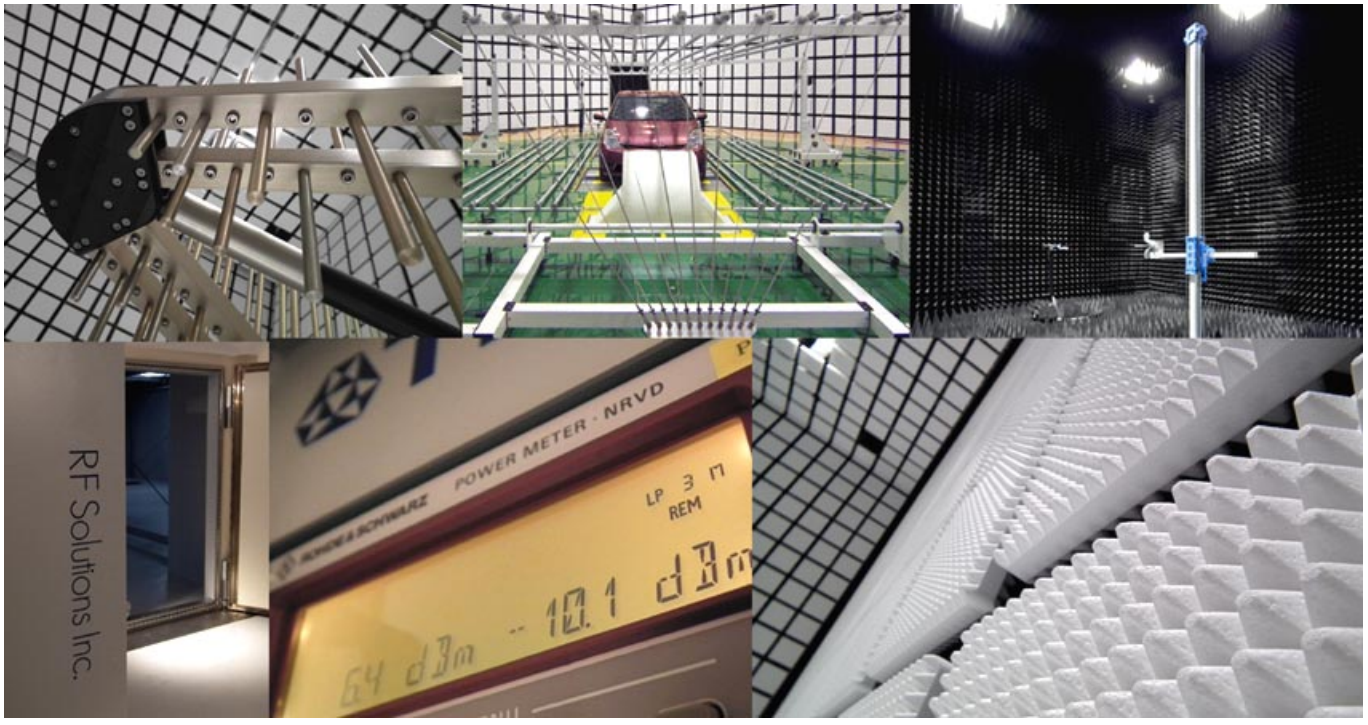
EMC·RF Solution

Electromagnetic Wave Anechoic Chambers
Electromagnetic Wave Absorbers
EMC Measurement and Evaluation System

Contents Update : AUGUST 2014

All specifications are subject to change without notice.



Achievements and challenges

Seeking, deepening, and accumulating the qualities of radio wave anechoic chambers that can respond to the demands of today's latest demands.

Ever since the development of the world's first ferrite electromagnetic wave anechoic chambers in 1969, the genealogy of TDK electromagnetic wave anechoic chamber technologies have responded to high expectations and demands of countless organizations and corporations that strive for next-generation technologies.

