NOTE: The cover page of this standard has been changed for administrative reasons. There are no other changes to this document.

NOT MEASUREMENT SENSITIVE

MIL-STD-188-243
15 March 1989

DEPARTMENT OF DEFENSE INTERFACE STANDARD

TACTICAL SINGLE CHANNEL ULTRA HIGH FREQUENCY (UHF) RADIO COMMUNICATIONS

AMSC N/A **AREA TCSS**

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DEPARTMENT OF DEFENSE
Washington DC 20301

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FOREWORD

Originally, Military Standard 188 (MIL-STD-188) covered technical standards for tactical and long haul communications, but later evolved through revisions (MIL-STD-188A, MIL-STD-188B) into a document applicable to tactical communications only (MIL-STD-188C).

The Defense Communications Agency (DCA) published DCA Circulars promulgating standards and engineering criteria applicable to the long haul Defense Communications System (DCS) and to the technical support of the National Military Command System (NMCS).

As a result of a Joint Chiefs of Staff (JCS) action, standards for all military communications are now being published in a MIL-STD-188 series of documents. The MIL-STD-188 series is subdivided into a MIL-STD-188-100 series covering common standards for tactical and long haul communications, a MIL-STD-188-200 series covering standards for tactical communications only, and a MIL-STD-188-300 series covering standards for long haul communications only.

This document contains technical standards and design objectives for tactical single channel ultra high frequency (UHF) radio communications equipment, and supersedes paragraph 4.5.9 of MIL-STD-188C. Values appearing herein are based on later data or corrections from those previously published in MIL-STD-188C.

Parameters such as ambient temperature, size, weight, power, climate, altitude, ventilation, and interconnecting cable assembly requirements are not found in this standard. These and other required specifications will be found in their own respective documents, and must be considered when developing new tactical single channel UHF radio equipment, and must be carefully tailored in accordance with the policies of DoD Directive 5000.43.

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1. SCOPE

1.1 Purpose. The purpose of this document is to establish the minimum essential interoperability and performance requirements necessary for tactical single channel UHF radio communications equipment. This standard addresses ground-to-air, air-to-air, ship-to-shore, and ship-to-ship tactical single channel UHF radio communications equipment. The requirements established by this document may be exceeded in order to satisfy specific operational requirements or to incorporate technological improvements, provided that interoperability is maintained.

1.2 Application. This standard is mandatory within the Department of Defense (DoD) in the design and development of new tactical single channel UHF radio communications equipment. Major modifications to existing tactical single channel UHF radio communications equipment shall comply with the requirements contained in this document. The term "single channel" refers to radios that are capable of transmitting, receiving, or transmitting and receiving only one discrete RF envelope at a time per transmit or receive section. This document encompasses radios that may be tuned or selected to a preset channel, but is not applicable to multichannel radios (a multichannel radio is defined as having two or more complete transmit or receive RF portions capable of operating on multiple frequencies, simultaneously).

1.3 Format. The requirements contained in this document are mandatory if the word "shall" is used in conjunction with the requirement. If the word "should" or "may" is used, the requirement is optional. Non-mandatory design objectives will normally be abbreviated as (DO). The term "radio equipment" will hereafter be used to refer to tactical single channel UHF radio communications equipment subject to the requirements herein.

2. REFERENCED DOCUMENTS

2.1 Government Documents.

2.1.1 Specifications, Standards, and Handbooks. Unless otherwise specified, the following specifications, standards, and handbooks, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this standard to the extent specified herein.

STANDARDS

FEDERAL

FED-STD-1037	Glossary of Telecommunication Terms

MILITARY

MIL-STD-1310	Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility and Safety
MIL-STD-188-110	Equipment Technical Design Standards for Common Long Haul/Tactical Data Modems
MIL-STD-188-111	Subsystem Design and Engineering Standards for Common Long Haul and Tactical Fiber Optic Communications
MIL-STD-188-114	Electrical Characteristics of Digital Interface Circuits
MIL-STD-188-124	Grounding, Bonding, and Shielding for Common Long Haul/Tactical Communication Systems including Ground Based Communications-Electronics Facilities and Equipments
MIL-STD-188-200	System Design and Engineering Standards for Tactical Communications
MIL-STD-188-203-1	Subsystem Design and Engineering Standards for Tactical Digital Information Link (TADIL) A Applications
MIL-STD-188-203-3	Subsystem Design and Engineering Standards for Tactical Digital Information Link (TADIL) C Applications
MIL-STD-449	Radio Frequency Spectrum Characteristics, Measurement of
MIL-STD-461	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference

MIL-STD-462	Electromagnetic Interference Characteristics, Measurement of
MIL-STD-463	Definitions and System of Units, Electromagnetic Interference and Electromagnetic Compatibility Technology

2.1.2 Other Government Documents, Drawings, and Publications. The following other government documents, drawings, and publications form a part of this standard to the extent specified herein.

