Ultra Wide Band test setup

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1. UWB test system description

Montena's UWB test system is designed to assess the immunity of electronic equipment against high intensity very fast electromagnetic pulses. A typical test setup comprises following elements.

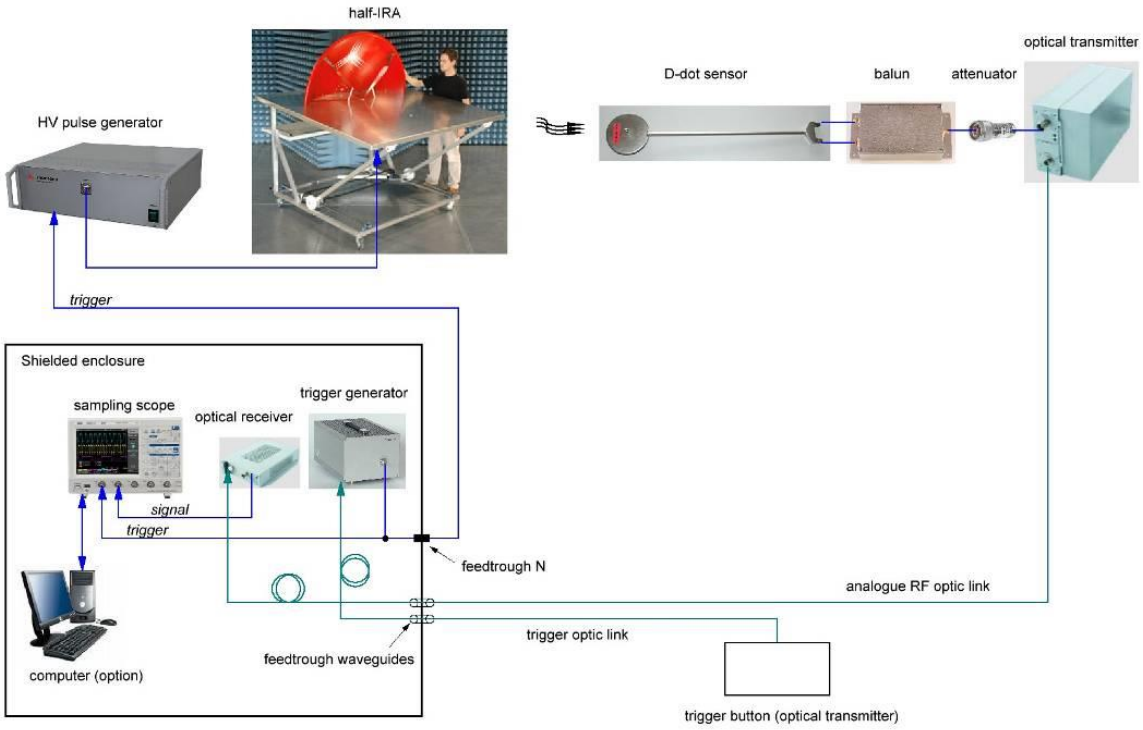

Figure 1: schematic of a typical test setup with HIRA antenna

The HV generator delivers high voltage pulses to an half parabolic Impulse Radiating Antenna (HIRA) which irradiates the equipment under test. A derivative field sensor can be used to measure the radiated E-field pulses.

The measurement chain usually comprises a derivative field sensor, with its balun, connected to the measurement system through an optical fiber transmission. This fibre optic link ensures a proper transmission of the measured signals in the strongly disturbed environment.

The measurement equipment, typically a digital oscilloscope, collects the measured signals from the sensors, integrates these signals for display and eventually storage in the control PC for the edition of test reports. The oscilloscope has to be placed in a shielded enclosure, in order to protect it from the strong E-field pulse and ensure correct measurement.

A trigger generator can trigger both the pulse generator and the oscilloscope to have a very stable synchronization between the pulse generator and the measurement of the field pulses.

