



SRM: WHEN SAFETY COUNTS



SRM-3006: SELECTIVE RADIATION METER FOR ELECTROMAGNETIC FIELDS UP TO 6 GHz

Narda Safety Test Solutions GmbH

Sandwiesenstrasse 7
72793 Pfullingen, Germany
Phone: +49 (0) 7121-97 32-777
Fax: +49 (0) 7121-97 32-790
E-mail: support@narda-sts.de
www.narda-sts.de

Narda Safety Test Solutions

435 Moreland Road
Hauppauge, NY 11788, USA
Phone: +1 631 231-1700
Fax: +1 631 231-1711
E-mail: NardaSTS@L-3COM.com
www.narda-sts.us

Narda Safety Test Solutions Srl

Via Leonardo da Vinci, 21/23
20090 Segrate (Milano), Italy
Phone: +39 02 2699871
Fax: +39 02 26998700
E-mail: support@narda-sts.it
www.narda-sts.it

© Narda Safety Test Solutions 2010

® The name and logo are registered trademarks of Narda Safety Test Solutions GmbH and L3 Communications Holdings, Inc. – Trade names are trademarks of their respective owners.

NSTS 12/10-E269B Technical advances, errors and omissions excluded.

SAFETY?

Radio, TV, mobile phones, wireless services: Electromagnetic fields are the medium wherever such forms of communication are used. These fields affect everything around them including the people that are moving within them. Complete coverage would otherwise be impossible.

National and international authorities have fixed limit values for such fields to prevent harmful effects. The field strengths allowed in the occupational environment are usually higher than those for the general public, because people who routinely work in electromagnetic fields are trained, aware of the potential dangers, and know what to do or have specific instructions which, for example, limit exposure time to the field.

Legislators have laid the responsibility for ensuring safety upon the operators of transmitting equipment and the relevant authorities. These, in turn, can take advantage of the measurement services offered by organizations and independent providers. There is really only one way to make sure everything is safe:

CHECK!

AM FM DVB-T



Photo reproduced by kind permission of ORS – Österreichische Rundfunksender GmbH & Co KG Austrian Broadcasting Services, www.ors.at



DAB TETRA GSM UMTS CDMA WIMAX

CHECK? HOW?

Wideband measuring equipment gives blanket coverage of large frequency ranges, which could range from the broadcast band to the mobile phone band and beyond, for example. When fitted with special probes, such equipment can deliver results that are expressed automatically in terms of the applicable permitted limit values. These devices are usually easy to operate.

Selective devices such as spectrum analyzers break the fields down into their individual frequency components, allowing detailed analysis. They are more complex to operate and some specialist knowledge is needed to evaluate results.

The Selective Radiation Meter SRM-3006 from Narda

Safety Test Solutions combines the analysis features of a spectrum analyzer with the simple application of a wideband measuring set. It was developed specifically to address safety concerns in electromagnetic fields. In contrast to a "converted" spectrum analyzer, it provides users with application-oriented operating modes for measuring separate transmission channels and services such as analog or digital broadcasts (TV, DVB-T, DAB), mobile phones (GSM, UMTS) or wireless (WLAN, WiMAX). Results are displayed as individual values in tables and as an overall total value, expressed in units of field strength, power density, or simply as a percentage of the permitted limit value. You don't need to be an expert in spectrum analysis to use the SRM.

SRM: WHEN SAFETY COUNTS

The Selective Radiation Meter and its measuring antennas are matched. Any antenna and any instrument in the range can be combined to form a handy unit. Plug and Play.



V/m A/m W/cm² %

The results can be shown in physical units, e.g. electric field strength in V/m, magnetic field strength in A/m, and power density in W/cm², or directly as a percentage of the limit values, for example those specified by ICNIRP. Important: The SRM can also subsequently convert results to percentages, physical units or logarithmic quantities.

DEPENDABLE?

Legally airtight, trustworthy results depend on many factors: The measuring equipment must be calibrated. The measurement must comply with standards, and it must be made professionally and correctly.

The SRM from Narda Safety Test Solutions is calibrated – traceable to national and international standards. It fulfills all the requirements of current human safety standards. And it makes correct, professional measurements easy, such as time-averaged measurements over the standard six-minute period or spatial averaging over several measurement points. When using the isotropic measuring antennas for the SRM, you don't need to worry about the direction of the field either; the instru-

ment doesn't miss a thing. And you can set up and save measurement routines in advance, ensuring reproducible results and eliminating incorrect settings.