And now, more than 1200 units* of our electromagnetic wave anechoic chambers, for which improvements have been made through customers' evaluation and trust, are used worldwide. *As of June 2014

Needs for EMC measurement have been changing and becoming more sophisticated as electronics technologies evolve.

Device developers who seek ideal EMS technologies for ideal earth environment must have sophisticated, comfortable development environment and convenient measurement knowhow.

To support the efforts in a complete and detailed fashion, we have been responding to cutting-edge, advanced demands of our customers, seeking further characteristic/performance improvement and specification refinement for our "world standard electromagnetic wave anechoic chambers", which are built on worldwide trust.

Our efforts toward realizing alternatives to CALTS*

*CALibration Test Site

The latest achievement is this 10m Test Range, quickly meeting the conditions of worldwide-sought measurement environment CALTS (Calibration Test Site).

Although this chamber alone can of course reinforce and promote next-generation-leading EMC/RF solutions, adding it at the top of the traceability hierarchy in your current measurement facilities such as 3m Test Range electromagnetic wave anechoic chambers provides further advantages.

You can build all-weather/multi-purpose/high-efficiency EMS measurement systems overcoming the issues of open site measurement limitations with superior reliability as good as that of CALTS specification open sites.

Achievements and challenges

Advantages of CALTS specification/cutting-edge 10m Test Range electromagnetic wave anechoic chambers

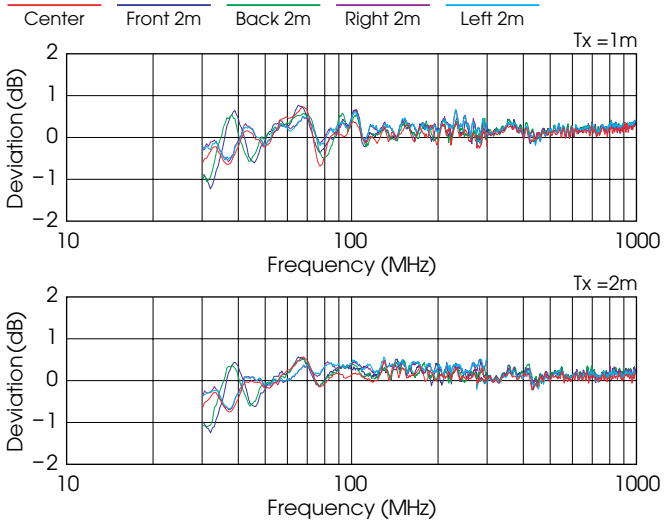
- ANSI C63.4 Normalized theoretical site attenuation within ±1.3dB was achieved, realizing next-generational electromagnetic environment even more optimal than the attenuation level of the conventional high-performing 10m Test Range electromagnetic wave anechoic chambers (within plus-minus 2.5dB).
- CALTS characteristics: within +0.4, −0.8dB.
  REFTS characteristics: within ±0.6dB
- Height pattern characteristics: Excellent height pattern characteristics, almost equivalent to theoretical figures and those of open sites were achieved.
- Site attenuation uniformity: ϕ6m (evaluated at 50cm intervals each direction of horizontal and vertical) area variable within ±1.3dB was was achieved, realizing a superior field uniformity flat which measurement environment which surpasses the conventional levels.

The chamber walls and ceilings are structured using cutting-edge IP-250BL (height: 2.5m) hybrid type absorber which realized TDK's best absorbing characteristics.
We now have a new performance realm of the 10m Test Range anechoic chamber surpassing the world's best standard.