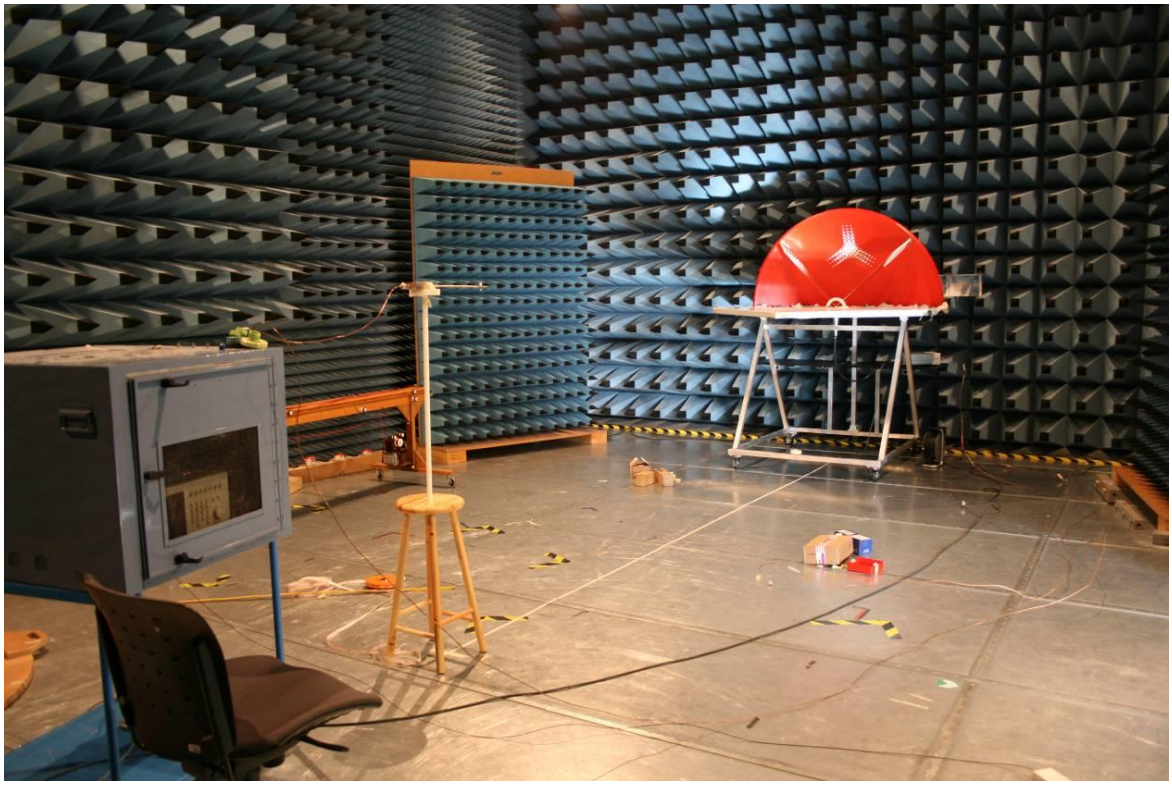

Figure 2 : Picture of a test setup with a network analyser in a shielded box

Pulse shapes

Montena can propose different pulse generators. Below is a typical pulse at the output of the GP10-01-2 pulse generator

- Peak voltage: 9.2 kV
- Rise time: 140 ps
- FWHM: 550 ps.

