Pro
Series

raditeq
Product Manual

Raditeq
GTEM Systems

www.raditeq.com

Raditeq GTEM cell product manual

This product manual refers to the GTEM Cells offered by Raditeq:

Models: GTM0250A | GTM0500A | GTM1000A

Carefully read the content of this manual before operating the product and make sure all the safety instructions are strictly followed.

Please contact your local reseller if you have any questions.

Supplier Information

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Operator warnings and instructions

The Raditeq GTEM cell is a device for EMC (Electromagnetic Compatibility) emission and immunity testing applications which requires operation by professional and trained personnel.

Special care should be taken:

- Don't push or lift the GTEM cell at the APEX as this can cause defects. Only move the GTEM cell by lifting it at the external structure or move in on the frame trolley.
- Before moving the trolley make sure the wheels are not blocked (unlock brake).
- Smoothly open and close the door, without smashing it.
- Only use straight N-type and/or SMA connectors, connect them using a torque tool.
- Never remove the special N-type corner connector on the APEX.
- Personnel should not be exposed to the microwave energy which may radiate from this device. All input or output RF connection gaskets must be leak proof. Never look inside or leave door open when this device is energized!

ELECTROMAGNETIC FIELD | Strong RF levels inside the GTEM cell may cause de-magnetization and interference to other devices. Please ensure the door is always closed during active usage of the GTEM cell and keep away from RF sensitive devices.

SHOCK HAZARD | Accidental short circuit or leakage currents may occur. Supply the unit only through magneto-thermal differential switched lines. Always ensure that the GTEM cell is properly grounded to earth, even when it is not connected to the mains power supply. During operational tests, ensure that the door is always closed.

ELEKTROSTATIC DISCHARGE (ESD) | To avoid ESD discharges, ensure that the GTEM cell is properly grounded using a permanent earth wire conductor with minimum diameter of 16 mm^2.

DANGER | The Raditeq GTEM cells are produced according to high quality standards. Nevertheless, there is a potential for injuries to the hands and head or cuts from the metallic surfaces of the cell. It is necessary to ensure that a clear area is maintained around the cell, free from any obstacles.

Introduction

A GTEM or Gigahertz Transverse Electromagnetic Cell is a type of EMC test environment to perform Electromagnetic Compatibility (EMC) or Electromagnetic Interference (EMI) testing. The Raditeq GTEM cell range offers a high quality, price effective solution for pre-certification EMC radiated immunity testing and emission measurements of 'Equipment Under Test' (EUT's) in accordance with the basic standard IEC61000-4-20 'Emission and immunity testing in Transverse Electromagnetic (TEM) waveguides".

In comparison to alternative measurement methods such as EMC tests performed in anechoic chambers or Open Area Test Sites (OATS), GTEM-cells present noteworthy advantages when it comes to testing small and medium-sized Equipment Under Test (EUT) within a frequency range of up to 20 GHz.

The utilization of GTEM-cells enables swift turnaround times for the EUT, facilitating efficient handling of numerous testing variations. Furthermore, transitioning from emission to immunity testing merely necessitates straightforward adjustments from receiver input to amplifier output.

One is relieved of the inconveniences associated with prolonged waiting periods at independent (accredited) EMC test laboratories. Whether one is engaged in design qualification, pre-certification, compliance, or production sampling stages, opting for GTEM-cells proves to be the optimal and cost efficient choice.

RadiMation® Software

RadiMation® is the brand independent EMC automation software from Raditeq. RadiMation® places the EUT in the center. The software is designed to perform all EMC tests required to certify an EUT. This instead of focusing on separate EMC tests. As a result, the test data of all different tests is collected in one single software package, allowing fully automated report generation.

Our advanced report generation tool streamlines the process of creating test reports following EMC tests. With its user-friendly interface and efficient functionality, generating a comprehensive test report has never been easier. By simply pressing a single button, the tool automatically compiles all the necessary data and formats them into a professional and organized report.

This automation significantly reduces the time and effort traditionally required to manually compile and format test reports. Our tool ensures consistency and accuracy in report generation, minimizing the risk of errors or omissions.

Furthermore, the report generation tool supports the inclusion of all relevant graphs, charts, tables, and explanatory notes to provide a comprehensive understanding of the test results.

By simplifying the report generation process, our tool empowers EMC test engineers to focus more on their core tasks, such as analyzing results and implementing mitigation strategies if necessary. This improves overall productivity and efficiency in the testing workflow, enabling faster times for delivering test reports to clients or internal teams.