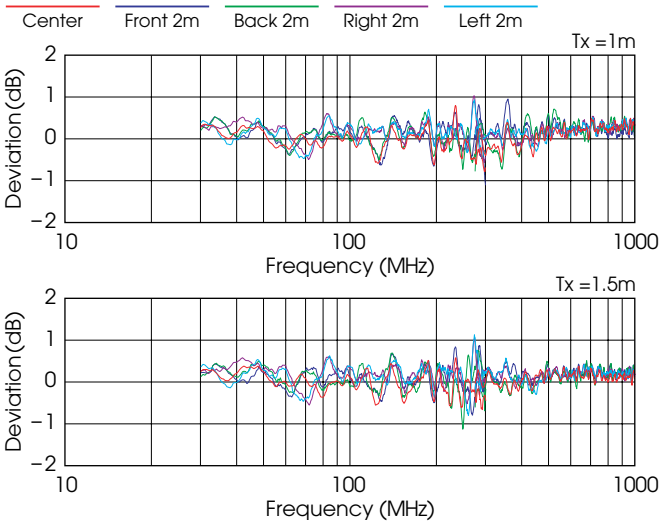
Reference Site Method

New test site evaluation method which replaces NSA (Normalized Site Attenuation)
Site evaluation method based on APR (Antenna Pair Reference) / Reference site: Liberty Labs.

Horizontal polarized wave



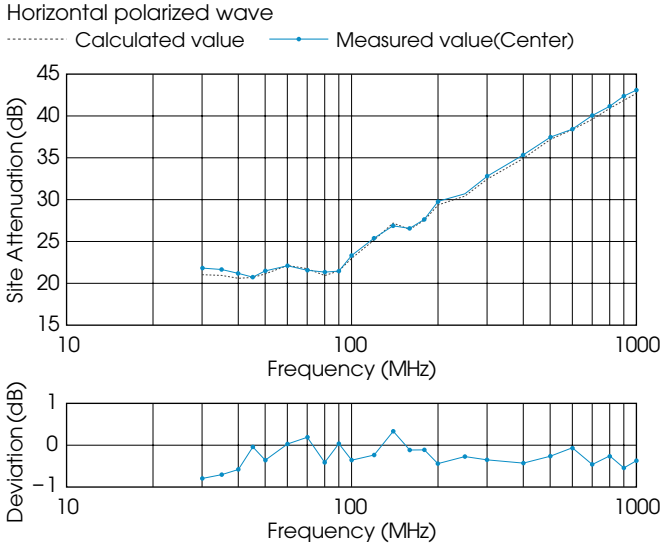
Vertical polarized wave



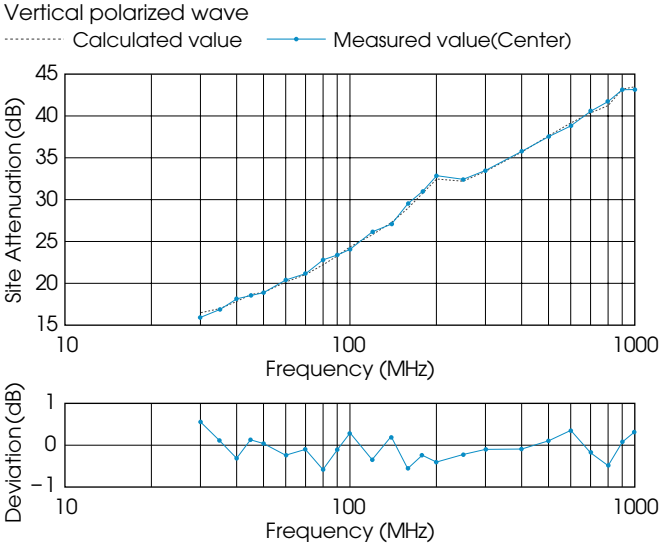
Site performance evaluation using reference dipole antennas: CISPR16-1-5 CALTS characteristics (Horizontal polarized wave), REFTS characteristics (Vertical polarized wave)

Evaluation using antenna calibration test site method stipulated in CISPR16-1-5: Using reference dipole antennas which allow theoretical calculation (moment method and such)

