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# R&S® IMS Integrated Measurement System

Off-the-shelf EMC – the one-box solution up to 3 GHz

## Compact

The R&S® IMS Integrated Measurement System offers everything needed in a modern EMS test system:

- ◆ Signal source
- ◆ Signal switching
- ◆ Power measurement
- ◆ Control and switching for up to three amplifiers, including interlock
- ◆ R&S® IMS operating system: fully compliant test software for EMS measurements
- ◆ Integrated amplifier
- ◆ Spectrum analyzer

## Wide range of applications

A compact instrument for EMS measurements for:

- ◆ Commercial standards
- ◆ Military standards
- ◆ Automotive standards
- ◆ Measurements supporting development
- ◆ Certification measurements

## Efficient and flexible

- ◆ Easy test setup – only a few additional components required
- ◆ Compact design – low space requirements – easy installation
- ◆ Plug & play – connect controller via USB interface and start measurements
- ◆ Cost-efficient, fully automatic measurements
- ◆ Further extensions possible



**ROHDE & SCHWARZ**

The era of space-consuming system racks that required a large amount of effort to install and configure has finally come to an end. The R&S®IMS Integrated Measurement System offers everything needed in a modern EMS test system:

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- ◆ Power measurement
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- ◆ Spectrum analyzer

## EMS certification measurements up to 3 GHz

The R&S®IMS Integrated Measurement System is a complete EMS test system for compliance tests in accordance with commercial, military and automotive standards from 9 kHz to 3 GHz.

### Signal generation

The analog modulation types AM, FM,  $\phi$ M and PM are available. The optional Generator Interlock Relay R&S®IMS-B3 makes it possible to insert a 50  $\Omega$  termination rather than the generator signal if an interlock loop is open.

### Power measurement

The Power Sensor R&S®NRP-Z91 is used to measure forward and reflected power and to monitor, for example, injected current in the case of bulk current injection (BCI). A fast, wear-free PIN diode switch allows switching between forward power, reflected power and monitoring. It is also used for system calibration. Additional power sensors can also be implemented (option R&S®IMS-B7 required).

### Spectrum analyzer module

If the optional Spectrum Analyzer Module R&S®IMS-B1 is added, frequency-selective power measurements can be performed. This makes it possible, for example, to take harmonic components of the amplifier into account at the 1 dB

compression point. Another application is current monitoring with the BCI method in the automotive range (checking of the first five harmonics).

