

Electromagnetic Pulse (EMP) Basics

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[Background relevant to January Communication Exercise in which the scenario was that there was an EMP event causing disruption of communication systems.]

Definition: An externally-applied or externally-caused electromagnetic radiation flux which impinges upon a system, thus leading to abnormal induction of voltages and currents in that system.

An electromagnetic pulse (EMP) can be caused by a number of natural and man-made sources. An obvious example of a natural source is lightning. Other natural sources could include geomagnetic storms, and electrical discharges which are sometimes present with seismic or volcanic activity. Man-made sources could include the detonation of nuclear weapons, detonation of a non-nuclear electromagnetic bomb, or electromagnetic pulse beam weapons.

Three general classes of EMP are considered in nuclear scenarios:

- 1) Local EMP - Caused by a nearby nuclear burst at low altitude, or a ground burst.**
- 2) High-altitude EMP (HEMP) - Caused by a nuclear burst, with detonation altitudes in the 10,000 to 100,000 foot range.**
- 3) System-generated EMP (SGEMP) - Caused by primary gamma- and X-radiation directly into an electronics package, thus leading to the induction of currents by that ionizing radiation in conductors due to charge exchange in cavities in the system.**

In nuclear scenarios, the rise time of the EMP may be sub-nanosecond in rate, with the resulting frequency content being very high and broad-banded.