

# Combining operating modes



In Technical Notes 01 and 02, we reported on the new characteristics of *Safety Evaluation* and *Spectrum Analysis* modes. In this Technical Note 03, we will show you how you can quickly and easily get the desired results by selective use of the different operating modes. We've chosen a GSM-900 mobile radio measurement as an example.

## Overview

In *Safety Evaluation* mode, you immediately get an overview of what's going on with regard to the fields relevant to safety. The real advantage is that you can simultaneously display maximum, minimum and average values, just like in the other operating modes – including the ICNIRP standard six-minute averages. This means that the full report on the radiation levels is already completed and can be assessed at a glance!

*The Selective Radiation Meter SRM-3006 from Narda Safety Test Solutions has been specially developed for environmental and safety measurements in electromagnetic fields. Using isotropic measuring antennas, the instrument covers the entire frequency range from 9 kHz to 6 GHz. It can therefore be used equally well to investigate safety in the near field region of long wave transmitters, make measurements on radio and TV broadcast transmitters, and determine exposure levels caused by the latest generation of mobile telecommunications services.*

Battery:	27.10.09	GPS:	15:03:29	48°27'28.8" N	Ant:	9°13'50.9" E	Cable:	3AX 75M-3G	SrvTbt:	---	Stnd:	Full Band EU
Table View: Standard												
Index	Service	Max	Avg	Min								
2	FM-Radio	56.45 mV/m	54.18 mV/m	52.89 mV/m								
3	Mid	15.48 mV/m	14.81 mV/m	14.19 mV/m								
4	Paging	7.912 mV/m	7.195 mV/m	6.477 mV/m								
5	BandIII	17.73 mV/m	17.25 mV/m	16.78 mV/m								
6	Trains	1.548 mV/m	1.214 mV/m	1.006 mV/m								
7	BandIV	24.60 mV/m	23.80 mV/m	23.15 mV/m								
8	BandV	9.484 mV/m	9.167 mV/m	8.928 mV/m								
9	GSM-R	221.9 mV/m	192.8 mV/m	173.2 mV/m								
10	L-Band	6.895 mV/m	6.668 mV/m	6.446 mV/m								
	Others	50.85 mV/m	50.45 mV/m	49.96 mV/m								
	Total	259.4 mV/m	223.7 mV/m	206.5 mV/m								
Isotropic												
Safety Evaluation												
MR:	1.8 V/m	RBW:	200 kHz (Auto)	Sweep Time:	4.482 s	Progress:						
				Noise Suppr.:		Off No. of Runs:	414					
						AVG:	6 min					

*Figure 1: A comprehensive Safety Evaluation made close to a railroad line. It includes radio and mobile phone bands from the FM range up to the L band, which is the band used in Europe for terrestrial radio broadcasting at 1.5 GHz.*

### Insight – an individual service

If you want to look at a service in more detail, simply select it: e.g. *GSM900 DL Germany*. Now you can see the field strengths in the 900 MHz downlink band listed by individual mobile network operator.

Battery: 		GPS: 48°27'28.9" N Ant: 3AX 75M-3G SrvTbl: GSM-900 DL Ger		
27.10.09 15:05:22		9°13'51.0" E Cable: --- Std: ICNIRP GP		
Table View: Standard				
Index	Service	Max	Avg	Min
1	E-Plus	3.940 mV/m	3.137 mV/m	2.328 mV/m
2	O2	226.8 mV/m	156.2 mV/m	90.1 mV/m
3	Vodafone	125.2 mV/m	72.38 mV/m	47.65 mV/m
4	T-Mobile	53.62 mV/m	37.63 mV/m	24.50 mV/m
5	Test	952.1 μV/m	685.5 μV/m	467.7 μV/m
Others		0.000 fV/m	0.000 fV/m	0.000 fV/m
Total		221.9 mV/m	176.3 mV/m	116.8 mV/m
Isotropic				
Safety Evaluation				
MR:	1.8 V/m	RBW: 50 kHz (Auto)	Sweep Time: 928 ms	Progress: 
		Noise Suppr.:	Off No. of Runs: 420	AVG: 8 min 

**Figure 2: Safety Evaluation of the GSM-900 band.**  
The frequencies used by different providers are stored as Service Tables so that the corresponding proportions of the field exposure level can be correctly assigned automatically.  
(Examples are provided in the Configuration menu of every instrument supplied.)

