



SEP

SELECTIVE ELECTRIC ISOTROPIC TRIAXIAL ANTENNA

FREQUENCY RANGE 100 KHz - 3.6 GHz

Minimum health and
safety requirements
regarding the
exposure of workers



2013/35/EU

ALL-IN-ONE "SPECTRUM ANALYZER + ISOTROPIC TRIAXIAL ANTENNA"



THE SMALLEST EMF SELECTIVE SYSTEM IN THE WORLD



Broadcasting, telecommunication systems and industrial sites



The fast growing need for selective electric field measurements in work environments, led the R&D department at MPB to design and develop the SEP.

The SEP selectively monitors the electric field, allowing automatic accurate measurements, in real time and with minimum effort for the operator, thanks to its small size and weight. This antenna allows covering different applications, such as broadcasting, telecommunication and industrial sectors.



FEATURES



ISSUES	TRADITIONAL SYSTEMS	SEP
USE OF THE COAXIAL FERRITE CABLE	The electrical connection between the antenna and the spectrum analyzer interferes in the frequency response of the antenna. Errors are not properly measurable. The problem cannot be totally solved but can only be reduced through the use of ferrites	There is no coaxial ferrite, because both the antenna and the spectrum analyzer are inside the same sphere
ISOTROPY ERROR	Between the three dipoles and the “N” connector there is more than one cable (RF cable and switching cable/power cable). This worsens the antenna isotropy	The three dipoles are directly connected to the receiver. This choice was intended to minimize the isotropy error
POWER SUPPLY	Very short battery life of the spectrum analyzer. In several cases the batteries cannot be replaceable by the operator. Their substitution implies a system shutdown	Batteries rechargeable and replaceable by the operator without having to turn off the system
CALIBRATION	Three elements to be calibrated: antenna, ferrite cable and analyzer	Only the SEP to be calibrated
DATA RECORD	It is possible to save data or screenshots	It is possible to save data or screenshots. It is also possible to record the measurement sessions and to post process the stored signals



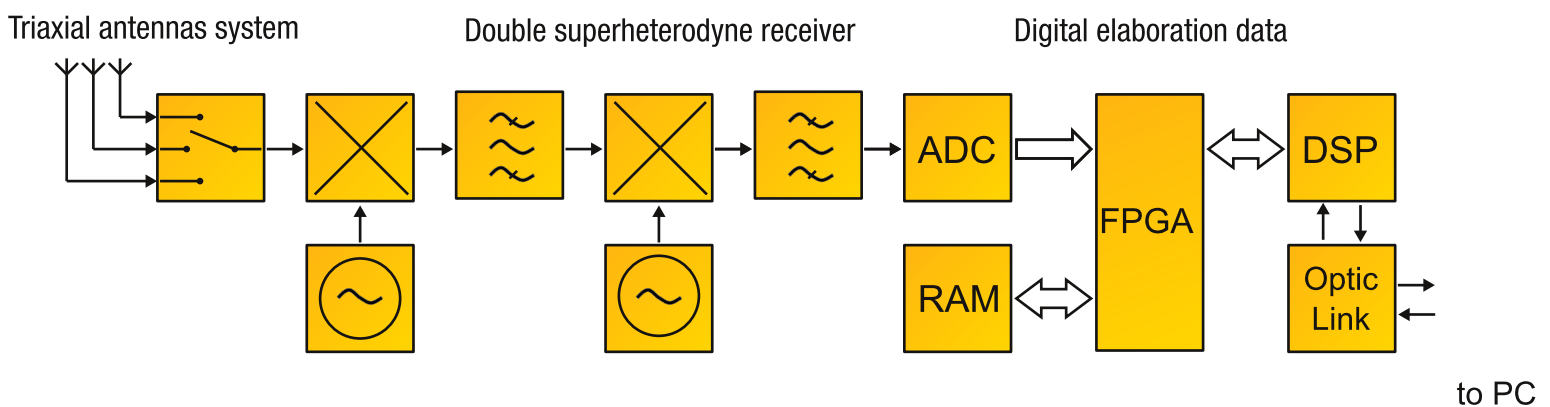
SYSTEM DESCRIPTION

The SEP is a spherical system that allows to selectively measure the electric field in a frequency range from 100 kHz to 3.6 GHz. Its all-in-one setting (spectrum analyzer + isotropic antenna) enables faster and easy to handle measurements.

