

Test systems

GTEM Test Cells

Test Cells for EMC Radiated &
Immunity Testing DC to 20GHz

SCHAFFNER

safety for electronic systems

GTEM Test Cells

Test cells for EMC Radiated & Immunity testing
DC to 20 GHz

- Emission and immunity testing in one fixed, shielded environment
- Meets IEC/EN 61000-4-3 & IEC/EN 61000-4-20
- Design qualification and pre-certification to IEC/EN 55022, VDE 0871 and others
- Generated fields are largely homogeneous and simple to calculate
- Efficient power conversion requires smaller power amplifier
- Excellent VSWR over the entire frequency range - no need for measurement of reflected power
- Simple single channel power meters required only
- Test time reduction due to no antenna heights variation but simple manipulator turning

Concept

The GTEM cell is a frequency extended variant of the traditional TEM (Transverse Electro-Magnetic) cell. The GTEM cell is, in principle, a tapered coaxial line (offset septum plate), from a coaxial feeding point, having an air dielectric and a characteristic impedance of $Z = 50 \Omega$.

This coaxial line is terminated by a combination of discrete resistors and RF absorbers to achieve a broadband match. The outer conductor of this "coax line" is created by the metal walls of the cell which provide screening for both internal and external electromagnetic fields.

Model Variations

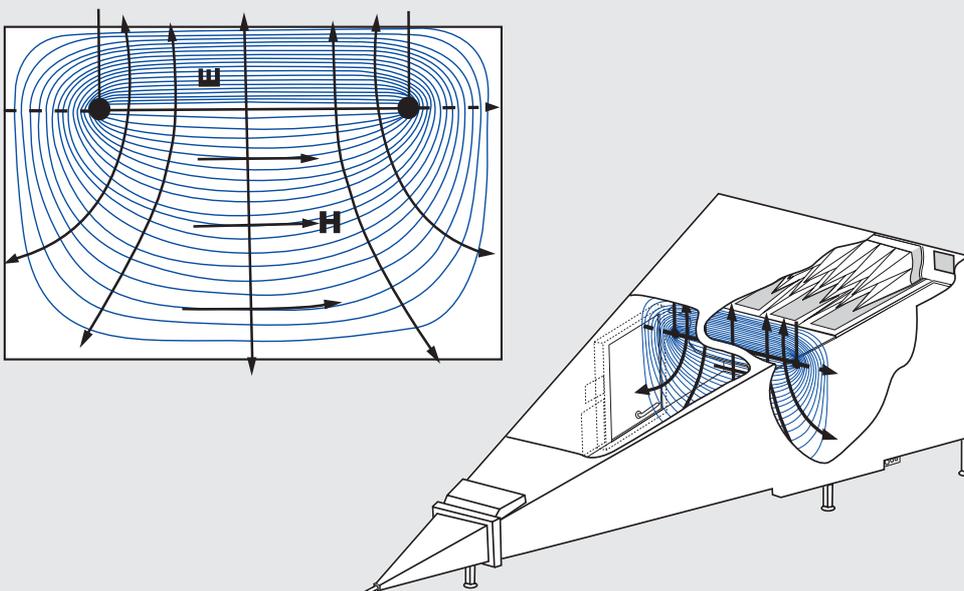
GTEMs are available in various sizes from 250 mm to 2000 mm septum heights. The size chosen will depend upon the EUT (Equipment Under Test) size that is to be tested. The table (right) lists the Schaffner models and options available.

Field Generation

When high-frequency signals are input, TEM waves will propagate along the septum. Field wave impedance is 377Ω for the TEM wave propagation.

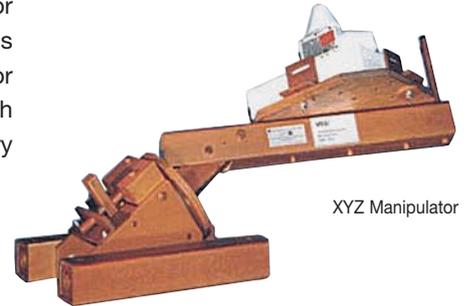
The intensity of the electromagnetic field generated is directly proportional to the applied voltage (power) and the distance between the inner conductor and ground. GTEMs give excellent field uniformity (see fig. 1) and reproducibility over a given test volume.

Fig. 1: GTEM fields - Idealised



XYZ-Manipulator

EMC manipulators are available to rotate the EUT around the centre point of test volume. The manipulators are ideal for rotating the EUT into the required three orthogonal axis for highest accuracy of calculations following the correlation algorithm. The manual versions (MPH) are installed inside the cell while the remote controlled versions (MPC) have a motor beneath the floor of the cell. If requested at time of order, GTEMs can be supplied with removable panels to allow the future installation of MPH. The MPC requires factory installation.



MPH (hand operated manipulator)

Types Available: MPH600/ MPH1250/ MPH1500/ MPH1750

MPC (controlled manipulator)

Types Available: MPC600/ MPC1250/ MPC1500/ MPC1750

EUT Filtered Power Supply

The control unit and AC supply for the EUT are available in different sizes. Depending on the applications there are possibilities for single or three phase supply. The test volume of the GTEM unit is, therefore, protected from as much disturbance/interference as possible.

Safety Interlock

All GTEMs with option EUT switching cabinet size 1 or 2 are supplied with a 'Safety Interlock' linked to the door. A visual indication is also provided with GTEM 1000 and above.

Immunity Testing

The GTEM offers a high degree of field uniformity and is fully compliant to IEC/EN 61000-4-20 provided the following conditions are met:

1. The EUT size per side should not exceed one third of the septum EUT height.
 2. The associated cables are radiated.
 3. The EUT is tested on three orthogonal orientations.
- GTEMs come in many sizes and the model number usually reflects the septum max. height. For example, a GTEM 1000 has a 1000 mm septum max. height, a GTEM 750 has a 750 mm septum max. height and so on.

Calculating Power Required

This is explained with the formula below. Basically, we have to consider the volts per metre, the height of the septum, an allowance for voltage peaks caused by amplitude modulation and the flatness with frequency. For flatness, we generally allow 3 dB, this only takes effect after the first resonance point.

Example:

GTEM 750

Septum height = 0.750 m

Flatness = 3 dB = 2

$$\text{Power Required} = (E \cdot h)^2 / R * \text{Flatness} * \text{Modulation Allowance}$$

Where E = required field strength: h = septum height: R = GTEM input impedance (50 Ω)

$$\text{Power Required} = (10 \cdot 0.75)^2 / 50 * 2 \cdot 3.24 = \underline{7.3 \text{ Watt}}$$

The example above shows 10 V/m with a GTEM 750. Fig. 3 shows the power required for all GTEMs with 80 % amplitude modulation. More examples are given on page 12.

Fig. 2: Basic GTEM Geometry

GTEM Side Revation

- A = max. EUT height
= 0.5 * Septum EUT height
- B = def. EUT height
= 1/3 * Septum EUT height
- C = 0.3 * Septum EUT height

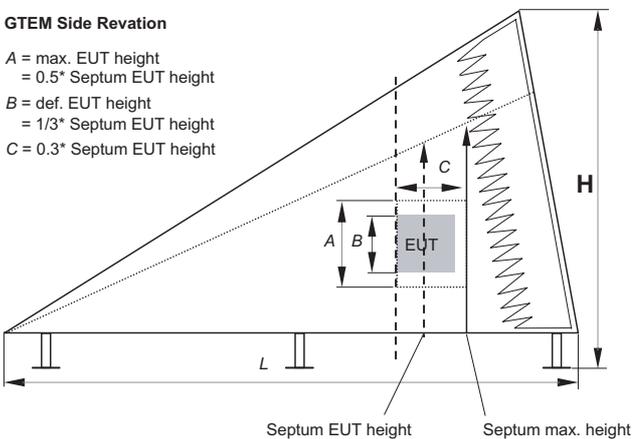
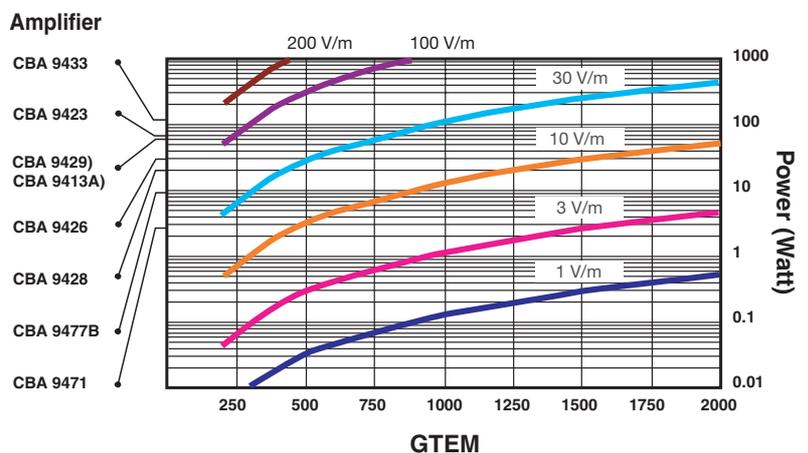


