

The State of Florida, State Technology Office(STO) holds authorization from the Federal Communications Commission (FCC) to utilize the radio frequencies 853.3875/808.3875 MHz as a Mutual Aid Channel in the Public Safety Radio Service within the state of Florida without regard to channel loading. This makes available to eligible Public Safety agencies, including Emergency Medical Services, an inter-service radio channel authorized for use during situations requiring interagency communication necessary toward safeguarding life, health, or property within the state of Florida.

#### **2.4.3.2 Eligibility**

Applicants satisfying one or more of the following eligibility criteria may apply for authorization to operate radio stations on this channel.

- A. Any state agency, county, city, town, district, authority, or similar governmental entity.
- B. Persons or organizations charged with specific fire protection or forestry conservation activities whose request for authorization is supported in writing by the governmental entity having legal jurisdiction over the area to be served.
- C. Hospitals and other institutions and organizations regularly engaged in providing emergency medical services.
- D. Ambulance companies regularly engaged in providing emergency medical ambulance services.
- E. Persons or organizations operating a rescue squad whose request is supported in writing by the governmental entity having legal jurisdiction over the area to be served.
- F. Organizations established for disaster relief purposes whose request is supported by a copy of the charter or other authority under which the organization was established and which details the relief plans to be implemented during emergency conditions.

#### **2.4.3.3 Application Procedures**

Applications for mobile-relay stations, mobile stations, or both, shall be submitted to this office and shall include the required eligibility showings, and written mutual agreement as to the technical and operational standards defined in Paragraphs 2.4.3.5 and 2.4.3.6.

Following a favorable determination by the STO, a letter of concurrence signed by the EMS Section shall be prepared and attached as an exhibit to the application. The entire application shall then be submitted to the appropriate FCC frequency coordinating organization for further processing as specified by FCC Rules.

#### **2.4.3.4 Communications Coverage Plan**

The intent of the coverage plan is to establish, on a zone-by-zone basis, statewide coverage for vehicular-mobile units, urban-metropolitan area coverage for hand-held portable units, and point-to-point wireless coverage for all agencies within a zone.

Communications reliability for system design purposes shall be defined as having been engineered for a 95% probability of communications at the defined coverage contour, or 98.3% probability of



communications over the defined coverage area, based on a received signal level of either 20 dB quieting or 17 dB SINAD, EIA, for the worst case of either talk-out, base to mobile, or talk-back, mobile to base.

A radio zone for vehicular-mobile units is defined to be one county unless otherwise approved by the STO. A radio zone for hand-held portable units is defined to be a specific urban-metropolitan area as agreed to by both the agency and/or STO.

Any application submitted to STO for authorization of a Fixed, Mobile-Relay, Station shall include detailed plans for establishment of either a county-wide vehicular-mobile system, or an urban-metropolitan area hand-held portable system, or both. Such applications shall also define the point-to-point wireless communications paths to be established with agencies in adjacent counties and/or metropolitan areas.

### **2.4.3.5 Technical Standards**

#### **2.4.3.5.1 System Configuration**

Fixed stations shall be configured for mobile-relay operation, such that the repeater function, repeat enable/disable, may be enabled or disabled from the associated supervisory control point.

Fixed station transmitters shall operate on 853.3875 Hz. Fixed station receivers shall operate on 808.3875 MHz for mobile relay purposes.

Vehicular-mobile and hand-held portable units shall be configured for repeater operation on one channel, 808.3875 MHz transmit, 853.3875 MHz receive, and for direct "talk-around" operation on a second channel, 853.3875 MHz transmit and receive. These channels may be in addition to any other trunked or conventional 800 MHz channels available in the same unit.

For each fixed station established, one supervisory control point shall be designated by the STO. A control point may be designated as supervisory for multiple fixed stations. Each supervisory control point, in addition to having the control functions of associated non-supervisory control points, shall have an override function which enables supervisory control of the repeat enable/disable function of supervised fixed stations.

Supervisory control points shall be staffed 24 hours continuously year-round, and shall have means for immediate contact with law enforcement, rescue, fire fighting and emergency medical services agencies in the coverage area of the station controlled.

Radio-frequency control stations transmitting on 808.3875 MHz shall not be authorized for supervisory control points. Radio frequency control stations for non-supervisory control points will be granted upon a showing of need.

Any supervisory or non-supervisory control points may alternatively operate via either local or remote, leased, wire-line links, or on other radio frequencies which may be authorized for such use.

#### **2.4.3.5.2 Equipment Requirements**

Continuous Tone-Controlled Squelch (CTCSS) frequency of 210.7 Hz shall be used statewide for transmission and reception on this channel.

This channel shall not be trunked or otherwise limited regarding its availability to conventional use.

Other selective signaling, voice-privacy systems, or any other exclusive communications modes shall not be employed without written concurrence from this office.

### **2.4.3.6 Operational Standards**

#### **2.4.3.6.1 Control Requirements**

During times of emergency, communications protocol and procedures for use of the channel shall be under the control of the State Division of Emergency Management of the Department of Community Affairs.

Regardless of ownership of, or licensee responsibility of the equipment comprising a station on this channel, any entity eligible under Paragraph 2.4.3.2 may apply for and may be granted authorization to operate a parallel control point for purposes of remotely controlling any existing fixed station where a showing of need has been demonstrated to the STO. No owner or licensee of a fixed station shall claim exclusive rights to the control of that station.

The supervisory control point shall normally cause the associated fixed, mobile-relay, station to be in repeat-disabled mode. The supervisory control point shall affect the repeat-enable mode only upon the specific request of a mobile, vehicular or hand-held, or radio frequency control station user. Upon completion of mobile-relay communications, the fixed station shall be switched to the repeat-disabled mode.

#### **2.4.3.6.2 Use Requirements**

Use of this channel shall be limited to situations in which radio communications between otherwise separate entities is essential for safeguarding life, health, or property within the state.

Regardless of the ownership of, or licensee responsibility of the equipment comprising a station on this channel, use of this channel shall be available on a non-exclusive basis to any entity eligible under Paragraph 2.4.3.2. No owner or licensee shall claim to have exclusive use of a fixed station on this channel.

**IT IS THE POLICY OF THE DIVISION TO CONTINUE TO USE AND SPECIFY THE STANDARDS AND CRITERIA LISTED ABOVE FOR PUBLIC SAFETY MUTUAL AID CHANNEL DESIGN AND IMPLEMENTATION.**

## **APPENDIX C**

### **PUBLIC SAFETY RADIOS FOR AIRCRAFT UTILIZATION**

This appendix is developed from the experiences of the Joint Task Force of State Law Enforcement Agencies, with the Federal Aviation Regulations, and with the Federal Communications Commission.

## Public Safety Radios for Aircraft Utilization

With regard to public safety radios for utilization in aircraft, the Federal Aviation Regulations (FAR) and the Federal Communications Commission (FCC) have established standards that require radios to meet certain design criteria for aircraft installation. Some of these standards are incorporated by reference to standards of the Radio Technical Commission for Aeronautics (RTCA). Selection of a radio system for public safety use may be accomplished by Scenario A, Aircraft radio equipment, Scenario B, Mobile radio equipment, or Scenario C, Hand-held portable radio equipment, as follows:

Scenario A: Install a radio system specifically designed for aircraft service.

Scenario B: Install a mobile radio such that the radio is compliant with current FAA-FARs and FCC rules. Specifically, a licensed avionics technician would modify the mobile radio and aircraft for installation. These modifications may include the following:

1. The installation of a 28VDC to 12VDC converter with the rated amperage and duty cycle required by the radio.
2. The installation of a universal interface apparatus that will provide the radio with the ability to generate "side tone." Further, this interface device would allow audio access (transmit and receive) to the radio via the aircraft's existing internal communications system (ICS). Additionally, this component will provide:
  - a. Isolated transmitter keying PTT (Push-to-Talk),
  - b. Isolated receiver audio input (balanced or matching),
  - c. Isolated receiver audio output (balanced or matching),
  - d. Microphone impedance output adapter (balanced or matching) with adjustable output, and
  - e. Internal receiver/side-tone audio amplifier.
3. Control of background lights on the radio control head, so as to not disturb or interfere with the pilot's ability to view the flight control instruments of the aircraft. (FAR 23.1381, instrument lights for aircraft)
4. When designing a mounting bracket configuration for the radio equipment, consider environmental parameters which would include installation of the system such that in the event of an aircraft mishap or accident, the radio and radio control head would remain secured. (FAR 43 & FAR 23.561)
5. Revise the mobile radio control head harness to include additional cable length as required for the aircraft installation. Replace the wiring harness provided for the radio control head with a wiring harness that is flame resistant and will not emit toxic fumes if burned. (FAR Part 23.1365)
6. Modification of the mobile radio control head advisory lights to eliminate red transmit light and yellow channel-busy light so as not to indicate an aircraft malfunction to the pilot. (FAR Part 23.1322)
7. Reduce the RF output power of the radio to 10 watts (FCC Rule section Part 90.423(a)(2)) or request modification of FCC license(s) for approval of an exception to the 10-watt RF power output limitation on board aircraft (if necessary) in accordance with FCC Rules.

Scenario C: Install a hand-held portable radio with a "vehicular adapter" such that the radio is compliant with current FAA-FARs and FCC rules. Specifically, a licensed avionics technician would modify the portable radio, "covert-a-com" and aircraft for installation. While similar, these modifications are listed separately from Scenario B and may include the following:

1. The "pilot in command" is ultimately responsible for the safe operation of the aircraft. If the portable radio is operated in a "hand-held" fashion, it should be done so as the "pilot in

command" is allowed to perform their duties without unreasonable concentration or fatigue. This provision may limit the utilization of a hand-held portable radio on board the aircraft to an ancillary crew-member or the co-pilot, provided the radio had no effect on other aircraft components. Speaker/microphone or speaker/microphone/antenna (SMA) use on a portable radio may be acceptable with the aforementioned understanding. Unless the portable radio is used in conjunction with a "covert-a-com," the remaining steps in this scenario do not apply.

2. The installation of a 28VDC to 12VDC converter with the rated amperage and duty cycle required by the radio and its associated "vehicular adapter."

3. The installation of a universal interface apparatus that will provide the radio with the ability to generate "side tone." Further, this interface device would allow audio access (transmit and receive) to the radio via the aircraft's existing internal communications system (ICS).

Additionally, this component will provide:

- a. Isolated transmitter keying PTT (Push-to-Talk),
- b. Isolated receiver audio input (balanced or matching),
- c. Isolated receiver audio output (balanced or matching),
- d. Microphone impedance output adapter (balanced or matching) with adjustable output, and
- e. Internal receiver/side-tone audio amplifier.

4. Control of background lights on the portable radio and vehicular adapter, so as to not disturb or interfere with the pilot's ability to view the flight control instruments of the aircraft. (FAR 23.1381, instrument lights for aircraft)

5. When designing a mounting bracket configuration for the vehicular adapter and portable radio equipment, consider environmental parameters which would include installation of the system such that in the event of an aircraft mishap or accident, the vehicular adapter and portable radio equipment would remain secured. (FAR 43 & FAR 23.561)

6. Revise the vehicular adapter wiring harness to include additional cable length as required for the aircraft installation. Replace the wiring harness provided for the vehicular adapter with a wiring harness that is flame resistant and will not emit toxic fumes if burned. (FAR Part 23.1365)

7. Modification of the portable and vehicular adapter advisory lights to eliminate red transmit light and yellow channel-busy light so as not to indicate an aircraft malfunction to the pilot. (FAR Part 23.1322)

8. Limit the RF output power of the portable radio/vehicular adapter to 10 watts (FCC Rule section Part 90.423(a)(2)) or request modification of FCC license(s) for approval of an exception to the 10-watt RF power output limitation on board aircraft (if necessary) in accordance with FCC Rules.

9. When utilizing a "covert-a-com" device, the battery must be restricted from recharging. It should be removed before inserting the portable radio into the vehicular adapter; or else, the charging circuit should be disabled in the vehicular adapter. This restriction is for compliance with FAR 23.1353.

*The essence of this portable installation guideline is to prevent distractions to the "pilot in command." These guidelines are also intended to prevent the portable radio battery from charging and potentially discharging dangerous gasses into the cockpit of the aircraft. Safety to the aircraft and its crew is paramount.*

Completing the aircraft installation in any of the above scenarios would also require:

A. Installation of an aircraft antenna with regard to wind loading at high speeds, in excess of 150 knots, constant vibration, limited ground plane, and potential interference to or from the aircraft's existing communications or navigational equipment, RTCA 160 C.

B. Appraising cost estimates for the radio equipment and installation as well as the cost associated with modifying the aircraft and for providing a new weight and balance on the aircraft, FAR Part 91.

C. Submitting FAA Form 337 received from an FAA-licensed repair station to apply for FAA approval of each completed aircraft installation in accordance with FAR Part 43.34-2a.

Per FCC Rule Section 90.423, any aircraft flying at an altitude of 1.6 km, 1 mile, or more shall not be permitted to communicate on any frequencies within the applicable Private Land Mobile Radio Service. Any aircraft communications on frequencies in the Private Land Mobile Radio Service operate on a secondary basis to land-based systems. "Secondary basis" means that any aircraft radio communications causing/receiving interference to/from land-based radio stations must correct the interference or cease operations on the suspect frequencies in the aircraft. This affects most, if not all, fixed-wing aircraft. There are phone systems available such as "Flightphone7," "Airphone7," "Flightlink7," and "Air-to-Ground7", not Cellular phones, that may provide alternative means of communications. With the potential for land-based radio interference and the aforementioned secondary basis to which aircraft communications is subjected, aircraft radios that operate in the Private Land Mobile Radio Service should have a label or placard to read, "maximum operation of this radio is 5,280' AGL by regulation of FCC."

## **APPENDIX D**

### **ACRONYMS FOR EMERGENCY MEDICAL SERVICES COMMUNICATIONS**

The following list of acronyms provides a sample of those used in communications technology and engineering. For the purpose of this Plan, any acronyms that may coincide with medical or other meanings shall be understood to represent the communications aspect herein.

