



6th Workshop on the Effect of
Electromagnetic Waves to the Human Body

Current Trends of EMF Regulations and Standard-Compliant Measurements of ELF and HF Radiation

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Narda Safety Test Solutions**

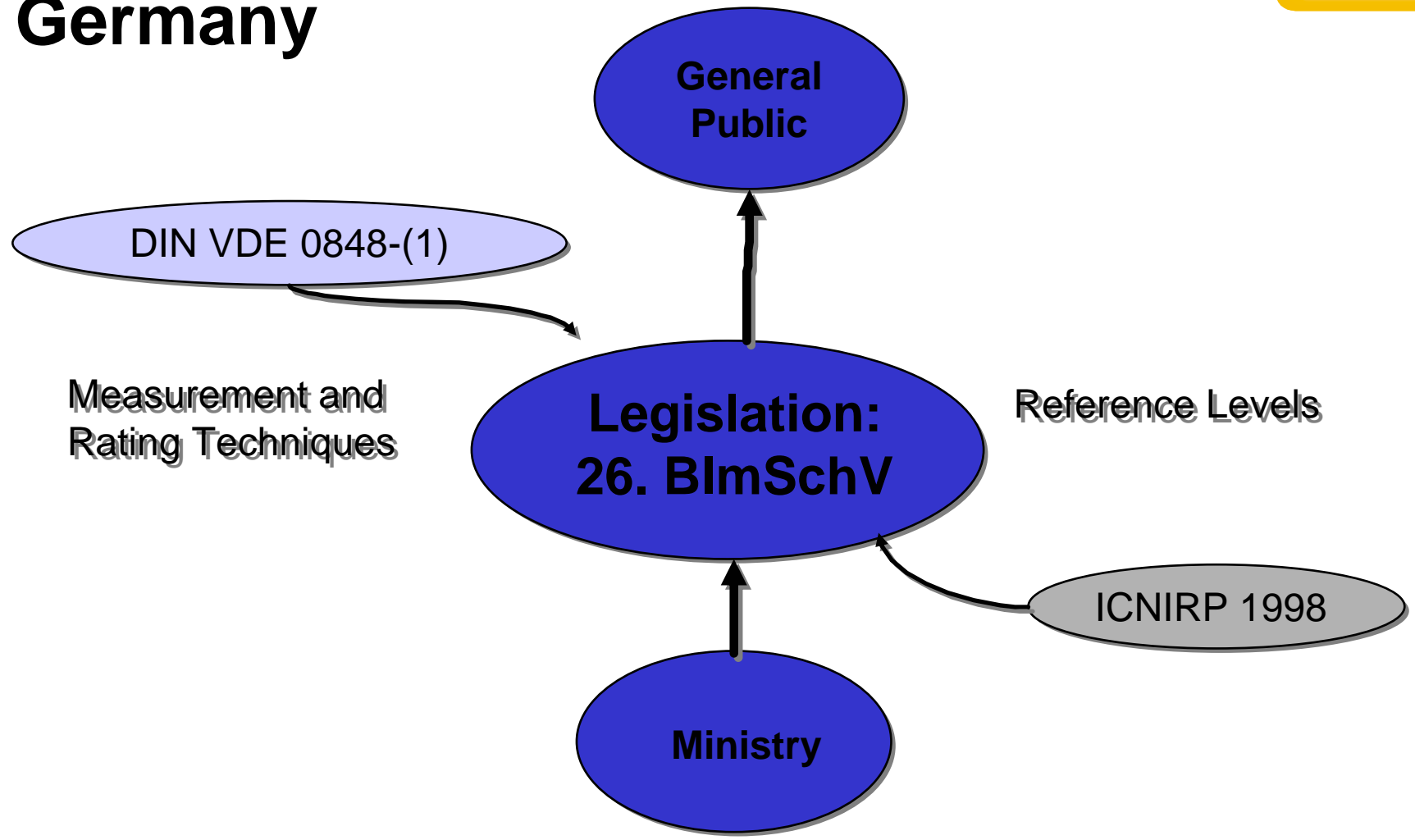
EMF Regulations in Europe - Examples



- Germany
 - ⇒ General Public: “26. Pollution Control Order”
 - ⇒ Occupational: “BGV-B11” - “Accident Prevention Order”
- Italy
 - ⇒ General Public: “Decree No. 381” and “Max. exposure limits to power frequencies”
 - ⇒ Occupational: “Framework Law on Protection against exposure to EMF”, now MPEs so far, ICNIRP currently
- Switzerland
 - ⇒ General Public: “Ordinance relating to Protection from Non-Ionizing Radiation”
 - ⇒ Occupational: Maximum Permissible Exposure Values at Workplaces

