

montena

PRODUCT OVERVIEW

The impulse to
your progress

montena technology sa

Faced with the technological complexity of today's world, you can achieve ambitious objectives with the support of a new network of partners who are masters in their own fields.

Since its foundation in 1978, montena technology has gained a worldwide reputation for its leading-edge skills and competence in high voltage, high frequency and electromagnetic fields.

Montena technology masters design, development, manufacturing and installation of test and measurement equipment according to MIL Standards.

Our company is now considered a leader and number one supplier of simulators for NEMP effects. With many systems in service worldwide, the outstanding manufacturing quality and equipment reliability has been proven over the years.

Innovation, continuous improvement and partnership with experts enable us to provide our customers breakthrough technologies and turnkey solutions.

The multidisciplinary background of our highly qualified engineers and the flexibility of our structure make montena technology your ideal partner for transient pulse management.

TABLE OF CONTENTS

TEST AND MEASUREMENT SYSTEMS		Page
NEMP simulators	MIL-STD-461 RS105	4–5
PCI test setup	MIL-STD-188-125	6
SE & CWI test setup	MIL-STD-188-125	7
Test setup	MIL-STD-461 CS101, RS101	8
Test setup	MIL-STD-461 CS106, CS114, CS115, CS116	9
ESD 300 kV test setup for helicopters	MIL-STD-331C or NATO AECTP-250	10
UWB test setup		11

COMPONENTS & ACCESSORIES

GENERATORS		
NEMP Generators		12
Pulsed current injection (PCI) generators		13
MIL-STD CS106, CS114, CS115, CS116		14
GENERATORS ACCESSORIES		
Inductive and capacitive couplers		15
LISN and TPDs		
Shielded Enclosure		
High voltage coaxial loads		
High voltage coaxial connectors and assemblies		
ANTENNAS, LINES		
Radiating lines		16
Impulse radiating antennas		
TEM cells		
Striplines, parallel plate lines		17
E/H field generators		
Helmholtz coils		
PULSE MEASUREMENT		
Field sensors		18
Ultra-fast voltage sensors		
Passive integrators, impedance adapter		19
Software application for pulse measurement		



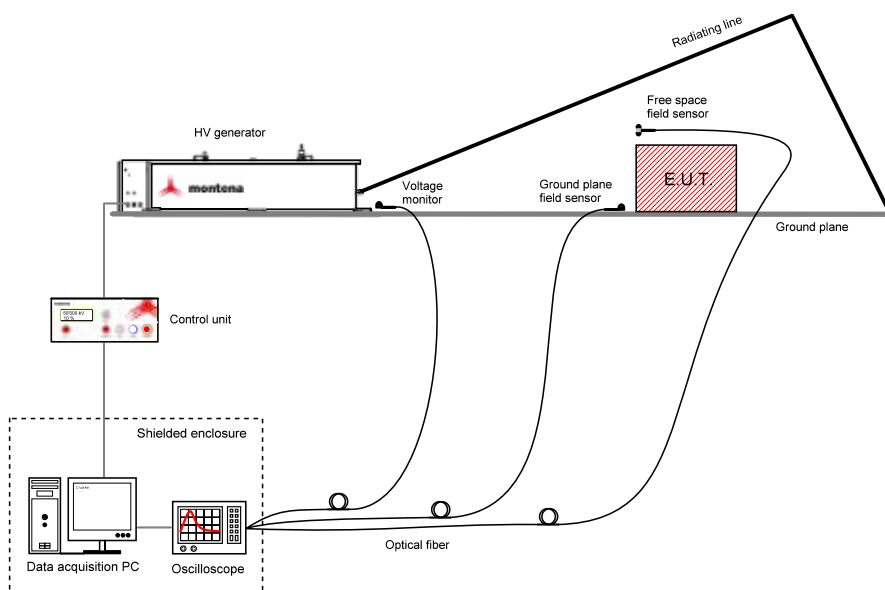
NEMP Simulators

MIL-STD-461 RS105

Montena designs and manufactures NEMP (Nuclear Electromagnetic Pulse) simulators according to MIL-STD-461 RS105 (radiated susceptibility).

This standard is applicable to equipment or subsystems located outside a shielded facility. A transient electromagnetic pulse of up to 50 kV/m with a rise time in the nanosecond range is applied to the equipment under test (EUT) at least 5 times. EUT should not exhibit any signs of performance degradation.

The simulator setup mainly consists of a high voltage pulse generator connected to a transmission line ended with distributed resistors. A voltage monitor and various field sensors are used to measure the generator output and the electric and magnetic field impulses. An optical fibre link is required to transmit the signal to the oscilloscope.



Montena systems include a range of standard size installations for EUT from a height of 50 cm up to large structures such as vehicles or airplanes. The smallest systems are transportable and can be set up and removed in less than 2 hours.

	EQUIPMENT	REFERENCE	SPECIFICATIONS
Movable indoor simulators	Generator + control unit	EMP80K, EMP170K or EMP230K	Generators with 80 kV, 170 kV or 230 kV charging voltage
	Transmission line	RL180, RL270 or RL360	Movable radiating lines. Heights of 1.8 m, 2.7 m or 3.6 m
Fixed outdoor simulators	Generator + control unit	EMP360K to 800K	Generators from 360 kV up to 800 kV charging voltage
	Transmission line	RL540 to RL1290	Fixed radiating line. Heights from 5.4 m to 12.9 m
Pulse monitoring	Voltage monitor	SV1G	Monitoring of the generator output pulse
	Free field sensor	SFE3-5G	Free space field sensors up to 3.5 GHz
	Ground field sensor	SGE3-5G	Ground plane field sensor up to 3.5 GHz
	Passive integrator	ITR1-2U	Passive integrator for ground plane field sensor and voltage monitor
	Balun	BL3-5G	Balun for free space field sensor
Measurement equipment	Data transmission	MOL3000 & FCLB50	Analog optical link with 50 m single mode fibre
	Shielded box	SB3G	Enclosure to protect the oscilloscope from the EM pulse
	Oscilloscope	OD4C600M	600 MHz bandwidth, 10 Gs/s, 4 channels
	Software		Computer control of the simulator and electromagnetic field measurement



The following table gives some examples of simulators compliant with the 50 kV/m electric field required in MIL-STD-461 RS105.