The SRM can create measurement reports on-site, so there's no possibility of transmission errors creeping in. The instrument includes the underlying standard in the result, records the date, time and GPS coordinates, and also saves written or voice comments, which can describe e.g. the ambient conditions or any events that occur during the measurement. All this means that you always get dependable results.

Band	Service	Fmin	Fmax	RBW	Avg
4	Band I	47.000 MHz	68.000 MHz	50 kHz	0.00004%
5	LKW	87.500 MHz	108.000 MHz	50 kHz	0.00002%
6	Band D/CAB	174.000 MHz	230.000 MHz	1 MHz	0.00003%
7	Band N/DIGITVB	470.000 MHz	790.000 MHz	1 MHz	0.040%
8	GSM 900	890.000 MHz	960.000 MHz	1 MHz	17.48%
9	GSM 1800	1710.000 MHz	1880.000 MHz	1 MHz	1.311%
10	UMTS	1920.000 MHz	2170.000 MHz	1 MHz	0.019%
Others					0.132%
Total					18.98%

Impossible to falsify: Screenshot of a 'Safety Evaluation' result.



The calibration certificate records the traceability of the calibration of the instrument and antenna to recognized standards – with accreditation if requested.

SRM: WHEN SAFETY COUNTS

GPS TIME DATE VOICE



SRM – WHAT FOR?

Electromagnetic fields always consist of an electrical and a magnetic field component. Limit values are therefore specified for both the electric as well as the magnetic field strength.

The electric and magnetic field strengths at a distance from the source are in a fixed relationship, so it is sufficient to measure just one of the two components. This relationship does not apply close to the source, so both components must be determined separately.

The wavelength of the radiation determines the location of the near-field and the far-field. The near-field of a long wave transmitter extends for several kilometers. The near-field for mobile phone antennas ends within the space of about one meter.

Narda Safety Test Solutions has developed a thoroughly researched range of measuring antennas. They make the SRM into a universal measuring set for electric and magnetic fields – from long wave up to the latest generation of mobile phone frequencies.

SRM: FOR EVERYTHING



The isotropic (three-axis) measuring antenna for electric fields (E-fields) up to 3 GHz is the all-round solution for trouble-free measurements covering VSW to UMTS.

Inside the isotropic electric field measuring antenna, showing three dipoles arranged at mutual right angles.

ISOTROP – SINGLE AXIS

Quick and reliable because they are non-directional: The isotropic antennas detect the field strengths in three mutually perpendicular directions, and the SRM automatically calculates the resulting field strength. Nevertheless, isotropic measurements are also possible using the single-axis antennas if you use a tripod and the antenna holder, which allows you to make successive measurements in three mutually perpendicular positions. The SRM supports this procedure by saving the result for each of the three positions and then calculating the resulting field strength – without a PC.

All antennas and antenna cables are interchangeable without affecting accuracy: The calibration data for each item is saved in the antenna or cable itself and is read out and applied automatically by the SRM Basic Unit. At the same time, the SRM blocks the frequency ranges for which the antenna has not been calibrated. This avoids incorrect measurements.

ALL-PURPOSE MEASURING ANTENNAS



For rapid, non-directional measurements involving latest generation wireless technologies: Three-axis (isotropic) E-field antenna for frequencies from **420 MHz to 6 GHz**



For rapid, non-directional measurements, e.g. covering mobile phone frequencies: Three-axis (isotropic) E-field antenna for frequencies from **27 MHz to 3 GHz**



For precision measurements in the mobile phone frequency range: Single-axis E-field antenna for frequencies from **27 MHz to 3 GHz**



For precision electric field measurements on radio / TV transmitters and industrial equipment: Single-axis E-field antenna for frequencies from **9 kHz to 300 MHz**

E-FIELD



For rapid, non-directional magnetic field measurements in the near-field of radio / TV transmitters and industrial equipment: Three-axis H-field antenna for frequencies from **9 kHz to 250 MHz**



For precision magnetic field measurements in the nearfield of radio / TV transmitters and industrial equipment: Single-axis H-field antenna for frequencies from **9 kHz to 300 MHz**

H-FIELD



The single-axis antennas can be mounted on a tripod and adjusted to produce isotropic results by making measurements in three mutually perpendicular positions. Hand-held, they are also ideal for locating maximum values within a room using the so-called pendulum method.