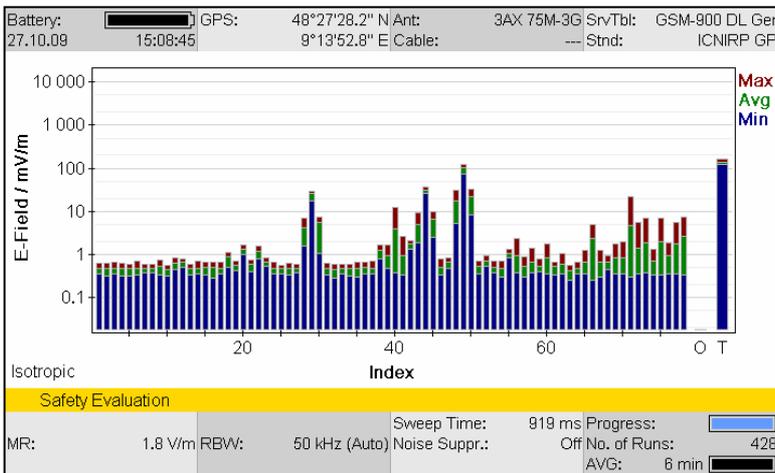
### Detail – the individual channel

If you switch to *Table View: Detailed*, you can actually see the proportions due to the individual channels, which is often of interest to the service providers themselves.

Battery: 		GPS: 48°27'28.8" N Ant: 3AX 75M-3G SrvTbl: GSM-900 DL Ger		
27.10.09 15:05:44		9°13'51.1" E Cable: --- Std: ICNIRP GP		
Table View: Detailed				
Index	Service	Fmin	Fmax	Max
1	E-Plus Ch 975	925.100 MHz	925.300 MHz	612.3 μV/m
2	E-Plus Ch 976	925.300 MHz	925.500 MHz	687.1 μV/m
3	E-Plus Ch 977	925.500 MHz	925.700 MHz	603.0 μV/m
4	E-Plus Ch 978	925.700 MHz	925.900 MHz	659.9 μV/m
5	E-Plus Ch 979	925.900 MHz	926.100 MHz	637.4 μV/m
6	E-Plus Ch 980	926.100 MHz	926.300 MHz	695.6 μV/m
7	E-Plus Ch 981	926.300 MHz	926.500 MHz	612.7 μV/m
8	E-Plus Ch 982	926.500 MHz	926.700 MHz	640.7 μV/m
9	E-Plus Ch 983	926.700 MHz	926.900 MHz	768.6 μV/m
Others				0.000 fV/m
Total				227.0 mV/m
Isotropic				
Safety Evaluation				
MR:	1.8 V/m	RBW: 50 kHz (Auto)	Sweep Time: 836 ms	Progress: 
		Noise Suppr.:	Off No. of Runs: 446	AVG: 6 min 

**Figure 3: Safety Evaluation with resolution down to individual channel level.** A prerequisite here, too, is that a corresponding Service Table has been recorded.