GENERATOR REFERENCE	RADIATING LINE REFERENCE	EUT DIMENSION IN METER			SYSTEM OVERALL DIMENSIONS IN METER		
		WIDTH	LENGTH	HEIGHT	WIDTH	LENGTH	HEIGHT
EMP80K-2-23	RL180-50	2.2	1.3	0.57	2.5	6.6	1.8
EMP170K-2-23	RL270-50	3.4	1.9	0.85	3.75	10.9	2.7
EMP230K-2-23	RL360-50	4.5	2.5	1.1	5.0	14.3	3.6
EMP360K-2-23	RL540-50	7.0	9.0	1.6	8.0	31.0	5.4
EMP450K-2-23	RL720-50	9.0	12.0	2.1	10.0	41.0	7.2
EMP670K-2-23	RL1080-50	13.0	18.0	3.2	15.0	62.0	10.8
EMP800K-2-23	RL1290-50	14.0	25.0	3.7	18.0	74.0	12.9

RS105 simulators using GTEM and coaxial generators are available on request

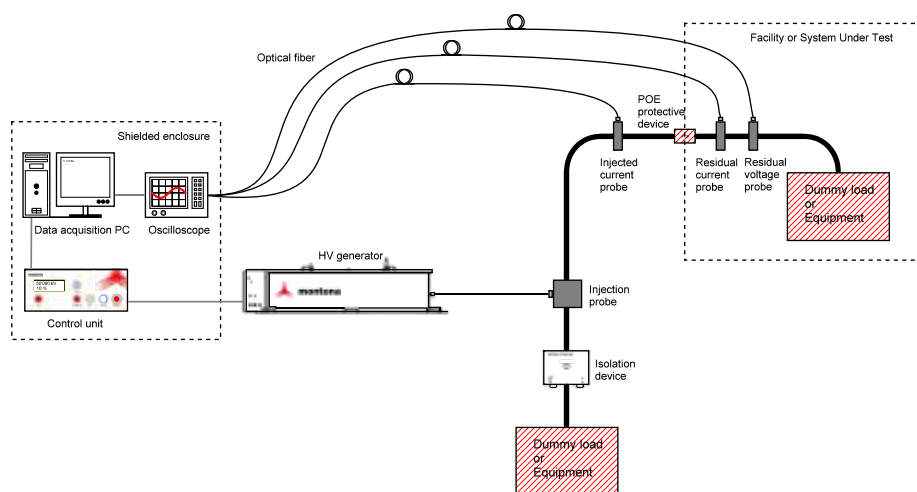
- Proven performance with many systems installed worldwide
- Triangular transmission line design with distributed load resistors for bounded wave propagation with minimal reflexion
- Indoor transportable small test systems; outdoor permanent large test installations
- Automated management and test report generation for simple measurement
- Low risk of operator's handling mistakes
- Other pulse shapes according to other standards such as IEC or national standards on request
- Expertise in the refurbishment of existing old test installations



Pulsed Current Injection (PCI) MIL-STD-188-125

Fixed and mobile ground-based mission critical C⁴I systems (command, control, communications, computer, and intelligence) require full functionality and network interoperability during and after exposure to HEMP environments. Hardening requirements include stringent shielding, electrical POE (Point Of Entry) protection and special protective measures.

Montena has developed a test system to perform Pulsed Current Injection (PCI) tests according to MIL-STD-188-125. All electrical and antenna line POE protective devices must be tested in accordance to the transient suppression / attenuation performance defined in this standard. Montena systems provide a comprehensive range of verification tests for short and intermediate pulses, as well as antenna line POE.

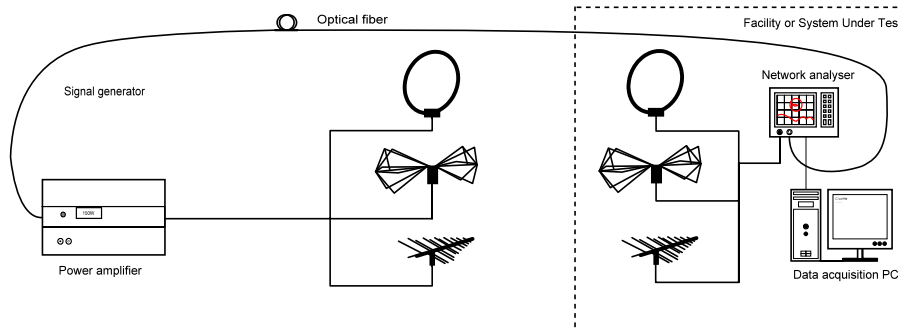


	EQUIPMENT	REFERENCE	SPECIFICATIONS
Pulse injection	Generator + control unit	EMP80K-5-500	1 kA, short pulse
		EMP300K-5-500	5 kA, short pulse
		IPP3K-4MS	260 A, intermediate pulse
		CLP40K	40 kV, charge line
	Injection probe	IC3B CCL3 CCS3	For short pulse only Inductive coupler for common mode pulse injection 230 V, 60 A, 2 power lines coupler 230 V, 60 A, 4 data lines coupler
Test accessories	Isolation device	DL3	
		DS3	
	Dummy load	TLB4	230 V, 60 A, 2 power lines decoupling box 230 V, 10 A, 4 signal lines decoupling box
Measurement equipment	Current / voltage sensor		Resistor box with 0.2, 0.5, 2 and 50 Ω
	Data transmission	MOL3000 + FCLB50	Set of current and voltage probes for injected and residual current measurement
	Oscilloscope	OD4C1G	Analog optical link with 50 m single mode fibre
	Software		1 GHz bandwidth, 10 Gs/s, 4 channels Integrated measurement and control automation software