The measuring antennas can be connected to the SRM Basic Unit directly or via a cable. An auxiliary control cable allows the Basic Unit to read out the measuring antenna and antenna cable data automatically.

WHO? WHAT?

Broadcasting, mobile telephony, industrial equipment: What proportion of the overall field is from which source? The answer is of interest to the relevant authorities and safety representatives as well as to the operators themselves. There is often a need to know what field strength is emanating from which equipment, which channel or which radio cell. This determines who must reduce output power in the event that the limit values are exceeded, for example. On the other hand, the overall field strength is more important when it comes to human safety and environmental protection.

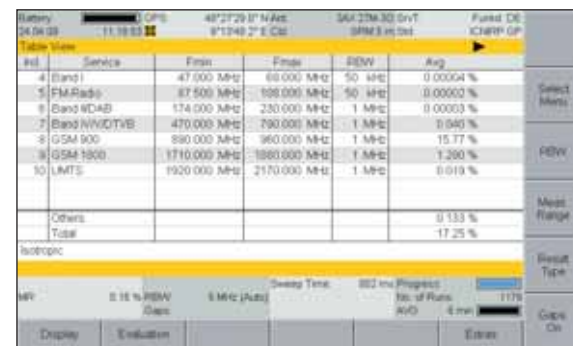
The Selective Radiation Meter SRM is perfect for such investigations, thanks to its application-oriented operating modes. For example: 'Safety Evaluation' with automatic evaluation of individual services such as analog TV, digital radio (DVB-T, DAB), mobiles (GSM, UMTS), and wireless (WLAN, WiMAX), as well as a summary of the results in the form of an overall value. Or 'Level Recorder' mode, which can even record pulsed radar signals as numerical values. Or 'Scope' mode, which displays the variation of the field over time.

Even the resolution bandwidths are tailored to the applications. Using these settings, the SRM can select out a single narrow GSM channel or capture an entire broad DVB-T channel.

SRM FOR DETAILS

SPECTRUM ANALYSIS SAFETY EVALUATION UMTS P-CPICH DEMODULATION

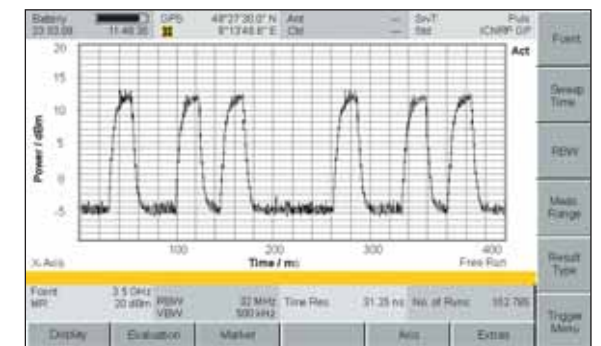
Overview with 'Safety Evaluation': The services to be checked are recorded in editable tables. There's no complicated evaluation needed in 'Safety Evaluation' mode: The numerical result shows the individual contributions of the services as well as the overall level in terms of the permitted limit value.



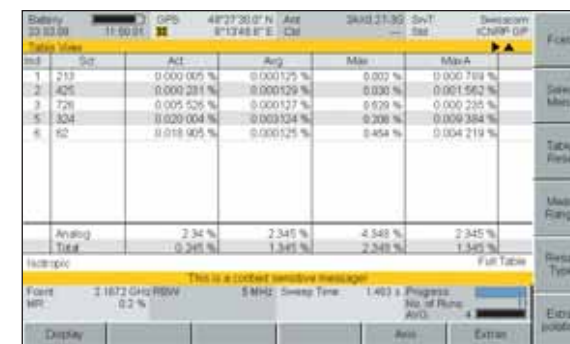
Which channels are occupied? The bar graph display in 'Safety Evaluation' mode shows maximum, average, and minimum values simultaneously, so you can clearly see what's going on.



