Examples of infrastructure threatened by EMP

What are the benefits of EMP hardening?

The major benefit that is derived from EMP hardening can be summed-up in one word, "survivability."

EMP hardening significantly increases the probability that equipment will survive an EMP environment and continue to perform its mission both during and after exposure to an EMP.

Having electronic and communications equipment that is operational in a post-EMP environment is critical to mission accomplishment and overall success in supporting interoperable emergency National Security and Emergency Preparedness (NS/EP) communications.

The DHS "Electromagnetic Pulse (EMP) Protection and Restoration Guidelines" is currently available for download. Please go to www.dhs.gov/shares, click on “SHARES Documents” and then “Electromagnetic Pulse (EMP) Protection and Resilience Guidelines for Critical Infrastructure Equipment.
https://www.dhs.gov/sites/default/files/publications/19_0307_CISA_EMP-Protection-Resilience-Guidelines.pdf

Department of Homeland Security

National Communications & Coordination Branch (NCC)

SHARES HF Radio Program

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The mission of the SHAred RESources (SHARES) High Frequency (HF) Radio Program is to support interoperable emergency communications for National Security and Emergency Preparedness (NS/EP) use.

NS/EP personnel need to transmit critical messages to coordinate emergency operations even when traditional means of communicating via landlines and cellphones are damaged or destroyed. The SHARES HF Radio Program, administered by the Department of Homeland Security’s (DHS) National Coordinating Center for Communications (NCC), provides an additional means for users with a NS/EP mission to communicate when normal methods of communications are unavailable.

SHAred RESources High Frequency Radio Program - Electromagnetic Pulse (EMP) Information

Revised 09 May 2019

Example of a Gas Discharge Tube used for EMP Protection

What is Electromagnetic Pulse (EMP)?

An electromagnetic pulse (EMP) is a release of energy caused by a nuclear detonation (NUDET) or from naturally occurring solar storms. It produces a radiated field that can be damaging to electronic equipment.

Electronics are used to control, communicate, compute, store, manage, and implement nearly every aspect of United States civilian life. A catastrophic EMP event could cause the collapse of critical civilian infrastructures such as the power grid and telecommunications.

When a NUDET occurs at high altitude, the EMP produced will cover a wide geographic region within the line of sight of the detonation. This broad band, high amplitude EMP has the capability to produce widespread and long lasting disruption and damage to the critical electronic infrastructure that supports the fabric of our society.

How can I protect against EMP?

The easiest and quickest way to reduce equipment vulnerabilities to EMP is to turn off non-essential equipment and then unplug this equipment from all metallic lines, such as power cords, telephone lines, Ethernet cables, and antennas/coaxial cables.

Radio systems and electronics should be hardened and shielded against the effects of EMP.

High Frequency (HF) radios need protection in three areas: 1) protection for antennas, 2) protection for power connections, and 3) protection for low voltage DC connections such as antenna rotators.

Protective devices must be well grounded using low inductance grounding cables as short as possible.

A proper ground system is a key factor in achieving protection from EMP and lightning strikes.

A single point grounding system should be installed to eliminate transient electrical paths through radio equipment and to provide a good physical ground for surge suppression devices.

Electrical power-line protection can be provided with easy-to-install, plug-in transient protectors.

Coaxial cable is recommended for use as the transmission line because it provides a certain amount of transient surge protection for the attached equipment.

RF coaxial line protection devices such as a surge protector and gas discharge tubes should be installed on coaxial cables.

For HF antennas, the protector voltage rating needs to be greater than the transmitter peak voltage, with a factor of two margin preferable. As a function of power P in watts for 50 Ω systems, this gives a protector voltage rating V of: $V=20\sqrt{P}$, which is 200 V for a 100 W system, 400 V for a 400 W system and 630 V for a 1 kW system.

An Uninterruptible Power Supply (UPS) or emergency power generators can provide transient-protection advantages by isolating radio equipment from the commercial AC power system, a major source of damaging transients.

Gas Discharge Tube protectors are commercially available from Polyphaser, Huber+Suhner, Fischer Custom Communications, Amphenol EMI/EMP Protection Connectors, ETS-Lindgren, and Bourns.

Example of a coax nuclear EMP protector