- Unique fully compliant test solution to cover the entire standard requirements
- Transportable for on-site verification tests
- Control and pulse management software package to simplify the test procedure

Shielding Effectiveness (SE)

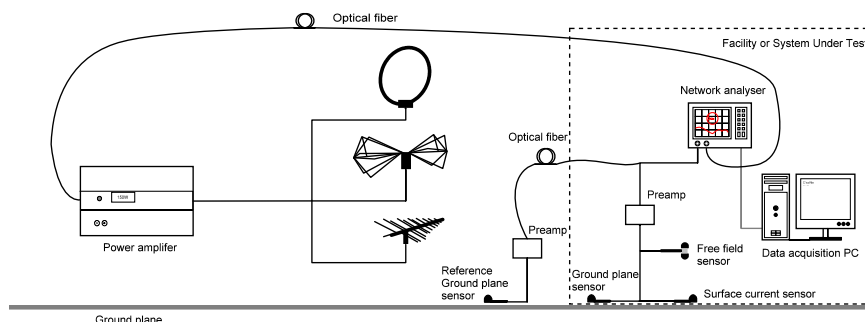
The purpose of the Shielding Effectiveness (SE) test is to demonstrate the compliance of a facility and apertures POE with the shielding performance required. Montena has developed a LabVIEW software application to simplify the shielding effectiveness assessment according to MIL-STD-188-125 test methods. The complete test setup is delivered with the software designed to drive a signal generator, amplifiers, a network analyser as well as RF-switches interconnecting the equipment.



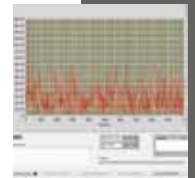
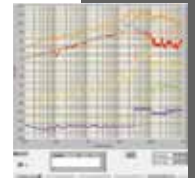
- Measurement automation with frequency sweeping and data collection
- Automatic switching between amplifiers and antennas
- Generation of measurement reports
- Software application can be used for IEEE Std 299 shielding effectiveness tests
- Delivery and installation of complete test system

Continuous Wave Immersion (CWI)

Verification of small and mobile facilities is usually performed with the exposure of the system to a threat level EMP using a pulse simulator as presented on pages 4 and 5. But the verification of large or fixed facilities can only be performed with a low level illumination field in the frequency domain. It involves measuring the residual fields, charge/current densities and currents inside the facility while sweeping in the frequency domain on the whole EMP spectrum. It is then possible to assess the expected internal residual electromagnetic pulse due to the exposure to EMP by means of fast Fourier transform and extrapolation. Montena supplies the entire test setup, including a LabVIEW software application.



- Measurement automation with frequency sweeping and data collection
- Automatic switching between amplifiers, antennas and sensors
- Measurement chain compensation and post-processing
- Computation of all pass-fail criteria according to the standard including the internal threat current
- Report and data file generation
- Delivery and installation of complete test system

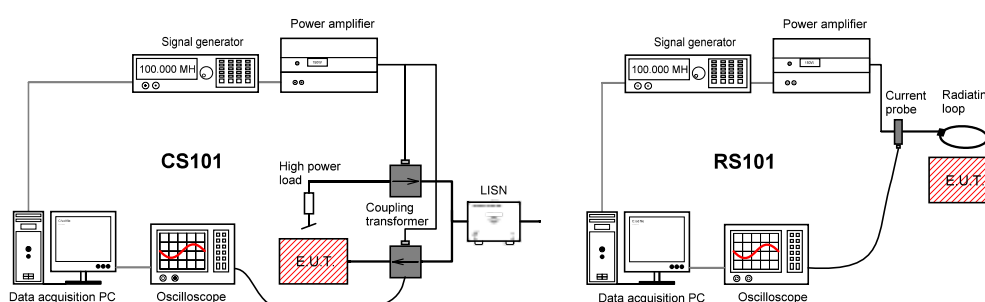


MIL-STD-461 CS101 and RS101

MIL-STD-461 CS101 specifies the conducted susceptibility test of equipment and subsystem AC and DC input power leads, in the frequency range of 30 Hz to 150 kHz.

MIL-STD-461 RS101 is also used to assess the radiated susceptibility of equipment and subsystem enclosures, including electrical cable interfaces, in the frequency range of 30 Hz to 100 kHz.

Montena offers a complete test solution for both standards. A dedicated control software with a graphical user interface allows simple setup via scroll down menus to select the appropriate components. Calibration and measurement are designed to be fully automated, with reports generated afterwards.



	EQUIPMENT	REFERENCE	SPECIFICATIONS
Frequency injection	Signal generator	SIG10M	0 to 10 MHz
	Power amplifier	PA20K13A	0 to 300 kHz frequency range
	Coupling transformers	TR250K50A	50 A, for CS101
	Radiating loop	SG12-RS101	30 Hz to 100 kHz, 15 A continuous for RS 101
Test accessories	High power load	VR15-210	Variable resistor to compensate the power current feedback into the amplifier
	Precision resistor	R0.5-200A	0.5 Ω 200 A, resistor for calibration
	LISN	LISN50-25	Line impedance stabilization network 50 μ H, 20 A
	Field monitoring sensor	SCR4-RS101	Single coil for calibration
Measurement equipment	Current probe	CT10000F	50 A, 1 Hz to 20 MHz
	Oscilloscope	OD2C100M	100 MHz bandwidth, 1 Gs/s, 2 channels
	Software		Management of calibration, settings, tests and reports

- Automatic calibration for the full test frequency range
- Automatic configuration of the measurement equipment setting
- Built-in scroll-down menus for selecting test equipment and components
- Frequency sweeping
- Test and calibration reports automatically generated

