PERFORMANCE SPECIFICATION
FOR THE
NEXT GENERATION MARINE CORPS GROUND EA SYSTEM
NGMCGEAS

19 February 2010 Draft

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Marine Corps Systems Command

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1. SCOPE

This specification covers the performance and acceptance requirements for the development, integration and testing of the Next Generation Marine Corps Ground EA System (NGMCGEAS).

1.1 System Overview

The Next Generation Marine Corps Ground EA System- (NGMCGEAS), a system of Commercial Off-the-Shelf (COTS), Non-Developmental Items (NDI), and Government Off-the-Shelf (GOTS) components, is designed to support the Marine Air-Ground Task Force (MAGTF) Commander in conducting operations. It provides the capability to effectively detect, deny, degrade, and attack, through the use of electromagnetic or directed energy, the enemy's communication systems in support of the commander's Information Operations (IO) plan. The system is a replacement for the existing AN/ULQ-30 and prosecutes the mission of detecting, denying, degrading, and attacking the enemy through the use of the electromagnetic spectrum and thereby disrupting his command and control system.

The NGMCGEAS **shall** provide the capability to operate within the bandwidth of 20MHz to 8GHz and utilize open architecture standards, which will allow NGMCGEAS to be compatible with future technology that allows NGMCGEAS to operate in a wider frequency range of 2MHz to 18GHz against enemy emitters that utilize modulation schemes as specified within the Signals List.

NGMCGEAS **shall** provide a system that allows for interoperability and cost effective evolutional upgrades over the entire life cycle of the system without dependence upon a single source. NGMCGEAS **shall** deploy a system characterized by life-long viability, a standard-based and robust architecture, and capability to insert new technology based on the cycle rates of the ensuing technologies in system components.

NGMCGEAS **shall** use modular open systems approach to:

- Facilitate development of a modular architecture and allow for affordable intra-operability
- Ensure that the system design is sufficiently flexible and robust to accommodate changing technology and requirements
- Facilitate integration with other systems and use of commercial products from multiple sources both in the initial design and in future enhancements
- Enable technology insertion as currently available commercial products mature and new commercial products become available in the future
- Allow continued access to technologies and products supported by many suppliers (a broad industrial base which does not restrict available sources to the detriment of competition)
- Enable evolutionary system improvements through upgrades of individual hardware or software modules with newer modular components without redesign of entire systems or large portions thereof.

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- Mitigate the risks associated with technology obsolescence, being locked into proprietary technology, and reliance on a single source of supply over the life of the system.

2 APPLICABLE DOCUMENTS

2.1 General

The documents listed in this section are listed in Sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or documents recommended for additional information or used as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that all specified requirements documents cited in Sections 3 and 4 of this specification, are to be met as indicated, whether or not the documents are listed.

2.2 Government Documents

2.2.1 Military Specifications, Standards, and handbooks

The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the Department of Defense (DOD) Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

2.2.2 Military Standards and Specifications - Mandatory Compliance

2.2.3 Other Government Documents, Drawings and Publications - Mandatory Compliance

Other Government documents, drawings, and publications form a part of this document to the extent specified herein.

2.2.3-1 CDD for the CESAS System, 07-July-06 (Update in process)

2.2.4 Other Government Documents, Drawings and Publications - Guidance Only

Other Government documents, drawings, and publications form a part of this document to the extent specified herein.

2.2.4-1 (For copies of NSTISSAM documents, U.S. Government contractors should contact their Contracting Officer Representative regarding distribution of these documents. Code of Federal Regulations (CFR) Titles, Volumes, and Chapters can be found at: “hppt://www.access.gpo.gov/nara/cfr/cfr-table-search.html”)

2.2.4-2 DODI 5000.2 - Operation of the Defense Acquisition System, 08 December 2008

2.3 Non-Government Publications

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents, which are DoD adopted, are those listed in the

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issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the document cited in the solicitation.

2.3-1 (Requests for ASTM D 3951 should be addressed to the American Society for Testing and Materials, 1916 Race, Street, Philadelphia, PA 19103-1187. Requests for American Conference of Government Industrial Hygienists, Inc. catalog are On-line at "http://www.acgih.org/". Requests for Institute of Electrical and Electronic Engineer / Electronics Industries Association (IEEE/EIA) documents can be purchased on-line at "http://www.ieee.org/prod_svcs.html" and from various publishers of Commercial and Industry standards and documents.)

2.3-2 SDR, OMG, JTRS JPEO documents

a. PIM (Platform Independent Model) and PSM (Platform Specific Model) for Smart Antenna Specification

b. Transceiver Facility Specification

c. Test and Certification Guide for SDRs based on SCA Part 1: SCA

d. Requirements for Radio Software Download for RF Reconfiguration (SDRF-02-S-007-V1.0.0)

e. Transceiver Facility Specification (SDRF-08-S-0008-V1.0.0)

f. The Unified Modeling Language (UML), defined by the Object Management Group (OMG), is used to graphically represent Software Communication Architecture interfaces, operational scenarios, use cases, and collaboration diagrams.