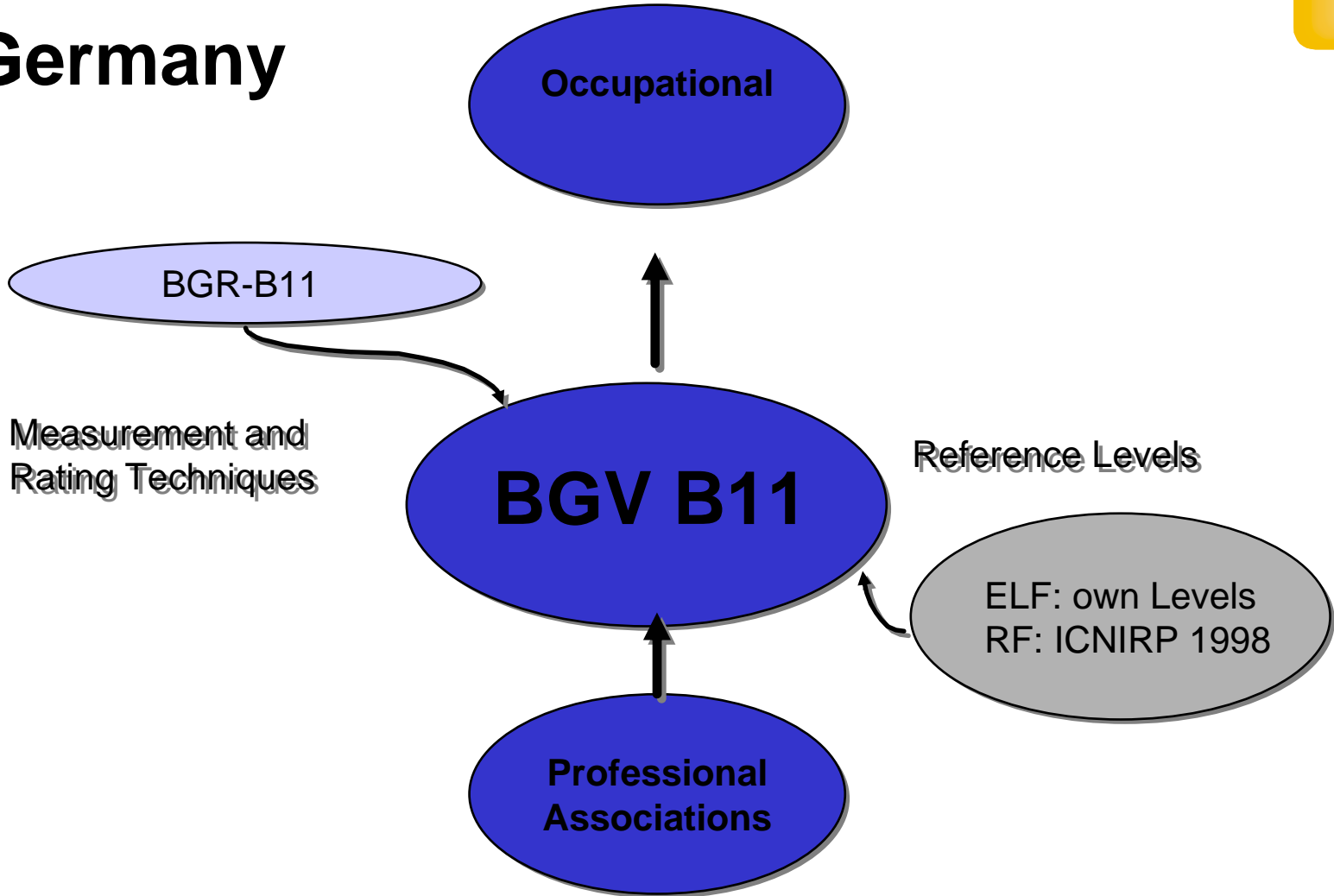


Germany





Germany





BGR-B11: Rules for the Execution of the Accident Prevention Regulation

Valid for all members of the Professional Associations exposed to EMF.

Contents:

- Definitions
- Actions to prevent hazards due to EMF
- Maximum Permissible Exposure Values
- Measurement Proceedings
 - ⇒ Measurement Proceedings according to DIN VDE 0848
 - ⇒ Measurement Technology - e.g. uncertainty
 - ⇒ Preparation and Execution
 - ⇒ Where to measure
 - ⇒ Measurement Report
- Markings, Signs



Measurement Report

Description of

- ⇒ application, technical specs, operating status
- ⇒ measurement equipment
- ⇒ environmental conditions (temp, humidity)
- ⇒ measurement points (area plans, drawing)
- ⇒ measurement results (graphics and tables)

⇒ **Aim: Reproducible Measurement Results**

Example: Deutsche Telekom



- from simulation to measurements
- measurements of all antenna sites
- documentation of the measurement results and environmental conditions
- determination of dangerous areas
- instructions for the different areas
 - ⇒ personal monitor is obligatory
 - ⇒ following markings
 - ⇒ consideration of “low-traffic-periods”
 - ⇒ level-down or switch off of services
 - ⇒ protection suit
- new measurement and documentation after any changes at the site
 - ⇒ problem: time-gap between installation and information

Execution of the Strategic Plan Deutsche Telekom



- department for the safety in EMF
- developed a RF safety concept
- responsibility for the safety of their maintenance workers and non Telekom members
- own research
- obligatory training for maintenance people
- regularly up-dates by intranet, brochures and videos



Example Italy

- **Decree No. 381:**
 - ⇒ 6 V/m for the frequency range 100 KHz - 3 GHz !!!
- **Act for the occupational sector is in process,**
 - ⇒ currently ICNIRP occupational MPEs
 - ⇒ new limits will be much more lower
- **Diversification into 3 classes**
 - ⇒ general public
 - ⇒ workers
 - ⇒ “quality of life” ⇒ totally new approach