Fig. 3: Power required for a given field strength for IEC/EN 61000-4-20



Field Uniformity - RF Immunity

Fig. 4: Calibration points to measure area of uniform field (for GTEM 1500)

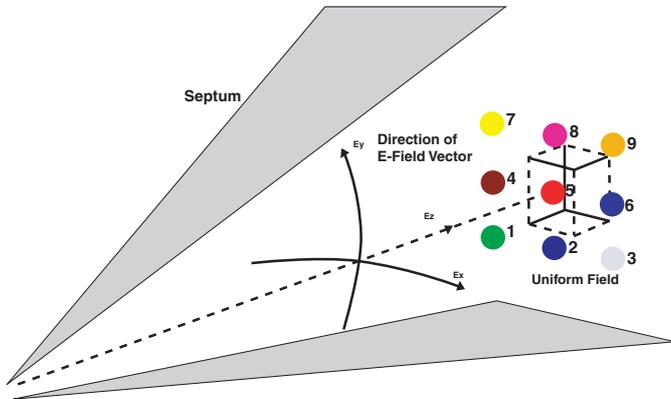


Fig. 5: Uniform field in GTEM 1500 (for $E = 10V/m$ $0dB = 35dBm$ (approx. 3 Watts CW))

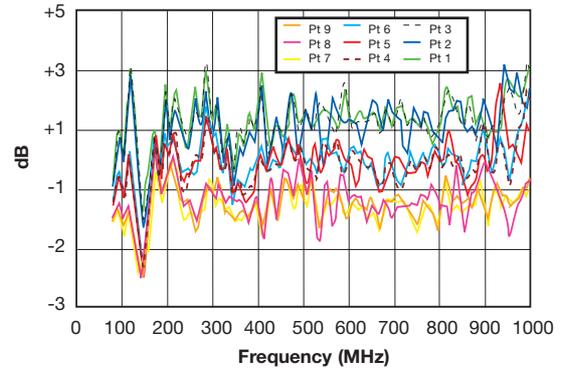
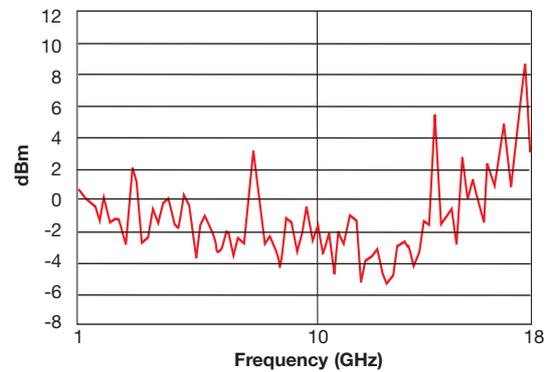


Fig. 6: Power Requirement Uniformity (1 MHz - 18 GHz)

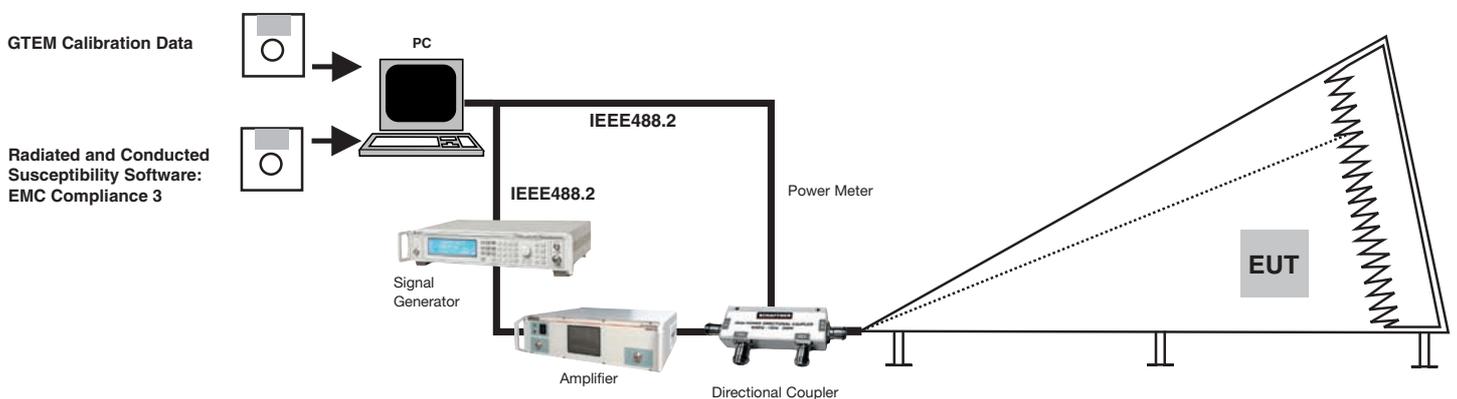


Immunity Test Set-up

Immunity testing is no different to any other kind of RF testing in a chamber except that the transducer now becomes a GTEM instead of an antenna. We still require all of the other instruments to make the test. In general, it is likely that testing in a GTEM will be faster than in a chamber because only three runs are necessary (instead of eight). Also, the set-up is generally much faster.

The basic set-up for an immunity test is shown below:

Fig. 7: Typical Test Set-up for RF Immunity



Emission Testing

By a simple reversal of the application principle and substituting the immunity signal source for a measuring receiver or spectrum analyser (Pre-compliance test only) at the feed-point of the GTEM cell, it is possible to measure EUT emissions. This is achieved by placing the EUT in three orthogonal planes. The results are then converted by means of a 'GTEM correlation' into a field intensity value. The correlation equations for remote field calculations (applicable when GTEMs are used in the >30 MHz frequency range) are formed by the computation of a multipole model of a configuration of three orthogonal axes. This correlation is automatically calculated by EMC Compliance 3 software reducing test time by up to 80%.

Fig. 8: Results of emission comparison measurements in different sizes of GTEM cell, with noise source VSQ 1000

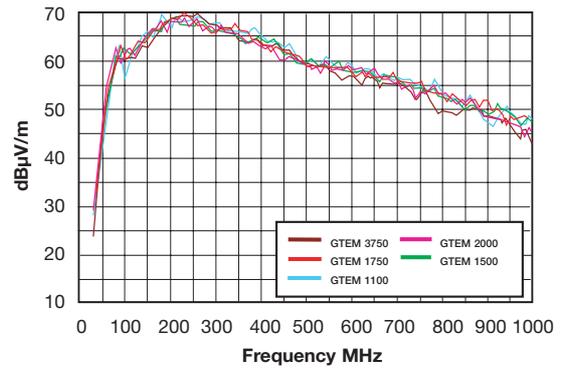


Fig. 9: Comparison of different OATS to different GTEMs (Source VSQ 1000, comparison of the emission measurement results of different open area test sites and different GTEMs)

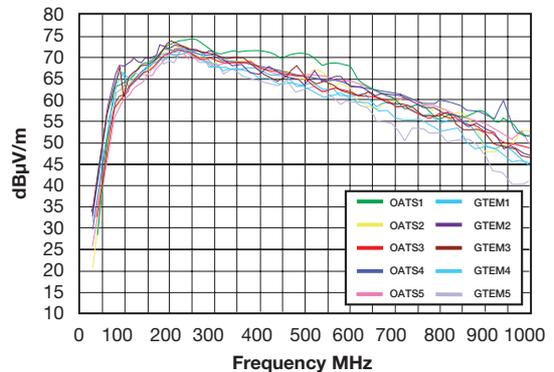
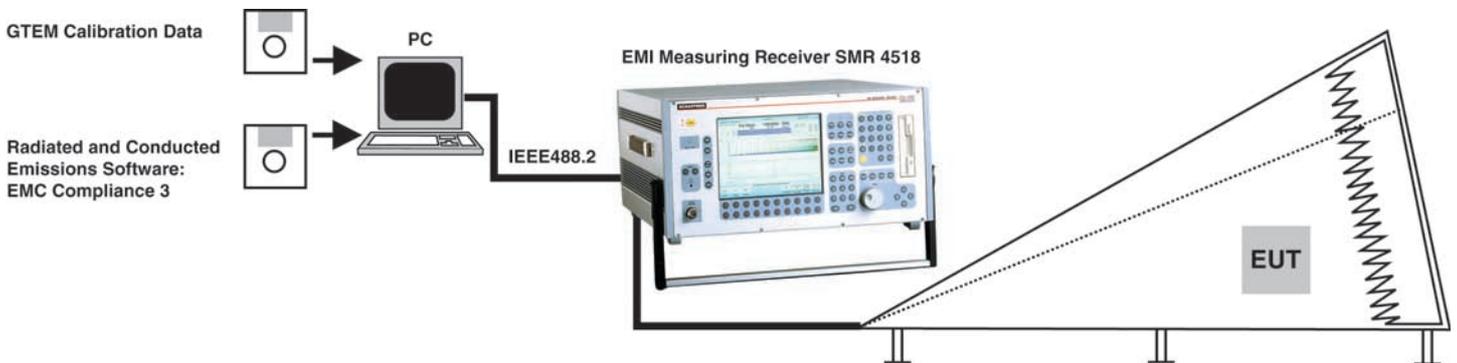