The signal is analyzed and stored directly in the PC through a safe fiber optic or wireless connection.



The operating mode of the SEP is described in a simplified block diagram



The signal, received from the three dipoles (X, Y and Z), is selected by a switch that directs it to the input of the receiver; the first stage of the superheterodyne receiver converts the signal to the frequency of the first IF, where it is filtered and amplified, before being re-converted to the frequency of the second IF. The latter makes it downloadable from the analog to the digital converter. The digital signal, as a result of complex processing, is made available to the optical interface, that transfers all the data to the PC.



As well as attention to electronics, same importance was given to the mechanics of the SEP.

This instrument provides the possibility to replace the batteries directly on the field, without having to turn off the system.

CHECK, CALIBRATION AND ASSISTANCE

In order to guarantee a quality and efficient product, several tests have been carried out for the SEP.

Our technical staff has developed, through the years, an important know-how in the field and works every day to improve products and skills.



MPB laboratories are also equipped with an anechoic chamber, a TEM cell and two G-TEM cells, in order to test the products under optimal conditions and to provide them with the calibration certificate.

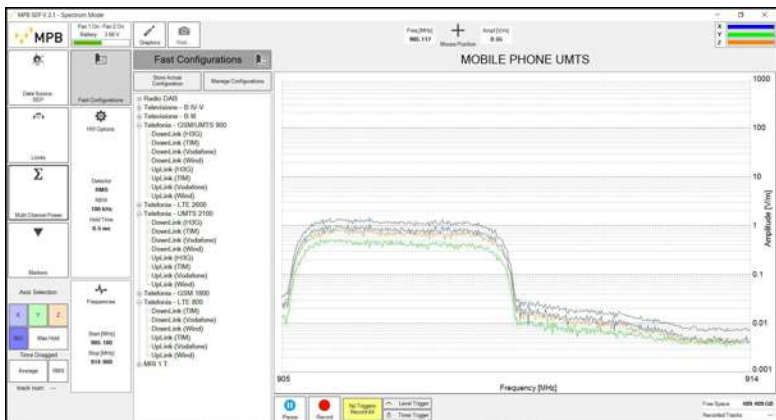
MPB engineers and technicians offer assistance and hold training courses to illustrate the functioning of the products.



