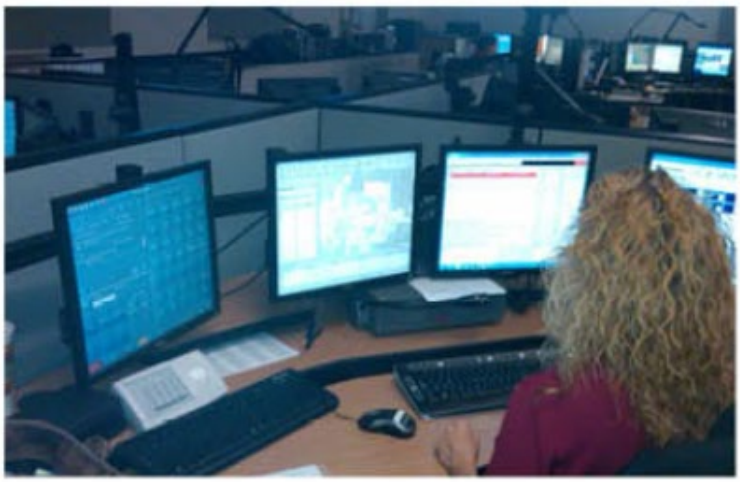
# 2023

**Division of Telecommunications**

Department of MANAGEMENT SERVICES
Division of Telecommunications

# Law Enforcement Communications Plan




**Ron DeSantis, Governor**

**Pedro Allende, Secretary**

Department of MANAGEMENT SERVICES
We Serve Those Who Serve Florida

Division of Telecommunications
4050 Esplanade Way
Tallahassee, FL 32399-0950

Ron DeSantis, Governor
Pedro Allende, Secretary

**MEMORANDUM**

**TO:** Florida Law Enforcement Communications Plan Recipients

**FROM:** Joshua Blood, Chief of Public Safety, Division of Telecommunications

**DATE:** July 13, 2023

**SUBJECT:** Florida Law Enforcement Communications Plan, 2023 Edition

The Florida Law Enforcement Communications Plan has been revised and is now available online at: https://www.dms.myflorida.com/business_operations/telecommunications/public_safety_communications/radio_communications_services/radio_communications_plans

This revision includes the following updates:

- Updated cover page
- Updated points of contact with current staff
- Updated and reformatted hyperlinks

This plan is intended to meet the expectations of state and local law enforcement agencies.

If you have any comments or questions regarding these revisions, please contact Shaun Krueger, Bureau of Public Safety Special Projects Manager, at 850-413-9213, or via email at Shaun.Krueger@dms.fl.gov.

Sincerely,

Joshua Blood
Bureau Chief Public Safety, Division of Telecommunications

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## 1.0 INTRODUCTION

### 1.1 Scope

The Law Enforcement Communications Plan encompasses state agencies' and local law enforcement agencies' land mobile radio systems.

### 1.2 Executive Summary

Subsection 282.7101(2), Florida Statutes, requires the Department of Management Services (*the department*) "…to develop and maintain a statewide system of regional law enforcement communications." Subsection 282.7101(5), Florida Statutes, requires that "A law enforcement communications system may not be established or expanded without the prior approval of the department." In formulating such a regional law enforcement communications system, subsection 282.7101(2), Florida Statutes, requires:

> *"…the department shall divide the state into appropriate regions and shall develop a program that includes, but is not limited to:*
>
> *(a) The communications requirements for each county and municipality comprising the region.*
> *(b) An interagency communications provision that depicts the communication interfaces between municipal, county, and state law enforcement entities operating within the region.*
> *(c) A frequency allocation and use provision that includes, on an entity basis, each assigned and planned radio channel and the type of operation, simplex, duplex, or half-duplex, on each channel."*

In 1973, the department's Division of Telecommunications (DivTel) prepared the first Law Enforcement Communications Plan (Plan) and implemented the approval system necessary to fulfill these statutory obligations. In conjunction with federal funding, the first communications plan enabled implementation of many law enforcement radio systems throughout Florida. Since then, the plan has been revised to keep pace with technology and the needs of customers. To improve and maintain this plan, readers are encouraged to send corrections, additions or comments on any matter in this plan to:

Department of Management Services
Division of Telecommunications
Bureau of Public Safety
4030 Esplanade Way, Suite 135
Tallahassee, FL 32399-0950
Phone (850) 413-9213
Email Shaun.Krueger@dms.fl.gov

In general, this plan contains administrative and regulatory information needed by managers involved in law enforcement radio communications system operations. It defines the broad concepts and goals of law enforcement communications within Florida. Additionally, this plan contains statewide radio frequency allotments as well as operational information for day-to-day law enforcement communications system operations.

This plan is broken into seven sections including this “Introduction” section. The “Administrative Information” section includes general information on the department; the Federal Communications Commission (FCC) rules, radio frequencies, and frequency coordination requirements; the Florida - Region 9 Plans for 700 and 800 MHz public safety radio communications; the Florida 700 MHz Public Safety Interoperability Channel Plan; and DivTel law enforcement communications approval procedures. The “Concepts of Law Enforcement Communications” section defines the fundamental modes and system capabilities referred to throughout the plan. The “Frequency Plan” section defines the methodology controlling the allotment and use of radio frequencies within the statewide system of regional law enforcement communications system. The “System Requirements” and “Equipment Requirements” sections give requirements for the high reliability needed in law enforcement communications. These requirements are used to determine the approval of a new radio system and expansion of existing law enforcement radio systems. The final section pertains to “Concepts of Mobile Data Communications” and provides information to assist in the design and/or implementation of a mobile data system employed in a law enforcement communications system.

Throughout the development of this plan, new editions have been kept as brief and as straightforward as possible. This approach should improve the usefulness of this plan and facilitate future revisions. The statewide requirements on law enforcement communications systems and equipment have been limited to the minimum level necessary to ensure the effectiveness of essential modes of communication.

### 1.3 Legislative Background

The department is authorized to plan and coordinate all telecommunications services for state agencies and political subdivisions, as specified in section 282.702, Florida Statutes. The role of the department is to provide the State of Florida and its operating agencies with an interconnected and operationally secure statewide telecommunications system that will satisfy operational needs. Since DivTel’s inception in 1970, it has received additional responsibilities and authority related to public safety telecommunications at the local level.

In 1974, the Florida Legislature enacted the Florida Emergency Telephone Act. Section 365.171(2) states "It is further the intent of the Legislature to implement and continually update a cohesive statewide emergency communications number E911 plan.” This plan does not include, other than conceptually, provisions for the 911 "citizen access" portion of law enforcement operations.

In 1996, Florida Legislature created section 318.21(9), Florida Statutes. This section specifically authorizes counties that participate in an approved intergovernmental radio communications program to use $12.50 from moving traffic violations for funding such a program. This statute requires the program to be approved by the department.

## 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 law enforcement communications are promptly made available to affected law enforcement organizations. This section defines the revision transmittal procedure and formatting style for both new and revised pages.

Copies of new editions of this plan will be sent in an email to public safety organizations (e.g., Florida Sheriff's Association, Florida Police Chiefs Association, and the Domestic Security State Working Group-Interoperable Communications Committee) each time the plan is revised. Distribution of this plan is via the Internet.

### 1.4.1 Revision Publication Procedures

Each new edition is accompanied by a revision memorandum defining the essence of the revisions.

### 1.4.2 Revision Format

A. Cover Page: With any revision, the cover page is replaced with a new page.

## 2.0 ADMINISTRATIVE INFORMATION

### 2.1 Division of Telecommunications (DMS DivTel Bureau of Public Safety)

The department's Division of Telecommunications is organized into several bureaus to include Public Safety, Engineering, Financial Operations, and Customer Services. These four bureaus are further subdivided into sections and other functional groupings.

The Bureau of Public Safety handles activities specifically related to land mobile radio systems, radio-frequency coordination, the Statewide Law Enforcement Radio System (SLERS), and Florida Interoperability Network (FIN). With respect to the law enforcement communications, the following are some examples of the bureau's responsibilities:

A. Communications Planning: Assist with communication system analysis and planning services to 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.

B. Radio Frequency Coordination and Licensing Assistance: Assistance in the preparation of radio frequency coordination forms and Federal Communications Commission (FCC) license applications may be provided.

Requests for project assistance in the above areas, or for any other information or assistance that DivTel may provide, should be directed to:

Division of Telecommunications
Bureau of Public Safety
4030 Esplanade Way, Suite 135
Tallahassee, FL 32399-0950
Phone (850) 413-9213

Requests for assistance may also be submitted via E-mail at:
Shaun.Krueger@dms.fl.gov

### 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. There are radio frequencies nationally allocated for public safety communications, which includes dispatch of law enforcement ground vehicles and other law enforcement related communications. Such radio communications are allowed under FCC Rules and Regulations (Title 47, Code of Federal Regulations; or, 47 CFR) Part 90, Private Land Mobile Radio Services, Subpart B, Public Safety Radio Pool. If inconsistencies exist between this plan and the FCC rules, the rules take precedence.

2.2.2 Radio Frequencies for Law Enforcement Communications Eligibility

Current FCC rules clearly state the eligibility of law enforcement frequencies in the Public Safety Pool. Per 47 CFR 90.20(a)(1), the eligible users of radio frequency spectrum allocated by the FCC for the Public Safety Pool are:

> "Any territory, possession, state, city, county, town or similar governmental entity is eligible to hold authorizations in the Public Safety Pool to operate radio stations for transmission of communications essential to official activities of the licensee, …"
>
> "A governmental institution authorized by law to provide its own police protection;"

The assignment limitations and designated frequency coordinator for each frequency in the Public Safety Pool is specified in the frequency table of 47 CFR 90.20(c)(3).

2.2.3 Radio Frequency Coordination and Licensing

All requests for radio frequency coordination and licensing must be directed to the appropriate FCC certified frequency coordinator as specified in 47 CFR 90.20(c), Region Committee (see sections 2.3 and 2.4 of this plan), or per the 700 MHz Public Safety Interoperability Channel Plan (see section 2.5 of this plan). Contact information for the FCC-certified coordinators may be found at Public Safety and Homeland Security Bureau. Frequency coordination usually requires a coordination fee. Consult with the appropriate coordinating organization to determine the current processing requirements and fee schedule prior to submitting applications.

2.2.4 Copy of FCC Rules

Licensees are required to have a current copy of the FCC rules governing the radio service in which authorization is granted. By signing FCC 601 Form, the applicant certifies having access to a current copy of the applicable radio service's rules.

Federal Communications Commission rules for Part 90 Private Land Mobile Radio Services are contained in a volume entitled "Code of Federal Regulations, Title 47, Part 90 to END," published after Oct. 1 of each year. Part 90 of these FCC rules is available via the internet.

## 2.3 Florida – Region 9 Plan for 800 MHz Public Safety Radio Communications

The FCC has established a National Public Safety Plan that specifies requirements governing the public safety eligible use of the 806-809/851-854 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. The State of Florida is Region 9.

The Florida - 800 MHz Region 9 Plan for Public Safety Radio Communications (Florida - Region 9 800 MHz Plan) was subsequently prepared by the Florida region and sub-region plan committees, which represent a cross-section of public safety communications interests throughout Florida. The first Florida - Region 9 800 MHz Plan was adopted by the FCC on May 10, 1990.

The Florida - Region 9 800 MHz Plan contains procedures and criteria for the selection and assignment of applications for, as well as utilization and protection of the 806-809/851-854 MHz frequencies. It specifies explicit channel allotments for planned and projected use throughout Florida. A major component of the Florida - Region 9 800 MHz Plan establishes implementation and use requirements for the five 800 MHz national mutual aid channels.

## 2.4 Florida – Region 9 Plan for 700 MHz Public Safety Radio Communications

The FCC has established rules and regulations governing the public safety eligible use of the 764-776/794-806 MHz band. This frequency band was divided for three different uses – General Use, Interoperable Use and State Use. Specifically, for the "General Use" channels, the Florida – Region 9 700 MHz Plan was subsequently prepared by the Florida Region Committee, which represents a cross-section of public safety communications interests throughout Florida. The first plan was adopted by the FCC on April 20, 2009. A copy of the Florida - Region 9 700 MHz Plan is available at:

Florida_700_MHz_State_Use_Channel_Plan__16A.pdf (myflorida.com)

This plan contains procedures and criteria for the selection and assignment of, applications for, as well as utilization and protection of, General Use channels. It specifies explicit channel allotments for planned and projected use throughout Florida.