2.3-3 Other Institute of Electrical and Electronic Engineering (IEEE) Standards and/or IEEE Working Groups:

- IEEE Standards Coordinating Committee 41 (Dynamic Spectrum Access Networks)
- IEEE 1900.1 Working Group on Terminology and Concepts for Next Generation Radio Systems and Spectrum Management
- IEEE 1900.2 Working Group on Recommended Practice for Interference and Coexistence Analysis - this standard will provide technical guidelines for analyzing the potential for coexistence or in contrast interference between radio systems operating in the same frequency band or between different frequency bands.
- IEEE 1900.3 Working Group on Recommended Practice for Conformance Evaluation of Software Defined Radio (SDR) Software Modules -this recommended practice will provide technical guidelines for analyzing Software Defined Radio (SDR) software modules to ensure compliance with regulatory and operational requirements.
- IEEE 1900.4 Working Group on Architectural Building Blocks Enabling Network-Device Distributed Decision Making for Optimized Radio Resource Usage in Heterogeneous Wireless Access Networks
- IEEE 1900.6 Working Group on Spectrum Sensing Interfaces and Data Structures for Dynamic Spectrum Access and other Advanced Radio

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Communication Systems - the intended standard defines the information exchange between spectrum sensors and their clients in radio communication systems. The logical interface and supporting data structures used for information exchange are defined abstractly without constraining the sensing technology, client design, or data link between sensor and client.

2.4 Requirements Flowdown from Referenced Documents

2.4.1 CESAS Capabilities Development Document (CDD)

The major reference for this Performance Specification is the CESAS CDD Dated 07-July-06 (In progress Update). The CDD sets out the threshold and objective requirements for the CESAS System.

2.5 Precedence

In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets), the text of this specification takes precedence. Nothing in this specification; however supersedes applicable laws and regulations unless a specific exemption has been obtained. The order of precedence of documents is:

The procurement contract.
The requirements contained in this specification.

The requirements contained in documents referenced in this specification.

2.6 Requirements Levels

Requirement levels established herein are either “threshold” or “objective”.

2.6.1 Threshold Requirements

Threshold Requirements represent the minimum functional or performance capabilities that the system must exhibit in order to meet signal environment, operational, and customer requirements. Threshold requirements include the word “**shall**.”

2.6.2 Objective Requirements

Objective Requirements represent functional or performance capabilities that are desired in order to more fully meet signal environment, operational, and customer requirements both now and in the future and/or are expected capabilities that the system **will** exhibit as a result of inherent technological capability. Objective requirements include the word “**will**”. Objective requirements may be traded off in the design process for a decreased capability in order to enhance other system parameters, enhance probability of system success, limit system cost, meet schedule deadlines, et cetera.

3 Mission Requirements

3.1 Functional Requirements

While all functional and performance requirements refer to the system, the developing contractor is responsible only for the contractor developed items and the overall integration of the NGMCGEAS. The system **shall** comply with DODI 5000.2. As this specification is

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provided to meet Engineering Development Model (EDM) and Production Model systems, the use of threshold and objective refers to the performance requirements that shall meet the threshold requirements of the CESAS Capability Development Document (CDD). Objective performance specifications are to be met in follow-on upgrades and product improvements of the NGMCGEAS and are not required to be met at this time, unless the upgrade/improvement has been incorporated. As this specification identifies the use of COTS equipment, the Contractor must identify the limitations of the COTS equipment (Government testing, manufacturer testing, analysis, etc), with respect to the Military Standards (MIL-STD) identified in the specification. All test results obtained from testing COTS equipment through Government testing, manufacturer testing, analysis, etc, **shall** be identified to the Government Program Manager (PM), for Government approval prior to integration. As well, the use of COTS that does not meet the MIL-STD requirements specified **shall** be identified to the Government Program Manager (PM), for Government approval prior to integration.

3.1.1 Missions

The NGMCGEAS can expect to be employed across the spectrum of conflict in geographical areas exhibiting extremes of physical environment and climatic conditions. NGMCGEAS has the ability to be employed in a stationary position or while on-the-move. The typical Mission Duration (MD) is estimated to be 16 hours. The typical transmitting/jamming mission is estimated to be 2.4 hours for combat and 9.6 hours for peacetime. This assumes that NGMCGEAS is transmitting, therefore NGMCGEAS **shall** be capable of surviving constant transmit for 10 hours. NGMCGEAS **will** be capable of surviving constant transmit for 24 hours.

3.2 Required States and Modes

The two states that NGMCGEAS **shall** employ are:

- non-operational (storage, transport)
- operational (stationary and on-the-move).

3.2.1 Stationary Mode

In Stationary Mode NGMCGEAS equipment **shall** be fully installed into and on the vehicle and the antenna(s) is/are deployed for attack operations. Subsystem **shall** provide operator interface for selectable stationary modes of operations.

a. Required to re-configure for detection and mission execution of the signal type contained in the new mission tasking message. NGMCGEAS **will** be required to determine:

    i. NGMCGEAS system **will** determine utilization factor; existing resources also handling new mission tasking

    ii. NGMCGEAS **will** determine if utilization factor requires reallocation of resources; new task priority versus current missions execution tasking

        i. Via software parameters download and re-configure software defined Hardware equipment in order to prosecute new mission tasking utilizing Techniques, Tactics and Procedures defined or detailed in the new tasking message

        ii. May also require re-configuring antenna via software control as part of reduction of RF-fratricide by selecting an appropriate antenna pattern

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iii. NGMCGEAS **will** reply to originator of new mission tasking with estimated effective radiated power and antenna pattern required for completing new mission tasking (via utilization of specific antenna pattern chosen based on Technique, Tactic or Procedure elected to be most effective given mission parameters).

3.2.2 On-The-Move Mode

In On-The-Move Mode NGMCGEAS equipment **shall** be fully installed into and on the vehicle for on-the-move operations. Subsystem **shall** provide operator interface for selectable on-the-move modes of operations.

b. Required to re-configure for detection and mission execution of the signal type contained in the new mission tasking message. NGMCGEAS **will** be required to determine:

   i. NGMCGEAS system **will** determine utilization factor; existing resources also handling new mission tasking

   ii. NGMCGEAS **will** determine if utilization factor requires reallocation of resources; new task priority versus current missions execution tasking

      i. Via software parameters download and re-configure software defined Hardware equipment in order to prosecute new mission tasking utilizing Techniques, Tactics and Procedures defined or detailed in the new tasking message

      ii. May also require re-configuring antenna via software control as part of reduction of RF-fratricide by selecting an appropriate antenna pattern

   iii. NGMCGEAS **will** reply to originator of new mission tasking with estimated effective radiated power and antenna pattern required for completing new mission tasking (via utilization of specific antenna pattern chosen based on Technique, Tactic or Procedure elected to be most effective given mission parameters).