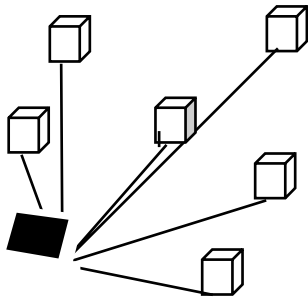


Example Switzerland

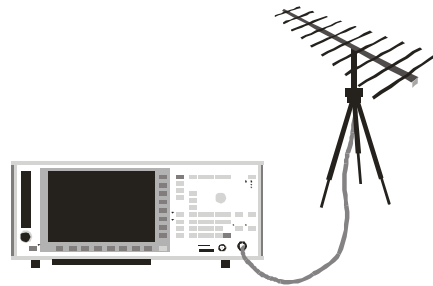
- Ordinance relating to Protection from Non-Ionizing Radiation (ONIR)
 - ⇒ Ordinance for the protection of the general public
 - ⇒ Issued by the Swiss Federal Government
 - ⇒ ICNIRP GP reference levels
 - ⇒ Additionally: “Installation Limit Values”
 - ⇒ Refers to the radiation of a single installation
 - ⇒ To be respected at places of sensitive use only (schools, hospitals, offices, apartments, ...)
 - ⇒ Overhead and cable lines, transformer stations, railways and trams, transmission installations for mobile telecommunications, broadcasting and other wireless applications.
 - ⇒ Measurements and/or calculations by authorities