## Acronyms for Emergency Medical Services Communications

### - A -

AAT - above average terrain  
AC - alternating current  
ACSB - amplitude compandored single-sideband  
AGL - above ground level  
ALI - automatic location identification  
ALS - Advanced Life Support  
AM - amplitude modulation  
AMSL - above mean sea level  
ANI - automatic number identification  
APCO - Associated Public-Safety Communications Officials-International, Inc.  
ASCII - American Standard Code for Information Interchange  
ASTM - ASTM, formerly the American Society of Testing and Materials  
AVC - automatic volume control  
AVI - automatic vehicle identification  
AVL - automatic vehicle location  
AVM - automatic vehicle monitoring

### - B -

BIT - binary digit  
BLS - Basic Life Support  
BPS - bits per second

### - C -

C - Centigrade, Celsius  
CAD - computer-aided dispatch  
CB - citizens band  
CCITT - International Telegraph and Telephone Consultative Committee  
CCU - Coronary Care Unit or Critical Care Unit  
CDC - Cooperative Dispatch Center  
CO - Central Office  
CTCSS - continuous tone-controlled squelch system

### - D -

dB - decibel  
dba - doing business as  
dBm - decibel referenced to one milliwatt  
dBv - decibel referenced to one volt  
dBw - decibel referenced to one watt  
DC - direct current  
DGPS - Differential Global Positioning Sattelite, Differential Global Positioning System  
DTMF - dual-tone multi-frequency (touch tone)



**- E -**

EACOM- Emergency and Administrative Communications system (General Electric Trademark)  
E & M - the receive and transmit leads of signaling system  
EMRS - Emergency Medical Radio Services  
ECG - electrocardiogram  
EIA - Electronic Industries Association  
EKG - electrocardiogram  
EMS - emergency medical services  
EMT - emergency medical technician  
EOC - emergency operations center  
ERP - effective radiated power  
ETA - Estimated Time of Arrival

**- F -**

F - Fahrenheit  
FAA - Federal Aviation Administration  
FAR - Federal Aviation Regulation  
FCC - U.S. Federal Communications Commission  
FCCA - Forestry Conservation Communications Association  
FEMA - Federal Emergency Management Agency  
FM - frequency modulation  
FSK - frequency-shift keying

**- G -**

GHz - gigahertz (1000 MHz)  
GPS - Global Positioning Satellite, Global Positioning System

**- H -**

HAAT - height above average terrain  
HEAR - Hospital Emergency Administrative Radio (Motorola trademark)  
HF - high frequency (3-30 MHz)  
Hz - hertz (cycles per second)

**- I -**

IAFC - International Association of Fire Chiefs  
IACP - International Association of Chiefs of Police  
ICU - intensive care unit  
IEEE - Institute of Electrical and Electronics Engineers  
IF - intermediate frequency  
IMSA - International Municipal Signal Association  
IRAC - the Federal Interdepartmental Radio Advisory Committee  
ITU - International Telecommunications Union

**- J -**

- K -

kbps - kilobits per second  
kHz - kilohertz

- L -

LATA - local access transport area  
LMR - land mobile radio  
LORAN - **L**ong **R**ange Navigation  
LOS - line of sight, loss of signal

- M -

MCC - Medical Control Console  
MSL - Mean Sea Level  
Mhz - Megahertz

- N -

NABER - National Association of Business and Educational Radio  
NTIA - National Telecommunications & Information Administration

- O -

- P -

PSAP - public safety answering point  
PSCC - Public Safety Communications Council  
PTT - press to transmit, or push to talk

- Q -

- R -

RCU - Remote Control Unit  
RF - radio frequency  
RX - receive

- S -

SERS - Special Emergency Radio Service

- T -

TCXO - temperature-compensated crystal oscillator  
TX - transmit  
TIA - Telecommunication Industry Association

- U -

UHF - ultra high frequency (300-3000 MHz)

UL - Underwriters Laboratories, Inc.  
UPS - uninterruptable power supply

- V -

V - volts  
VAC - volts, alternating current  
VDC - volts, direct current  
VHF - very high frequency (30 - 300 MHz)  
VOR - voice-operated relay  
VOX - voice-operated transmitter keyer  
VSWR - voltage standing wave ratio

- W -

- X -

- Y -

- Z -

## **APPENDIX E**

### **GLOSSARY OF COMMUNICATIONS TERMS**

This glossary provide definitions commonly used in communications technology and engineering. They have been abridged specifically for EMS communications aspects.

A

**Adapter:** A device used for changing the terminal connections of a circuit or part to connect to another circuit or part with unlike connections.

**Alphabet, phonetic:** A method of passing alphabetic information over a poor communication path with word substitution for letters. A widely accepted phonetic alphabet is: Alfa; Bravo; Charlie; Delta; Echo; Foxtrot; Golf; Hotel; India; Juliett; Kilo; Lima; Mike; November; Oscar; Papa; Quebec; Romeo; Sierra; Tango; Uniform; Victor; Whiskey; X-ray; Yankee; Zulu.

**American Standard Code for Information Interchange (ASCII):** An eight level code for data transfer adopted by the American Standards Association to achieve compatibility between data devices.

**Amplitude Compandored Single-Sideband:** A form of sideband modulation used for narrow channel transmission that incorporates a guide tone.

**Amplitude modulation (AM):** Modulation in which the amplitude of the carrier-frequency current is varied above and below its normal value in accordance with the audio, picture, or other intelligence signal to be transmitted.

**Analog:** Physical representation of information such that the representation bears an exact relationship to the original information. Pertaining to data in the form of continuously variable physical qualities.

**Analog Communication:** System of telecommunications used to transmit information other than voice that is sometimes used in telemetry.

**Antenna:** A system of wires or electrical conductors employed for reception or transmission of radio waves. Specifically, a radiator that couples the transmission line or lead-in to space for transmission or reception of electromagnetic radio waves. It changes electrical currents into electromagnetic radio waves and vice versa.

**Antenna Gain:** The effectiveness of a directional antenna expressed as the ratio of the power of a directional antenna to the power of the isotropic antenna to produce the same field strength in the same direction.

**Antenna, isotropic:** A hypothetical, lossless antenna having equal radiation intensity in all directions. (ANSI/IEEE Std 100-1988)

**Attack time:** The interval required after a sudden increase in input signal to a transducer, transmitter, receiver, etc., to attain a percentage of final output level due to this increase.

**Attenuation:** The decrease in amplitude of a signal during its transmission from one point to another. It may be expressed as a ratio or, by extension of the term, in decibels.

**Attenuator:** A device for reducing the energy of a wave without introducing distortion. Also called a pad, gain control, level adjustor, volume control, etc.

**Audible signal:** A buzzer, bell, or other audible sound device that indicates an incoming call.

**Audio:** Pertaining to frequencies corresponding to normally audible sound waves. These frequencies range from 15 to 20,000 hertz.

**Aural:** Pertaining to the ear or sound.

**Automatic gain control (AGC):** A receiver circuit that maintains the output constant with wide variations in the receiver input level.

**Automatic number identification (ANI):** Equipment for recording the calling party's number without operator intervention.

**Automatic volume control (AVC):** A self-acting gain control which maintains the output of a receiver constant despite variations in received signal strength.

**Antenna, parabolic:** A directional antenna with a radiating, or receiving, element, and a paraboloid reflector that concentrates the power into a beam.

## B

**Back bone:** A point-to-point wireless communications system utilizing several fixed stations.

**Back-to-back repeater:** A repeater consisting of a receiver and transmitter with the output of the receiver connected directly to the input of the transmitter.

**Band (radio frequency):** A range of frequencies between two definite limits. By international agreement, the radio spectrum is divided into nine bands. For example, the very high frequency (VHF) band extends from 30 MHz to 300 MHz.

**Bandpass filter:** Passes frequencies within a specified band, and attenuates all frequencies outside that band.

**Bandwidth:** (1) The width of a band of frequencies used for a particular purpose. (2) The range of frequencies within which a performance characteristic of a device is above specified limits. For filters, attenuators, and amplifiers these limits are generally taken to be 3 dB, half-power, below the average level.

**Baseband:** For microwave systems, the available frequency band that the RF equipment is capable of transmitting.

**Base station:** An item of fixed radio hardware consisting of a transmitter and a receiver.

**Baud:** A term used to define the operating speed of a printing telegraph or data system. It is the total number of discrete conditions or signal events per second.

**Baudot code:** A five-unit code used for teletypewriter signals.

**Beacon** A radio transmitter or lights designed to indicate exact geographical location or direction.

**Beam:** A configuration of radiated energy whose rays are sharply directional and parallel.

**Beat:** A regularly recurring pulsation from the combination of two-tone or frequency waves of different frequencies.

**Beat frequency:** The frequency produced when signals of two different frequencies are combined and refracted. The beat frequency is equal in value to the difference between the original frequencies.

**Beeper:** A pocket paging receiver that emits a beeping sound upon receiving a page specifically directed to it.

**Bel:** A unit of relative power, named after Alexander Graham Bell, and used to express differences in power.

**Biomedical telemetry (biotelemetry):** The technique of monitoring or measuring vital biological parameters and transmitting data to a receiving point at a remote location.

**Bit:** A unit of digital information (abbreviation of "Binary digit").

**Boom microphone:** A microphone arranged on an arm type mechanical support to permit better placement on the microphone.

**Boost:** To amplify; amplification.

**Braid:** A group of fibrous or metal filaments or threads woven into cylindrical shape to form a covering over one or more wires.

**Broadcast:** Radio or television transmission intended for general reception.

**Business Radio Service:** A subpart of the Industrial Radio Services section of the FCC rules.

**Busy indicator:** An indicator provided at a control point to indicate the in use condition of a circuit or channel.

## C

**Cable:** One or more insulated or non-insulated wires used to conduct electrical current or impulses. Grouped insulated wires are called a multi-conductor cable.

**Calibrate:** (1) to adjust a measuring device so that it reads correctly. (2) To determine error by comparison with a known standard.

**Call, all:** The alerting of all decoder equipped units in a system by the transmission of a single coded signal.

**Call, group:** The alerting of subdivided selective call groups by function, type of vehicle, location, etc. by sending a single coded signal.

**Call, individual:** The alerting of a specific coded decoder unit by sending a single coded signal.

**Call sign:** Federal Communications Commission assigned identifying letters and numbers used for identification of a radio station, transmitter, or transmission.

**Call taker (complaint taker):** An individual who is responsible for staffing an appropriately equipped answering position that receives incoming 9-1-1 calls.

**Capture effect** An effect occurring in FM reception when the stronger of two stations on the same frequency suppresses the weaker station.

**Cardioid microphone:** A microphone having a heart-shaped space response pattern of 180 degrees in front, and minimum response in the rear.

**Carrier:** A radio signal generally without voice or other information.

**Carrier control timer (CCT):** A device that limits the length of time that the transmitter carrier is on.

**Carrier frequency:** The frequency of an unmodulated electromagnetic wave produced by the transmitter.

**Cellular radio:** A commercially available mobile or portable radio telephone service.

**Celsius:** The metric scale of temperature in which water freezes at zero degrees C. To convert a Celsius temperature to Fahrenheit, multiply by  $9/5$  and add 32. New name for Centigrade.

**Central medical emergency dispatch (CMED):** See command and control center.

**Central office:** Sometimes called a wire center; the smallest subdivision within the telephone system which has relatively permanent geographic boundaries.

**Change out:** To replace.

**Channel element:** A temperature-compensated crystal oscillator.

**Channel, point-to-point:** A radio channel used for radio communications between two definite fixed stations.

**Channel, radio:** An assigned band of radio frequencies of sufficient width to permit its use for radio communication. The necessary width of a channel depends on the type of transmission and the tolerance for the frequency of emission.

**Channel, television:** A band of radio frequencies 6 MHz wide used for television broadcast.

**Channelization:** The assignment of circuits to channels, and the arrangement of those channels into groups.

**Charge:** To replenish the electrical potential in battery or capacitor.

**Charge, fast or quick:** A method of quickly recharging nickel-cadmium batteries under controlled conditions.

**Charge, trickle:** The continuous charge of a battery at a slow rate.

**Chart, 4/3 earth's radius:** A radio profile chart whose horizontal lines are curved to correspond to an earth having a radius  $4/3$  times larger than actual earth radius.

**Chassis:** The framework on which parts of a radio or other electronic circuits are mounted.

**Circuit merit:** A rating of overall circuit quality. Circuit merit '5' is clear circuit. Merit '3' is readable with noise. Any rating below '3' is not readable and generally unacceptable.

**Coaxial cable:** A transmission line in which one conductor completely surrounds the other, the two being coaxial and separated by a continuous solid dielectric or by dielectric spacers.

**Code dialing:** A method of signaling or encoding and decoding address codes by the use of standard telephone dial.



**Command and control center (dispatch center):** A system which is responsible for establishing communications channels and identifying the necessary equipment and facilities to permit immediate management and control of an EMS patient. This operation must provide access and availability to public safety resources essential to the effective and efficient EMS management of the immediate EMS problem.

**Communications:** The transmission of information from one point to another by means of electromagnetic waves (ANSI/IEEE Std. 100-1988). Also, see Telecommunications.

**Communications subsystems:** Comprises those resources and arrangements for notifying the EMS system of an emergency, for mobilizing and dispatching resources, for exchanging information, for remote monitoring of vital indicators, and for the radio transmission of treatment procedures and directions.

**Communications system:** A collection of individual communication networks, transmission system, relay stations, control and base stations, capable of interconnection and inter-operations that are designed for form an integral whole. The individual components must serve a common purpose, be technically compatible, employ common procedures, respond to control, and operate in unison.

**Comparator:** A circuit that compares two or more signals, and selects the strongest or best.

**Complaint taker:** See call taker.

**Compression:** In audio systems, reducing the volume range of the input signal so that the minimum output has less noise, and the maximum output has less distortion.

**Compressor:** A variable gain audio device used to provide a relatively constant output level for wide range of varying input levels.

**Computer:** An electrical device which can accept information, process it mathematically in accordance with previous instructions and provide the results of this processing.

**Cone of silence:** The area directly over or under a vertical transmitting antenna in which little or no signal is radiated.

**Console:** A cabinet housing electronic circuitry normally used in controlling other equipment such as transmitters and receivers installed at a remote location.

**Continuous duty** - (1) an unending transmission. (2) Operating 100% of the time. (3) EIA - full load output under the manufacturers normal loading conditions for this class of service for twenty-four hours.

**Continuous tone-controlled squelch system (CTCSS):** A system wherein radio receiver(s) are equipped with a tone responsive device which allows audio signals to appear at the receiver audio output only when a carrier modulated with a specific tone is received. The tone must be continuously present for continuous audio output. CTCSS functions are sometimes referred to by various trade names such as private line or PL (Motorola Communications & Electronics), Channel Guard or CG (General Electric Mobile Radio Department), or Quiet Channel (RCA).

**Control console:** A desk-mounted, enclosed piece of equipment which contains a number of controls or circuits used to operate a radio station.

**Control head:** A device with appropriate controls, microphone, volume, squelch, on/off, etc., generally mounted in a vehicle, from which control of the radio or mobile unit is performed.

**Control, local:** A control system packaged with the control unit (hard wired) wired directly to the base station.

**Control point:** A position from which a radio system is controlled and supervised.

**Control, remote:** A control scheme for a radio system where all control functions are performed remotely via telephone lines or other transmission media.

**Convert-a-com:** A Motorola term for a vehicular adapter which utilizes a portable radio for a vehicular installation, but with reduced operational characteristics.

**Coordination:** That process by which something is arranged to happen in a good acceptable way in contrast to random occurrence.

**Coordination, frequency:** The cooperative selection and allocation of radio frequencies such that all systems can operate with minimum interference.

**Coverage area:** In a radio communications system, the geographic area where reliable communications exist; usually expressed in terms of square miles surrounding a fixed radio station.

**Coverage contour:** In a radio communications system, the boundary at which reliable communications exist; usually expressed in terms of miles extending readily from a fixed radio station.

**Crosstalk:** The unwanted transfer of energy from one communication circuit to another by means of mutual coupling.

**Cut over:** To transfer from one system to another.

**Cycle:** One complete reversal of an alternating current, including a rise to the maximum level in one direction and a return to zero. The number of cycles occurring in one second is the frequency of the current. The word cycle is commonly used to mean cycles per second (now call hertz).

## D

**DC control:** A remote base station control scheme that requires metallic conductors and currents of different values to control the station's various functions.

**Data base:** A collection of basic and factual information organized for rapid search and retrieval.

**Decibel (dB):** A unit that expresses the level of power value relative to a reference power value. Specifically, the level of power value P relative to a reference value PR in decibels is defined as  $10 \log (P/PR)$ .