AIR-STD-19/4	Interoperability of Aircraft UHF Multi-Frequency Transceiver Installation and Compatible Ground Transmitter and Receivers
STANAG 4202	Transmission Envelope Characteristics for High Reliability Data Exchange Between Land Tactical Data Processing Equipment Over Single Channel Radio Links
STANAG 4205	Technical Standards for Single Channel UHF Radio Equipment
STANAG 5020	Interoperability of Aircraft UHF Multi-Frequency Transceiver Installation and Compatible Ground Transmitters and Receivers
QSTAG 263C	Standards to Achieve Interoperability of ABCA Armies with Ultra High Frequency Combat Net Radio Equipments
National Telecommunications and Information Administration (NTIA) (Dept of Commerce)	Manual of Regulations and Procedures for Federal Radio Frequency Management

(Copies of specifications, standards, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other Publications. The following document(s) form a part of this standard to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. The issues of documents which have not been adopted shall be those in effect on the date of the cited DoDISS.

International Telecommunication Union (ITU) Radio Regulations.

(Application for copies should be addressed to the International Telecommunication Union, Place des Nations, CH-1211 Geneva 20, Switzerland.)

International Civil Aviation Organization (ICAO), Standards and Recommended Practices for Aeronautical Telecommunications, Annex 10 to the Convention on International Civil Aviation.

(Application for copies should be addressed to the International Civil Aviation Organization, Attn: Distribution Officer, P.O. Box 400, Succursale: Place de Aviation Internationale, 1000 Cherbrooke St. West, Montreal, Quebec, Canada, H3S2R2.)

(Nongovernment standards are generally available for reference from libraries. They are also distributed among nongovernment standards bodies and using Federal agencies.)

2.3 Order of Precedence. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence.

3. DEFINITIONS

3.1 Definition of Terms. The definitions of terms used in this document shall be as defined in FED-STD-1037 unless otherwise noted. Definitions of electromagnetic compatibility (EMC) terms shall be as defined in the current edition of MIL-STD-463.

3.2 Abbreviations and Acronyms. Abbreviations and acronyms used in this document are listed in the Appendix.

4. GENERAL REQUIREMENTS

4.1 Frequency Range. The UHF frequency band, as defined by FED-STD-1037, extends from 300 MHz to 3000 MHz. The military has been restricted to use of only the 300 MHz to 400 MHz segment, but has also been authorized to extend into the upper portion of the Very High Frequency (VHF) frequency band from 225 MHz to 300 MHz. This results in a military UHF frequency band which extends from 225 MHz to 400 MHz. For the purposes of this document the UHF frequency range shall be 225 MHz to 400 MHz.

4.2 International Telecommunications Union (ITU) Radio Regulations. The ITU Radio Regulations is a consolidated document which sets forth worldwide radio regulations as well as resolutions and recommendations. It is regulated by the most recent World Administrative Radio Conference (WARC) and published under the authority of the Secretary General of the ITU. These radio regulations are further defined at the national level by federal agencies such as the Department of Commerce and the Interdepartment Radio Advisory Committee (IRAC), and by military agencies such as the Joint Chiefs of Staff (JCS), and the Military Communications and Electronics Board (MCEB). The radio equipment shall comply with the applicable requirements of the ITU Radio Regulations.

4.3 Interoperability Requirements.

4.3.1 Interconnection of Radio Equipment with Telephone Facilities. The radio equipment shall comply with the applicable requirements of MIL-STD-188-200.

4.3.2 Interoperability with NATO. The radio equipment shall comply with the applicable requirements of STANAG 4205. Radio equipment designed to operate with aircraft or be installed on board aircraft shall comply with the applicable requirements of STANAG 5020. Radio equipment that is designed with data modems installed shall comply with the applicable requirements of STANAG 4202.

4.3.3 Interoperability with American-British-Canadian-Australian (ABCA) Armies. The radio equipment shall comply with the applicable requirements of QSTAG 263C.