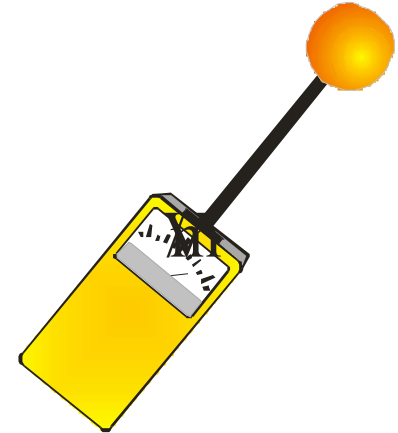
Field test equipment



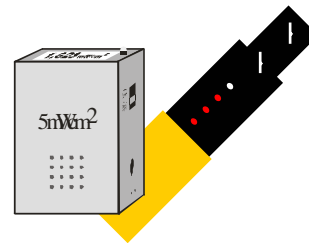
Spatial Indoor
Monitoring Systems



Spectrum
Analyzers



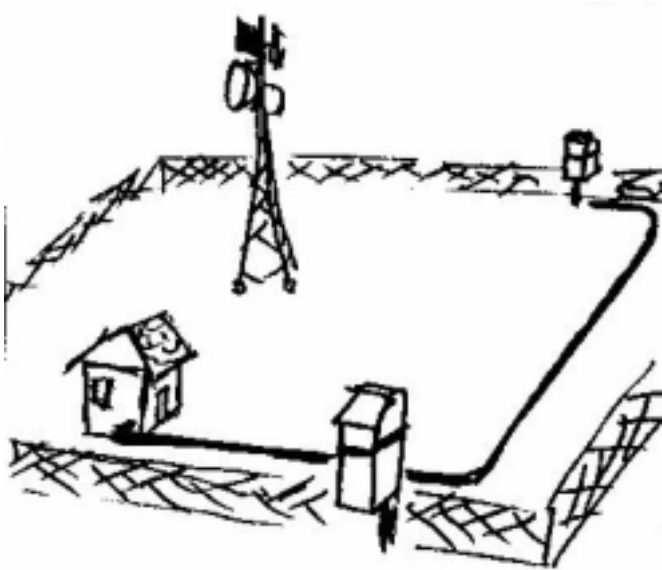
Handheld Devices



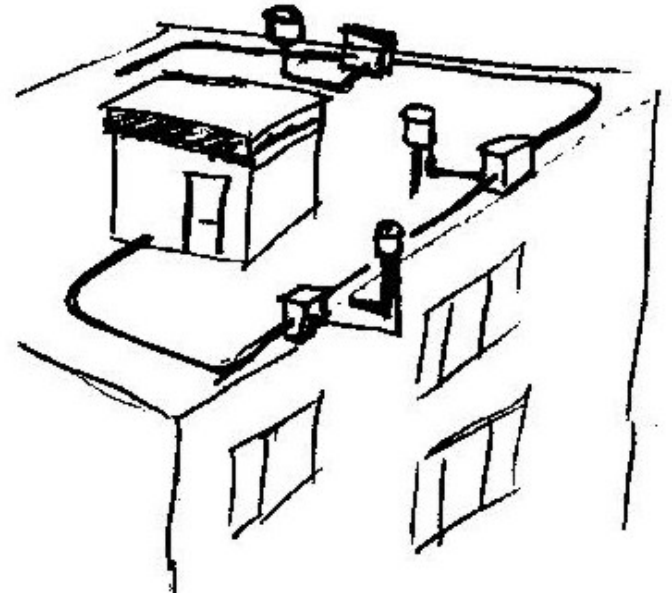
Personal Monitors



Area Monitoring Systems



Gate Entrance Monitor

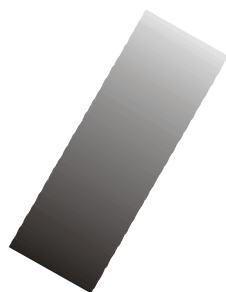


Roof Top / Site Monitor

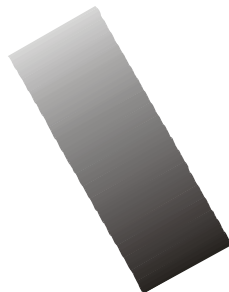


Field test equipment

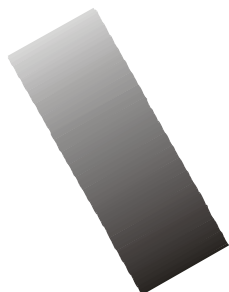
Limit value



Frequency



Field strength



Selective test equipment

Limit value



Field strength



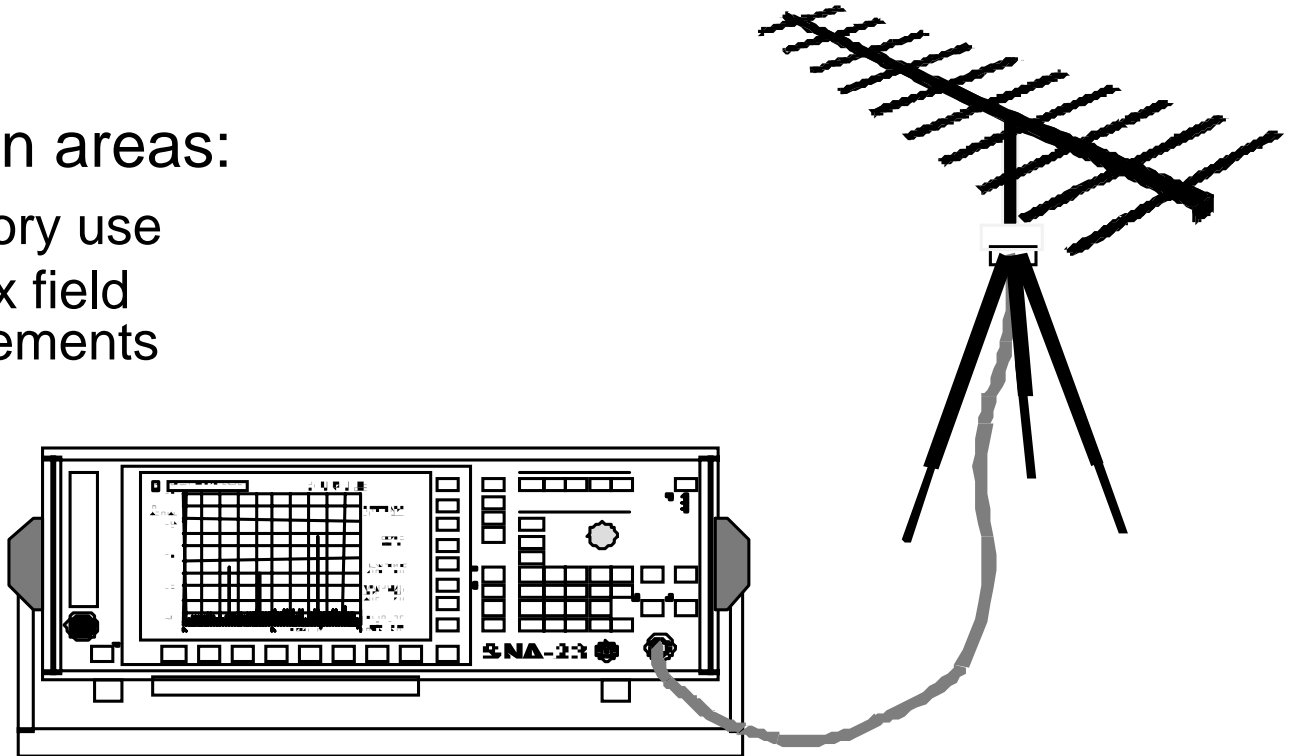