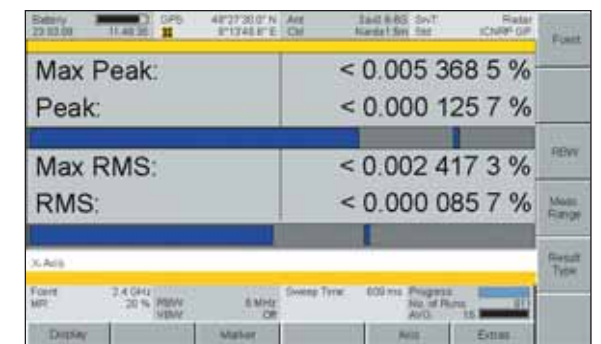
View pulsed signals directly in 'Scope' mode: The time domain display can be set to cover a period of 24 hours or can be more finely resolved, even down to the microsecond level.



Classical spectrum analysis: Result evaluation using markers and delta markers. The integration function can be used to determine the channel power level, for example. Special feature: Service identification by means of pre-recorded service tables.



UMTS P-CPICH Demodulation: The SRM automatically identifies every received UMTS cell by means of its scrambling code and measures the field strength or power density of the associated pilot channel (P-CPICH) at the same time. The SRM also shows the sum of all P-CPICH levels as an overall value (Total). The analog measured value for the frequency channel is also shown for comparison. You can also set a factor that the SRM can use to extrapolate the field strength that would result if all channels were fully loaded.



Measure pulsed signals easily in 'Level Recorder' mode: The SRM complements the numerical display of maximum and minimum values with a bar graph 'thermometer' display: A marker remains on the maximum level in each case.

LEVEL RECORDER SCOPE

KEEP CHECKING

It doesn't take long to measure the actual field exposure level. But how does the level change over a period of seconds, minutes, hours, or even days?

The SRM-3006 records individual radio channels in real time with microsecond resolution in 'Scope' mode; this capability is needed in order to capture radar impulses. On the other hand, the instrument can also be used for long-term measurements, such as a 'Safety Evaluation'. The flow of data doesn't have to become a flood, though. The start and sequence of measurements can be timer controlled or triggered when a threshold is crossed. The SRM then summarizes the data sets in a clear display.

Particularly convenient: The SRM determines the instantaneous, average, maximum, and minimum values at the same time.

The SRM can operate independently for about three hours on fully charged batteries. The batteries can easily be replaced on-site, so there's no need to hunt for the nearest power outlet.

SRM FOR LONG-TERM MONITORING



Long term monitoring in the workplace: Even the WLAN connection to a laptop and the in-house wireless telephones contribute to the field exposure level. The SRM can be operated for hours or days on end using an AC adapter.



'Safety Evaluation' in a residential area: Is it really only the mobile phone base stations that are the source of the field?



Practical, on-site battery exchange: With a spare set of batteries, you can run the equipment for a whole day without needing AC line power.

ACT AVG MAX MIN MAX AVG MIN AVG

EVERYDAY CHECKS

There is a different field situation at each different measurement location. However, the measurements themselves are repeated. Narda Safety Test Solutions has equipped the SRM-3006 with programmable measurement routines for this reason. The SRM runs through specific setups in succession and performs the necessary tasks. This saves time, avoids incorrect measurements, and means that the results from different locations are comparable and reproducible.

The SRM can do a lot of things automatically if you want it to, such as setting a suitable measurement range and selecting the appropriate resolution bandwidth. You can also easily perform measurement steps manually, such as switching from the FM radio range to the DVB-T range or from GSM-900 to GSM-1800.

Switching between operating modes also includes some clever features. For example, if you determine the center frequency of a UMTS frequency channel using spectrum analysis, the SRM will continue measuring at exactly that frequency when you switch to 'UMTS P-CPICH Demodulation', 'Scope', or 'Level Recorder' mode.

Meaningful measurement involves a process, which begins with configuring the instrument and ends with the evaluation, documentation, and management of

the measured data. The SRM-3006 TS PC software lets you do all this easily.

You can also combine instrument setups into measurement routines and upload them to the SRM using the PC software. Conversely, you can download the results from the SRM, evaluate, record, and discuss them without any time-consuming further processing on a PC.

ROUTINE WITH SRM



INSIGHT

A single spectrum captured using the SRM contains thousands of measurement points. During the course of a normal working day, the SRM may store many such spectra along with other results. Which data is important, what information is relevant for assessing safety?

