EMP Testing & Measurement

2025. 05.14.

정 영 경

REPLEX

주식회사 리플렉스

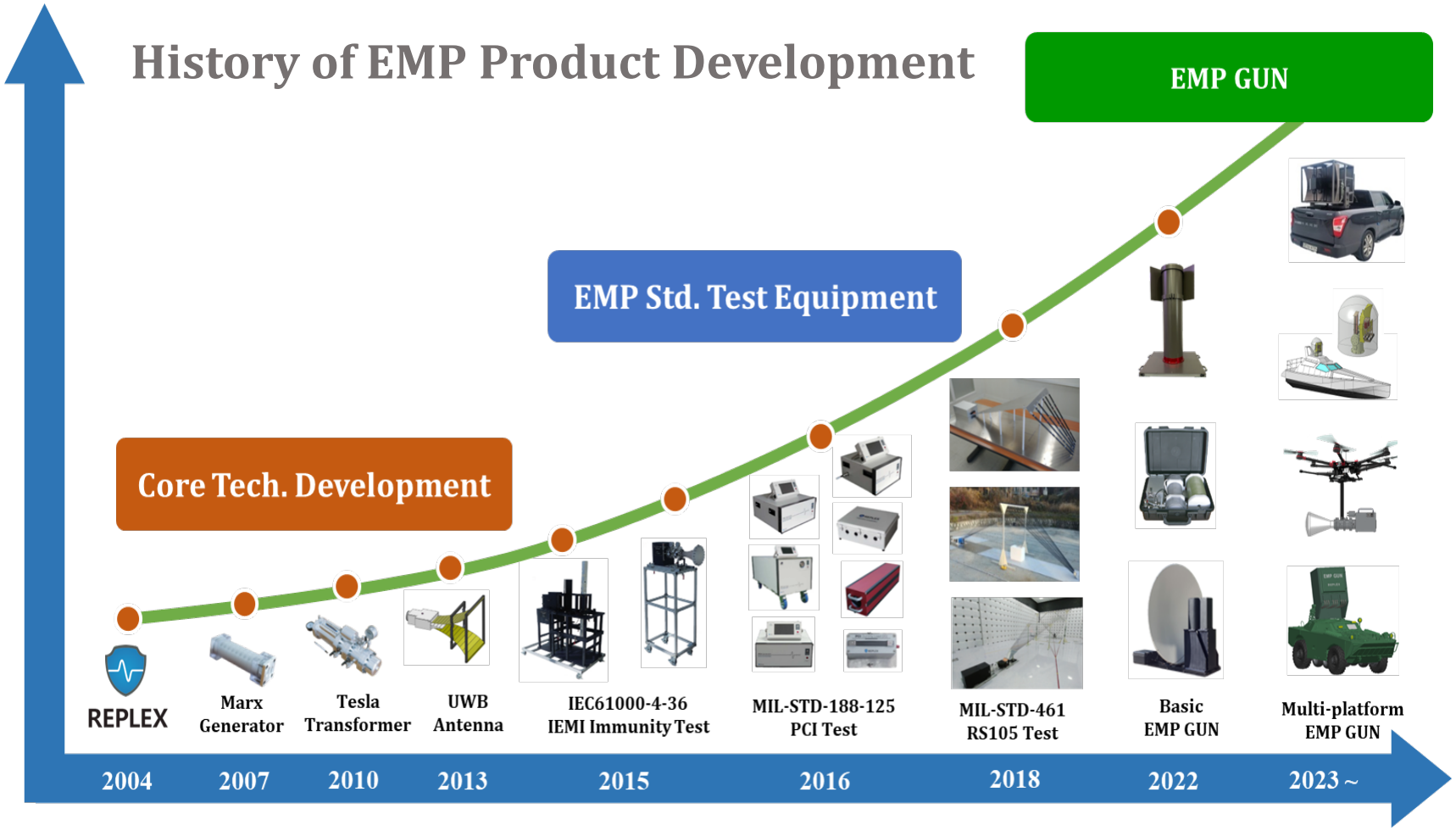
Company Profile

REPLEX

Only one Provider of the EMP generator in Korea

Main Office , Factory , Research Lab.

EMP Test Site



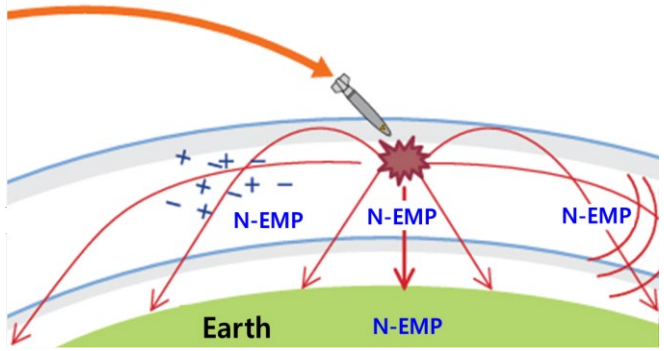
What is EMP(ElectroMagnetic Pulse)?

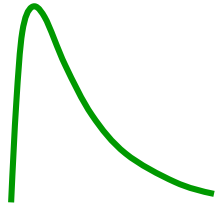
EMP

Very strong electromagnetics wave ; Stop working electronic devices
Pulse-Type waveform ; Harmless to human body

Nuclear EMP (N-EMP)

Generated when nuclear bomb explodes more than 30km above the ground

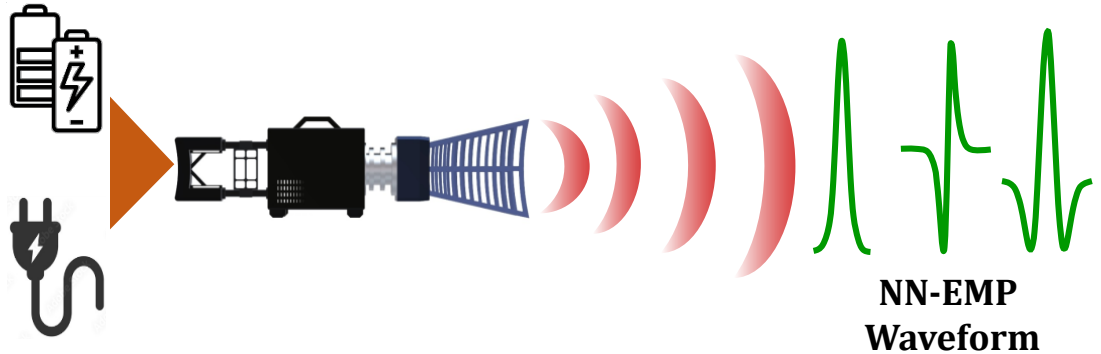




N-EMP Waveform

Non-Nuclear EMP (NN-EMP)

Generated by using the electric energy Such as battery or commercial power



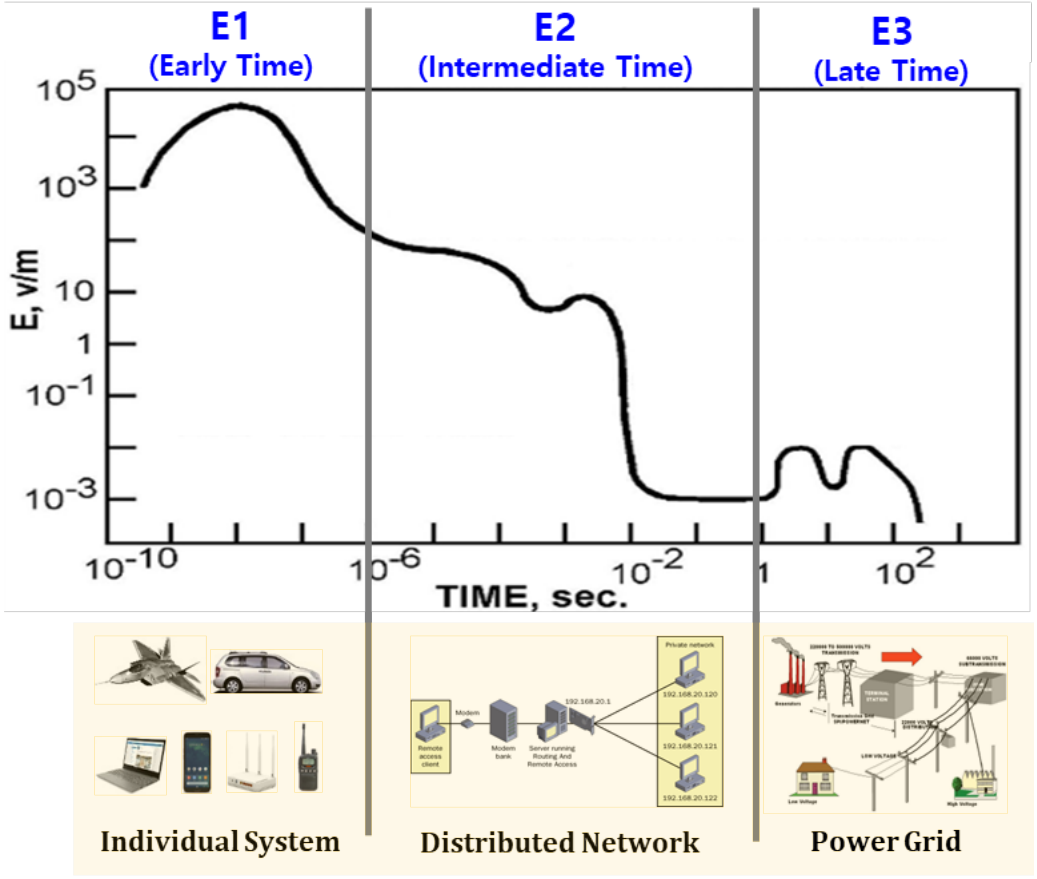
NN-EMP Waveform

Category of Nuclear-EMP

Item	Generation environment	Maximum E-field strength	Features
HEMP	Generated by nuclear explosion at an altitude of 30 km or more	50kV/m	- Threats to the widest range Most of the energy - Distributed from 100kHz to 10MHz
SBEMP	Generated by nuclear explosion within 0.2km of altitude	1MV/m(Source region) 10kV/m(Radiated region)	- Most of the energy is distributed within 100kHz - No reference waveform
ABEMP	At an altitude of 2 to 20 km Generated by nuclear explosion	1MV/m(Source region) 300V/m@5km(Radiated region)	
SGEMP	Between nuclear radiation and electronic systems Generated by interaction	100kV/m	- Affects systems outside the atmosphere - No reference waveform
MHD-EMP	EMP component at late time of high altitude nuclear explosion	30kV/m	On intercontinental long tracks or submarine cables effect