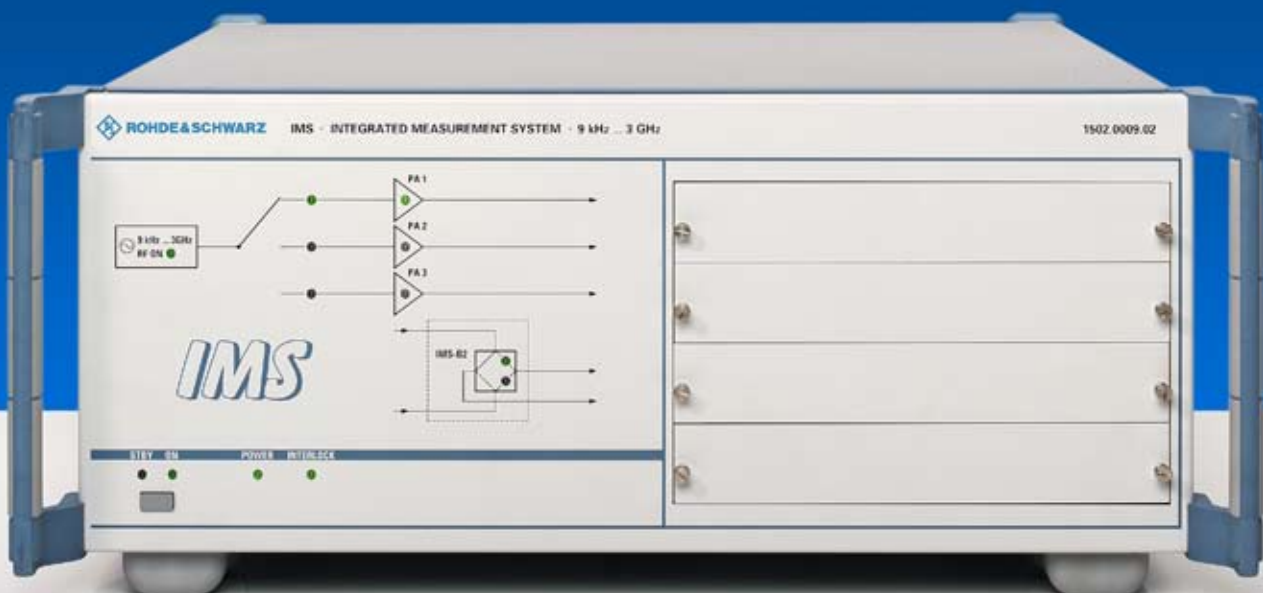
### RF switching unit

The RF switching unit handles the switching of all R&S®IMS RF paths for up to three amplifiers. Two amplifier outputs can be switched to two different transducers (e.g. antennas, current probes) or connection points (e.g. in anechoic chambers and shielded enclosures) by means of the optional Transfer Relay R&S®IMS-B2.

### Internal amplifier module

Conducted measurements can be performed using an internal amplifier module (R&S®IMS model 14), which has a frequency range of 9 kHz to 250 MHz. The minimum amplifier power of 25 W (CW lin) permits measurements with coupling/decoupling networks (CDN) at a test voltage of 10 V in accordance with EN 61000-4-6.

R&S®IMS, model 02





Rear view

### External amplifiers

Amplifiers with an authorized USB control (e.g. from BONN Elektronik GmbH) can be integrated into the system via plug & play. Other amplifiers can be controlled using the GPIB interface (option R&S®TS-PIEC2). Up to three amplifiers can be controlled and connected.

### Interlock

The R&S®IMS operating system supports the control of an interlock loop for monitoring security functions during the EMS measurement, e.g. door contacts and amplifier status.

### EUT monitoring

To allow EUT monitoring during the EMC test, the R&S®IMS has four digital inputs. These inputs can be queried either individually or together. To allow EUT stimulation, the R&S®IMS provides four digital outputs (static values or pulse signals).

## The R&S®IMS operating system

### Complete EMS package

The R&S®IMS operating system supports measurements for determining conducted and radiated susceptibility on terminal equipment, modules and integrated circuits. A complete EMS test system is obtained by adding just a few extra components. The intuitive graphical user interface makes learning and operating the system easy.

The measurement philosophy is designed for compliance and batch tests with high EUT throughput as well as for interactive tests supporting development. Applications range from development and conformance tests to production and quality assurance.

## Electromagnetic susceptibility – EMS

The factory-ready test sequences can be adapted to lab instruments either interactively or via the configuration wizard. The online help provides step-by-step instructions for all tasks from configuring the setup to performing measurements.

During susceptibility tests, integrated control mechanisms limit the susceptibility level to protect both the EUT and the test system from being overloaded.

### EMS measurement features for automotive applications

The following list contains various measurement functions for generating interference that are implemented specifically for the automotive industry:

- ◆ The test specifications for conducted susceptibility (BCI) call for the measurement of amplifier harmonics and the limiting of the current susceptibility level. To make this possible, the R&S®IMS operating system offers a function for monitoring harmonics via a spectrum analyzer or test receiver. This function can also be used to check an amplifier
- ◆ Parallel measurement of the forward and reflected power and the susceptibility level helps boost measurement speed and EUT throughput

R&S®IMS, model 04



- ◆ To ensure the reproducibility of test results, the R&S®IMS operating system supports the TEM cell attenuation measurement required in ISO 11452-3
- ◆ User-defined equations make it possible to calculate additional single quantities from the current measured values, for example the system impedance of a BCI test setup

### EUT monitoring and stimulation

In addition to generating interference, the EMS measurement software is responsible for monitoring, where the two main tasks are stimulation and monitoring of the EUT.

