



Department of Defense INSTRUCTION

NUMBER 3222.03

August 25, 2014

Incorporating Change 2, October 10, 2017

DoD CIO

SUBJECT: DoD Electromagnetic Environmental Effects (E3) Program

References: See Enclosure 1

1. PURPOSE. This instruction:

a. Reissues DoD Directive (DoDD) 3222.3 (Reference (a)) as a DoD instruction (DoDI) in accordance with the authority in DoDD 5144.02 (Reference (b)).

b. Establishes policy, assigns responsibilities, and provides instructions for the management and implementation of the DoD E3 Program to ensure mutual electromagnetic compatibility (EMC) and effective E3 control among ground-, air-, maritime, and space-based platforms, electronic and electrical systems, subsystems, and equipment, and with the existing natural and man-made electromagnetic environment (EME).

c. Establishes and assigns representation to the DoD E3 Integrated Product Team (IPT). The charter for the DoD E3 IPT is at Enclosure 2 of this instruction.

d. Incorporates and cancels DoDD C-3222.5 (Reference (c)).

2. APPLICABILITY. This instruction applies to:

a. OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff (CJCS) and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD (referred to collectively in this instruction as the "DoD Components").

b. The United States Coast Guard. The U.S. Coast Guard will adhere to DoD requirements, standards, and policies in this instruction in accordance with the direction in Paragraph 4a of the Memorandum of Agreement Between the Department of Defense and the Department of Homeland Security (Reference (w)).

b c. All ground-, air-, maritime, and space-based, spectrum-dependent systems (SDS) and non-spectrum-dependent electrical and electronic systems, subsystems, and equipment, including ordnance, that are developed, acquired, and operated by the DoD Components (referred to collectively in this instruction as “military platforms, systems, subsystems, and equipment”).

3. POLICY. It is DoD policy that:

a. Military platforms, systems, subsystems, and equipment will be mutually compatible in their electromagnetic operational environment (EMOE).

(1) Military systems will meet their operational performance requirements without experiencing unacceptable performance degradation from E3 or causing unacceptable performance degradation to other systems.

(2) Joint-Service E3 control will be attained by implementing common DoD-wide philosophies, approaches, and tactics, techniques, and procedures (TTPs) in the development, design, production, testing, and operation of military platforms, systems, subsystems, and equipment to address unacceptable degradation from E3.

(3) Rather than relying on after-the-fact remedial measures, built-in safety by design and electromagnetic interference (EMI) mitigation techniques will be addressed in the acquisition process.

b. Requirements to control E3, including those used to mitigate the impact of high-power microwave and electromagnetic pulse (EMP), will be implemented throughout the acquisition life cycle of military platforms, systems, subsystems, and equipment.

(1) Requirements to control E3 will be developed during the risk reduction phase of the acquisition life cycle of military platforms, systems, subsystems, and equipment, and fully defined and evaluated before production and deployment.

(2) Joint Capabilities Integration and Development System (JCIDS) and acquisition system documents will be used to specify, define, and verify requirements to control E3. These documents include the initial capabilities document (ICD), capability development document (CDD), capability production document (CPD), equipment specification, information support plan (ISP), acquisition strategy (AS), system engineering plans, and test and evaluation master plan (TEMP).

c. E3 control and mitigation techniques will be validated and verified for military platforms, systems, subsystems, and equipment using the implementation and tailoring of applicable military or industry standards, procedures, and handbooks of test requirements. Vulnerabilities and limitations will be documented and reported during critical design and milestone reviews.

d. Hazards of electromagnetic radiation to ordnance (HERO), personnel (HERP), and fuel (HERF) will be mitigated before the administration of military exercises, operations, and activities.

e. Military E3 standards, specifications, and handbooks stressing interface and verification requirements will follow the guidance in DoD *Manual* 4120.24-M (Reference (d)).

f. Analytical tools and databases for EMC analyses and E3 assessments will be developed and shared among the DoD Components. They will be maintained to predict, prevent, and correct E3 deficiencies of military platforms, systems, subsystems, and equipment in the intended EMOE.

g. The DoD will maintain test ranges, simulation facilities, and measurement capabilities to quantify E3 of military platforms, systems, subsystems, and equipment to and from their intended operational EME.

h. E3 awareness and training will be disseminated throughout the DoD and is mandatory for acquisition workforce and operating personnel involved in research and development, procurement, test and evaluation (T&E), and operation and maintenance of military platforms, systems, subsystems, and equipment.

