

Portable System for EMF Measurements R&S TS-EMF

Accurate measurements of electromagnetic fields caused by transmitter systems

The effects of electromagnetic fields (EMFs) are widely discussed in public at present, particularly in connection with the advancing implementation of mobile radio networks. The Portable System for EMF Measurements R&S TS-EMF with software R&S RFEX permits electromagnetic fields to be accurately measured and statistically evaluated especially in densely populated areas.



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FIG 1 The Portable System for EMF Measurements R&S TS-EMF fits in a carrying bag.

Accurate measurements and statistical evaluation

Providing a sound basis for the discussion about the effects of mobile radio networks requires not only comprehensive short-term and long-term measurements of electromagnetic fields to be performed on site (e.g. when new systems are installed) but also statistical

data to be obtained by means of broad-area measurement sequences [1].

Two methods have been available up to now for measuring the effects of electromagnetic fields on the environment (EMCE), a broadband measurement with the aid of an isotropic sensor and a frequency-selective measurement using a dipole or directional antenna. The new

- ▶ Portable System for EMF Measurements R&S TS-EMF from Rohde & Schwarz (FIG 1) combines the advantages of both: Frequency-selective measurements of electromagnetic fields are performed with an isotropic sensor in the frequency range 80 MHz to 2.5 GHz.

In conjunction with software R&S RFEX, which has been specially designed for environmental electromagnetic compatibility applications, the system can be used for accurate measurements and statistical evaluation of electromagnetic fields particularly in densely populated areas. With the aid of this software, critical locations such as schools can be monitored over an extended period of time (days or weeks).

With the R&S TS-EMF, electromagnetic fields caused by radiocommunication services such as GSM, CDMA, UMTS, DECT, *Bluetooth*[™] or W-LAN, or by sound and TV broadcasting can be measured.

All in one bag

The measuring system consists of a Handheld Spectrum Analyzer R&S FSH3 [2] and an isotropic sensor, both stowed in the supplied carrying bag, as well as system software R&S RFEX. The system offers a variety of advantages:

- ◆ Emissions can be assigned to discrete frequencies and analyzed
- ◆ Reference to (frequency-dependent) limit values
- ◆ High sensitivity and wide dynamic range
- ◆ Simple measurement procedure

Various field-strength parameters can be determined with the test system:

- ◆ Instantaneous value
- ◆ Mean value over time
- ◆ Peak and average value
- ◆ Maximum value, calculated from basic channel (BBCH with GSM) and maximum channel number

Isotropic sensor simplifies measurements

The sensor comprises three orthogonally arranged passive monopoles which are selectable by means of an integrated PIN diode switch. The software calculates the equivalent isotropic field strength from the three measured values with the aid of an evaluation algorithm.

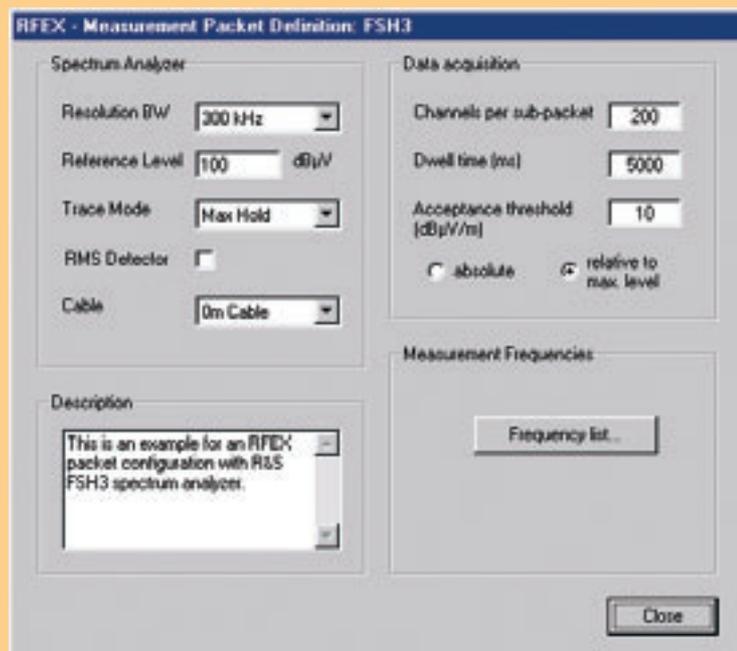
To obtain optimum isotropic characteristics, the monopoles are symmetrical to the sensor handle. They are covered by a radome made of polystyrene for protection against weather effects or mechanical damage.