## 2.5 Florida's 700 MHz Public Safety Interoperability Channel Plan

The FCC has established rules and regulations governing the public safety eligible use of the 764-776/794-806 MHz band. This frequency band was divided for three different uses – General Use, Interoperable Use and State Use. Specifically for the "Interoperability Use" channels, the Florida 700 MHz Public Safety Interoperability Channel Plan was subsequently prepared by DivTel. This plan represents a cross-section of public safety communications interests throughout Florida. The first edition was completed on November 23, 2010. A copy of this plan is available at:

700_IO_Plan_Final_V3_05_-_First_Edition_w-DMS_wrap.pdf (myflorida.com)

This plan "…serves to define the method of administration and oversight for the Interoperability Tactical channels, National Interoperability Calling channels and the Low-Speed Data Interoperability channels designated for use by public safety entities in the 700 MHz frequency band within Florida."

## 2.6 Statewide Law Enforcement Radio System

### 2.6.1 Overview

The Florida Legislature authorized the department to acquire and implement a statewide radio communications system to serve state and local law enforcement agencies through a shared trunked radio system and mutual aid channels. The goal of the Statewide Law Enforcement Radio System (SLERS) is to provide state law enforcement officers with a shared 800 and 700 MHz radio system. This digital system serves more than 20,400 radios in patrol cars, boats, motorcycles and aircraft throughout Florida. Per subsection 282.709(2), Florida Statutes, "The Joint Task Force on State Agency Law Enforcement

Communications is created adjunct to the department to advise the department of member-agency needs relating to the planning, designing, and establishment of the statewide communication system."

#### 2.6.2 Partners

Public safety entities, which are eligible under 47 CFR Part 90 to use spectrum allocated for public safety use, can apply to join SLERS as interoperability or local first responder users, and use SLERS as a primary or auxiliary system for direct communications with other SLERS users on interagency and inter-local talk groups. Public safety entities can become an SLERS partner with minimum capital investment and at a fraction of the cost of installing a new local system.

There are three types of partners on the network: SLERS Partners, Interoperability Partners and Affiliate Partners. To become a partner, contact L3Harris Technologies Customer Advocate Keith Gaston at 904-860-6787 or email at Keith.Gaston@L3Harris.com.

## 2.7 State Agencies and Law Enforcement Policies

Florida has established a policy related to the public safety agencies' use of the 809/854.6375 mutual aid channel (named MA-FLA). Eligible public safety agencies are authorized to use this mutual aid channel during situations requiring interagency communications necessary toward safeguarding life or property within Florida. These policies are found at Appendix A of this Plan.

## 2.8 CASM, NIMS, SAFECOM Interoperability Continuum, SCIP, and NIFOG

The Law Enforcement Communications Plan refers to CASM, NIMS, SAFECOM, Interoperability Continuum, SCIP, NIFOG, and FIFOG.

### 2.8.1 Communications Assets Survey and Mapping (CASM)

The CASM tool is a resource to identify communications interoperability between different agencies and disciplines in Florida and its adjacent counties. The information provided in CASM is a result of local, state and federal agencies contributing their radio system information. It is managed in Florida by regional and state administrators and accepted by the Florida Domestic Security Oversight Council as "…Florida's collection repository."[1] CASM is available on the Public Safety Technical Assistance Tools web page at: https://www.dhs.gov/safecom/casm-tool

### 2.8.2 National Incident Management System (NIMS)

Florida has adopted the use of the NIMS into all facets of its operations. This includes training, exercising, mobilizing, deploying and recovery of all communications resources. Public safety personnel are expected to complete Incident Command System (ICS) and NIMS training as part of their training regimen.

[1] Domestic Security Oversight Council's June 11, 2013 meeting.

### 2.8.3 SAFECOM

SAFECOM was established in 2001 to coordinate various federal initiatives. It is under the Department of Homeland Security's Office of Emergency Communications and Office for Interoperability and Compatibility. SAFECOM "…relies heavily on local and state emergency response practitioners for input and guidance as it works to define and implement solutions for the interoperability challenge."[2]

The SAFECOM Statement of Requirements (SoR) envisions public safety communications operations as taking place in a networking environment capable of operating as a system-of-systems. Such a system-of-systems would satisfy the requirements of public safety agencies for communication systems by providing increased functionality, improved efficiency, and built-in interoperability. As envisioned, wireless devices, local networks, regional networks, and wide area networks would be able to work together to pass information back and forth seamlessly. The SoR concept is described in more detail in section 7.0, Concepts of Mobile Data Communications.

### 2.8.4 SAFECOM Interoperability Continuum

The SAFECOM Interoperability Continuum is a tool developed by the Department of Homeland Security and is designed to assist emergency response agencies and policymakers to plan and implement interoperability solutions for data and voice communications. This tool identifies five critical success elements that must be addressed to achieve an interoperability solution. The required success elements include governance, standard operating procedures (SOPs), technology, training and exercise, and usage of interoperable communications. Jurisdictions across the nation can use the Interoperability Continuum to track progress in strengthening interoperable communications. Additional information on the Interoperability Continuum is available at:

SAFECOM Interoperability Continuum Brochure

### 2.8.5 Florida's Statewide Communications Interoperability Plan (SCIP)

Florida's Statewide Communications Interoperability Plan documents the existing communications resources, plans, and information needed to efficiently implement interoperability communications solutions for state and local agencies. For additional information, contact Greg Holcomb (352) 343-9491 or email at GHolcomb@lakecountyfl.gov, or Cindy Cast (305) 596-8607 or email at cindy@miamidade.gov. Both individuals are SCIP points of contact.

### 2.8.6 National Interoperability Field Operations Guide (NIFOG)

The National Interoperability Field Operations Guide "…is a technical reference for emergency communications planning for radio technicians responsible for radios used in disaster response."[3] It is maintained by the U.S. Department of Homeland Security, Office of Emergency Communications. The latest version of the NIFOG is available at:

https://www.dhs.gov/publication/fog-documents

It provides "a pocket-sized listing of land mobile radio (LMR) frequencies that are often used in

2 See "Governance" at https://www.dhs.gov/safecom/governance.

3 National Interoperability Field Operations Guide, Introduction page.

disasters or other incidents where radio interoperability is required, and other information useful to emergency communicators."[4]

## 2.9 Communications Systems Approvals

### 2.9.1 General

Subsection 282.7101(5), Florida Statutes, requires that "A law enforcement communications system may not be established or expanded without the prior approval of the department." This requirement applies to all state and local law enforcement communications systems, regardless of funding source. All requests for approval must be submitted in writing to:

Division of Telecommunications
Bureau of Public Safety
4030 Esplanade Way, Suite 135
Tallahassee, Florida 32399-0950

### 2.9.2 Submittal Requirements

All submittals for approval must comply with the following requirements:

A. Professional Engineering: Each submittal to establish or expand services that involve engineering as defined by subsection 471.005(7), Florida Statutes, must demonstrate that such engineering has been accomplished by a registered individual or firm certified to practice engineering within Florida (pursuant to Chapter 471, Florida Statutes).

B. Exemption to Chapter 471: If the individual or firm claims exemption to Chapter 471 as specified in section 2.9.2(A), an alternative to demonstrating professional engineering may be as follows:

    a. A performance bond required from the firm/vendor and/or

    b. An acceptance test procedure to demonstrate system expectations.

    If mobile and/or portable equipment is to be purchased for use on an existing system, a statement from the requestor may be included with the submittal, attesting the expected coverage reliability already being met by that existing system.

C. Statement of Need: Provide a statement on how the proposed system and/or equipment will benefit the organization and whether the communications project will be integrated into the existing radio system. If the existing system is involved, indicate expected improvements and enhancements.

D. Complete Description: Each submittal must include a complete description of the proposed communications system compliant with section 5 and/or propose communications equipment compliant with section 6, to include:

4 National Interoperability Field Operations Guide, pg. 1.

a. Type of equipment with manufacturer's specifications sheet for mobile, portable, base station, radio frequency control station, antenna tower, dispatch console, switching matrix, etc.

b. Frequency band, number of channels, channel frequencies, and channel descriptions (type of talk-groups such as police, fire, mutual aid, etc.).

c. Location of equipment (fixed site names, and latitude and longitude).

d. System diagram (if fixed station equipment is proposed).

e. Transmitter power output, antenna height, tower height, antenna structure registration number, antenna type/directivity, and coverage reliability area(s) per section 5.2 (include 98.3 percent area reliability in the predicted coverage maps for mobile and/or portable, whichever is the design).

f. Vertical antenna profile for each fixed site.

g. Special options such as tone-coded squelch, channel scan, selective call, etc., if required.

h. Line-item budget delineating equipment quantities and unit pricing.

i. Any other information or documentation that the requesting organization deems pertinent to the project.

E. Copies of Applications for FCC Licenses: Provide copies of FCC licenses and applications with approval requests.

### 2.9.3 Approval Procedure

A. Approval

Implementation of new systems or expansion of existing communications systems require a written approval prior to a commitment to purchase. 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 approval before commencing formal or binding competitive processes such as an invitation to bid or request for proposals. Allow at least 30 workdays for DMS DivTel Bureau of Public Safety to process the approval request.

B. Additional Quantities

Procurement of additional quantities of mobile radio equipment, hand-held portable radio equipment, and associated accessories which previously received approval, do 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 is purchased within one year of the date of the original approval.

## 3.0 CONCEPTS OF LAW ENFORCEMENT COMMUNICATIONS

### 3.1 General

A law enforcement communications system must provide the means by which law enforcement resources can be accessed, mobilized, managed, and coordinated in both normal and adverse situations. A law enforcement communications system must employ sufficient communications paths and operational capabilities among all participants to facilitate the functional law enforcement communications concepts described in the remainder of this section.

### 3.2 Citizen Access

The law enforcement communications system must have the ability to receive and process any incoming requests which report emergencies and requires law enforcement assistance. The public should be able to summon help rapidly in an emergency whether for police, medical, fire rescue, or other emergency needs. Local, statewide, and national uniformity is required to fully enable this concept.

Florida's Emergency Communications E911 State Plan includes a cohesive statewide emergency telephone number 911 system, which provides citizens with this rapid direct access to public safety agencies. This plan was developed in response to the Florida Emergency Telephone Act of 1974.

### 3.3 Primary Dispatch Communications

On notification of need for law enforcement assistance, the communications system must enable prompt dispatch of law enforcement personnel within the jurisdictional boundaries of the agency. The communications system must further enable dispatchers to communicate with responding personnel while en route to the scene, at the scene, and returning to availability for further assignment.

A primary dispatch channel is used for law enforcement communications between the dispatcher and the field units (mobile or portable radio-equipped officers). Small law enforcement agencies with few radio units may need to share a dispatch channel with neighboring law enforcement agencies, while those with large quantities of radio units may need more than one dispatch channel. This kind of sharing is prudent because of limited availability of public safety frequencies. In a trunked radio system, talk groups may effectively alleviate the need for shared channels.

### 3.4 Tactical Communications

When necessary, an agency may temporarily dedicate channels for tactical communications. Every agency should establish the criteria under which a channel is so dedicated. During the tactical situation, all routine traffic on that channel should be suspended until it is restored for routine use. In a trunked system, tactical communications may have talk groups assigned which would make this procedure unnecessary. Agencies may also use the standard package of very high frequency high-bandwidth (VHF-HB), ultra-high frequency (UHF) and 700/800 MHz radios in the mobile command posts for tactical communications.

### 3.5 Police Alert Paging

As a sub-concept to the primary dispatch, some law enforcement communications systems (as determined by local procedure) may require the direct alerting of law enforcement personnel,

either individually or in groups. This direct alerting may be accomplished using either monitor or paging receivers or by means of two-way, hand-held portable radios with a selective call capability. This concept is limited to alert paging required for facilitation of immediate response and action of personnel resulting from a request for law enforcement services.

### 3.6 Interagency/Mutual aid Communications

Law enforcement emergencies often involve the response of other public safety agencies, most commonly law enforcement agencies, medical, and fire. Interagency/mutual aid communications are needed to support daily law enforcement 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. Interagency/mutual aid radio communications can be enabled through mobile relay control stations, cross-band interface devices, Voice over Internet protocols (VoIP) (like the Florida Interoperability Network) or using radio frequencies common to the different agencies. Law enforcement agencies that operate on shared-use radio systems should use a number of interoperability talk groups, which allow for seamless communication within the coverage of the radio system. Telephone lines between communications control centers or dispatch centers can be used for interagency/mutual aid communications during normal operations. However, radio communications are needed during disaster situations, such as hurricanes, tornadoes, floods, fires, etc., when telephone lines are inoperative, or when telephone central office switching facilities are jammed or disabled.