Device drivers for all main manufactures are freely made available or are made free of charge when required, as long as the equipment is standard commercially available and still supported by the original manufacturer. This allows you to select the best EMC test equipment for each specific application, instead of being locked in by a vendor.

The GTEM Series

The Raditeq GTEM cells are available as different models with different dimensions to match and comply to the maximum size of products that need to be tested :

GTM0250A, GTEM test cell	Horizontal positioned	250 mm septum
GTM0500A, GTEM test cell	Horizontal positioned	500 mm septum
GTM1000A, GTEM test cell	Horizontal positioned	1000 mm septum

When looking for a different septum height and there is an interested in a vertical positioned GTEM, please contact us directly. This vertical system can be useful when horizontal vertical space is unavailable or limited.

Key features of Raditeq GTEM cells:

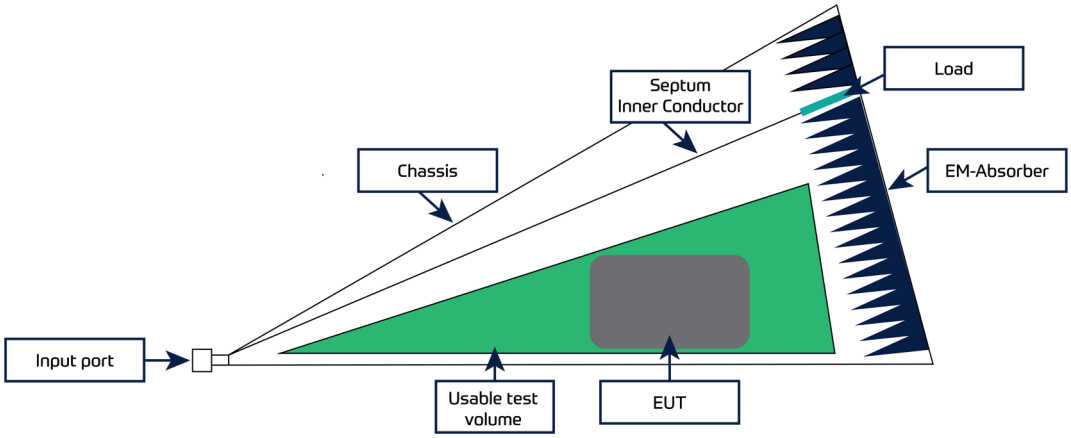
- Range of multiple GTEM cells for small and/or medium size EUT's
- Excellent RF performance from 9 kHz up to 20 GHz
- Effective generation of RF fields with minimum input power
- Ruggedized construction with internal lighting and filter box

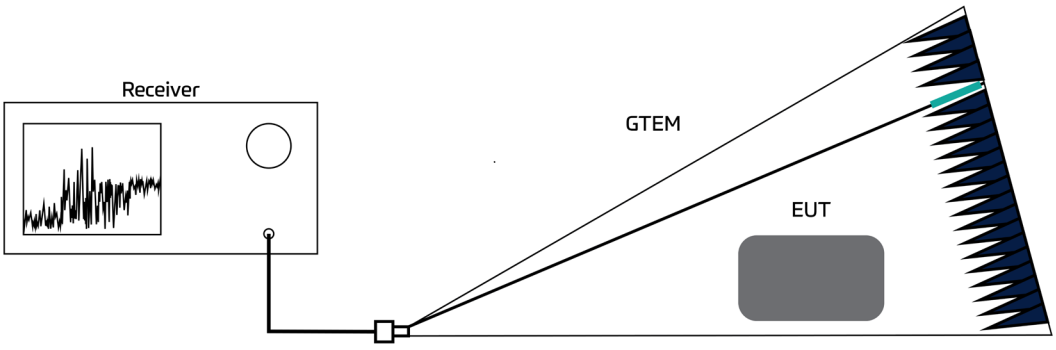
The GTEM cell is primarily intended as a precision electromagnetic compatibility (EMC) device for radiated immunity and radiated emission testing. The cell can be defined as a coaxial cable which is 'open' on one side (called apex) and closed on the other side with a defined impedance.

Pre-certification EMC application

A GTEM cell can be used for both radiated emission measurements and for radiated immunity tests. The setup seen in the figure below, shows a typical configuration for emission measurements, where the EUT is placed inside the GTEM and the radiated emission from the EUT can be measured by a spectrum analyzer or EMI receiver. Typically, the EUT should be measured in three different EUT orientations (x-y-z).

RadiMation Pro EMC test software can be used to perform a radiated emission measurement in three EUT orientations, controlling the spectrum analyzer or EMI receiver. The three emission measurement results can be automatically correlated to an Open Area Test Site (OATS correlation).