Horizontal polarized wave



Vertical polarized wave



For EMC measurement/evaluation
Electromagnetic wave anechoic chambers

REPRESENTATIVE SPECIFICATION EXAMPLE

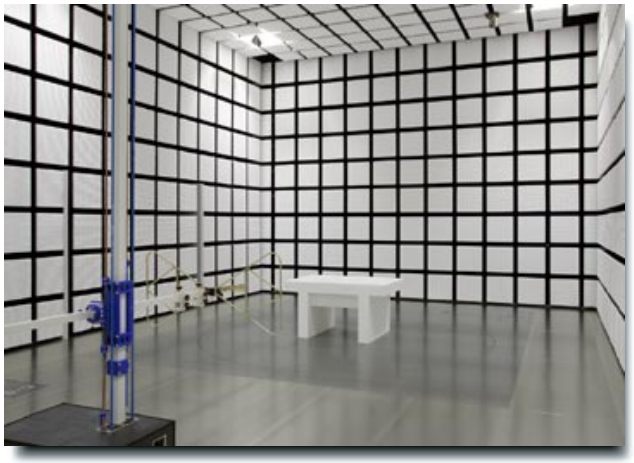
10m test range

Specification example

Shield surface dimension	L25 x W14 x H9m
Inner-wall dimension	L22.4 x W11.4 x H7.7m
Electromagnetic Wave Absorbers	IB-017(L100 x W100 x T5.2mm)
	IP-130BLB(L600 x W600 x H1300mm)
	ICM-006(L100 x W100 x H60mm)*
Turntable	ϕ3m(0.5ton)/ ϕ6m(4ton)Dual

* ICM-006-mounted EMS absorbing plate + Fully-automated beneath floor storage device

Site attenuation characteristics
30MHz～1GHz : Within ±3dB(ϕ5m area)



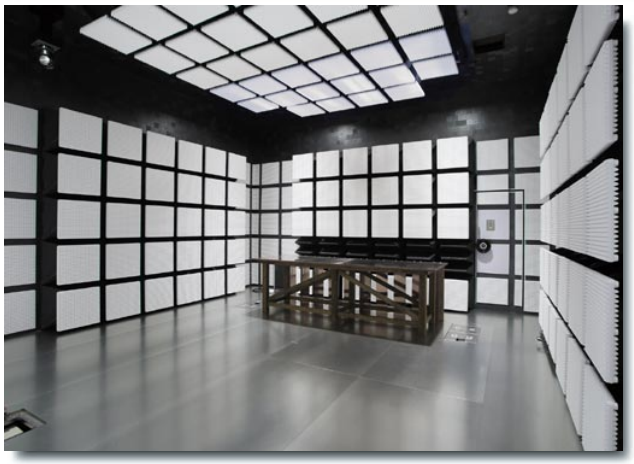
3m test range

Specification example

Shield surface dimension	L12 x W8.5 x H6m
Inner-wall dimension	L10.6 x W7.1 x H5.3m
Electromagnetic Wave Absorbers	IB-017(L100 x W100 x T5.2mm)
	IP-065BL(L600 x W600 x H650mm)
	IP-045C(L600 x W600 x H450mm)*
Turntable	ϕ3m(1ton)

* Floor-installed EMS-absorbing electromagnetic wave absorber

Site attenuation characteristics
30MHz～1GHz : Within ±3dB(ϕ3m area)



For evaluation and testing of car-mounted components

Specification example

Shield surface dimension	L7 x W6.5 x H4.3m
Inner-wall dimension	L6.5 x W5.5 x H3.5m
Electromagnetic Wave Absorbers	IB-017(L100 x W100 x T5.2mm)
	IP-045BLB(L600 x W600 x H450mm)
	IP-045C(L600 x W600 x H450mm)
Measurement table for CISPR25	L3000 x W1500 x H900mm