You don't need to be a spectrum analysis specialist to use the SRM. Nevertheless, experts can set all the parameters for spectrum analysis individually and evaluate the details manually. For example, you can zoom in on individual lines in the spectrum, compare spectral com-

ponents using the delta marker, or read off the maxima and minima at a specific frequency. You can also select a video bandwidth to smooth the trace, just as with a laboratory spectrum analyzer. The original resolution is still retained in the background.

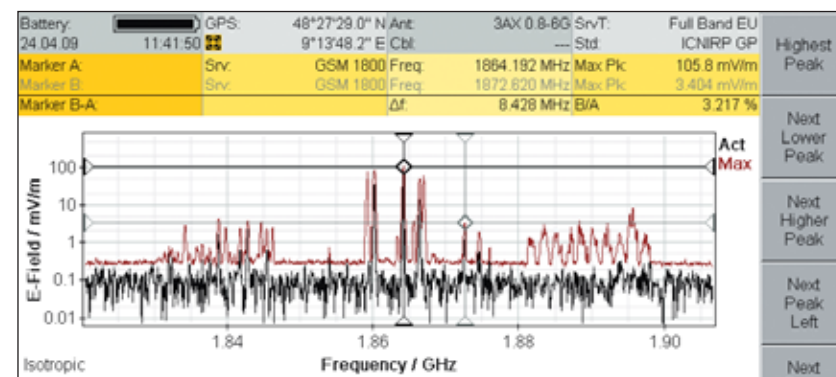
Selective measurement in the time domain is unique: Pulsed signals can be displayed directly in 'Scope' mode – with time intervals ranging from hours right down to microseconds. In 'Level Recorder' mode, the SRM-3006 displays the instantaneous peak and RMS values as well

as the maximum peak and RMS values that occurred during the measurement. With a resolution bandwidth extending up to 32 MHz, the SRM-3006 is also fully equipped to handle the next generation of mobile communications systems.

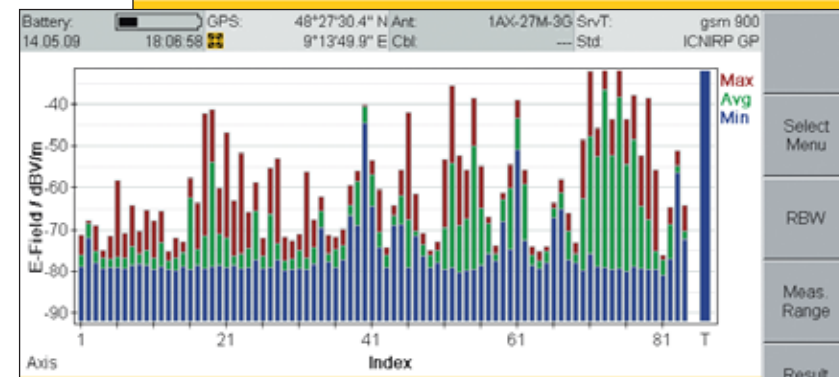
Expert users don't need to put up with inconvenience, either. The SRM automatically generates a list, even from the most detailed spectrum. This 'Peak Table' gives access to important details.