4. RESPONSIBILITIES. See Enclosure 3.

5. PROCEDURES. See Enclosures 4 through 6.

6. RELEASABILITY. **Cleared for public release.** This instruction is available on ~~the Internet from the DoD Issuances Website at <http://www.dtic.mil/whs/directives>~~ *the Directives Division Website at <http://www.esd.whs.mil/DD/>.*

7. EFFECTIVE DATE. This instruction is effective August 25, 2014.



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Acting DoD Chief Information Officer

Enclosures

1. References
2. DoD E3 IPT Charter
3. Responsibilities
4. DoD E3 Program
5. Criteria for Operation at Designated DoD Sites
6. Procedures for Controlling EMR Hazards

Glossary

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ENCLOSURE 1

REFERENCES

- (a) DoD Directive 3222.3, "DoD Electromagnetic Environmental Effects (E3) Program," September 8, 2004 (hereby cancelled)
- (b) DoD Directive 5144.02, "DoD Chief Information Officer (DoD CIO)," ~~April 22, 2013~~ *November 21, 2014*
- (c) DoD Directive C-3222.5, "Electromagnetic Compatibility (EMC) Management Program for SIGINT Sites (U)," April 22, 1987 (hereby cancelled)
- (d) DoD *Manual* 4120.24-~~M~~, "Defense Standardization Program (DSP) ~~Policies and Procedures,~~" ~~March 9, 2000~~ *September 24, 2014*
- (e) DoD Directive 5134.08, "Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs (ASD(NCB))," January 14, 2009, as amended
- (f) DoD Instruction 3150.09, "The Chemical, Biological, Radiological, and Nuclear (CBRN) Survivability Policy," ~~September 17, 2008, as amended~~ *April 8, 2015*
- (g) Section 139 of Title 10, United States Code
- (h) Military Standard MIL-STD-461F, "Requirements for the Control of the Electromagnetic Interference Characteristics of Subsystems and Equipment," December 10, 2007
- (i) Military Standard MIL-STD-464C, "Electromagnetic Environmental Effects Requirements for Systems," December 1, 2010
- (j) DoD Directive 6055.09E, "Explosives Safety Management (*ESM*) ~~and the DoD Explosives Safety Board,~~" ~~August 19, 2005~~ *November 18, 2016*
- (k) DoD Directive 5101.14, "DoD Executive Agent and Single Manager for Military Ground-Based Counter Radio-Controlled Improvised Explosive Device Electronic Warfare (CREW) Technology," June 11, 2007, as amended
- (l) DoD Directive 5000.01, "The Defense Acquisition System," May 12, 2003, as amended
- (m) DoD Instruction 5000.02, "Operation of the Defense Acquisition System," January 7, 2015, *as amended*
- (n) Chairman of the Joint Chiefs of Staff Instruction 6212.01F, "Net Ready Key Performance Parameter (NR KPP)," March 21, 2012
- (o) Chairman of the Joint Chiefs of Staff Instruction 3170.01H, "Joint Capabilities Integration and Development System," January 10, 2012
- (p) DoD Instruction 8330.01 "Interoperability of Information Technology (IT), Including National Security Systems (NSS)," May 21, 2014
- (q) Military Handbook MIL-HDBK-237D "Electromagnetic Environmental Effects and Spectrum Supportability Guidance for the Acquisition Process," May 20, 2005
- (r) Military Handbook MIL-HDBK-235-1C, "Military Operational Electromagnetic Environment Profiles (Part 1C) General Guidance," October 1, 2010
- (s) DoD Instruction 4650.01, "Policy and Procedures for Management and Use of the Electromagnetic Spectrum," January 9, 2009
- (t) DoD Instruction 6055.11, "Protecting Personnel From Electromagnetic Fields," August 19, 2009
- (u) Military Handbook MIL-HDBK-240A, "Hazards of Electromagnetic Radiation to Ordnance (HERO) Test Guide," March 10, 2011

- ~~(v) Joint Publication 1-02, "Department of Defense Dictionary of Military and Associated Terms," current edition~~
- (v) *Office of the Chairman of the Joint Chiefs of Staff, "DoD Dictionary of Military and Associated Terms," current edition*
- (w) *Memorandum of Agreement between the Department of Defense and The Department of Homeland Security Regarding Department of Defense and U.S. Coast Guard Cooperation on Cybersecurity and Cyberspace Operations, January 19, 2017*

ENCLOSURE 2

DOD E3 IPT CHARTER

1. PURPOSE. The DoD E3 IPT serves as the responsible body for addressing DoD-wide E3 matters on behalf of the DoD Chief Information Officer (DoD CIO) in support of the DoD E3 Program. The mission of the DoD E3 IPT is to promote communication, coordination, commonality, and synergy among the DoD Components for E3-related matters.

2. SCOPE. The DoD E3 IPT will focus on pertinent E3 issues and activities regarding DoD policies, acquisition support, emerging technologies, T&E issues, and operational support matters to recommend improvements to current DoD processes and procedures. The DoD E3 IPT will also interface with federal agencies and other organizations as required to promote cooperation and information exchange.

3. MISSION. The DoD E3 IPT will:
 - a. Advise the DoD CIO on E3 matters.

 - b. Provide a forum to discuss pertinent E3 topics and develop coordinated DoD positions for such matters.

 - c. Promote harmonization of E3 design, test, and operational support requirements within the DoD.

 - d. Establish dialogue with federal agencies as required to discuss E3-related initiatives that may impact EMC within the DoD.

 - e. Serve as the liaison among DoD spectrum management organizations.