*** HEMP : High Altitude EMP/SBEMP : Surface Burst EMP/ABEMP : Air Burst EMP/ SGEMP : System-genrated EMP/ MHD-EMP : Magnetohydrodynamic EMP**

HEMP signal characteristics

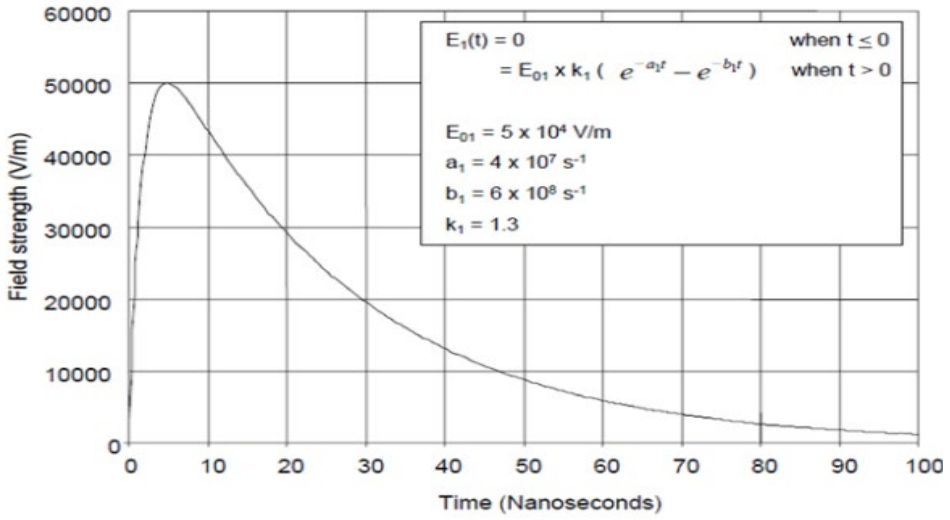


Item	Time of Occur	Frequency Band	Features
E1	t <1us	1MHz~1GHz	the strongest initial EMP of tens kV/m
E2	1us < t < 1sec	1kHz~100kHz	Similar to medium EMP, Surge waveform of several hundred V/m
E3	t > 1sec	~1Hz (quasi-DC)	EMP with long wavelength of several tens of mV/m, similar to geomagnetic storm

※ Most electronic devices, such as computers and telecommunications equipment, are damaged by E1 and E2, and E3 is a very long power line damage to transformer, communication system, etc.

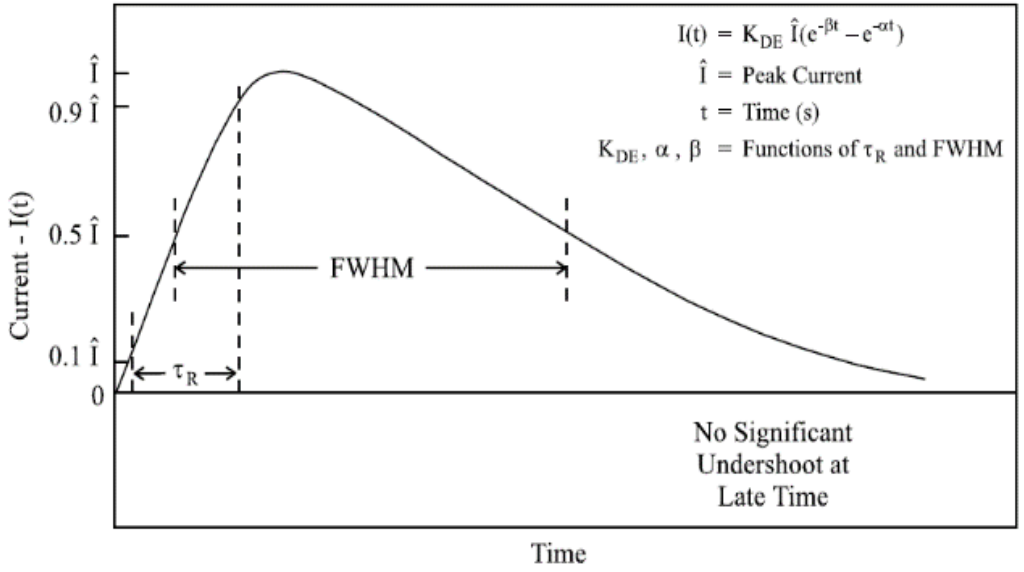
Nuclear-EMP(HEMP) Waveform

Radiated Nuclear-EMP



Standard	Waveform	Parameter	Value
MIL-STD-461G	E1	Rise Time	1.8~2.8ns
		Pulse Width	18~28ns
		E-field Strength	5~50kV/m

Conducted Nuclear-EMP



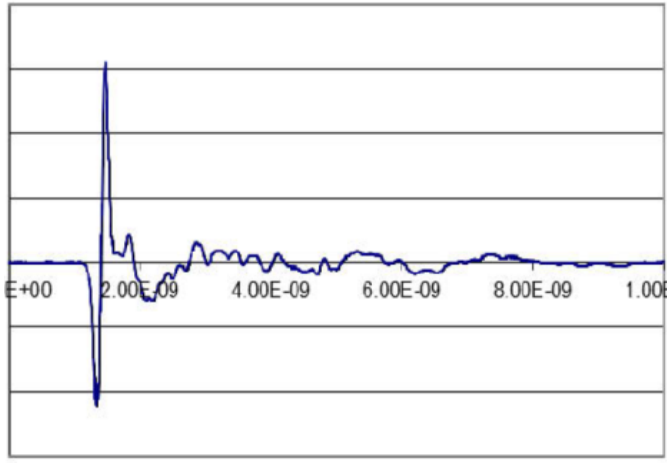
Standard	Waveform	Rise Time	Pulse Width	Peak Current
MIL-STD-188-125	E1	≤20ns	500~550ns	5,000A
	E2	≤1.5us	3~5ms	250A
	E3	≤0.2sec	20~25s	1,000A

Non Nuclear-EMP(IEMI) Waveform

IEMI(Non Nuclear-EMP) Source can be used for criminal or terror purpose.
IEC61000-4-36 defined to test levels & environment for immunity test of electronic devices and systems against IEMI .

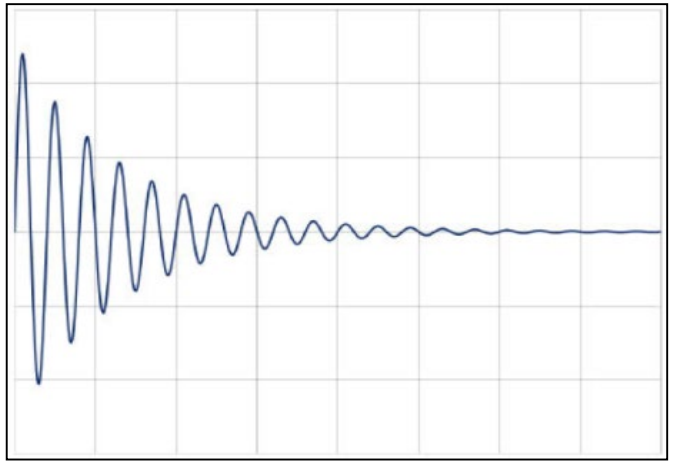
Radiated IEMI Environments

Hyperband environments



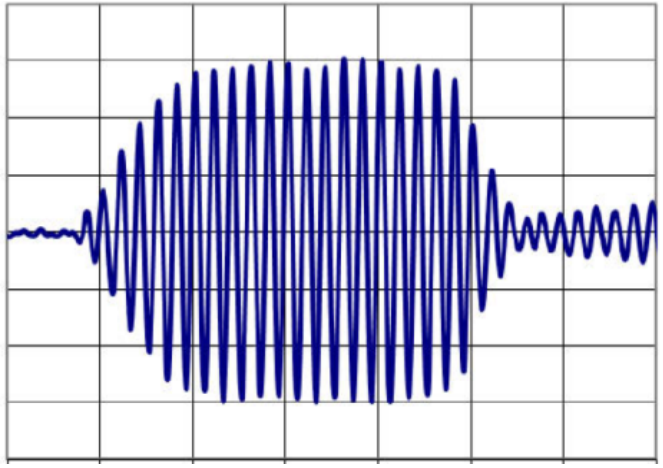
Transient Wave(Pulse)
Rise Time : 100~500ps, Pulse width : 0.2~5ns