OVERVIEW

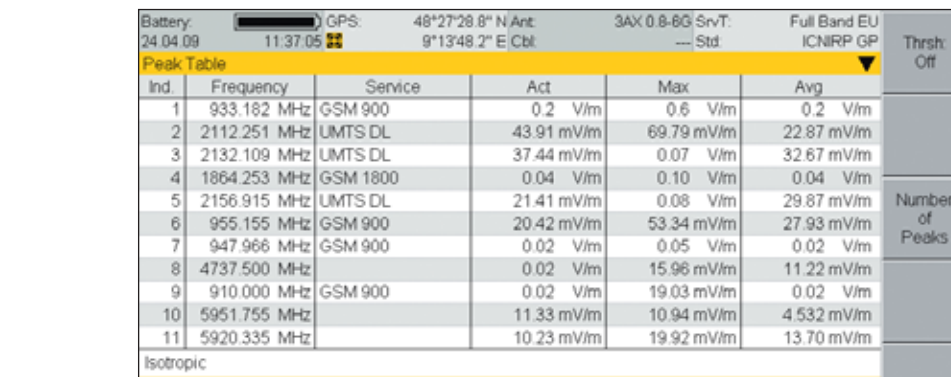
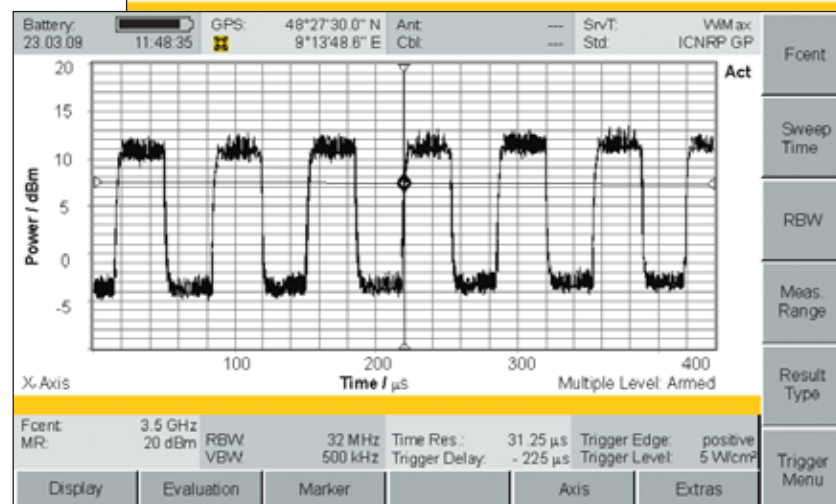
Detailed evaluation of a 'Spectrum Analysis' in the 1800 MHz mobile phone range (GSM-1800): Using the Delta marker, spectral components can be compared or the maxima and minima at a specific frequency can be read out.



'Safety Evaluation' with bar graph display: Professional users can immediately see the difference between traffic channels (TCH) and control channels (BCCH) when the maximum, average, and minimum values are displayed simultaneously.



Pulsed fields in 'Scope' mode: As with an oscilloscope, you can measure impulse lengths and period durations. And you can also set triggers: Measure once when the threshold is exceeded, or each time the threshold is exceeded – or by timer control.



Keep it simple: Evaluation of a 'Spectrum Analysis' using the 'Peak Table'. The list of the highest field strengths and their corresponding frequencies, service names and even the names of the service providers if these have been recorded in service tables is particularly convenient. Items in the table can be sorted according to various criteria.

'Safety Evaluation' in the UMTS range: The individual channels with their channel numbers are shown next to each other in the bar graph display, just like a textbook. The "T" bar on the extreme right shows the total power density. The "O" bar shows the contributions from the frequency gaps (others) between the services.

ON-SITE OR LAB?

Handy enough for on-site work but with high-end specifications suitable for laboratory use – the SRM offers both.

The Basic Unit has a footprint which is about the same size as this brochure. Together with the measuring antenna, it forms a unit that can easily be carried up any tower. The combination is ergonomically designed, mechanically robust, and splash proof. The casing is electrically resistant to field strengths of up to 200 V/m. This means that you can still measure the field strength in areas where most other instruments have long ceased to function. Many of its features show their real

worth in difficult environments: the voice recorder for spoken comments, the rough textured rear panel ensuring you have a good grip, and the large area keypad that can still be operated even if you are wearing gloves.

