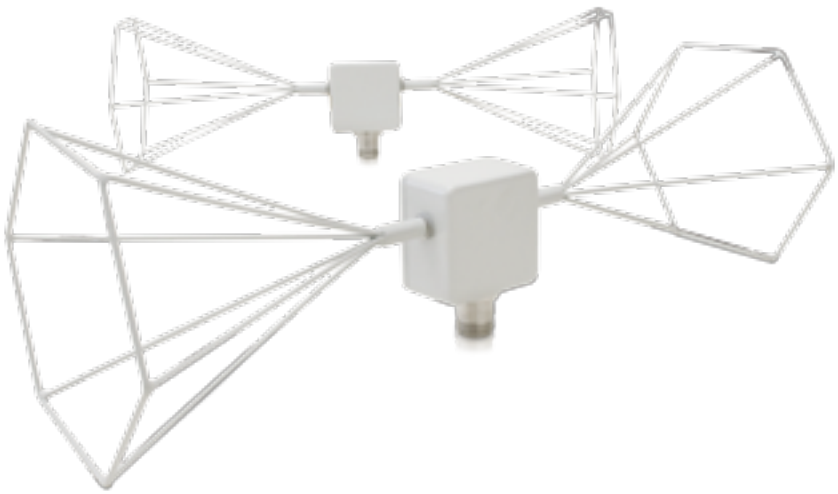
MPB

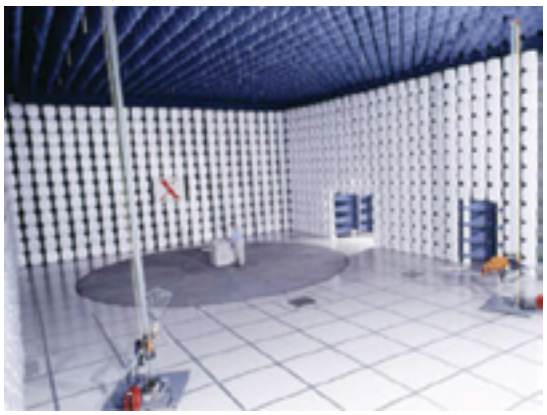
SEMS

SHIELDING EFFECTIVENESS MEASUREMENT SYSTEM
IN MRI AND SHIELDED ENVIRONMENT

ELECTRIC AND MAGNETIC FIELD
FROM 10 kHz TO 300 MHz*



MRI Shielding Environment
(Magnetic Resonance Imaging)



Shielded and anechoic environment for EMI/EMC testing

Shielded environment with high electromagnetic protection for civil and military applications (Shelter)

SEMS

SEMS has been conceived and designed to meet the growing test / verification requirements of shielding effectiveness for shielded environments in hospitals and other applications, such as EMI-EMC chamber, military and civil Shelters for telecommunications.

SEMS allows great automatic and precise measurement and within a short time to determine the reduction value of the magnetic and electric field in shielded environments.

NOT ONLY SHIELDING EFFECTIVENESS
(RAPID, PRECISE AND CORRECT MEASUREMENTS)

THERE ARE MANY ADVANTAGES IN USING SEMS INNOVATIVE SYSTEM

EXAMPLE OF SETUP: TRADITIONAL SYSTEM

CONNECTION
Coaxial cables to connect transmitting and receiving antennas.

POWER SUPPLY
Plug in power supplies needed to supply energy to the instrumental chain of the signal generator/spectrum analyser.

DYNAMIC
External amplifier to increase the signal strength and, therefore, the measurement dynamic.

CONNECTION TO THE PC
A PC is required for the automation of the Measurement Test and the subsequent data storage.

MEASUREMENT USERS
Two users are required to perform measurements.

EXAMPLE OF SETUP: SEMS SYSTEM

CONNECTION
The antennas of the SEMS system are directly connected to the TX and RX units without any cables.

POWER SUPPLY
The TX and RX units of the SEMS system are equipped with rechargeable batteries with an autonomy of 6 hours.

DYNAMIC
The TX unit of the SEMS system has a power amplifier covering the whole range up to 300 MHz.