The following integrated stimulus functions make it possible to control the EUT at defined points in the test sequence:

- ◆ Changing the EUT to a defined state (e.g. switching it on or off) when a measurement is started or stopped

- ◆ Triggering an action of the EUT at specific frequencies or at each test frequency and using the monitoring functions to check the EUT's response to the effects of the interference
- ◆ Resetting the EUT to a defined state after a faulty EUT response has been detected

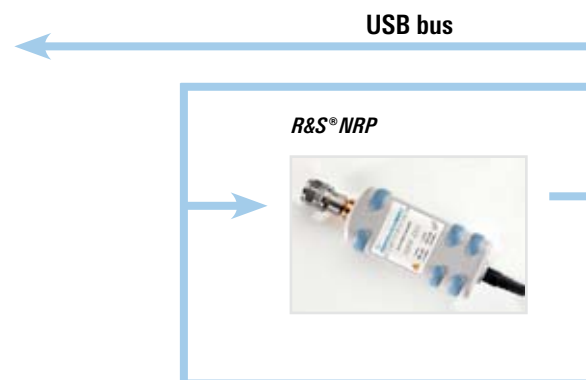
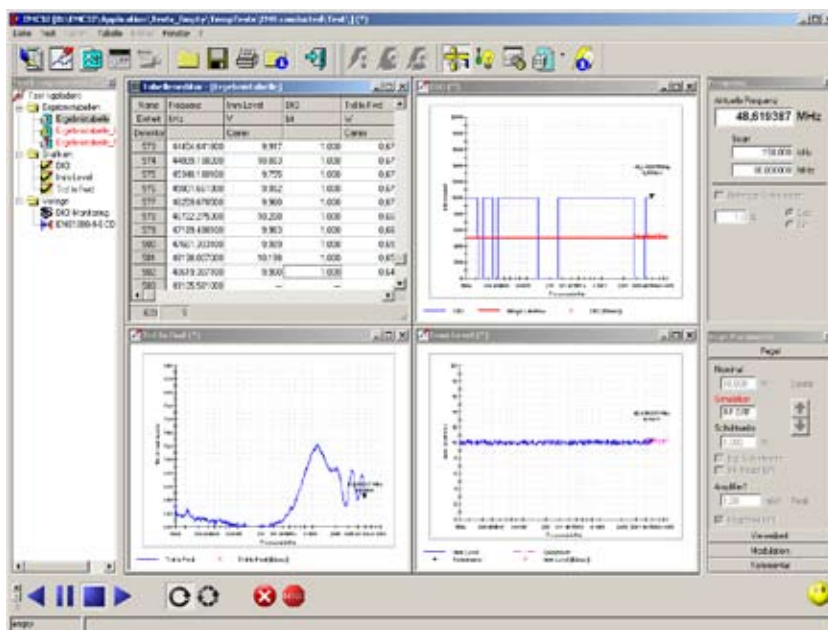
The monitoring functions of the R&S®IMS operating system permit fully automatic monitoring of the EUT. The objective is to obtain a GO or NOGO (PASS / FAIL) result for the test frequency and the test level. Monitoring channels can be defined for this purpose. A GO / NOGO decision is reached by using a definable threshold or a decision window. The measured values are displayed in a result table or in a graph. In addition, a separate table is generated that contains only the NOGO frequencies.

Physical quantities (voltage, current, frequency, temperature) can be monitored either acoustically (sound level) or visually (camera). In the case of tests in the automotive range, vehicular bus systems (CAN, LIN, MOST, FlexRay) can also be monitored.

### Monitoring with measuring instruments

If communication is via physical quantities, measuring instruments (oscilloscope, TTL converter or voltmeter) are used to monitor the EUT's output signals or inject a defined signal at its inputs. USB, RS-232-C, TTL inputs and outputs and software interfaces are possible.

The R&S®IMS operating system during a susceptibility test





*Test site with R&S® IMS and R&S® ESCI*

Automatic EMS test sequences are an important expansion option and allow further automation and thus a more efficient use of the test chambers. An automatically controlled EUT test can be performed using several parameters (loops) (sequential test, e.g. several types of modulation, several turntable positions or several polarizations).

**Automatic determination of immunity thresholds**

It is important – particularly in development – to determine maximum susceptibility versus frequency. This fully automatic susceptibility measurement yields two susceptibility level characteristics (hysteresis) that show the susceptibility level at which the faulty EUT response disappears and then reappears. The extensive monitoring capabilities of the R&S® IMS operating system allow this measurement task to be automated.

**Functional expansions**

The option concept of the IMS OS allows functional expansions for specific customer requirements. By using the options of the R&S EMC32-S EMS measurement software, it is possible to perform measurements in reverberation chambers or measurements in line with mobile radio standards, for example.