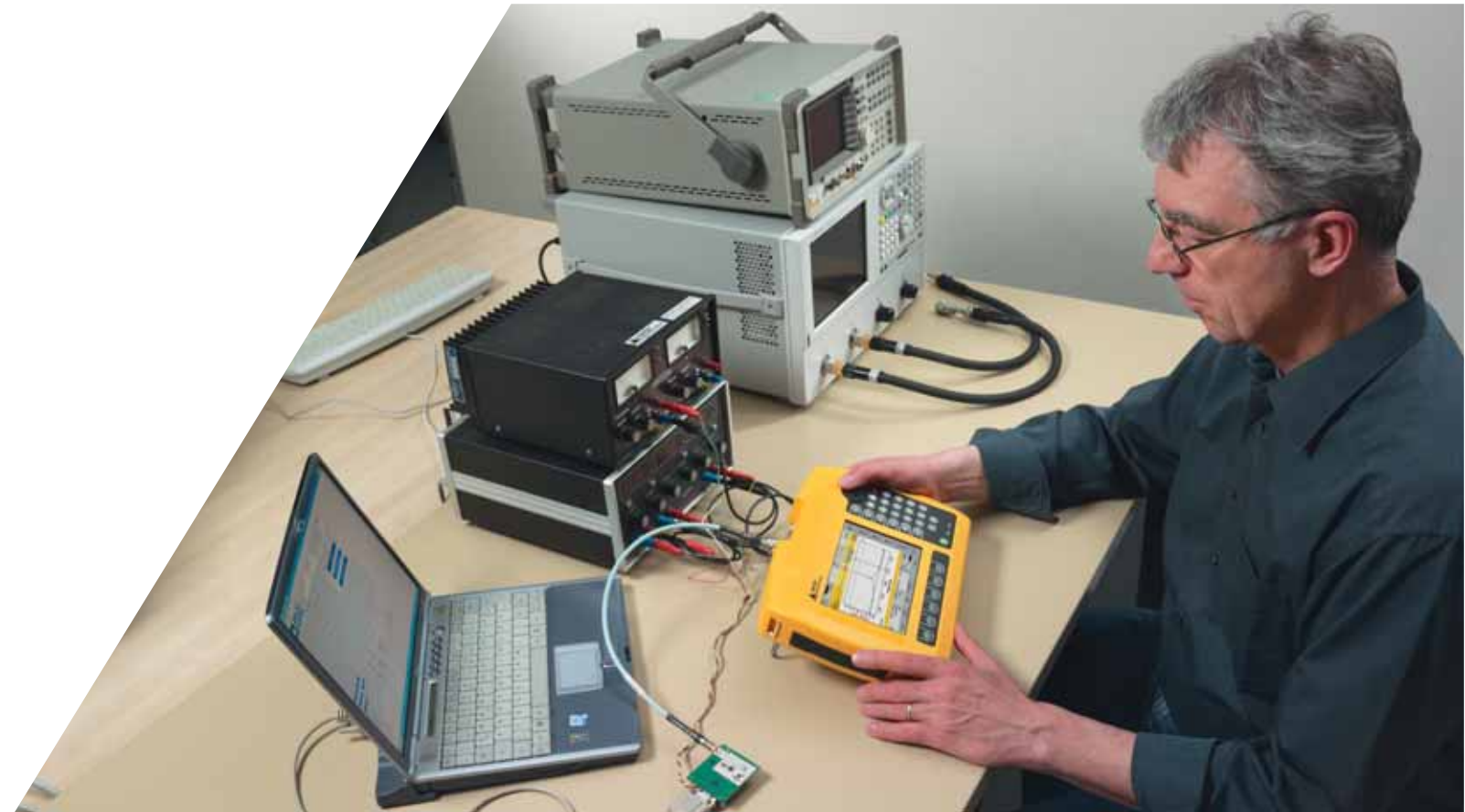
Nevertheless, the specifications of the SRM-3006 are such that it can double as a laboratory instrument: An unusually high maximum bandwidth of 32 MHz, a signal to noise ratio that is excellent for a hand-held device, and the standard N connector that can be used to connect cables and antennas from other manufacturers.

ON-SITE AND LAB

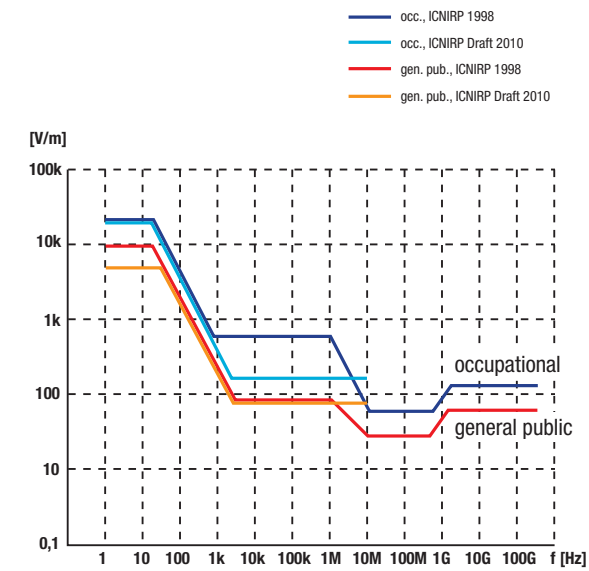
Everything on hand: Measuring workplace safety using the SRM Basic Unit and measuring antenna.



Photo reproduced by kind permission of ORS – Österreichische Rundfunksender GmbH & Co KG Austrian Broadcasting Services, www.ors.at



Ergonomics for the lab: The SRM can be set at a tilt so it is easy to operate and read.