3.2.3 Reconfiguring Between Stationary and On-The-Move Modes

The NGMCGEAS **shall** be able to switch between On-The-Move operations and stationary operations in less than 20 minutes.

3.2.4 Emergency Displacement

The NGMCGEAS **shall** be capable of emergency displacement (to move physically out of position) within 1 minute. *** Note: During emergency displacement equipment may be damaged and/or lost.**

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3.2.5 Operating Power (All Modes)

The NGMCGEAS **shall** operate from standard 24VDC vehicle power, and with a maximum power draw no greater than 3KW.

4 System Capabilities (Threshold)

4.1 Key Performance Parameters (KPP).

4.1.1 Net Ready

Assesses the information needs, information timelines, information assurance, and net-ready attributes required for both the technical exchange of information and the end-to-end operational effectiveness of that exchange. The NR-KPP is comprised of the following elements: (CJCSI 3170.01G)

1. Compliance with the Net-Centric Operations and Warfare Reference Model
2. Compliance with applicable Global Information Grid key interface profiles
3. Verification of compliance with the Department of Defense information assurance requirements
4. Supporting integrated architecture products required to assess information exchange for a given capability

The NR-KPP assesses information needs, information timeliness, information assurance, and net-ready attributes required for both the technical exchange of information and the end-to-end operational effectiveness of that exchange. The NR-KPP consists of measurable and testable characteristics and/or performance metrics required for timely, accurate, and complete exchange and use of information to satisfy information needs for a given capability. The NR-KPP is comprised of the following elements:

a. Compliance with the Net-Centric Operations and Warfare Reference Model.

b. Compliance with applicable Global Information Grid key interface profiles.

c. Verification of compliance with DOD information assurance requirements.

d. Supporting integrated architecture products required to assess information exchange and use for a given capability.

Net-Ready Key Performance Parameter (NR-KPP) - The NR-KPP is a key, measurable, performance parameter stating a system's information needs, information timeliness, information assurance, and net-ready attributes required for both the technical exchange of information needs, information timeliness, information assurance, and net-ready attributes required for both the technical exchange of information and the end-to-end operational effectiveness of that exchange. The NR-KPP consists of verifiable performance measures and associated metrics required to evaluate the timely, accurate, and complete exchange and use of information to satisfy information needs for a given capability. The NR-KPP is comprised of the following elements: compliance with the Net-Centric Operations and Warfare (NCOW) Reference Model (RM) (reference m), supporting integrated architecture products (references n and o) required to assess information exchange and operationally effective use for a given capability, compliance with applicable Global Information Grid (GIG) Key Interface Profiles (KIPs)

(http://kips.disa.mil), and verification of compliance with DOD information assurance requirements (references p through u).

4.1.1.1 Timing Data

System **shall** be able to obtain timing data from a Government GPS device for the communications data network. System **shall** be able to obtain positioning data from Government GPS device. The system **shall** automatically obtain Joint Force network timing.

4.1.1.2 Comply with mandated Joint Standards

System **shall** comply with the Joint Technical Architecture (JTA) standards outlined in the DoD Information Technology Standards and Profile Registry (DISR) profile for this capability.

4.1.1.3 Information Assurance

System and software **shall** be certified and accredited for SCI through NSA and SSO Navy and accredited for GENSER through DIA as required.

4.1.1.4 Database Functionality

System **shall** be capable of exporting data in a tabular, ASCII format.

Database **shall** be searchable locally and remotely utilizing the appropriate standards from the IC community **shall** be searchable via a web interface. Web interface **will** require secure sign on for logging purposes and to determine appropriateness of search request.

4.1.1.5 Communications with SIGINT/EW Systems

System **shall** communicate via secure voice and data via Wide Area Network (WAN) with the TCAC and other System of SIGINT Systems (SoSS) systems including NGMCGEAS, MEWSS, RREP, TPCS-MPC given full mission capable communications and compatible SIGINT software baseline.

4.1.1.6 Provide tools to facilitate mission planning, preparation, configuration, and tasking

System **shall** have tools to facilitate receipt and display of:

- Tasking,
- Mission area
- Country data
- Text files
- Frequency lists
- GPS input
- Map data
- Embedded training
- RF propagation
- On-line library descriptions of target(s) at layer 1 and 2 in the protocol stack – **will** assist operator in determining cause and effect of using a specified technique or procedure

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- Built-in-Test

4.1.1.7 Provide a collaborative tool

System **shall** provide chat (instant message exchange) for external technical collaboration given full mission capable communications and bandwidth.

4.1.1.8 Provide a Local Area Network (LAN)

System **shall** be able to incorporate an internal secure LAN (Server and one or more client positions).

4.1.1.9 XML Metadata Standards

All NGMCGEAS data that will be exchanged **shall** be tagged in accordance with the JTA/DISR standard for tagged data items (XML, the current JTA/DISR standard), and tags **shall** be registered in accordance with the DoD XML registry and clearinghouse policy implementation plan.