4.3.4 Interoperability with Air Standardization Coordinating Committee (ASCC) Member Nations. The radio equipment intended for use with ASCC member nations or designed to be installed on board or operate with aircraft shall comply with the applicable requirements of AIR-STD-19/4.

4.3.5 Interoperability with Civil Aviation Organizations. The radio equipment shall comply with the applicable requirements of the current edition of Annex 10 to the Convention on International Civil Aviation published by the ICAO.

4.4 Electronic Warfare (EW) Vulnerability and Electronic Counter - Countermeasures (ECCM) Capabilities. The radio equipment shall conform to the EW and ECCM requirements of MIL-STD-188-200, as specified in the equipment specification.

NOTE: Consideration should be given to modular construction of the radio equipment to allow for cost effective upgrades to incorporate ECCM improvements as they are developed, as specified by the applicable equipment specification.

4.5 Electromagnetic Compatibility (EMC) Requirements.

4.5.1 Electromagnetic Interference (EMI) Requirements. The radio equipment shall comply with the applicable requirements of MIL-STD-461, as specified in the equipment specification. Test methods and measurements taken to determine equipment EMI characteristics shall be accomplished in accordance with the requirements of MIL-STD-462.

4.5.2 Electromagnetic Pulse (EMP) Vulnerability. The radio equipment shall comply with the applicable requirements of MIL-STD-461, as specified in the equipment specification. Test methods and measurements taken to determine the EMP vulnerability shall be accomplished in accordance with the applicable requirements of MIL-STD-462.

4.6 UHF Spectrum Characteristics. The spectrum characteristics of the radio equipment shall be tested in accordance with the applicable requirements of MIL-STD-449, as specified in the equipment specification.

4.7 Microphone/Headset Circuit Requirements. The radio equipment shall have local input/output capabilities for microphone/headset operation.

4.8 Grounding, Bonding, and Shielding Requirements. Methods and practices for grounding, bonding, and shielding radio equipment shall comply with the provisions of MIL-STD-188-124 and MIL-STD-1310.

4.9 National Telecommunications and Information Administration (NTIA) Compliance. The radio equipment shall comply with the applicable requirements of the NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management, as specified in the equipment specification.

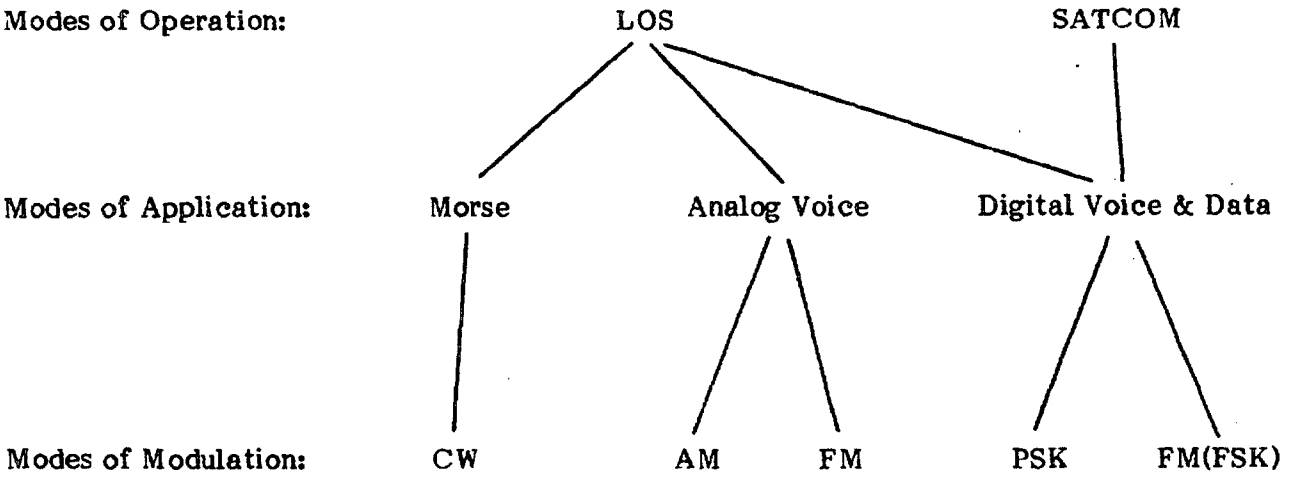
5. DETAILED REQUIREMENTS

5.1 Introduction. This section provides detailed performance standards for tactical single channel UHF radio communications equipment.