Broadband test equipment

Selective test equipment



⇒ **Spectrum analyser**

- Application areas:
 - Laboratory use
 - Complex field measurements





Spectrum analyser

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SPECTRUM ANALYSIS

30.000000 MHz FSTART
3000.00000 MHz FSTOP

Benefits

- + High precision
- + High sensitivity
- + indication of signal parameter

Disadvantages

- Operation
- Costs
- Level and not field strength
- Single-level sensors

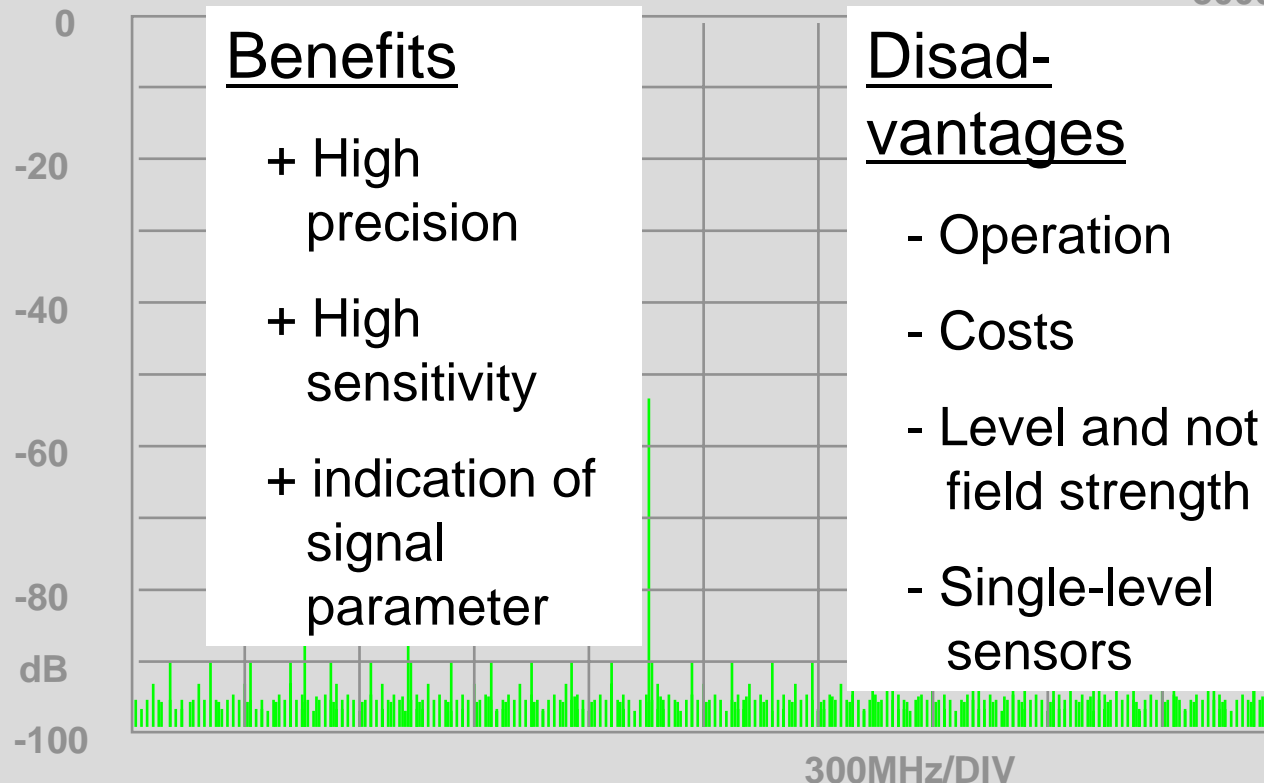
REFERENCE
+10.00dBm

SCALE
100dB

RBW 1MHz
AUTO OFF

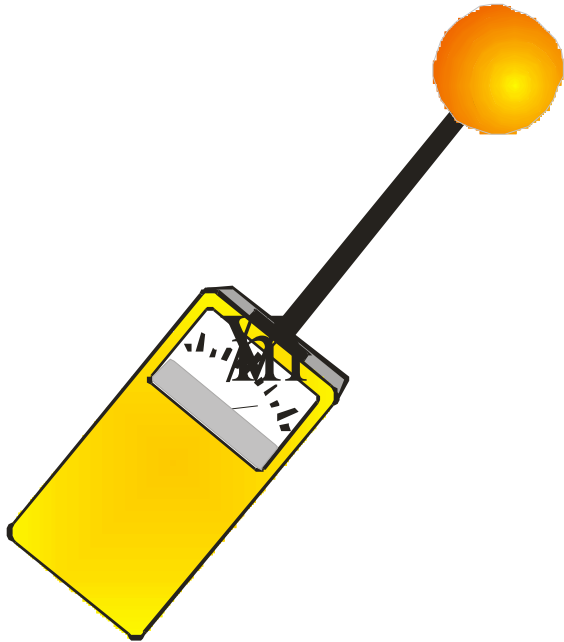
VBW 1.5MHz
SWT 50s
AUTO OFF

INPUT ATT
30dB
AUTO OFF