*R&S® IMS with external amplifier*



# Full-compliance measurements for certification tasks and platform for additional measurement tasks

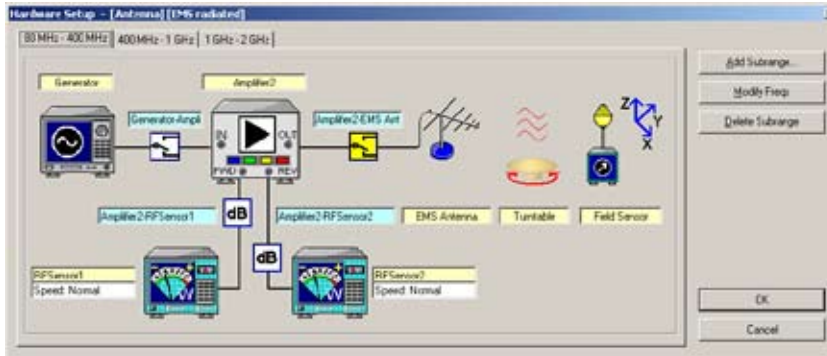
## Application

The R&S®IMS Integrated Measurement System is a new addition to the reliable family of Rohde & Schwarz EMS test systems. It is a compact instrument for all commercial, military and automotive standards. It operates in the 9 kHz to 3 GHz frequency range and can be scaled

to any measurement task by means of internal and external amplifier modules. When the internal amplifier module is omitted, the R&S®IMS can be equipped with other add-ons such as EUT monitoring. The basic configuration of the instrument can be adapted to any measurement standard merely by adding a few components.

## R&S®IMS basic configuration

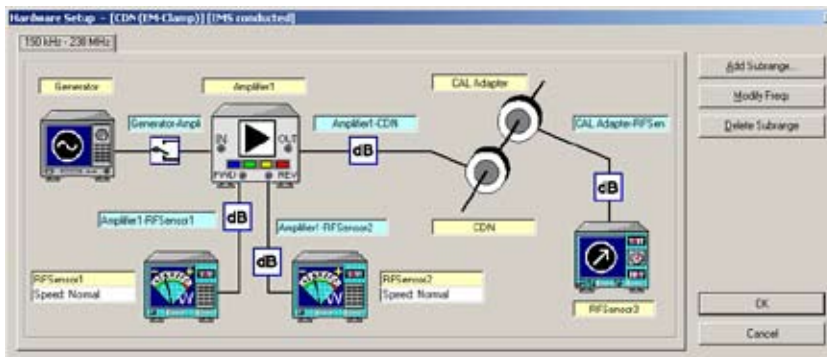
- ◆ R&S®IMS Integrated Measurement System
- ◆ Power Sensor R&S®NRP-Z91
- ◆ USB Adapter (passive) R&S®NRP-Z4
- ◆ Controller
- ◆ Cable set (USB and RF cables)



## Commercial standards

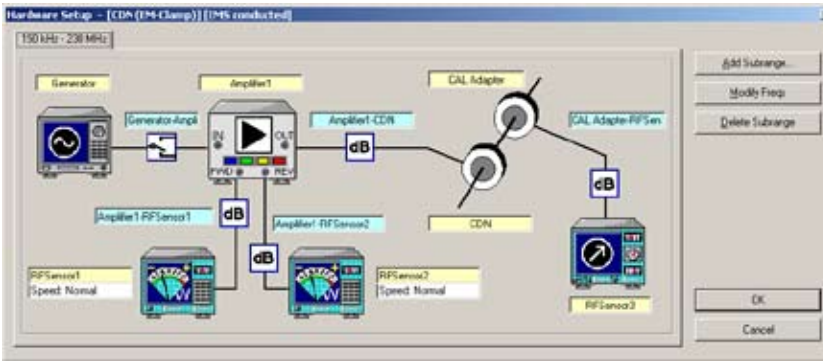
### EN 61000-4-3: radiated susceptibility in anechoic chamber, 80 MHz to 2 GHz, 10 V/m at 80 % AM

- ◆ R&S®IMS basic configuration
- ◆ EMS Antenna R&S®HL046E
- ◆ Suitable amplifier
- ◆ Field strength measurement system