4.1.2 Signals Detection

The system **shall** detect threshold Signal of Interest (SOI) or signal types as identified in Appendix E of the CESAS CDD. The system **shall** demonstrate the ability to detect a minimum of 80 percent of those SOIs/signal types the Ground Truth Platform collects within each mission during testing.

a. Required to re-configure for detection and mission execution of the signal type contained in the new mission tasking message. NGMCGEAS **will** be required to determine:

    i. NGMCGEAS system **will** determine utilization factor; existing resources also handling new mission tasking

    ii. NGMCGEAS **will** determine if utilization factor requires reallocation of resources; new task priority versus current missions execution tasking

        a. Via software parameters download and re-configure software defined Hardware equipment in order to prosecute new mission tasking utilizing Techniques, Tactics and Procedures defined or detailed in the new tasking message

        b. May also require re-configuring antenna via software control as part of reduction of RF-fratricide by selecting an appropriate antenna pattern

    iii. NGMCGEAS **will** reply to originator of new mission tasking with estimated effective radiated power and antenna pattern required for completing new mission tasking (via utilization of specific antenna pattern chosen based on Technique, Tactic or Procedure selected to be most effective given mission parameters).

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4.1.2.1 Perform Signals Search and Detection

System **shall** provide the capability for operators to search and detect within 20MHz to 8GHz of the electromagnetic spectrum signal types identified in Appendix E of the CESAS CDD. System **will** provide the capability to search and detect within 2MHz to 18GHz. Subsystem specification **shall** provide a search capability through a spectrum display and operator interface GUI. Subsystem specification **shall** provide detection and demodulation capability for signal types identified in Appendix E of the CESAS CDD

a. Required to re-configure for detection and mission execution of the signal type contained in the new mission tasking message. NGMCGEAS **will** be required to determine:

   i. NGMCGEAS system **will** determine utilization factor; existing resources also handling new mission tasking

   ii. NGMCGEAS **will** determine if utilization factor requires reallocation of resources; new task priority versus current missions execution tasking

      a. Via software parameters download and re-configure software defined Hardware equipment in order to prosecute new mission tasking utilizing Techniques, Tactics and Procedures defined or detailed in the new tasking message

      b. May also require re-configuring antenna via software control as part of reduction of RF-fratricide by selecting an appropriate antenna pattern

   iii. NGMCGEAS **will** reply to originator of new mission tasking with estimated effective radiated power and antenna pattern required for completing new mission tasking (via utilization of specific antenna pattern chosen based on Technique, Tactic or Procedure selected to be most effective given mission parameters).

4.1.2.2 Tune a receiver

System **shall** provide the capability for operators to tune a receiver to a selected frequency between 20MHz to 8GHz. System **will** provide the capability for operators to tune a receiver to a selected frequency between 2MHz to 18GHz

4.1.2.3 Program and Prioritize SOI or Signal Type

System **shall** allow operator to program and prioritize a minimum of 20 SOIs or signal types.

4.1.2.4 Alert Operator of active SOI or Signal Type

System **shall** automatically notify operator upon detection of SOIs or signal types.

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4.1.2.5 Self-Location

System **shall** be capable of self-location from a Government GPS device, and **shall** provide automated and manual means to enter positional data.

4.1.3 Electronic Attack

The system **shall** attack to deny, disrupt, and degrade threshold SOI or signal types as identified in Appendix E of the CESAS CDD. The system **shall** attack 100 percent of those SOIs/signal types that were detected. Successful disruption **shall** be considered meeting 30% of 20-30MHz and 80% of 31MHz -8GHz.

In addition to the traditional techniques, tactics and procedures for Electronic Attack (Reactive, Barrage, Swept) the system **shall** also be capable of:

> Within a stream of data the system **shall** be able to execute a mission for either a single target or group of targets.

NGMCGEAS **will** incorporate Algorithms, Techniques, Tactics and Procedures that **will** be agnostic of layer 1 (Physical Layer) or layer 2 (Data Link Layer) in the protocol stack (OSI or TCP/IP); examples are:

1. modulation agnostic
2. protocol reservation scheme (TDMA, FDMA, CDMA, etc)
3. forward or reverse management schemes
    a. In-band or out-of-band signaling schemes

NGMCGEAS **will** be capable of adjusting the Effective Radiated Power via the Algorithms, Techniques, Tactics and Procedures such that Effective Radiated Power is sufficient for mission execution.

The NGMCGEAS **shall** be able to adjust the Effective Radiated Power in such a way that NGMCGEAS shall not interfere with other users, groups, transceivers, etc. (agnostic of modulation, diversity, reservation scheme utilized by mission target)

NGMCGEAS **shall** be able to reduce Effective Radiated Power, reduce the pattern of Effective Radiated Power and the cyclic nature of the Effective Radiated Power while still successfully executing mission targets.

a. The pattern of Effective Radiated Power **shall** be controllable and adaptive in real time, thus allowing execution of sequential missions located in different areas, and targets that are subject to different environmental effects.
b. Cyclic nature of the Effective Radiated Power **will** be controllable and adaptive in real time such that mission prosecution **will** be successful and the RF Fratricide is either non-existent or minimal.
c. Effective Radiated Power **will** be evolutional and adaptive so as to complete assigned mission scenario but reduce/eliminate RF Fratricide. Additional benefit **will** be reduction in signature, increased system usage because of reduction in RF Fratricide.

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NGMCGEAS **will** describe the Algorithms, Techniques, Tactics and Procedures that will allow Measurements of Effectiveness (MOEs) of Algorithms, Techniques, Tactics and Procedures to be collected, analyzed.

d. MOE collection and analysis **will** not impact performance of mission scenario.

e. MOE alerts **will** be displayed to the operator for determination of appropriateness of algorithm, technique, tactic and procedure in mission scenario.