Mesoband environments



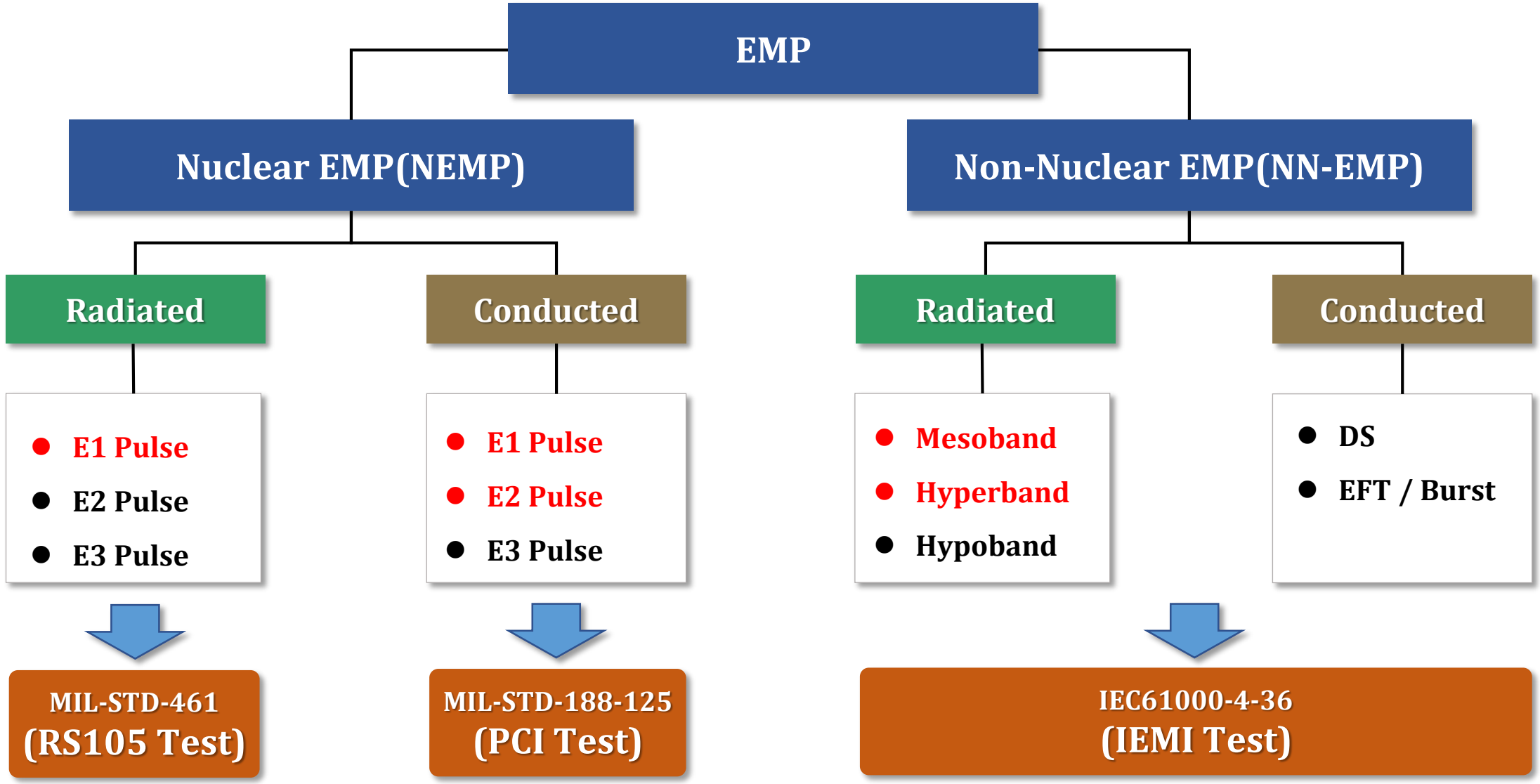
Damped Sine(DS) Wave
Oscillation frequency : 80-500MHz

Hypoband environments



Continuous Wave(CW)
Fixed frequency and continuous

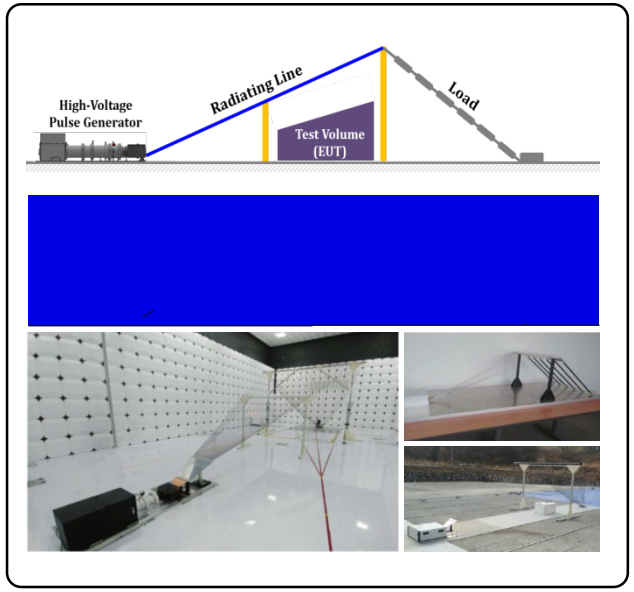
EMP Standard Testing Classification



Classification of Replex' EMP Generators

Nuclear-EMP Generator

Radiated N-EMP Generator (MIL Standard Test Equip.)



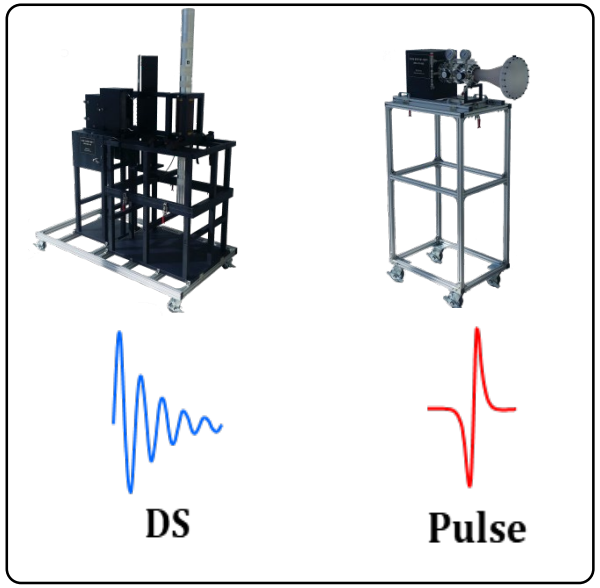
Radiated N-EMP Immunity Test
Of the Military Electronic Device

Conducted N-EMP Generator (MIL Standard Test Equip.)

Performance Testing of EMP filter
on the EMP Protection Facility

Non Nuclear-EMP Generator

Radiated NN-EMP Generator (IEC Standard Test Equip.)



Immunity test of electronic devices
against Intentional EMI(IEMI)

Radiated NN-EMP Generator (EMP GUN)

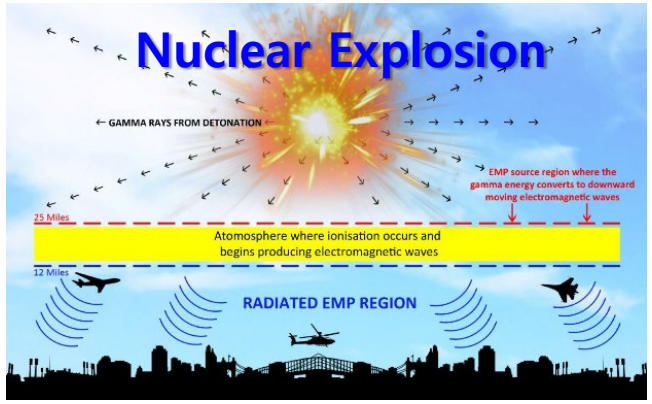
Stop working
Malicious Electronic Device