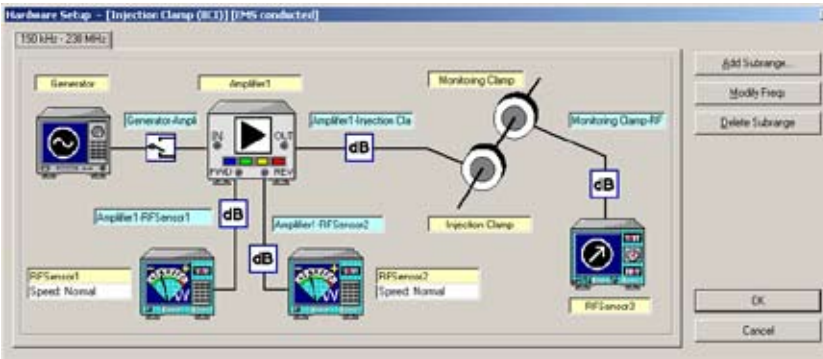
### EN 61000-4-6: conducted susceptibility with CDN, 150 kHz to 230 MHz, 10 V

- ◆ R&S®IMS basic configuration with R&S®IMS model 14 with internal amplifier module 9 kHz to 250 MHz, 25 W
- ◆ CDN suitable for EUT



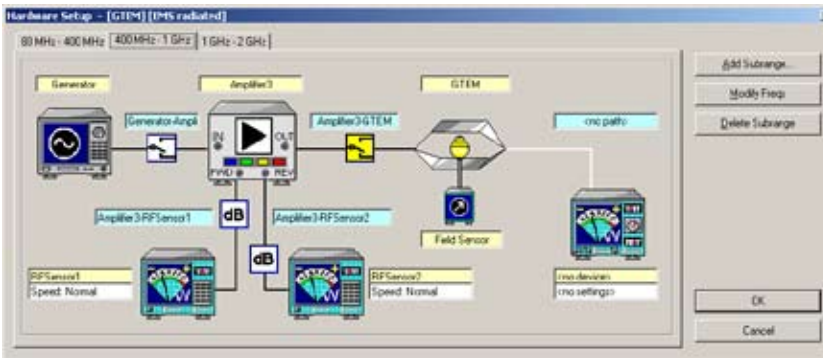
**EN 61000-4-6: conducted susceptibility with EM clamp, 150 kHz to 230 MHz, 10 V**

- ◆ R&S® IMS basic configuration
- ◆ EM clamp
- ◆ Suitable amplifier



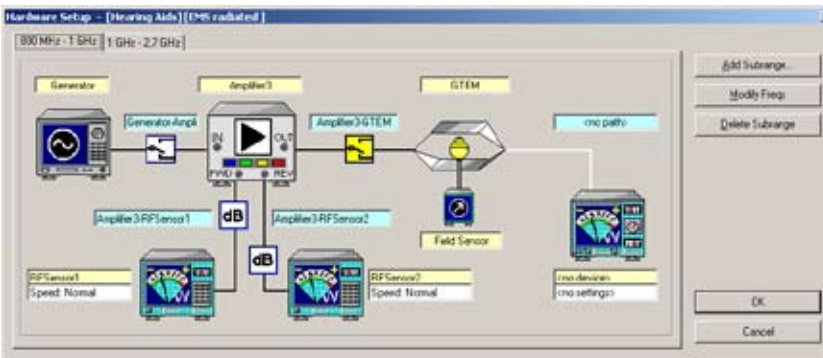
**EN 61000-4-6: conducted susceptibility with BCI method, 150 kHz to 230 MHz, 10 V**

- ◆ R&S® IMS basic configuration
- ◆ Bulk current injection and monitoring clamps
- ◆ Suitable amplifier



**EN 61000-4-20: radiated susceptibility with GTEM cell, 80 MHz to 2 GHz, 10 V/m at 80% AM**

- ◆ R&S® IMS basic configuration
- ◆ GTEM cell
- ◆ Suitable amplifier
- ◆ Field strength measurement system



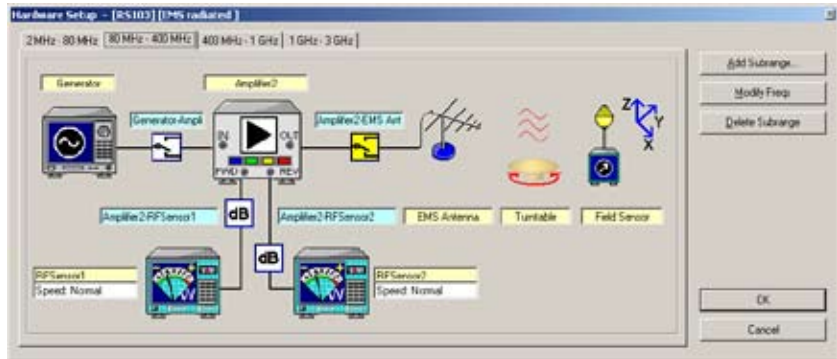
**EN 60118-13: susceptibility of hearing aids, 800 MHz to 2.7 GHz**