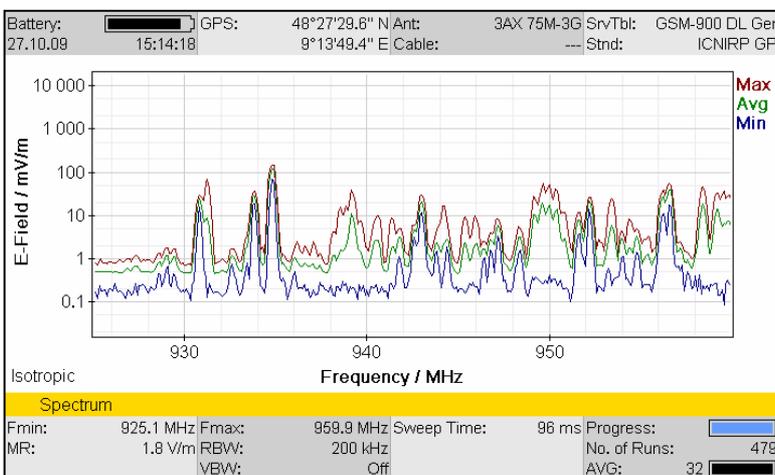
All of these many details can also be shown as an easy to read bar graph. The channel occupancy and loading can then be seen at a glance.



**Figure 4: Safety Evaluation of individual channels shown as a bar graph. The bar to the right represents the overall value (Total).**

**▲ Still not enough detail?  
Use Spectrum Analysis!**

The bar graph display in *Safety Evaluation* mode is basically already a spectrum analysis in its own right. However, if you want to look at specific details, just switch to *Spectrum Analysis*: using *Extras – Go to Spectrum*. The SRM-3006 automatically applies the frequency limit settings  $F_{min}$  and  $F_{max}$ . You now have all the evaluation facilities such as integration or markers at your fingertips.



**Figure 5: Spectrum analysis. When you switch from Safety Evaluation mode to Spectrum Analysis mode, the instrument automatically retains the frequency limit settings. (More about this can be found in Chapter 6.11 of the operating manual.)**

**▲ Too much information?**  
**Back to basics – Peak Table**

You can also get to an evaluation quickly straight from Spectrum Analysis. The *Peak Table* automatically displays the largest peak values. For example, you can set a suitable threshold so that you can see all the control channels (BCCH) but hide the traffic channels (TCH) to a large extent.

Battery: 27.10.09		GPS: 15:15:14		48°27'28.8" N Ant: 9°13'51.3" E Cable:		3AX 75M-3G SrvTbl: --- Stnd:		GSM-900 DL Ger ICNIRP GP	
Peak Table									
Index	Frequency	Service	Avg	Max					
1	934.799 MHz	O2 Ch 1023	133.6 mV/m	121.1	%				
2	956.605 MHz	Vodafone Ch 108	62.06 mV/m	115.7	%				
3	931.223 MHz	O2 Ch 1005	50.19 mV/m	337.0	%				
4	933.798 MHz	O2 Ch 1018	32.78 mV/m	135.3	%				
5	950.400 MHz	Vodafone Ch 77	25.93 mV/m	257.5	%				
Isotropic									
Spectrum • Peak Table									
Fmin:	925.1 MHz	Fmax:	959.9 MHz	Sweep Time:	92 ms	Progress:		No. of Runs:	573
MR:	1.8 V/m	RBW:	200 kHz	VBW:	Off	AVG:	32		

**Figure 6: Peak Table for a spectrum analysis.**  
The BCCH maximum values are only slightly above the average values.

**Unique: You can put the measurements together in any order as a measurement routine and run them manually or automatically one after the other!**

## Technical Notes from Narda Safety Test Solutions

These notes report, in no particular order, on the possible applications of Narda measuring equipment. Typical applications for the Selective Radiation Meter SRM-3006 are safety measurements on

- **Radio and TV transmitters (AM, FM, DAB, DVB-T)**
- **Mobile phone stations (GSM-900, GSM-1800, UMTS, CDMA, W-CDMA, LTE)**
- **Wireless communications networks (WiFi, WLAN, WiMAX, DECT, ZigBee, Bluetooth)**
- **Radio controls using ISM frequencies**

The Technical Notes are found on [www.narda-sts.de](http://www.narda-sts.de) under Literature ► High Frequency

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