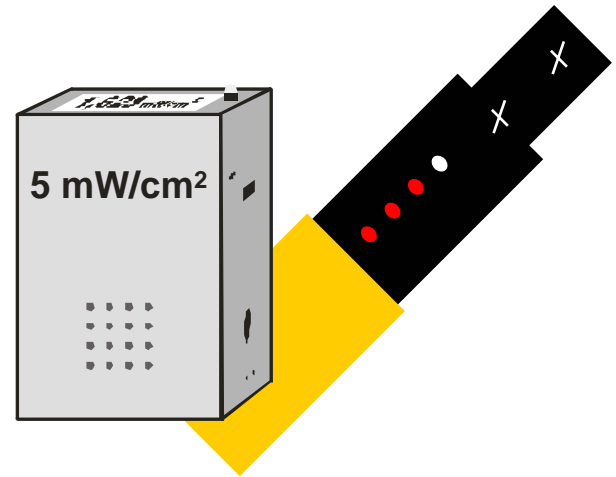




Broadband test equipment



Handheld devices



Indicators / Personal monitors



Broadband measuring devices

Benefits

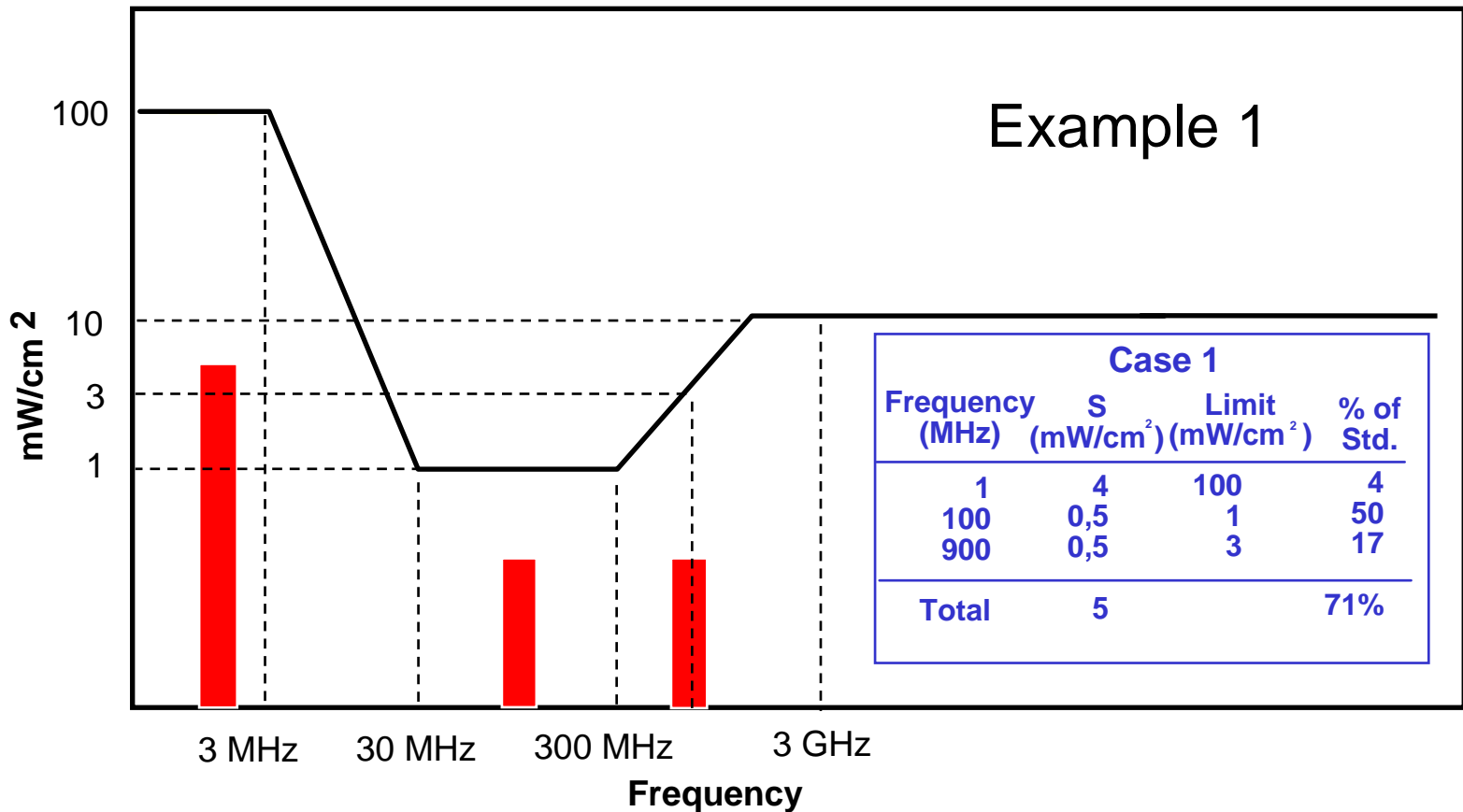
- + Simple operation
- + Isotropic
- + RMS field strength
- + Price
- + Functionality

START	Probe: 9	type:	Date: 02-26-		
	E		1998		
EMR-300 - A-0001-VO2.11	Max.: OFF		Average: OFF		
CAL factor: 1.000	Unit: V/m				
Index	Time	x	y	z	RMS
1	12:23:26.0	0.45	0.63	0.24	0.81
2	12:23:28.0	0.41	0.66	0.14	0.79
3	12:23:30.0	0.45	0.66	0.14	0.81
4	12:23:32.0	0.45	0.69	0.14	0.84
5	12:23:34.0	0.45	0.66	0	0.8
6	12:23:36.0	0.45	0.63	0.14	0.79
7	12:23:38.0	0.45	0.66	0.14	0.81