MIL-STD-461 CS106, 114, 115 and 116

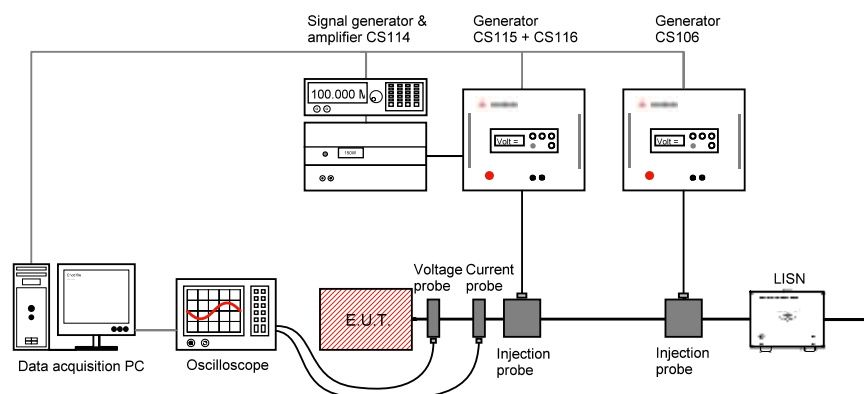
CS106 is applicable to submarine and surface ship equipment and subsystem AC and DC input power leads. The generator delivers a transient pulse in the microsecond range, with repetition up to 20 pulses per second.

CS114 is a swept bulk cable injection which simulates currents that will be developed on platform cabling from electromagnetic fields generated by antenna transmissions.

CS115 uses a fast trapezoidal pulse to excite natural resonances associated with cables. The basic concern is to protect equipment from fast rise and fall time transients that may be present due to platform switching operations and external transient environments such as lightning and electromagnetic pulses.

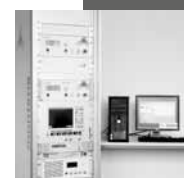
CS116 defines damped sinusoid transients at several fixed frequencies to simulate electrical current and voltage waveforms occurring in platforms from excitation of natural resonances.

Montena has developed a software controlled test bench covering all these test requirements. Thanks to a high frequency switching module, the calibration and measurement phases can be performed without changing any cabling of the test system. Montena proposes up to 17 frequencies for the CS116 test, enhancing the frequency coverage and test results.



	EQUIPMENT	REFERENCE	SPECIFICATIONS
Signal injection	Pulse generator	PG-CS106	400V peak, 1.5 μ s rise time, transient for CS106
	Signal generator	SIG1-2G	1.2 GHz, for CS114
	Power amplifier	PA400M150W	150 W, for CS114
	Pulse generator for CS115 and CS116	POG-CS116+M-CS115	Pulse generator with 6, 9, 17 frequencies for CS116 and module for CS115
	Low frequency injection probe	IC10M	10 kHz to 30 MHz, for CS106
	High frequency injection probe	IPDR250	10 kHz to 400 MHz, for CS114, 115 and 116
Test accessories	Coaxial dummy load	PCL1G-400	50 Ω load for system calibration
	Attenuators	PATP20-100, PATP40-100	20 and 40 dB attenuators for system calibration
	LISN	LISN50-25	Line impedance stabilization network, 50 μ H, 20 A
Measurement equipment	Current / voltage sensor		Set of current and voltage probes
	Oscilloscope	OD2C600M	600 MHz bandwidth, 10 Gs/s, 2 channels
	Software		Automatic calibration, configuration, test and report

- Single generator output for CS114, CS115 and CS116 tests allowing remote test automation
- Automatic calibration for each test and for the full test frequency range
- Automatic configuration of the measurement equipment settings
- Built-in scroll-down menus for selecting test equipment and components
- Test and calibration reports automatically generated

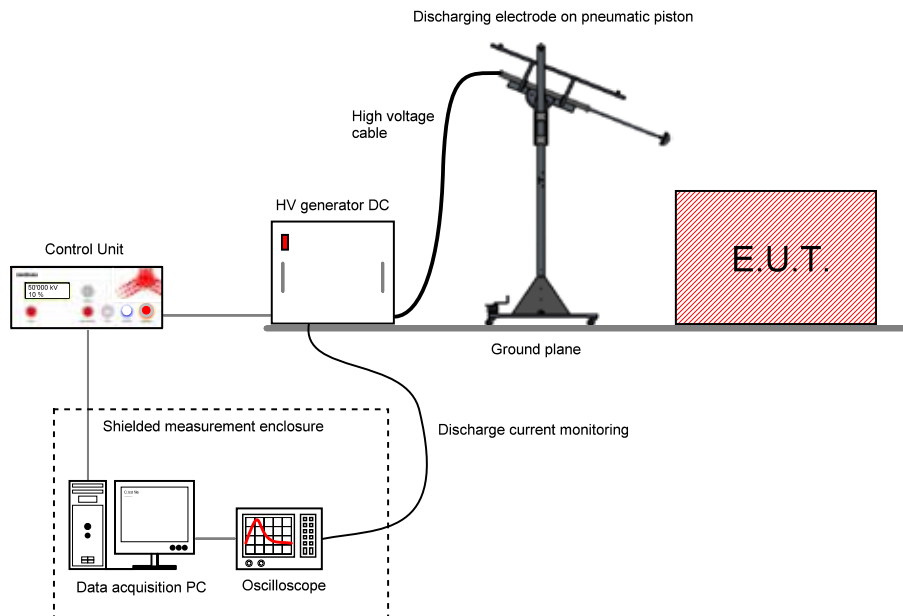


ESD 300kV Test Setup for Helicopters

MIL-STD-331 or NATO AECTP-250

Helicopters and aircrafts can be electrically charged by flying through the air and by collisions with rain or snow. Additionally rain drops and snowflakes can also generate damage and disturbance known as precipitation static (P-static).

Montena has developed a system for electrostatic discharges up to 300 kV, to test personnel and helicopter borne electrostatic parameters according to MIL-STD-331C, MIL-STD-464A or NATO AECTP-250 leaflet 253. This test equipment simulates various parameters such as ESD from personnel to munitions, helicopter landing, in-flight refuelling and static precipitation. The equipment is built on two separate movable trolleys with the discharge electrode mounted on a piston which is adjustable in height and angle.