**Decoding:** The conversion and recognition by the addressed (receiving) unit of numerical address codes that have been transmitted through a communications system.

**Dedicated telephone line:** A telephone wire pair, originating at one point, and terminating at another point, operating in a closed circuit. Also called Private Line or RT circuit.

**Defibrillator:** An electrical device used to eliminate fibrillation of the heart muscle, by the application of high voltage impulses.

**Demodulation:** The process of recovering the modulation information from a modulated signal.

**Deviation ratio:** The ratio of the maximum frequency deviation of the RF carrier to the highest frequency contained in the modulating band.

**Digital:** Data represented in discrete, discontinuous form, as contrasted with analog data represented in continuous form.

**Digital dial code:** A signaling technique generally used in EMS VHF radio systems to bypass a receiver CTCSS system.

**Diplexer:** A device which enables the use of two radio transmitters or two receivers, operating on different frequencies, on the same antenna simultaneously.

**Direct:** In terms of communications circuits, means a dedicated, instant method of communications. A dial telephone is not direct, a radio or ring down line are direct.

**Direct leased land lines:** Dedicated or designated point-to-point wire circuits (telephone) used in transmitting voice or data communications. See: dedicated telephone line.

**Direct trunking:** An arrangement where a telephone line connection has no intermediate points before reaching the final destination (called) party.

**Directional antenna:** An antenna which radiates radio waves more effectively in some directions than in others.

**Directivity:** The value of the directive gain of an antenna in the direction of its maximum value.

**Dish:** A type of antenna. A parabolic reflector used in microwave systems.

**Dispatch:** The process of receiving a request for emergency medical assistance and the act of sending an EMS vehicle or air ambulance in response to each such request (10D-66).

**Dispatch center:** A location where coordination of resources is facilitated through radio communications.

**Dispatch point:** A position from which a radio system is used but not a supervision or control point. Dispatch points are not usually listed on a station radio license.

**Distortion:** Unfaithful reproduction of audio or video signals due to change occurring in the wave form of the original signal, somewhere in the course of its transmission or reception. The lower the percentage of distortion, the more distortion free the system is and the more intelligible the message.

**Diversity:** A method of radio transmission and/or reception which counteracts the effects of fading by combining several signals all bearing the same information.

**Doctor-interrupt:** The ability of a physician or hospital-based communicator to interrupt the voice or telemetry transmission from a radio in the field.

**Dual-tone, multi-frequency (DTMF):** The simultaneous generation of two audio tones generally compatible to AT&T's standard "Touch-Tone" Frequencies. Used for control or signaling purposes. A method of sending numerical information from an encoder by sending specific pairs of audio tones for each digit.

**Duplex:** Pertaining to a simultaneous two-way independent transmission in both directions.

**Duplexed/multiplexed telemetry unit:** A radio device capable of simultaneous transmission and reception and concurrent transmission of both voice and EKG information.

**Duplexer:** A device that is used in radio equipment to provide simultaneous transmit and receive capabilities on a single antenna.

**Duplex operation:** (a) the operation of transmitting and receiving apparatus at one location in conjunction with associated transmitting and receiving equipment at another location; the process of transmission and reception being concurrent. (b) the operation utilizing two radio-frequency channels, one for each direction of transmission, in such a manner that intelligence may be transmitted concurrently in both directions. For comparison see Simplex operation.

## E

**E & M signaling:** An arrangement by which signaling between two points on a radio or carrier path is accomplished. An M lead is associated with the transmit (or mouth) while the E lead is associated with the receiver (or ear).

**EACOM:** Emergency and Administrative Communications for hospitals established by General Electric Mobile Radio. A VHF radio system operating on standard frequencies with a selective calling system between stations. The system is similar to Motorola Communications HEAR radio system.

**Effective height:** The true electrical height of an antenna corresponding to a "perfect" antenna that will produce the same field strength. The height of its center of radiation above the effective ground level.

**Effective radiated power (ERP):** The calculated power output from an antenna system which incorporates all the gains and losses in the antenna system. ERP is calculated as follows: (1) convert power output of transmitter to dB referenced to one watt (dBw); (2) subtract all transmission line losses including losses in equipment between the transmitter and antenna (filter, diplexers, circulators, duplexers, etc.) expressed in dB; (3) add the antenna's power gain (expressed in dB reference to half-wave dipole); and (4) convert the results into watts.

**Effective signal radiated:** The rating basis for licensing radio transmitters. Equal to the square root of the effective radiated power times the antenna height in feet above ground level.

**EKG display console:** A unit of electronic equipment located in a hospital emergency room and/or cardiac care unit which displays EKG and records voice and data information received from an EMS scene by transmission via radio or telephone path. A demodulation display console.

**Electrocardiogram (ECG or EKG):** A visual or hard copy trace of a patient's electrical heartbeat information.

**Electrode:** (1) either of the two terminals of an electric source, such as a battery. (2) A conducting element through which electric current enters or leaves an electrolyte, gas, or vacuum. (3) A conducting element, usually metallic (such as silver/silver chloride), with a conducting medium or electrolyte (such as sodium chloride and water) attached to a patient to obtain the electrical signals of the heart.

**Electromagnetic radiation:** Radiation associated with a periodical varying electric and magnetic field that is traveling at the speed of light, including radio waves, light waves, X-rays, and gamma radiation.

**Electromagnetic wave:** A wave of electromagnetic radiation, characterized by variations of electric and magnetic fields.

**Emergency call:** A call that requires immediate action.

**Emergency operations center (EOC):** (1) a secure, protected facility designed and equipped for the use of community officials to manage response of a community in time of emergency. (2) A dispatch designed and operated by a community or within a geographic area for a combination of emergency resources, such as police, fire, and EMS.

**EMS region:** The geographic area served by a given EMS system.

**Enclosure:** A housing such as a case, cabinet, cabinet rack or console which is designed to provide protection and support to equipment.

**Encoding:** The conversion of numerical address codes, such as telephone number or message codes, into a format of tone or on-off pulses of audio tones for transmission over a communications system, usually for individual or group addressing, such as for paging or selective calling.

**Engineering:** As defined by Florida Statutes, Chapter 471.005(6), "Engineering" includes the term "professional engineering" and means any service or creative work, the adequate performance of which requires engineering education, training, and experience in the application of special knowledge of the mathematical, physical, and engineering sciences to such services or creative work as consultation, investigation, evaluation, planning, and design of engineering works and systems, planning the use of land and water, teaching of the principles and methods of engineering design, engineering surveys, and the inspection of construction for the purpose of determining in general if the work is proceeding in compliance with drawings and specifications, any of which embraces such services or work, either public or private, in connection with any utilities, structures, buildings, machines, equipment, processes, work systems, projects, and industrial or consumer products or equipment of a mechanical, electrical, hydraulic, pneumatic, or thermal nature, insofar as they involve safeguarding life, health, or property; and includes such other professional services as may be necessary to the planning, progress, and completion of any engineering services."

## F

**Facility, communications:** A communications facility is anything used or available for use in the furnishing of communications service.

**Fade margin:** The number of decibels of attenuation which can be added to a specified radio frequency propagation path before the signal-to-noise ratio of the channel falls below a specified minimum.

**Fading:** The variation of radio field strength caused by a gradual change in the transmission medium.

**FCC Part 90:** The section of Federal Communications Commissions Rules and Regulations that affects most EMS communications.

**Federal Communications Commission (FCC):** A board of seven commissioners appointed by the President under the Communications Act of 1934 to formulate Rules and Regulations and to authorize use of radio communications. The FCC regulates all communications in the United States by radio or wireline, including television, telephone, radio facsimile and cable systems.

**Field strength:** The strength of an electric, magnetic or electromagnetic field. Electromagnetic (radio) field strength is expressed in microvolts per meter or millivolts per meter.

**First responder, EMS-recognized:** Any individual or organized group that has a valid Memorandum of Understanding between themselves and an EMS licensee within the same jurisdictional area.

**Fixed relay station:** An operational fixed station established for the automatic retransmission of radio communications received from either one or more fixed stations or from a combination of fixed and mobile stations and directed to a specified location.

**Fixed service:** A service or radio communication between specified fixed points. Fixed station - (1) a radio which is not mobile; (2) a station which is permanently installed; (3) a base station in a mobile radio system.

**Float:** To operate a storage battery in parallel with a charger and a load at such voltage that the charger supplies the load current and the battery supplies only transient peaks above the normal load.

**FM transmitter:** A radio transmitter that emits or radiates a frequency modulated wave.

**Folded dipole:** A receiving or transmitting antenna composed of two parallel dipoles, connected at the ends. The connection to the receiver or transmitter is made at the center of one of the poles.

**Foot switch:** A switch or contact arrangement that is operated by the feet.

**Four-wire operation:** Telephone operation in which the inbound audio signal is carried on one pair of wires and the outbound signal on another pair.

**Free space loss:** The theoretical radiation loss that would occur in transmission if all variable factors were disregarded. Free space loss depends only on the frequency and the distance between antennas.

**Frequency:** The number of cycles, repetitions, or oscillations of a periodic process completed during a unit of time. The frequency of waves in the electromagnetic spectrum (radio waves) is designated in hertz (Hz), kilohertz (kHz or 1000 Hz). One hertz is equivalent to one cycle per second.

**Frequency band:** A continuous range of frequencies extending between two limiting frequencies. Frequency bands that are involved in two-way radio are 25-50 MHz (VHF-low band), 150-174 MHz (VHF-high band), 450-512 and 890-960 Mhz (UHF band).

**Frequency deviation:** Frequency deviation of an FM signal is the change in the carrier frequency produced by the modulating signal. The frequency deviation is proportional to the instantaneous amplitude of the modulating signal.

**Frequency modulation (FM):** A method of modulating a carrier-frequency signal by causing the frequency to vary above and below the unmodulated value in accordance with the intelligence signal to be transmitted. The amount of deviation in frequency above and below the resting frequency is at each instant proportional to the amplitude of the intelligence signal being transmitted. The number of complete deviations per second above and below the resting frequency corresponds at each instant to the frequency of the intelligence signal being transmitted.

**Frequency response:** The transmission loss or gain of a system, measured over the useful bandwidths, compared to the loss or gain at some reference frequency (generally 1000 Hz).

**Frequency separation:** The frequency displacement between a receive frequency and transmit frequency to insure that the signal-to-interference ratio does not fall below a specified value in order to function satisfactorily.

**Fresnel zone:** The circular zone about the direct path between a transmitter and a receiver at such a radius that the distance from a point on this circle to the receiving point has a path length that is some multiple of a half wave length longer than the direct path.

**Fringe area:** An area or locality at such a distance from the transmitter that the signals received are weak.

**Full-duplex operation:** A method of operation of a radio system which provides simultaneous two-way communications between two points. In EMS radio systems, provides for mutual interrupt capabilities between the field technician and the physician or medical direction at a hospital location.

## G

**Gain, of an antenna:** The effectiveness of a directional antenna in a particular direction, compared against a standard (usually an isotopic antenna). The ratio of standard antenna power to the directional antenna power that will produce the same field strength in the desired direction.

**Generator, signal:** A portable test oscillator that can be adjusted to provide a test signal at some desired frequency, voltage, modulation or wave form.

**Generator, standby power:** A device that develops electrical voltage from mechanical energy. An AC electrical power source held in reserve and used to supply the necessary AC power when commercial power fails.

**Geographical assignment:** The assignment and use of communications channels on a dedicated use basis within a given geographical area.

**Gigahertz (GHz):** One billion hertz or 1000 MHz.

**Goal:** A statement of broad direction, general purpose, or intent. A goal is general and timeless and is not concerned with a particular achievement with a specified time period. (See also: Objective).

**Ground:** A reference point, also a connection, intentional or accidental, between an electrical circuit and the earth or its equivalent.

**Ground plane antenna:** A type of vertical transmitting or receiving antenna used primarily for short wavelength or high band communications. A ground plane antenna consists of a quarter-wave vertical element, and three or four radial elements spaced equally apart, and mounted on the base of the vertical element. Antennas of this type are non-directional and have a low angle of radiation.

**Ground wire:** A conductor leading from the radio equipment to an electrical connection with the ground.

**Guard band:** A narrow band of frequencies provided between adjacent channels in certain portions of the radio spectrum to prevent interference between stations.

**Guy anchor:** The buried weight or mass to which the lower end of a guy wire is attached.

## H

**Half-duplex operation:** Operation of a duplex system arranged to permit operation in either direction but not in both directions simultaneously.

**Half-wave dipole antenna:** A straight, ungrounded antenna having an electrical length equal to half the wave length of the signal being transmitted or received. Mounted vertically, it has a donut-shaped pattern, circular in the horizontal plane.

**HAM:** A term applied to an amateur radio operator, as opposed to business or commercial operators. A person that makes amateur radio operation a hobby.

**Hand microphone:** A microphone designed to be held in the hand. Sometimes called a "palm" microphone.

**Handset:** A device similar to a telephone handset used in place of a hand microphone.

**Hardware:** The screws, nuts, clamps, anchors, connectors, etc. used in the installation and maintenance of communications systems.

**Hardwire:** To wire or cable directly between units of equipment without passing through other media.

**Harmful interference:** Any emission, radiation, or induction which endangers the functioning of a radio service or seriously degrades, obstructs, or repeatedly interrupts a radio communication service.

**Harmonic:** An integral multiple of fundamental frequency. The third harmonic of 20 Hz is 60 Hz. The fifth harmonic of 40 Hz is 200 Hz.

**Headphone:** A device which can be placed on the head to allow individual listening to messages.

**Hospital Emergency Administrative Radio (HEAR):** Motorola Communications and Electronics trade name for a system of VHF radio systems.

**Heliax:** Andrew Corporation trade name for semi-rigid coaxial transmission line.

**Helicopter landing site:** A location used for helicopter take-offs and landings on a one-time, a temporary, or an infrequent basis. (FAR-Aviation Circular 150/5390-1B)

**Heliport:** A designated landing area used primarily for the operation and basing of rotorcraft. (Florida Statute 14-60)

**Helistop:** A designated landing area used for the operation of rotorcraft where no basing facilities are provided. (Florida Statute 14-60)

**Helix:** A single layer, spiral wound coil usually having air or foamed polyethylene core.

**Heterodyne:** (1) pertaining to the production of difference in frequencies (beat frequencies) by the combination of the two frequencies. (2) To shift an incoming radio signal to a different frequency, often to a lower intermediate frequency.

**Heterodyne frequency:** The beat frequency, which is the sum or difference between two frequency signals.

**Hertz (Hz):** International unit of frequency, which replaced "cycles-per-second".

**High band, VHF:** A portion of the radio frequency spectrum from 150 to 174 MHz in which two-way radio operates.

**Hookswitch:** The device on which a handset or microphone hangs when not in use. The handset operates a switch, or switches, which open the associated circuits.



**Ho:** (1) the number of reflections from the ionosphere encountered by the radio wave in traveling from the transmitter to the receiver. (2) The number of radio links required to span a given path.

**Hot line:** Direct circuit between two or more points for immediate use without patching or switching. (See: direct leased land lines) The hot line can employ various signaling configurations (ie: ringdown, audio amplifier, etc.).

**Hot standby operation:** A method of achieving reliable operation by energizing two identical equipments fed by and to a switchable input and output circuits when a failure is indicated.