The Florida Interoperability Network (FIN) offers an alternative for interagency/mutual aid coordination. The FIN can patch disparate radio systems and allow for cross-band, interagency communications. The FIN can be referred to as an Extended Area Network (EAN). The EAN is addressed with other terms in section 7.2, SAFECOM Statement of Requirements.

### 3.7 Backup Communications

Backup communications enables an overall improvement in system reliability through redundancy or the provision of alternate means. With regard to law enforcement, the concept of backup communications is applied to base station or other fixed radio equipment to:

A. Enable primary dispatch communications to continue despite outage of the primary dispatch radio base station.

B. Enable tactical communications to continue despite outage of the tactical radio base station.

The backup communications concept includes only fixed station radio equipment and does not include any communications other than primary dispatch and tactical.

### 3.8 Telephone and other Interconnection

Telephone interconnection is required. The law enforcement communications system must provide interconnection with specialty information centers, such as the Florida Crime Information Center (FCIC) and National Crime Information Center (NCIC)[3] for criminal information. In addition, the required level of confidentiality may exceed what is typically available within land mobile radio systems. This concept includes the requirement for law enforcement personnel to exchange voice

[3] NCIC was upgraded to a new system that was made fully operational on July 11, 1999, see the National Crime Information Center website for more information at: http://www.fas.org/irp/agency/doj/fbi/is/ncic.htm on the Internet.

and/or data directly with sources located outside their law enforcement communications system and at diverse locations only accessible via the public switched telephone network, internet or private network.

## 3.9 Communications Reliability

Communications reliability is a specified minimum probability to achieve a specified minimum level of performance in communications. Law enforcement and other public safety agencies require communications reliability to be high when compared with most non-public safety services.

### 3.9.1 Communications Coverage Reliability

Communications coverage reliability is a system design goal to achieve a minimum probability for a minimum level of performance in system-level communications with mobiles and portables within the required area of operation. Besides those parameters that can be controlled by the designer, there are several environmental factors that influence the communications coverage reliability of a system. Examples of these include terrain features (such as hills), foliage (trees and shrubs), and buildings. Communications coverage reliability increases with the number of properly located base-station sites within a system. The communications coverage reliability also improves as the distance from the base-station sites decreases (inversely proportional). To achieve 100 percent reliability throughout the required area of operation would be exceedingly expensive, therefore some compromise to this parameter is allowed. The minimum requirements for communications coverage reliability in law enforcement systems are described in section 5.2 of this plan.

### 3.9.2 Point-to-Point Communications Reliability

Communications systems for law enforcement may employ one or more radio frequency (RF) control stations for point-to-point RF communication between mobile relay stations and a fixed location such as an office. Within such a system, RF control stations are held to a higher minimum level of reliability than mobiles and portables. The minimum level of reliability for RF control stations is specified in section 5.3 of this plan.

## 3.10 Interference between Systems

### 3.10.1 Harmful Interference

Harmful interference is the prevention or interruption of the desired communications within a land mobile radio communications system by undesired signals from another system. In law enforcement communication systems, this level of interference can result in life-threatening and/or delays in responses to calls for assistance. Two types of harmful interferences are defined as follows:

A. Co-Channel Interference

For the purposes of engineering analysis in frequencies below 470 MHz, harmful interference is defined as an undesired received signal having greater than 5 percent probability of exceeding a power level of 12 dB (6 dB in base-to-base situations) less than a desired analog signal power level, when the desired analog signal has a 95 percent probability of achieving a power level required to produce either 20 dB quieting, 17 dB SINAD or digital 5 percent bit error rate (BER).

Channel allocation principles and interference criteria in the 470 MHz, 700 MHz, and 806 MHz frequency bands are governed by FCC rules and other Florida-specific plans such as:

- 806 MHz channels
- 700 MHz Interoperable Use channels
- 700 MHz Radio Communications Plan

B. Adjacent-Channel Interference

Adjacent channel interference is defined as harmful when a desired signal (at 95 percent probability) is degraded by an undesired adjacent channel signal (at 5 percent probability) 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 Plans and Florida's 700 MHz Public Safety Interoperability Channel Plan.

### 3.10.2 Nuisance Interference

Nuisance interference is the reception of signals from another system that does not cause harmful interference but is annoying to the users of the system receiving it. This level of interference can be eliminated by utilizing a continuous tone-coded squelch system (CTCSS) or digital coded squelch system (DCS), which are available in most new equipment today.

## 4.0 FREQUENCY PLAN

### 4.1 Law Enforcement Radio Frequencies

Frequencies available to law enforcement agencies are described with associated special assignment limitations in FCC rules sections 90.20(c) and 90.20(d). Some frequencies are shared with public safety agencies other than law enforcement.

VHF-HB frequency pairs have been established and are included in Table 4-1. For frequencies above 470 MHz, channel allocation principles are governed by FCC rules. As frequencies are vacated, they should be reassigned to conform to the lists of statewide channels as shown in Table 4-1. In this table, the base station transmit frequency is shown first, followed by the mobile transmit frequency. This convention only takes effect when filing for a licensed VHF-HB channel pair.

There are no frequencies in the 700/800 MHz frequency band specifically allocated to law enforcement, but all law enforcement may license 700/800 MHz frequencies allocated for public safety eligible(s).

**TABLE 4-1** — STATEWIDE VHF-HB LAW ENFORCEMENT FREQUENCY PAIRS

| Frequency Pair Base[6]/Mobile[7] (MHz) | Frequency Pair Base/Mobile (MHz) | Frequency Pair Base/Mobile (MHz) | Frequency Pair Base/Mobile (MHz) | Frequency Pair Base/Mobile (MHz) | Frequency Pair Base/Mobile (MHz) |
|---|---|---|---|---|---|
| 154.6500/155.1900 | 154.7625/155.4375 | 154.8300/155.5650 | 154.8975/155.6325 | 155.7000/158.9700 | 155.9175/156.2175 |
| 154.6575/155.1975 | 154.7700/155.4900 | 154.8375/155.5725 | 155.0100/155.6550 | 155.7075/158.9775 | 158.7300/159.0300 |
| 154.7100/155.2500 | 154.7775/155.4975 | 154.8450/155.5800 | 155.0175/155.6625 | 155.7300/156.0300 | 158.7375/159.0375 |
| 154.7175/155.2575 | 154.7850/155.5200 | 154.8525/155.5875 | 155.0700/155.6700 | 155.7375/156.0375 | 158.7900/159.0900 |
| 154.7250/155.3100 | 154.7925/155.5275 | 154.8600/155.5950 | 155.0775/155.6775 | 155.7900/156.0900 | 158.7975/159.0975 |
| 154.7325/155.3175 | 154.8000/155.5350 | 154.8675/155.6025 | 155.1300/155.6850 | 155.7975/156.0975 | 158.8500/159.1500 |
| 154.7400/155.4150 | 154.8075/155.5425 | 154.8750/155.6100 | 155.1375/155.6925 | 155.8500/156.1500 | 158.8575/159.1575 |
| 154.7475/155.4225 | 154.8150/155.5500 | 154.8825/155.6175 | 155.6400/155.9700 | 155.8575/156.1575 | 158.9100/159.2100 |
| 154.7550/155.4300 | 154.8225/155.5575 | 154.8900/155.6250 | 155.6475/155.9775 | 155.9100/156.2100 | 158.9175/159.2175 |

### 4.2 Interagency/Mutual aid Channels

Radio channels for interagency and mutual aid operations may be used only within the provisions of FCC Rules and Regulations, 47 CFR, Part 90, " Operating Requirements." A portion of those rules are applicable to law enforcement organizations. Contingent on eligibility or licensee concurrence, specific wide-area and statewide channels may be used for interagency/mutual aid. These channels are listed in Table 4-2. As frequencies are vacated, they should be reassigned to conform to the list of statewide channels as shown in Table 4-2. In this table, the base transmit frequency is shown first, followed by the base receive frequency. The use of these or any other frequencies for interagency/mutual aid use for which the user is not directly eligible must be in accordance with the applicable FCC rules.

[6] Base transmit frequency.
[7] Mobile/Portable transmit frequency.

**TABLE 4-2** — WIDE-AREA AND STATEWIDE INTERAGENCY/MUTUAL AID FREQUENCIES

| FREQUENCY Base TX/RX (MHz) | ANS Standard [8] Name | CTCSS-Hz/NAC | RADIO SERVICE | PRIMARY USE | AREA |
|---|---|---|---|---|---|
| 154.950/154.950 | n/a | None | PW | Law Enforcement Emergency | Wide-Area |
| 460.275/465.275 | n/a | None | PW | Law Enforcement Emergency | Wide-Area |
| 155.370/155.370 | n/a | None | PW | Law Enforcement Intercity | Statewide |
| 154.265/154.265 | VFIRE22 | None | PW | Fire Mutual aid "Red" (Mobile/Portable Only) | Statewide |
| 154.280/154.280 | VFIRE21 | None | PW | Fire Mutual aid "White" (Base and Mobile) | Statewide |
| 154.295/154.295 | VFIRE23 | None | PW | Fire Mutual aid "Blue" (Mobile/Portable Only) | Statewide |
| 155.340/155.340 | VMED28 | None | PW | Air Secondary-EMS Air Transport | Statewide |
| 463.175/468.175 | MED-8 | 167.9 | PW | Statewide Medical Coordination-MED-8 | Statewide |
| 463.1875/468.1875 | MED-82 | Various | PW | ESF8 Medical Coordination – MED-82 | Statewide |
| 769.24375/799.24375 | 7CALL50 | NAC $293 | SG/SY | National Public Safety Interoperability Calling channel[9] | Nationwide |
| 769.74375/799.74375 | 7TAC55 | NAC $293 | SG/SY | National Public Safety Interoperability Tactical channel | Nationwide |
| 770.24375/800.24375 | 7TAC56 | NAC $293 | SG/SY | National Public Safety Interoperability Tactical channel | Nationwide |
| 770.99375/800.99375 | 7GTAC57 | NAC $293 | SG/SY | National Public Safety Interoperability Tactical channel | Nationwide |
| 773.25625/803.25625 | 7CALL70 | NAC $293 | SG/SY | National Public Safety Interoperability Calling channel | Nationwide |
| 773.75625/803.75625 | 7TAC75 | NAC $293 | SG/SY | National Public Safety Interoperability Tactical channel | Nationwide |
| 774.25625/804.25625 | 7TAC76 | NAC $293 | SG/SY | National Public Safety Interoperability Tactical channel | Nationwide |
| 774.85625/804.85625 | 7GTAC77 | NAC $293 | SG/SY | National Public Safety Interoperability Tactical channel | Nationwide |
| 854.6375/809.6375 | n/a | 210.7 | GE | Public Safety Mutual aid FCC channel 256[10] | Statewide |
| 851.0125/806.0125 | 8CALL90 | 156.7 | GE | National Public Safety Mutual Aid Calling FCC channel 01[11] | Nationwide |
| 851.5125/806.5125 | 8TAC91 | 156.7 | GE | National Public Safety Mutual Aid Tactical #1 FCC channel 39 | Nationwide |

[8] APCO/NPSTC ANS 1.104.1-2010 naming standard.
[9] See section 2.5.
[10] See Section 4.2.3.
[11] See Section 4.2.3.

| FREQUENCY Base TX/RX (MHz) | ANS Standard [8] Name | CTCSS-Hz/NAC | RADIO SERVICE | PRIMARY USE | AREA |
|---|---|---|---|---|---|
| 852.0125/807.0125 | 8TAC92 | 156.7 | GE | National Public Safety Mutual Aid Tactical #2 FCC channel 77 | Nationwide |
| 852.5125/807.5125 | 8TAC93 | 156.7 | GE | National Public Safety Mutual Aid Tactical # 3 FCC channel 115 | Nationwide |
| 853.0125/808.0125 | 8TAC94 | 156.7 | GE | National Public Safety Mutual Aid Tactical # 4 FCC channel 153 | Nationwide |

### 4.2.1 Law Enforcement Emergency Communications

The Law Enforcement Emergency channel (154.950 or 460.275/465.275 MHz) is assigned for base station and mobile radio use during emergency situations when an officer is out of his or her prime area and unable to access the local dispatch center. This channel may also be used during isolated critical situations, which prolonged use of the primary dispatch communications channel/talkgroup would not be feasible due to other primary dispatch communications traffic. In addition, the Law Enforcement Emergency channel provides a common emergency channel for base/mobile and mobile/mobile communications among agencies in a region or in an adjacent region to include the following situations:

A. Multi-agency involvement in an emergency situation (such as riots, civil unrest, hot pursuits, etc., for coordination, command and control via a single dispatch center)

B. Individual agency involved in loss of the primary dispatch channel

C. Limited portable radio use for surveillance and stakeout operations, which does not cause interference with other agencies

D. Tactical communications in the event secondary use of a channel compromises its primary function for an extended duration

### 4.2.2 Law Enforcement Intercity (Point-to-Point) Communications

The primary purpose of the Law Enforcement Intercity channel (155.370 MHz) is to provide a point-to-point communications channel between law enforcement dispatch centers. Telephone lines between communications control centers can be used for resource coordination during normal operations. However, radio communications are needed during situations such as hurricanes, tornadoes, floods, fires, etc., when telephone lines are inoperative, or when telephone central office switching facilities are jammed or disabled.