Objective for non-classical jamming algorithms, techniques, tactics and procedures is Subtle Jamming, whose definition "Subtle jamming is not obvious; …. They cannot receive an incoming friendly signal, even though everything appears normal to the radio operator".

4.1.3.1 Attack SOI or Signal Type

System **shall** provide the capability to disrupt, deny, or degrade threshold signal types as defined and listed in Appendix E of the CESAS CDD with following effectiveness:
20-30MHz – 30%
31MHz-8GHz – 80%

In addition to the traditional techniques, tactics and procedures for Electronic Attack (Reactive, Barrage, Swept) the system **shall** also be capable of:

Within a stream of data the system **shall** be able to execute a mission for either a single target or group of targets.

NGMCGEAS **will** incorporate Algorithms, Techniques, Tactics and Procedures that **will** be agnostic of layer 1 (Physical Layer) or layer 2 (Data Link Layer) in the protocol stack (OSI or TCP/IP); examples are:

1. modulation agnostic
2. protocol reservation scheme (TDMA, FDMA, CDMA, etc)
3. forward or reverse management schemes
    a. In-band or out-of-band signaling schemes

NGMCGEAS **will** be capable of adjusting the Effective Radiated Power via the Algorithms, Techniques, Tactics and Procedures such that Effective Radiated Power is sufficient for mission execution.

The NGMCGEAS **shall** be able to adjust the Effective Radiated Power in such a way that NGMCGEAS shall not interfere with other users, groups, transceivers, etc. (agnostic of modulation, diversity, reservation scheme utilized by mission target)

NGMCGEAS **shall** be able to reduce Effective Radiated Power, reduce the pattern of Effective Radiated Power and the cyclic nature of the Effective Radiated Power while still successfully executing mission targets.

f. The pattern of Effective Radiated Power **shall** be controllable and adaptive in real time, thus allowing execution of sequential missions located in different areas, and targets that are subject to different environmental effects.

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g. Cyclic nature of the Effective Radiated Power **will** be controllable and adaptive in real time such that mission prosecution **will** be successful and the RF Fratricide is either non-existent or minimal.

h. Effective Radiated Power **will** be evolutional and adaptive so as to complete assigned mission scenario but reduce/eliminate RF Fratricide. Additional benefit **will** be reduction in signature, increased system usage because of reduction in RF Fratricide.

NGMCGEAS **will** describe the Algorithms, Techniques, Tactics and Procedures that will allow Measurements of Effectiveness (MOEs) of Algorithms, Techniques, Tactics and Procedures to be collected, analyzed.

i. MOE collection and analysis **will** not impact performance of mission scenario.

j. MOE alerts **will** be displayed to the operator for determination of appropriateness of algorithm, technique, tactic and procedure in mission scenario.

Objective for non-classical jamming algorithms, techniques, tactics and procedures is Subtle Jamming, whose definition "Subtle jamming is not obvious; …. They cannot receive an incoming friendly signal, even though everything appears normal to the radio operator".

4.1.3.2 "Stop Buzzer" capability

System **shall** provide a remote shutdown "Stop Buzzer" capability, during all modes of operation, which will enable a designated authority to interrupt NGMCGEAS jamming via HF, VHF, UHF, and/or SHF (SHF between 3GHz to 8GHz) radio communications if necessary to prevent inadvertent interference with friendly communications.

4.1.3.3 Stationary Mode EA (automatic/omni-directional)

The NGMCGEAS **shall** conduct automatic, omni-directional attack from 20MHz to 8GHz while in Stationary Mode. The NGMCGEAS **will** conduct automatic, omni-directional attack from 2MHz to 18GHz while in Stationary Mode.

a. Required to re-configure for detection and mission execution of the signal type contained in the new mission tasking message. NGMCGEAS **will** be required to determine:

i. NGMCGEAS system **will** determine utilization factor; existing resources also handling new mission tasking

ii. NGMCGEAS **will** determine if utilization factor requires reallocation of resources; new task priority versus current missions execution tasking

a. Via software parameters download and re-configure software defined Hardware equipment in order to prosecute new mission tasking utilizing Techniques, Tactics and Procedures defined or detailed in the new tasking message

b. May also require re-configuring antenna via software control as part of reduction of RF-

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fratricide by selecting an appropriate antenna pattern

iii. NGMCGEAS **will** reply to originator of new mission tasking with estimated effective radiated power and antenna pattern required for completing new mission tasking (via utilization of specific antenna pattern chosen based on Technique, Tactic or Procedure selected to be most effective given mission parameters).

4.1.3.4 Stationary Mode EA (manual/omni-directional)

The NGMCGEAS **shall** conduct manual, omni-directional attack from 20MHz to 8GHz while in Stationary Mode. The NGMCGEAS **will** conduct manual, omni-directional attack from 2MHz to 18GHz while in Stationary Mode.

a. Required to re-configure for detection and mission execution of the signal type contained in the new mission tasking message. NGMCGEAS **will** be required to determine:

i. NGMCGEAS system **will** determine utilization factor; existing resources also handling new mission tasking

ii. NGMCGEAS **will** determine if utilization factor requires reallocation of resources; new task priority versus current missions execution tasking

a. Via software parameters download and re-configure software defined Hardware equipment in order to prosecute new mission tasking utilizing Techniques, Tactics and Procedures defined or detailed in the new tasking message

b. May also require re-configuring antenna via software control as part of reduction of RF-fratricide by selecting an appropriate antenna pattern

iii. NGMCGEAS **will** reply to originator of new mission tasking with estimated effective radiated power and antenna pattern required for completing new mission tasking (via utilization of specific antenna pattern chosen based on Technique, Tactic or Procedure selected to be most effective given mission parameters).