**Hum:** Audio frequency interference which is at the frequency of the power supply or its harmonics.

**Hybrid:** (1) made up of several different components or a mixture of technologies. (2) A circuit required to convert 4-wire operation to 2-wire, while maintaining isolation of the 4-wire circuit.

## I

**Ignition noise:** Interference produced by sparks or other ignition discharged in a vehicle.

**Image:** One of the two groups of sidebands generated in the process of modulation, so called because one is the reverse (mirror image) of the other with respect to operating frequency.

**Image frequency:** In heterodyne frequency converters, and undesired input frequency which can beat with the local oscillator to produce the intermediate frequency and thus appear in the receiver output.

**Image rejection:** The action of a receiver in suppressing the image frequency.

**Impedance:** The total resistance that a circuit offers to the flow of alternating current. Impedance is a combination of resistance and reactance. The ohm is used as a unit of impedance measurement.

**Impedance, characteristic:** The importance of characteristic impedance lies in the fact that when a transmission line is terminated, as with an antenna, in an impedance matching its own, then all of the energy or power flowing along the line is radiated by the antenna. If the impedance of the termination (antenna) is not matched to the transmission line, a portion of the energy will be reflected at the mismatch resulting in a lower output from the antenna.

**Impedance match:** The condition in which the impedance of one component is the same as the component to which it is connected or attached.

**Impulse:** A surge of electricity having a single polarity.

**In-band signaling:** The transmission of signaling tones within the frequency band of the channel.

**Indicator:** A device used to inform of a condition or change in condition.

**Induced:** Produced as a result of exposure to a changing electric or magnetic field.

**Industrial Radio Service:** An FCC designated radio service.

**Insertion loss:** The loss introduced when a device or line section is interposed between two elements of a circuit.

**Insulation:** Any nonconductive material used to prevent the leakage of electricity from a conductor, such as rubber, glass, mica, etc.

**Integrated circuit:** A complete circuit consisting of transistors, capacitors, resistors, diodes, etc. which is formed on a single semiconductor substrate.

**Interface:** A concept involving the specification of the interconnection between two equipments or systems. The specification includes the type, quantity, and function of the interconnection circuits and the type and form of the signals to be interchanged via these circuits.

**Interference:** Interference in a signal transmission path is either extraneous power which tends to interfere with the reception of the desired signals or the distribution of signals which results in loss of signal or distortion of information.

**Intermittent:** Not continuously present; disappearing and reappearing.

**Intermittent duty cycle:** A duty cycle of 1 minute on, 4 minutes off, or 20% per Electronic Industries Association (EIA).

**Intermodulation:** The combination of two signals beating together to form a third unusable signal which interferes with reception of the desired signal. In a radio receiver the method of expressing in dB below the desired signal, the receiver's rejection of the unwanted signal to its acceptance of correct signals.

**Intrinsically safe:** A laboratory (UL) rating for equipment considered approved to operate in areas in which hazardous concentrations of flammable gases exist.

**Inverter:** (1) Any of several devices used to convert direct current to alternating current. (2) A single input, single output device that changes the polarity of (inverts) a signal when passing it from input to output. A negative signal at the input produces a positive signal at the output and vice versa. A differential EKG amplifier has a normal and an inverting input.

**Ionosphere:** The upper portion of the earth's atmosphere beginning at about 50 miles above the surface of the earth; the cause of radio signals being, and returned to earth.

**Isolator:** A passive RF device which permits transmission in only one direction, absorbing energy in the opposite direction. Generally used to minimize transmitter generated intermodulation signals.

**Itinerant:** Traveling from place to place.

## J

**Jack:** A connecting device ordinarily used to make an electrical contact with mating contacts of a plug.

**Jacket:** The outer covering on an insulated wire or cable.

**Jamming:** The deliberate radiation, reradiation or reflection of electromagnetic energy with the object of impairing the use of electronic devices, equipment or systems.

**Jumper:** A short length of conductor used to bridge electrical connections.

**Junction box:** A metal or other container into which wires or cables are led and connected.

## K

**Key:** A push-to-operate switch used for operating a transmitting circuit in a radio system.

**Key telephone equipment:** An instrument that has the capability of multiple line terminations. Each line is accessed by depressing an associated button (key).

**Kilo:** A prefix meaning one thousand.

**Kilohertz (kHz):** Equal to one thousand cycles per second. Replaces the term kilocycle.

## L

**Land line:** A generic term which refers to the public-switched telephone system.

**Land-mobile:** An abbreviation for land to mobile communications such as between base stations and mobile radios, or from mobile radio to mobile radio.

**Land Mobile Radio Service:** A mobile radio service defined by the Federal Communications Commission - FCC Rules and Regulations Part 90.

**Leased wire line:** A pair of wires or a circuit, usually leased or rented from a telephone company, designed for exclusive use between two fixed points for various communication control functions.

**Life cycle:** A test performed on a material device to determine the length of time before failure.

**Life, service:** The life expectancy under normal conditions of use.

**Line:** A transmission line or power line. A system of one or more wires.

**Linear:** Describing a device in which the signal output voltage is directly proportional to the signal input voltage. A straight line relationship.

**Line, balanced:** A two-wire line which has identical impedance from each wire.

**Line equalizer:** A connection in series with a telephone line that will alter the frequency response characteristics of the line.

**Line, four-wire:** A two-way transmission circuit using separate paths for transmit and receive functions.

**Line, lossy:** A transmission line, usually a coaxial cable, which is designed to have very high transmission loss per unit length. Used in tunnels, underground, or buildings for radio communications systems.

**Line of sight:** An unobstructed path between two points. Radio waves at those frequencies where signals travel in a straight line and are not reflected by the ionosphere.

**Line of sight distance:** The straight-line distance from a radio station antenna to horizon. This represents the normal transmitting range of FM transmitting stations.

**Link:** The portion of a radio relay system between adjacent radio stations.

**Live:** Energized. Connected to a power source.

**Load:** (1) A device that receives power from a transmission system. (2) The amount of electric power drawn by an electric or electronic device.

**Load, dummy:** A device which can dissipate energy (into heat) without radiating it. Used to terminate radio transmitters while being tested.

**Loading, antenna:** Insertion of reactance in an antenna circuit to improve its transmission characteristic in a given frequency band.

**Loading, wind:** The stress imposed on an antenna or antenna structure caused by wind.

**Lobe:** One of the three-dimensional petals representing the radiation or reception efficiency of a directional antenna.

**Local Government Radio Service:** A service of radio communications defined by the FCC essential to official activities of states, possessions, and territories, including counties, towns, cities, and similar governmental subdivisions.

**Log:** A list of radio stations showing frequency, location, power, and other data. Also a communication record for a station showing calls made, time, date, and other data. A detailed record.

**Loop:** (1) A short transmission line that connects a subscriber to a switchboard. (2) A closed path in which a signal may circulate. This path may be within a piece of equipment, such as a repeater or carrier terminal, or may be a complete carrier circuit.

**Loss:** A decrease in power suffered by a signal as it is transmitted from one point to another, usually expressed in decibels. Energy dissipated without accomplishing useful work.

**Loss, free space:** The theoretical transmission loss between two radio antennas dependent only upon distance and frequency.

**Loss, path:** The reduction or attenuation of signal strength that occurs between the transmitted signal strength and the received signal strength.

**Low band, VHF:** A section of the radio frequency spectrum from 25-50 MHz in which mobile radio equipment is licensed to operate.

**Low loss:** Describing circuits and transmission lines in which little energy is lost from the input to the output.

**Lower sideband:** The lower of two frequencies or of two groups of frequencies produced by a modulation process.

## M

**Marginal:** Operating at the borderline of permissible limits.

**Matrix:** An array of horizontal and vertical input or output leads with cross points at the intersections, used as a means of switching from any input to any output.

**Mean:** The arithmetic middle point of a range of values, obtained by adding the highest and lowest values and dividing by two.

**Median:** The point below which there are as many instances as there are above.

**Medical control:** Directions and advice provided from a centrally designated medical facility staffed by appropriate EMS personnel, operating under medical physician supervision, supplying professional support through radio or telephonic communication for on-site and transit, Basic and Advanced Life Support Services given by field personnel such as EMT's or Paramedics.

**Medical Control Center (MCC):** A communications capability, usually located at a hospital, which provides for medical control and direction of an EMS system.

**Medical Control Console:** An installation of communications control equipment, usually located at a hospital, which provides for control of the transmitting and receiving equipment necessary for the medical control and direction of an EMS system.

**Medical emergency:** An unforeseen event affecting an individual in such a manner that a need for immediate medical care (physiological or psychological) is created.

**Microwave:** A term applied to radio waves in the frequency range of 1,000 megahertz and upward. Microwave radio generally performs the same functions as telephone cables, and may be used for radio remote control purposes.

**Mobile:** Term used to describe equipment designed for vehicular installation.

**Mobile command unit:** Temporary dispatch center.

**Mobile Intensive Care Unit (MICU):** An emergency vehicle unit staffed by Paramedics or Mobile Intensive Care Nurses.

**Mobile relay station:** A fixed station established for the automatic retransmission of mobile service radio communications which originate on the transmitting frequency of the mobile stations and which are retransmitted on the receiving frequency of the mobile stations.

**Mobile repeater station:** A mobile station in the mobile service authorized to retransmit automatically on a mobile service frequency communications originated by hand-held or portable units or by other mobile or base stations directed to such hand-carried units.

**Mobile service:** A service of radio communication between mobile and land stations, or between mobile stations.

**Mobile station:** A two-way radio station in the mobile service intended to be used while in motion or during halts at unspecified points.

**Mobile transmitter:** A radio transmitter designed for installation in a vehicle, vessel, or aircraft and normally operated while in motion.

**Mobile unit:** A two-way radio equipped vehicle or person. Also, sometimes the two-way radio itself, when associated with a vehicle or person.

**Modem:** Contraction of modulator-demodulator.

**Modular:** A construction technique incorporating the use of standard size units for interchangeability.

**Modulate:** To vary the amplitude (am), frequency (fm), or phase (pm) of a high frequency wave or carrier in step with amplitude variations of another wave (the modulating wave). The carrier is usually a sine wave while the modulating wave is often a complex voice or EKG signal.

**Modulator:** The electronic circuit that combines the modulating wave with the carrier wave. In radio transmitters the audio-frequency stage which mates the audio signal with the carrier signal. In EKG telemetry, the circuit that combines the amplified EKG signal with the subcarrier (audio) signal for transmission by radio or telephone.

**Multi-channel system:** A radio system which uses more than one radio channel. Also known as a multi-frequency system.

**Multicoupler, receiver:** A device which permits several radio receivers to use the same antenna. Usually a broadband amplifier with several output ports.

**Multi-frequency operation:** Employing radio equipment capable of operation on two or more frequencies.

**Multi-jurisdictional system:** A system covering more than one political boundary or agency.

**Multipath:** The propagation phenomenon which results in signals reaching a radio receiving antenna by two or more paths usually resulting in a degradation of the original signal.

**Multiplex:** Transmitting two or more signals over the same medium. In EKG telemetry equipment, the ability to transmit electrocardiograph (EKG) signals and voice signals concurrently over the same transmitter.

**Multiplex, frequency division:** A multiplex system in which the total transmission bandwidth is divided into narrower bands each used for a single separate channel.

**Multiplex, time division:** A method of multiplexing in which the total frequency spectrum available is used by each channel, but only for part of the time. A sharing of transmission ability, first by one parameter, then by another.

**Multi-tone:** A method of signaling that involves two or more tone signals produced simultaneously or sequentially.

**Mute:** To silence or reduce sound level.

## N

**Net loss:** The algebraic sum of the gains and losses between two terminals of a circuit.

**Netting:** The process of adjusting a system's transmitters and receivers to the same operating frequencies.

**Network:** An orderly arrangement of stations interconnected through communications channels in order to form a coordinated entity.

**Nine-one-one (9-1-1):** A three digit emergency telephone number accepted and promulgated nationally and by Florida Statutes as the statewide emergency telephone number.

**Noise:** Interference characterized by undesirable random voltages caused by an internal circuit defect or from some external source. Any extraneous signal tending to interfere with the proper and easy perception of those signals, which are intended to be received.

**Noise blanker:** A device used in mobile radio applications which senses the presence of undesired noise on the desired channel and causes the desired signal to be interrupted for the time period that the undesired noise signal is present. The time period is controlled and measured in milliseconds so that the interruption of the desired signal is not audible.

**Noise level:** Volume of noise usually expressed in decibels.

**Noise limiter:** A circuit that cuts off the noise peaks that are stronger than the highest peak of the desired signal being received.

## O

**Objective:** A desired accomplishment that can be measured within a given time frame and under specifiable conditions. The attainment of the objective advances a system toward a corresponding goal.

**Omnidirectional:** Equally effective in all directions.

**Open:** A break in circuit continuity.

**Outage:** A disruption of communications from any cause, whether planned or accidental.

**Out-of-band signaling:** Transmission of signals by frequencies outside of the voice band.

**Overload:** A load greater than a device is designed to handle.

## P

**Paging:** A one-way communications service from a base station to mobile or fixed receivers that provides selective signaling or information transfer by such means as tone, tone-voice, tactile, optical readout, etc.

**Pair:** Two wires of a signal circuit generally applied to telephone wherein one wire is designated "tip" and the second wire "ring".

**Passive:** A device which does not contribute energy to the signal it passes.

**Passive repeater:** A device intentionally interposed in a microwave transmission path to redirect or reflect energy.

**Patch:** A means of connecting one system to another. A patch may be between radio systems, or radio to telephone, as in a radio/phone patch.

**Path, signal:** The route by which intelligence is conveyed from transmitter to receiver or through a circuit.

**Personal radio:** A small portable radio intended to be carried by hand or on the person of the user.

**Phase:** The position at any instant which the periodic wave occupies in its cycle of 360 degrees.

**Phone patch** - an interconnection between radio and telephone communications circuits which permits direct voice interchange between telephone lines and radio system.

**Pin:** An electrical terminal in a connector which pushes into a socket to make a connection.

**Plug-in:** Describing any device having terminals so it can be connected by simply pushing it into a suitable socket or connector.

**Point:** A physical or geographic location.

**Portable:** An easily transportable radio.

**Primary power:** A reliable source of electrical power normally serving as the principle source of energy to equipment, such as the commercial 120 volt AC power main.

**Private automatic branch exchange (PABX):** A telephone switchboard with many stations not individually identifiable to the telephone company's switching network requiring an operator.

**Propagation, electromagnetic:** The travel of electromagnetic waves through a medium, or the travel of a sudden electric disturbance along a transmission line. Also called wave propagation.

**Protect:** To equip with devices for safeguarding from damage by excessive voltages, current or physical abuse.

**Public safety agency:** A functional division of a public agency which provides fire fighting, police, ambulance, emergency medical, or other emergency services.

**Pulse:** A signal of short duration.

**Pulsed tone:** A system of selective signaling using a keyed on-off tone signal.

**Push-to-talk or press-to-talk (PTT):** In radio or telephone systems, that method of communication over a speech circuit in which transmission occurs from only one station at a time, the talker being required to keep a switch operated while he is talking. The keying button used to operate a radiotelephone transmitter.

## Q

**Quarter-wave antenna:** An antenna electrically equal to one-fourth of the wavelength of the signal to be transmitted or received.

**Quieting:** Reduction of system noise.

## R

**Rack mounting:** A method of mounting equipment in which metal panels supporting the equipment are attached to pre-drilled steel channel rails or racks. The dimensions of the panels, the spacing of the rails and the size of the mounting screws are standardized.