Fig. 10: Typical Test Set-up for RF Emission

EMC manipulators are available to rotate the EUT around the centre point of test volume. The manipulators are ideal for rotating the EUT into the required three orthogonal axis for field calculation



Additional GTEM Applications

Immunity Testing of Car Components in GTEM

With the use of the same test setup as for "Immunity", it is possible to extend the frequency range to up to 18 GHz in contrast with standard TEM cells or open Strip-lines as per ISO 11452-5 or Triplate as per SAE J1113-25.

No additional screened room is necessary, because the GTEM cell is fully screened.

Product examples:

Radio Equipment
Hand held radios, base stations, mobile phones, pagers, cellular phones, etc

TTE

Direct / indirect product connection to PSTN, DESK telephones, cellular phones, modems connected to PSTN, etc

Emission according to

ETS 300 086 (to 4 GHz) and IEC/EN 55022 (to 1 GHz)

Testing of Radio and Telecom Terminal Equipment in GTEM

Basic requirements in

- EMC Compliance
- Effective use of the assigned frequency spectrum

Fig. 11: Typical Test Set-up for Automotive Emission Testing

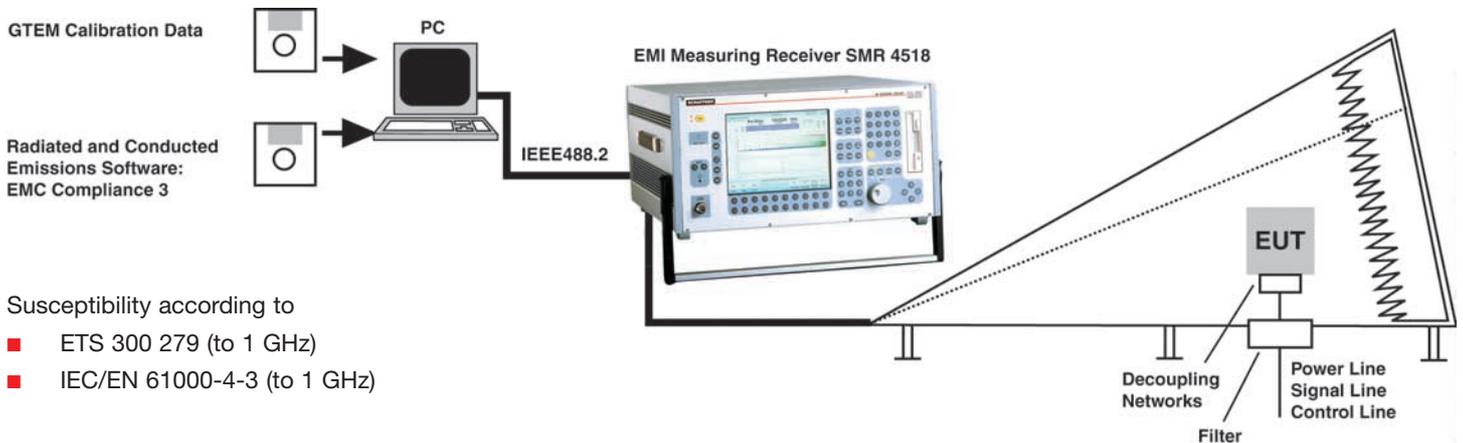
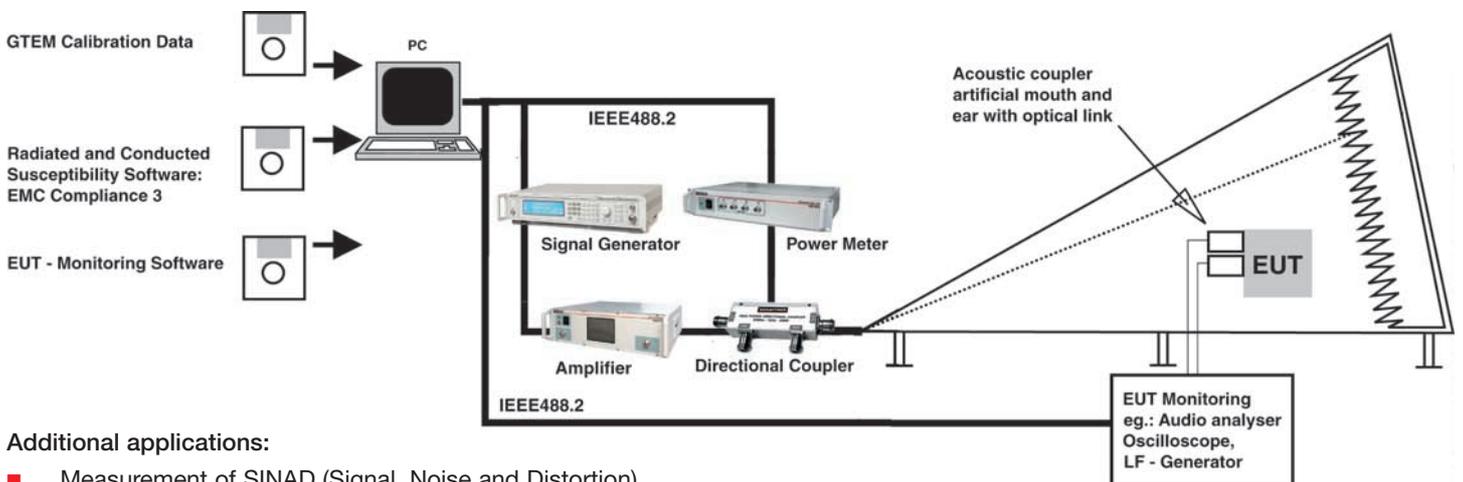


Fig. 12: Typical Test Set-up for Automotive Immunity Testing



Additional applications:

- Measurement of SINAD (Signal, Noise and Distortion)
- Measurement of antennas
- Measurement of total radiated carrier power

GTEM Cell Testing of VLSI integrated circuits

Standard SAE 1752/3 defines:

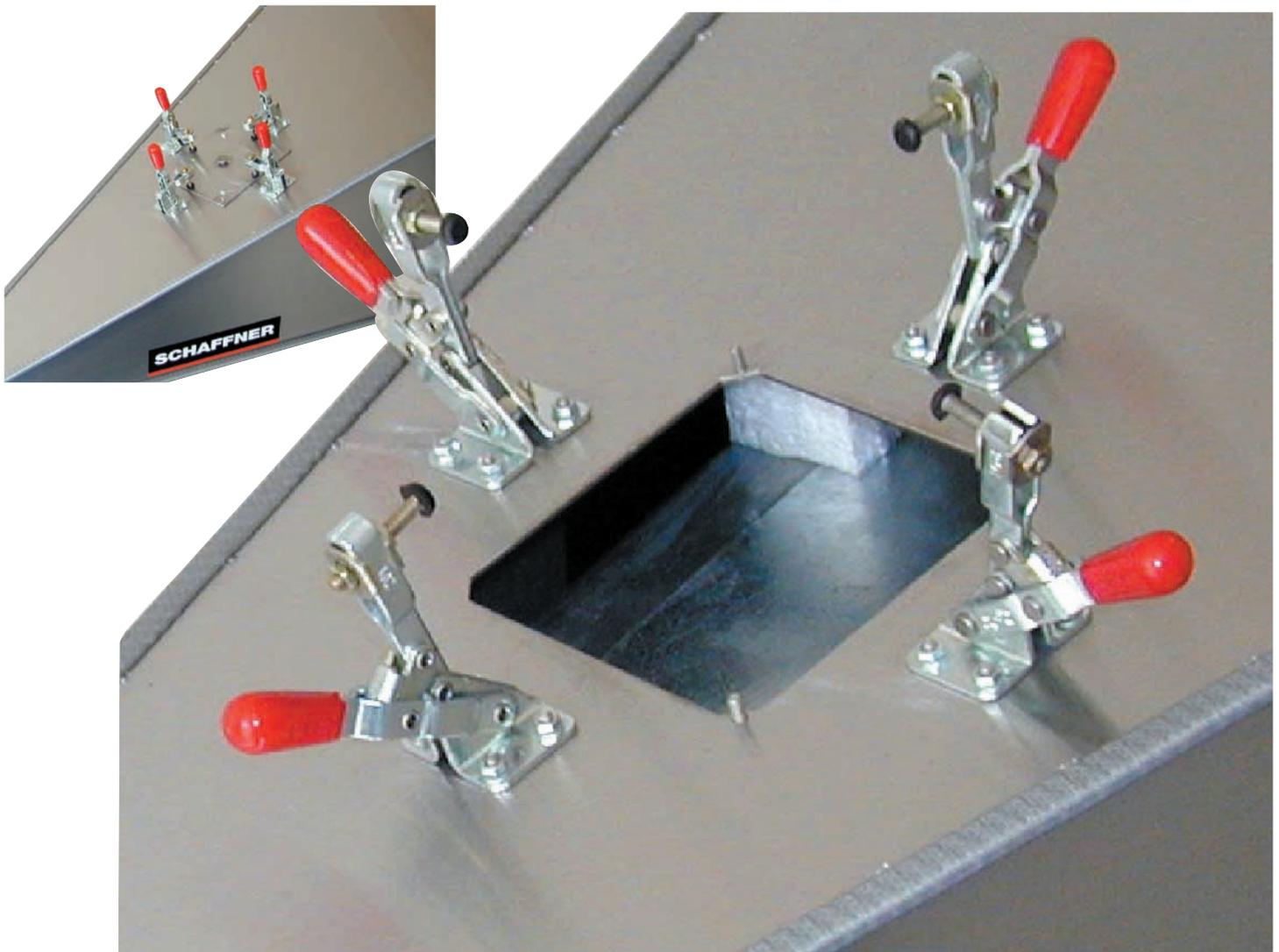
- a wave guide with a small distance between septum and outer conductor (approx. 45 mm)
- a window at this location in the outer conductor for a standardised IC Test Board

Measurement Philosophy:

The measured RF-Voltage on the feeding point of the cell is related to the electromagnetic radiation of the IC.



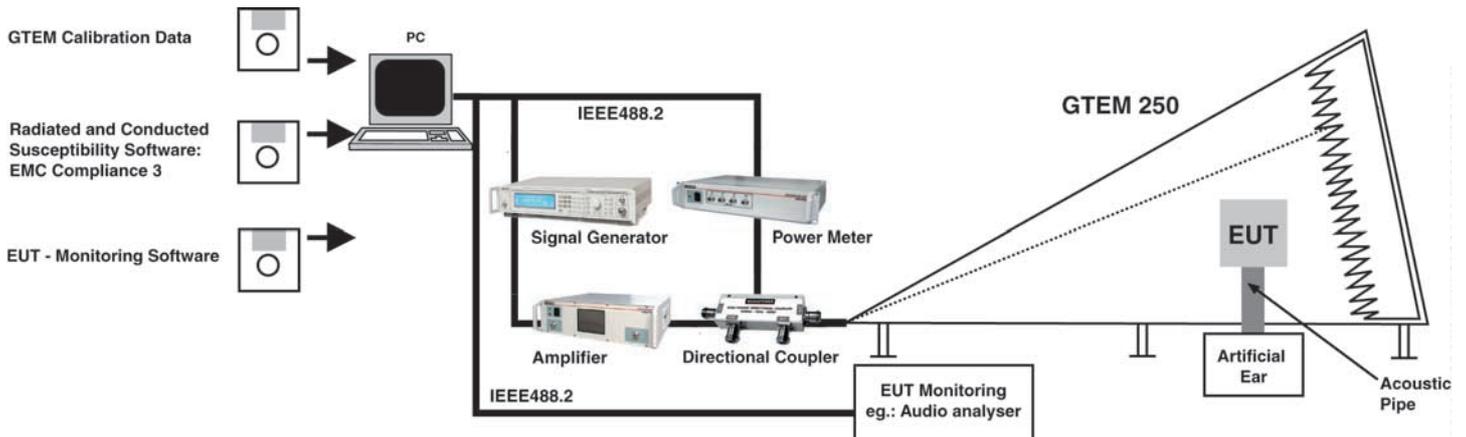
Fig. 13: GTEM 250 for SAE 31 752/3



Testing of Hearing Aids with GTEM-cell

- Standard demands:
 - immunity test in frequency range 800 MHz to 2 GHz
- monitor the demodulation products

Fig.14: Typical Test Set-up for Hearing Aid Immunity Testing

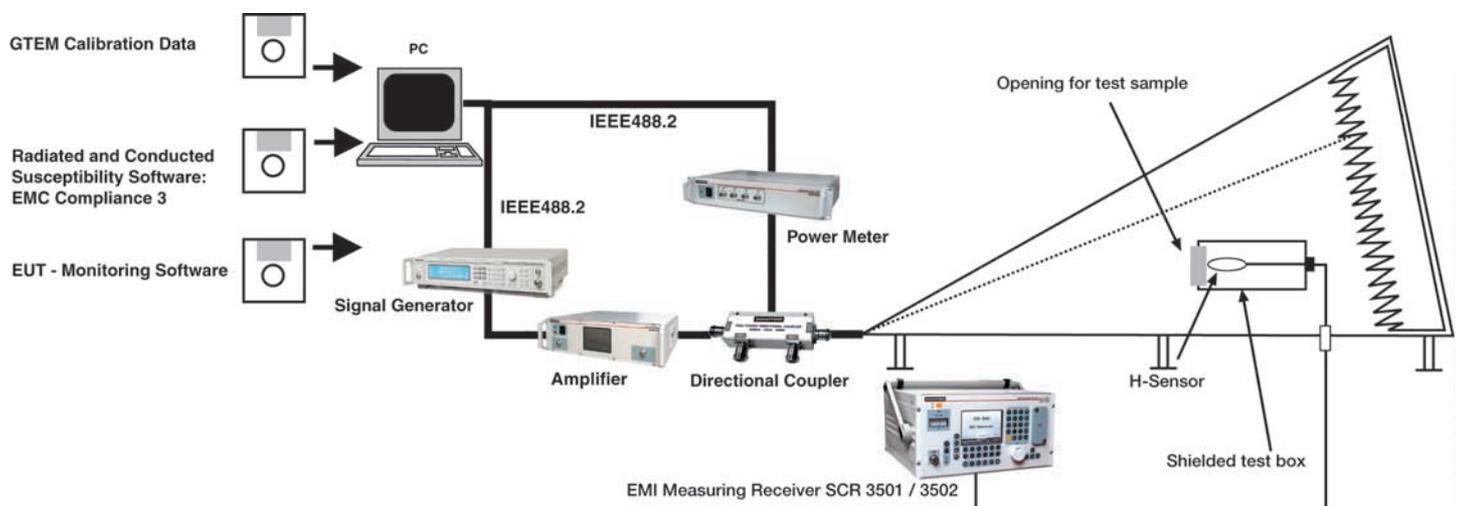


Testing of Shielding Effectiveness of Materials in GTEM Cell

In the test volume of a GTEM cell 500, a welded box of 15 cm³ with one side open is installed. The “open” side of this box is covered by the material under test. Inside the test box, a probe is located. RF power is provided to the GTEM cell input, thus initiating a strong electromagnetic field. The “inside test box” probe will pick up residual signals, resulting from a lack in shielding of the material under test.

The quotient of field strength in GTEM test volume and residual test result reflects the shielding effectiveness of the material under test.