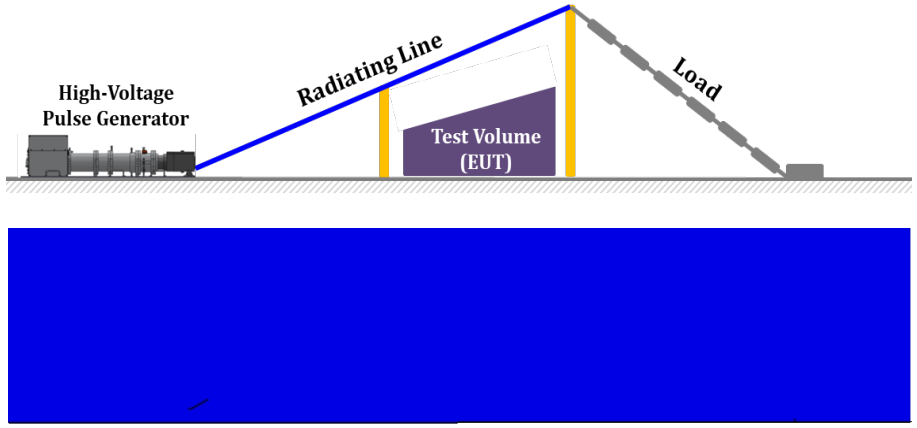
RS105 Test & Measurement

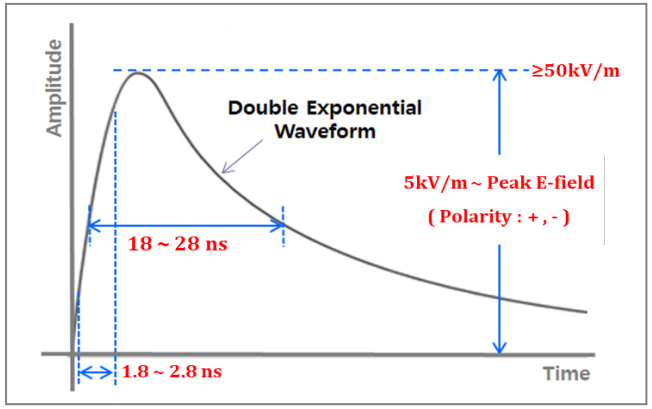
RS105 Test : Overview

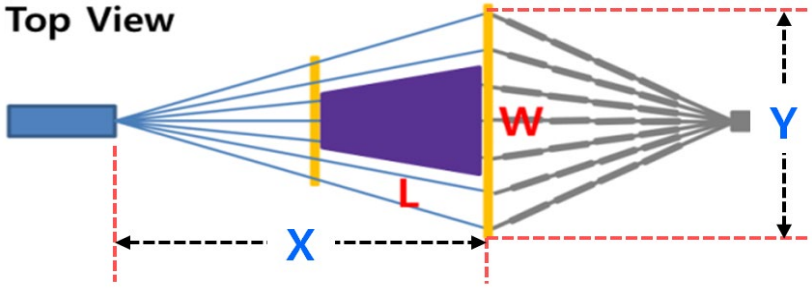
NEMP Simulator

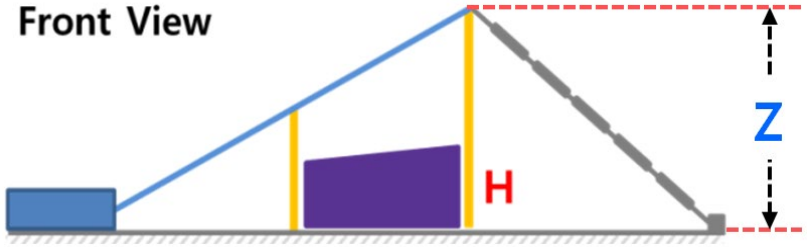
Generates the radiated N-EMP signal which is reached on the earth surface by the nuclear bomb explosion more than 30km over the ground.











Test Volume Size Condition

H : not exceed 1/3 of radiator's height.

W : not exceed 1/2 of radiator's width

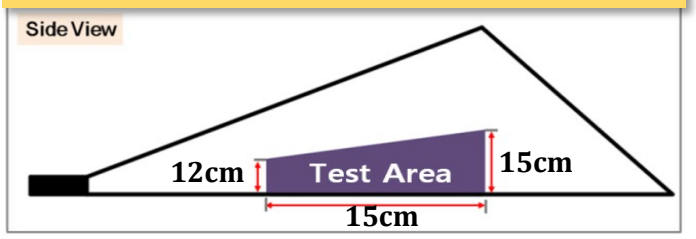
L : not exceed 1/2 of radiator's length

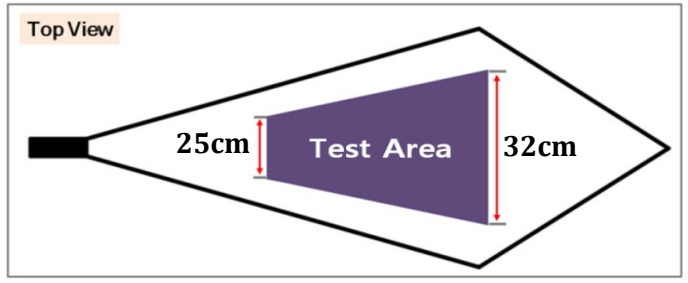
RS105 Test : Type of NEMP Simulator

Small N-EMP Simulator

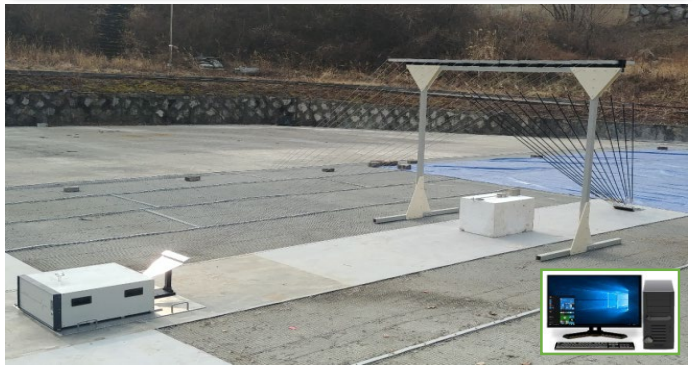
Simulator Size: 2.3m x 0.8m x 0.5m

Test Volume Size (15x15x15cm)



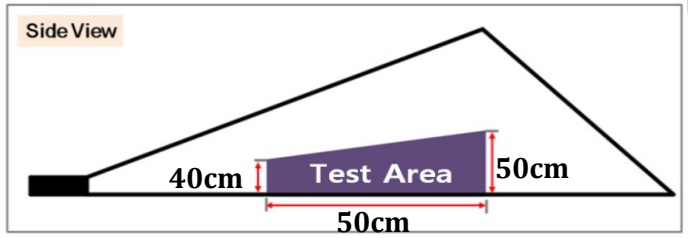


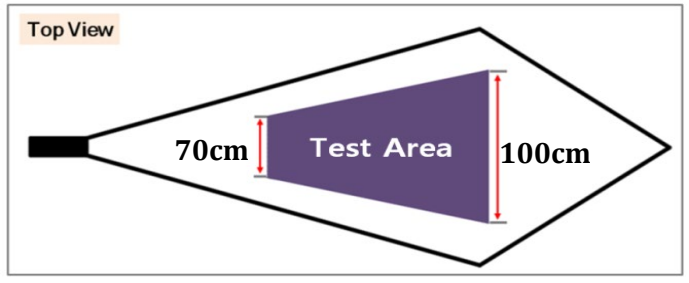
Middle N-EMP Simulator



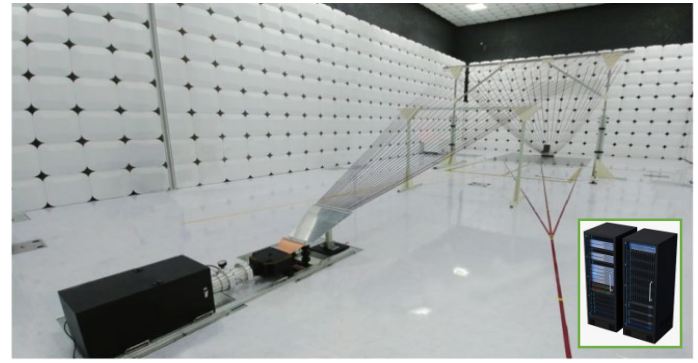
Simulator Size: 7m x 2.5m x 1.8m

Test Volume Size (50x50x50cm)