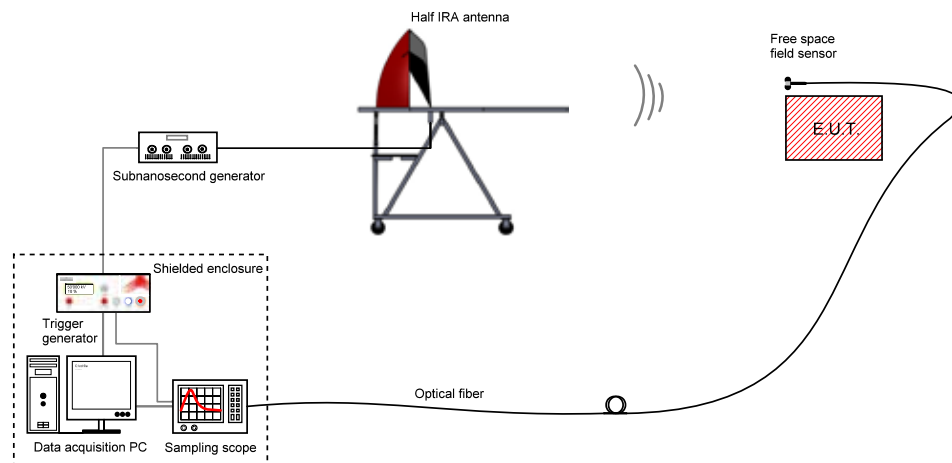
	EQUIPMENT	REFERENCE	SPECIFICATIONS
ESD generator	Generator + control unit	PGESD-300K-DP	Output voltage ranging from 25 kV to 300 kV
	Discharging electrode	ESD-DE-300K	1m travel, 4 m high, $\pm 60^\circ$ tilt with pneumatic piston
Generator accessories	High voltage resistor	ESD-R500-300K	Optional 500 Ω discharge resistor
	P-static adapter	PST-50K	Rod used with the precipitation test
Measurement equipment	Data transmission	MOL3000 & FCLB50	Analog optical link with 50 m single mode fibre
	Shielded box	SB3G	Enclosure to protect the oscilloscope from the EM pulse
	Oscilloscope	OD2C100M	100 MHz bandwidth, 1 Gs/s, 2 channels
	Software		Remote control of test equipment and measurement management

- Multi-purpose movable test equipment on separate trolleys
- Electrode adjustable in height (from 1 to 4 meters) and angle ($\pm 60^\circ$)
- Positive and negative polarity available
- One system for ESD and P-static tests
- Pulse current measurement
- Optional 500 ohms discharge resistor
- Possible charging of the EUT with the electrode grounded
- Computer controlled or manual operation

Ultra Wide Band (UWB) Test Setup

UWB refers to a high power electromagnetic (HPEM) threat for electronic and computer systems. Standardisation bodies such as IEC Study Group 77c are working on threat classification and test procedure definitions.

The test setup consists of a fast pulse generator connected to a HIRA (Half Impulse Radiating Antenna). The HIRA has the ability to radiate a narrow beam of pulsed electromagnetic energy over a large bandwidth. This antenna can also be used for continuous wave signals. Electronic equipment immunity assessment is the main application of this test setup.



	EQUIPMENT	REFERENCE	SPECIFICATIONS
Pulse generation	High speed pulse generator	GP20-01-2, GP30-01-2, GP70-01-2	130 ps rise time with 600 ps duration, up to 70 kV
	Half Impulse Radiating antenna	HIRA180, HIRA180S	Frequency range from 100 MHz to 18 GHz
Test accessories	High voltage RF load	HVLD50K	50 Ω load
	High voltage cables	HVK50-xx	Coaxial cable xx cm, up to 50 kV
Measurement equipment	Free field sensors + access.	SFE3-5G, SFE10G or SFM8-5G	D- and B-dot sensors 3.5 GHz, 10 GHz and 8.5GHz with balun and cables
	Derivative voltage sensor	VDOT8GS	Derivative voltage divider for pulse measurement
	Data transmission	MOL3000 & FCLB50	Analog optical link with 50 m single mode fiber
	Sampling oscilloscope	OSD20G	20 GHz bandwidth acquisition module
	Shielded box	SB3G	Enclosure to protect the oscilloscope from EM pulse
	Trigger generator	TG-1K	Single pulse up to 1000 pps to synchronize the pulse generator and the oscilloscope trigger.
	Software		Remote control of test equipment and measurement management

- Transportable test system for onsite testing possibilities
- Parabolic antenna with adjustable horizontal and vertical tilt
- Measurement sensors adapted to the test system



NEMP Generators



Montena develops and manufactures high voltage pulse generators for NEMP (Nuclear Electromagnetic Pulse) tests according to MIL-STD-461 E/F.

These generators use direct capacitive circuits or Marx technology. Peaking circuits are often used to increase the impulse rise time.

All generators have a remote control unit providing indications and settings of the charging voltage, gas pressures and pulse triggering as well as an interlock switch for safety. USB and RS232 interfaces are available for control software applications.

Montena NEMP generators are designed to be connected to radiation lines such as bounded wave transmission lines or GTEM-cells.

REFERENCE	CHARGING VOLTAGE	WAVEFORM	LINE IMPEDANCE	REMARKS
EMP80K-2-23	80 kV	Double exponential Rise time : 2.3 ± 0.5 ns Duration time : 23 ± 5 ns	110 Ω	Direct discharge circuit
EMP170K-2-23	170 kV			Marx + peaking circuit
EMP230K-2-23	230 kV			
EMP450K-2-23	450 kV			
EMP670K-2-23	670 kV			
EMP800K-2-23	800 kV		50 Ω	To be connected to a GTEM-cell
EMP80K-2-23-50	80 kV			

Generators for MIL-STD-461 version D are available upon request

- Technology and design scales up to a charging voltage of 1.2 MV
- Interlock switch and automatic capacitor discharge for high safety requirements
- Compact and robust construction
- Possible recycling of the SF₆ gas
- Proven performance and reliability with many generators installed worldwide

Montena design can be adapted to customers' requirements to fulfil other standards, for other fields of application or for the refurbishment of existing NEMP test installations.