CONNECTION TO THE PC
SEMS system has a powerful internal CPU that manages independently all the functions of calibration, zero setting and measurement with the respective storing. Data can be downloaded onto a PC via Wireless connection.

MEASUREMENT USERS
Only one user is required because the system synchronizes itself via Wireless.

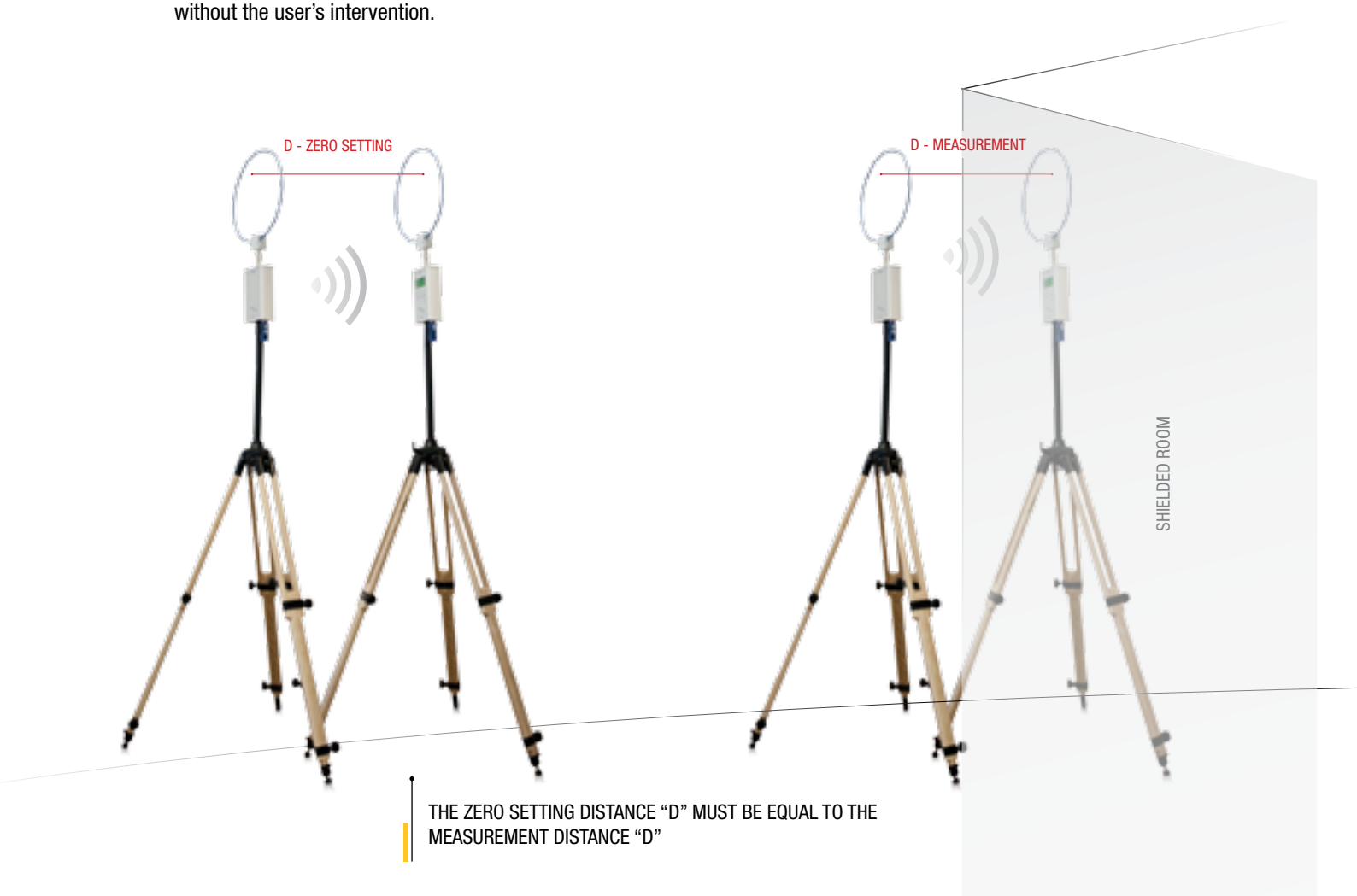
SYSTEM DESCRIPTION

SEMS Measurement system is made of a TX transmitting unit and a RX receiving unit.
Both of them use two pairs of small antennas to measure respectively the attenuation of the magnetic and electric field. TX and RX system covers the whole frequency range from 10 kHz to 300 MHz.
Obviously, the measurement range being tested is determined by the antenna.
In Standard configuration SEMS is equipped with loop antennas for magnetic fields from 2 to 128 MHz and bi-conical antennas for electric fields from 60 to 300 MHz.
Alternatively, two loops for the 10 kHz to 4 MHz coverage, two rod antennas for the 1MHz to 60 MHz coverage and two dipole antennas for the 40MHz to 300MHz coverage can be supplied.
Contrary to the traditional system, which measures the shielding effectiveness only at a few frequency points, SEMS performs the complete Test continuously on the whole frequency range.
A further innovation and development compared to traditional Test systems is the synchronization of the TX and RX units. The two units communicate with each other thanks to a Wireless technology, which is very useful to automate, speed up the test and minimize any user errors.

OPERATING PRINCIPLE

SEMS measures the shielding effectiveness of a shielded environment, that is the attenuation of the electric and magnetic field that such environment causes. The operating principle is simple:

FIRST PHASE OR "ZERO SETTING"
The TX receiving unit generates a RF signal, which is radiated via the antenna.
The RX receiver is positioned at a predetermined distance, receives the signal via similar antenna and measures its level in dBm.
SECOND PHASE "MEASUREMENT"