Primary mobile and portable radio operation on this channel is restricted to those units that routinely travel beyond agency boundaries such as law enforcement executive vehicles and prisoner transfer vehicles. However, during times of natural or man-made disasters, and during non-routine travel, secondary mobile and portable radio operation for mutual aid communications is allowable from any law enforcement unit.

The secondary purpose of this channel is to be used when the Law Enforcement Emergency channel is not available.

### 4.2.3 700/800 MHz Mutual aid Communications

Mutual aid communications in the 700/800 MHz frequency band serves a purpose similar to law enforcement emergency communications as described in section 4.2.1; however, these frequencies are available to all public safety agencies. The use of these frequencies is set forth by plans other than this plan.

The state agencies and local law enforcement policies in Appendix A provide the requirements for the public safety mutual aid channel referred as MA-FLA (854.6375/809.6375 MHz)

A. Section 6.2 of the Florida - Region 9, 800 MHz Plan for public safety radio communications describes the implementation requirements for the five national mutual aid channels including 8CALL90, 8TAC91, 8TAC92, 8TAC93 and 8TAC94 channels.

B. Florida's 700 MHz Interoperability Channel Plan describes the minimum channel set and other implementation requirements for 700 MHz interoperability channels.

## 5.0 SYSTEM REQUIREMENTS

### 5.1 General

The principal requirements defined in the following sections are the requirements by which approval is determined for implementation of new 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 (Equipment Requirements) section 6.

These system requirements refer to specific law enforcement communications system concepts which are explained in section 3.

Two options for public safety radio standards are included in this plan.

1. Option-A is for public safety personnel who operate in a fully public, expansive environment while responding to imminent threat(s) to life and/or protection of property situations. Option-A radios must meet or exceed the minimum performance standards in section 6.1 based on enhanced TIA/EIA-603D standards (Class A) and Military Standards 810E, 810F or 810G.

2. Option-B is for public safety personnel who operate in a contained environment, such as a correctional institution. These personnel respond to imminent threat to life and/or protection of property, are augmented by close proximity to other officers, and rely on a secondary means of communications. Option-B radios must meet or exceed the minimum performance standards in section 6.1 based on enhanced TIA/EIA-603D standards (Class A).

   Additionally, at the option of agencies, military standards in section 6.1.2 may be selected to match the environment in which the radio will be used. For example, an agency which operates in an outside environment may consider blowing rain (Procedure I) standards and/or may consider vibration/shock standard (Procedure I).

   The radios can either be analog or digital (Project 25), conventional or trunked that is type-accepted for narrowband operational bandwidths (700/800 MHz digital/Project 25 radios, and 470 MHz or below) and wideband and/or narrowband for 700/800 MHz analog radios.

System configurations not explicitly included in this plan will be approved on a case-by-case basis by the department. System requirements are subject to change by DivTel. Be certain to review all applicable system requirements prior to submitting a request for approval.

### 5.2 Communications Coverage Reliability for Mobiles and Portables

Reliable communications for the primary law enforcement (Option-A) is defined as having been engineered for a 95 percent probability of communications at the defined coverage contour. The defined contour of reliable radio coverage must normally be the boundary of the agency's legal jurisdiction. This 95 percent contour probability equates to a 98.3 percent probability of communication within the agency's area of operation. This probability is based on a received analog signal level of either 20 dB quieting or 17 dB SINAD, or a received digital signal at 5 percent bit error rate (BER) for the worst case of either talk-out (base to mobile) or talk-back

(mobile to base). This minimum requirement provides for reliable probability of communications at 95 percent of locations, 95 percent of the time.

Stations serving only as a backup to the primary station may have a lesser coverage area. Option-B radio systems, communications coverage reliability for mobiles and portables is 90 percent contour probability. This provides for reliable probability of communications at 90 percent of locations, 90 percent of the time.

## 5.3 Point-to-Point Communications Reliability for Radio Frequency Control Stations

Communications reliability for radio frequency (RF) control stations (Option A) must be engineered for 99 percent probability of wireless communications point-to-point. This probability is based on a received analog signal level of either 20 dB quieting or 17 dB SINAD, or a received digital signal at 5 percent BER for the worst case of either talk-out (Base to RF control station) or talk-back (RF control station to base). Reliable point-to-point communications for RF control stations (Option-B) are engineered for 95 percent probability of communications within the agency's area of operation.

## 5.4 Primary Dispatch Communications

The primary law enforcement dispatch communications for vehicular mobile or portable radio systems (Option-A) must be designed to meet the minimum communications coverage requirements as defined in section 3.9.

Every primary law enforcement dispatch center must be configured to enable continuous reception of local mobile transmissions on each primary dispatch channel or talk group. The mutual aid communications system may be used to provide backup communications for the duration of unexpected events such as outage or excessive traffic.

A separate dedicated electronic screen is highly recommended with dispatch specifically for 911 call-taker functions.

## 5.5 Mutual Aid Communications

### 5.5.1 Dispatch Center

Each law enforcement dispatch center must have the capability for mutual aid communications on the Intercity channel (155.370 MHz), and an Emergency channel (45.86 MHz; 154.950 MHz, or 460.275/465.275 MHz). Alternatives for the Emergency channel are 854.6375/809.6375 MHz (MA-FLA) channel, or Region 9 Calling channel (8CALL90) and Tactical channels (8TAC91, 8TAC92, 8TAC93 or 8TAC94) as appropriate for the frequency band of operation in the associated area. The mutual aid channel(s) must be established within the county such that applicable base-to-base, base-to-mobile, and mobile-to-mobile communications are achieved. Mutual aid channels that may be established within Florida are included in Table 4-2. Leased wireline control of primary base or repeater station equipment is recommended to be backed up at every dispatch center by means of a locally controlled law enforcement emergency channel.

### 5.5.2 Mobile and Portable Equipment

A. VHF-High Bandwidth

Wide-Area Emergency Communications (E-Channel)

All new VHF-HB law enforcement mobile and portable radios must be configured with the frequency 154.950 MHz transmit and receive with no continuous tone-coded squelch system (CTCSS) or digital-coded squelch (DCS). This frequency (L.E. Emergency – VHF) is designated as the E-channel and is used in areas of Florida for law enforcement emergency communications.

Statewide Intercity Communications

All new VHF-HB mobile and portable radios in law enforcement units must be configured with the frequency 155.370 MHz transmit and receive with no CTCSS or DCS. This frequency is designated as the L.E. Intercity used throughout Florida for law enforcement intercity communications.

B. UHF Band

Wide-Area Emergency Communications (E-channel)

All new UHF law enforcement mobile and portable radios must be configured with frequencies 465.275 MHz transmit and 460.275 MHz receive with no CTCSS or DCS. This frequency pair is designated as the E-channel and is used in areas of Florida for law enforcement emergency communications.

A talk-around channel (simplex) must be incorporated into all UHF non-duplex mobile and portable radios. This simplex channel (operating as 460.275 MHz transmit and receive, with no CTCSS or DCS) will provide intra- and inter-agency tactical communications at a local incident scene.

C. 800 MHz Frequency Band

All new law enforcement mobile and portable radio equipment operating in the 800 MHz frequency band must be equipped with the national public safety Calling channel operating in duplex mode and the four National Public Safety (NPSPAC) Tactical channels for both duplex and talk-around operation. Refer to the Florida - Region 9 800 MHz Plan (section 2.3 of this plan) for operating requirements on these five 800 MHz channels.

At the option of the agency, the radio equipment may be equipped with the Florida public safety mutual aid channel 854.6375 MHz (MA-FLA) for duplex and talk-around operation. Refer to the State Agencies and Local Law Enforcement Policies (Appendix A of this plan) for complete licensing and operating requirements on this channel.

D. 700 MHz Frequency Band

All new law enforcement mobile and portable radio equipment operating in the 700 MHz frequency band must be equipped with the two National Public Safety (NPSPAC) Calling channels operating in the duplex mode and minimally the six national public

safety (NPSPAC) Tactical channels for both duplex and talk-around operation. Refer to Florida's 700 MHz Public Safety Interoperability Channel Plan (section 2.5 of this plan) for operating requirements on these eight 700 MHz interoperability channels.

### 5.5.3 Mutual Aid Repeater Default Mode

All mutual aid repeater radios must default to repeat disable mode upon power-up. Should an agency use the mutual aid repeater for an operation, the repeater must be disabled after the operation. The agency must also call the repeater's Network Control Center (NCC) and advise them that the repeater is in the disabled mode.

### 5.5.4 Mutual Aid Repeater Program Settings

A. Inactivity Timer

All mutual aid repeaters must automatically reset to non-repeat mode if not used for three hours after the last push-to-talk (PTT).

B. Hang Time

All mutual aid repeaters must be standardized to a two-second hang time after the mobile or portable radio input signal is removed.

## 6.0 EQUIPMENT REQUIREMENTS

### 6.1 Minimum Performance Standards

The minimum performance standards defined in the following sections are the standards by which the Department approval is determined for individual equipment items for use within law enforcement communications systems. These minimum performance standards apply to analog or digital (Project 25), conventional or trunked that is type-accepted for narrowband operational bandwidths (700/800 MHz digital/Project 25 radios, and 470 MHz or below), and wideband and/or narrowband for 700/800 MHz analog radios.

These standards have been developed by the department through research, engineering modeling, and analysis of communications equipment parameters, which 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 law enforcement 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 Florida.

As previously discussed in section 5.1 of this plan, two options for public safety standards are contained within this plan: (1) Option-A,[12] which meets or exceeds the Telecommunications Industry Association (TIA)/ Electronics Industries Association (EIA)-603D (enhanced Class A), and meets Military Standards 810E, 810F or 810G, and (2) Option-B,[13] which meets or exceeds TIA/EIA-603D standards (enhanced Class A).

#### 6.1.1 TIA/EIA Standards

Radio equipment (Option-A and Option-B) must meet or exceed the following standards and test procedures of the current issue on the date of this revision. This plan takes precedence over inconsistencies between the specifications in this plan and any other specifications and publication standards such as in TIA/EIA-603D and TIA-102. The TIA/EIA Standards include:

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

B. TIA-102 – P25 System and Standards

Equipment not explicitly included in the following sections will be approved on a case-by-case basis by DivTel.

#### 6.1.2 Military Standards (MIL- STD-810)

The transmitter/receiver unit for Option-A mobile, portable, and vehicular repeater radio equipment must meet or exceed MIL-STD-810E, 810F or 810G utilizing the following

[12] Also known as Category 1
[13] Also known as Category 2

test methods and procedures:

| E | F | G | |
|---|---|---|---|
| 506.3 | 506.4 | 506.5 | Rain, Procedure I (blowing rain) |
| 509.3 | 509.4 | 509.5 | Salt Fog, Procedure I (aggravated screening) |
| 510.3 | 510.4 | 510.5 | Sand and Dust, Procedure I (blowing dust) |
| 514.4 | 514.5 | 514.6 | Vibration, Procedure I, Category1 (3 axes) or Category 4 (truck/trailer) |
| 516.4 | 516.5 | 516.6 | Shock, Procedure I (functional) |
| 507.3 | 507.4 | 507.5 | Humidity, Procedure I (Induced/Natural) |
| 501.3 | 501.4 | 501.5 | High Temperature, Procedure II (Operation) |

### 6.1.3 Project 25 Radio ID Numbering

Each subscriber radio (mobile, portable, or control station) operating on a Project 25 (P25) trunked radio system shall be assigned and utilize an individual identification number (commonly called Logical ID or Unit ID) per Florida's Statewide P25 Radio Identification (ID) Plan approved by the State Working Group, Executive Committee on September 24, 2015.