Fig.15: Typical Test Set-up for Shielding Effectiveness Testing



GTEM 250



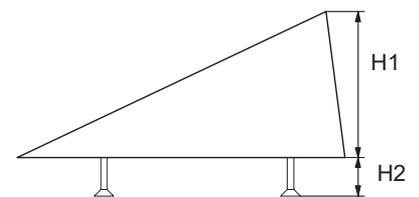
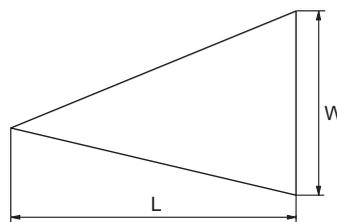
GTEM 250 with option SIA 250

Standard

- Desktop version with door on the right side
- Primary door (LxH in m): 0.20 x 0.13
- EUT Box for free application or option SIA 250 or SIB 250
- Emissions correlation tool (Windows software)
- TDR, VSWR and input power needed for 10 V/m results
- Shipped assembled

Options

- Window in door (LxH in m): 0.12 x 0.07
- Special version for more RF input power (100W)
- Feed through for Fiber Optic Link FOL
- SIA 250: Special filter 10x 15 A / 200 V, Sub-D with 4x 1 A / 200 V filter
- SIB 250: Special filter 2x 15 A / 200 V, Sub-D with 37x 1 A / 200 V filter
- Design specification for SAE 1752/3: "Testing of VLSI integrated circuits"
- Endwise vertical cell on request



GTEM 250	Specifications
Septum height:	250 mm
Dimension (LxWxH in m):	1.25 x 0.65 x 0.45
Height 1 (H1 in m) cell corpus:	0.345
Height 2 (H2 in m) supports:	0.105
Door (LxH in m):	0.20 x 0.13
EUT size (max. dimension, LxWxH in m):	0.20 x 0.20 x 0.15
EUT size (3 dB criteria, LxWxH in m):	0.150 x 0.15 x 0.08
RF-input connector:	N-type
Nominal impedance:	50 Ω
Frequency range:	DC up to 20 GHz
Max input power:	50 W (special version with 100 W)
Applications:	Measuring of Emission, Radiated, radio frequency field-immunity test Calibration of antennas and field probes / Test and measuring of Mobil Phones / Screening measuring of material

GTEM 500

Standard

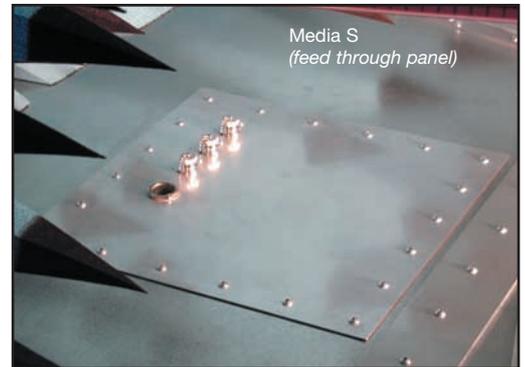
- Under-carriage with locking casters
- Primary door (LxH in m): 0.44 x 0.38
- Window in door (LxH in m): 0.30 x 0.10
- EUT Box for single phase, 2x 16 A filter, 1 socket inside, line safety switch, earth leakage circuit breaker, switchable illumination
- Media S: Connector panel with frame, 3x N-type connectors and feed through for Fiber Optic Link FOL
- Emissions correlation tool (Windows software)
- TDR, VSWR and input power needed for 10 V/m results
- Shipped assembled (except under-carriage)



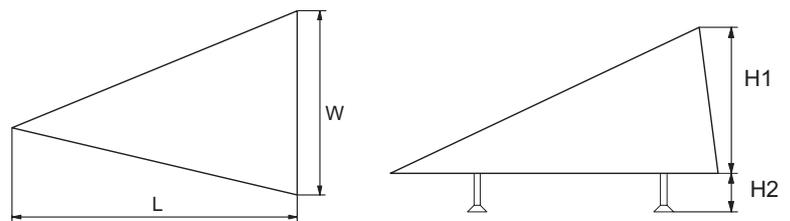
GTEM 500
(Door on the left side)

Options

- EUT-BOX3: EUT Box for three phase, 4x 32 A filter, 1 socket inside, line safety switch, earth leakage circuit breaker, switchable illumination
- DC1: DC power filter 2x 10 A, banana jacks 4 mm, optional for EUT-BOX or EUT-MK
- EUT-MK: Switching cabinet size 1, 2x 16 A filter, 1 socket inside and outside, line safety switch, earth leakage circuit breaker, line switch, emergency switch, pilot lamp, switchable illumination
- SIF: 25 lines signal filter applicable for EUT-MK or EUT-MG
- SIF M: 25 lines signal filter for Media S
- POW: Extended version for 400 W RF-input, switchable fans
- Media1: Blank feed through panel with frame (LxW in mm): 46 x 236
- Plate 1: Exchange panel for media 1
- Endwise vertical cell on request



Media S
(feed through panel)



GTEM 500

Specifications

	GTEM 500
Septum height:	500 mm
Dimension (LxWxH in m):	2.95 x 1.48 x 1.61
Height 1 (H1 in m) cell corpus:	1.04
Height 2 (H2 in m) under-carriage:	0.57
Door (LxH in m):	0.44 x 0.38
EUT max. size (LxWxH in m):	0.41 x 0.41 x 0.31
EUT size (3 dB criteria, LxWxH in m):	0.30 x 0.30 x 0.15
Max input power:	100 W (400 W with option POW)
RF-input connector:	N-type
Nominal impedance:	50 Ω
Frequency range:	DC up to 20 GHz
Applications:	Measuring of Emission, Radiated, radio frequency field-immunity test / Calibration of antennas and field probes Test and measuring of Mobil Phones / Screening measuring of material

GTEM 750

Standard

- Under-carriage with locking casters
- Primary door (LxH in m): 0.65 x 0.50
- Window in door (LxH in m): 0.30 x 0.10
- EUT Box for single phase, 2x 16 A filter, 1 socket inside, line safety switch, earth leakage circuit breaker, switchable illumination
- Media S: Connector panel with frame, 3x N-type connectors and feed through for Fiber Optic Link FOL
- Emissions correlation tool (Windows software)
- TDR, VSWR and input power needed for 10 V/m results typical values
- Shipped disassembled



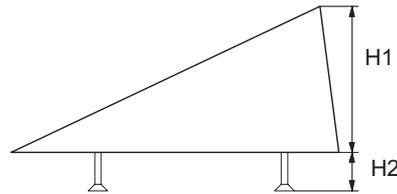
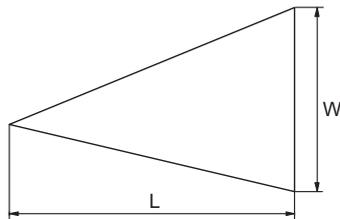
GTEM 750
(Door on the right side)

Options

- EUT-BOX3: EUT Box for three phase, 4x 32 A filter, 1 socket inside, line safety switch, earth leakage circuit breaker, switchable illumination
- DC1: DC power filter 2x 10 A, banana jacks 4 mm, optional for EUT-BOX or EUT-MK
- EUT-MK: Switching cabinet size 1, 2x 16 A filter, 1 socket inside and outside, line safety switch, earth leakage circuit breaker, line switch, emergency switch, pilot lamp, switchable illumination
- SIF: 25 lines signal filter applicable for EUT-MK or EUT-MG
- SIF M: 25 lines signal filter for Media S
- POW: Extended version for 500 W RF-input, switchable fans
- MPH 600: Manipulator handoperated
- MPC 600: Manipulator remote controlled
- Media1: Blank feed through panel with frame (LxW in mm): 46 x 236
- Plate 1: Exchange panel for media 1



Media S and EUT-BOX1
(feed through panel and EUT power supply)



GTEM 750

Specifications

Septum height:	GTEM 750
Dimension (LxWxH in m):	750 mm
Height 1 (H1 in m) cell corpus:	3.95 x 2.02 x 1.95
Height 2 (H2 in m) under-carriage:	1.38
Door (LxH in m):	0.57
EUT max. size (LxWxH in m):	0.65 x 0.50
EUT size (3 dB criteria, LxWxH in m):	0.62 x 0.62 x 0.49
Max input power:	0.45 x 0.45 x 0.22
RF-input connector:	200 W (500 W with option POW)
Nominal impedance:	N-type
Frequency range:	50 Ω
Applications:	DC up to 20 GHz
	Measuring of Emission, Radiated, radio frequency field-immunity test / Calibration of antennas and field probes
	Test and measuring of Mobil Phones / Screening measuring of material

GTEM 1000

Standard

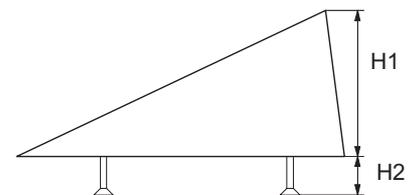
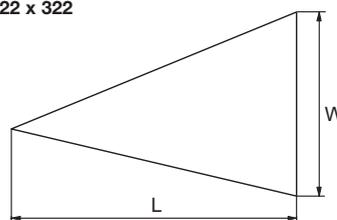
- Under-carriage with locking casters
- Window in door (LxH in m): 0.30 x 0.10
- EUT Box for single phase, 2x 16 A filter, 1 socket inside, line safety switch, earth leakage circuit breaker, switchable illumination
- Media S: Connector panel with frame, 3x N-type connectors and feed through for Fiber Optic Link FOL
- Switchable fans
- Emissions correlation tool (Windows software)
- Typical TDR, VSWR and input power needed for 10 V/m results
- Shipped disassembled