Now, if the RX receiver is moved into the environment to be measured, being careful to maintain the same initial distance from the TX unit, a reduction of the measured signal is achieved.
The RX unit will show directly the reduction of the environment in dB by subtracting the two results measured without the user's intervention.



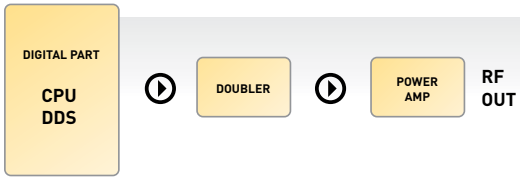
THE ZERO SETTING DISTANCE "D" MUST BE EQUAL TO THE MEASUREMENT DISTANCE "D"

SEMS RECEIVER

The following concise block diagram represents SEMS receiving part. By following the RF signal coming from the receiving antenna, you find the reduction module, which adjusts the level of the RF signal to the subsequent stages, and the filter modules, which select the bands according to the reception frequency. The RF signal thus adjusted gets into the digital part through a digital analog converter (ADC). Then a RSP and a DSP process the digital signal by using complex algorithms and show it on the display.

SEMS TRASMITTER

SEMS transmitting part is briefly represented by the following diagram. The signal to be transmitted is generated by the DDS, following the CPU commands. The CPU receives instructions by the wireless interface of the receiver. This signal is duplicated and amplified to reach the level necessary to the transmitting antenna.



SAME MEASUREMENT, DIFFERENT WAYS

Unconnected Mode

This function allows to do the measurements in all those enviroment where it's not possible using neither the bluetooth bridge nor the fiber optic cable. The operator will make a list of frequencies with the SEMS Software and upload it on the RX unit from the PC. It's fast and easy.

Sniffer Mode

Sniffing is an important function for all those technicians that want to mantain the performance of the chamber.
Using this operating mode you can find the weak spots in the shielding.

Prequiet Mode

During the test you will find inside the chamber one or more noisy frequencies.
Beore making the measurement, the RX unit can find these frequencies and re-start the test with a new list of frequencies.
The new list differs from the former one by few decimal units.