5.2 Tactical Single Channel UHF Radio Communications Equipment. These parameters apply to all operational modes unless otherwise specified.

5.2.1 Common RF Characteristics. These radio frequency (RF) parameters shall apply to both transmitters and receivers unless otherwise specified.

5.2.1.1 Equipment Operational Modes. This standard specifies requirements for equipment designed to operate in narrowband and wideband amplitude modulation (AM), narrowband and wideband frequency modulated (FM), continuous wave (CW), and phase shift keying (PSK) modes. These requirements do not preclude the use of operational modes not addressed herein. The following diagram illustrates the relationship of the typical modes employed in UHF single channel tactical radios subject to this standard.



5.2.1.2 Frequency Coverage. The radio equipment shall tune to any integral multiple of 25 kHz within the frequency range of 225.000 MHz to 399.975 MHz.

NOTE: This requirement does not preclude tuning in integral subdivisions of 25 kHz.

5.2.1.3 Displayed Frequency. The displayed frequency shall be the same as the carrier frequency, whether suppressed or not.

5.2.1.4 Assigned Frequency. The assigned frequency shall be in the center of the occupied bandwidth.

5.2.1.5 Frequency Stability. The radio equipment shall maintain frequency stability with respect to the initial frequency, to within 1.0 parts per million (ppm) (DO 0.1 ppm) per day, 2.0 ppm (DO 0.2 ppm) during the first 30 day period after alignment, and 1.0 ppm (DO 0.1 ppm) each 30-day period thereafter.

5.2.1.6 Frequency Calibration Resolution. The radio equipment shall incorporate a frequency adjustment control that will calibrate and align the radio equipment to within 1.0 ppm (DO 0.1 ppm) of its assigned frequency.

5.2.1.7 Audio Frequency Response.

5.2.1.7.1 Narrowband. The frequency response of the radio equipment over the range of 300 to 3500 Hz shall be within ±2 dB of the response at 1000 Hz.

5.2.1.7.2 Wideband. The frequency response of the radio equipment over the range of 20 Hz to 20 kHz shall be within ±3 dB, with a minimum rolloff of 6 dB/octave above and below the bandpass, except that from 300 to 3500 Hz the amplitude frequency response shall not vary by more than ±2 dB.

5.2.1.8 Morse Code Telegraphy. Equipment that is intended to operate with morse code telegraphy shall be compatible with on-off keying of a 1000 Hz (±10 Hz) tone at rates up to 30 words per minute (wpm) in a manual mode and up to 300 wpm in a burst mode.

5.2.1.9 Digital Performance Characteristics.

5.2.1.9.1 Bit Error Ratio (BER). Not standardized.

NOTE: For digital radio equipment applications, the BER shall be established by the applicable equipment specifications.

5.2.1.9.2 Character-Count and Bit-Count Integrity. For radio equipment designed to be used for digital communications, no extraneous characters or bits shall be inserted, nor shall any valid characters or bits be deleted in bit streams representing digitized voice or message texts. This requirement shall apply to all modulation and data signaling rates and shall be measured with the transmitter and receiver set up in a back-to-back configuration. This measurement shall be made over a continuous 24 hour or longer time period.

5.2.1.9.3 Protection of Signal Sense. Radio equipment designed to be used for digital communications shall not invert the logic or signal sense of the data stream for digital applications.

NOTE: This requirement does not preclude manual selection of inverted bit streams.

5.2.1.9.4 Jitter Error. In radio equipment designed to be used for digital communications, the stability of synchronization or clock timing shall be sufficient to ensure that synchronism is maintained between received and transmitted signals within ±25 percent of the unit interval for a 24-hour time period.

NOTE: The time period, expected to be less than 100,000 seconds for single channel radio equipment, is under consideration.

5.2.1.9.5 Modulation and Data Signal Rates. Radio equipment that is equipped with a data modem shall comply with the applicable requirements of MIL-STD-188-110, STANAG 4202, and STANAG 4205, as specified in the equipment specification.

5.2.1.9.6 Tactical Digital Information Link (TADIL) A Applications. Radio equipment designed for use in TADIL A applications shall comply with the applicable requirements of MIL-STD-188-203-1, as specified in the equipment specification.

5.2.1.9.7 Tactical Digital Information Link (TADIL) C Applications. Radio equipment designed for use in TADIL C applications shall comply with the applicable requirements of MIL-STD-188-203-3, as specified in the equipment specification.