**Rack unit:** In mobile radio generally a rack mounting 19 inches between rails and a height of 1.75 inches per unit.

**Radiax:** Andrew Corporation trade name for a radiating transmitting line.

**Radio:** The transmission and reception of signals by means of electromagnetic waves without a connecting wire.

**Radio-frequency power:** The power associated with any signal consisting of electromagnetic radiation which is used for telecommunications.



**Radio interference:** Undesired disturbance of radio reception. Man-made interference is generated by electric devices, with the resulting interference signals either being radiated through space as electromagnetic waves or traveling over power lines or other conducting media. Radio interference is also due to natural sources such as atmospheric phenomena such as lightning. Radio transmitters themselves may additionally interfere with each other.

**Radio network:** A number of radio stations, fixed and mobile, in a given geographical area which are jointly administered or which communicate with each other by sharing the same radio channel or channels.

**Radio receiver:** An instrument which amplifies radio frequency signals, separates the intelligence signal from the RF carrier, amplifies the intelligence signal additionally, and converts the intelligence signal to its original form.

**Radio relay system (radio relay):** A point-to-point radio transmission system in which the signals are received and retransmitted by one or more intermediate radio stations.

**Radio station:** A complete assemblage of equipment for radio transmission or reception, or both.

**Radio transmitter:** A radio-frequency power source which generates radio waves for transmission through space.

**Radome:** A dome shaped cover for a parabolic antenna which protects the antenna from the elements and their attenuating effects.

**Range:** Distance over which a radio signal can be transmitted for effective reception or the distance at which a usable signal can be received.

**Receiver:** An electronic device used to detect and amplify transmitted radio signals.

**Receiver, paging:** A small, light, pocket sized receiver used for alerting individuals when they are away from their normal communication instruments.

**Refraction:** The change of direction experienced by a wave of any form of radiated energy when passing from one medium to another having a different dielectric constant or index of refraction.

**Regional EMS system:** An emergency medical service area (trade, catchment, market, patient flow, geographic or governmental) that provides essentially all of the definitive emergency medical care for all emergencies and for the most critically ill and injured patients within the area.

**Relay:** Transmission forwarded through an intermediate station.

**Relay station:** Radio stations that rebroadcast signals the instant they are received, so that the signal can be passed on to another station outside the range of the originating transmitter.

**Reliability:** The ability of an item to perform a required function under stated conditions for a stated period of time.

**Remote base station:** A base station located away from the operating console, to take advantage of improved coverage offered by a better geographical location.

**Remote control:** The operation of a device from a distance either electrically or by radio waves.

**Remote control equipment:** The apparatus used for performing monitoring, controlling, supervisory control, or a combination of these functions at a distance by electrical means.

**Repeater:** A combination of apparatus for receiving either one-way or two-way communication signals and delivering corresponding signals which are either amplified or reshaped or both.

**Repeater station:** An operational fixed station established for the automatic re-transmission of radio communications received from any station in the mobile service.

**Repeater station, re-modulating:** A microwave repeater station in which the signal is demodulated to the original baseband frequencies and reinjected onto the modulator for transmission to the distant station.

**Requirement, task:** A desired accomplishment that is subordinate to an objective. A requirement is attainable within a specified and immediate time limit, is consistent with the time frame of the objective, and is clearly measurable.

**Revision:** A change or modification.

**Ringback:** In a public safety answering center, permits the answering point to ring the hung-up telephone on a held circuit. The feature is useful when a calling party has failed to provide all necessary information to the answering point before hanging up.

## S

**Schematic diagram:** A diagram or drawing which shows electrical connections of a radio or other electrical device by means of symbols which are used to represent the components.

**Selective call:** A system for alerting individual or groups of stations by means of coded signals.

**Selectivity:** The ability to select one particular signal from other signals at nearby frequencies. This specification is important in urban areas where radio spectrum congestion exists. The more negative the dB rating, the better the specification.

**Sensitivity:** The characteristic of a radio receiver which determines the minimum input signal strength required for a given signal output. In FM, sensitivity is the signal level required to produce a given ratio of signal to noise. The more sensitive a receiver is, the weaker the signal it can receive.

**Service channel:** In a microwave system, a voice channel used for maintenance and fault location. Also called an order wire.

**Signal:** The form of a radio wave in relation to the frequency serving to convey intelligence in communication.

**Signal-to-noise ratio:** The ratio of the intensity of the desired signal to that of the undesired noise signal, usually expressed in decibels.

**Signal strength:** A measure of the field intensity caused by a radio transmitter at a particular location within its operating range. Usually expressed as microvolts, or millivolts of signal.

**Simplex:** (1) single frequency operation whereby all base stations and mobiles operate on one common frequency. (2) Operation on two different frequencies in a system that can communicate in two directions, but not simultaneously, such as when a base station and a mobile radio operate on reversed pairs of frequencies without duplexing.

**Simplex channel:** A communication channel providing transmission in one direction only at any given time. For comparison, see duplex channel.

**Simplex operation:** A method of radio operation in which communication between two stations takes place in only one direction at a time. This includes ordinary transmit-receive operation, press-to-talk operation, voice-operated transmit, and other forms of manual or automatic switching from transmit to receive. Also call simplex.

**SINAD:** The ratio of signal plus noise, plus distortion to the noise, plus distortion; expressed in decibels. An EIA standard method of measuring receiver sensitivity. Basically a measure of RF signal strength that will result in a readable signal.

**Software:** The programs or instructions required to use a computer or data processing device.

**Solid state:** Denoting the use of semiconductors instead of vacuum tubes or relays.

**Special Emergency Radio Service (SERS):** That portion of radio communications frequency resources authorized by the FCC for use in the alleviation of emergency situations endangering life or property. See FCC Part 90.

**Spectrum:** A continuous range of frequencies arranged in order of wavelength or frequency within which waves have some common characteristics, such as audio spectrum, radio spectrum, etc. The entire range of electromagnetic radiation extending from the longest known radio waves to the shortest known cosmic rays.

**Spurious response:** The response of a radio receiver to an undesired frequency.

**Squelch:** A circuit function that acts to suppress the audio output of a receiver when noise power exceeding a predetermined level is present.

**Squelch, carrier:** A squelch system that responds to the presence of an RF carrier signal.

**Squelch circuit:** A circuit that reduces or lowers the noise that would otherwise be heard in a radio receiver between transmissions.

**Stability, frequency:** The ability of a radio transmitter to maintain any predetermined frequency, such as its assigned frequency. Measured in percent of the carrier. The lower the percentage the better the stability.

**Standing wave ratio (SWR):** A measure of the amount of lost transmitting power due to impedance differences between the transmission line and the antenna. The ratio of reflected to incident waves which exists at some particular point on a transmission line.

**Statewide EMS system:** A network of EMS systems, integrated and coordinated at the state level.

**Station, radio:** A fixed installation or mobile unit that is equipped to transmit and receive radio signals.

**Strip chart recorder:** An electromechanical device used to make paperchart recording of EKG information. Usually it uses a heat sensitive paper and a heated stylus.

**Subcarrier:** A frequency sensitive device used to generate a modulated wave that in turn is applied as a modulating wave to modulate another carrier. For EMS telemetry the subcarrier frequency is 1400 Hz.

**Supergroup:** In microwave systems groups of 60 channels each, occupying a particular range of frequencies.

**Switched network:** A complex of diversified channels and equipment that automatically routes communications between the calling and called person or data equipment. The public telephone system.

**Synchronization:** The process of making the carrier at the receiving end of a line or system match the frequency of the carrier at the transmitting end.

**Synthesizer, frequency:** A highly precise crystal oscillator with frequency dividers used to provide the precise radio frequency. A typical synthesizer can be set to small frequency increments and have an accurate output at the desired output frequency.

**System:** A combination of two or more stations in such a way as to provide communications.

## T

**Tariff:** A document filed by a communications company with the Public Utilities commission which lists the services offered the public and a schedule of rates and charges.

**Telecommunications (EMS):** As defined by Florida Statutes, Chapter 401.015, "voice, data, and signaling transmissions and receptions between emergency medical service components, including, but not limited to : ambulance; rescue vehicles; hospitals or other related emergency receiving facilities; emergency communications centers; physicians and emergency medical personnel; paging facilities; law enforcement and Fire protection agencies; and poison control, suicide, and emergency management agencies."

**Telemetry:** The sensing and measuring of information at some remote location and transmitting the data to a convenient location to be read and recorded.

**Telephone line:** A telephone line from a telephone company central office that is connected to key or non-key telephone equipment.

**Ten signals:** A series of coded messages designed to reduce air transmission time and confusion in busy mobile radio systems.

**Third harmonic:** A frequency wave having three times the fundamental frequency value.

**Threshold:** In an FM receiver, the point at which the peaks of the incoming RF signal exactly equal the peaks of the internally generated thermal noise power or the point above which increasing the input signal strength provides only a dB for dB improvement in the output signal-to-noise ratio.

**Tone:** An audio or carrier of controlled amplitude and frequency used in a selective signaling system, or for equipment control purposes.

**Tone code:** A specified character of transmitted tone signals required to effect a particular selection or function.

**Tone-controlled squelch:** A system whereby a superimposed tone is transmitted with the radio carrier to protect against nuisance type interference.

**Topographic map:** An accurately scaled map having contour lines which show the elevation above sea level. Used in preparing profiles of radio propagation paths.

**Touch pad:** A method of signaling or encoding and decoding address codes by the use of a simple numerical push button keyboard.

**Tower, antenna:** A tall antenna support structure used to support one or more antennas or when an antenna must be mounted high above the ground or other support formation such as a building.

**Traffic:** A term used for messages handled by a radio communications system.

**Training:** The process of instruction, so as to make proficient or qualified Personnel in a specific field or subject.

**Transceiver:** The combination of radio transmitting and receiving equipment in a common housing, usually for portable or mobile use, and employing common circuit components for both transmitting and receiving.

**Transient:** A rapid, sometimes violent, fluctuation of voltage or current in a circuit usually of short duration caused by switching or changes in load.

**Transmission line:** A waveguide, coaxial line, or other system of conductors used to transfer signal energy efficiently from one location to another. In communications systems, the coaxial line between the base station and the antenna.

**Transmitter:** Apparatus for the production and modulation of radio frequency energy for the purpose of radio communication.

**Turret:** A section of a communications control console, containing switches, controls, meters, etc.

**Two-way radio:** A radio that is able to transmit and to receive.

**Two-wire operation:** Uses a single pair (two wires) for both transmitting and receiving.

## U

**Ultra High Frequency (UHF):** Frequencies between 300 and 3000 MHz.

**Ultrasonic:** Describing frequencies higher than those which are audible. Generally above 20,000 hertz.

**Unbalanced line:** A transmission line in which the voltages on the two conductors are unequal.

**Underwriters Laboratories, Inc.:** A laboratory sponsored by the National Board of Fire Underwriters which examines and tests devices, material and equipment whose action may affect casualty, fire and life hazards.

**Unmodulated:** Without modulation; the RF carrier signal alone as it exists during phases in conversations.

**Upper sideband:** The higher of two frequencies or groups of frequencies produced by a modulation process.

## V

**Vehicular repeater station:** A mobile station in the mobile services authorized to retransmit automatically on a mobile service frequency, communications originated by hand carried portable units or by other mobile or base stations directed to such hand-carried units.

**Vertical antenna:** A vertical steel tower, rod, or shaft used as an antenna.

**Very High Frequency (VHF):** Frequencies between 30 and 300 MHz.

**Voice:** Referring to the sounds uttered by human beings.

**Voice grade:** A communications circuit which is nominally 300 to 3000 hertz.

**Voltage standing wave ratio (VSWR):** The ratio of the maximum voltage to the minimum voltage along a transmission line. It is the measure of the mismatch between the load and the line.

**Volume:** The strength of loudness.

**Volume control:** A potentiometer voltage divider used to adjust the loudness of an audio circuit.

**Volume unit (VU):** A measure of the magnitude of sound from an electrical wave. Measured in decibels.

**Voting:** Automatic selection of remote radio receiver. All incoming signals are compared for signal quality and the first signal found that meets or exceeds a pre-set level is selected and sent to the audio amplifier.

## W

**Watt:** The unit of power.

**Wattmeter:** A meter to indicate the rate at which electrical energy is being used or produced.

**Wave:** A propagated periodic disturbance such as a radio, light, or sound wave.

**Waveguide:** A transmission line comprising a hollow conducting tube within which electromagnetic waves may be propagated. Generally used in microwave communications systems.

**Wavelength:** The distance measured along the direction of propagation between two points that are in phase on adjacent waves. A wavelength is the distance traveled by a wave in the time of one cycle. Electromagnetic waves include both light and radio waves and travel in space at approximately 300,000,000 meters per second. To determine the exact length of a wave, divide 300,000,000 meters by the frequency in hertz.

**Wave, radio:** An electro-magnetic wave which travels through space at the speed of light.

**Wave, refracted:** A radio wave that is bent (refracted) as it travels into a second medium of propagation, such as from the atmosphere to the ionized layers of the stratosphere.

**Wire:** A single metallic conductor.

## X

## Y

## Z

**APPENDIX F**

**IN THE MATTER OF**

Implementation of Sections 309(j) and 337  
of the Communications Act of 1934 as Amended

Promotion of Spectrum Efficient  
Technologies on Certain Part 90  
Frequencies

Before the  
**Federal Communications Commission**  
 Washington, D.C. 20554

In the Matter of	)	
	)	
Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended	)	WT Docket No. 99-87
	)	
Promotion of Spectrum Efficient Technologies on Certain Part 90 Frequencies	)	RM-9332
	)	

**SECOND REPORT AND ORDER  
 AND SECOND FURTHER NOTICE OF PROPOSED RULE MAKING**

**Adopted: February 12, 2003**

**Released: February 25, 2003**

**Comment Date:** 60 days after Federal Register publication

**Reply Comment Date:** 90 days after Federal Register publication

By the Commission:

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INTRODUCTION AND EXECUTIVE SUMMARY

1. In the *Report and Order and Further Notice of Proposed Rule Making* (“R&O” and “FNPRM” respectively) in this proceeding,<sup>38</sup> the Commission, *inter alia*, sought comment on certain

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<sup>38</sup> Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended; Promotion of Spectrum Efficient Technologies on Certain Part 90 Frequencies; Establishment of Public Service Radio Pool in the Private Mobile Frequencies Below 800 MHz; Petition for Rule Making of the American Mobile Telecommunications Association, *Report and Order and Further Notice of Proposed Rule Making*, WT Docket No. 99-87, RM-9332, RM-9405, RM-9705, 15 FCC Rcd 22709 (1999) (“R&O and FNPRM”).



proposals to promote new spectrum-efficient technology. This *Second Report and Order* (“2<sup>nd</sup> R&O”) addresses the comments and reply comments received with respect to promoting new spectrum-efficient technologies as proposed in the *FNPRM*. The *Second Further Notice of Proposed Rule Making* (“2<sup>nd</sup> NPRM”) seeks comment on additional issues related to promoting spectrum efficiency in the private land mobile radio services (PLMRS).