- ◆ R&S® IMS basic configuration
- ◆ GTEM cell with EUT positioner
- ◆ Suitable amplifier
- ◆ Audio Analyzer R&S® UPL
- ◆ R&S® TS-PIEC2 GPIB interface for USB
- ◆ Microphone

## Military standards

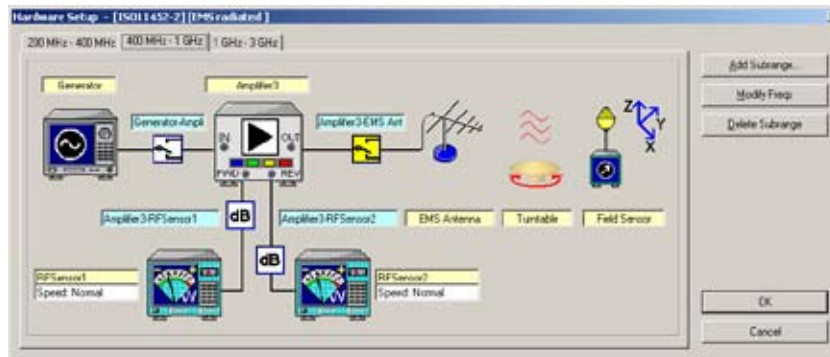
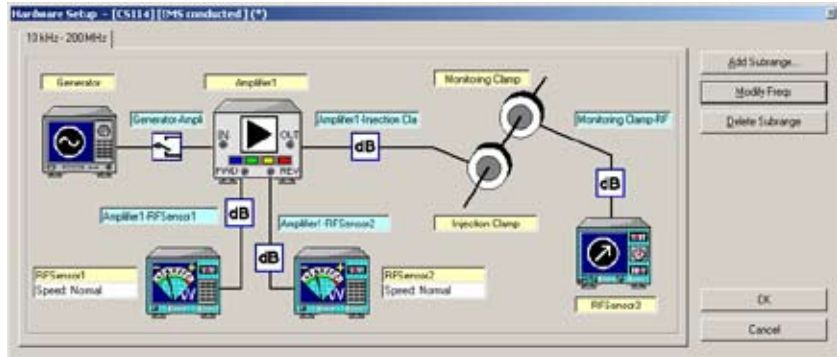
### MIL-STD- 461E: radiated susceptibility RS103, 2 MHz to 3 GHz

- ◆ R&S®IMS basic configuration
- ◆ Suitable amplifier
- ◆ Antenna
- ◆ Field strength measurement system



### MIL-STD- 461E: conducted susceptibility CS114 (bulk cable injection), 10 kHz to 200 MHz

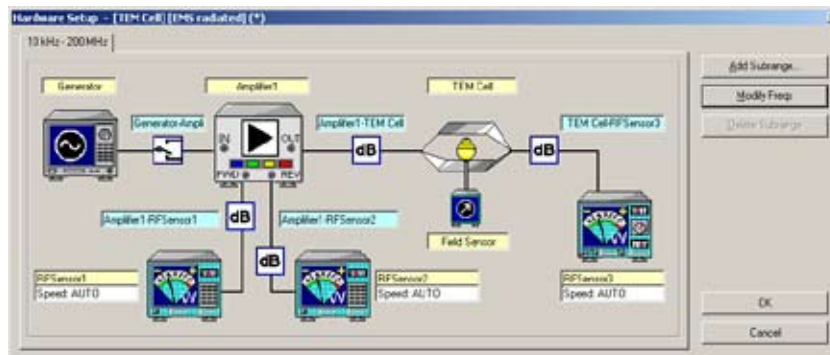
- ◆ R&S®IMS basic configuration
- ◆ Suitable amplifier
- ◆ Bulk current injection and monitoring clamps



