AIAA
S-121-2009

Standard

Electromagnetic Compatibility Requirements for Space Equipment and Systems

AIAA
S-121-2009

Standard

Electromagnetic Compatibility Requirements for Space Equipment and Systems

Sponsored by

American Institute of Aeronautics and Astronautics

Approved

4 September 2009

Abstract

This document, when followed in its entirety, will yield a robust electromagnetic capability design suitable for high-reliability space missions. This document specifies general design practices and sets recommended verification and validation requirements for space vehicles and launch vehicles.

Library of Congress Cataloging-in-publication data on file

Published by
American Institute of Aeronautics and Astronautics
1801 Alexander Bell Drive, Reston, VA 20191

Printed in the United States of America

Contents

Figures

Tables

Foreword

This standard has been developed under the sponsorship of the Chief Engineer's office of the United States Air Force Space and Missile Systems Center (SMC) and under the auspices of the AIAA Electromagnetic Compatibility (EMC) Committee on Standards. It is one in a series of standards planned to codify industry best practices to ensure the very highest level of performance and reliability for the next generation of high-reliability space systems. It follows in the footsteps of MIL-STD-1541A, "Electromagnetic Compatibility Requirements for Space Systems and Equipment," but has been thoroughly updated to reflect current industry design practices.

The starting point for this document was "Electromagnetic Compatibility Requirements for Space Systems and Equipment," TOR 2005(8583)-1, 8 August 2005, developed by Mark W. Dunbar of the Electrical and Electronic Systems Engineering Department, Electronics Engineering Subdivision at The Aerospace Corporation. However, as a result of committee deliberations, this standard draws most of its content from MIL-STD-461F and MIL-STD-464A. Additional requirements deemed necessary for high reliability space systems have been added by the committee.

The intent is to address approximately 80% of space systems. For missions that do not require all the provisions of this standard, or which may need additional requirements, it is understood that tailoring may be performed to balance performance, risk, and cost to suit the needs of a particular program.

The final product reflects the best EMC design and verification practices for high reliability space systems.

At the time of approval, the members of the AIAA EMC Committee on Standards were:

David Brumbaugh, Co-Chair	The Boeing Company
James Lukash, Co-Chair	Lockheed Martin
Karen Barker	Brahe Corporation
Leard Bell	The Aerospace Corporation
Larry Campbell	MEI Technologies
Joe Chott	General Dynamics
Mark Dunbar	The Aerospace Corporation
Glen Gassaway	General Dynamics
Grant Helling	Ball Aerospace & Technologies Corp
Ken Jav	EMC Compliance
Haris Kh	Honeywell
Alex Kristalinski	Aerojet
Dede Luong	The Boeing Company
Matt McCollum	NASA
Elias Moawad	United Technologies
Paul St Jean	ATK Thiokol
Noel Sargent	Analex Corporation
Bob Shappell	Honeywell

Carl Vogelsang	The Boeing Company
Les Warboys	Northrop Grumman
Ed Whitcomb	United Technologies
Albert Whittlesey	Jet Propulsion Laboratory

The above consensus body approved this document in September 2009.

The AIAA Standards Executive Council (Mr. Amr El Sawy, Chairman) accepted the document for publication in October 2009.

The AIAA Standards Procedures dictate that all approved Standards, Recommended Practices, and Guides are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any AIAA standards publication and no commitment to conform to or be guided by standards reports. In formulating, revising, and approving standards publications, the committees on standards will not consider patents that may apply to the subject matter. Prospective users of the publications are responsible for protecting themselves against liability for infringement of patents or copyright or both.

1 Scope

This standard is applicable for the procurement of space systems, including spacecraft, space vehicles, launch vehicles, ground systems, and associated equipment/subsystems.

This standard establishes performance and verification requirements for the purpose of ensuring space systems electromagnetic compatibility (EMC), including all electromagnetic environmental effects. Engineering issues that must be addressed in order to achieve system-level EMC are identified herein, with guidance and rationale toward achieving specification compliance.

2 Tailoring

When viewed from the perspective of a specific program or project context, the requirements defined in this standard may be tailored to match the actual requirements of the particular program or project. Tailoring of requirements shall be undertaken in consultation with the procuring agency where applicable.

NOTE Tailoring is a process by which individual requirements or specifications, standards, and related documents are evaluated and made applicable to a specific program or project by selection, and in some exceptional cases, modification and addition of requirements in the standards.

3 Applicable Documents

The following documents contain provisions that, through reference in this text, constitute provisions of this standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

AFSPCMAN 9-710, Vol. 3	*Range Safety User Requirements Manual, Volume 3 – Launch Vehicles, Payload, and Ground Support Systems Requirements*
AFSC DH 1-4 (4th Ed, Rev 1)	*AFSC Design Handbook 1-4*
AIAA S-113-2005	*Criteria for Explosive Systems and Devices on Space Launch Vehicles*
ANSI/IEEE C95.1-2005	*Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz*
JSC-28596 (2000)	*NASA Standard Initiator User's Guide*
MIL-HDBK-83575 (1998)	*General Handbook for Space Vehicle Wiring Harness Design and Testing*
MIL-STD-331C	*Fuse and Fuse Components Environmental and Performance Tests*
MIL-STD-461F	*Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment*
MIL-STD-464A	*Electromagnetic Environmental Effects Requirements for Systems*
MIL-STD-889B	*Dissimilar Metals*
MIL-STD-1576 Valid Notice 1	*Electroexplosive Subsystem Safety Requirements and Test Methods for Space Systems*