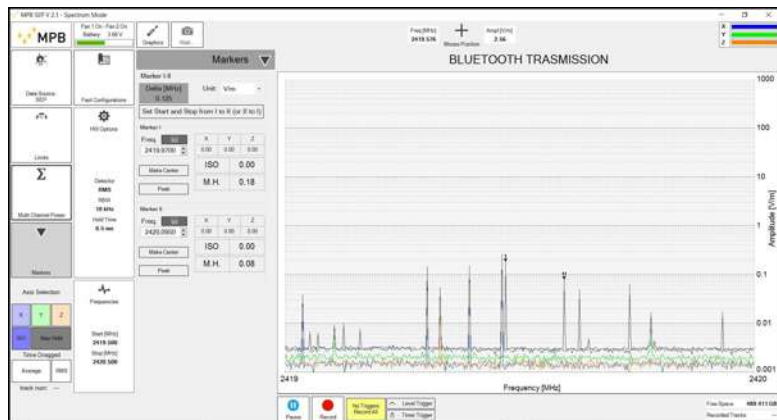
SEP SOFTWARE



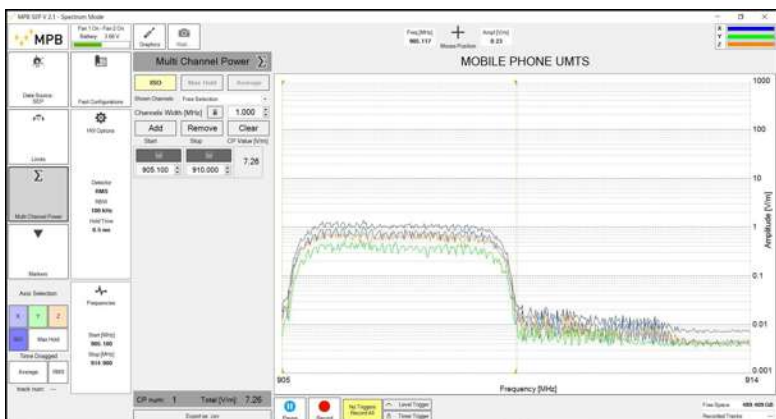
The SEP software allows measurements in real time, offers the possibility to apply filters like the channel power, to display the signal on each axis, to set markers, to adapt the multiple graphic settings for each measurement requirement, to save the chosen configuration. All the functionalities can be applied also on previously stored tracks, in order to perform a signal post processing.



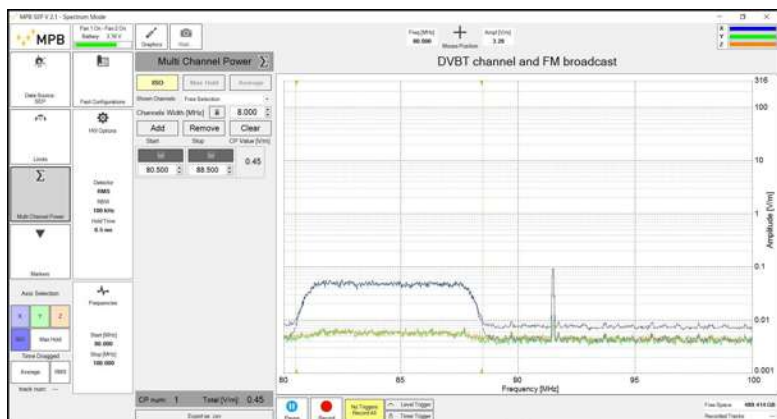
Standard UMTS measurement on X, Y, Z and isotropic



RMS measurement on X, Y, Z and isotropic on bluetooth transmission



UMTS Channel Power RMS measurement on X, Y, Z and isotropic



DVBT and FM broadcast RMS measurement on X, Y, Z and isotropic

STANDARD CONFIGURATION

- Plexiglass support
- Fiber optic (10 m)
- USB with PC utility software
- Operating manual
- USB cable
- USB optical converter
- Bag
- 4 rechargeable batteries
- Cap remover
- Chargers
- Calibration certificate

AVAILABLE OPTIONS

- Rugged tablet PC
- Non-magnetic and non-reflective tripod
- Fiber optic connection
- Bluetooth link connection
- WiFi link connection