2. The major decisions in this 2<sup>nd</sup> R&O are as follows:

- We prohibit any applications for new operations using 25 kHz channels, beginning six months after publication of the 2<sup>nd</sup> R&O in the Federal Register.
- We prohibit any modification applications that expand the authorized contour of an existing station if the bandwidth for transmissions specified in the modification application is greater than 12.5 kHz, beginning six months after publication of the 2<sup>nd</sup> R&O in the Federal Register.
- We prohibit the certification of any equipment capable of operating at one voice path per 25 kHz of spectrum, *i.e.* equipment that includes a 25 kHz mode, beginning January 1, 2005.
- We prohibit the manufacture and importation of any 150-174 MHz and 421-512 MHz band equipment that can operate on a 25 kHz bandwidth beginning January 1, 2008.
- We impose deadlines for migration to 12.5 kHz technology for PLMRS systems operating in the 150-174 MHz and 421-512 MHz bands. The deadlines are January 1, 2013 for non-public safety systems and January 1, 2018 for public safety systems.

3. In addition, the 2<sup>nd</sup> *FNPRM* seeks comment on whether the equipment certification provision in the current rules is sufficient to promote migration to one voice path per 6.25 kHz bandwidth, or equivalent technology or whether migration to 6.25 kHz bandwidth or equivalent technology should be mandatory.

## BACKGROUND

4. In the R&O, the Commission adopted rules and policies to implement Sections 309(j) and 337 of the Communications Act of 1934, as amended by the Balanced Budget Act of 1997.<sup>39</sup> The Commission decided to retain the current licensing scheme for the PLMRS frequencies below 470 MHz.<sup>40</sup> It concluded that the continued use of a site-based licensing approach for these channels on a shared basis, rather than on an exclusive basis, was in the public interest.<sup>41</sup>

5. Within this context, the Commission sought further comment in the *FNPRM* on a petition for rulemaking filed by the American Mobile Telecommunications Association, Inc. (AMTA) proposing that certain Part 90 licensees be required to employ new spectrum-efficient technologies.<sup>42</sup> The AMTA Petition urged that non-public safety licensees in the bands between 222 MHz and 896 MHz be required to either deploy technology that achieves the equivalent of two times the capacity of most current

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39 The Commission addressed petitions for reconsideration of the R&O in a *Memorandum Opinion and Order* in this proceeding. See Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended, *Memorandum Opinion and Order*, WT Docket No. 99-87, 17 FCC Rcd 7553 (2002).

40 R&O and *FNPRM*, 15 FCC Rcd at 22755 ¶ 96, 22759 ¶ 107.

41 *Id.* at 22754 ¶ 95.

42 R&O and *FNPRM*, 15 FCC Rcd at 22772-73 ¶¶ 141-42. See generally AMTA Petition for Rulemaking (RM-9332) at 3 (filed June 19, 1998) (describes AMTA’s proposal) (“AMTA Petition”). AMTA’s petition was placed on public notice on July 31, 1998, see Public Notice, Report No. 2288 (rel. July 31, 1998), and included in the *NPRM* in this proceeding, see Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended; Promotion of Spectrum Efficient Technologies on Certain Part 90 Frequencies; Establishment of Public Service Radio Pool in the Private Mobile Frequencies Below 800 MHz; Petition for Rule Making of the American Mobile Telecommunications Association, *Notice of Proposed Rule Making*, WT Docket No. 99-87, RM-9332, RM-9405, RM-9705, 14 FCC Rcd 5206, 5242 ¶ 71 (1999). The Commission also sought comments addressing the use of 900 MHz PLMR channels in commercial operations. This matter is now being addressed in another proceeding. See Improving Public Safety Communications in the 800 MHz Band; Consolidating the 900 MHz Industrial/Land Transportation and Business Pool Channels, *Notice of Proposed Rule Making*, WT Docket No. 02-55, 17 FCC Rcd 4873 (2002) (*800 MHz NPRM*).

operations, *i.e.*, one voice path per 12.5 kilohertz of spectrum using a 25 kilohertz frequency,<sup>43</sup> or accept secondary status.<sup>44</sup> AMTA contended that such requirements are needed because, under the current rules, it is financially imprudent for a licensee to invest in new, more efficient technology, since doing so results in additional costs without additional benefits for its system.<sup>45</sup>

6. In addition, in the *FNPRM*, the Commission sought comment on the effectiveness of the current Part 90 rules, which were adopted in the course of the Commission's *Refarming* proceeding, PR Docket No. 92-235;<sup>46</sup> on the current pace of migration to narrowband technology;<sup>47</sup> and on whether sufficient time has elapsed to allow it to evaluate the effectiveness of the current rules.<sup>48</sup> The current rules provide that, in order to encourage migration to narrower bandwidths or their technological equivalents, we will certify only increasingly efficient equipment.<sup>49</sup> The Commission allowed 25 kHz capability to be included in new narrowband 12.5 kHz and/or 6.25 kHz equipment, *i.e.* multi-mode operation, facilitating "backward compatibility." The Commission permitted this multi-mode equipment on the premise that supporting existing 25 kHz systems would ultimately lead to conversion to 12.5 kHz and/or 6.25 kHz operations.<sup>50</sup> It was envisioned that such an approach would provide for ease of transition and introduce narrower-band equipment to a nascent marketplace. In particular, since February 1, 1997, certification of equipment for 25 kHz channels has been permitted only if the equipment is capable of operating on 12.5 kHz and/or narrower channels, though it may also operate on wider channels.<sup>51</sup> Further, under the current rules, after January 1, 2005, only new equipment that is capable of operating on 6.25 kHz channel bandwidths will be certified.<sup>52</sup> That is, the Commission's rules provide that new equipment that operates on 25 and/or 12.5 kHz channels will be authorized after January 1, 2005 only if it is also capable of operating on 6.25 kHz or narrower channels.<sup>53</sup>

7. Although the Commission encouraged migration to narrowband technology, the current rules do not require users to replace existing systems.<sup>54</sup> Nor do they prohibit the sale of previously certified equipment that uses less spectrally efficient technology. Rather, by limiting the availability of new certifications to such equipment, the Commission expected that the certification process itself could

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43 AMTA Petition at 6. AMTA excluded from this proposal all channel blocks awarded by competitive bidding, as well as Part 90 spectrum at 220 and 900 MHz, because bandwidth requirements are already strict in those bands. *Id.* Although AMTA's primary concern here is to facilitate migration to one voice path per 12.5 kHz of spectrum, we note that the Commission, in the *Refarming R&O and FNPRM*, stated that narrowband or NB refers to channel spacings of 7.5 kHz in the VHF PLMR band and 6.25 kHz in the UHF PLMR bands, or channel bandwidths of 6.25 kHz or less in all PLMR bands unless otherwise specified. *See* Replacement of Part 90 by Part 88 to Revise the Private Land Mobile Radio Services and Modify the Policies Governing Them, *Report and Order and Further Notice of Proposed Rule Making*, PR Docket No. 92-235, 10 FCC Rcd 10076, 10080 n.6 (1995) ("*Refarming R&O and FNPRM*"). In that connection, the Commission added NB technology or NB equipment will include all advanced technologies designed to operate with channel bandwidths of 6.25 kHz or less or equipment with 6.25 kHz equivalent efficiency such as TDMA (2 channels in 12.5 kHz or 4 channels in 25 kHz). *Id.*

44 AMTA Petition at 7. Secondary operations may not cause interference to operations authorized on a primary basis and are not protected from interference from those primary operations. 47 C.F.R. § 90.7.

45 AMTA Petition at 3. AMTA argued that when commercial licensees operate on shared spectrum, any increased capacity would merely become available to co-channel licensees who have not made a comparable investment. *Id.*

46 *See Refarming R&O and FNPRM* 10 FCC Rcd 10076; *see also Memorandum Opinion and Order*, 11 FCC Rcd 17676 (1996) ("*Refarming MO&O*").

47 In the *Refarming NOI*, the Commission noted that narrowband is a relative term and prior to 1968, there was a one voice path per 120 kHz standard. *See* Spectrum Efficiency in the Private Land Mobile Radio Bands in Use Prior to 1968, *Notice of Inquiry*, PR Docket No. 91-170, 6 FCC Rcd 4126, 4131-32 ¶ 40 (1991) (*Refarming NOI*). For the purposes of this 2<sup>nd</sup> R&O and 2<sup>nd</sup> FNPRM, narrowband technology will refer to utilization of one voice path per 12.5 kHz of spectrum.

48 *R&O and FNPRM*, 15 FCC Rcd at 22772-73 ¶ 141.

49 *Refarming R&O and FNPRM*, 10 FCC Rcd at 10099 ¶ 38; *see also* 47 C.F.R. § 90.203(j)(2)-(3).

50 *See Refarming R&O and FNPRM*, 10 FCC Rcd at 10100 ¶ 40.

51 *Id.* at 10 FCC Rcd at 10099-100 ¶ 38-40; *see also Refarming MO&O*, 11 FCC Rcd 17676.

52 *See* 47 C.F.R. § 203(j)(4)-(5); *see also Refarming R&O and FNPRM*, 10 FCC Rcd at 10099 ¶ 38.

53 *See* 47 C.F.R. § 203(j)(2)(ii), (4)(iii); *see also Refarming R&O and FNPRM*, 10 FCC Rcd at 10100 ¶ 40.

54 *Refarming R&O and FNPRM*, 10 FCC Rcd at 10080-82 ¶ 7.

provide the catalyst for transition from one technology to another.<sup>55</sup> The Commission specifically declined in the *Refarming* proceeding to mandate manufacturing and licensing requirements, deciding instead to allow licensees to choose equipment and a transition schedule that best fulfills their needs while balancing technical capabilities and financial considerations.<sup>56</sup>

8. AMTA and others have argued in this proceeding that we should adopt a timetable for mandatory migration to narrowband technology, because the certification rules from the *Refarming* proceeding are not resulting in migration as rapidly as the Commission anticipated.<sup>57</sup> Other commenters believed that the *Refarming* rules should be retained at least for the time being, because not enough time has elapsed to assess the outcome of that approach.<sup>58</sup>

9. In the *FNPRM*, the Commission tentatively concluded that the current pace of migration to more spectrally efficient technology has not been sufficiently rapid.<sup>59</sup> It sought comment on this tentative conclusion, as well as on whether enough time has elapsed to allow us to evaluate the effectiveness of our current rules.<sup>60</sup> The Commission tentatively concluded that it should encourage migration to narrowband technology by prohibiting the manufacture or importation of equipment that does not meet certain efficiency standards by certain dates.<sup>61</sup> The Commission also sought comment on whether it should require employment of new spectrum-efficient technologies by certain dates, and, if so, what timetable would be appropriate for implementing any new requirement.<sup>62</sup>

## SECOND REPORT AND ORDER

10. Our tentative conclusion that the *Refarming* proceeding has not resulted in a rapid migration to narrower band usage or the technological equivalent on PLMRS frequencies below 800 MHz was based on the observations of many of the commenters at the initial stages of this rulemaking proceeding. For example, AMTA and PCIA opined that the transition is not occurring as rapidly as the Commission intended.<sup>63</sup> UTC stated that the *Refarming* process has caused significant delays due to regulatory uncertainty.<sup>64</sup> Similarly, ComSpace believed that the current regulatory scheme has resulted in unbalanced uncertainty, a delayed transition and ever-increasing congestion.<sup>65</sup>

11. The record developed in response to our tentative conclusion supports the proposition that the Commission's *Refarming* rules have not resulted in the desired efficiency of use of spectrum in the 150-174 MHz and 421-512 MHz bands. AMTA contends that inefficient use of spectrum continues because the current *Refarming* rules do not provide a sufficient incentive for incumbents to use more efficient technology.<sup>66</sup> APCO asserts that the vast majority of operations on channels below 512 MHz remain at wider bandwidths.<sup>67</sup> Similarly, ITA believes that the stimulus anticipated in the *Refarming* proceeding

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<sup>55</sup> *Id.* at 10097-98 ¶¶ 34-36.

<sup>56</sup> *Id.* at 10099 ¶ 37.

<sup>57</sup> See *R&O and FNPRM*, 15 FCC Rcd at 22772 ¶ 141.

<sup>58</sup> See *id.*

<sup>59</sup> *Id.*

<sup>60</sup> *Id.*

<sup>61</sup> *Id.* at 22773 ¶ 142.

<sup>62</sup> *Id.*

<sup>63</sup> See AMTA Petition at 5; PCIA Comments (RM-9332) at 2-3.

<sup>64</sup> UTC Comments (RM-9332) at 12.

<sup>65</sup> ComSpace Reply Comments (RM-9332) at 4.

<sup>66</sup> AMTA Comments at 4.

<sup>67</sup> APCO Comments at 3.

has proven inadequate to propel use of more efficient technology.<sup>68</sup> LMCC notes the continued receipt of applications for frequency coordination of new 25 kHz wideband systems.<sup>69</sup> UTC also avers that the current *Refarming* rules do not promote migration to more efficient technologies.<sup>70</sup>

12. We agree with the majority of commenters that our current approach to encourage spectral efficiency in the PLMRS bands, based on the equipment certification process, is not by itself sufficient to bring about a timely transition to narrowband technology; thus, we conclude that stronger action is required. As discussed herein, we amend our rules to provide a 10-year schedule for the migration of PLMR systems to narrowband technology. Specifically, our amended rules will: 1) beginning six months after publication of this 2<sup>nd</sup> R&O in the Federal Register, prohibit any applications for new operations using 25 kHz channels, for any system operating in the 150-174 MHz or 421-512 MHz bands; 2) beginning six months after publication of this 2<sup>nd</sup> R&O in the Federal Register, allow incumbent 25 kHz Part 90 licensees in the 150-174 MHz and 421-512 MHz bands to make modifications to their systems provided their respective authorized interference contours are not expanded as a result thereof; 3) beginning January 1, 2005, prohibit the certification of *any* equipment capable of operating at one voice path per 25 kHz of spectrum, *i.e.*, multi-mode equipment that includes a 25 kHz mode; 4) beginning January 1, 2008, prohibit the manufacture and importation of any 25 kHz equipment (including multi-mode equipment that can operate on a 25 kHz bandwidth); 5) beginning January 1, 2013, require non-public safety licensees using channels in these bands to deploy technology that achieves the equivalent of one voice path per 12.5 kHz of spectrum; 6) beginning January 1, 2018, require public safety licensees<sup>71</sup> using channels in these bands to deploy technology that achieves the equivalent of one voice path per 12.5 kHz of spectrum.<sup>72</sup>

13. First, we note that there is a consensus among the commenters, including AMTA, that any change in spectrum efficiency requirements should be limited to frequency bands below 800 MHz, *i.e.*, “refarmed” bands.<sup>73</sup> We agree. The “refarmed” bands at 150-174 MHz and 421-512 MHz are licensed on a shared basis. By contrast, the 800 MHz and 900 MHz bands are licensed on an exclusive basis.<sup>74</sup> A licensee operating in a shared use environment does not necessarily directly accrue the benefits of its own investment in narrowband technology. Even if that licensee chooses more efficient equipment, other users in the band may not. Moreover, any spectrum efficiency gains may be realized by others sharing the spectrum, or by new applicants who gain access to the shared spectrum, rather than by the licensee choosing to use more efficient technology. Such dependency and resulting investment disincentives for any licensee to become more efficient are not manifest in the bands above 800 MHz where channels are

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68 ITA Comments at 7.

69 LMCC Comments at 3.

70 UTC Reply Comments at 3.

71 *See* 47 C.F.R. § 90.20.