GTEM 1000
with option: EUT - MG

Options

- EUT-BOX3: EUT Box for three phase, 4x 32 A filter, 1 socket inside, line safety switch, earth leakage circuit breaker, switchable illumination
- DC1: DC power filter 2x 10 A, banana jacks 4 mm, optional for EUT-BOX or EUT-MK
- EUT-MG1: Switching cabinet size 2, 2x 16 A filter, 3 sockets inside and 2 sockets outside, line safety switch, earth leakage circuit breaker, line switch, emergency switch, pilot lamps, switchable illumination, door switch
- EUT-MG3: Switching cabinet size 2, 4x 32 A filter, 1x CEE socket and 2 sockets inside and 2 sockets outside, line safety switch, earth leakage circuit breaker, line switch, emergency switch, pilot lamps, switchable illumination, door switch
- DC2: DC power filter 2x 10 A, line safety switch, banana jacks 4 mm, optional for EUT-MG
- SIF: 25 lines signal filter applicable for EUT-MK or EUT-MG
- SIF M: 25 lines signal filter for Media S
- MPH 600: Manipulator handoperated
- MPC 600: Manipulator remote controlled
- Media 1: Blank feed through panel with frame in size (LxW in mm): 46 x 236
- Media 2: Blank feed through panel with frame in size (LxW in mm): 186 x 236
- Media 3: Blank feed through panel with frame in size (LxW in mm): 322 x 322
- Plate 1 up to 3: Exchange panel for media 1- 3
- Plate S: Exchange panel for media S
- Video system on request
- Additionally doors, windows and filters on request
- Additionally connections for water pipes or others on request



GTEM 1000

Specifications

Septum height:	1000 mm
Dimension (LxWxH in m):	4.95 x 2.54 x 2.30
Height 1 (H1 in m) cell corpus:	1.730
Height 2 (H2 in m) under-carriage:	0.570
Door (LxH in m):	0.48 x 0.68
EUT size (max. dimension, LxWxH in m):	0.74 x 0.74 x 0.66
EUT size (3 dB criteria, LxWxH in m):	0.60 x 0.60 x 0.30
RF-input connector:	N-type
Nominal impedance:	50 Ω
Frequency range:	DC up to 20 GHz
Max input power:	1000 W
Applications:	Measuring of Emission, Radiated, radio frequency field- immunity test Calibration of antennas and field probes / Test and measuring of Mobil Phones / Screening measuring of material

GTEM 1250

Standard

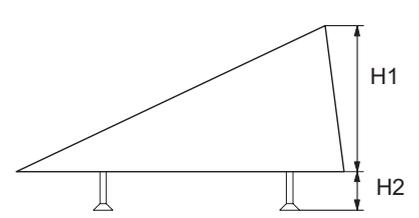
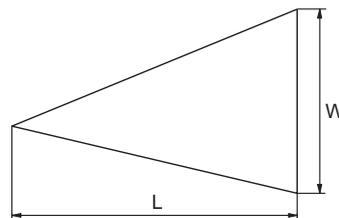
- Support with 16 feet
- Window next to door (LxH in m): 0.30 x 0.10
- EUT Box for single phase, 2x 16 A filter, 1 socket inside, line safety switch, earth leakage circuit breaker, switchable illumination
- Media S: Connector panel with frame, 3x N-type connectors and feed through for Fiber Optic Link FOL
- Switchable fans
- Emissions correlation tool (Windows software)
- Typical TDR, VSWR and input power needed for 10 V/m results
- Shipped disassembled



GTEM 1250 (Door on the right side) with option: EUT - MG

Options

- EUT-BOX3: EUT Box for three phase, 4x 32 A filter, 1 socket inside, line safety switch, earth leakage circuit breaker, switchable illumination
- DC1: DC power filter 2x 10 A, banana jacks 4 mm, optional for EUT-BOX or EUT-MK
- EUT-MG1: Switching cabinet size 2, 2x 16 A filter, 3 sockets inside and 2 sockets outside, line safety switch, earth leakage circuit breaker, line switch, emergency switch, pilot lamps, switchable illumination, door switch
- EUT-MG3: Switching cabinet size 2, 4x 32 A filter, 1x CEE socket and 2 sockets inside and 2 sockets outside, line safety switch, earth leakage circuit breaker, line switch, emergency switch, pilot lamps, switchable illumination, door switch
- DC2: DC power filter 2x 10 A, line safety switch, banana jacks 4 mm, optional for EUT-MG
- SIF: 25 lines signal filter applicable for EUT-MK or EUT-MG
- SIF M: 25 lines signal filter for Media S
- MPH 1250: Manipulator handoperated
- MPC 1250: Manipulator remote controlled
- Media 1: Blank feed through panel with frame in size (LxW in mm): 46 x 236
- Media 2: Blank feed through panel with frame in size (LxW in mm): 186 x 236
- Media 3: Blank feed through panel with frame in size (LxW in mm): 322 x 322
- Plate 1 up to 3: Exchange panel for media 1- 3
- Plate S: Exchange panel for media S
- Video system on request
- Additionally doors, windows and filters on request
- Additionally connections for water pipes or others on request
- Under-carriage with locking casters



GTEM 1250	Specifications
Septum height:	1250 mm
Dimension (LxWxH in m):	5.95 x 3.06 x 2.52
Height 1 (H1 in m) cell corpus:	2.060
Height 2 (H2 in m) supports:	0.455 (0.190 on request)
Height 2 (H2 in m) under-carriage:	0.340 (option)
Door (LxH in m):	0.85 x 0.85
EUT size (max. dimension, LxWxH in m):	0.93 x 0.93 x 0.83
EUT size (3 dB criteria, LxWxH in m):	0.70 x 0.70 x 0.38
RF-input connector:	N-type
Nominal impedance:	50 Ω
Frequency range:	DC up to 20 GHz
Max input power:	1000 W
Applications:	Measuring of Emission, Radiated, radio frequency field- immunity test Calibration of antennas and field probes / Test and measuring of Mobil Phones / Screening measuring of material

GTEM 1500 / 1750 / 2000

Standard

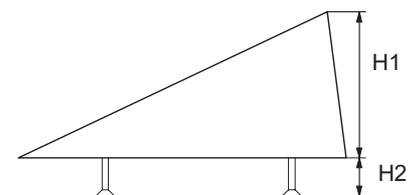
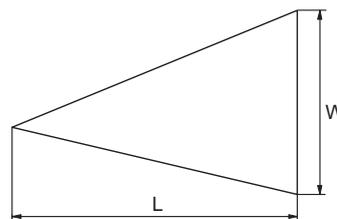
- Support with 26 feet
- Window next to door with dimensions (LxW in m): 0.30 x 0.10
- Media S with three N-type connectors and feed through for fiber optic link (FOL)
- EUT Box for single phase, 2x 16 A filter, 1 socket inside, line safety switch, earth leakage circuit breaker, switchable illumination
- Switchable fans
- Typical TDR and VSWR results
- Emissions correlation tool (Windows software)
- Primary door (LxH in m) 1.00 x 1.30
- Shipped disassembled



GTEM 1500 (Door on the right side) with option: EUT - MG and special filters

Options

- MPH 1750: Manipulator handoperated
- MPC 1750: Manipulator remote controlled
- Media 1: Blank feed through panel with frame in size (LxW in mm): 46 x 236
- Media 2: Blank feed through panel with frame in size (LxW in mm): 186 x 236
- Media 3: Blank feed through panel with frame in size (LxW in mm): 322 x 322
- Plate 1 up to 3: Exchange panel for media 1- 3
- Plate S: Exchange panel for media S
- EUT-BOX3: three phase, 4x 32 A filter, 1 socket inside, line safety switch, earth leakage circuit breaker, switchable illumination
- DC1: DC power filter 2x 10 A, banana jacks 4 mm, optional for EUT-BOX or EUT-MK
- DC2: DC power filter 2x 10 A, line safety switch, banana jacks 4 mm, optional for EUT-MG
- EUT-MG1: Switching cabinet size 2, 2x 16 A filter, 3 sockets inside and 2 sockets outside, line safety switch, earth leakage circuit breaker, line switch, emergency switch, pilot lamps, switchable illumination, door switch
- EUT-MG3: Switching cabinet size 2, 4x 32 A filter, 1x CEE socket and 2 sockets inside and 2 sockets outside, line safety switch, earth leakage circuit breaker, line switch, emergency switch, pilot lamps, switchable illumination, door switch
- SIF: 25 lines signal filter applicable for EUT-MK or EUT-MG
- SIF M: 25 lines signal filter for Media S
- Video system on request
- Additionally doors, windows and filters on request
- Additionally connections for water pipes or others on request
- High voltage pulse feed section on request (LEMP, NEMP)