 - f. Maintain a relationship with applicable industry to stay abreast of emerging policy, technology, standards, and product designs.

 - g. Advocate and coordinate DoD E3 awareness and training.

 - h. Participate in the planning and execution of an annual DoD E3 program review and seminar to promote communication, coordination, commonality, and synergy for E3-related matters among the DoD Components. An annual review of IPT activities attended by representatives of the DoD Components will be conducted at the DoD E3 IPT program review and seminar.

4. ORGANIZATION AND MEMBERSHIP. The DoD E3 IPT will consist of representatives from the DoD Components, to include but not be limited to:

- a. DoD CIO, Director of Spectrum Policy and Programs as the chairperson.
- b. Director, Defense Spectrum Organization (DSO), Defense Information Systems Agency (DISA).
- c. Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)).
- d. Deputy Assistant Secretary of Defense, Developmental Test and Evaluation (DASD(DT&E)).
- e. Director, National Security Agency/Chief, Central Security Service (DIRNSA/CHCSS).
- f. CJCS.
- g. Secretaries of the Military Departments. The Secretary of the Navy will provide three representatives, one each for the Navy and the Marine Corps and one for the DoD Single Manager Ground-Based Counter Radio-Controlled Improvised Explosive Device Electronic Warfare (CREW). The Secretary of the Army and the Secretary of the Air Force will each provide one representative.
- h. Director, Defense Threat Reduction Agency (DTRA).

5. AD HOC WORKING GROUPS. The chairperson may, as necessary, establish ad hoc working groups and designate working-group leads.

6. MEETINGS. The DoD E3 IPT will convene monthly at a location selected by the chairperson.

ENCLOSURE 3

RESPONSIBILITIES

1. DoD CIO. As the Principal Staff Assistant and advisor to the Secretary and Deputy Secretary of Defense for E3 matters pursuant to Reference (b), the DoD CIO:

a. Provides policy, direction, and guidance to the DoD for the implementation of the DoD E3 Program.

b. Serves as the focal point for coordination and resolution of E3 issues involving non-DoD entities.

c. Establishes and chairs a DoD E3 IPT in accordance with Enclosure 2 of this instruction, and conducts an annual DoD E3 program review to promote communication, coordination, commonality, and synergy for E3-related matters among the DoD Components.

d. Provides, in coordination with the DIRNSA/CHCSS, guidance for development of DoD policies for the control of E3 near sensitive communications sites and platforms performing intelligence, surveillance, and reconnaissance (ISR) missions, referred to in this instruction as “designated DoD sites.”

e. Coordinates the integration of E3 policy and criteria into DoD chemical, biological, radiological, and nuclear survivability policy with the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs (ASD(NCB)), pursuant to DoDD 5134.08 and DoDI 3150.09 (References (e) and (f)).

f. Authorizes the Director, DSO, to perform E3 engineering support services to foreign entities as appropriate in the interest of national defense.

2. DIRECTOR, DISA. Under the authority, direction, and control of the DoD CIO, and in addition to the responsibilities in section 8, Director, DISA delegates Director, DSO the following responsibilities:

a. Manages the DoD E3 Program, and provides representation and technical support to the DoD E3 IPT.

b. Provides operational electromagnetic (EM) engineering support to the CJCS and the Combatant Commanders for contingency operations and exercises, and as otherwise requested.

c. Provides E3 control assessments for the DoD CIO and the CJCS.

d. In coordination with the DoD E3 IPT, develops, maintains, and distributes E3 analytical tools to predict, assess, and mitigate E3 problems.

e. Develops and maintains a net-centric capability to facilitate sharing of E3 data with the DoD Components.

f. Serves as the lead standardization activity (LSA) for the DoD EMC standardization (EMCS) area in accordance with Reference (d).

g. Provides E3 engineering support services on a reimbursable, customer-funded basis to:

(1) The DoD Components, federal agencies, and non-federal government organizations when it is in the interest of national defense.

(2) Foreign entities when authorized by the DoD CIO, the CJCS, or the foreign military sales process through the Defense Security Cooperation Agency.

h. Provides E3 engineering support services on a reimbursable basis before the installation of new or substantially upgraded commercial telecommunications services (CTS) on federal property when requested by the DoD Components or federal agencies.

i. Provides engineering support to maintain EMC at designated DoD sites, including evaluation of installation requests.

j. Confers with DIRNSA/CHCSS on the review and approval of requests for installation at designated DoD sites.

k. Provides ordnance EME susceptibility analysis, electromagnetic radiation (EMR) hazards assessments, and EME surveys in support of joint operations and deployments in response to requests from the DoD Components.

l. Develops, coordinates, and provides E3 training and education to the DoD Components.

3. USD(AT&L). The USD(AT&L):

a. Requires acquisition programs to implement and comply with requirements to control E3 during the acquisition of military platforms, systems, subsystems, and equipment.

b. Incorporates E3 education and training into the Advanced Program Management, Test and Evaluation, and Systems Engineering course curriculums at the Defense Acquisition University.

c. Pursues resolution of E3 problems discovered during testing.