72 Except for the date that operation on a 12.5 kHz bandwidth becomes mandatory, the rule changes that we adopt today apply equally to both public safety and non-public safety licensees. We note that, while AMTA’s original proposal was limited to non-public safety users, the actions suggested by the Commission’s tentative conclusions applied equally to public safety licensees. Similarly, while AMTA’s original proposal concerned the bands between 222 MHz and 800 MHz, the Commission proposed to amend rules that also govern the 150-174 MHz band. Thus, the decisions in this 2<sup>nd</sup> R&O do not expand the scope of this proceeding beyond that contemplated by the *FNPRM*.

73 AMTA Comments at n.5; American Petroleum Institute (API) Comments at 3-4; Cinergy Comments at 7; Personal Communications Industry Association, Inc. (PCIA) Comments at 3; SCANA Reply Comments at 3-4; Xcel Reply Comments at 3-4; UTC Reply Comments at 5-6; AMTA Reply Comments at 1-3, 6 (agreeing with commenters that its proposal should be limited to bands below 800 MHz band); *see generally Refarming R&O and FNPRM*, 10 FCC Rcd at 10092 ¶ 24 (identifying frequency bands 150-174, 421-430, 450-470 and 470-512 MHz as the frequency bands subject to refarming).

74 *See* Amendment of Part 90 of the Commission’s Rules to Release Spectrum in the 806-821/856-866 MHz bands and to Adopt Rules and Regulations which Govern Their Use, PR Docket 79-191, RM-3380, PR Docket 79-334, RM-3691, PR Docket 79-107, PR Docket 81-703, *Second Report and Order*, 90 FCC 2d 1281 (1982) and Amendment of Parts 2, 15, and 90 of the Commission’s Rules and Regulations to Allocate Frequencies in the 900 MHz Reserve Band for Private Land Mobile Use, GEN Docket 84-1231, RM 4812, GEN Docket 84-1233, RM 4829, GEN Docket 84-1234, RM-4247, *Report and Order*, 2 FCC Rcd 1825 (1986).

exclusive, rather than shared.<sup>75</sup> The current certification rules apply to use of channels in the 150-174 MHz and 421-512 MHz bands and do not extend to channels above 512 MHz.<sup>76</sup> As the Commission indicated in the *Refarming NOI*, the rules governing spectrum above 800 MHz already contain incentives designed to foster the research and development of advanced, spectrum-efficient techniques.<sup>77</sup> For example, PCIA contends that trunked 800 MHz operations already efficiently use spectrum.<sup>78</sup> In that connection, we note that the *Refarming NOI* cites trunking as an efficiency that is encouraged in the 800 MHz band.<sup>79</sup> Additionally, there are regulatory and operational distinctions between operations above 800 MHz band and those below 800 MHz band.<sup>80</sup> For example, licensees in 800 MHz and 900 MHz bands are permitted to utilize non-standard bandwidths, subject to interference standards.<sup>81</sup> We agree with these commenters and the reasons offered above for excluding operations above 512 MHz, and will limit any new requirements to operations in the *Refarming* bands -- 150-174 MHz and 421-512 MHz.

14. The clear majority of commenters support mandatory conversion to 12.5 kHz equivalent equipment. Most of these commenters agree that such a conversion should be by a date certain, although they do not agree on the timeframe for such mandatory conversion.<sup>82</sup> AMTA, Digital Wireless Corporation (DWC) and the American Petroleum Institute (API) propose mandatory migration in a tiered fashion based on market size.<sup>83</sup> Similarly, APCO argues that public safety licensees in rural areas should not be required to migrate to narrowband technology at the same time as those in urban areas, in light of state and local government budgetary constraints.<sup>84</sup> AMTA and API argue for a phased approach on the basis that greater efficiency is required in those areas where demand for spectrum is at a high level; moreover, they suggest that congestion is generally less severe in smaller markets.<sup>85</sup> In addition, DWC states that a phase-in schedule would ease the burden on equipment manufacturers and better balance the supply and demand ratio.<sup>86</sup>

15. By contrast, the majority of the remaining commenters argue that a single transition date should be used for the entire country. In this connection, PCIA and ITA argue that a nationwide plan ensures a uniform and smooth transition to narrowband technology and avoids the difficulty of defining a market's location and defining benchmarks for frequency coordination for operators inside and outside a market.<sup>87</sup> Moreover, ITA states that a tiered transition to narrowband technology, with differing

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<sup>75</sup> Petition at 3; *see also Refarming NOI*, 6 FCC Rcd 4126, 4133 ¶ 51.

<sup>76</sup> *See* 47 C.F.R. § 90.203(j); *see* Motorola Comments at 5 (noting the inapplicability of *Refarming* to 800 MHz band); SCANA Reply Comments at 5 (stating that any rule changes should not apply to 800 MHz band because the current rules do not apply to 800 MHz band).

<sup>77</sup> *See Refarming NOI*, 6 FCC Rcd at 4127 ¶¶ 4-5.

<sup>78</sup> PCIA Comments at 3.

<sup>79</sup> *Refarming NOI*, 6 FCC Rcd at 4129-30, ¶¶ 24-25, 29.

<sup>80</sup> API Comments at 4.

<sup>81</sup> *See* Amendment of Part 90 of the Commission's Rules to Release Spectrum in the 806-821/856-866 MHz bands and to Adopt Rules and Regulations which Govern Their Use, PR Docket 79-191, RM-3380, PR Docket 79-334, RM-3691, PR Docket 79-107, PR Docket 81-703, *Second Report and Order*, 90 FCC 2d 1281 (1982) and Amendment of Parts 2, 15, and 90 of the Commission's Rules and Regulations to Allocate Frequencies in the 900 MHz Reserve Band for Private Land Mobile Use, GEN Docket 84-1231, RM 4812, GEN Docket 84-1233, RM 4829, GEN Docket 84-1234, RM-4247, *Report and Order*, 2 FCC Rcd 1825 (1986).

<sup>82</sup> *See e.g.* AMTA Comments at 6; API Comments at 5-6; Industrial Telecommunications Inc. (ITA) Supplemental Comments at 2-3; Digital Wireless Corporation (DWC) Reply Comments at 2, 4-6; UTC Reply Comments at 3.

<sup>83</sup> *See* AMTA Comments at 6 (suggests mandatory migration to 12.5 kHz equipment in the top fifty markets by December 31, 2003; markets 51-100 by December 31, 2008; and all other markets by December 31, 2020); AMTA Reply Comments at n.10 (states that it is considering changing its proposal to require mandatory migration for the top 100 markets by December 31, 2003); API Comments at 5-6 (proposes migration to 12.5 kHz equipment for markets 1-50 by five years from effective date of this 2<sup>nd</sup> R&O and for markets 51-100 by eight years from effective date of this 2<sup>nd</sup> R&O); DWC Reply Comments at 2, 4-6 (suggests migration to 12.5 kHz equipment for markets 1-50 by December 31, 2003, for markets 51-100 by December 31, 2005, and for all other markets by December 31, 2008).

<sup>84</sup> APCO Comments at 3-4.

<sup>85</sup> AMTA Comments at 7; API Comments at 6.

<sup>86</sup> DWC Reply Comments at 4.

<sup>87</sup> PCIA Comments at 3; ITA Supplemental Comments at 2-3.

technologies deployed in rural and urban areas, would not address the extent to which radio systems are integrated across all geographic areas.<sup>88</sup> It anticipates that certain licensees may operate communications systems in various markets that cross more than one geographic area, and a migration period that attempts to draw lines of distinction among markets would either delay or impede the most efficient use of spectrum.<sup>89</sup> As for the proposed time frames in which to mandate nationwide conversion to narrowband technology, some parties suggest a relatively brief transition period in the range of three years (proposed by ITA)<sup>90</sup> to five years (proposed by PCIA and MRFAC).<sup>91</sup> Other commenters, however, while not opposing mandatory migration to narrowband technology, argue that the lifespan of equipment, which they suggest is ten to fifteen years,<sup>92</sup> be considered prior to adoption of a date certain for mandatory migration.<sup>93</sup>

16. Finally, two commenters argue that the tenets of the *Refarming* proceeding should be allowed to mature prior to implementing any additional spectrum efficiency requirements.<sup>94</sup> They suggest that the imposition of mandatory conversion dates would fail to consider the amortization and lifespan of current equipment and the costs associated with converting or abandoning current equipment.<sup>95</sup> They also are concerned that such an approach would impose a significant and unnecessary burden on licensees.

17. Based upon our review and analysis of the record in this proceeding, we conclude that the public interest would be best served if we establish a date certain by which PLMRS licensees in the *Refarming* bands must migrate to narrowband technology. We agree with the majority of commenters, who advocate a nationwide implementation methodology to affect migration to narrowband technology, rather than the establishment of different dates for different areas.<sup>96</sup> We also agree with APCO, however, that consideration should be given to the budgetary constraints of state and local governments and the associated budgetary planning cycles. Consequently, we adopt different nationwide mandatory migration dates for non-public safety systems and public safety systems.

18. We believe that the date certain should be January 1, 2013 for non-public safety licensees. As discussed earlier, some parties advocate a three-to-five year span for implementation of narrowband migration; while others argue that a ten-to-twenty year span is necessary.<sup>97</sup> The parties that support a shorter time frame suggest that PLMR licensees have been on notice since the *Refarming* proceeding that the Commission sought to improve migration to narrowband technology. On the other hand, those commenters that suggest the longer time frame for migrating to narrowband technology note the importance of amortization of equipment costs and the life span of equipment. We believe that mandating migration to 12.5 kHz technology by January 1, 2013 for non-public safety entities strikes a balance between the budgetary exigencies surrounding equipment costs and our goal of promoting spectral efficiency in a fairly expeditious manner. While we cannot ensure that the lifespan of all 25 kHz equipment is completely exhausted prior to required migration to 12.5 kHz technology, we can implement rules that afford consideration of equipment lifespan and amortization. Just as users in this proceeding estimate ten-, fifteen- and twenty-year time frames for equipment lifespan,<sup>98</sup> users in the *Refarming R&O*

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<sup>88</sup> ITA Supplemental Comments at 2.

<sup>89</sup> *Id.*

<sup>90</sup> *Id.* at 2-3.

<sup>91</sup> PCIA Comments at 3-4; MFRAC Comments at 2-3. Other commenters support a uniform nationwide requirement, but do not propose a specific migration date. See Land Mobile Communications Council (LMCC) Comments at 3-4; Motorola Comments at 5-6; UTC Reply Comments at 3

<sup>92</sup> We note that in the *Refarming* proceeding, ten years was deemed a reasonable transition cycle for replacing equipment. See *Refarming R&O and FNPRM*, 10 FCC Rcd 10098 ¶ 35.

<sup>93</sup> APCO Comments at 3-4; Cinergy Comments at 5.

<sup>94</sup> Association of American Railroads (AAR) Comments at 3; DW Communications, Inc. Comments at 2.

<sup>95</sup> AAR Comments at 3; DW Communications, Inc. Comments at 2.

<sup>96</sup> See *supra* para. 15.

<sup>97</sup> See *supra* paras. 14-15.

<sup>98</sup> APCO Comments at 3-4 (suggesting that a reasonable equipment lifespan for top 50 markets would be 10 years and that the for remaining markets, a reasonable equipment lifespan would be 15 years); Cinergy Comments at 5 (stating that 15 years or more represents the life span of equipment).

and *FNPRM* stated that many systems last between fifteen to twenty years. However, in the *Refarming R&O and FNPRM*, there was general agreement that ten years was a reasonable transition cycle.<sup>99</sup> Therefore, in this instance, we afford those non-public safety licensees using one voice path per 25 kHz of spectrum permission to continue operating until January 1, 2013, a ten-year period.

19. With respect to public safety licensees, we believe that public safety licensees play a role, along with other PLMR licensees, in ensuring that spectral efficiencies are realized in the 150-174 MHz and 421-512 MHz bands. As such, the Commission did not exclude public safety licensees in the *Refarming* rules; nor did the Commission exclude public safety licensees from the questions posed regarding the efficiencies in the 150-174 MHz and 421-512 MHz bands in this proceeding. APCO requests consideration of equipment cost amortization, and suggests that ten years is a reasonable equipment replacement cycle and a reasonable life span for equipment.<sup>100</sup> However, APCO asks that public safety licensees in rural markets be provided an additional five years to migrate to 12.5 kHz technology.<sup>101</sup> To avoid the inefficiencies of producing interference and impeding interoperability, we also reject APCO's request for a phased approach for public safety licensee migration to narrowband technology.<sup>102</sup> Although we decline adoption of a phase-in implementation approach by markets for public safety licensees, we nonetheless are mindful of the unique budgetary paradigm under which public safety licensees must plan, design, finance and implement their communications systems. The Commission has previously acknowledged the budgetary constraints that public safety licensees endure and implemented special provisions to account therefor. For example, in the *Microwave Relocation* proceeding, the Commission reasoned that the longer negotiation timetable provided for public safety licensees was intended to reflect the fact that public safety agencies typically operate under greater budgetary constraints and longer planning cycles than do non-public safety entities.<sup>103</sup> Likewise, the Commission incorporated a channelization approach in 700 MHz band to ensure that the 70 MHz public safety band spectrum is used efficiently in light of budgetary concerns that usually drive the public safety decision making regarding radio communications systems.<sup>104</sup> Similarly, we believe that special consideration should be given here regarding the financial limitations of public safety licensees. Accordingly, we will provide for a longer migration period for public safety licensees. All public safety licensees shall be required to migrate to 12.5 kHz technology by January 1, 2018, providing an additional five years from the time by which non-public safety licensees will be required to migrate.

20. We reject APCO's suggestion that any public safety licensee failing to meet its migration deadline be permitted to continue to operate on a secondary basis.<sup>105</sup> APCO fails to offer guidance as to how to resolve issues resulting from secondary basis operation, such as resolution of interference complaints and whether it would be in the public interest to compel a secondary public safety licensee to

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<sup>99</sup> *Refarming R&O and FNPRM*, 10 FCC Rcd at 10098 ¶ 35.

<sup>100</sup> APCO Comments at 3.

<sup>101</sup> *Id.* at 4.

<sup>102</sup> *See supra* para. 14.

<sup>103</sup> *See* Amendment to the Commission's Rules Regarding a Plan for Sharing the Costs of Microwave Relocation, *Second Report and Order*, WT Docket 95-157, 12 FCC Rcd 2705, 2712 ¶ 14 (1997).

<sup>104</sup> *See* Development of Operational, Technical and Spectrum Requirements For Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010; Establishment of Rules and Requirements for Priority Access Service, *Third Memorandum Opinion and Order and Third Report and Order*, WT Docket 96-86, 15 FCC Rcd 19844, 19853-54 ¶ 22 (2000) (observing that each jurisdiction typically provides public safety communications to better protect the safety of life and property – with spectrum utilization based more on budgetary limitations than on considerations of the most efficient and effective technologies).

<sup>105</sup> APCO Comments at 4.

discontinue operations immediately because it was causing interference to a primary licensee. Moreover, we believe that the relief afforded by the later mandatory migration date for public safety licensees addresses the concerns which appear to be the basis for APCO's request.

21. We also conclude that we should take other steps to increase spectrum efficiency in the 150-174 MHz and 421-512 MHz bands prior to the mandatory migration dates. While we believe that the incremental changes set forth below do not by themselves guarantee use of narrowband technology, we do believe that they will serve as catalysts toward employment of 12.5 kHz technology and encourage licensees to begin their conversion to narrowband technology prior to the mandatory migration dates established herein.