GTEM 1500 / 1750 / 2000		Specifications		
	GTEM 1500	GTEM 1750	GTEM 2000	
Septum height:	1500 mm	1750 mm	2000 mm	
Dimension (LxWxH in m):	6.95 x 3.58 x 2.55	7.95 x 4.10 x 2.90	8.95 x 4.62 x 3.24	
Door (LxH in m):	1.00 x 1.30	1.00 x 1.30	1.00 x 1.30	
EUT max. size (LxWxH in m):	1.11 x 1.11 x 0.99	1.32 x 1.32 x 1.16	1.50 x 1.50 x 1.32	
EUT size (3 dB criteria, LxWxH in m):	0.85 x 0.85 x 0.45	1.00 x 1.00 x 0.50	1.15 x 1.15 x 0.60	
RF-input connector:			N-type	
Nominal impedance:			50 Ω	
Frequency range:			DC up to 20 GHz	
Max input power:			1000 W	
Applications:	Measuring of Emission, Radiated, radio frequency field- immunity test Calibration of antennas and field probes / Test and measuring of Mobil Phones / Screening measuring of material / Transient pulse immunity testing / Field probe calibration			

'GTEM 3 Immunity' - RF Immunity Software

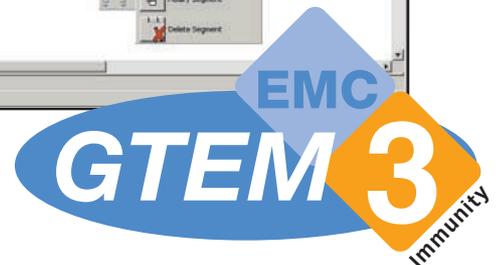
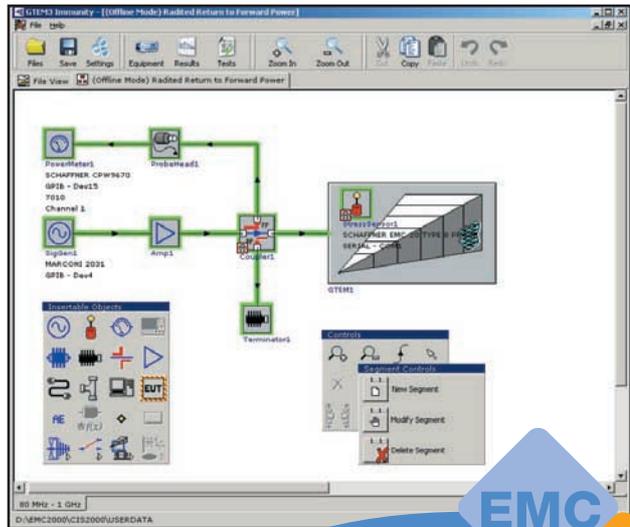
- Easy to Install and Use
- Operates on Windows 98SE, 2000 and XP
- Automatic testing in a GTEM Cell
- Simple and Clear results presentation

GTEM 3 Immunity is a lower cost and simplified version of the well established Compliance 3 Immunity test software. Specifically designed to perform basic RF immunity tests in a GTEM cell this flexible program can also run conducted RF immunity tests using CDN, clamps and BCI probes.

Standard hardware configurations are pre-loaded and can be used as the basis of user defined set ups. Creating a new configuration in this way is simple, quick and less prone to error. Once configurations for the calibration and test phases have been created it is only a four step process to start to run a test. The software leads the user through a numbered sequence of steps to the point where a test is started.

GTEM 3 Immunity supports a wide range of hardware, more than 200 instrument drivers are distributed with the software, new drivers are available for free download from our support web site where you can also receive up-to-date information about the software and rapid response to questions and requests for help. Special drivers will be written free of charge and tools can be provided to enable users to create their own drivers. This facility means that new instruments can be quickly integrated into any test system without delay.

Included in the software are some standard EUT test sequences which allows for manual or automatic notification of EUT failure to the software. If the EUT status is only identifiable by visual or audio means, the user can input failures on the keyboard or via the mouse. However if the equipment can be electronically monitored simple automatic EUT status monitoring can be implemented thus freeing the engineer from a protracted and time wasting task.



Report generation is a simple task, graphical and tabular data can be exported to spreadsheet or word processor packages, this includes all result files, test set-ups and configuration information as well as results files.

Additionally a 'Global Report' package is included which allows the user to create a report template and automatically fill it from this software and some other Schaffner software packages thus allowing a single report to be generated for conducted and radiated, emission and immunity tests.

Users who require more sophisticated control of the test procedure or the EUT test sequence can upgrade to the full Compliance 3 Immunity package which has all of the mentioned features but much greater flexibility and control.

Hardware requirements

PC	500MHz Pentium Processor or equivalent / 64MB RAM / CD-ROM Drive / 250MB of Disk Space / 256-colour display adaptor at 1024 x 768 resolution
 GPIB Interface card	National Instruments PCI, PCMCIA, USB (Ethernet card not supported)
Operating system	Windows 98SE, 2000, XP, NT4 (SP6)
Supported Test equipment	Advantest R4131D, R3131, R3132, R3261 (A - D), R3361 (A - D), LHR 7000, UHR 4000, SCR 3000 Series.

'GTEM 3' - RF Emission Software

- Easy to Install and Use
- Operates on Windows 98SE, 2000 and XP
- Automatic testing in a GTEM Cell
- Simple and Clear results presentation

Based on the established and successful Schaffner Compliance 3 software, GTEM 3 RF emissions software makes testing in a GTEM a simple process.

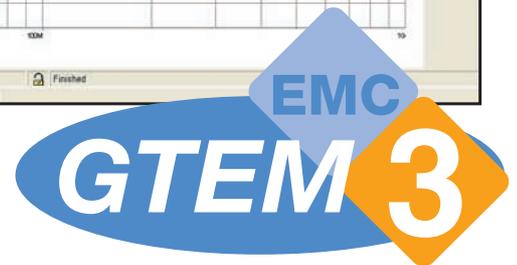
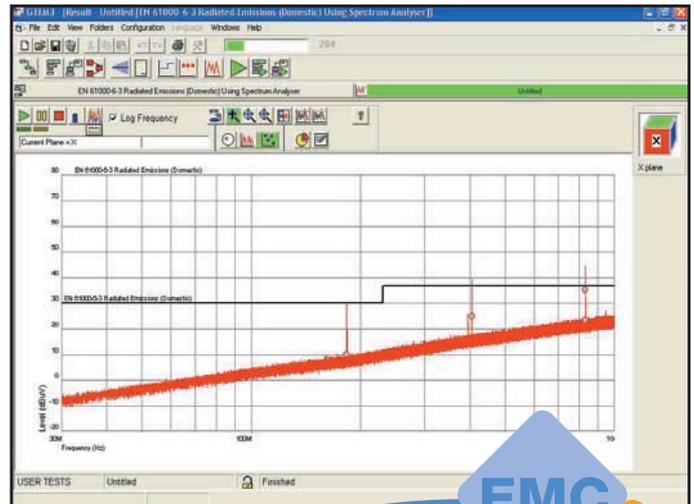
GTEM 3 supports the complete range of Schaffner measuring receivers and a large range of Advantest spectrum analysers. Designed to make testing in a GTEM cell simple, this software also enables similar simple conducted emissions testing.

The algorithm to allow correlation to an OATS is included in the software and is automatically applied at the end of the test. Uncorrelated data is also optionally presented which can be easily displayed or hidden by the user.

A series of simple forms are used to set up the test required allowing the user to quickly select the frequency range for a specific test, input details of the EUT and enter the details of the GTEM dimensions.

Tests where the user will manually orientate the EUT and ones using an automatic manipulator are preconfigured.

A special feature allows automatic frequency optimisation to compensate for the inherent frequency inaccuracy when using a spectrum analyser.



GTEM 3 is a feature packed but simple to use test program specifically designed for users of GTEM cells. Predefined tests are available listed by EMC test standards, the user needs only to define the test equipment in use, select the required test standard and hit the run button.

The software will either prompt the user to rotate the EUT or control an automatic positioner. The software takes measurements in the three orthogonal positions in swept mode, the data is correlated to produce a single swept result which is used to determine points for re-examination using the QP detector.

In order to run a test

Select from the list of pre-loaded test standards
 Make any changes required from the 'standard test' required using the simple form. Start and stop frequency can be changed for narrow sweeps around known problem areas. Users can optionally select to measure just one orientation of the EUT but still apply the GTEM correction algorithm.

More detailed changes can be made to define the GTEM dimensions and the position of the EUT in the GTEM
 During the test a graph shows the 'raw data' for each orientation of the EUT. When each of the orientations selected has been measured, the software creates a combined result and automatically re-tests the frequencies near the limit line.

Results are displayed in graphical and tabular form, all traces created during the test are stored but can be switch on or off by the user to customise and clarify the display.