The isotropic radiation pattern of the sensor considerably simplifies measurements since they need not be carried out with different polarizations and in different directions. Particularly when

long-term measurements with a stationary sensor are to be performed, reliable and frequency-selective field-strength measurements can be conducted independently of direction and polarization. Even locating maximum field strength in spaces such as rooms merely requires scanning the room with the sensor in hand. The sensor can also be mounted on a tripod for long-term measurements.

The passive sensor offers considerably higher sensitivity and a wider dynamic range than active, broadband field-strength sensors. The maximum field strength of 100 V/m allows measurements in the vicinity of emitters with sufficient spacing from limit values. The minimum sensitivity of typically 1 mV/m also permits reliable measurements of low field strengths, as occur further away from the field-strength source.

FIG 2
Menu of system software R&S RFEX for selecting measurement packets.



Highly specialized software

The R&S RFEX software package has been specially configured for the detection and evaluation of electromagnetic fields. Using remote control, the required functions of the Spectrum Analyzer R&S FSH3 can be activated via RS-232-C and switchover between the sensor antennas carried out via USB interfaces. Predefined measurement packets optimized for the signals to be measured are available for the most common emitters so that measurement errors caused by incorrect setting (e.g. integration time for pulsed signals too short) can be avoided. This makes the system ideal even for non-experienced users. The measurement packets can be edited and new ones can be created.

A great variety of functions can be performed via simple menus:

- ◆ Use of predefined measurement packets (FIG 2)
- ◆ Setting of instrument parameters
- ◆ Short-term measurements (minutes) or long-term measurements (hours or days), FIG 3
- ◆ Averaging over time
- ◆ Automatic switchover of sensor elements, sensor correction and calculation of isotropic field strength
- ◆ Automatic correction of cable loss
- ◆ Data reduction (sum value with average and peak value indication)
- ◆ Display referenced to limit value
- ◆ Result display in table or graphical format
- ◆ Export of measurement results for further processing, e.g. in Word or Excel for Windows™

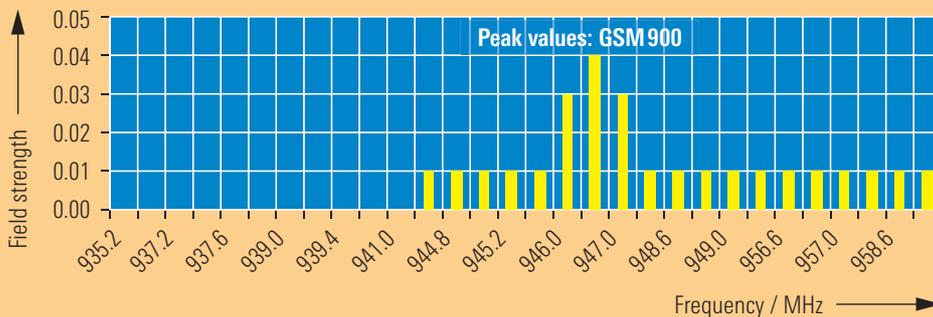
Summary

The Portable System for EMF Measurements R&S TS-EMF is ideal for fast overall measurements as well as for accurate measurements and statistical evaluation of electromagnetic fields in the frequency range 80 MHz to 2.5 GHz.

The advantage of the favourably priced system over conventional measurement methods is that frequency-selective measurements are performed with the aid of an isotropic sensor. The supplied R&S RFEX software package simplifies measurements by providing predefined measurement packets and permits results to be evaluated with reference to a limit line.

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FIG 3 Long-term measurement in frequency band GSM 900. Frequencies causing the essential part of the measured electromagnetic fields can be seen at a glance. The diagram shows peak values of the measured field strength in parts per thousand of a limit value selectable by software.



Condensed data of the R&S TS-EMF

Frequency range	80 MHz to 2.5 GHz
Sensor characteristics	isotropic, passive antenna elements
Measurement range	approx. 1 mV/m to 100 V/m
Operating time of Spectrum Analyzer R&S FSH3	approx. 4 h with battery; alternatively AC supply operation
Software package	R&S RFEX

More information at
www.rohde-schwarz.com
(search term: TS-EMF)



Data sheet R&S FSH3

REFERENCES

- [1] System for statewide EMF monitoring. News from Rohde & Schwarz (2002) No. 174, pp 50–51 (NEWSGRAMS)
- [2] Handheld Spectrum Analyzer R&S FSH3 – New mobility in spectrum analysis. News from Rohde & Schwarz (2002) No. 175, pp 20–25