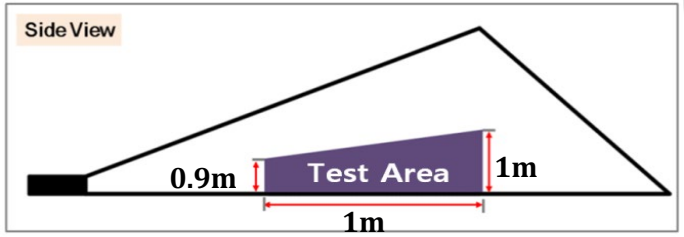


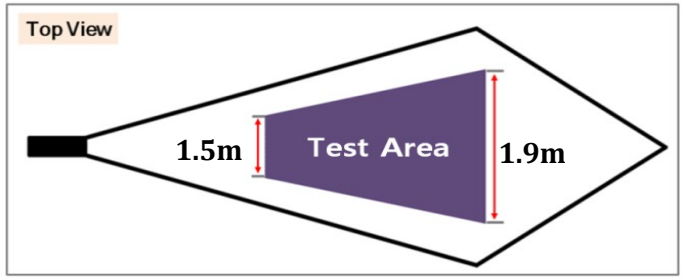
Large N-EMP Simulator



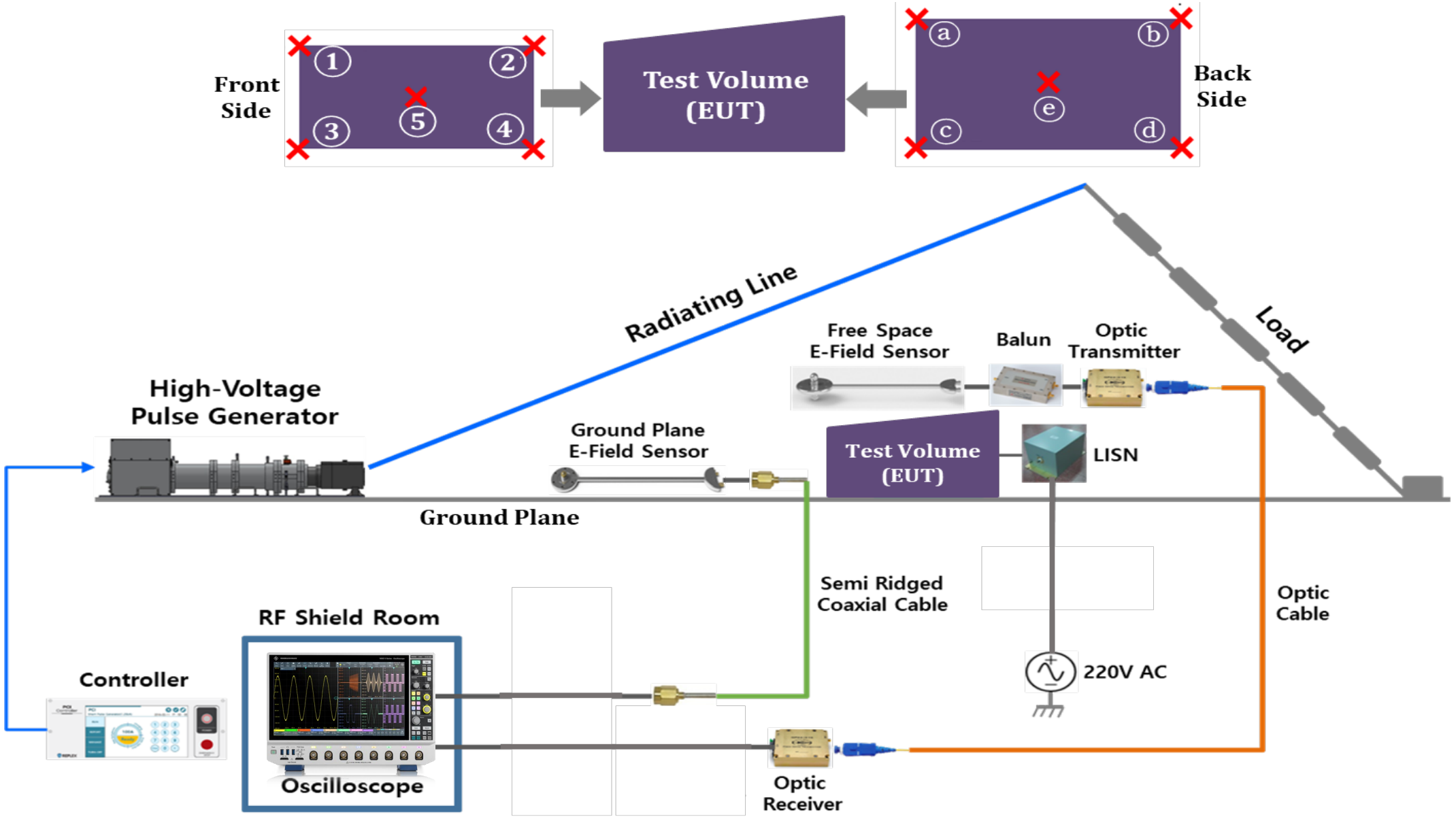
Simulator Size: 15m x 5m x 3.6m

Test Volume Size (1x1x1m)



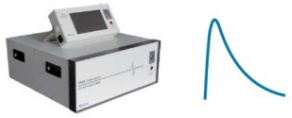
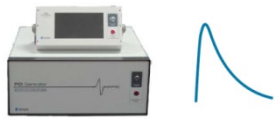
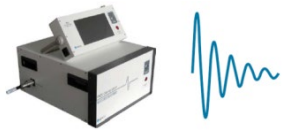


NEMP Simulator : Test Volume Verification



PCI Test
& Measurement

PCI Test System : Generator & Accessories

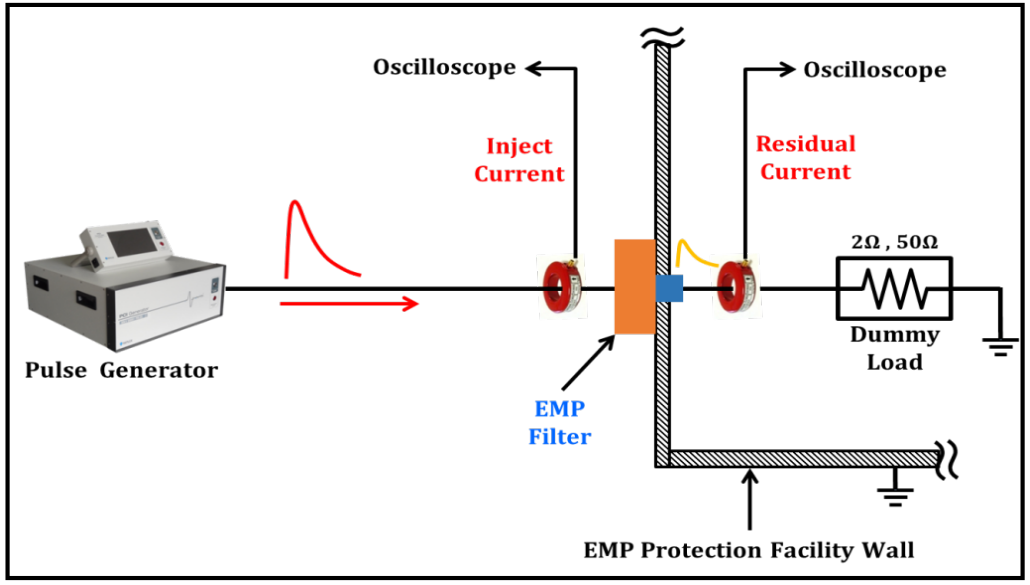
PCI Pulse Generator		
E1 Pulse Generator (1.25kA)		Used for performance test of Data/Audio Line Filter & Power Line Filter
E1 Pulse Generator (5kA)		
E2 Pulse Generator (270A)		
Charged Line Pulse Generator		Used for performance test of RF antenna Line Filter

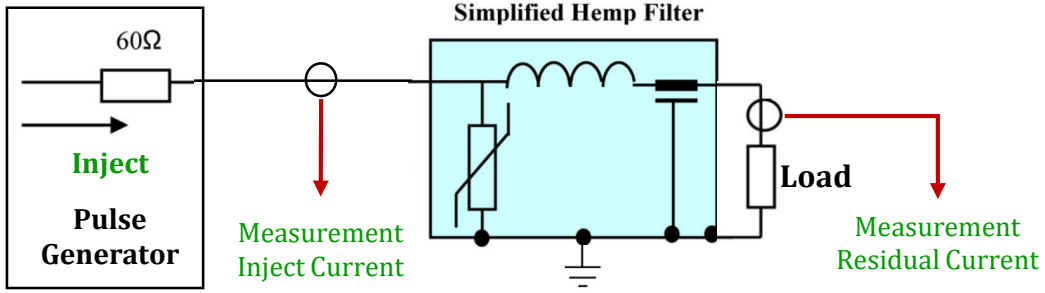
Test Accessories		
Capacitive Coupler		A device that injects a current pulse signal into a cable through an electrical connection
Inductive Coupler		A device that injects a current pulse signal into a cable without electrical connection
Isolation Device		A device that block current pulses so that the injected current pulse does not affect in other equipment or systems.
Dummy Load (2Ω , 50Ω)		Used as internal load in PCI acceptance test (Power line filter is 2Ω, communication line filter is 50Ω load resistance)

PCI Test : Acceptance & Verification Test

Acceptance Test (wire-to-ground)

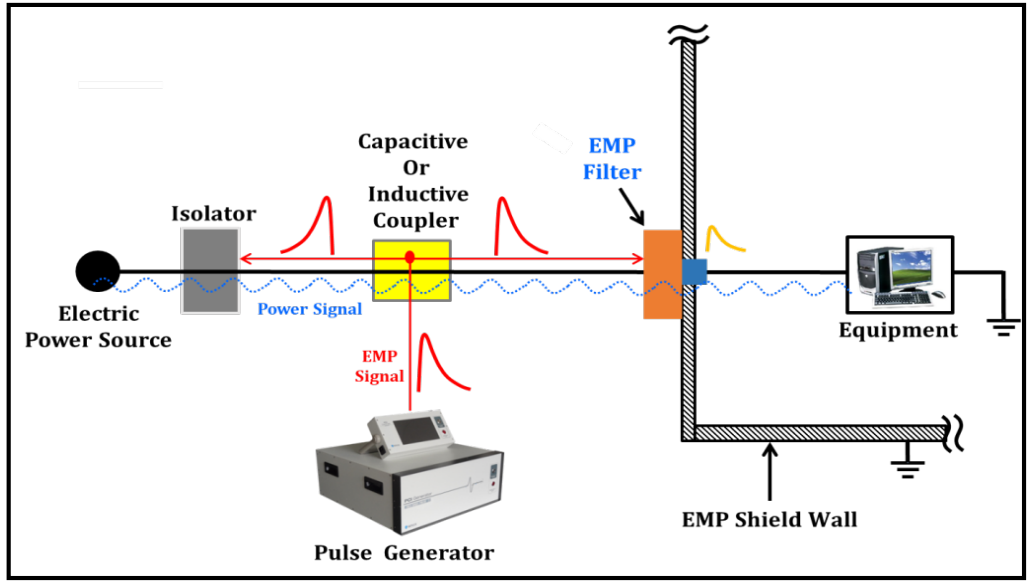
- Testing under the condition of not supplying power
- Pulse is injected into each line
- dummy load and current sensor are required