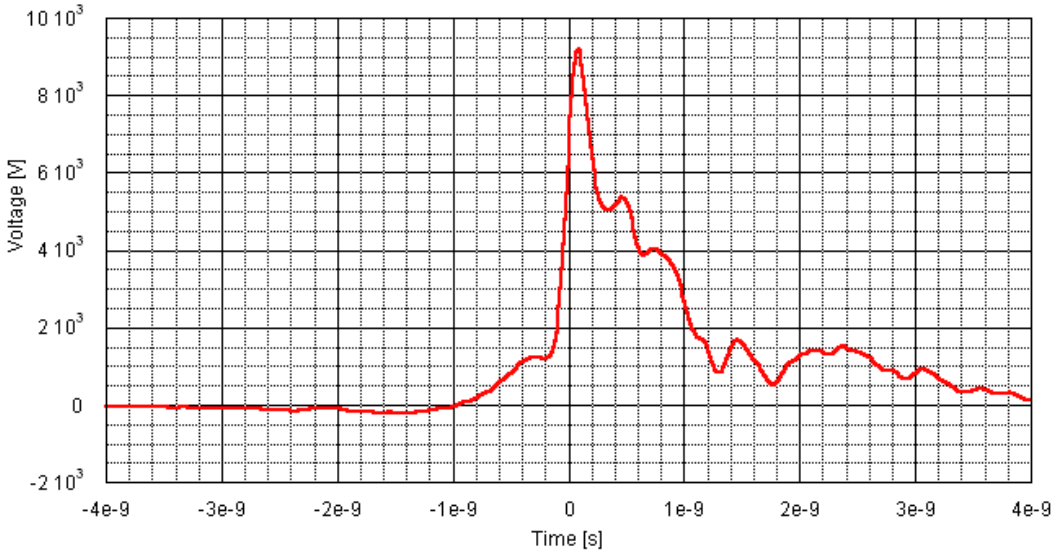

Figure 3 : Typical UWB electrical pulse shape

Other models can be proposed with higher output voltage or different rise times and durations.

Electrical pulse measurement

Montena proposes a derivative voltage divider for the measurement of the pulse delivered by the pulse generator.

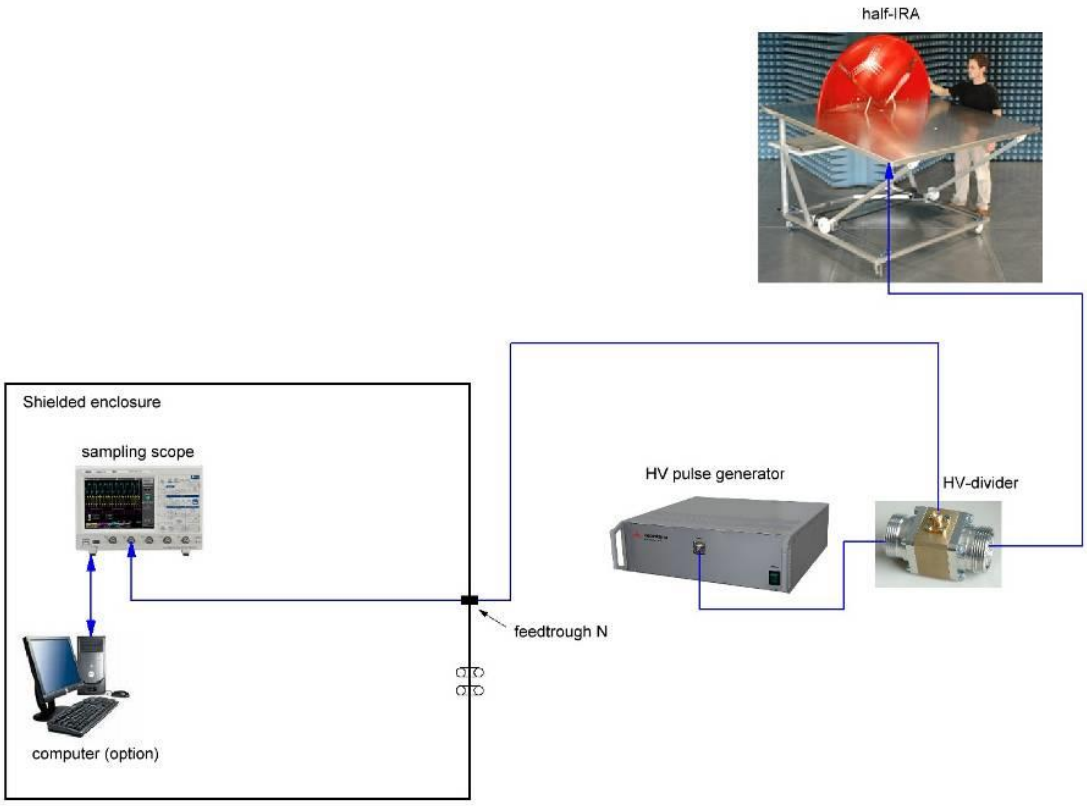

Figure 4 : Typical electrical pulse shape control with a measurement through a HV-divider

The HV-divider type VDOT8G or VDOT8GS is a derivative high voltage divider able to measure the very fast pulses, up to 8GHz.