Pulsed Current Injection (PCI) Generators

Montena offers PCI generators for tests according to MIL-STD-188-125 1 / 2. Pulsed current injections (PCI) acceptance testing is used to demonstrate that electrical Point Of Entry (POE) protective devices perform in accordance with the transient suppression / attenuation requirements.

The PCI tests require high energy generators for delivering current pulses either directly or through coupling devices in the cables.

The short pulse test is covered with two generators, EMP80K-5-500 for up to 1 kA pulse and EMP300K-5-500 for peak current pulses from 1 kA up to 5 kA. Additionally montena proposes a lower level pulse generator (EMP10K-5-500) for tests on electronic components.

The intermediate pulse test requires a generator delivering up to 260 A.

RF antenna line POE must be tested up to 400 A. Montena proposes a “charge line” generator for port testing, supplied with 9 different high voltage line lengths.

Each generator is fully configurable, with single and repetitive pulses, voltage adjustable output, manual or remote control.

REFERENCE	SHORT CIRCUIT CURRENT	CHARGING VOLTAGE	SPECIFICATIONS
EMP80K-5-500	1 kA	80 kV	High current PCI short, rise time < 20ns, duration = 500 ns
EMP300K-5-500	1 kA to 5 kA	350 kV	
IPP3K-4MS	260 A	3 kV	PCI intermediate pulse, rise time = 1 µs, duration = 4 ms
CPL40K	400 A	25 kV	Charge line pulser, 50 Ω output
EMP10K-5-500	200 A	10 kV	PCI short pulse for tests of electronic components

- Transportable, compact and robust generators
- Unique set of test generators for MIL-STD-188-125 available on the market
- Control and data acquisition system available (calibration, data measurement and automatic report generation)

All designs can be adapted to the customer's requirements, to fulfil other standards. Montena also supplies all accessories such as inductive, capacitive couplers, isolation devices, termination loads and automatic system monitoring, as shown on pages 6 and 7.





MIL-STD Conducted Susceptibility Generators

Montena develops and manufactures pulse generators for MIL standards conducted susceptibility tests, according to MIL-STD-461 CS106, CS114, CS115 and CS116 test methods.

For better frequency range coverage, montena CS116 generator is offered in 3 versions with respectively 6, 9 and 17 frequencies.

The following standalone generators are proposed :

REFERENCE	SPECIFICATIONS	STANDARDS
PG-CS106	0 – 1 kV	MIL-STD-461 F CS106
PG-CS115	0 – 5 kV	MIL-STD-461 D/E/F CS115
POG-CS116-6	10, 100 kHz, 1, 10, 30, 100 MHz	MIL-STD-461 CS116, 6 frequencies
POG-CS116-9	10, 30, 100, 300 kHz, 1, 3, 10, 30, 100 MHz	MIL-STD-461 CS116, 9 frequencies
POG-CS116-17	10, 18, 30, 56, 100, 180, 300, 560 kHz 1, 1.8, 3, 5.6, 10, 18, 30, 56, 100 MHz	MIL-STD-461 CS116, 17 frequencies
PG1275	125 V	Imported and exported spikes and surges

Montena has designed the POG-CS116 pulse generator to host additional pulse modules for CS106, CS115 pulse delivery beside the built-in CS116 damped sinusoidal pulse modules. These factory installed modules and the CS116 modules are all connected to the same generator output. This allows the execution of all test frequencies and pulse shapes without re-cabling or module exchange need. The calibration as well as the measurement process is entirely automated. All settings and levels are recorded for measurement and test reports.

The POG-CS116 generator can host following additional modules:

REFERENCE	CHARGING VOLTAGE	REMARKS
M-CS106	0 – 1 kV	Module CS106 to be plugged in POG-CS chassis
M-CS115	0 – 5 kV	Module CS115 to be plugged in POG-CS chassis

- Control software for fully automated test setup and measurement
- CS116 generator with up to 17 test frequencies for more accurate susceptibility assessment
- One single output for the POG-CS116 (all CS116 test frequencies and additional modules)
- Modular approach for all budgets
- Complete set of accessories for test and measurement available (probes, loads, etc..)
- All generators can be ordered such as table top or 19" rack mounting versions

All designs can be adapted to the customer's requirements, to fulfil other standards.

Inductive and Capacitive Couplers

Inductive and capacitive couplers are intended for currents injection on signals or mains supply cables.

REFERENCE	MAX CURRENT	MAX VOLTAGE	NUMBER OF LINES	REMARKS
CCL3	5 kA peak	80 kV	2 lines, mains	Capacitive couplers designed for MIL-STD-188-125, short pulse
CCS3			4 lines, signals	
DS3			4 lines, signals	Decoupling box to be used with CCS3
DL3			2 lines, mains	Decoupling box to be used with CCL3
IC3B	100 W permanent / 500 W 15 min.	80 kV	Bundle Ø100 mm max	Inductive coupler for common mode injection of MIL-STD-188-125, short pulse
IPDR250			Bundle Ø44 mm max	Injection probe for MIL-STD 461 CS114, CS115 or CS116 tests
CJDR250				Calibration jig for injection probe IPDR250
IC10M		600 V		Injection probe for MIL-STD 461 CS106 or RTCA DO160 section 17



GENERATORS
ACCESSORIES

LISN and TPDs

Montena proposes high current LISN according to MIL STD specifications. TPDs (terminal protection devices) are a combination of a LISN with additional filters to protect the power supply network.

REFERENCE	REMARKS
LISN50-25	LISN for MIL-STD, 1 phase, 50 µH, 25 A
LISN50-500	LISN for MIL-STD, 1 phase, 50 µH, 500 A
LISN50-1000	LISN for MIL-STD, 1 phase, 50 µH, 1000 A
TPD50-100	LISN with TPD for MIL-STD 461 D/E/F, 50 µH, 100 A including 20 m shielded cable



Shielded Enclosure

This shielded box is meant to protect the measurement equipment during EM pulse tests.