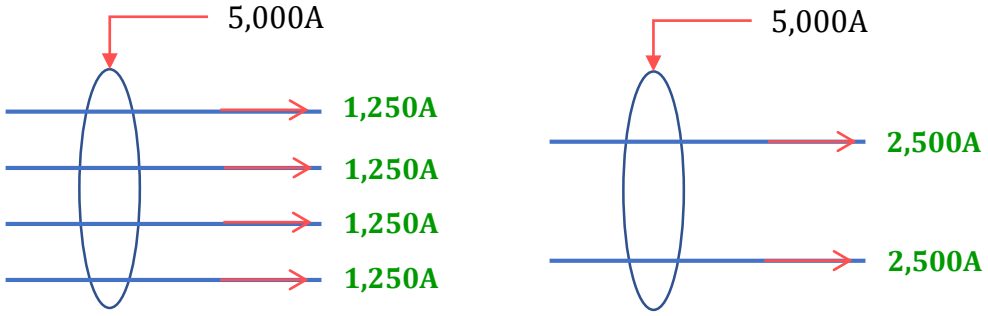




Verification Test (common mode)

- Testing under the condition of supplying power
- Pulse is injected in the bulk.
- coupler and isolator are required





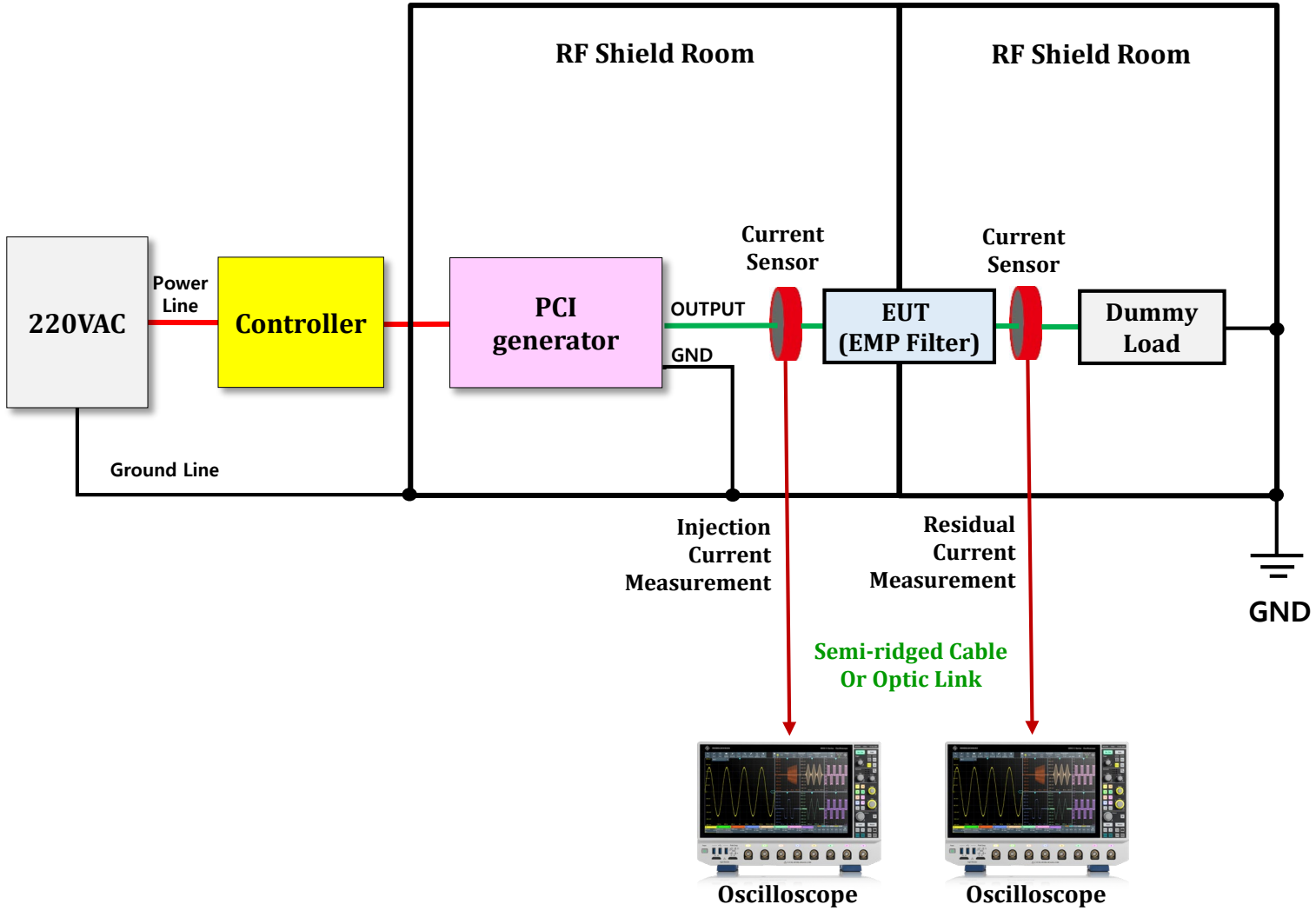
PCI Test : Acceptance Test Configuration