Raditeq GTEM cells are ideal for radiated immunity testing applications as relative high field strengths can be achieved with low input power.

The following theoretical calculations can be used where the maximum field strength (E) depends on the height of the septum (h) and the applied input power (P).

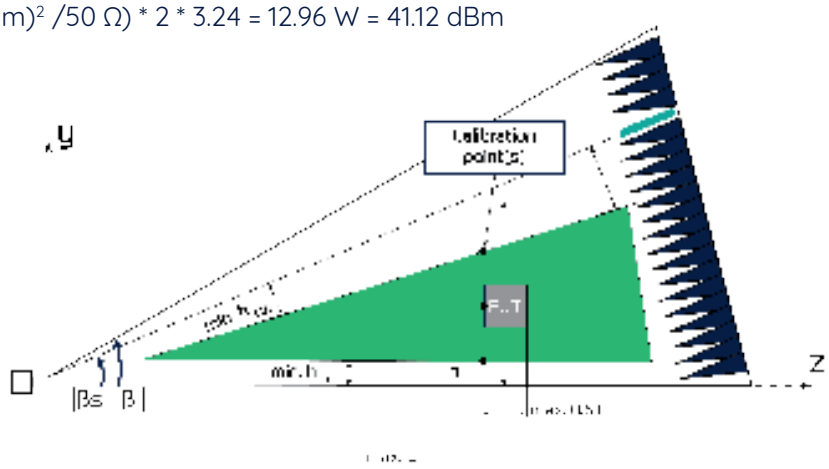
Furthermore, the flatness (F) and modulation (M) should be taken into account

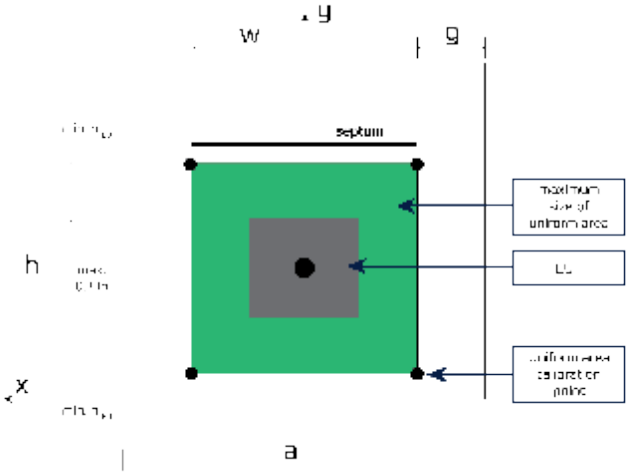
Formula: $P = ((E * h)^2 / Z) * F * M$

Example of power requirement for 20 V/m at septum height 0.5 m

Field strength E = 20 V/m
Septum height h = 0.5 m
Input impedance Z = 50 Ω
Flatness F = 3 dB = 2
Modulation M = 3.24 (for AM 80% as required for IEC 61000-4-3)

Power $P = (E * h)^2 / Z * F * M$
Example $P = ((20\ V/m * 0.5\ m)^2 / 50\ \Omega) * 2 * 3.24 = 12.96\ W = 41.12\ dBm$





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Maintenance

The Raditeq GTEM cells are produced according to high quality standards.
Nevertheless, the GTEM cell requires periodical verification of:

- Quality and shielding of the door gasket;
- Integrity of the I/O connectors on the filter box;
- (When applicable) Applying lubrication to both the wheels of the trolley and the hinges of the door.

Furthermore, the interior of the GTEM cell should be regularly cleaned by using a soft cloth or a vacuum cleaner. Metallic surfaces should be protected and handled against corrosion, using a soft cloth wet of Vaseline, Silicon or Paraffin oils. Avoid cleaning with water-based products or chlorine solutions!

Preventive maintenance

- When the GTEM cell is not actively used, partially open the door avoiding over-stressing the door gasket, preventing “memory form” which will reduce the shielding performance.
- Avoid touching the anechoic pyramids by fingers/objects as they can be damaged.
- Take extra care at the N input connector as it is a sensitive part of the system.
- Periodically check the safety earth connection wire.