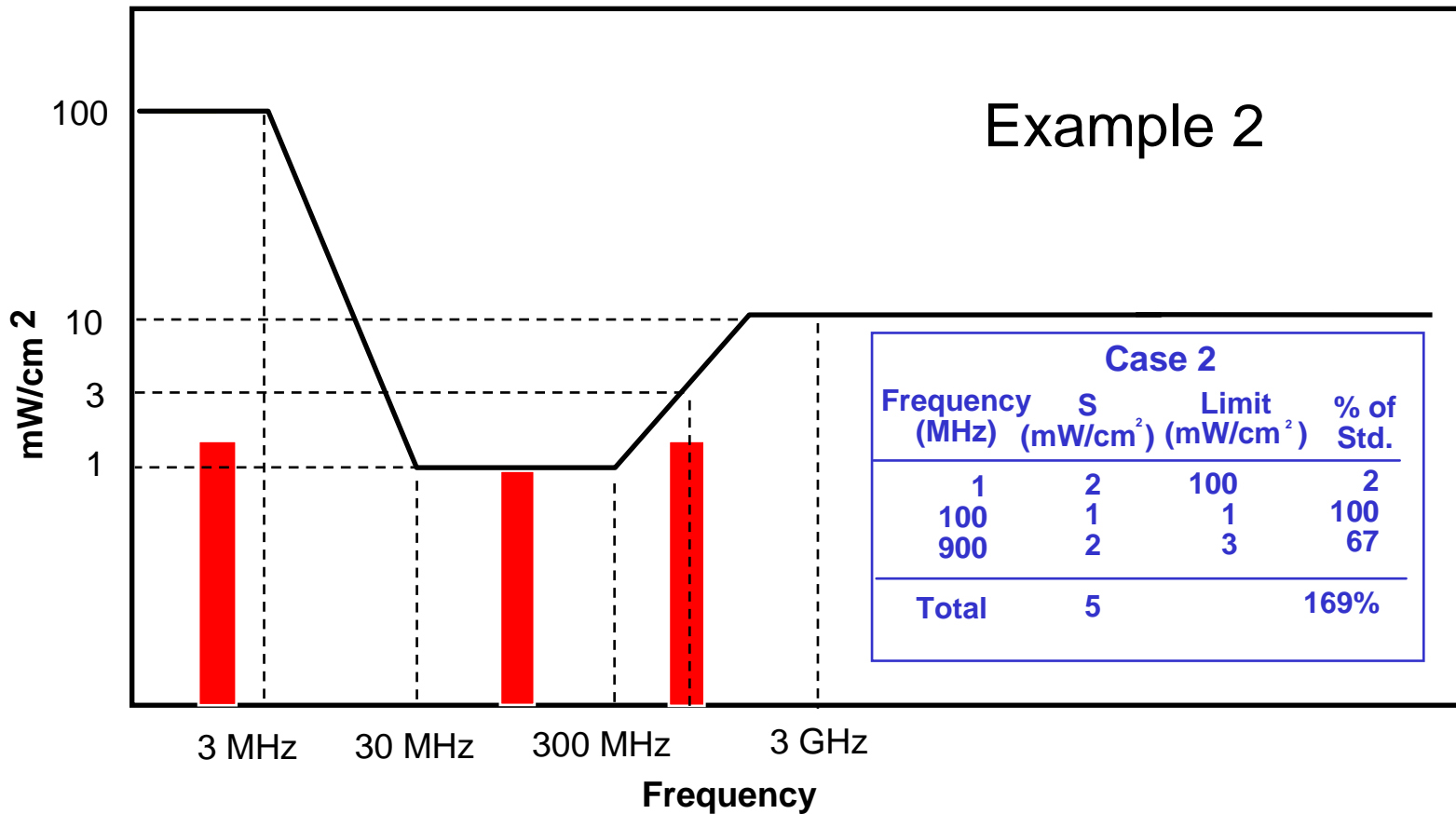
Disadvantages

- Less precise
- No frequency allocation

Broadband Measurement: Frequency depending Evaluation (Shaping)



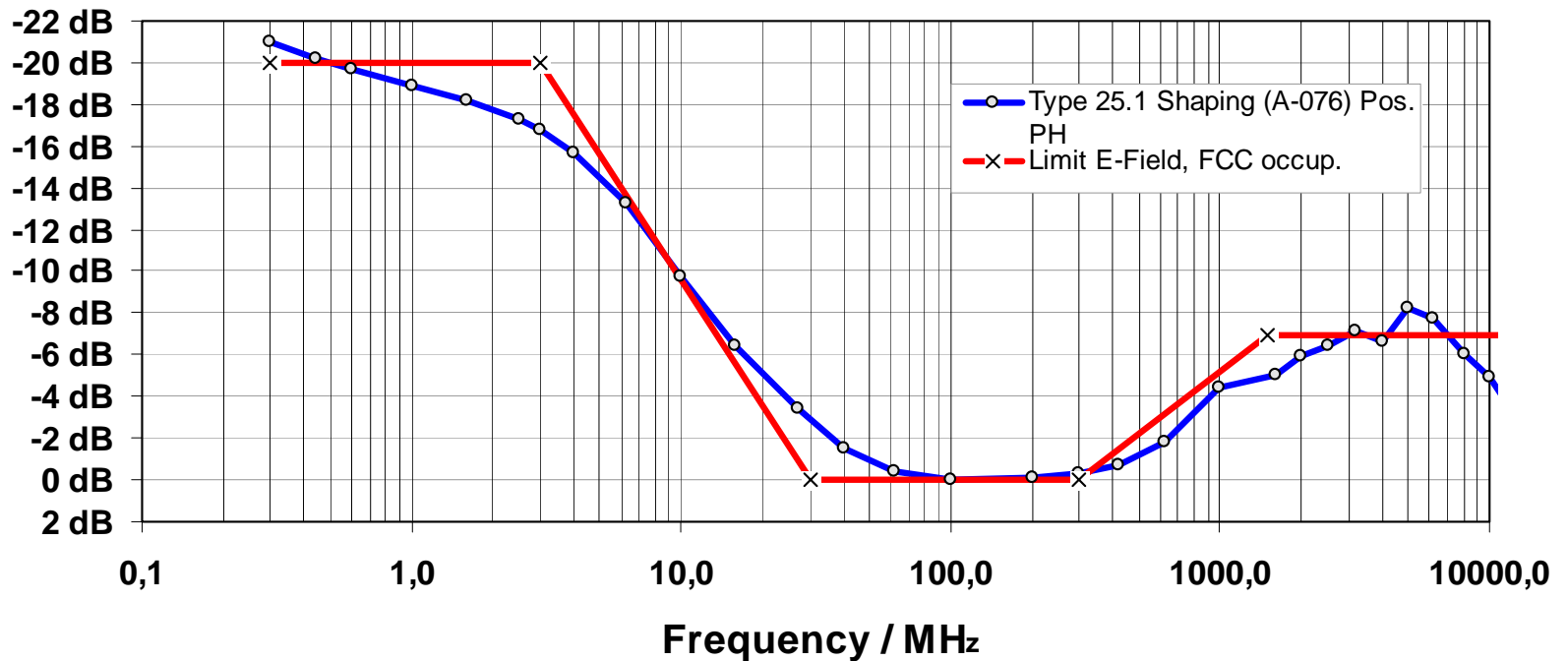
Broadband Measurement: Frequency depending Evaluation (Shaping)