## Automotive standards

### ISO 11452-2: radiated susceptibility in anechoic chamber, 200 MHz to 3 GHz, 100 V/m

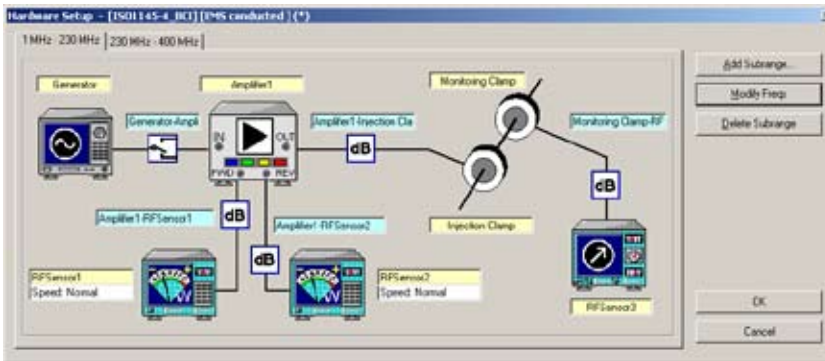
- ◆ R&S®IMS basic configuration
- ◆ Antenna
- ◆ Suitable amplifier
- ◆ Field strength measurement system



### ISO 11452-3: radiated susceptibility with TEM cell, 10 kHz to 200 MHz, 200 V/m

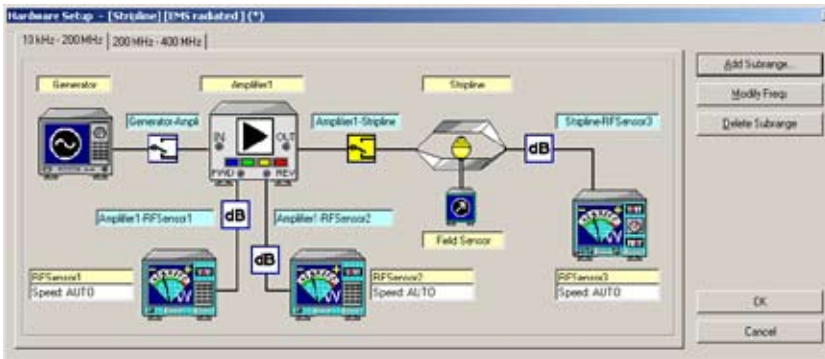
- ◆ R&S®IMS basic configuration
- ◆ TEM cell
- ◆ Suitable amplifier
- ◆ Field strength measurement system





**ISO 11452-4: conducted susceptibility with BCI method, 1 MHz to 400 MHz, 300 mA**

- ◆ R&S® IMS basic configuration
- ◆ Suitable amplifier
- ◆ Bulk current injection and monitoring clamps



**ISO 11452-5: radiated susceptibility with stripline, 10 kHz to 400 MHz, 200 V/m**

- ◆ R&S® IMS basic configuration
- ◆ Stripline
- ◆ Suitable amplifier
- ◆ Field strength measurement system

**Additional applications**

The R&S® IMS can be used for numerous other standards and applications, including the following:

- ◆ IEC 62132-2 TEM cell on integrated circuits, 150 kHz to 1 GHz
- ◆ IEC 62132-3 BCI (bulk current injection) on integrated circuits, 10 kHz to 400 MHz
- ◆ IEC 62132-4 DPI (direct power injection) on integrated circuits, 150 kHz to 1 GHz
- ◆ ISO 11 452-6 parallel plate antenna
- ◆ ISO 11 452-7 DPI (direct power injection)

**The efficient solution**

- ◆ Easy test setup – only a few additional components required
- ◆ Compact design – low space requirements
- ◆ Measurements supporting development and certification measurements
- ◆ Cost-efficient, fully automatic measurements
- ◆ Automatic calibration using only one power sensor

**The flexible solution**

- ◆ Expansion options available
- ◆ Scalable for various measurement tasks from development to certification
- ◆ Future-oriented: adaptable to modified standards and requirements
- ◆ Dongle for controller not required
- ◆ EMS software installable on additional computers for evaluations

**The user-friendly solution**

- ◆ Easy software installation
- ◆ Configuration wizard, plus many pre-installed configurations
- ◆ Plug & play – connect controller via USB interface and start measurements

For specifications, see PD 0758.2525.22  
and [www.rohde-schwarz.com](http://www.rohde-schwarz.com)  
(search term: IMS)



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