REFERENCE	REMARKS
SB3G	Shielded box, 0 to 3 GHz with 230 V power filter and coaxial feedthrough connectors



High Voltage Coaxial Loads

These high voltage coaxial loads are especially designed for high voltage pulses.

REFERENCE	MAXIMUM VOLTAGE	REMARKS
HVLD50K	75 kV (1 ns pulse)	High voltage 50 Ω coaxial load
HVLD200K	200 kV (1 ns pulse)	
TBL4	30 kV	Cable termination load for MIL-STD-188-125 : 0.2 / 0.5 / 2 / 50 Ω



HV Coaxial Connectors & Assemblies

Montena proposes high voltage/high frequency 50 ohms coaxial cables with proprietary connectors, specifically developed for fast high voltage pulse transmission.

REFERENCE	TYPE	IMPEDANCE	PULSE MAX. VOLTAGE	FREQUENCY RANGE	REMARKS
HVM50K-a ¹	Connector	50 Ω	75 kV, < 1 ns	DC – 4 GHz	¹ : a is connector male and socket female
HVK50-x ² -y ³	Assembly				³ : y, connectors HVM50K, N, open end
HVM200K-a	Connector		200 kV, < 1 ns	DC – 1.6 GHz	¹ : a is connector male and socket female
HVK200-x ² -y ³	Assembly				³ : y, connectors HVM50K, N, open end



²: x is the length in cm. Available cable lengths : 50, 100 and 200 cm

Radiating Lines

Radiating lines are to be connected with high voltage pulse generators, for MIL-STD-461 RS105 test method.

REFERENCE	LINE HEIGHT	LINE LENGTH	EUT MAX HEIGHT	REMARKS
RL180-50	1.8 m	6.6 m	0.57 m	MIL-STD-461 E/F RS105
RL270-50	2.7 m	10.9 m	0.85 m	
RL360-50	3.6 m	14.3 m	1.1 m	
RL540-50	5.4 m	31 m	1.6 m	
RL720-50	7.2 m	41 m	2.1 m	
RL1080-50	10.8 m	62 m	3.2 m	
RL1290-50	12.9 m	74 m	3.7 m	

Impulse Radiating Antennas

Impulse Radiating Antenna (IRA) is a special type of antenna designed to radiate ultra wideband (UWB) electromagnetic field signals. Montena proposes Half Impulse Radiating antennas (HIRA).

REFERENCE	DIAMETER	FREQUENCY RANGE	MAX INPUT VOLTAGE	REMARKS
HIRA 180	1.8 m	100 MHz – 18 GHz	20 kV	50 Ω high voltage connector and impedance adapter for the antenna
HIRA 180S			75 kV	

Customized versions can be proposed on request.

TEM Cells

Open TEM cells are tri-plate cells designed for small objects immunity testing and field probes calibration.

REFERENCE	PLATE HEIGHT	FREQUENCY RANGE	MAXIMUM FIELD	REMARKS
TEM220	33 cm	0 to 220 MHz	800 V/m	Open TEM cells
TEM500	14.7 cm	0 to 500 MHz	1 kV/m	
TEM1000	7.4 cm	0 to 1 GHz	2.6 kV/m	
TEM3000	2.5 cm	0 to 3 GHz	5.6 kV/m	



Striplines / Parallel Plate Lines

Striplines and parallel plate lines suited for small and medium size objects immunity testing.

REFERENCE	FREQUENCY RANGE	SEPTUM HEIGHT	INPUT POWER	IMPEDANCE	REMARKS
SR50-1000	0 to 1 GHz	15 cm	1 kW	50 Ω	Stripline according to ISO 11452-5
SR90-1000		15 cm	200 W	90 Ω	
SR50-1000-20		20 cm	200 W	50 Ω	
SRA5090			100 W	Impedance adapter 50 Ω to 90 Ω	
PPL200-70S	10 kHz – 30 MHz	70 cm	500 W	50 Ω	Parallel plate line for immunity test to vertical and horizontal EM fields
PPL200	10 kHz – 30 MHz	106 cm	500 W	50 Ω	



E / H Field Generators

E/H generators are designed for immunity test to electromagnetic fields on medium size devices such as automotive vehicles and broadcast receivers.

REFERENCE	FREQUENCY RANGE	HEIGHT	MAX POWER
GENE-H-15-1K	10 kHz – 30 MHz	1.5 – 2.5 m	1 kW
GENE-H-15-3K			3 kW
GENE-H-30-1K		2.5 – 3.5 m	1 kW
GENE-H-30-3K			3 kW



Helmholtz Coils

Helmholtz coils are used to generate precise low frequency magnetic fields.

REFERENCE	DIAMETER	COIL FACTOR	FIELD IN THE CENTRE (1 MIN)		REMARKS
HC300	300 cm	7.5 A/m /A	430 A/m	5.4 G	Coils mounted on 2 trolleys for SAE J551-17
HC100	100 cm	15.6 A/m /A	940 A/m	11.8 G	IEC-61000-4-8 / -10
HC30	30 cm	117 A/m /A	4'700 A/m	59 G	IEC-61000-4-8 / -10
HC11	11 cm	1'250 A/m /A	25'000 A/m	310 G	Multi-directional support, especially designed for the watch industry
SC65	6.5 cm	4'800 A/m /A	290'000 A/m	3'644 G	Very high field coil
SC100	10 cm	4'600 A/m /A	230'000 A/m	2'870 G	Very high field coil and cooling fan



Field Sensors



Montena designs and manufactures derivative electromagnetic field sensors for fast pulse measurement. Sets of D-dot (electric field) and B-dot (magnetic field) sensors are available. Sensors are passive devices – no power supply is required. Montena provides accessories to complete the measurement chain, such as baluns, passive integrators, specific coaxial cables and optical fibre link.