22. As noted above, presently we approve 25 kHz equipment so long as it also is capable of 12.5 kHz operation.<sup>106</sup> Under our current rules, we would continue to approve 25 kHz equipment after January 1, 2005, provided that it is capable of 6.25 kHz operation.<sup>107</sup> Based on the record in this proceeding, however, we now conclude that the continued approval of new equipment that operates on a 25 kHz bandwidth impedes our goal of encouraging more efficient spectrum use, by encouraging the continued use of 25 kHz equipment with which the new equipment is backward-compatible. Such an approach is appropriate in a regulatory framework where equipment certification represents the limit of inducement to migrate to narrowband technology. However, in light of our decision to establish a firm migration date, we are concerned that allowing backward compatibility might frustrate the underlying purpose -- to ensure efficient use of spectrum by promoting expeditious migration to narrowband technology. Therefore, we will amend our rules to prohibit the certification of *any* equipment capable of operating at one voice path per 25 kHz of spectrum, *i.e.*, multi-mode equipment that includes a 25 kHz mode, beginning January 1, 2005. We elect to begin this prohibition in concert with the date on which equipment certification will require operation on channels of 6.25 kHz or less. We also believe this interim step will prepare licensees for their upcoming migration to 12.5 kHz technology.

23. As another means toward promoting and facilitating migration to narrowband technology, commenters suggest a freeze on new applications that propose to use 25 kHz bandwidth channels.<sup>108</sup> These commenters argue that the introduction of 25 kHz-only wideband systems must end in order to facilitate migration to 12.5 kHz technology.<sup>109</sup> We agree that continuing to accept new wideband applications would result in a continued and broader proliferation of 25 kHz operations. We also agree that such consequence would hinder migration to 12.5 kHz technology. To that end, we will amend our rules to prohibit any applications for new operations using 25 kHz channels, for systems operating in the 150-174 MHz or 421-512 MHz bands, beginning six months after publication of this *2<sup>nd</sup>* R&O in the Federal Register.<sup>110</sup> After that date, new systems will be authorized only for a bandwidth of 12.5 kHz or less. We note that the record reflects that 12.5 kHz equipment already is widely available.<sup>111</sup> Thus, we do not believe that this approach would be unduly burdensome to current and prospective licensees.

24. Another related issue is how the expansion of existing 25 kHz systems should be treated in the new PLMR environment we establish today. One commenter suggests that modification applications to add frequencies to a system should be permitted only if the equipment is 12.5 kHz compatible.<sup>112</sup> Another commenter argues that certain types of modifications, such as adding mobiles and small location changes, should be permitted even if 25 kHz equipment will be used.<sup>113</sup> When the Commission began the transition from a site-by-site licensing approach to a geographic area licensing approach for the 800 MHz Specialized Mobile Radio (SMR) service, the interests of incumbent SMR licensees were

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<sup>106</sup> 47 C.F.R. § 90.203(j)(2).

<sup>107</sup> 47 C.F.R. § 90.203(j)(4).

<sup>108</sup> AMTA Comments 5-6; DWC Reply Comments at 2, LMCC Reply Comments at 3-4; PCIA Reply Comments at 2. *But see* API Reply Comments at 5.

<sup>109</sup> AMTA Comments 5-6; DWC Reply Comments at 2, LMCC Reply Comments at 3-4; PCIA Reply Comments at 2.

<sup>110</sup> This timing will permit the filing and processing of applications already in the process of being prepared and coordinated.

<sup>111</sup> *See* AMTA Comments at 5; ITA Comments at 6; Motorola Comments at 5.

<sup>112</sup> Motorola Comments at 6.

<sup>113</sup> PCIA Reply Comments at 2.



considered.<sup>114</sup> The Commission determined that the incumbent SMR licensees should be permitted to make modifications within their authorized interference contour.<sup>115</sup> These measures were implemented to promote geographic area licensing and promote the relocation of the upper 200 channel incumbents in the 800 MHz band, while accounting for the continuing needs of the site-by-site licensed incumbents. Similarly, it is our objective here to promote migration to narrowband technology in order to alleviate congestion, while also accounting for the needs of 25 kHz incumbents. Therefore, we will allow incumbent 25 kHz Part 90 licensees in the 150-174 MHz and 421-512 MHz bands to make modifications to their systems provided their respective authorized interference contours are not expanded as a result thereof. Any modification application that expands the authorized contour will be granted only on the condition that the bandwidth not exceed 12.5 kHz. This change also will take effect six months after publication of this 2<sup>nd</sup> R&O in the Federal Register.

25. Further, the Commission tentatively concluded in the *FNPRM* that it should ban the importation and manufacture of inefficient equipment.<sup>116</sup> One commenter suggests, *inter alia*, prohibiting manufacture or importation of equipment which does not have the capability of at least one voice path per 12.5 kHz or equivalent effective six months from publication of this item in the Federal Register.<sup>117</sup> Another commenter supports such a ban, but would make it effective beginning January 1, 2004.<sup>118</sup> We agree that the manufacture and importation of 25 kHz equipment should be prohibited in advance of the mandatory migration date to add yet another incentive for expeditious migration to 12.5 kHz technology. However, in light of the other incremental actions we take in this proceeding, *i.e.* prohibiting modifications to existing stations limited to those modifications that expand the station's authorized contour, prohibiting new operations using 25 kHz channels and prohibiting certification of any equipment capable of operating at one voice path per 25 kHz or spectrum, we do not believe that this prohibition needs to occur as early as certain commenters have suggested. Moreover, we believe that operators who purchase equipment and receive approval to use equipment capable of operating at one voice path per 25 kHz of spectrum as late as December 31, 2004<sup>119</sup> should be able to realize some benefit from their certified equipment. Therefore, we will amend our rules to prohibit the manufacture and importation of any 25 kHz equipment (including multi-mode equipment that can operate on a 25 kHz bandwidth) beginning January 1, 2008.

26. Finally, we note that use of more efficient technology creates additional channels that become available for licensing (*i.e.*, the 12.5 kHz channel between the center frequencies of each current 25 kHz channel). In the *Refarming R&O and FNPRM*, the Commission noted the improved spectrum efficiency that would result from migration to narrowband technology.<sup>120</sup> Consistent with the assumptions underlying the *Refarming* proceeding, the current regulatory regime results in the licensee retaining authorization on the channels indicated on its license and the vacated channels reverting to their respective pools for assignment.<sup>121</sup> While the Commission sought comment on the treatment of new

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<sup>114</sup> See Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Band, Implementation of Sections 3(n) and 322 of the Communications Act - Regulatory Treatment of Mobile Services and Implementation of Section 309(j) of the Communications Act - Competitive Bidding, *First Report and Order, Eighth Report and Order and Second Further Notice of Proposed Rulemaking*, PR Docket No. 93-144, 11 FCC Rcd 1463 (1995).

<sup>115</sup> *Id.* at 1514 ¶ 86; see also Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Band, Implementation of Sections 3(n) and 322 of the Communications Act - Regulatory Treatment of Mobile Services and Implementation of Section 309(j) of the Communications Act - Competitive Bidding, *Second Report and Order*, PR Docket No. 93-144, 12 FCC Rcd 19079, 19105 ¶ 67 (1997).

<sup>116</sup> *R&O and FNPRM*, 15 FCC Rcd at 22773 ¶ 142.

<sup>117</sup> ITA Comments at 7.

<sup>118</sup> MFRAC Comments at 3.

<sup>119</sup> See *supra* para. 22.

<sup>120</sup> *Refarming R&O and FNPRM*, 10 FCC Rcd at 10092 ¶ 24.

<sup>121</sup> See, e.g., AMTA Comments at 3 (acknowledging the broader public interest in maximizing the efficient use of limited spectrum resources); AAR Comments at 5 (recognizing the need for users of the radio spectrum to take steps to use this valuable national resource more efficiently); ITA Comments at 6 (stating that the entire industry would benefit from an increase in the amount of private land mobile channels available for use).

channels created as a result of users converting from 25 kHz to narrower band technology,<sup>122</sup> it never took action to implement any of the proposed alternatives. We decline to alter the current regulatory regime.

## SECOND FURTHER NOTICE OF PROPOSED RULE MAKING

27. In the 2<sup>nd</sup> R&O in this proceeding, we amended our rules to impose a deadline of January 1, 2013 for mandatory migration to 12.5 kHz technology for non-public safety licensees and a deadline of January 1, 2018 for public safety licensees, and took other actions to encourage users to migrate from 25 kHz bandwidth to 12.5 kHz bandwidth technology before those dates. We note that the Commission did not seek comment in the *FNPRM* regarding migration to 6.25 kHz operation. Most commenters addressing the issue oppose a mandatory conversion date for use of 6.25 kHz compatible equipment.<sup>123</sup> Only one commenter proposed a date certain for conversion to 6.25 kHz equipment.<sup>124</sup> Another commenter suggests a mandatory conversion date to 6.25 kHz equipment, but warns that its proposed date may need to be revisited.<sup>125</sup> We note that operation at 12.5 kHz technology was initially viewed as a transitional standard to facilitate migration to 6.25 kHz technology.<sup>126</sup> In light of the actions taken in the 2<sup>nd</sup> R&O regarding migration to 12.5 kHz technology, we tentatively conclude that similar actions are warranted to facilitate migration to 6.25 kHz technology. We seek comment on our tentative conclusion and ask that the commenters provide reasons for supporting or opposing our tentative conclusion. If mandatory migration to 6.25 kHz technology were adopted, we also seek comment on the date or dates by which licensees would be required to migrate to 6.25 kHz technology, and on any other compliance dates for other provisions facilitating migration to 6.25 kHz technology.

## PROCEDURAL MATTERS

### Regulatory Flexibility Act Analyses

28. As required by the Regulatory Flexibility Act (RFA), *see* 5 U.S.C. § 604, the Commission has prepared a Final Regulatory Flexibility Analysis of the possible impact of the rule changes contained in this 2<sup>nd</sup> R&O on small entities. The Final Regulatory Flexibility Act analysis is set forth in Appendix C. Additionally, we have prepared an Initial Regulatory Flexibility Analysis concerning the impact of the policies and rules addressed by the 2<sup>nd</sup> *FNPRM*. The Initial Regulatory Flexibility Analysis is set forth in Appendix D. The Commission's Consumer Information Bureau, Reference Information Center, will send a copy of this 2<sup>nd</sup> R&O and 2<sup>nd</sup> *FNPRM*, including the Final and Initial Regulatory Flexibility Act Analyses, to the Chief Counsel for Advocacy of the Small Business Administration.

### Filing Procedures

29. Pursuant to Sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415, 1.419, interested parties may file comments on or before 60 days after publication in the Federal Register, and reply comments on or before 90 days after publication in the Federal Register. Comments may be filed using the Commission's Electronic Comment Filing System ("ECFS") or by filing paper copies. *See Electronic Filing of Documents in Rulemaking Proceedings*, 13 FCC Rcd 11322, 11326 (1998).

30. Comments filed through the ECFS can be sent as an electronic file via the Internet to <<http://www.fcc.gov/e-file/ecfs.html>>. Generally, only one copy of an electronic submission must be filed. If multiple docket or rulemaking numbers appear in the caption of this proceeding, however, commenters must transmit one electronic copy of the comments to each docket or rulemaking number referenced in the caption. In completing the transmittal screen, commenters should include their full name, Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To obtain filing instructions for e-mail comments,

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<sup>122</sup> *Refarming R&O and FNPRM*, 10 FCC Rcd at 10141 ¶ 148.

<sup>123</sup> ITA Comments at 8; LMCC Comments at 3; Motorola Comments at 7.

<sup>124</sup> API Comments at 5.

<sup>125</sup> PCIA Comments at 4.

<sup>126</sup> *See Refarming R&O and FNPRM*, 10 FCC Rcd 10095 ¶ 28.

commenters should send an e-mail to [ecfs@fcc.gov](mailto:ecfs@fcc.gov), and should include the following words in the body of the message, "get form <your e-mail address>." A sample form and directions will be sent in reply.

31. Parties choosing to file by paper must file an original and four copies of each filing. If participants want each Commissioner to receive a personal copy of their comments, an original plus nine copies must be filed. All filings must be sent to the Commission's Secretary, Marlene H. Dortch, Office of the Secretary, Federal Communications Commission, The Portals, 445 12th Street, S.W., Room TW-A325, Washington, D.C. 20554. In addition, courtesy copies should be delivered to Karen Franklin, Public Safety and Private Wireless Division, Wireless Telecommunications Bureau, Federal Communications Commission, 445 12th Street, S.W., Room #4-C405, Washington, D.C. 20554.

32. All relevant and timely comments will be considered by the Commission before final action is taken in this proceeding. Comments and reply comments will be available for public inspection and duplication during regular business hours in the FCC Reference Information Center, Room CY-A257, 445 12th Street, S.W., Washington, DC 20554. Copies also may be obtained from Qualex International., 445 12th Street, S.W., Room CY-B400, Washington, DC 20554, (202) 863-2893.

#### Further Information

33. For further information concerning this 2<sup>nd</sup> R&O and 2<sup>nd</sup> FNPRM, contact Karen Franklin, Esq. Public Safety and Private Wireless Division, Wireless Telecommunications Bureau, Federal Communications Commission, Washington, D.C. 20554, at (202) 418-0680, TTY (202) 418-7233. Alternative formats (computer diskette, large print, audio cassette, and Braille) are available to persons with disabilities by contacting Jenifer Simpson at (202) 418-0008, TTY (202) 418-2555. This 2<sup>nd</sup> R&O and 2<sup>nd</sup> FNPRM can be downloaded at <http://www.fcc.gov/Wireless/Orders/2003>.

#### ORDERING CLAUSES

34. Accordingly, pursuant to Sections 1, 2, 4(i), 5(c), 7(a), 11(b), 301, 302, 303, 307, 308, 309(j), 310, 312a, 316, 319, 323, 324, 332, 333, 336, 337, and 351 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 152, 154(i), 155(c), 157(a), 161(b), 301, 302, 303, 307, 308, 309(j), 310, 312a, 316, 319, 323, 324, 332, 333, 336, 337, and 351, the Balanced Budget Act of 1997, Pub. L. No. 105-33, Title III, 111 Stat. 251 (1997), and Sections 1.421 and 1.425 of the Commission's Rules, 47 C.F.R. §§ 1.421 and 1.425, IT IS ORDERED that the *Second Report and Order and Second Further Notice of Proposed Rule Making* is hereby ADOPTED.

35. IT IS FURTHER ORDERED that Parts 1 and 90 of the Commission's Rules ARE AMENDED as set forth in Appendix B, and that these Rules shall be effective **[60 days after publication in the Federal Register]**.

36. IT IS FURTHER ORDERED that NOTICE IS HEREBY GIVEN of the proposed regulatory changes contained in the *Second Further Notice of Proposed Rule Making*, and that comment is sought on these proposals.

37. IT IS FURTHER ORDERED that the Commission's Consumer Information Bureau, Reference Information Center, SHALL SEND a copy of this *Second Report and Order and Order and Second Further Notice of Proposed Rule Making*, including the Initial and Final Regulatory Flexibility Analyses, to the Chief Counsel for Advocacy of the U.S. Small Business Administration.

38. IT IS FURTHER ORDERED that the Motion to Accept Supplemental Comments submitted by Industrial Telecommunications Association, Inc. is GRANTED.

Marlene H. Dortch  
Secretary