Controller

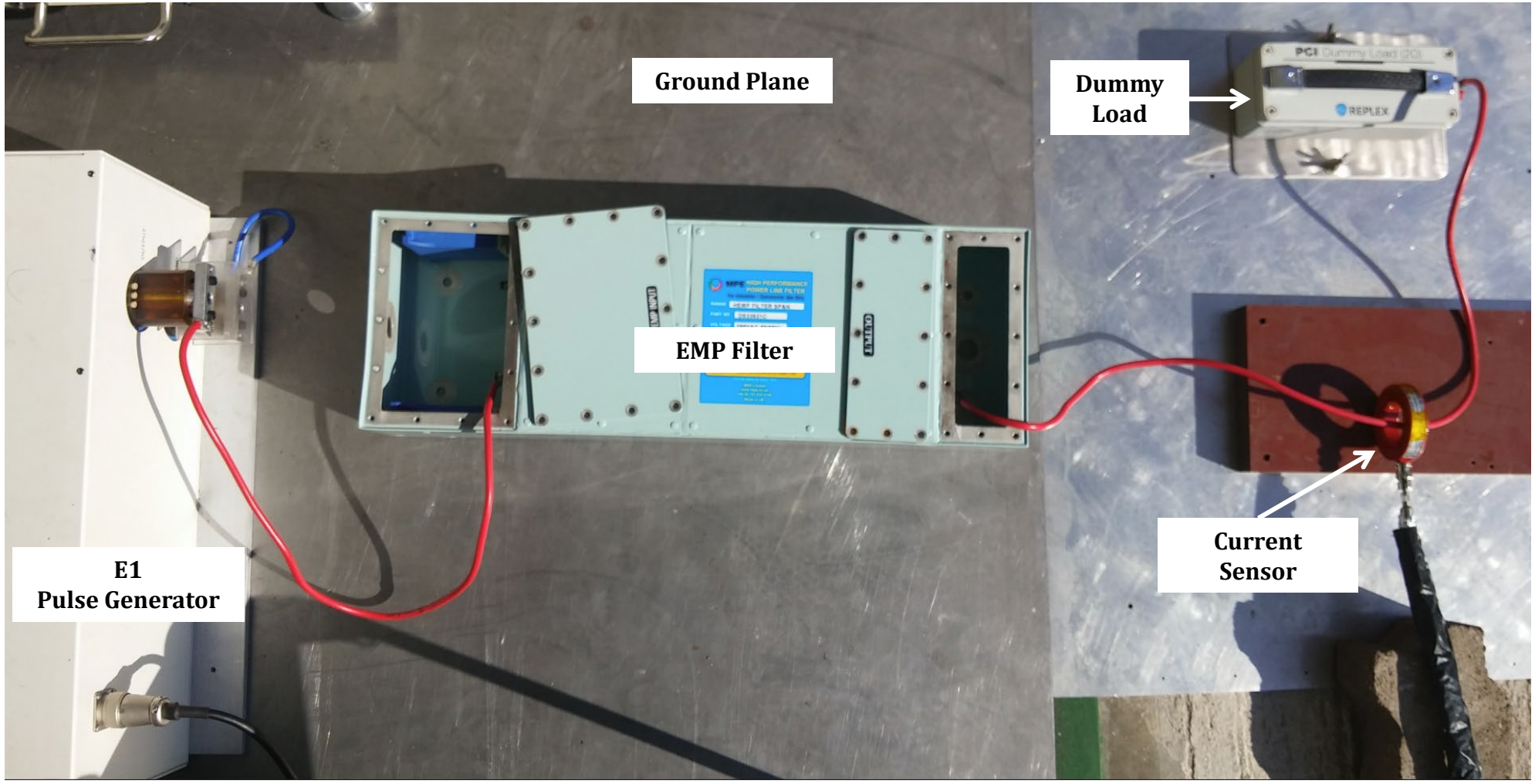
Pulse Generator

Pulse Generator Back Side

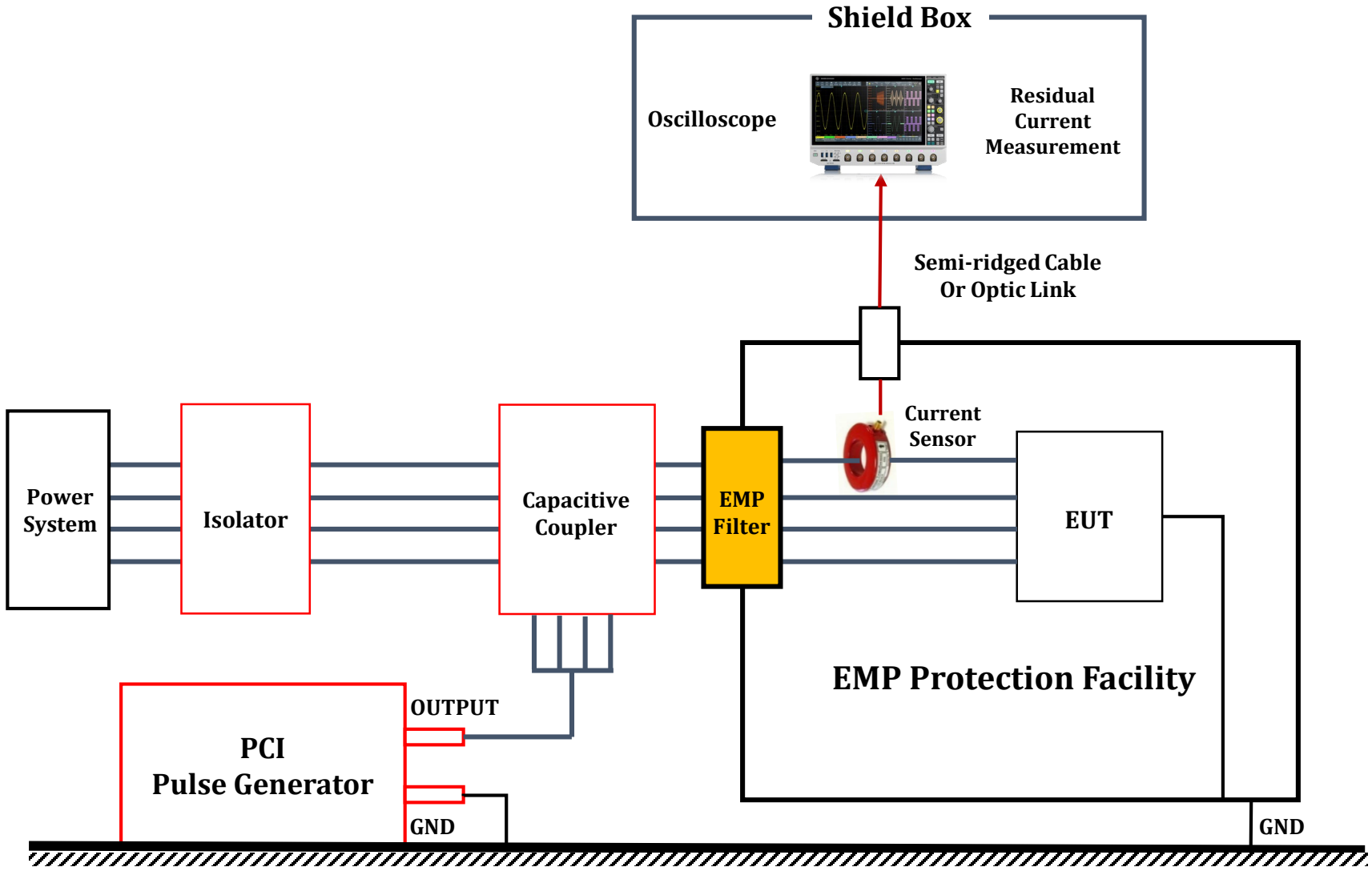
* Power is supplied to the PCI Generator through the controller.