The advantage of a specialized device: If required, the SRM evaluates directly according to safety standards. Shown here: ICNIRP occupational and general public limit value curves.

VERSIONS AND FUNCTIONS

The Selective Radiation Meter SRM-3006 is available packaged in various sets of equipment; for example: Basic Unit with isotropic (three-axis) E-field measuring antenna up to 6 GHz – or – Basic Unit with isotropic (three-axis) E-field measuring antennas up to 3 GHz and 6 GHz. Each set also includes the SRM-3006 Tools PC software, USB cable, AC adapter / charger, wrist strap and carry strap. The equipment is fitted in a choice of either a soft case or a rigid shell case.

All these components as well as other equipment can be supplied as accessories.

Please refer to the latest data sheet at www.srm3006.com for detailed specifications.

SAFETY EVALUATION

For a rapid overview of the field exposure level as a graph, a table, or a total value

SPECTRUM ANALYSIS

For analyzing the field exposure level in detail, as a graph or table, with display of individual values and calculation of the exposure due to entire frequency ranges

LEVEL RECORDER

For a rapid overview of time-variable fields, with numerical display of peak and RMS values

SCOPE (OPTION)

For detailed real time recording and evaluation of time-variable fields

UMTS (OPTION)

Pilot channel (P-CPICH) demodulation and extrapolation to the maximum possible field exposure level

GENERAL FUNCTIONS

Time or event controlled recording
User-defined configuration
Importation of calibration data
Measurement routines, setups
Spatial averaging
Voice recorder
GPS

ACCESSORIES



OPTIONAL ACCESSORIES

Antennas

- Three-axis E-field antenna up to 6 GHz
- Three-axis E-field antenna up to 3 GHz
- Three-axis H-field antenna up to 250 MHz
- Single-axis E-field antenna up to 3 GHz
- Single-axis E-field antenna up to 300 MHz
- Single-axis H-field antenna up to 300 MHz

Antenna cables

- RF cable, 1.5 m
- RF cable, 5 m

Tripod

- Tripod adapter for single- and three-axis antennas
- Tripod adapter for three-axis antennas

Transport

- Soft case or rigid shell case
- Shoulder bag
- Carry strap

Power supply

- Spare batteries
- Battery charging station

Software

- SRM-3006 TS PC software with comprehensive data management features

Care Packages with extended warranty and calibration



SRM: WHEN SAFETY COUNTS



LOW FREQUENCY MEASUREMENT

Measuring devices for electric and magnetic fields from DC up to several hundred kilohertz. For power utilities, electric railroads, and industry. Standard-compliant evaluations, e.g. according to the "Domestic Appliance" standard IEC 62233.



WIDEBAND HIGH FREQUENCY MEASUREMENT

NBM-500: The instrument range that covers practically every application between 100 kHz and 60 GHz.



SELECTIVE HIGH FREQUENCY MEASUREMENT

SRM-3006: The instrument that selectively identifies and measures every source in the frequency range from 9 kHz to 6 GHz with a sensitivity that can detect individual telecommunications channels even within a building.



PERSONAL MONITORS

Worn or carried on the person, these devices give reliable warning of excessive radiation levels.



AREA MONITORING STATIONS

For permanent monitoring of the field strength situation. Frequency selective or wideband. Data transmission via mobile phone link.

NARDA: WHEN SAFETY COUNTS

Narda Safety Test Solutions is a global leader in the development and production of measuring equipment for electric, magnetic, and electromagnetic fields. This is borne out by our owning some 95% of all the published patents for measuring such fields. Narda instruments are the products of a highly innovative company that specializes in EMF – measurements for safety in electromagnetic fields – and which is continually expanding its position in this sector.

Our three facilities are located at Hauppauge, Long Island / USA, Pfullingen / Germany and Cisano / Italy. It is our aim to provide all our customers with tailor-made, high-tech products of the highest quality.

The comprehensive product portfolio for human safety in electromagnetic fields (EMF) includes wideband and frequency-selective measuring devices, monitoring stations and personal monitors. Under the PMM brand, we offer instruments for assessing the electromagnetic compatibility (EMC) of devices. Our range of customer services also includes servicing, calibration, and training.

OUR COMPLETE RANGE