Hardware requirements

PC	500MHz Pentium Processor or equivalent / 64MB RAM / CD-ROM Drive / 250MB of Disk Space / 256-colour display adaptor at 1024 x 768 resolution
GPIO Interface card	National Instruments PCI, PCMCIA, USB (Ethernet card not supported)
Operating system	Windows 98SE, 2000, XP, NT4 (SP6)
Supported Test equipment	Advantest R4131D, R3131, R3132, R3261 (A-D), R3361 (A-D), LHR 7000, UHR 4000, SCR 3000 Series.

Specifications of filters and feed through panel

Specifications of filters and feed through panel

AC Filter specification (used for EUT-BOX1, EUT-MK, EUT-MG1)

Current rating @ 60°C:	16 A
Rated voltage:	250 VAC @ 50/60 Hz (EN 132400 approval) 300 VAC @ 50/60 Hz (other applications)
Test voltage:	3000 VDC for 2 s
Capacitor class:	Y2
Attenuation (50 Ohm system):	10dB/100kHz, 23dB/1MHz, 60dB/10MHz, 80dB/50MHz, >90dB/>100MHz

AC Filter specification (used for EUT-BOX3, EUT-MG3)

Current rating @ 60°C:	32 A
Rated voltage:	250 VAC @ 50/60 Hz (EN 132400 approval) 300 VAC @ 50/60 Hz (other applications)
Test voltage:	3000 VDC for 2 s
Capacitor class:	Y2
Attenuation (50 Ohm system):	10dB/100kHz, 23dB/1MHz, 60dB/10MHz, 80dB/50MHz, >90dB/>100MHz

DC Filter specification (used for DC1 / DC2)

Connector type:	4 mm banana
Current rating @ 60°C:	10 A
Rated voltage:	130 VDC or 130 VAC @ 50/60 Hz
Test voltage:	1700 VDC for 2 s
Capacitor class:	Y4
Attenuation (50 Ohm system):	10dB/100kHz, 25dB/1MHz, 50dB/4MHz, 70dB/30MHz, >90dB/>50MHz

Filter specification (used for SIF / SIF M)

Connector type:	Sub-D, 25 pins
Current rating:	5 Amps
Rated voltage:	200 Volts
Attenuation @25 °C:	14dB/10MHz, 55dB/100MHz, 70dB/1GHz, 70dB/10GHz

Filter specification (used for SIA 250)

Connector type:	4 mm banana (for 10 lines of SIA 250) Sub-D, 9 pins (for 4 lines of SIA 250)
Current rating:	15 Amps (banana), 5 Amps (Sub-D)
Rated voltage:	200 Volts
Attenuation @25 °C:	14dB/10MHz, 55dB/100MHz, 70dB/1GHz, 70dB/10GHz

Filter specification (used for SIB 250)

Connector type:	4 mm banana (for 2 lines of SIB 250) Sub-D, 37 pins (for 37 lines of SIB 250)
Current rating:	15 Amps (banana), 5 Amps (Sub-D)
Rated voltage:	200 Volts
Attenuation @25 °C:	14dB/10MHz, 55dB/100MHz, 70dB/1GHz, 70dB/10GHz

Specification of the feed through panel (used for Media S)

Dimension (LxW in m):	approx. 0.3 x 0.3
Connector type:	3x connector N type
Frequency range:	up to 11 GHz
Nominal impedance:	50 Ω
Rated voltage:	1 kV@ 50 Hz
Optical feed through:	25.4 mm diameter

GTEM Calculating Power Required

GTEM Calculating Power Required							
Field Strength E	Septum max. height h	GTEM input impedance R	Flatness	Modulation Allowance	Required Power with Modulation	Required Power CW	SCHAFFNER GTEM max Input Power
<i>in V/m</i>	<i>in m</i>	<i>in Ω</i>	<i>3 dB = 2</i>	<i>80 % AM</i>	<i>in Watts</i>	<i>in Watts</i>	<i>in Watts</i>
10	0.10	50	2	3.24	0.1	0.04	
30	0.10	50	2	3.24	1.2	0.4	
100	0.10	50	2	3.24	13.0	4.0	
150	0.10	50	2	3.24	29.2	9.0	
200	0.10	50	2	3.24	51.8	16.0	
400	0.10	50	2	3.24	207.4	64.0	
10	0.25	50	2	3.24	0.8	0.3	100
30	0.25	50	2	3.24	7.3	2.3	100
100	0.25	50	2	3.24	81.0	25.0	100
150	0.25	50	2	3.24	182.3	56.3	100
200	0.25	50	2	3.24	324.0	100.0	100
10	0.50	50	2	3.24	3.2	1.0	400
30	0.50	50	2	3.24	29.2	9.0	400
100	0.50	50	2	3.24	324.0	100.0	400
150	0.50	50	2	3.24	729.0	225.0	400
200	0.50	50	2	3.24	1296.0	400.0	400
10	0.75	50	2	3.24	7.3	2.3	500
30	0.75	50	2	3.24	65.6	20.3	500
100	0.75	50	2	3.24	729.0	225.0	500
150	0.75	50	2	3.24	1640.3	506.3	500
200	0.75	50	2	3.24	2916.0	900.0	500
10	1.00	50	2	3.24	13.0	4.0	1000
30	1.00	50	2	3.24	116.6	36.0	1000
100	1.00	50	2	3.24	1296.0	400.0	1000
150	1.00	50	2	3.24	2916.0	900.0	1000
200	1.00	50	2	3.24	5184.0	1600.0	1000
10	1.25	50	2	3.24	20.3	6.3	1000
30	1.25	50	2	3.24	182.3	56.3	1000
100	1.25	50	2	3.24	2025.0	625.0	1000
150	1.25	50	2	3.24	4556.3	1406.3	1000
200	1.25	50	2	3.24	8100.0	2500.0	1000
10	1.50	50	2	3.24	29.2	9.0	1000
30	1.50	50	2	3.24	262.4	81.0	1000
100	1.50	50	2	3.24	2916.0	900.0	1000
150	1.50	50	2	3.24	6561.0	2025.0	1000
200	1.50	50	2	3.24	11664.0	3600.0	1000
10	1.75	50	2	3.24	39.7	12.3	1000
30	1.75	50	2	3.24	357.2	110.3	1000
100	1.75	50	2	3.24	3969.0	1225.0	1000
150	1.75	50	2	3.24	8930.3	2756.3	1000
200	1.75	50	2	3.24	15876.0	4900.0	1000

Ordering Information (overview)

Septum height	Door side	Additional door	Additional window	Power (extension)	EUT supply	Country code	Feed through panel	Filter	Signal Filter	Manipulator
GTEM 250	right / left	SHD 1		POW					SIA 250 SIB 250	
GTEM 500	right / left	SHD 1 SHD 2	SHW 2000	POW	EUT-BOX1 EUT-BOX3 EUT-MK	Schuko US/ Japan UK	Media S Media 1	DC 1	SIF SIF M	
GTEM 750	right / left	SHD 1 SHD 2 SHD 3	SHW 2000	POW	EUT-BOX1 EUT-BOX3 EUT-MK	Schuko US/ Japan UK	Media S Media 1 Media 2	DC 1	SIF SIF M	MPH 600 MPC 600
GTEM 1000	right / left	SHD 1 SHD 2 SHD 3 SHD 4	SHW 2000		EUT-BOX1 EUT-BOX3 EUT-MK EUT-MG1 EUT-MG3	Schuko US/ Japan UK	Media S Media 1 Media 2 Media 3	DC 1 DC 2	SIF SIF M	MPH 600 MPC 600
GTEM 1250	right / left	SHD 1 SHD 2 SHD 3 SHD 4 SHD 5	SHW 2000		EUT-BOX1 EUT-BOX3 EUT-MK EUT-MG1 EUT-MG3	Schuko US/ Japan UK	Media S Media 1 Media 2 Media 3	DC 1 DC 2	SIF SIF M	MPH 1250 MPC 1250
GTEM 1500	right / left	SHD 1 SHD 2 SHD 3 SHD 4 SHD 5 SHD 6	SHW 2000		EUT-BOX1 EUT-BOX3 EUT-MK EUT-MG1 EUT-MG3	Schuko US/ Japan UK	Media S Media 1 Media 2 Media 3	DC 1 DC 2	SIF SIF M	MPH 1500 MPC 1500
GTEM 1750/2000	right / left	SHD 1 SHD 2 SHD 3 SHD 4 SHD 5 SHD 6	SHW 2000		EUT-BOX1 EUT-BOX3 EUT-MK EUT-MG1 EUT-MG3	Schuko US/ Japan UK	Media S Media 1 Media 2 Media 3	DC 1 DC 2	SIF SIF M	MPH 1750 MPC 1750



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