The sensor is recommended to monitor the output of the generator during the tests.

Radiated field pulse

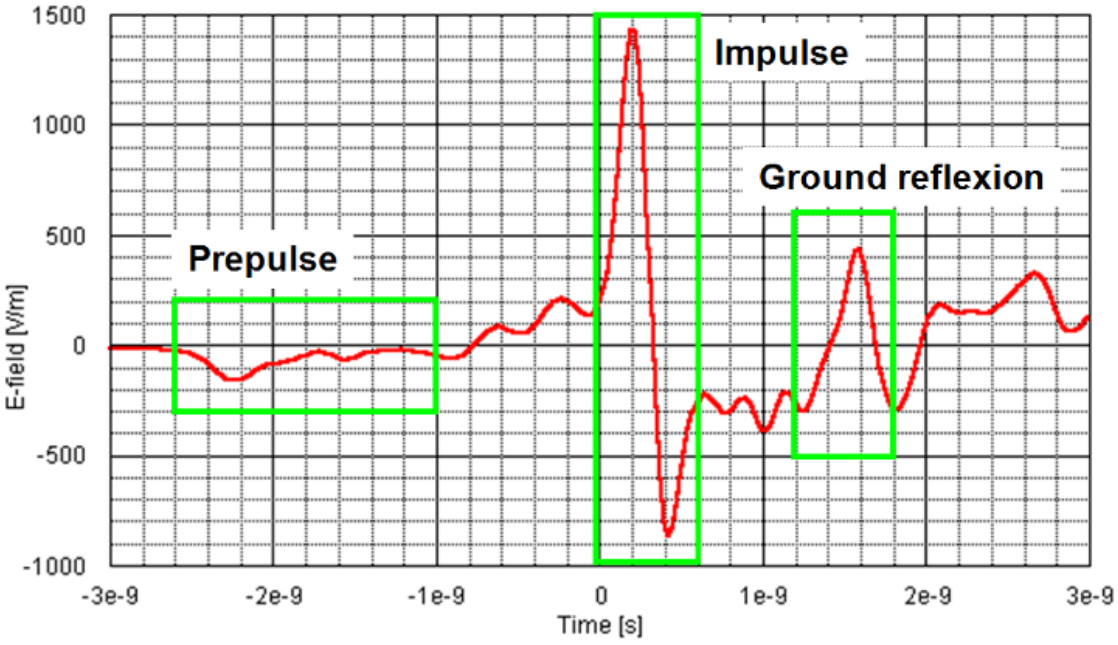

Figure 5 : Typical radiated electrical field pulse with the above described electrical pulse

The above pulse is a typical example measured with a derivative E-field sensor placed at 15m from the HIRA antenna.

The intensity of the radiated EM pulse decreases with the distance, as shown in the figure below.