5.2.1.9.8 Electrical Characteristics of a Digital Interface. Radio equipment that is equipped with a digital interface shall comply with the applicable requirements set forth in the current edition of MIL-STD-188-114, as specified in the equipment specification.

5.2.1.9.9 Characteristics of a Standard IF Interface. For radios having digital modes, and providing an intermediate frequency (IF) transmit and receive interface to an external mode, the interface shall have the following characteristics:

a. Nominal IF center frequency: 70 MHz

b. Impedance: 50 ohms

c. Transmit Level (Keyed): 0 dBm, ± 1dB.

5.2.1.9.10 Characteristics of Fiber Optic Interfaces. Radio equipment that is equipped with a fiber optic interface shall comply with the applicable requirements of MIL-STD-188-111, as specified in the equipment specification.

5.2.1.10 Envelope Delay. The absolute envelope delay for the transmitter and the receiver over the frequency band from 300 Hz to 3500 Hz shall not exceed 2.5 milliseconds (ms).

5.2.1.11 Equipment Time Delays. The maximum time delay measured between the input and output of the transmitter and receiver for any single frequency between 300 Hz and 3500 Hz shall be less than 2.5 ms.

5.2.1.12 Peak Deviation. The FM peak deviation shall be 5 kHz (±1 kHz) for narrowband and 20 kHz (±5 kHz) for wideband.

5.2.2 Transmitter Characteristics.

5.2.2.1 Occupied Bandwidth. Ninety-nine percent of the mean radiated power shall be contained within a bandwidth of 25 kHz for narrowband operation and 70 kHz for wideband operation.

5.2.2.2 Time Delays. The time delays shall not exceed the following:

a.	Transmitter attack time delay	25 ms maximum
b.	Transmitter release time delay	10 ms maximum
c.	Transmit-after-receive time delay	70 ms maximum

5.2.2.3 Transmitter Interfaces.

5.2.2.3.1 Local Audio Input Impedance. All transmit radio equipment shall have one local microphone or handset input with an impedance of 150 ohms unbalanced. This input shall have a minimum return loss of 26 dB against a 150-ohm resistance over the frequency range from 300 Hz to 3500 Hz. Additional balanced or unbalanced local audio inputs and strap options shall be optional.

5.2.2.3.2 Local Audio Input Signal Level. The transmit radio equipment shall process microphone/handset inputs between -35 dBm and +10 dBm.

5.2.2.3.3 Line Audio Input Impedance. Transmit radio equipment requiring a line audio input shall have at least one line input with an impedance of 600 ohms balanced, with a minimum return loss of 26 dB against a 600-ohm resistance over the frequency bandwidth from 300 Hz to 3500 Hz. The electrical symmetry should be sufficient to suppress longitudinal currents to a level which is at least 40 dB below reference level (-40 dBm0). Additional balanced or unbalanced local audio inputs and strap options shall be optional.

5.2.2.3.4 Line Audio Input Signal Level. The transmit radio equipment with line inputs installed shall process line audio input signals between -15 dBm and +10 dBm. The nominal audio input level shall be 0 dBm.

5.2.2.3.5 RF Output Impedance. The nominal RF output impedance shall be 50 ohms, unbalanced to ground. The transmitter shall deliver full rated output power over the operating range to a nominal 50-ohm unbalanced line with a maximum voltage standing wave ratio (VSWR) of 2.0:1 (DO 3.0:1). The transmitter shall not be damaged by operation into a load with a VSWR greater than 3.0:1, including the conditions of open and short circuit.

5.2.2.4 Transmitter Noise and Distortion.

5.2.2.4.1 Carrier Noise Level. The AM carrier noise level shall be at least 50 dB (DO 60 dB) below the unmodulated carrier level at full rated RF output power. The FM carrier noise level shall be at least 40 dB (DO 50 dB) below the carrier level at full rated RF output power. Measurements shall be taken with the audio input terminated into its characteristic impedance with no audio drive applied. The measuring device shall have the same bandwidth as the radio equipment, reference paragraph 5.2.1.7.

5.2.2.4.2 Harmonic Distortion. Any in-band harmonic distortion product produced by any single test signal within the operating audio input frequency range shall be a maximum of -33 dBm0 (DO -43 dBm0) at full rated RF output power. In the AM mode measurements shall be taken with the audio input signal adjusted to produce 90 percent modulation. Narrowband FM measurements shall be made with the audio input signal adjusted to produce a peak deviation of 5 kHz. Wideband FM measurements shall be made with the audio input signal adjusted to produce a peak deviation of 20 kHz.