For evaluation and testing of cars

Specification example

Shield surface dimension	L16 x W12 x H6.5m
Inner-wall dimension	L14 x W10 x H5.5m
Electromagnetic Wave Absorbers	IB-017(L100 x W100 x T5.2mm)
	IP-090BLB(L600 x W600 x H950mm)
Turntable*	ϕ8m(5ton)

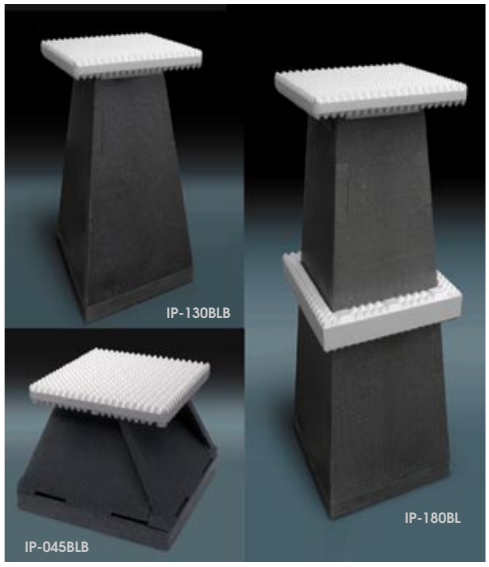
* Chassis-dynamometer equippedr

Site attenuation characteristics
30MHz～1GHz : Within ±3dB(ϕ5m area)

For EMC measurement/evaluation
Electromagnetic wave absorber

SPECIFICATION EXAMPLES OF STANDARD TYPE

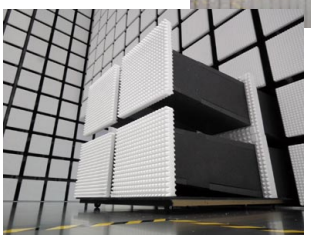
For EMC measurement/evaluation electromagnetic wave anechoic chambers



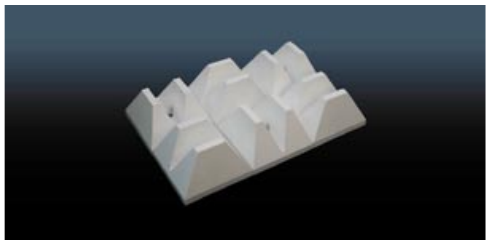
L600 x W600mm
IP-045BLB : H450mm / IP-065BLB : H650mm
IP-090BLB : H950mm / IP-130BLB : H1300mm
IP-180BL : H1800mm / IP-250BL : H2500mm

IP-045BLB, IP-065BLB, IP-090BLB, IP-130BLB, IP-180BL, IP-250BL

Hybrid type wave absorber IP-090BLA solves the limitations of decreasing the size and weight of the conventional wedge-shaped casting type, and reinforces wave absorbing characteristics throughout a wide range.
The Hybrid type wave absorber IP-BLB series further expands the innovative original structure of IP-090BLA.
While IP-090BLA's highly-acclaimed outstanding absorbing characteristics are maintained, further weight saving and rationalization of the structure have been made.
We provide one of the industry's smallest occupied volume and the best wave absorbing characteristics for all kinds of anechoic chambers, such as special-purpose large anechoic chambers, as well as the 3m Test Range and 10m Test Range anechoic chambers.



Hybrid type absorber IP-250BL (total length: 2.5m) used for the wall of the latest 10m Test Range anechoic chambers. Ideal electromagnetic environment of the CALTS-specification surpassing the existing world highest standard is realized.



L100 x W100 x H60mm
Picture : x 6 pieces
Non flamable certification number : NM-0582

ICM-006

Small noncombustible wave absorber as short as 60mm high. In a combination with ferrite wave absorber, it allows construction of 3m Test Range electromagnetic wave anechoic chambers and small anechoic chambers through the combination with ferrite electromagnetic wave absorbers in a space-effective way with superb electromagnetic wave absorbing characteristics even at low frequencies.