4. ASD(NCB). Under the authority, direction, and control of the USD(AT&L), the ASD(NCB):

a. Develops EM pulse policy and provides guidance, and requirements for acquisition programs in accordance with Reference (f).

b. As the principal advisor to the Secretary and Deputy Secretary of Defense and the USD(AT&L) for all matters concerning the formulation of policy and plans for nuclear weapons pursuant to Reference (e), coordinates with the DoD CIO and the Director, DSO, regarding EMP policy, guidance, and requirements for acquisition programs and their integration into the DoD E3 Program.

5. DASD(DT&E). Under the authority, direction, and control of the USD(AT&L) through the Assistant Secretary of Defense for Research and Engineering, the DASD(DT&E):

a. Ensures that requirements to control E3 are addressed during developmental test and evaluation (DT&E) of major defense acquisition programs and other systems with DASD(DT&E) oversight.

b. Ensures that TEMPs, developmental test plans, and reports adequately address E3 testing.

c. Ensures that vulnerabilities and limitations with respect to E3 are identified and their disposition documented in appropriate T&E program documents supporting the acquisition process.

d. Assigns a representative to the DoD E3 IPT.

6. DIRECTOR, OPERATIONAL TEST AND EVALUATION (DOT&E). The DOT&E will evaluate the operational effectiveness and suitability of systems in accordance with section 139 of Title 10, United States Code (Reference (g)).

7. DIRNSA/CHCSS. Under the authority, direction, and control of the Under Secretary of Defense for Intelligence and in addition to the responsibilities in section 8, the DIRNSA/CHCSS:

a. Develops and manages an E3 program plan for ISR programs.

b. Implements E3 control assessments during the acquisition process for ISR platforms, systems, subsystems, and equipment and requires E3 control assessments during critical design reviews.

c. Establishes guidelines for achieving EMC at ISR sites and platforms and for protecting ISR platforms, electronic and electrical systems, subsystems, and equipment.

d. Provides ISR platform, system, subsystem, and equipment characteristics data to the Director, DSO, for inclusion in applicable databases.

8. DoD COMPONENT HEADS. The DoD Component heads:

a. Implement requirements to control E3 during the acquisition process for military installations, platforms, systems, subsystems, and equipment, including the implementation and tailoring of Military Standard (MIL-STD)-461F (Reference (h)), MIL-STD-464C (Reference (i)), and the EMR hazards criteria in Enclosure 6 of this instruction, as applicable.

b. Perform E3 control assessments during developmental and operational testing to identify limitations and vulnerabilities and evaluate their significance.

c. Address and mitigate the E3 issues identified by the evaluation of the test results.

d. Address the HERO requirements of Reference (h) throughout the DoD military munitions life cycle, in accordance with DoDD 6055.09E (Reference (j)). Provide military platform, system, subsystem, and equipment EME characteristics data and ordnance susceptibility test data to the Director, DSO, in appropriate standard data format, for inclusion in applicable databases.

e. Conduct E3 analyses for new or substantially upgraded CTS on federal property, including those that will be installed on existing towers. Provide results of analyses to the Director, DSO.

f. Coordinate within the DoD E3 IPT on the development of analytical tools or services to predict, assess, and mitigate E3 problems.

g. Implement E3 control procedures to maintain EMC at designated DoD sites in accordance with Enclosure 5 of this instruction before the installation and operation of systems, subsystems, and equipment. Advise the Director, DSO, of requests for installation and provide results of EMC analyses.

h. Implement E3 education and awareness training to acquisition workforce and operational personnel in acquisition, communications, weapon systems, electronics technician, and maintenance designated billets. Coordinate training requirements with the DoD E3 IPT.

i. In accordance with DoDD 5101.14 (Reference (k)), document CREW system, subsystem, and equipment limitations and vulnerabilities for unresolved E3 control problems and report the results during operational interoperability and compatibility decisions.

j. Assign a representative to the DoD E3 IPT, in accordance with Enclosure 2 of this instruction.

9. CJCS. In addition to the responsibilities in section 8 of this enclosure, the CJCS:

a. On behalf of the Combatant Commanders, provides operational direction for resolution of joint E3 issues to the Director, DSO, through the Director, DISA.

b. Ensures that requirements to control E3 and measures of performance are addressed during the JCIDS requirements generation process.

c. Provides doctrine to mitigate hazards of EM radiation to ordnance, personnel, and fuel during joint, allied, and coalition operations.

10. COMBATANT COMMANDERS. Through the CJCS and in addition to the responsibilities in section 8 of this enclosure, the Combatant Commanders:

a. Establish internal policies and procedures to ensure requirements to control E3 are addressed in the acquisition and operation of military platforms, systems, subsystems, and equipment.

b. Ensure requirements to control E3 are addressed during operational training, forces-on-forces simulations and war games, and in the day-to-day activities for all force postures. Ensure TTPs are developed and used to mitigate the risk of systems assessed as vulnerable to the EME.

c. Review and be cognizant of E3 control programs and initiatives of the Military Services and Defense Agencies and recommend requirements for research and development, as appropriate.

d. Certify E3, including EM pulse readiness of mission-critical systems under Combatant Command oversight.