5.2.2.4.3 Intermodulation Distortion. Any intermodulation distortion product produced by any two equal level audio tones within the operating audio input range shall be a maximum of -38 dBm0 at full rated RF output power. In the AM mode, measurements shall be made with the audio input signals adjusted to produce 90 percent modulation. Narrowband FM measurements shall be made with the audio input signals adjusted to produce a peak deviation of 5 kHz. Wideband FM measurements shall be made with the audio input signals adjusted to produce a peak deviation of 20 kHz.

5.2.2.4.4 Spurious Emissions. The out-of-band spurious emissions shall be at least 80 dB below the unmodulated carrier at full rated RF output power. In the AM mode, measurements shall be made with the operating audio input signal adjusted to produce 90 percent modulation. Narrowband FM measurements shall be made with the operating audio input signal adjusted to produce a peak deviation of 5 kHz. Wideband FM measurements shall be taken with the operating audio input signal adjusted to produce a peak deviation of 20 kHz. All measurements shall be taken outside the limits of 0.95f to 1.05f, where f is the carrier frequency.

5.2.3 Receiver Characteristics.

5.2.3.1 Time Delays. The time delays shall not exceed the following:

a.	Receiver attack time delay	40 ms maximum
b.	Receiver release time delay	40 ms maximum
c.	Receive-after-transmit time delay	60 ms maximum

5.2.3.2 Sensitivity. The sensitivity of the receiver over the specified frequency range shall be such that an RF input test signal applied to the antenna input results in a minimum output (S+N)/N ratio of 10 dB taken at the audio output. Narrowband measurements shall be made with an RF input test signal level of -103.5 dBm (1.5 microvolts into 50 ohms). Wideband measurements shall be made with an RF input test signal level of -101.0 dBm (2.0 microvolts into 50 ohms). AM measurements shall be made with 30 percent modulation. Narrowband FM measurements shall be made with a peak deviation of 5 kHz. Wideband FM measurements shall be made with a peak deviation of 20 kHz. All measurements shall be taken with a modulation rate of 1 kHz.

5.2.3.3 Selectivity. The 6-dB bandwidth shall be at least 24 kHz, the 60-dB bandwidth shall be no more than 50 kHz and the 100-dB bandwidth shall be no more than 2 MHz for narrowband modes. For wideband modes the 6-dB bandwidth shall be at least 70 kHz and the 60-dB bandwidth shall be no more than 140 kHz. The peak-to-peak ripple of the 6-dB bandwidth shall not exceed 3 dB.

5.2.3.4 Squelch. When receiver squelch is employed it shall not be dependent upon the addition of special characteristics to the transmitted signal in transceivers. The squelch circuit shall be able to control the switching of another radio for retransmission, and the attack time shall not be greater than 50 ms.

5.2.3.5 Receiver Protection. The receiver, with primary power on or off, shall not be damaged when subjected to continuously applied signals of up to +50 dBm (DO +56 dBm) of available power delivered from a 50-ohm source.

5.2.3.6 Receiver Interfaces.

5.2.3.6.1 Local Audio Output Impedance. The local audio output impedance shall be 600 ohms balanced, with a minimum return loss of 26 dB against a 600-ohm resistance over the frequency range from 300 Hz to 3500 Hz. The electrical symmetry shall be sufficient to suppress longitudinal currents to a level which is at least 40 dB below reference level (-40 dBm0). Additional balanced or unbalanced local audio inputs and strap options shall be optional.

5.2.3.6.2 Local Audio Output Signal Level. The local audio output signal level shall be continuously variable between -20 dBm and +12.5 dBm.

NOTE: Additional signal levels different from those cited or for automatic level or gain control may be established in the applicable equipment specifications.

5.2.3.6.3 Line Audio Output Impedance. Receive radio equipment requiring a line audio output shall have at least one line output with a nominal impedance of 600 ohms, balanced, with a minimum return loss of 26 dB against a 600-ohm resistance over the frequency range of 300 Hz to 3500 Hz. The electrical balance shall be sufficient to suppress longitudinal currents at least 40 dB below the reference signal level (-40 dBm0). Additional balanced or unbalanced local audio inputs and strap options shall be optional.