For more information on the P25 ID Plan, contact your regional domestic security task force representative for communications. The list of contacts is found at:

https://www.dms.myflorida.com/business_operations/telecommunications/radio_communications_services/florida_interoperability_network_fin/regional_domestic_security_task_force_communications

## 6.2 Base/Repeater Stations – Analog

**MINIMUM PERFORMANCE STANDARDS**
**Analog Base/Repeater Station Equipment**

### 6.2.1 TRANSMITTER PARAMETERS

| **Type** | ***Analog Base Station Repeater Radios (Transmitter)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 25 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **FM Hum and Noise** | 45dB | 34dB | 45dB | 34dB | 45dB | 45dB |
| **Power Output (Watts)** [14] | 60W | 60W | 50W | 50W | 75W | 75W |
| **Continuous Duty Cycle** | Yes | Yes | Yes | Yes | Yes | Yes |

### 6.2.2 RECEIVER PARAMETERS

| **Type** | ***Analog Base Station Repeater Radios (Receiver)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 25 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Sensitivity, 12 dB SINAD (µV)** | 0.35uV | 0.35uV | 0.35uV | 0.35uV | 0.35uV | 0.35uV |
| **Adjacent Channel Rejection Ratio** | 80dB | 45dB | 70dB | 45dB | 75dB | 75dB |
| **Spurious Response Rejection Ratio** | 100dB | 75dB | 100dB | 75dB | 90dB | 75dB |
| **Intermodulation Rejection Ratio** | 75dB | 75dB | 75dB | 75dB | 75dB | 75dB |

[14] Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC rules

## 6.3 Mobile Radios – Analog

All RF frequencies and CTCSS tones must be generated electronically (synthesized).

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

### **6.3.1** TRANSMITTER PARAMETERS

| **Type** | ***Analog Mobile Radios (Transmitter)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 25 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 18 | 18 |
| **Power Output (Watts)**[15] | 50W | 50W | 50W | 50W | 35W | 35W |
| **FM Hum and Noise** | 44dB | 34dB | 39dB | 34dB | 40dB | 35dB |

### **6.3.2** RECEIVER PARAMETERS

| **Type** | ***Analog Mobile Radios (Receiver)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 25 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 18 | 18 |
| **Sensitivity, 12 dB SINAD (µV)** | 0.35uV | 0.35uV | 0.35uV | 0.35uV | 0.25uV | 0.25uV |
| **Adjacent Channel Rejection Ratio** | 63dB | 45dB | 65dB | 45dB | 75dB | 75dB |
| **Intermodulation Rejection Ratio** | 75dB | 75dB | 75dB | 75dB | 75dB | 75dB |
| **Spurious Response Rejection Ratio** | 75dB | 75dB | 75dB | 75dB | 75dB | 75dB |
| **Audio Power Per Speaker** | 10 W | 10 W | 10 W | 10 W | 10 W | 10 W |
| **Audio Distortion at Full Power** | 5% | 10% | 5% | 10% | 5% | 10% |

[15] - Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC rules

## 6.4 Portable Radios – Analog

All RF frequencies and CTCSS tones must be generated electronically (synthesized). Portable radios must be equipped with a battery of sufficient capacity to provide a 5 percent transmit, 5 percent receive, and 90 percent standby (5/5/90) duty cycle for at least an eight-hour period.

**MINIMUM PERFORMANCE STANDARDS**
**Analog Portable Radio Equipment**

### **6.4.1** TRANSMITTER PARAMETERS

| **Type** | ***Analog Portable Radios (Transmitter)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 25 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 18 | 18 |
| **Power Output (Watts)**[16] | 4 W | 4 W | 4 W | 4 W | 3 W | 3 W |
| **FM Hum and Noise** | 34dB | 33dB | 38dB | 34dB | 40dB | 35dB |

### 6.4.2 RECEIVER PARAMETERS

| **Type** | ***Analog Portable Radios (Receiver)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 25 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 18 | 18 |
| **Sensitivity, 12 dB SINAD (µV)** | 0.35uV | 0.35uV | 0.35uV | 0.35uV | 0.35uV | 0.35uV |
| **Adjacent Channel Rejection Ratio** | 63dB | 45dB | 60dB | 45dB | 70dB | 70dB |
| **Intermodulation Rejection Ratio** | 70dB | 70dB | 70dB | 70dB | 70dB | 70dB |
| **Spurious Response Rejection Ratio** | 70dB | 70dB | 70dB | 70dB | 70dB | 70dB |
| **Audio Power Per Speaker** | 0.5 W | 0.5 W | 0.5W | 0.5 W | 0.5 W | 0.5 W |
| **Audio Distortion at Full Power** | 5% | 10% | 5% | 10% | 5% | 10% |

16 Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC rules.

## 6.5 Base/Repeater Stations – P25 Digital

All RF frequencies and DCS codes must be generated electronically (synthesized). The transmitter/receiver base repeater station unit must comply with Project 25 digital minimum performance standards.

**MINIMUM PERFORMANCE STANDARDS**
**P25 Digital Base/Repeater Station Equipment**

### **6.5.1** TRANSMITTER PARAMETERS

| **Type** | ***P25 Digital Base Station Repeater Radios (Transmitter)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **700/800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 12.5 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **FM Hum and Noise** | 40dB | 40dB | 40dB | 38dB | 49dB | 45dB |
| **Power Output (Watts)**[17] | 100 W | 100 W | 100 W | 100 W | 100 W | 100 W |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 24/18 | 24/18 |
| **Continuous Duty Cycle** | Yes | Yes | Yes | Yes | Yes | Yes |

### **6.5.2** RECEIVER PARAMETERS

| **Type** | ***P25 Digital Base Station Repeater Radios (Receiver)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **700/800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 12.5 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Digital Sensitivity, 5% (BER)** | 0.35uV | 0.35uV | 0.35uV | 0.35uV | 0.28uV | 0.28uV |
| **Adjacent Channel Rejection Ratio** | 60dB | 60dB | 60dB | 60dB | 60dB | 60dB |
| **Spurious Response Rejection Ratio** | 90dB | 80dB | 80dB | 80dB | 90dB | 85dB |
| **Intermodulation Rejection Ratio** | 80dB | 80dB | 80dB | 80dB | 77/80dB | 77/80dB |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 24/18 | 24/18 |

[17] Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC rules.

## 6.6 Mobile Radios – P25 Digital

All RF frequencies and DCS codes must be generated electronically (synthesized). The transmitter/receiver mobile unit must comply with Project 25, digital performance standards.

**MINIMUM PERFORMANCE STANDARDS**
**P25 Digital Mobile Radio Equipment**

### 6.6.1 TRANSMITTER PARAMETERS

| **Type** | ***P25 Digital Mobile Radios (Transmitter)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **700/800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 12.5 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 24/18 | 24/18 |
| **Power Output (Watts)**[18] | 40 W | 40 W | 40 W | 40 W | 30/35 W | 19/34 W |
| **FM Hum and Noise** | 39dB | 34dB | 39dB | 34dB | 34dB | 33dB |

### 6.6.2 RECEIVER PARAMETERS

| **Type** | ***P25 Digital Mobile Radios (Receiver)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **700/800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 12.5 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 24/18 | 24/18 |
| **Digital Sensitivity, 5% (BER)** | 0.30uV | 0.30uV | 0.35uV | 0.35uV | 0.35uV | 0.35uV |
| **Adjacent Channel Rejection Ratio** | 60dB | 60dB | 60dB | 60dB | 60dB | 60dB |
| **Intermodulation Rejection Ratio** | 75dB | 75dB | 75dB | 75dB | 75dB | 75dB |
| **Spurious Response Rejection Ratio** | 80dB | 75dB | 80dB | 75dB | 75dB | 75dB |
| **Audio Power Per Speaker** | 10 W | 10 W | 10 W | 10 W | 10 W | 10 W |
| **Audio Distortion at Full Power** | 3% | 3% | 3% | 3% | 3% | 3% |

[18] Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC rules.

## 6.7 Multi-Band Mobile Radios – P25 Digital

All RF frequencies and DCS codes must be generated electronically (synthesized). The transmitter/receiver mobile unit must comply with Project 25, digital performance standards.

**MINIMUM PERFORMANCE STANDARDS**
**P25 Digital Mobile Radio Equipment**

### **6.7.1** TRANSMITTER PARAMETERS

| **Type** | ***P25 Digital Multi-Band Mobile Radios (Transmitter)*** | | |
|---|---|---|---|
| **Frequency Band** | **VHF High Band** | **UHF** | **700/800 MHz** |
| **Channel Spacing** | 12.5 kHz | 12.5 kHz | 12.5 kHz |
| **Information Source** | **Option A** | **Option A** | **Option A** |
| **Number of Channels** | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 20 | 24/18 |
| **Power Output (Watts)**[19] | 50 W | 50 W | 35 W |
| **FM Hum and Noise** | 34dB | 34dB | 34dB |

### **6.7.2** RECEIVER PARAMETERS

| **Type** | ***P25 Digital Multi-Band Mobile Radios (Receiver)*** | | |
|---|---|---|---|
| **Frequency Band** | **VHF High Band** | **UHF** | **700/800 MHz** |
| **Channel Spacing** | 12.5 kHz | 12.5 kHz | 12.5 kHz |
| **Information Source** | **Option A** | **Option A** | **Option A** |
| **Number of Channels** | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 20 | 24/18 |
| **Digital Sensitivity, 5% (BER)** | 0.30 uV | 0.30 uV | 0.25 uV |
| **Adjacent Channel Rejection Ratio** | 60dB | 60dB | 60dB |
| **Intermodulation Rejection Ratio** | 80dB | 80dB | 80dB |
| **Spurious Response Rejection Ratio** | 80dB | 80dB | 80dB |
| **Audio Power Per Speaker** | 12 W | 12 W | 12W |
| **Audio Distortion at Full Power** | 3% | 3% | 3% |

[19] Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC rules.

## 6.8 Single-Band Portable Radios – P25 Digital

All RF frequencies and DCS codes must be generated electronically (synthesized). The transmitter/receiver portable unit must comply with Project 25, digital performance standards. The portable radio must be equipped with a battery of sufficient capacity to provide a 5 percent transmit, 5 percent receive, and 90 percent standby (5/5/90) duty cycle for at least an eight-hour period.

**MINIMUM PERFORMANCE STANDARDS**
**P25 Digital Single-Band Portable Radio Equipment**

### 6.8.2 TRANSMITTER PARAMETERS

| **Type** | ***P25 Digital Single-Band Portable Radios (Transmitter)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **700/800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 12.5 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 24/18 | 24/18 |
| **Power Output, (watts)[20]** | 4 W | 4 W | 4 W | 4 W | 3 W | 3 W |
| **FM Hum and Noise** | 39dB | 37dB | 39dB | 37dB | 35dB | 34dB |

### 6.8.3 RECEIVER PARAMETERS

| **Type** | ***P25 Digital Single-Band Portable Radios (Receiver)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **700/800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 12.5 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 24/18 | 24/18 |
| **Digital Sensitivity, 5% (BER)** | 0.25uV | 0.25uV | 0.32uV | 0.32uV | 0.25uV | 0.25uV |
| **Adjacent Channel Rejection Ratio** | 60dB | 60dB | 60dB | 60dB | 60dB | 60dB |
| **Intermodulation Rejection Ratio** | 73dB | 73dB | 70dB | 70dB | 72dB | 72dB |
| **Spurious Response Rejection Ratio** | 70dB | 70dB | 70dB | 70dB | 72dB | 70dB |
| **Audio Power Per Speaker** | 0.5 W | 0.5 W | 0.5 W | 0.5 W | 0.5 W | 0.5 W |
| **Audio Distortion at Full Power** | 3% | 3% | 3% | 3% | 3% | 3% |

[20] Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC Rules.

## 6.9 Multi-Band Portable Radios – P25 Digital

All RF frequencies and DCS codes must be generated electronically (synthesized). The transmitter/receiver portable unit must comply with Project 25, digital performance standards, and must meet or exceed the following minimum performance standards. The portable radio must be equipped with a battery of sufficient capacity to provide a 5 percent transmit, 5 percent receive, and 90 percent standby (5/5/90) duty cycle for at least an eight-hour period.