L600 x W600 x H450mm
Fire resistance: JIS A1322 flameproof 1st degree
UL94V-0, VTM-0

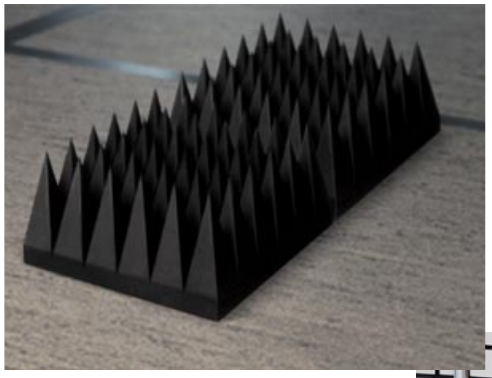
ID-045

A cross-wedge shape is formed to achieve optimal electromagnetic wave absorbing efficiency with thin-plate electromagnetic wave absorber material in which special conductive fabric is incorporated with inorganic-organic mixed base materials. It is light and has high incombustibility.
Outstanding wave absorbing performance from low as 30MHz up to 18GHz high frequency in combination with ferrite electromagnetic wave absorber materials is realized.
Flat-pile supported separated/folded structures greatly reduce the cubic capacity during transportation, realizing a single mass of 1kg, as well as reducing the environmental burden.

For EMC measurement/evaluation
Electromagnetic wave absorber

SPECIFICATION EXAMPLES OF STANDARD TYPE

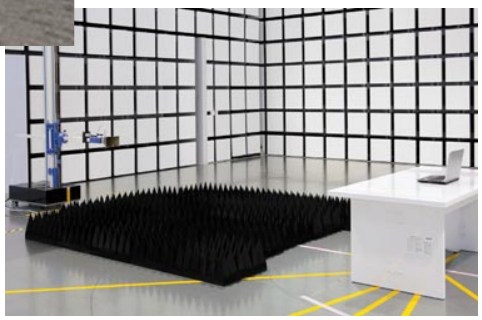
For GHz band radiation noise measurement



L600 x W600 x H300mm
Picture : x 2 pieces

IS-030A2

30cm-high pyramid-shaped electromagnetic wave absorber which has proven its outstanding performance in microwave/millimetric wave electromagnetic wave anechoic chambers.
Wide frequency range performance covering 800MHz-110GHz is realized.
Anechoic characteristics for GHz-band radiation noise measument, compatible with Site VSWR standard*, can be easily configured.
More than 10 years of mechanical longevity without creep (sagging) at the tip has been achieved. A long term of superb electromagnetic wave absorbing performance is maintained.



*The measurement of Site VSWR (Site Voltage Standing Wave Ratio) is a method stipulated in CISPR16-1-4 Ed3.1 as an evaluation method for the electromagnetic environment of test sites which are used to measure interfering waves over 1GHz, and it measures the anechoic characteristics of the test range of sample devices.

For antenna design/evaluation
Electromagnetic wave anechoic chambers

REPRESENTATIVE SPECIFICATION EXAMPLE

Large type for the evaluation of radar and large antennas

Specification example

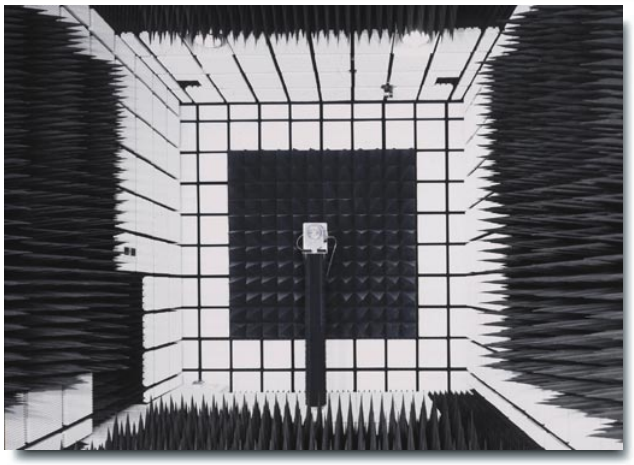
Shield surface dimension	L33.6 x W13.6 x H13m
Inner-wall dimension	L33 x W12.6 x H12m
Electromagnetic wave absorbers	IS-M030*(L600 x W600 x H300mm)
	IS-SM050**(L600 x W600 x H500mm)
Quiet zone (QZ) dimension	ϕ3m sphere
Distance between QZ center and source: 20m	