Ground plane field sensors

REFERENCE	TYPE	RISE TIME	FREQUENCY RESPONSE	EQUIVALENT AREA
SGE1G	D-dot (electric)	320 ps	1 GHz	$1 \times 10^{-2} \text{ m}^2$
SGE3-5G	D-dot (electric)	110 ps	3.5 GHz	$1 \times 10^{-3} \text{ m}^2$
SGE10G	D-dot (electric)	32 ps	10 GHz	$1 \times 10^{-4} \text{ m}^2$
SGM2G	B-dot (magnetic)	160 ps	2.0 GHz	$1.32 \times 10^{-4} \text{ m}^2$

Free space field sensors

REFERENCE	TYPE	RISE TIME	FREQUENCY RESPONSE	EQUIVALENT AREA
SFE1G	D-dot (electric)	320 ps	1.0 GHz	$2 \times 10^{-2} \text{ m}^2$
SFE3-5G	D-dot (electric)	110 ps	3.5 GHz	$2 \times 10^{-3} \text{ m}^2$
SFE10G	D-dot (electric)	32 ps	10 GHz	$2 \times 10^{-3} \text{ m}^2$
SFM2G	B-dot (magnetic)	160 ps	2.0 GHz	$2.65 \times 10^{-4} \text{ m}^2$

Ultra-fast Voltage Sensor



The ultra-fast derivative voltage dividers are used to measure high voltage fast pulse signals into a coaxial cable. They can be inserted in the measurement chain with minimal insertion loss.

REFERENCE	TYPE	RISE TIME	FREQUENCY RESPONSE	MAX VOLTAGE MEASUREMENT	CONNECTORS
VDOT8G	V-dot (voltage)	50 ps	7.5 GHz	20 kV for 1 ns pulse	Coaxial 7/16
VDOT8GS	V-dot (voltage)	120 ps	3.0 GHz	75 kV for 1 ns pulse	Coaxial HVM50K

Passive Integrators, Impedance Adapter



Passive integrators are used to compensate the derivative behaviour of the B-dot, D-dot electromagnetic field and voltage sensors. They have 1 megohm output impedance and should be directly connected to the oscilloscope high impedance input. The impedance adapter converts the signal of high impedance systems to 50 Ω equipment, such as remote measurement of voltage probe using a 50 Ω fiber optic link.

REFERENCE	TIME CONSTANT	FREQUENCY LIMIT	IN / OUT IMPEDANCE	CONNECTORS
ITR1-2U	1.2 μs	1.0 GHz	50 Ω / 1 M Ω	N input BNC output
ITR12U	12 μs	150 MHz		
IA1M50		650 MHz	1 M Ω + 100 k Ω / 50 Ω	BNC inputs SMA output

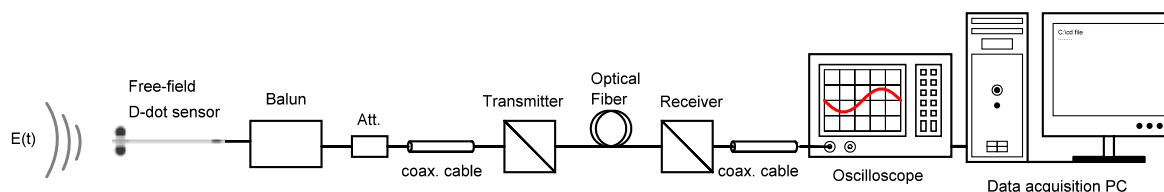


Software Application for Pulse Measurement

The monitoring of high intensity fast electromagnetic pulses requires specific measurement competencies. Montena has developed software applications to simplify the measurement of the following type of pulses:

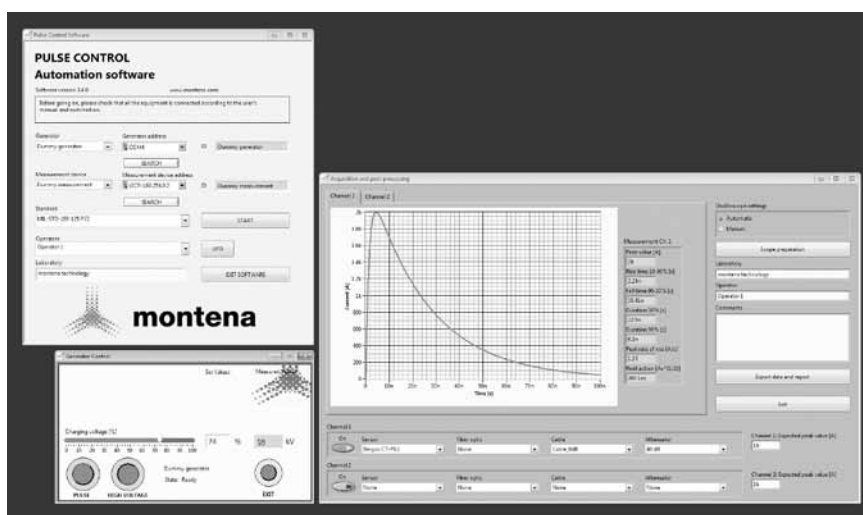
- Fast high intensity electromagnetic pulses from derivative field sensors
- Fast high voltage pulse from derivative voltage dividers
- Current transformers.

The proposed software package includes for instance the following measurement equipment:



Once all equipment involved in the measurement chain has been introduced, the software application is able to automatically control the digital oscilloscope and process the read values to display the measured E-field, B-field or voltage pulses in their respective units.

- Universal software for various types of sensors and pulse measurement capabilities
- Automatic management of the oscilloscope
- Includes all factors for the sensors, attenuators, fibre optic link, etc.
- Compatible with most available digital oscilloscopes.
- User-friendly - handling error free.





montena technology sa
route de montena 89
1728 Rossens
Switzerland

Tel : +41 26 411 84 84
Fax : +41 26 411 17 79

products@montena.com
www.montena.com



Your local representative

NEMP field test simulation

www.polygone.ch