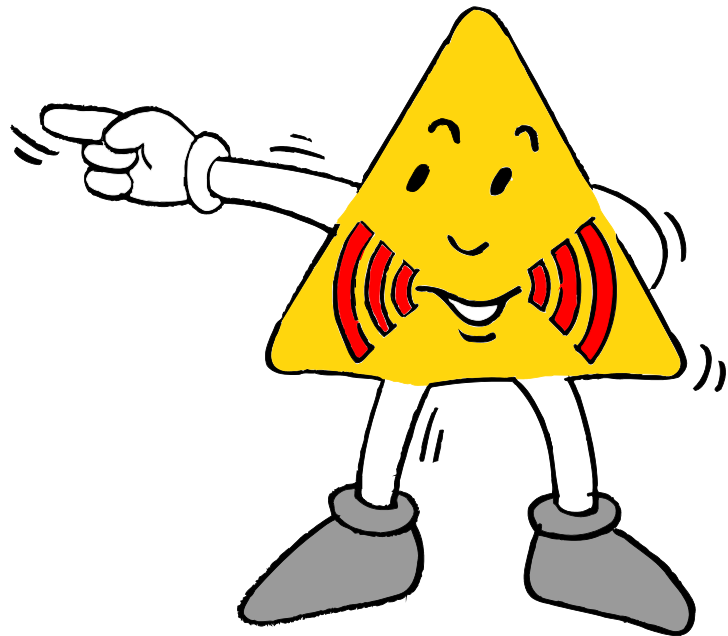
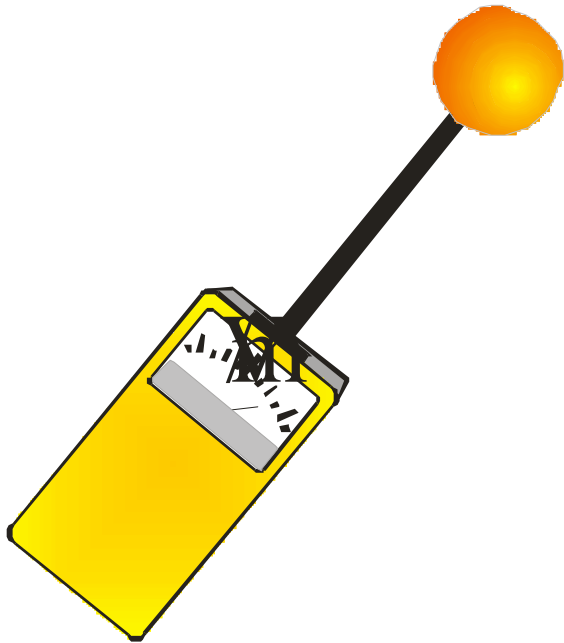
Shaped frequency response

Frequency response of a probe "shaped" to FCC 96-326



Source: technical data sheet Narda Safety Test Solutions

Requirements for field measuring devices



Desirable Characteristics for RF Survey Instruments



Electrical Performance

- ⇒ isotropic probe response
- ⇒ self-contained power supply (min. 8 h operation)
- ⇒ indication of V/m, A/m, mW/cm² and percent of exposure limit
- ⇒ remote control
- ⇒ extension cable between probe and meter
- ⇒ time averaging
- ⇒ spatial averaging
- ⇒ maximum hold function
- ⇒ audio and optical alarm

Desirable Characteristics for RF Survey Instruments



Electrical Performance

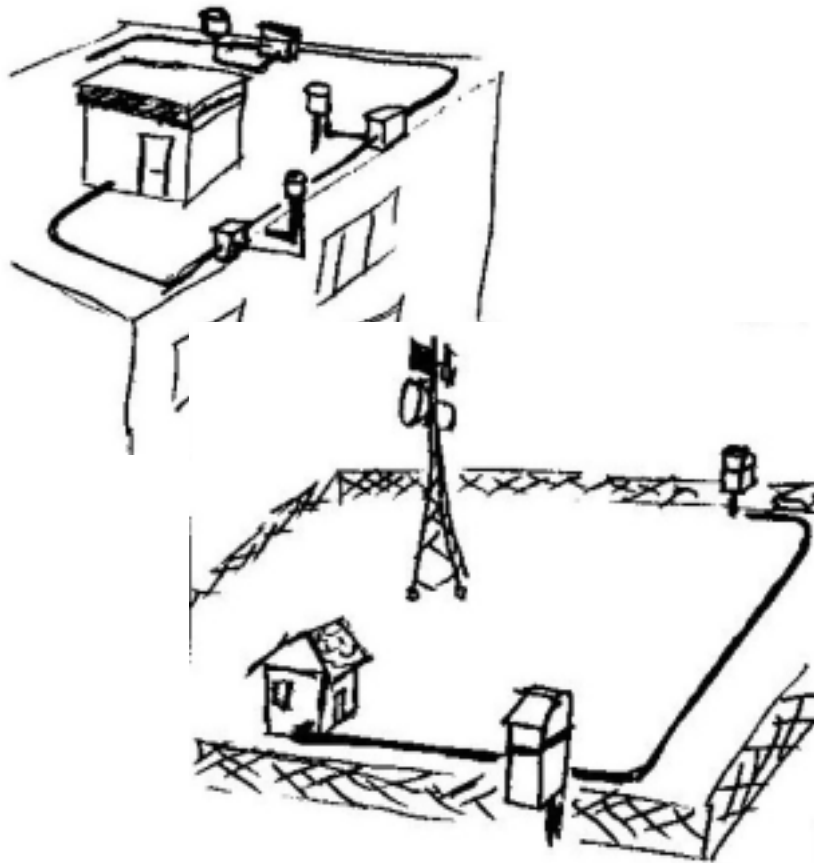
- ⇒ data logging function
- ⇒ auto zero (also under field conditions)
- ⇒ insensitivity to thermal variation

Physical

- ⇒ portable, low weight, small volume ⇒ convenient hand-held operation
- ⇒ rugged design, carrying case / strap
- ⇒ ease of adjustment and use



Area Monitoring Systems



all-weather proofed housing

permanent power supply, e.g. solar panels

remote control for configuration and analysing

data access via Internet, SMS, environmental conditions board



Thanks for your attention

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