5.2.3.6.4 Line Audio Output Signal Level. The nominal receiver line audio output level shall be 0 dBm. For radio equipment designed to be used for digital communications, the level of the composite audio output shall not vary by more than 1.5 dB.

5.2.3.6.5 RF Input Impedance. The RF input impedance shall be a nominal 50 ohms, unbalanced to ground. The input VSWR, with respect to 50 ohms, shall not exceed 2.0:1 over the operating frequency range.

5.2.3.7 Receiver Noise and Distortion.

5.2.3.7.1 Harmonic Distortion. The in-band harmonic distortion produced by any single frequency test signal within the operating audio input range shall be at least 23 dB below reference level (-23 dBm0). The DO shall be -33 dBm0. In the AM mode, measurements shall be taken with an RF input signal that produces 90 percent modulation at full rated audio output. Narrowband FM measurements shall be taken with an RF input signal that produces a peak deviation of 5 kHz at full rated audio output. Wideband FM measurements shall be taken with an RF input signal that produces a peak deviation of 20 kHz at full rated audio output.

5.2.3.7.2 Intermodulation Distortion. The intermodulation distortion products produced by any two test frequencies within the operating audio input range shall be a minimum of 20 dB below the reference level (-20 dBm0) for narrowband, and a minimum of 40 dB below the reference level (-40 dBm0) for wideband. In the AM mode, measurements shall be taken with an RF input signal that produces 90 percent modulation at full rated audio output. Narrowband FM measurements shall be taken with an RF input signal that produces a peak deviation of 5 kHz at full rated audio output. Wideband FM measurements shall be taken with an RF input signal that produces a peak deviation of 20 kHz at full rated audio output.

5.2.3.7.3 Internally Generated Spurious Signals. Not standardized.

NOTE: Spurious signals generated internally in the receiver in the absence of RF input signals, shall have sufficiently low levels to allow unrestricted tuning and reception of wanted signals in any channel. Detailed requirements shall be stated in the equipment specifications.

5.2.3.7.4 Hum and Noise Levels. The hum and noise levels measured at the receiver output shall be at least 40 dB below the reference level (-40 dBm0). The DO shall be -50 dBm0.

5.2.3.7.5 Spurious Response. The receiver response to spurious signals, including image response, shall be attenuated not less than 80 dB with respect to the received signal.

5.3 UHF Single Channel Survival Radio Equipment. The international survival frequency, 243.0 MHz, is within the military UHF frequency band. Such equipment includes a line-of-sight (LOS) antenna. The requirements contained in this document for single channel survival radio equipment have been based on, and are compatible with, the standards set forth by the ICAO.

5.3.1 Frequency. Survival radio equipment shall operate on the frequency of 243.0 MHz.

5.3.2 Frequency Tolerance. The frequency tolerance shall not exceed 0.005 percent.

5.3.3 Emission Requirements. The antenna emission shall be vertically polarized and omnidirectional in the horizontal plane.

5.3.4 Minimum Radiated Power. The radio's prime power source shall have the capability such that, over a 24-hour period of continuous operation, the mean radiated power shall at no time be less than 100 mW.

5.3.5 Emission Type. The type of emission shall be A2A. A3E shall be permitted in addition to A2A.

5.3.6 Emission Interruption. The duration of interruption of the emission, if any, shall be such that it will not prejudice the detection and precise location of the survival radio by the homing equipment.

5.3.7 Modulation. The carrier shall be amplitude modulated by a factor of at least 85 percent.

5.3.8 Audio Characteristics. The emission shall have a distinctive audio characteristic achieved by modulating the carrier with a varying audio frequency. The audio frequency shall sweep downward from a higher frequency to a lower frequency. The higher frequency and the lower frequency shall be separated by not less than 700 Hz. Both the higher frequency and the lower frequency shall be within the range of 1600 Hz to 300 Hz. The sweep pattern shall be repeated at a rate of between two to four sweeps per second.

5.4 Emergency Location Beacon-Aircraft (ELBA). ELBA single channel UHF radio equipment is used in search and rescue missions for downed aircraft. The requirements contained in this document for single channel ELBA radio equipment have been based on, and are compatible with, the standards set forth by the ICAO.

5.4.1 Frequency. Emergency location beacon-aircraft shall operate on the frequency of 243.0 MHz.

5.4.2 Frequency Tolerance. The frequency tolerance shall not exceed ±0.001 percent.

5.4.3 Emission Requirements. The antenna emission from a beacon under normal conditions and attitudes of the antenna shall be vertically polarized and omnidirectional in the horizontal plane.