CALIBRATION WITH CAL-KIT

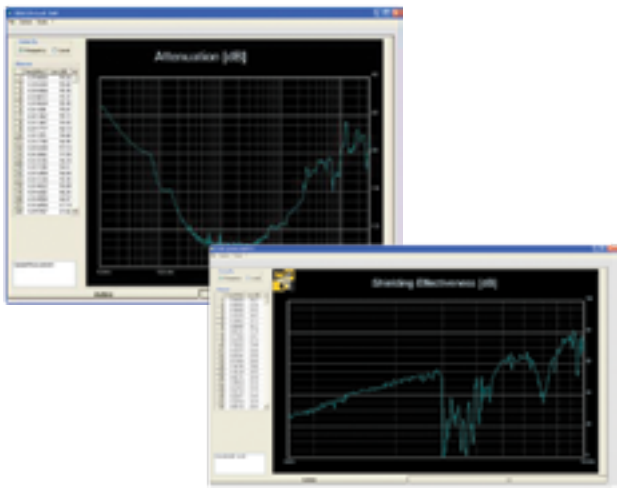
SEMS system, while not taking measurements in absolute values, needs a periodic check of its linearity. Cal-Kit meets this requirement simply and precisely. Cal-Kit is supplied with Accreditated Calibration. Calibration procedure can be recalled from the Cal menu. By selecting CalK, the display will show the correct execution step by step. The following pictures show the set-up to be used.

STAND ALONE MEASUREMENTS

Both SEMS units, TX ed RX, are powered by rechargeable Li-Ion batteries.
This ensures completely independent measurements without any problem with the industrial mains power supply.
Two battery chargers are supplied.

USE AND OPERATION OF THE SEMS PC UTILITY SW

Thanks to SEMS PC Utility software the measurements recorded on the RX unit can be downloaded, stored and/or exported in ASCII format to write customized measurement reports. Also, zero setting scans can be pre-programmed and then directly transferred to the non-volatile memory of the RX unit.



TECHNICAL SPECIFICATIONS

TX/RX Frequency range Resolution	10 kHz...300MHz 10 Hz
RF Output (TX Module) Max output power (typical)	Z_{out} 50 Ω, N fem. +30 dBm
RF input (RX module) VSWR Attenuators Max Input Level Dynamics	Z_{in} 50 Ω, N fem. < 1.2 0...20dB 110 dBuV 120 dB max
IF bandwidth (RX Module) 3 dB bandwidth	 5/150Hz
Precision of the attenuation measurement (typical)	10 kHz... 30MHz ± 1.0dB 30 MHz...300MHz ± 1.5dB
I/O Interface	RS232 / Wireless
Acoustic alarm	Programmable at the attenuation level
Compliance with international standards	MIL-Std-285 IEEE Std 299 EN50147-1 NSA65-6
Operating temperature	0° ... 40°C
Battery power supply	Rechargeable Li-Ion (6h life) Not replaceable by the user
Weight and Dimensions: TX RX Total Weight Rigid case Dimension	 708 g 106x46x194mm 774 g 106x46x194mm 9,4 kg 52 x 43 x 23 cm
Antennas Loop Mod. L1 Bi-conical Mod. B1	 Frequency range 2...128MHz / Diameter 30cm Frequency range 60...300MHz / Width 35cm
Set-Up of “0” Calibration & Measurement	Pre-programmable by the user via software
Options Loop Antennas Mod. L2 Rod Antennas Mod. R1 Dipole Antennas Mod. D1 Wood tripods Mod. TR-02-A Optical Link Mod. LO CalKit	 Frequency range 10kHz...4MHz / Diameter 30 cm Frequency range 1MHz...60MHz Frequency range 40MHz ... 300MHz Adjustable in height 10m 4x 30dB attenuators kit.

SPECIFICATIONS MAY CHANGE WITHOUT PRIOR NOTICE

THE SYSTEM INCLUDES

1) SEMS RX receiver
2) SEMS TX trasmitter
3) 2 biconical antennas Mod. B1
4) 2 loop antennas Mod. L1
5) 2 loop antennas Mod. L2 (Option)
6) 2 dipole antennas Mod. D1 (Option)
7) 2 RS232/wireless
8) 2 AC Adapter/Charger
9) 2.4GHz Active bridge
10) SEMS PC Utility software
11) Rigid case

MPB
WE ELECTRONIC!

MPB srl
Headquarters - Place of Business
Via Giacomo Peroni, 400/402
00131 - Rome (Italy)
T +39 06 41200744
F +39 06 41200653

www.gruppompb.com
info@gruppompb.com