### 6.9.2 TRANSMITTER PARAMETERS

| **Type** | ***P25 Digital Multi-Band Portable Radios (Transmitter)*** | | |
|---|---|---|---|
| **Frequency Band** | **VHF High Band** | **UHF** | **700/800 MHz** |
| **Channel Spacing** | 12.5 kHz | 12.5 kHz | 12.5 kHz |
| **Information Source** | **Option A** | **Option A** | **Option A** |
| **Number of Channels** | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 20 | 24/18 |
| **Power Output (Watts)**[21] | 5 W | 5 W | 3 W |
| **FM Hum and Noise** | 47dB | 47dB | 48dB |

### 6.9.3 RECEIVER PARAMETERS

| **Type** | ***P25 Digital Multi-Band Portable Radios (Receiver)*** | | |
|---|---|---|---|
| **Frequency Band** | **VHF High Band** | **UHF** | **700/800 MHz** |
| **Channel Spacing** | 12.5 kHz | 12.5 kHz | 12.5 kHz |
| **Information Source** | **Option A** | **Option A** | **Option A** |
| **Number of Channels** | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 20 | 24/18 |
| **Digital Sensitivity, 5% (BER)** | 0.23 uV | 0.21 uV | 0.25 uV |
| **Adjacent Channel Rejection Ratio** | 65dB | 65dB | 65dB |
| **Intermodulation Rejection Ratio** | 72dB | 73dB | 74dB |
| **Spurious Response Rejection Ratio** | 70dB | 75dB | 70dB |
| **Audio Power Per Speaker** | 0.5 W | 0.5 W | 0.5 W |
| **Audio Distortion at Full Power** | 3% | 3% | 3% |

[21] Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC rules.

## 6.10 Radio Frequency Control Stations – P25 Digital

All RF frequencies and DCS codes must be generated electronically (synthesized). The transmitter/receiver control station unit must comply with Project 25, digital standards, and must meet or exceed the following minimum performance standards.

### **6.10.1** TRANSMITTER PARAMETERS

| **Type** | ***P25 Digital Radio Frequency Control Stations (Transmitter)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **700/800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 12.5 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 24/18 | 24/18 |
| **Power Output (Watts)**[22] | 40 W | 40 W | 40 W | 40 W | 19/30 W | 19/30 W |
| **FM Hum and Noise** | 39dB | 34dB | 39dB | 35dB | 34dB | 34dB |
| **Duty Cycle** | 20-80 | 20-80 | 20-80 | 20-80 | 20-80 | 20-80 |

### **6.10.2** RECEIVER PARAMETERS

| **Type** | ***P25 Digital Radio Frequency Control Stations (Receiver)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **700/800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 12.5 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 24/18 | 24/18 |
| **Digital Sensitivity, 5% (BER)** | 0.30uV | 0.30uV | 0.35uV | 0.35uV | 0.35uV | 0.35uV |
| **Adjacent Channel Rejection Ratio** | 60dB | 60dB | 60dB | 60dB | 60dB | 60dB |
| **Intermodulation Rejection Ratio** | 75dB | 75dB | 75dB | 75dB | 75dB | 75dB |
| **Spurious Response Rejection Ratio** | 80dB | 75dB | 80dB | 75dB | 75dB | 75dB |
| **Audio Power Per Speaker** | 5 W | 5 W | 5 W | 5 W | 5 W | 5 W |
| **Audio Distortion at Full Power** | 5 % | 5 % | 5 % | 5 % | 5 % | 5 % |

[22] Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC rules.

## 6.11 Vehicular Repeaters – P25 Digital

All RF frequencies and DCS codes must be generated electronically (synthesized). The transmitter/receiver vehicular repeater unit must comply with Project 25, digital performance standards, and must meet or exceed the following minimum performance standards.

### **6.11.1** TRANSMITTER PARAMETERS

| **Type** | ***P25 Digital Vehicular Repeater (Transmitter)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **700/800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 12.5 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | As Needed | As Needed | As Needed | As Needed | As Needed | As Needed |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 24/18 | 24/18 |
| **Power Output (milliwatts)**[23] | 100 mW | 100 mW | 100 mW | 100 mW | 250 mW | 250 mW |
| **FM Hum and Noise (analog)** | 37dB | 37dB | 37dB | 37dB | 33dB | 33dB |

### **6.11.2** RECEIVER PARAMETERS

| **Type** | ***P25 Digital Vehicular Repeater (Receiver)*** | | | | | |
|---|---|---|---|---|---|---|
| **Frequency Band** | **VHF High Band** | | **UHF** | | **700/800 MHz** | |
| **Channel Spacing** | 12.5 kHz | | 12.5 kHz | | 12.5 kHz | |
| **Information Source** | **Option A** | **Option B** | **Option A** | **Option B** | **Option A** | **Option B** |
| **Number of Channels** | 6 | 6 | 6 | 6 | 6 | 6 |
| **Frequency Spread (MHz)** | 24 | 24 | 20 | 20 | 24/18 | 24/18 |
| **Digital Sensitivity, 5% (BER)** | 0.32uV | 0.32uV | 0.32uV | 0.32uV | 0.32uV | 0.32uV |
| **Adjacent Channel Rejection Ratio** | 60dB | 60dB | 60dB | 60dB | 60dB | 60dB |
| **Intermodulation Rejection Ratio** | 75dB | 75dB | 75dB | 75dB | 70dB | 70dB |
| **Spurious Response Rejection Ratio** | 70dB | 70dB | 70dB | 70dB | 70dB | 70dB |
| **Audio Power Per Speaker** | N/A | N/A | N/A | N/A | N/A | N/A |
| **Audio Distortion at Full Power** | 5% | 5% | 5% | 5% | 5% | 5% |

[23] Transmitter power output is a minimum standard unless demonstrated otherwise by system engineering and/or FCC rules.

## 7.0 CONCEPTS OF MOBILE DATA COMMUNICATIONS

### 7.1 General

While voice communications remain the primary means of coordinating law enforcement activities, mobile data systems (MDS) can operate in a secondary role. Law enforcement agencies may operate mobile data systems over voice networks such as VHF-HB, UHF, 700 MHz and 800 MHz frequency bands, on a secondary basis and subject to bandwidth constraints or over data networks with frequencies dedicated for that use. A mobile data system is packet-switched or Internet protocol (IP) network as outlined in this section. Mobile data systems provide a means for law enforcement personnel to instantly access local, state, and national databases, locator mapping, and record management.

### 7.2 SAFECOM Statement of Requirements

Department of Homeland Security's SAFECOM program published a Statement of Requirements (SoR) for public safety communications interoperability. This SoR defines future requirements for crucial voice and data communications in day-to-day, task force and mutual aid operations to include:

The SoR includes references to Extended Area Networks, Jurisdictional Area Networks, Incident Area Networks, and Personal Area Networks.

A. Personal Area Networks (PANs):

Personal Area Networks permit wireless data sharing among public safety communications devices and sensors attached to an individual. Examples of data to be shared are information on the location, environment, and physical condition of that individual. Bluetooth is an example of one wireless PAN technology. In the voice radio field, talk-around channels and vehicular repeaters are examples of voice PAN technologies. From a technology perspective, the PAN aligns with current industry technology that utilizes the Bluetooth short-range wireless connectivity standard.

B. Incident Area Networks (IANs):

Incident Area Networks are temporary network infrastructures brought to the scene of an incident or otherwise configured for an incident. The wireless technologies that are likely to implement a component of an IAN system include IEEE 802.11 wireless local area networks and wireless ad hoc networking. The IAN is also applicable to transportable radio systems such as the EDICS,[31] EDWARDS[32] or MARC[33] units.

C. Jurisdictional Area Networks (JANs):

Jurisdictional Area Networks are permanent network infrastructures in particular cities or areas. They are dedicated to public safety communications and are capable of connecting to larger area networks. The wireless technologies that are likely to implement a component of JAN include IEEE 802.16e mobile broadband wireless networking and mesh networking technologies. The JAN is also applicable to radio systems such as the Statewide Law Enforcement Radio System, county or city radio systems, and nationwide radio systems.

[31] EDICS – Emergency Deployable Interoperable Communications System
[32] EDWARDS – Emergency Deployable Wide-Area Remote Data System
[33] MARC – Mutual aid Radio Cache

D. Extended Area Networks (EANs):

Extended Area Networks consist of regional, state and national network resources, particularly those dedicated to public safety communications. The EAN is also applicable to the Florida Interoperability Network because it connects jurisdictional systems.

### 7.3 Mobile Data Communication Coverage Reliability

If an agency is building its own mobile data system, it is recommended that the minimum system be engineered at 90 percent area coverage reliability for -116 dBm at 5 percent BER. If the agency is not building its own MDS, it is prudent to check the coverage area of the MDS service provider for acceptable coverage reliability before subscribing to the network.

### 7.4 Mobile Data Security

Because mobile data security is evolving, agencies should integrate the latest developments in security technology. The approved encryption algorithms are Data Encryption Standard (DES), Triple DES and Advanced Encryption Standard (AES). Although AES is recommended, any encryption method should be at least 128 bits. Mobile data security must also include the latest processes for network access, authentication, and authorization.

### 7.5 Mobile Data Computer Minimum Recommended Specifications

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

- Rain, Procedure I (blowing rain)
- Salt Fog, Procedure I (aggravated screening)
- Sand and Dust, Procedure I (blowing dust)
- Vibration, Procedure I, Category 1 (3 axes) or Category 4 (truck/trailer)
- Humidity, Procedure I (Induced/Natural)
- Shock, Procedure I (functional)

Note: A vehicular modem is also recommended to meet Military Standard 810G.

### 7.6 Wireless Local Area Network Technologies

#### 7.6.1 General

The wireless local area network (WLAN) should comply with the latest minimum requirements of the Institute of Electrical and Electronic Engineers (IEEE) 802.11, which is the standard for WLANs. The future holds Long-Term Evolution (LTE) as a potential public safety interoperable communications standard.

#### 7.6.2 Overview of Technologies

As newer 802.11 and LTE 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 these new standards are adopted, components in extended WLANs may have to be replaced.

Long-Term Evolution (LTE) technology is the latest technology offering public safety agencies may utilize as an option for interoperable mobile data communications. A migration plan will be necessary to promote a smooth transition from 802.11-based technology to LTE technology. The plan should minimize or avoid potential negative impacts to response times and protection of life and/or property.

It is envisioned that the public safety radio communications system will transition from proprietary radio systems to P25 radio systems and eventually to an LTE communications system once mission-critical push-to-talk (MCPTT) has been demonstrated for public safety. Long-Term Evolution planning considerations include ruggedized mobile and portable terminal equipment (Military Standard 810G); public safety communications coverage reliability for mobiles and portables; interoperable broadband networks; licensure of radio frequency; hardened base repeater sites; end-to-end encrypted voice; and multi-year budgetary and transition plan from existing system to P25 and/or LTE.

The effort currently underway to offer LTE technology to public safety agencies for mobile data communications is FirstNet. More about FirstNet can be found at:

https://firstnet.gov/

# APPENDIX A

## STATE AGENCIES AND LOCAL LAW ENFORCEMENT POLICIES

State agencies and local law enforcement policies contained within this appendix include:

1. Public Safety Mutual Aid Channel (MA-FLA)
2. Minimizing Risk of Obsolescence for Radio Equipment
3. Radio Equipment Replacement Policy
4. Radio Frequency Buy Out Policy
5. Capitol Building Rooftop Antenna Policy
6. New and Existing State-Owned Facilities Rooftop Antenna Policy

### 1.0 PUBLIC SAFETY MUTUAL AID CHANNEL (MA-FLA)

The State of Florida, through an application filed by the Department of Management Services, holds authorization from the Federal Communications Commission (FCC) to utilize the radio frequencies 854.6375/809.6375 MHz as a mutual aid channel in the public safety radio service. This makes available to eligible public safety agencies an inter-service radio channel authorized for use during situations requiring interagency communications necessary toward safeguarding life, health or property within Florida. This channel is referred to as Mutual Aid-Florida or MA-FLA—the label specified as the common display abbreviation. Applicants that meet the eligibility requirements for frequencies in the public safety radio pool, specified in FCC rules, 47 CFR Part 90, may apply to license stations on this channel.

A. APPLICATION PROCEDURES

Applications for mobile-relay stations, mobile stations or both must be submitted to the department and must include the required eligibility showings and written mutual agreement, as to the technical and operational standards defined below.