- Mod ALGIZ 10X
- Mod NMR-01
- Mod FO-50
- Mod SEP-WLD
- Mod SEP-WHD



TECHNICAL SPECIFICATIONS

Frequency range Band1 Band2 Resolution	100 KHz ... 9.999 MHz 10 MHz ... 3.6 GHz 1 KHz
Reference Frequency Aging year Temperature drift (0°C ... +30°C)	1 x 10 ⁻⁵ 5 x 10 ⁻⁶
Frequency span Range Step number	100 kHz to full span MIN 50; MAX 12000 (Each Axis)
Resolution bandwidth Range (-3 dB bandwidth) Tolerance	3 KHz to 1 MHz 1/3 sequence 5%
Spectral purity SSB phase noise @ 3 KHz (carriers) @ 30 KHz (carriers) @ 300 KHz (carriers)	@ 1 GHz <-85 dBc/Hz <-90 dBc/Hz <-102 dBc/Hz
Measurement range Max level Min level @ 500 KHz @ 10 ... 100 MHz @ 0.1 ... 2 GHz @ 2 ... 3 GHz @ 3 ... 3.6 GHz Damage level Dynamic range @ 200 MHz @ 3 KHz RBW; Hw Detector Average Linearity error @ 200 MHz	200 V/m @ 10 MHz ... 3.6 GHz 1 V/m @ 3 KHz RBW; Hw Detector Average 0.1 V/m @ 3 KHz RBW; Hw Detector Average 0.02 V/m @ 3 KHz RBW; Hw Detector Average 0.09 V/m @ 3 KHz RBW; Hw Detector Average 0.1 V/m @ 3 KHz RBW; Hw Detector Average 350 V/m @ 10 MHz ... 3.6 GHz 750 V/m < 2 MHz > 80 dB; 85 dB (Typ) < +/-0.5 dB @ 0.1 ... 30 V/m (+/- 0.25 dB Typ) < +/-1 dB @ 0.03 ... 100 V/m
Flatness @ 0.5 MHz ...10 MHz @ 10 MHz ...2 GHz @ 2 GHz ...3 GHz @ 3 GHz ...3.6 GHz	< +/- 1 dB @ 50V/m < +/- 1 dB @ 6V/m < +/- 1.2 dB @ 6V/m < +/- 1.5 dB @ 6V/m
Isotropy @ 6 V/m; 3 KHz RBW; Hw Detector Average 500 MHz 1000 MHz 2000 MHz 2500 MHz	< +/-0.5 dB ; < +/-0.3 dB (Typ) < +/-0.6 dB (Typ) < +/-0.8 dB (Typ) < +/-1.3 dB (Typ)
Resolution level Max Min	0.001 V/m 0.1 V/m
Spurious response Input related Residual @ HW Detector Average	< -60 dBc (Typ) 0.1 V/m @ 30 MHz .. 1.5 GHz 0.2 V/m @ 10 MHz .. 3 GHz
Selectable standards	Pre-defined
Correction factor	Stored in EEPROM
Detectors HW	Peak, AVG and RMS
Antenna	Three-axial X, Y and Z (Identified by a led) Positioned with an axis in vertical or all the axes inclined at 54.7 degrees
I/O Interface Optic link ("Connector-less" type) USB Bluetooth WiFi	Plastic fiber cable (length max 20 m) Micro USB connector Fiber/Bluetooth Adapter (distance max 20 m in open air) WiFi radio link Adapter (distance max 300 m in open air)
Operating Temperature	0 °C to 50 °C
Power supply Rechargeable and replaceable battery Operation time Battery charger	Li-Ion 3.7 V 4 h 4 slots battery 110...240V
Dimensions	140x140x140 mm
Weight	370 g
Recommended calibration interval	24 months

Subject to change without notice

SOFTWARE SPECIFICATIONS

Scale	Linear or semi-logarithmic
Data acquisition	X, Y, Z selectable
Selective standards Marker Limit (horizontal marker) Isotropic Max hold RMS Average Channel power Multi channel power	Marker with value (V/m; W/m ² ; mW/cm ² ; mV/m) Detects the peaks over the selectable limit. Sortable in frequency/amplitude Root mean square value Selects the max value of the isotropic trace With selectable time (from 1 minute to 1 hour) With selectable time (from 1 minute to 1 hour) Settable from 1 MHz to 20 MHz Multiple simultaneous channel powers with value acquisition
Report	Easy screenshots of measures with possibility to take notes
Setup	Programmable, customizable. Saved setup can be stored and post processed
Pc requirement OS RAM Resolution	Windows 7, Windows 8, Windows 8.1, Windows 10 Minimum 2 GB Minimum 800 x 600

Subject to change without notice

DRONE APPLICATION

Thanks to its light weight and the possibility of using a wireless connection, the SEP can also be used for high altitude measurements with a drone.

This application is enabled through:

- Bluetooth connection with mod. SEP-WLD up to 20m
- WiFi connection with mod. SEP-WHD up to 300m