ENCLOSURE 4

DoD E3 PROGRAM

1. GENERAL. This enclosure establishes requirements and procedures for implementing the DoD E3 Program by DoD Components and their program managers (PMs) and material developers (MATDEVs).

2. E3 IN ACQUISITIONS. Military platforms, systems, subsystems, and equipment will be designed for EMC and evaluated to verify, by test, analysis, or modeling and simulation as appropriate, that the desired performance requirements will be met when subjected to the EMOE. Military platforms, systems, subsystems, and equipment will be compatible in their intended EME without causing or suffering unacceptable mission degradation due to E3, and will comply with applicable EM spectrum requirements.
 - a. Requirements to control E3 will be identified and documented during the JCIDS requirements generation process and implemented throughout the Defense Acquisition System (DAS) established by DoDD 5000.01 (Reference (l)) and implemented by DoDI 5000.02 (Reference (m)) to ensure mutual compatibility with the EMOE. The linkage between the acquisition process and the required E3 tasks is shown in Table 1.

 - b. The potential mission degradation from co-located systems, subsystems, and equipment in the EMOE will be determined and minimized. DoD Components will direct their PMs and MATDEVs to:
 - (1) Implement the E3 control guidance criteria from CJCS Instructions 6212.01F and 3170.01H, and DoDI 8330.01 (References (n), (o), and (p)) into the analysis of alternatives, ICD, CDD, CPD, AS, TEMP, and ISP, as applicable. DoD acquisition process E3 and spectrum supportability guidance is provided in Military Handbook (MIL-HDBK)-237D (Reference (q)).

 - (2) Determine the intended EME in which military platforms, systems, subsystems, and equipment will operate. Guidance for determining the EME can be found in References (h), (i), and MIL-HDBK-235-1C (Reference (r)) including its supplemental parts.

 - c. The EME includes intentional and unintentional EMR from DoD systems, as well as contributions from civil and foreign systems. Specific mission-oriented EME profiles are comprised of a combination of measured and calculated data provided in Reference (r) and its supplemental parts. To further refine and tailor these EMEs, PMs and MATDEVs will:
 - (1) Identify the mission scenarios in which the system or equipment is targeted and the associated platforms and systems supporting the missions.

 - (2) Determine the major geographic regions and countries in which the platform, system, or equipment including ordnance is expected to operate.

Table 1. E3 Activities in the DAS and JCIDS Processes

DAS PHASE	MATERIEL SOLUTION ANALYSIS	TECHNOLOGY MATURATION AND RISK REDUCTION	ENGINEERING AND MANUFACTURING DEVELOPMENT	PRODUCTION AND DEPLOYMENT	OPERATIONS AND SUPPORT
EVENT	MS A	MS B	MS C	IOC	FOC
DECISION or REVIEW	MDD	PDR	CDR	LRIP Decision	FRP
JCIDS DOCUMENTS	ICD	CDD	CPD		
T&E EVENTS		DT&E		IOT&E FOT&E	
E3 TASKS IN ACQUISITION	Perform E3 assessment for SSRA Define EME Budget for E3 E3 requirements definition	Update E3 assessment for SSRA Update EME as required Establish E3 IPT Prepare E3 inputs to ISP Address E3 in TEMP and acquisition documents	Update E3 assessment for SSRA Update E3 inputs to TEMP and ISP Perform E3 DT&E & analyses Define/test mitigation measures Update EME as required	Update E3 assessment for SSRA Finalize E3 requirements for production specification and TEMP Determine E3 effects on mission performance Include E3 assessment in OA and BLIP Report	Interference resolution Deployed support
Legend:					
CDR	critical design review		LRIP	low rate initial production	
FOC	full operational capability		MDD	materiel development decision	
FOT&E	follow-on operational test & evaluation		MS	milestone	
FRP	full rate production		PDR	preliminary design review	
IOT&E	initial operational test & evaluation		SSRA	spectrum supportability risk assessment	

(3) Conduct engineering analyses to identify EMI source and victim pairs with the proposed system or equipment during these missions.

(4) Run E3 analyses based on the mission profile to identify all systems contributing to the EMOE. DoD and Service-accepted analysis tools may be used.

(5) Use Reference (q) to verify spectral characteristics of systems and equipment identified in paragraphs 2c(1) through 2c(4) of this enclosure.

d. The incorporation of E3 interface standards outlined in References (h) and (i), or other comparable commercial E3 standards, into contractual acquisition documentation (e.g., the statement of work, the procurement specification, and the contract data requirements list) ensures

platforms, systems, subsystems, and equipment meet their performance requirements when exposed to the EMOE.

e. The E3 T&E objectives and sufficient program resources to meet those objectives will be defined in the TEMP.

f. The results of the E3 control assessments will be included for program milestone reviews to the Defense Acquisition Board and other milestone decision authorities.

g. An E3 IPT or advisory body will be established for:

(1) Each program designated as, or meets the criteria of, an Acquisition Category I or II in References (l) and (m).