Following a favorable determination by the department, a letter of concurrence signed by the Director of DivTel, the Chief of the Public Safety Bureau or a designee will be prepared and attached as an exhibit to the application. In addition, a copy of the State of Florida's waiver of FCC General Category Freeze (DA 97-1631) should also be attached to the application. A copy is located the FCC's web site at:

http://www.fcc.gov/Bureaus/Wireless/Orders/1997/da971631.txt)

The entire application will then be returned to the requesting agency for submission to the appropriate FCC-certified frequency coordinating organization for further processing, as specified by FCC rules.

B. TECHNICAL STANDARDS

**1. System Configuration**

Fixed stations are to 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 must operate on 854.6375 MHz. Fixed station receivers must operate on 809.6375 MHz for mobile relay purposes.

All mutual aid repeaters must default to the repeat disable mode upon power-up. Should an agency use the mutual aid repeater for an operation, the repeater must be disabled after the operation. The agency must also call the repeater's Network Control Center (NCC) and advise them that the repeater is in the disabled mode. In addition, mutual aid repeaters must be programmed to automatically reset to non-repeat if not used for three hours after last push to talk (PTT), and must be standardized to a 2-second delay after the mobile or portable radio input signal is removed.

Vehicular mobile units and hand-held portable units are to be configured for repeater operation on one channel (809.6375 MHz transmit, 854.6375 MHz receive) and for direct talk-around operation on a second channel (854.6375 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 must be designated by the department. 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, must have an override function, enabling supervisory control of the repeat enable/disable function of supervised fixed stations.

Supervisory control points must be staffed 24 hours a day, year-round, and must have means for immediate contact with law enforcement and/or emergency medical services agencies in the coverage area of the station controlled.

Radio frequency control stations transmitting on 809.6375 MHz must not be used as a supervisory control point. Radio frequency control stations for non-supervisory control points will be granted upon an exhibition of need.

Any supervisory or non-supervisory control point may alternatively operate via either local or remote (leased) wireline links or on radio frequencies that may be authorized for such use. In any event, direct and immediate control of the repeater is required by at least the supervisory control point.

**2. Communications Coverage Plan**

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

Communications reliability for system design purposes is defined as having been engineered for a 95 percent probability of communications at the defined coverage contour (or 98.3% probability of communications over the defined coverage area). This is based on a received signal level of either 20 dB quieting or 17 dB SINAD (TIA/EIA), or digital 5 percent BER 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 department. A radio zone for hand-held portable units is defined to be a specific urban metropolitan area unless otherwise approved by the department.

Any application submitted to the department for authorization of a fixed (mobile-relay) station must include detailed plans for the establishment of either a countywide vehicular mobile system or an urban-metropolitan area hand-held portable system, or both. Such applications must also define the radio frequency control station communications paths to be established with agencies in adjacent counties and/or metropolitan areas.

**3. Minimum Performance Standards**

As mentioned in section 6 of this plan, the minimum performance standards defined for new equipment in the following sections are the standards by which the department approval will be determined for individual equipment items for use within the law enforcement communications systems. Equipment not explicitly included in the following sections, their approval will be determined on a case-by-case basis by the department.

## C. OPERATIONAL STANDARDS

**1. Control Requirements**:

During times of emergency, communications protocol and procedures for use of the channel must be coordinated with the Florida Division of Emergency Management (FDEM).

Any eligible entity may apply for and be granted authorization to operate a parallel control point for purposes of remotely controlling any existing fixed station regardless of ownership or licensee responsible for the equipment comprising a station on the MA-FLA channel. This applies where a showing of need has been demonstrated to the department. No owner or licensee of a fixed station has claim to exclusive rights to the control of a fixed station on the MA-FLA channel.

The supervisory control point must normally maintain the associated fixed (mobile-relay) station in repeat-disabled mode. The supervisory control point will 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 must be switched to the repeat-disabled mode.

Should a local MA-FLA radio repeater site be established within the coverage of the proposed wide-area MA-FLA system, the local agency must acknowledge the wide-area MA-FLA coverage and that the local system enhances the wide-area MA-FLA channel.

**2. Usage Requirements:**

Usage of the MA-FLA channel is limited to situations in which radio communications between otherwise separate entities is essential for safeguarding life, health, or property within Florida. Regardless of the ownership or licensee responsibility of the equipment comprising a station on this channel, use of this channel will be available on a non-exclusive basis to any eligible entity. No owner or licensee has claim to exclusive use of a fixed station on this channel. It is the department's policy to continue to use and specify the standards and criteria

listed above for the design and implementations of public safety mutual aid channels.

## 2.0 MINIMIZING RISK OF OBSOLESCENCE FOR RADIO EQUIPMENT

The department will consider purchases of new radio equipment and may recommend equipment with additional capacity and/or features beyond what is immediately necessary to minimize the economic risk of obsolescence for the purchased equipment if additional capacity and/or features are later required. At a minimum, the department will consider the following recommendations for the purchase of new equipment.

A. Mobile and Portable Radios

One additional blank channel in each radio is recommended for every 10 channels programmed.

B. Frequency/Tone Synthesis

Electronic generation of RF frequencies and/or CTCSS and DCS (synthesized) is recommended to be able to change RF frequencies and/or CTCSS and DCS simply and inexpensively.

C. Control Consoles

One additional blank channel port and control-module space is recommended for every three equipped channels.

D. Paging Encoders

Universal format paging encoders are to include a digital numeric format with reserve capacity for system expansion.

E. Antenna Towers

All antenna towers, either new or existing, are to be certified by a Professional Engineer licensed by the State of Florida to conform to the current TIA/EIA wind speed survivability requirements. Certification letters should be submitted with the radio system approval request. All towers must be inspected annually for corrosion and feedline/waveguide damage. If required by the Federal Aviation Administration (FAA)/FCC, tower lighting operation must also be part of the tower certification.

### 1. Distributed Loads

The minimum recommended design load capacity is one square foot of flat-plate equivalent area per 10 feet of tower height. This loading is to be distributed in five square-foot (nominal) increments centered at 25-foot intervals, beginning at the tower top. This loading represents normal land-mobile antenna loads. Two additional five square-foot equivalent loads, in addition to the planned loading, should be considered for growth capacity. This spare capacity should be designed at a minimum of 66 percent and 75 percent of the tower height. For each of these antenna loads, there will be an associated transmission line with required mounting hardware from the tower base to the antenna load point. The transmission line will

be 1- 5/8” diameter, Andrew type LDF7-50A, or 7/8" diameter, Andrew type LDF5-50A, or equivalent.

**2. Concentrated Loads**

In addition to the distributed loads, growth capacity for two eight-foot diameter solid microwave antennas is recommended for towers exceeding 150 feet in height. These loads should be positioned within the top 30 percent of the tower. For these antenna loads, there will be an associated transmission line with required mounting hardware from the tower base to the antenna load point. The transmission line will be elliptical wave-guide equivalent to Andrew type EW63 series, or Andrew type LDF7-50A 1-5/8” diameter coaxial cable.

**3. Roof Top Installation**

All roof-top installations are to be certified by a Professional Engineer licensed by the State of Florida to conform to the current TIA/EIA wind speed survivability of the buildings location. Certification letters should be submitted with the radio system approval request. All installations are to conform to FCC exposure rules found on the FCC web page at:

https://www.fcc.gov/encyclopedia/radio-frequency-safety

**4. Equipment Shelters**

Equipment shelters should have sufficient spare space, air conditioning, power service, uninterruptible power supply and communications cable conduits for two additional Electrical Industries Association standard (EIA 310-D) equipment racks requiring 5 kW total power and 17,000 British Thermal Units (BTU) per hour of cooling (2.5 kW and 8,500 BTU/hour, per rack). Emergency power generators should be sized for a minimum of 10 percent excess continuous kilovolt-ampere (kVA) capacity over planned loads, including start-up capacity for rotating equipment.

**5. Buried Transmission Lines and Control Cables**

Metallic or polyvinyl chloride raceway should be used for mechanical protection. It is recommended that at least one spare raceway be provided with capacity for two lines/cables of equal size to those initially installed. A nylon pull cord should be left in place for future use.

F. Microwave and Other Carrier Facilities

Where possible, the department recommends sharing the use of carrier facilities with other agencies, including the procurement by an agency of additional capacity for the needs of other agencies. Present and future capacity requirements will be included.

**1. Digital Versus Analog Microwave**

Digital microwave will be chosen for design, unless otherwise justified.

### 2. Cable Right-of-Way

Normally, not relinquishing present or potential government-owned or leased right-of-way is recommended. Where there is cable right-of-way that can support a planned carrier facility, the cost effectiveness of fiber optics versus other cable systems will be considered. When cost estimates are comparable, fiber-optic cable will be chosen for design. When proven to be in the best interest of the agency, right-of-way may be shared in return for the use of transmission facilities.

### 3. System Signal Level Design Margins

Microwave systems or other broadband transport system will be designed for a minimum bit error rate of $10^{-6}$ and/or a two-way path availability of at least 99.999 percent per year. Fiber optics and RF-carrier cable systems will have a minimum of 1 decibel (dB) per mile design margin to allow for future splices and taps. Fiber optics and RF-carrier cable systems will also have an additional 5 dB design margin for system aging.

G. Communications Control Centers

Communications control centers (dispatch rooms) will be sized from actual floor plan drawings, showing all required consoles with chair space and all other required furniture and equipment. If this information is not available, there should be an allowance for a range of 100 to 120 square feet for each position. Allocation includes room for chair movement and access to the console electronics.

The department recommends that new radio communications equipment or facilities be purchased with additional capacity and/or features to minimize obsolescence. With the universal utilization of computers, monitors along with modular furniture are recommended for their potential to save space and add to the overall efficiency of the dispatch environment.

H. Communications Equipment Life Cycle

Communications equipment should be in an environmentally controlled facility unless the equipment is rated for outside operations. This supports the radio equipment replacement policy in the next section.

## 3.0 RADIO EQUIPMENT REPLACEMENT POLICY

The department has established guidelines for the replacement of communications equipment. Specific situations that warrant equipment replacement (with proper maintenance) are listed below:

**A.** Equipment has reached age listed below although it may not have been in continuous use:

| Type of Equipment | Age (Years) |
|---|---|
| Mobile Radios | 8 |
| Portable Radios | 6 |
| | |
| Base and Control Station Radios | 10 |
| Transmitter combiners | 10 |
| | |
| Antennas and Transmission Lines | |
| Within 10 miles of bodies of salt water | 10 |
| Other locations | 12 |
| | |
| Antenna Towers | |
| Within 10 miles of bodies of salt water | 15 |
| Other locations | 20 |
| | |
| Antenna Tower Lighting Systems | 10 |
| | |
| Control consoles | 10 |
| | |
| Logging Recorders | 10 |
| | |
| Instant Recall Recorders | 6 |
| | |
| Prefabricated Equipment Shelters | 15 |
| | |
| Standby Emergency Power Generators | |
| Within 10 miles of bodies of salt water | 8 |
| Other locations | 12 |
| | |
| Microwave Equipment | 15 |

**B.** Based on an investigation by the department or a written statement of need from an agency, the department may recommend an earlier than normal replacement schedule in situations where equipment is damaged, abnormally worn or technically obsolete.

**C.** The department recognizes that adequate preventative maintenance programs will extend the usable life of equipment beyond the times schedules above and therefore encourages agencies to develop and implement such programs. In such cases, longer replacement schedules may be warranted.

**D.** For large systems, phased replacement schedules may be necessary for economic reasons. The department will consider earlier replacement schedules for a portion of the system equipment such that the last equipment to be replaced will not be older than three years beyond the normal replacement schedule.

## 4.0 RADIO FREQUENCY BUY-OUT POLICY

When an agency needs to implement a new radio system or to expand an existing one, in certain situations, the shortage of available radio channels may preclude a straightforward implementation or expansion. In those situations, the most economical alternative may be the relocation of an existing radio user from one channel to another to free up a channel for the agency planning to implement or expand. When feasible, the department will support such an arrangement and may recommend that the agency purchase new radio equipment for the user being relocated, in exchange for the user's current radio channels and radio equipment.