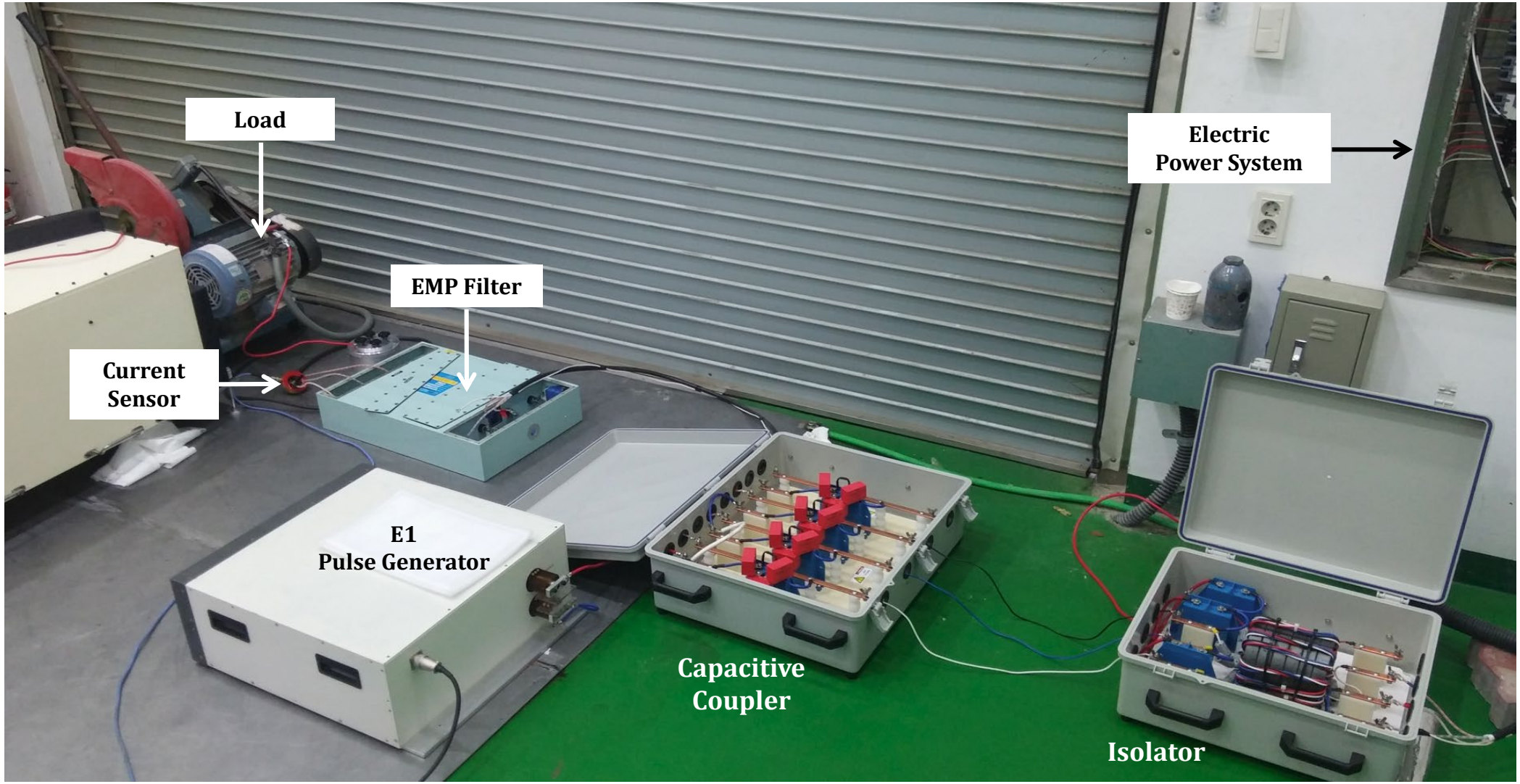
PCI Test : Example of Acceptance Test



PCI Test : Verification Test Configuration

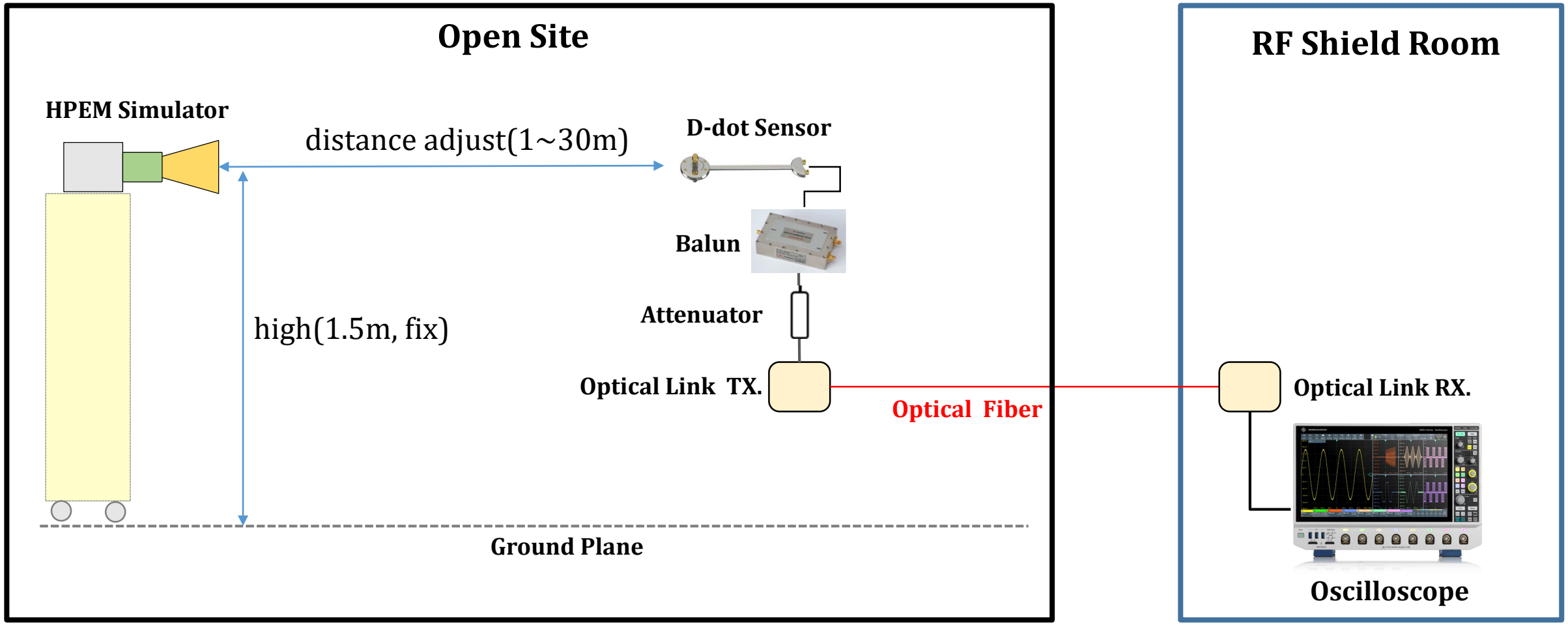


PCI Test : Example of Verification Test



IEMI Test
& Measurement

IEMI Source E-field Strength Measurement



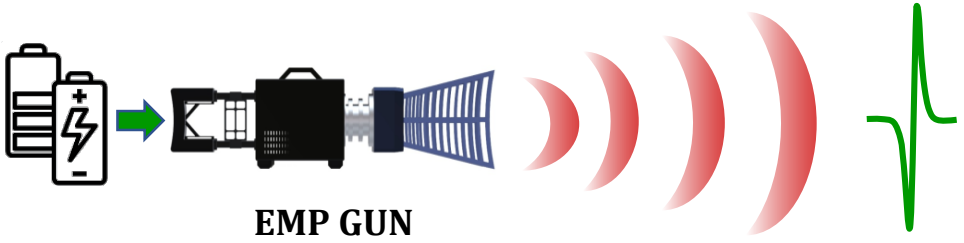
EMP GUN

Overview of the EMP GUN

EMP GUN : Stop working Malicious Electronic Device

EMP GUN Feature

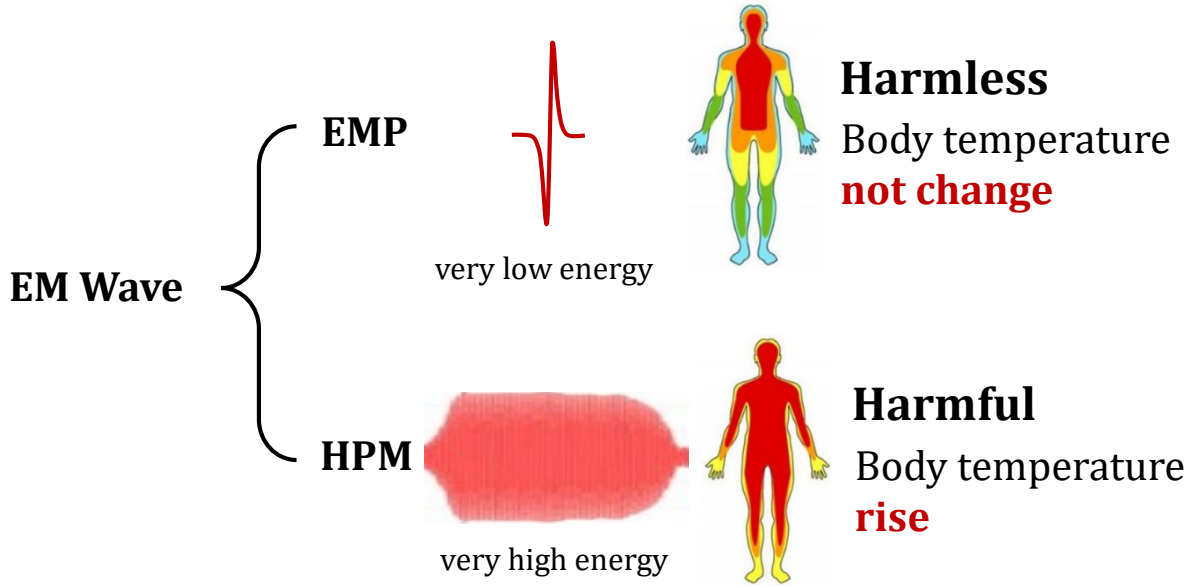
- Very strong electromagnetics wave
- Stop working electronic devices
- Pulse-Type waveform (EMP)
- Harmless to human body
- Operate using the battery power



EMP GUN

Waveform

The impact of EMP on the human body

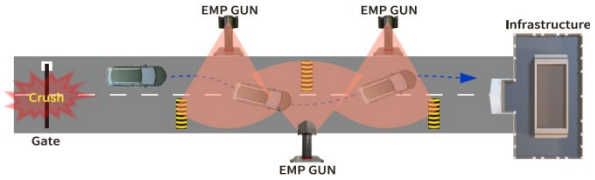


EMP GUN Product List

Suitcase Type (M30 & M30R)

Picture	Parameter	Specifications
 	Power Source	Battery
	Pulse Repetition Rate	1 to 5Hz
	Peak Electric-Field	150kV/m
	Direction Type	Omni-Directional
	Size/Weight	≤0.5m × 0.7m × 0.4m / ≤22kg
VIP protect , Blocking of IED, Spy camera & Wiretapping		

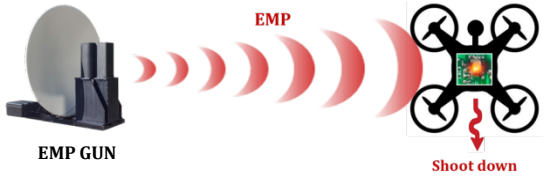
Pole Type (M60)

Picture	Parameter	Specifications
	Power Source	Battery
	Pulse Repetition Rate	1 to 5Hz
	Peak Electric-Field	300kV/m
	Direction Type	Directional
	Size/Weight	≤0.4m × 0.4m × 1.2m / ≤50kg
Unauthorized Entry Vehicle Blocking by the Engine Stopping		

Vehicle-Mounted Type (M200)

Picture	Parameter	Specifications
	Power Source	Battery
	Pulse Repetition Rate	1 to 10Hz
	Peak Electric-Field	850kV/m
	Direction Type	Directional
	Size/Weight	≤1m × 1.5m × 1.9m / ≤280kg
Engine stopping of Vehicle, Motor Cycle and Motor Boat		

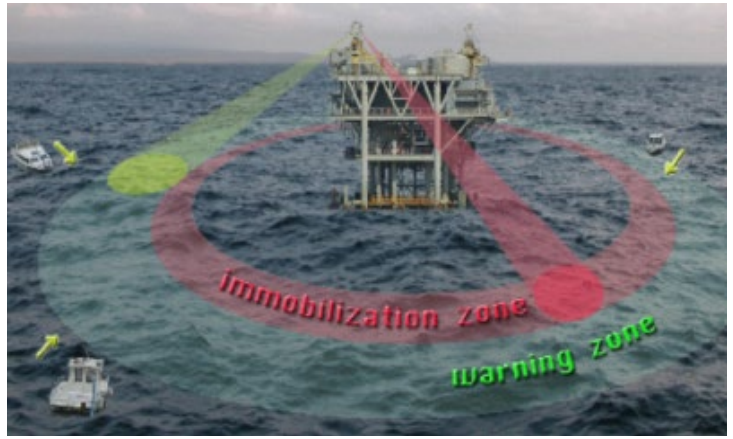
Anti-Drone System(M500)

Picture	Parameter	Specifications
	Power Source	Battery
	Pulse Repetition Rate	1 to 10Hz
	Peak Electric-Field	2MV/m
	Direction Type	Directional
	Size/Weight	≤2m × 2.5m × 2.8m / ≤350kg
Anti-Drone System (Neutralization of swarm drones)		

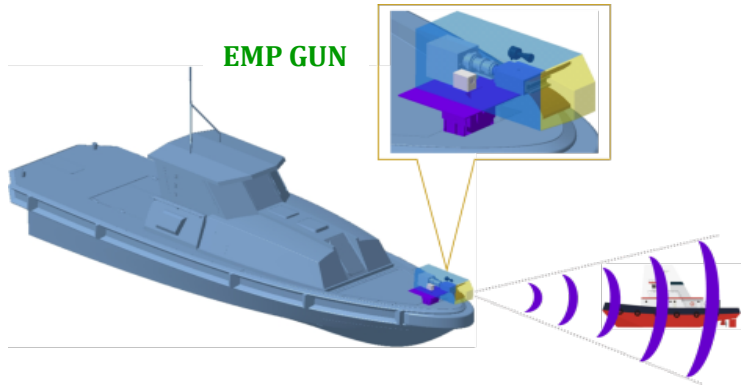
EMP GUN Applications

Anti-Drone System

Protect of the Infrastructure



Motor Boat Engine Stopping

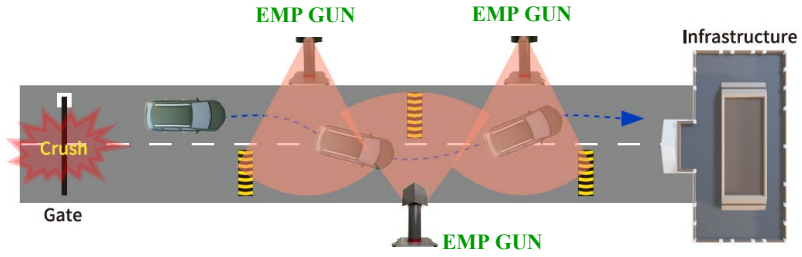


RC-IED Blocking

IED Controller

- Mobile Phone
- 2-Way Radio
- RC Toy Car
- Wireless Door Bell
- Car Alarm
- Digital Timer

Car Stopping



Wiretap Stopping

Thank You !