(2) Any acquisition when the end-item may affect or be affected by its intended operational EME.

(3) Programs with complex, multi-discipline EM issues.

h. Additional guidance for establishing an effective lifecycle E3 and spectrum supportability program in Reference (q) will be consulted.

i. The E3 assessments of SDS for incorporation into a SSRA pursuant to DoDI 4650.01 (Reference (s)) will be performed to determine the potential for EMC and for EMI interactions between the proposed SDS and its anticipated operational EME. Additional assessments involving the other E3 disciplines may also be required on a case-by-case basis. The acquisition PM or MATDEV should seek the guidance of the Military Department SSRA review authority to obtain Military Department-specific requirements regarding SSRA development and submission.

3. T&E. The DoD Components will allocate sufficient resources to conduct E3 assessments during DT&E and operational test and evaluation (OT&E), and to resolve or mitigate E3 problems identified. The DoD Components will:

a. Define E3 control T&E objectives in the TEMP, and program resources to meet test objectives. The net-ready key performance parameters required for interoperability certification as outlined in Reference (n) will include compatibility.

b. Verify and document E3 control during DT&E and OT&E. Modeling and simulation may augment E3 testing when certified capabilities are available.

c. Conduct early operational assessments that consider the intended operational EME, including storage, training, transportation, staging, and employment in single Service, joint, and coalition contingency operations.

d. Provide E3 assessments during operational test readiness reviews. Assess the operational impact from unresolved E3 issues.

e. Identify operational limitations and vulnerabilities for uncorrected E3 problems.

f. Maintain measurement capability to quantify the performance of military platforms, systems, subsystems, and equipment when subjected to their intended operational EME.

g. Develop and maintain analytical capabilities and databases to perform E3 analyses to predict, prevent, and correct E3 deficiencies of military platforms, systems, subsystems, and equipment in the intended operational EME. Coordinate such developments with the DoD E3 IPT.

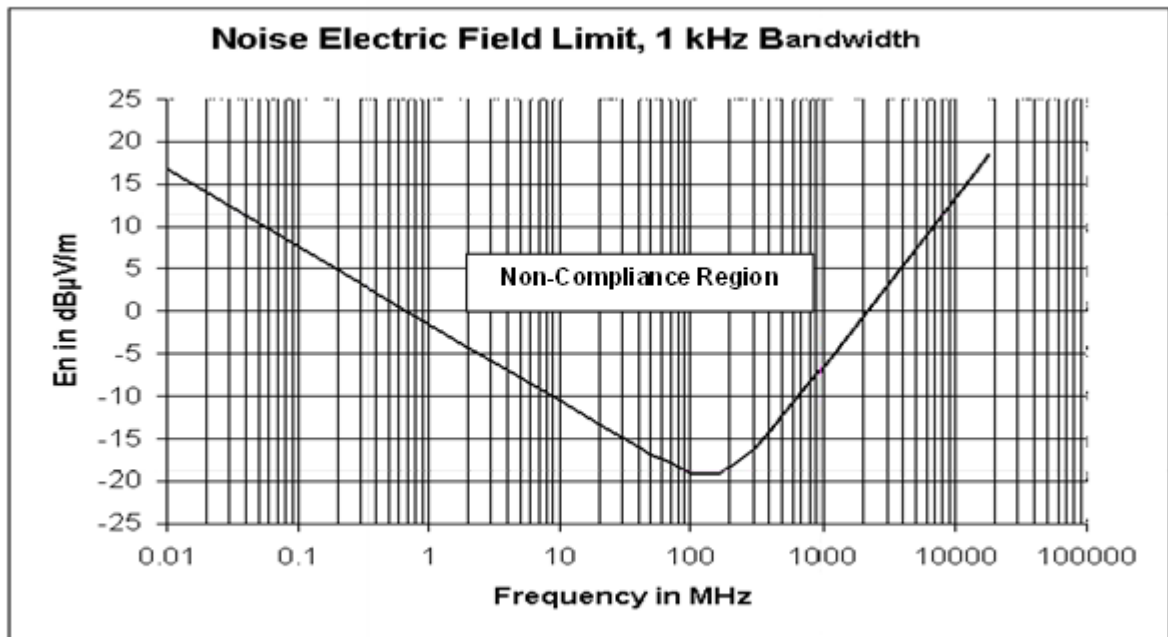
4. STANDARDS. DoD Components, in conjunction with the EMCS LSA, will develop E3 specifications, standards, and handbooks that define interface requirements and DT&E methodologies that evaluate, predict, and characterize operational performance and identify system limitations and deficiencies in accordance with Reference (m).

5. TRAINING. The DoD Components will provide E3 training to DoD civilian program management and systems engineering personnel and to military personnel assigned to acquisition, communications, weapon systems, electronics technician, operational, and maintenance billets.