4.1.3.5 Stationary Mode EA (automatic/directional)

The NGMCGEAS **shall** conduct automatic, directional attack from 20MHz to 8GHz while in Stationary Mode. The NGMCGEAS **will** conduct automatic, directional attack from 2MHz to 18GHz while in Stationary Mode.

a. Required to re-configure for detection and mission execution of the signal type contained in the new mission tasking message. NGMCGEAS **will** be required to determine:

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i. NGMCGEAS system **will** determine utilization factor; existing resources also handling new mission tasking

ii. NGMCGEAS **will** determine if utilization factor requires reallocation of resources; new task priority versus current missions execution tasking

a. Via software parameters download and re-configure software defined Hardware equipment in order to prosecute new mission tasking utilizing Techniques, Tactics and Procedures defined or detailed in the new tasking message

b. May also require re-configuring antenna via software control as part of reduction of RF-fratricide by selecting an appropriate antenna pattern

iii. NGMCGEAS **will** reply to originator of new mission tasking with estimated effective radiated power and antenna pattern required for completing new mission tasking (via utilization of specific antenna pattern chosen based on Technique, Tactic or Procedure selected to be most effective given mission parameters).

4.1.3.6 Stationary Mode EA (manual/directional)

The NGMCGEAS **shall** conduct manual, directional attack from 20MHz to 8GHz while in Stationary Mode. The NGMCGEAS **will** conduct manual, directional attack from 2MHz to 18GHz while in Stationary Mode.

a. Required to re-configure for detection and mission execution of the signal type contained in the new mission tasking message. NGMCGEAS will be required to determine:

i. NGMCGEAS system **will** determine utilization factor; existing resources also handling new mission tasking

ii. NGMCGEAS **will** determine if utilization factor requires reallocation of resources; new task priority versus current missions execution tasking

a. Via software parameters download and re-configure software defined Hardware equipment in order to prosecute new mission tasking utilizing Techniques, Tactics and Procedures defined or detailed in the new tasking message

b. May also require re-configuring antenna via software control as part of reduction of RF-fratricide by selecting an appropriate antenna pattern

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iii. NGMCGEAS **will** reply to originator of new mission tasking with estimated effective radiated power and antenna pattern required for completing new mission tasking (via utilization of specific antenna pattern chosen based on Technique, Tactic or Procedure selected to be most effective given mission parameters).

4.1.3.7 On-The-Move Mode EA (automatic/omni-directional)

The NGMCGEAS **shall** conduct automatic, omni-directional attack from 20MHz to 8GHz while in On-The-Move Mode. The NGMCGEAS **will** conduct automatic, omni-directional attack from 2MHz to 18GHz while in On-The-Move Mode.

a. Required to re-configure for detection and mission execution of the signal type contained in the new mission tasking message. NGMCGEAS **will** be required to determine:

   i. NGMCGEAS system will determine utilization factor; existing resources also handling new mission tasking

   ii. NGMCGEAS **will** determine if utilization factor requires reallocation of resources; new task priority versus current missions execution tasking

      a. Via software parameters download and re-configure software defined Hardware equipment in order to prosecute new mission tasking utilizing Techniques, Tactics and Procedures defined or detailed in the new tasking message

      b. May also require re-configuring antenna via software control as part of reduction of RF-fratricide by selecting an appropriate antenna pattern

   iii. NGMCGEAS **will** reply to originator of new mission tasking with estimated effective radiated power and antenna pattern required for completing new mission tasking (via utilization of specific antenna pattern chosen based on Technique, Tactic or Procedure selected to be most effective given mission parameters).

4.1.3.8 On-The-Move Mode EA (manual/omni-directional)

The NGMCGEAS **shall** conduct manual, omni-directional attack from 20MHz to 8GHz while in On-The-Move Mode. The NGMCGEAS **will** conduct manual, omni-directional attack from 2MHz to 18GHz while in On-The-Move Mode.

a. Required to re-configure for detection and mission execution of the signal type contained in the new mission tasking message. NGMCGEAS **will** be required to determine:

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i. NGMCGEAS system **will** determine utilization factor; existing resources also handling new mission tasking

ii. NGMCGEAS **will** determine if utilization factor requires reallocation of resources; new task priority versus current missions execution tasking

a. Via software parameters download and re-configure software defined Hardware equipment in order to prosecute new mission tasking utilizing Techniques, Tactics and Procedures defined or detailed in the new tasking message

b. May also require re-configuring antenna via software control as part of reduction of RF-fratricide by selecting an appropriate antenna pattern

iii. NGMCGEAS **will** reply to originator of new mission tasking with estimated effective radiated power and antenna pattern required for completing new mission tasking (via utilization of specific antenna pattern chosen based on Technique, Tactic or Procedure selected to be most effective given mission parameters).

4.1.4 Provide on-the-move electronic attack capability

In the On-The-Move Mode, system **shall** provide automatic and manual omni-directional EA capability while on-the-move (20MHz-8GHz). In the On-The-Move Mode, system **will** provide automatic and manual omni-directional EA capability while on-the-move (2MHz-18GHz).

a. Required to re-configure for detection and mission execution of the signal type contained in the new mission tasking message. NGMCGEAS **will** be required to determine:

i. NGMCGEAS system **will** determine utilization factor; existing resources also handling new mission tasking

ii. NGMCGEAS **will** determine if utilization factor requires reallocation of resources; new task priority versus current missions execution tasking

a. Via software parameters download and re-configure software defined Hardware equipment in order to prosecute new mission tasking utilizing Techniques, Tactics and Procedures defined or detailed in the new tasking message

b. May also require re-configuring antenna via software control as part of reduction of RF-fratricide by selecting an appropriate antenna pattern

iii. NGMCGEAS **will** reply to originator of new mission tasking with estimated effective radiated power and antenna pattern required for completing new mission tasking (via utilization of specific antenna pattern chosen based on Technique, Tactic or

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Procedure selected to be most effective given mission parameters).