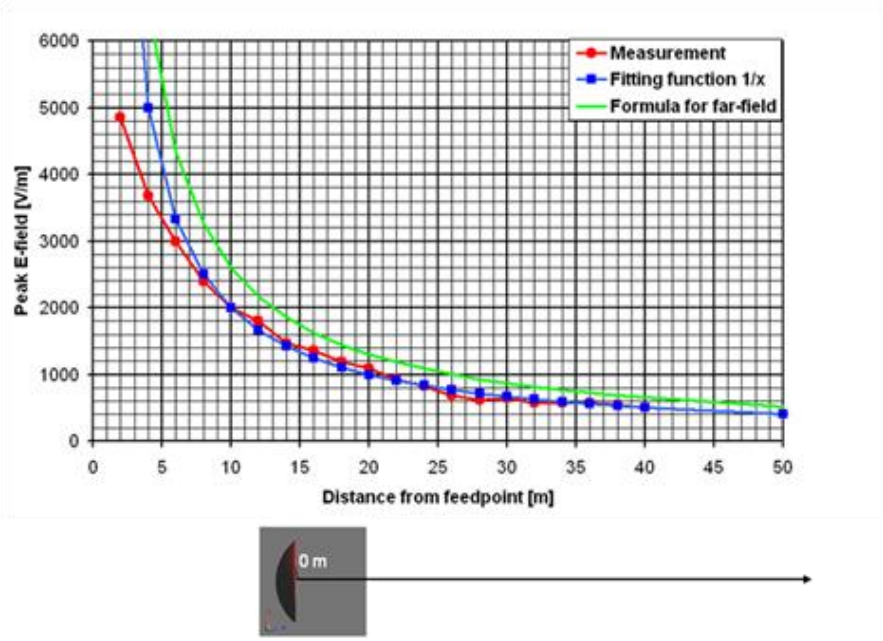

Figure 5 : radiation intensity with a GP10-01-2 pulse generator

2. System monitoring

Derivative electrical field sensors (D-dot) or derivative magnetic field sensors (B-dot) can be used to measure the radiated EM pulses.

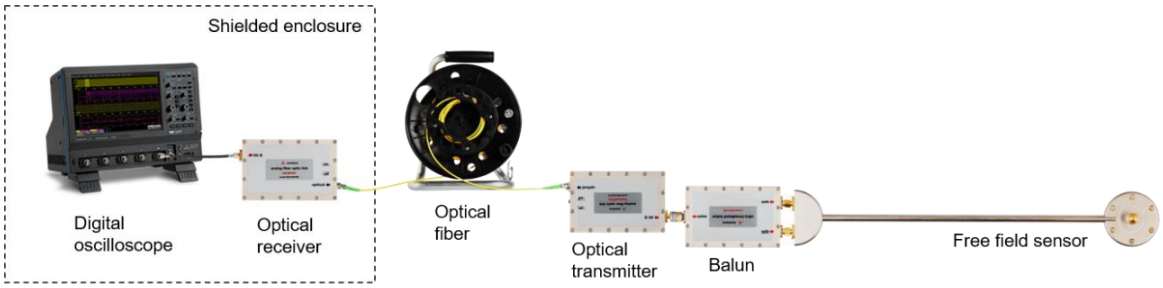

Figure 6 : free field sensor setup

The free field sensor and his balun are connected to an optical transmitter. Usually an attenuator is inserted to avoid the saturation of the optical transmitter. At the other end of the optical fibre link, an optical receiver converts back the electrical signal which is then integrated by the mathematical function of the digital oscilloscope to recover the field pulse.

Note that the magnetic field can be calculated from the electric field by dividing its value by the impedance of the vacuum (377 ohm) because we are in far field conditions. Therefore only an electric field sensor is sufficient.

3. Other measurement systems & accessories

3.1 OSCILLOSCOPE & SHIELDED ENCLOSURE

The oscilloscope is used to measure the voltage and the field produced by the test installation. A minimum of 5 GHz bandwidth is required.

To ensure a correct measurement, the oscilloscope has to be placed in a shielded enclosure, or shielded room.

The SB3G shielded enclosure is intended for the protection of the oscilloscope and accessories.

The dimensions of the SB3G are: 61 x 52 x 73 cm

3.2 OPTICAL LINK

An optical link is required to connect the free space field sensor to the oscilloscope. Characteristics of the proposed optical link is:

- One shielded TX module and one RX module per analogue channel
- 50 ohm, 80Hz - >3.5 GHz
- 50 m fibre optic

3.3 CABLES

The HIRA antenna as well as the pulse generator and the HV derivative voltage divider have montena proprietary connectors referenced as HVM50K connectors.

4. Services

4.1 ONSITE INSTALLATION AND TRAINING

Montena provides onsite installation and training performed by either an engineer from montena or by a local authorized representative support engineer with help of skilled and unskilled workmen provided by the customer.

A training session is usually given directly after installation. This training includes the both the test system operation and maintenance

4.2 SYSTEM ACCEPTANCE

The UWB test setup acceptance procedure is performed with a verification of the generated field based on a measurement of the generated field pulse with electrical derivative field sensor

4.3 MAINTENANCE

No periodical maintenance is required other than calibration of the measurement equipment.

On customer request montena can offer this calibration service with support of montena's authorized local representative.