## 5.0 CAPITOL BUILDING ROOFTOP ANTENNA POLICY

To maintain the aesthetic beauty of the State Capitol Building and DivTel's responsibility to minimize radio interference between users, the number of antennas on the Capitol rooftop is limited to those currently authorized and in place. This includes four land mobile antennas owned by the State Attorney's office; the Department of Law Enforcement; the Capitol Police (FDLE) and the Leon County Sheriff's Office. There are also two microwave antennas owned by the Department of Education and one Master Antenna TV (MATV) antenna owned by the department's Division of Facilities Management. Additional antennas permitted on the State Capitol Building will be assigned for state agency use only. The Division of Facilities Management and the department must approve configuration changes to radio hardware associated with rooftop antennas.

## 6.0 ROOFTOP ANTENNA POLICY ON NEW AND EXISTING STATE-OWNED FACILITIES

To minimize radio interference between users, the number of antennas on state-owned building rooftops is normally limited to three. These antennas are normally attached to the antenna mounting supports provided as part of the building. Antennas required on state-owned buildings are normally assigned for state agency use only and must be approved the Division of Facilities Management and the department.

## APPENDIX B

## ACRONYMS FOR PUBLIC SAFETY LAND MOBILE RADIO COMMUNICATIONS

**– A –**

AAT – above average terrain
AGL – above ground level
AMSL – above mean sea level

**– B –**

BER – bit error rate

**– C –**

CASM – communications asset survey and mapping
CFR – Code of Federal Regulations
CTCSS – continuous tone-coded squelch system

**– D –**

dB – decibel
dBh – decibel reference to a half-wave dipole
dBm – decibel referenced to one milliwatt
dBv – decibel referenced to one volt
dBw – decibel referenced to one watt
DCS – digital-coded squelch
DTMF – dual-tone multi-frequency (touch tone)

**– E –**

EAN – extended area network
EIA – Electronics Industries Association
ERP – effective radiated power
EMS – emergency medical services

**– F –**

FAA – Federal Aviation Administration
FCC – Federal Communications Commission
FEMA – Federal Emergency Management Agency
FM – frequency modulation
FLFOG – Florida field operations guide
FOG – field operations guide

**– G –**

GHz – gigahertz (1000 MHz)
GPS – global positioning system

**– H –**

HAAT – height above average terrain
Hz – hertz (cycles per second)

**– I –**

IACP – International Association of Chiefs of Police
IAN – incident area network

**– J –**

JAN – jurisdictional area network

**– K –**

kbps – kilobits per second
kHz – kilohertz

**– L –**

LAN – local area network
LMR – land mobile radio
LOS – line of sight or loss of signal

**– M –**

MDC – mobile data computer
MSL – mean sea level
MHz – megahertz

**– N –**

NIFOG – national interoperability field operations guide
NIMS – national incident management system
NTIA – National Telecommunications & Information Administration

**– O –**

**– P –**

PAN – personal area network
PSAP – public safety answering point
PTT – press to transmit, or push to talk

**– Q –**

**– R –**

RF – radio frequency
RX – receive

**– S –**

SCIP – statewide communications interoperability plan
SLERS – statewide law enforcement radio system

**– T –**

TIA – Telecommunication Industry Association
TX – transmit

**– U –**

UPS – uninterruptable power supply

**– V –**

VSWR – voltage standing wave ratio

**– W –**

WLAN – wireless local area network

**– X –**

**– Y –**

**– Z –**

## APPENDIX C

## GLOSSARY OF COMMUNICATIONS TERMS

This glossary provides definitions commonly used in communications technology and engineering. They have been abridged specifically for law enforcement communications of this plan.

**– A –**

**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.

**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.

**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)

**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.

**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.

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

**– 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 frequency bands. For example, the very high frequency (VHF) band extends from 30 MHz to 300 MHz.

**Bandwidth:** (1) The width of a frequency band 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.

**Base Station**: A station at a specified site authorized to communicate with mobile stations. (47 CFR, section 90.7)

**Base-to-mobile communications:** Two-way radio communications between a fixed radio stations (base) and a mobile station. Typically, base-to-mobile communications is referred to as talk-out. Talk-back represents mobile-to-base.

**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.

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

**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").

**Bit error rate (BER):** The percentage of error bits relative to the total number of bits received in a transmission. Bit error rates that are too high may indicate that a slower data rate may speed overall transmission time.

**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:** FCC assigned identifying letters and numbers used for identification of a radio station, transmitter, or transmission.

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

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

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

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

**Channel, radio:** An assigned radio frequency band 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.

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

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

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

**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 to 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.

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

**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 percent of the time. (3) EIA – full load output under the manufacturer's normal loading conditions for this class of service for twenty-four hours.

**Continuous tone-coded 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. These 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:** Any place from which a transmitter's functions may be controlled (47 CFR, section 90.7).

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

**Control Station:** An operational fixed station (FCC station class FX1 or FX1T), the transmissions of which are used to control automatically the emissions or operation of another radio station at a specified location. (based on 47 CFR 90.7)

**Coordination, frequency:** The process of obtaining the recommendation of a frequency coordinator for a frequency(ies) that will most effectively meet the applicant's needs while minimizing interference to licensees already operating within a given frequency band. (47 CFR, 90.7)

**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 radially from a fixed radio station.

**Coverage tests, radio:** Tests performed on the system to verify radio communications within the required or predicted service area for the reliability specified by the purchaser. The tests are based upon measurements taken within a number of grids representing the service areas with at least one measurement per grid, and at additional locations specified within each grid (such as, in building portable coverage, as applicable).

**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 called hertz).

## – D –

**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.

**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.

**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.

**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.

**Dispatch:** The process of receiving a request for emergency and the act of sending a vehicle or aircraft in response to each such request.

**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.

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

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

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

**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 –

**Effective radiated power (ERP):** The calculated power output from an antenna system which incorporates all the gains and losses in the antenna system. Effective radiated power 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 (dBh); and (4) convert the results into watts.

**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 law enforcement, fire, and EMS.

**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:** Is defined by section 471.005(7), Florida Statutes.

**– 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:** Fading is defined as the variation of radio field strength caused by a gradual change in the transmission medium.

**FCC Part 90, 47 CFR:** The part of Federal Communications Commission (FCC), Title 47 of the Code of Federal Regulations (47 CFR) that affects most public safety communications.

**Federal Communications Commission (FCC):** A board of five 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 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.

**Fixed relay station:** A station at a specified site used to communicate with another station at another specified site. (47 CFR, section 90.7)

**Fixed service:** Fixed service is 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.

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

**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, such as 150-174 MHz, 450-512 and 698-869 MHz.

**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 1,000 Hz).

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

**Full-duplex operation:** A method of operation of a radio system which provides simultaneous two-way communications between two points.

**– G –**

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

**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.

**Gigahertz (GHz):** One billion hertz or 1,000 MHz.

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

**– 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.

**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.

**Harmful interference:** Any emission, radiation, or induction which specifically degrades, obstructs, or interrupts the service provided by such stations. (47 CFR, section 90.7)

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

**High band (HB), VHF:** A portion of the radio frequency spectrum from 150 to 174 MHz.

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

**– I –**

**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.

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

**Interface:** A concept involving the specification of the interconnection between two pieces of equipment 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 duty cycle:** A duty cycle of 1 minute on, 4 minutes off, or 20 percent 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.

**– J –**

**– K –**

**Kilohertz (kHz):** Equal to one 1,000 cycles per second (replaces the term kilocycle).

**Kilobits per second (kbps):** One thousand bits per second, which is used to specify data transfer rates.

**– 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 service between base stations and land mobile stations, or between land mobile stations. A mobile radio service defined by the Federal Communications Commission - FCC Rules 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.

**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.

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

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

**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.

## – M –

**Megabits per second (Mbps):** A million bits per second, which is used to specify data transfer speeds.

**Microwave:** A term applied to radio waves in the frequency range of 1,000 MHz 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 relay station:** A base station in the mobile service authorized to retransmit automatically on a mobile service frequency communications which originate on the transmitting frequency of the mobile station. (47 CFR, section 90.7)

**Mobile service:** A service of radio communication between mobile and base stations, or between mobile stations. (47 CFR, section 90.7)

**Mobile station:** A station in the mobile service intended to be used while in motion or during halts at unspecified points. This includes hand carried transmitters. (47 CFR, section 90.7)

**Mobile repeater station:** A mobile station (FCC station class MO3) 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. (based on 47 CFR 90.7)

**Mobile-to-base communications:** Two-way radio communications between a mobile station (or control station) and a fixed radio stations (base). Typically, mobile-to-base communications is referred to as talk-in (or talk-back). Talk-out represents base-to-mobile.

**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.

**Multicoupler, receiver:** A device which permits several radio receivers to use the same antenna. Usually a broadband amplifier with several output ports.

**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.

**Multi-tone:** A method of signaling that involves two or more tone signals produced simultaneously or sequentially.

**– N –**

**Narrow-banding:** Frequency-modulated broadcasting system used primarily for two-way voice communication, typically having a maximum 4 KHz deviation of 15 kHz bandwidth or less.

**Network:** An orderly arrangement of stations interconnected through communications channels in order to form a coordinated entity.

**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.

**– O –**

**Omnidirectional:** Equally effective in all directions.

**Outage:** A disruption of communications from any cause, whether planned or accidental.

**Output power:** The radio frequency output power of a transmitter's final radio frequency stage as measured at the output terminal while connected to a load of the impedance recommended by the manufacturer. (47 CFR, section 90.7).

**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 provide signaling or information transfer by such means as tone, tone-voice, tactile, optical readout, etc. (47 CFR, section 90.7)

**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.

**Phone patch:** An interconnection between radio and telephone communications circuits which permits direct voice interchange between telephone lines and radio system.

**Portable:** An easily transportable radio.

**Propagation, electromagnetic:** The travel of electromagnetic waves through a medium, or the travel of a sudden electric disturbance along a transmission line. It is also called wave propagation.

**Public safety agency:** A functional division which provides firefighting, law enforcement, emergency medical, or other emergency service.

**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 on station at a time, the talker being required to keep a switch operated while 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:** Defined as The 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.

**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.

**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 system:** 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 transmitter:** A radio-frequency power source which generates radio waves for transmission through space.

**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.

**Region:** The area encompassed by the jurisdictional boundary of each county within Florida.

**Relay:** Transmission forwarded through an intermediate station.

**Relay station:** Radio stations that rebroadcast a signal 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, re-modulating:** A microwave repeater station in which the signal is demodulated to the original baseband frequencies and re-injected onto the modulator for transmission to the distant station.

**– S –**

**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. 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. The more sensitive a receiver is, the weaker the signal it can receive.

**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.

**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 called simplex.

**SINAD:** The ratio of signal plus noise, plus distortion to the noise, plus distortion; expressed in decibels. In TIA/EIA, it is the standard method of measuring receiver sensitivity.

**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 extends from the longest known radio waves to the shortest known cosmic rays.

**Spurious response:** The response of a radio receiver to an undesired frequency.

**Spectrum management:** The procedure whereby the frequency spectrum, consisting of the limited available radio channels is managed in such a manner as to ensure maximum utilization of the available channels, to ensure reliable interference-free radio communications between the various users of radio service.

**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.

**Statewide law enforcement system (SLERS):** A single unified digital radio network that meets the radio voice needs of state law enforcement officers and other participating agencies throughout the state.

**Station, radio:** A fixed installation or mobile unit which is equipped to transmit and receive radio signals.

**– T –**

**Telephone line:** A telephone line from a telephone company central office that is connected to key or non-key telephone equipment.

**Tone:** An audio or carrier of controlled amplitude and frequency used in a selective signaling system, or for equipment control purposes.

**Tone-coded squelch:** A system whereby a superimposed tone is transmitted with the radio carrier to protect against nuisance type interference.

**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.

**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.

**Transmission line:** A waveguide, coaxial line, or other system of conductors used to transfer signal energy efficiently from one location to another. In radio systems, the coaxial line between the radio station and the antenna.

**Transmitter:** Apparatus for the production and modulation of radio frequency energy for the purpose of radio communication.

**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.

**Unmodulated:** Without modulation; the radio frequency carrier signal alone as it exits during phases in conversations.

**– 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.

**– W –**

**Watt: The unit of power.**

**Wave:** A propagated periodic disturbance such as a radio, light, or sound wave.

**Wavelength:** 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 million meters per second. To determine the exact length of a wave, divide 300 million meters by the frequency in hertz.

**Wave, radio:** An electro-magnetic wave which travels through space at the speed of light.

**– X –**

**– Y –**

**Yagi:** A highly directional and selective shortwave antenna consisting of a horizontal conductor of one or two dipoles connected with the receiver or transmitter and of a set of nearly equal insulated dipoles parallel to and on a level with the horizontal conductor.

**– Z –**