4.1.5 Signals Reporting

The system **shall** disseminate relevant information in accordance with established CMM and local reporting timeline precedents, and provide secure data and voice communications from/to USMC SIGINT/EW System of SIGINT Systems (SoSS) given full mission capable RadBn organic communications.

4.1.5.1 Display mission log files

System **shall** be capable of displaying mission log files (previously detected and attacked signals).

Subsystem **shall** be capable of displaying mission log files to include:

1. All signals detected
    - a. time of intercept
    - b. signal strength
    - c. Stop Buzzer activity
    - d. modulation type (objective)
2. All EA engagements
    - a. time of engagement
    - b. output power
    - c. modulation file (by file name only).
3. Mode/Modes of operation
    - a. Stationary or Mobile
    - b. Automatic or Manual (when jamming)
4. GPS location
    - a. display map data.
    - b. display of tasking
    - c. display of mission area
    - d. display of country data
    - e. Display frequency lists
    - f. GPS input
    - g. map data.

Subsystem **will** be capable of displaying mission log files to include:

1. GEO locate
2. Software controlled antenna pattern and technique
    - a. Unique user identification
3. Measure of Engagements and Effectiveness (MOEE)

4.1.5.2 Copy mission log files to removable media

System **shall** allow operator to copy recorded mission log files to removable media.

4.1.5.3 Prepare information for reporting

System **shall** provide the capability to manually prepare formatted and free-text reports.

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4.1.5.4 Reporting

System **shall** provide operator the capability to forward reports.

4.2 Other Requirements (Threshold).

4.2.1 Electromagnetic Environmental Effects (E3) and Spectrum Supportability

4.2.1.1 Electromagnetic Environment (EME) and E3

The NGMCGEAS **shall** demonstrate compliance with analyses and tests as noted in MIL-STD-464A; including hazards of electromagnetic radiation to personnel, ordnance, and volatile materials; and natural phenomena effects of lightning, and electrostatic discharge.

4.2.1.1.1 Electromagnetic Environment (EME)

The performance and functionality of NGMCGEAS **shall not** be degraded by electromagnetic environmental effects; and with other systems and platforms in the operating environment, including allied and coalition systems. The minimum RF EME for NGMCGEAS is the ground systems environment as defined in MIL-STD-464A.

4.2.1.1.2 Electromagnetic Interference Characteristics

The NGMCGEAS **shall** demonstrate compliance, via analyses and tests, applicable requirements contained in RE-103.

4.2.1.1.3 Lightning Effects

The NGMCGEAS **shall** maintain operational capability following a 90th percentile indirect lightning strike at a minimum distance of 50m.

4.2.1.2 Spectrum Supportability and Spectrum Certification

The NGMCGEAS **shall** be compliant with existing Service, DoD, Joint, national and international spectrum management policies and regulations and obtain spectrum certification, a statutory requirement; (DODI 5000.2, 12 May 2003). DD Form 1494 "Application for Equipment Frequency Allocation" **shall** be submitted for each spectrum dependent piece of equipment or system, or confirmation **shall** be obtained for authorities that an approved frequency allocation exists. Approved Stage 4 DD-1494 or "Note to Holders" **shall** be available in support of Milestone C.

4.2.2 Transportability and Deployability.

4.2.2.1 Transport

When installed in a platform, the NGMCGEAS **shall** be transportable via helicopter (CH-53E) (external), cargo transport aircraft (C-130, C-5, and C-17), railroad, and all USN amphibious forces shipping and landing craft. All NGMCGEAS variations and components using a modular and scalable architecture **shall** allow for the maximum performance capabilities, while meeting the size and weight limits established for a particular platform.

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4.2.2.2 Shock and Vibration

The NGMCGEAS PIKS **shall** be capable of withstanding vibration and shock during military transport.

The NGMCGEAS components **shall** withstand vibration and shock during military transport and during operation. System **shall** be able to perform as specified (no degradation of the system).

4.2.3 Reliability, Availability, and MTTR.

4.2.3.1 Reliability

The NGMCGEAS **shall** have a Mean Time Between Operational Mission Failure based on MD of 16 hours, with 90% reliability.

> The NGMCGEAS Evolution II **shall** achieve a Mean Time Between Critical Failure (MTBCF) of 7,966 hours, under the expected environmental conditions specified herein for the NGMCGEAS Evolution II system. MTBCF is defined as the total time the NGMCGEAS operates divided by the number of failures that prevent the product from full operational capability. Full operational capability is the level of performance which allows the NGMCGEAS to perform its primary function.
>
> The NGMCGEAS **shall** have a warranty period of 3 years where the supplier will repair or replace any failed items(s) as described in the warranty clause(s)
>
> The NGMCGEAS **shall** be designed so that all failures can be reliably detected and isolated to the source of failure using a combination of manual, semi-automatic, and automatic means. The average time to fault isolate **shall** not exceed 30 minutes and the maximum time to fault isolate **shall** be no more than 60 minutes at the 95th percentile at the operational level when fault isolation is performed by trained maintenance technicians.
>
> The supplier **shall** develop and include as part of his proposal a plan that describes the Reliability and Maintainability (R&M) activities in sufficient detail (i.e., tasks, management, schedule, etc.) to show how R&M will be addressed as part of the overall engineering and manufacturing effort and give a high degree of confidence that the R&M requirements **shall** be met.