5.4.4 Minimum Radiated Power. The radio's prime power source shall have the capability such that, over a period of 48 hours of continuous operation, at an operating temperature of -20 degrees Celsius, the mean radiated power shall at no time be less than 7.5 mW.

5.4.5 Emission Type. The type of emission shall be A2. Any other type of modulation that meets the requirements of paragraphs 5.4.6, 5.4.7, and 5.4.8 may be used, provided that it will not prejudice the precise location of the beacon by homing equipment.

5.4.6 Emission Interruption. The duration of interruption of the emission, if any, shall be such that it will not prejudice the detection and precise location of the survival radio by the homing equipment.

5.4.7 Modulation. The carrier shall be amplitude modulated by a factor of at least 85 percent.

5.4.8 Audio Characteristics. The emission shall have a distinctive audio characteristic achieved by modulating the carrier with a varying audio frequency. The audio frequency shall sweep downward from a higher frequency to a lower frequency. The higher frequency and the lower frequency shall be separated by not less than 700 Hz. Both the higher frequency and the lower frequency shall be within the range of 1600 Hz to 300 Hz. The sweep pattern shall be repeated at a rate of between two to four sweeps per second.

APPENDIX

ABBREVIATIONS AND ACRONYMS

This appendix contains a list of abbreviations and acronyms used in MIL-STD-188-243. Appendix B is a non-mandatory part of this standard.

ABCA	American-British-Canadian-Australian
AM	amplitude modulation
ASCC	Air Standardization Coordinating Committee
BER	bit error ratio
CW	continuous wave
dB	decibel
dBm	dB, referenced to 1 mW
dBm0	dBm0, referenced to zero transmission level point (0TLP)
DCA	Defense Communications Agency
DCS	Defense Communications System
DO	design objective
DoD	Department of Defense
DoDISS	DoD Index of Specifications and Standards
ECCM	electronic counter-countermeasures
ELBA	emergency location beacon-aircraft
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EMP	electromagnetic pulse
EW	electronic warfare
f	center frequency
FED-STD	Federal Standard
FM	frequency modulation
FSK	frequency shift keying
Hz	Hertz, (1 Hz = 1 cycle per second)
ICAO	International Civil Aviation Organization
IF	intermediate frequency
IRAC	Interdepartment Radio Advisory Committee
ITU	International Telecommunication Union
JCS	Joint Chiefs of Staff
kHz	kilohertz, (1 kHz = 1000 Hz)
LOS	line-of-sight

MCEB	Military Communications Electronics Board
MHz	megahertz, (1 MHz = 1000 kHz)
MIL-STD	military standard
ms	millisecond(s), (1 ms = 1/1000 s)
mW	milliwatt (1 mW = 1/1000 W)
NATO	North Atlantic Treaty Organization
NMCS	National Military Command System
NTIA	National Telecommunications and Information Administration
ppm	parts per million
PSK	phase shift keying
QSTAG	Quadripartite Standardization Agreement (of the ABCA Armies)
RATT	Radio Teletypewriter
RF	radio frequency
(S+N)/N	signal plus noise-to-noise ratio
SATCOM	satellite communications
STANAG	Standardization Agreement (of the NATO)
TADIL	Tactical Digital Information Link
UHF	ultra high frequency, (300 MHz to 3000 MHz)
VF	Voice Frequency
VHF	very high frequency, (30 MHz to 300 MHz)
VSWR	voltage standing wave ratio
WARC	World Administrative Radio Conference
wpm	words per minute
0TLP	Zero Transmission Level Point

CONCLUDING MATERIAL

International Interest. Certain provisions of this standard (see 4.3) are the subject of international standardization agreements (STANAGs 4202, 4205 and 5020, QSTAG 263C, and AIR-STD-19/4). When an amendment, revision, or cancellation of this standard is proposed which will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels, including departmental standardization offices, to change the agreement or make other appropriate accommodations.

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Preparing activity:
Air Force — 90

(Project TCTS-2430)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

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1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-STD-188-243	INTEROPERABILITY AND PERFORMANCE STANDARDS FOR TACTICAL SINGLE CHANNEL ULTRA HIGH FREQUENCY RADIO COMMUNICATIONS

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a. Paragraph Number and Wording:

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c. Reason/Rationale for Recommendation:

6. REMARKS

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