Specifications GTEM series

Technical Specifications	GTM0250A	GTM0500A	GTM1000A
Frequency range	For emissions: 9 kHz - 6 Ghz, For immunity applications: 80 MHz – 6 GHz * DC-20 GHz optional		
Septum height	250 mm	500 mm	1000 mm
Max EUT Size (LxWxH)	20 x 20x 15 cm	35 x 40 x 27 cm	75 x 75 x 50 cm
Defined test Volume	8.3 x 8.3 x 8.3 cm	18 x 18 x 18 cm	35.5 x. 33.5 x 33.5 cm
Typical VSWR (average value)	1:1.2	1:1.3 (for immunity test range)	1:1:6
Typical VSWR at critical frequency (average value)	<1:1.6	< 1:1.6 (for immunity test range)	1:1:6
Max. input power, W continuous/ pulsed	1 kW/ *2,5 Kw	1 kW / 2.5 kW	1.5 kW / 2.5 kW
Input connector	7/16“ and Adapter to N UG-21		
Nominal impedance	50 Ohm		
Shielding effectiveness	From 40 to 65 dB		
Mechanical			
Construction materials	Hot galvanized steel, Door Inox steel, Hybrid Carbon loaded polyurethane foam + ferrite		
Outer dimensions (Lx W x H)	125 x 64 x 44 cm	238 x 122 x 83 cm + 70 cm Trolley	500 x 271 x 188 cm + 25 cm trolley
Door (W x H)	30 x 20 cm	Standard: 40 x 40 cm * Optional: 40 x6 0 cm	80 x 80 cm
Window in the door (W x H)	24 x 14 cm	Optional: circular Diam. 200 mm.	Optional: circular Diam. 200 mm.

Technical Specifications	GTM0250A	GTM0500A	GTM1000A
Weight	Approx. 40 kg	Approx. 250 kg	Approx. 650 kg
Wheeled undercarriage (with brakes)	Optional	Optional	Optional
Mains connectors	Fix/CEE		
Main switch	Magnetic- Thermal 16A mono phase		
Input socket plug	16 AC IEC Type (mono phase + ground)		
Output socket EUT tape	16 AC SHUCO type (mono phase + ground)		
Additional EUT sockets	Optional		
Ground connection	M6 bolt		
EMI AC Line filter (mono phase + ground)	16A 250V n.2 terminals +ground		
EMI AC/DC secondary filter	10A 250V AC/DC N.2 terminals		
Channel for fiber optic leads	3 couples (18 GHz Cut-off frequency)		
RF feed-through connector	N.1 N-N female		
RF feed-through SMA connectors	N.2 SMA-SMA female		
Technical panel pre-drilled for options	supplied		
Additional Option			
Media filter unit	*Optional: N.1 RJ45, N.1 DB9-RS232, N.2 USB-2, N.1 DC filter.		
Indoor lighting	10W LED		

Warranty Conditions

Raditeq B.V. offers a standard warranty term of three (3) years on their products, calculated from the shipping date, under the condition that the product is registered on www.raditeq.com. For registration of the product, the customer should provide the product model, serial number and the responsible reseller (if applicable). If the product is not registered, a limited warranty term of one (1) year will be applicable.

Return Material Authorization (RMA) & Warranty repair

If a defect occurs to our product within the warranty term, a Return Material Authorization (RMA) 'Warranty Repair' request can be issued using the RMA link at www.raditeq.com/support**.** Upon receipt of the request, an RMA number will be provided. **Please do not send the product without this RMA number!** The defective product should be shipped to our service department at the following address:

Raditeq B.V. – Service Department
Vijzelmolenlaan 3
3447GX WOERDEN
The Netherlands

There will be no charge for repair services (materials or labour) within the (extended) warranty term.
These warranty terms are not applicable to:

- Normal wear and tear
- Fibre optic cables
- Products that have been improperly used
- Products that have been used outside their specified range
- Products that have been improperly installed and/or maintained
- Products that have been modified without approval of Raditeq
- Calibration and/or re-calibration of the product
- Repair services on products that are not covered by the Raditeq warranty will be charged to the customer.

Repairs outside warranty

If a defect is not covered under warranty, an RMA fixed-repair can be ordered on the RMA link: www.raditeq.com/support If a re-calibration is needed after repair, this calibration should be ordered separately. The calibration will be performed at the ISO17025 accredited calibration laboratories of KIWA DARE!! Calibrations, based on the applicable service code / prices.

Warranty after repair

For repairs outside the original warranty period, a limited warranty of six months is applicable on the performed repair. Shipping conditions are the same as with repairs that are covered within the original warranty period.

Shipping

The customer will need to arrange shipping and cover the costs (like e.g. transportation costs, duties, taxes) for sending the defect product to the service department of Raditeq in The Netherlands. Raditeq will arrange the courier and cover for the costs for the return shipment after repair.

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