AMEREM 2018-Nuclear Environments and Effects Standards: An Overview

Walter J. Scott
Engility Corporation
Chantilly, Virginia, USA

Michael R. Rooney
Defense Threat Reduction Agency
Ft. Belvoir, Virginia, USA

Abstract–The US Department of Defense began developing nuclear environment and effects military standards for specifying nuclear threat environments and protection of strategic military platforms and systems in the early 1980s. The first standard issued was MIL-STD-2169, the High-altitude Electromagnetic Pulse (HEMP) threat environment to be used by all military services in developing survivable systems. Subsequently, MIL-STDs-188-125-1, and -2 were issued for protection of fixed and transportable ground-based systems; MIL-STD-3023 for protection of military aircraft; and MIL-STD-4023 for protection of military ships. As our understanding of nuclear source region, field generation and coupling, and system effects phenomenology has matured, as well as to leverage advances in hardening and testing technologies, these standards have been revised. Most recently, development of new nuclear environments standards is underway that specify nuclear environments applicable to designing, hardening, and testing buried, terrestrial and space-based platforms and systems. This paper will provide a top-level overview of nuclear environments and system protection standards, with added focus on recent changes made to MIL-STD-188-125-1 for HEMP protection of fixed ground-based facilities with time-urgent missions.

Keywords-nuclear threat environments, HEMP, nuclear, environments, survivability, protection, platforms, systems

I. INTRODUCTION

Nuclear threat and protection standards define the nuclear threat environments; enact pass-fail performance metrics; and define best practices for hardening and testing critical facilities and systems. Recent standards issued include:

- MIL-STD-3053, Satellite System Natural and Nuclear Survivability Standard (SSNS) – Published 19 November 2015,
- MIL-STD-4023, High Altitude Electromagnetic Pulse (HEMP) Protection for Military Surface Ships – Published 25 January 2016, and
- MIL-STD-3054, Comprehensive Atmospheric Nuclear Environment Standard (CANES) – Published 14 March 2016

In addition, new nuclear environment and protection standards are being developed that address scintillation and protection of satellites, and environments associated with surface and near-surface bursts:

- Nuclear Disturbed Communications Environment (NDCE), CANES Annex – 4QFY18,
- Satellite System Nuclear Survivability Interface/Protection Standard (SSNS-P) – 1QFY19, and
- CANES Surface/Near Surface Environments Annex – 4QFY18

Together, these standards specify the complete sub-terrestrial, terrestrial, and space nuclear threat environments needed to harden and test military platforms and systems.

II. DISCUSSION

The talk will provide a short overview on the scope of each of these standards followed by a discussion on some of the major changes recently made to MIL-STD-188-125-1.

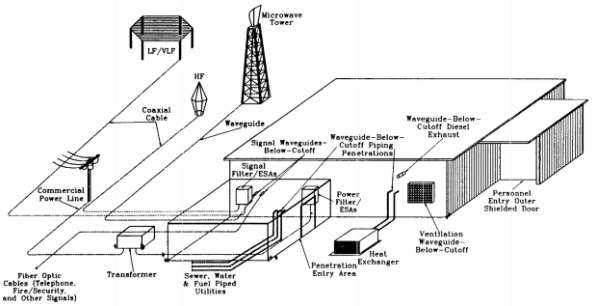

Figure 1. Typical HEMP hardening topology.

Major changes made to MIL-STD-188-125-1 affected the system topology (Fig.1), testing methodologies, and a few pass/fail criteria. Changes that will be discussed include:

- Addition of a new appendix that addresses requirements for Small Shield Enclosures,
- Modification of Continuous Wave Immersion (CWI) Test Procedures to include allowed use of minimum phase algorithms, and
- Changes to Acceptance Test requirements