ENCLOSURE 5CRITERIA FOR OPERATION AT DESIGNATED DOD SITES

1. GENERAL. This enclosure provides criteria for the installation and operation of systems and equipment in the vicinity of designated sites. Information on designated sites can be obtained from the Director, DSO. The limit curve in Figure 1, developed and validated by DIRNSA/CHCSS, is based on measurements conducted at designated sites.

Figure 1. Electric Field Noise Limit for Designated Sites



Legend:

En = energy	k = kilo	m = meter	M = mega
dB = decibel	Hz = hertz	μ = micro	V = volt

2. UNINTENTIONAL EMISSION LIMITS. Unintended radiated electric field emissions from systems and equipment installed and operated near designated sites will be at or below the electric field noise limit shown in Figure 1 at the receiver antenna(s) at the designated sites. Compliance will be verified by measured data when the system and equipment in the vicinity of the designated sites are operated in normal operating modes. No specific test distance is implied or intended for Figure 1.

3. SEPARATION DISTANCES

a. Reference (h) contains EMI requirements (and test procedures) which, if met, will reduce the potential for EMI. For military subsystems and equipment intended for installation or operation near designated DoD sites, compatibility with the sites will occur when radiated

electric field emissions meet the applicable radiated emissions requirements in Reference (h) and the adequate separation distance using acceptable far-field radiated signal attenuation equations is determined to be at or below the electric field noise limits in Figure 1. In this case, it has been calculated that the equipment must be installed or operated at least 430 meters from the designated site.

b. For equipment meeting commercial or international EMI standards, the minimum distance between the EM source and the designated site must be determined. This is done by using acceptable far-field radiated signal attenuation equations to identify how far the potential EMI source has to be from the designated site to meet the electric field noise limit in Figure 1. Assistance for determining minimum distances can be obtained from the Director, DSO.

c. When these minimum distances are not possible and systems and equipment are operated closer to the designated sites, the unintentional radiated emissions will be controlled to acceptable levels by using shielding techniques, filtering, and other appropriate EMI control design measures. The actual controls that are necessary are based on transfer functions for coupling EM energy between the locations of the offending EMI devices and the designated sites. Antenna-to-antenna EMI interactions can be addressed by spectrum control measures at the operational level.

4. REQUEST FOR APPROVAL OF INSTALLATION. The DoD Components will request approval for installation of systems and equipment that will be installed closer than 1.6 kilometers from designated sites, regardless of whether the system or equipment meets any EMI standard. Requests for approval of installation must include EMI mitigation techniques that will be employed to reduce the impact to the designated sites. An example letter is provided in Figure 2.

Figure 2. Sample Letter for Request for Approval of Installation

<p>From:</p> <p>To: Director, Defense Spectrum Organization</p> <p>Via:</p> <p>SUBJECT: Request for Approval of Installation of Systems and Equipment for Operation Near Designated Sites</p> <p>1. PURPOSE:</p> <p>[This section will contain a description of the purpose of the system or project.]</p> <p>2. TECHNICAL DETAILS:</p> <p>[This section will provide technical parameters including proposed distance relative to the designated site, operating frequencies, signal modulation types, power output, antenna types, building structure, and other electronic components, such as computers, electric motors, electronic switches, and radio frequency-controlled devices. Describe the impact of not being able to proceed with the installation.]</p> <p>3. SYSTEM/PROJECT TRADEOFFS:</p> <p>[This section will contain a plan of action to minimize the impact at the designated site if the installation and operation of the system, subsystem, or equipment are permitted.]</p> <p>SIGNATURE BLOCK:</p> <p>Enclosures:</p> <p>[Include maps, blueprints (including elevation plan), design specifications, and environmental impact statements to help provide more of the project's visual details.]</p>

ENCLOSURE 6

PROCEDURES FOR CONTROLLING EMR HAZARDS

1. GENERAL. The DoD Components will design, produce, and operate military platforms, systems, subsystems, and equipment to address EMR hazards (i.e., HERP, HERF, and HERO) during their expected life cycles. This enclosure provides criteria for controlling these potential EMR hazards.

2. HERP. DoDI 6055.11 (Reference (t)) and Reference (h) provide criteria for the protection of personnel against the potentially hazardous effects of EMR. The DoD Components will verify compliance with the applicable requirements by test, analysis, and inspection. Guidance for conducting HERP evaluations can be found in Reference (i).

3. HERF. Precautions will be taken to prevent fuels and volatile materials from inadvertent ignition by radiated EMEs. Reference (h) provides the criteria for the protection of fuels against the potentially hazardous effects of EMR. The criterion in Reference (h) includes EME levels from onboard emitters and external sources. The DoD Components will verify compliance with the applicable requirements by test, analysis, and inspection. Guidance for conducting HERF evaluations is in Reference (h).