Implementation requirements may include restrictions on the product design and implementation, as well as restrictions on the processes and development approaches to be used to build the system. The System Specification does not generally include any programmatic requirements addressing cost, schedule, and other contractual items. The aspects of a system that Open Architecture is concerned with all information types listed above to varying degrees of importance. The desired open system attributes of the system **shall** be captured in the System Specification since this document provides the basis for the development effort.

4.2.3.2 Availability

The NGMCGEAS **shall** have an operational availability of 90 percent.

4.2.3.3 MTTR

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The NGMCGEAS **shall** achieve a mean-corrective-maintenance-time (M_{ct}) of no greater than 30 minutes and a maximum-corrective-maintenance-time (M_{maxct}) of no greater than 120 minutes at the 95th percentile at the operational level when repaired/fixed by a trained maintenance technician. The design of the hardware **shall** allow the removal of items such as circuit boards or subassemblies without cutting or unsoldering connections. All plug-in modules **shall** be mechanically keyed to prevent insertion of a wrong module.
The NGMCGEAS **shall** not exceed 30 minutes for each preventative maintenance period and the periods **shall** not be more frequent than every week.

4.2.4 RadBn Support

4.2.4.1 Organization

The NGMCGEAS **shall** cause no changes to the current RadBn organizational structure.

4.2.4.2 Facilities

There **shall** be no additional RadBn facilities requirement based upon the development and production of this system.

4.2.4.3 Support Equipment

The NGMCGEAS **shall not** generate new or modified RadBn support equipment requirements. It is anticipated the system **will** use existing and planned tool sets and inventories, including calibration, general and special purpose test equipment (SPTE). Special purpose support equipment and special purpose test tools should be avoided to the maximum extent possible. Tools and test equipment required, but not resident in the Marine Corps inventory, **shall** be identified as special tools and SPTE, and supplied through initial issue provisioning. A forklift **will** be required to support install/removal of the shelter.

4.2.4.4 Environmental Compliance Requirements

The NGMCGEAS user **shall** have the ability to train, operate, maintain, and dispose of the system in full compliance with applicable U.S., foreign, and international environmental quality laws and regulations. The design, production, operation, maintenance and disposal of the system **shall** eliminate, or minimize to the greatest extent possible, adverse environmental quality impacts.

4.2.5 Operating Environment

4.2.5.1 Environmental Conditions (Temperature)

4.2.6 Safety

4.2.6.1 Occupational Health Considerations

4.2.6.2 Hazards of Electromagnetic Radiation to Ordnance (HERO)

4.2.6.3 Physical and Operational Security Needs

The NGMCGEAS **shall** comply with current security requirements and be capable of evolving to meet state-of-the-art technology advances designed to protect information from unwanted exploitation as imposed by National, DoD, and joint policy. The NGMCGEAS **shall** employ physical protection measures as required when employed in an operational state. The NGMCGEAS **shall** operate at SCI level and all personnel **shall** have appropriate clearances;

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the system software **shall** support the ability to constrain/control the awareness of the existence of information using software controls and permissions (identification and authentication).

4.2.6.4 Information Protection Standards.

5 System Capabilities (Objective)

5.1 Net Ready

The system **will** meet 100 percent of interfaces; services; policy-enforcement controls; and data correctness, availability and processing requirements in the Joint integrated architecture and IC System for Information Sharing.

5.1.1 Comply with mandated Joint Standards

The system **will** comply with all mandated joint standards.

5.1.2 Database Functionality

The system **will** have the capability of performing parsing, storage, exchange and synchronization of database information, consistent with current DoD, IC and commercial efforts regarding data and metadata standardization. Additionally, the system **will** be capable of performing semi-automated system-formatted database functions.

5.1.3 Communications with SIGINT/EW Systems

The system **will** communicate via secure voice and data with all Joint SIGINT systems given full mission capable communications.

5.1.4 Provide tools to facilitate mission planning, preparation, configuration, and tasking

The system **will** have tools to facilitate receipt and display of tasking, mission area, country data, text files, frequency lists, map data, and GPS input. The system **will** have inherent survey capability with the ability to identify signal types to aid in mission planning.

5.1.5 Provide a collaborative tool

The system **will** provide whiteboard, chat for technical collaboration externally, e.g. other Service Distributed Common Ground/Surface System.

5.1.6 Provide a Local Area Network (LAN)

The system **will** provide an internal secure LAN for all operator positions. The system **will** provide the status of the LAN to all clients on the network.

5.2 Signals Detection

The system **will** detect objective SOI or signal types as identified in Appendix E of the CESAS CDD. The system **will** demonstrate the ability to detect a minimum of 95 percent of those SOIs/signal types the Ground Truth Platform collects within each mission during testing.

5.2.1 Perform Signals Search and Detection

The system **will** provide the capability for operators to search and detect all signal types identified in Appendix E of the CESAS CDD within 2MHz to 18GHz of the electromagnetic spectrum.

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5.2.2 Tune a receiver

The system **will** provide the capability for operators to tune a receiver to a selected frequency between 2MHz to18GHz.

5.2.3 Program and Prioritize SOI or Signal Type

The system **will** allow operator to program and prioritize at least 100 SOIs or signal types.

5.3 Electronic Attack

The system **will** attack to deny and disrupt objective SOI or signal types as identified in Appendix E of the CESAS CDD. The system **will** attack 100 percent of those SOIs/signal types that were detected.

5.3.1 Attack SOI or Signal Type

The system **will** provide the capability to disrupt, deny, or degrade objective signal types as defined and listed in Appendix E of the CESAS CDD.

5.3.2 Provide stationary and on-the-move electronic attack capability

The system **will** provide automatic and manual omni directional and directional EA capability while stationary and on-the-move (2MHz – 18GHz).

5.4 Environmental Conditions

5.4.1 Operational Environment

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