* For main walls for millimeter waves ** For long sidewalls, ceilings, and floors

Unwanted incidental characteristics of QZ

4GHz～: −45dB / 10GHz～: −45dB / ～75GHz: −50dB

This high-performance anechoic chamber can be used to evaluate large-scale radar scattering cross-sectional areas.



Middle-sized type for antenna evaluation

Specification example

Shield surface dimension	L12 x W6 x H6m
Inner-wall dimension	L10 x W4 x H4m
Electromagnetic wave absorbers	IS-100*(L600 x W600 x H1000mm)
	IS-SM100**(L840 x W600 x H1000mm)
Quiet zone (QZ) dimension	ϕ2m sphere
Distance between QZ center and source: 6m	

* For main walls ** For long sidewalls, ceilings, and floors

Unwanted incidental characteristics of QZ

0.8GHz～: −30dB / 1.6GHz～: −35dB / 2.5GHz～: −43dB / 5.5GHz～: −50dB
27～100GHz: −53dB

High-precision small type for antenna evaluation

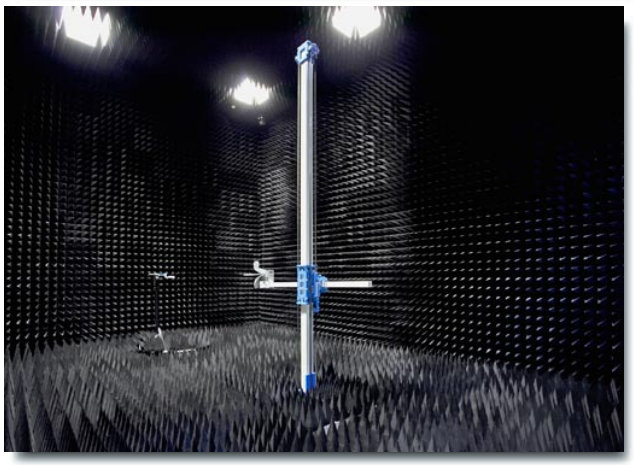
Specification example

Shield surface dimension	L7 x W4 x H3m
Inner-wall dimension	L5.8 x W3 x H2m
Electromagnetic wave absorbers	IS-060*(L600 x W600 x H600mm)
	IS-SM050**(L600 x W600 x H500mm)
Quiet zone (QZ) dimension	ϕ0.6m sphere
Distance between QZ center and source: 3m	

* For main walls ** For long sidewalls, ceilings, and floors

Unwanted incidental characteristics of QZ

0.8GHz～: −30dB / 1.0GHz～: −35dB / 2.5GH～: −40dB
5.5～100GHz: −50dB



Middle-sized type for performance/diverse communication devices

Specification example

Shield surface dimension	L12 x W7 x H7m
Inner-wall dimension	L11.1 x W6.1m x H6.1m
Electromagnetic wave absorbers	IS-045*(L600 x W600 x H450mm)
3D manipulator	ϕ1.2m, 2 axes