4. HERO. The DoD Components will design ordnance and associated systems to address inadvertent ignition and to perform safely and effectively during and after exposure to the EMOE.

a. Instrumented HERO testing will be conducted to determine if exposure of an electrically initiated device (EID) to specified EME levels will result in unintentional activation of the ordnance that can have either safety or reliability consequences. Reliability consequences (e.g., failure of ordnance to function after being initiated) can also occur through repeated radio frequency (RF) heating of an EID.

b. The general approach for HERO testing is to expose inert, instrumented ordnance to a controlled test EME and to monitor each EID contained within the ordnance for a possible response. HERO requirements including the EME levels are specified in Reference (h). Guidance for conducting HERO tests can be found in MIL-HDBK-240A (Reference (u)).

c. HERO testing will emphasize exposure of the ordnance to the EME levels that are associated with each stockpile-to-safe separation sequence phase of an ordnance item, as defined in Table 2. Significant differences in the physical configuration of the ordnance item and its response to the EME can be expected as the item transitions from one phase to another.

Table 2. Ordnance Stockpile-to-Safe Separation Sequence

ORDNANCE PHASES
1. Transportation/Storage
2. Assembly/Disassembly
3. Staged
4. Handling/Loading
5. Platform-Loaded
6. Immediate Post-Launch

GLOSSARY

PART I. ABBREVIATIONS AND ACRONYMS

AS	acquisition strategy
ASD(NCB)	Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs
CDD	capability development document
CDR	critical design review
CJCS	Chairman of the Joint Chiefs of Staff
CPD	capability production document
CREW	counter radio-controlled improvised explosive device electronic warfare
CTS	commercial telecommunications services
DAS	Defense Acquisition System
DASD(DT&E)	Deputy Assistant Secretary of Defense for Developmental Test and Evaluation
dB	decibel
DIRNSA/CHCSS	Director, National Security Agency/Chief, Central Security Service
DISA	Defense Information Systems Agency
DoD CIO	DoD Chief Information Officer
DoDD	Department of Defense directive
DoDI	Department of Defense instruction
DOT&E	Director, Operational Test and Evaluation
DSO	Defense Spectrum Organization
DT&E	developmental test and evaluation
E3	electromagnetic environmental effects
EID	electrically initiated device
EM	electromagnetic
EMC	electromagnetic compatibility
EMCS	electromagnetic compatibility standardization
EME	electromagnetic environment
EMI	electromagnetic interference
EMOE	electromagnetic operational environment

EMP	electromagnetic pulse
EMR	electromagnetic radiation
En	energy
FOC	full operational capability
FOT&E	follow-on operational test and evaluation
FRP	full rate production
HERF	hazards of electromagnetic radiation to fuel
HERO	hazards of electromagnetic radiation to ordnance
HERP	hazards of electromagnetic radiation to personnel
HoD	heads of delegation
Hz	hertz
ICD	initial capabilities document
IOT&E	initial operational test and evaluation
IPT	integrated product team
ISP	information support plan
ISR	intelligence, surveillance, and reconnaissance
k	kilo
JCIDS	Joint Capabilities Integration and Development System
LRIP	low rate initial production
LSA	lead standardization activity
μ	micro, mathematical symbol
m	meter
M	mega
MATDEV	materiel developer
MDD	materiel development decision
MIL-HDBK	military handbook
MIL-STD	military standard
MS	milestone

NATO	North Atlantic Treaty Organization
OT&E	operational test and evaluation
PDR	preliminary design review
PM	program manager
RF	radio frequency
SDS	spectrum-dependent system
SSRA	spectrum supportability risk assessment
STANAG	standardization agreement
T&E	test and evaluation
TEMP	test and evaluation master plan
TTPs	tactics, techniques, and procedures
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
V	volt

PART II. DEFINITIONS

Unless otherwise noted, these terms and their definitions are for the purpose of this instruction.

E3. The impact of the EME on the operational capability of military forces, equipment, systems, and platforms. E3 encompasses the electromagnetic effects addressed by the disciplines of EMC, EMI, EM vulnerability, EM pulse, electronic protection, electrostatic discharge, and EMR hazards to personnel, ordnance, and fuels or volatile materials. E3 includes the effects generated by all EME contributors including RF systems, ultra-wideband devices, high-power microwave systems, lightning, and precipitation static. This term and its definition are proposed for modification in the next edition of ~~Joint Publication 1-02~~ *the DoD Dictionary of Military and Associated Terms* (Reference (v)).

E3 control. Mitigating the effects of the EME such that an operational mission is not degraded, capabilities are not significantly reduced, or system vulnerability is not increased. This term and its definition are proposed for addition in the next edition of Reference (v).

EME. Defined in Reference (v).

EMOE Defined in Reference (v).

EMP. Defined in Reference (v).

high-power microwave. A threat that radiates high-peak power EM pulses intended to disrupt or damage electronic systems.

SDS. All electronic systems, subsystems, devices, and equipment that depend on the use of the spectrum to properly accomplish their function(s), regardless of how they were acquired (e.g., full acquisition, rapid acquisition, Joint Concept Technology Demonstration) or procured (e.g., commercial off-the-shelf, government off-the-shelf, non-developmental items).

SSRA. Risk assessment performed by DoD Components for all SDS to identify regulatory, technical, operational spectrum, and E3 risks as early as possible and affect design and procurement decisions. These risks are reviewed at acquisition milestones and are managed throughout the system's life cycle.