* For main walls, sidewalls, ceilings, and floors

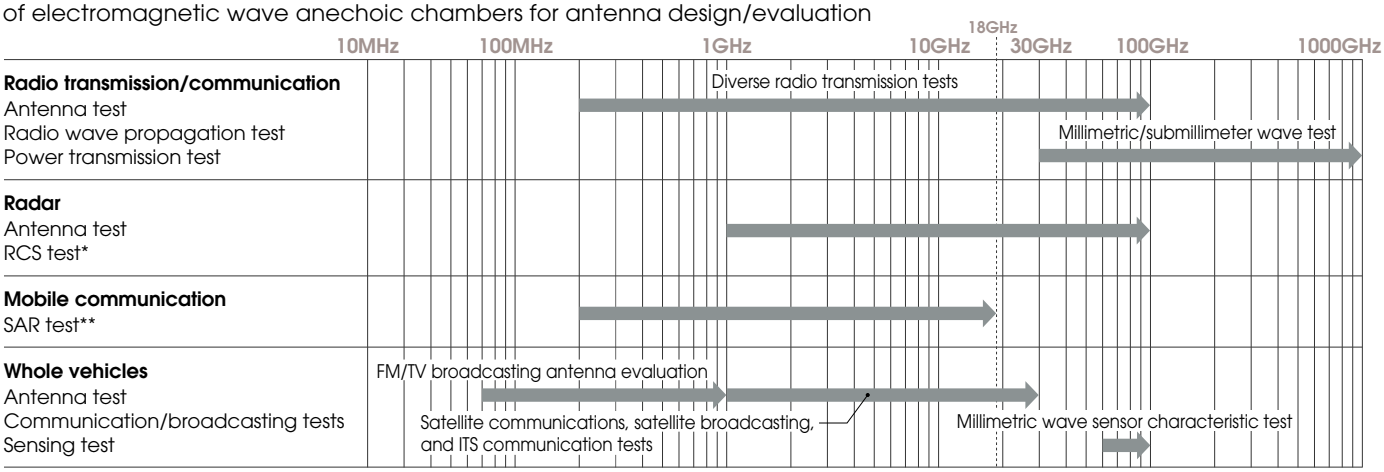
OTA performance evaluation

Supporting CTIA(Cellular Telecommunications Industry Association)
TRP (Total Radiation Power) measurment
TIS (Total Isotropic Sensitivity) measurment

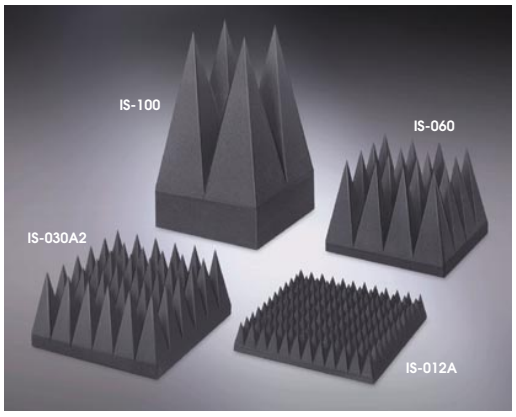
For antenna design/evaluation
Electromagnetic wave absorber

SPECIFICATION EXAMPLES OF STANDARD TYPE

Major applications and measurement frequency ranges
of electromagnetic wave anechoic chambers for antenna design/evaluation



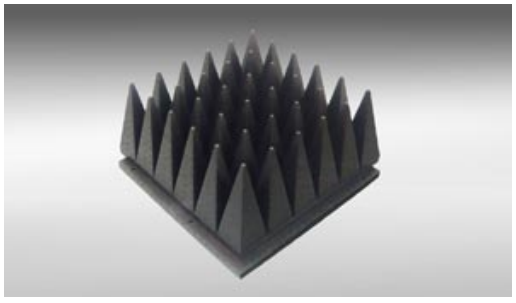
* RCS (Radar Cross Section) test : Radar reflection cross-section area (stealth property) test
** SAR (Specific Absorption Rate) test : Electromagnetic wave energy specific absorption rate test



For microwave - submillimetric wave
IS-012A, IS-030A2, IS-060, IS-100

Piramidal electromagnetic wave absorber using carbon ohmic resistivity with formed polystyrol base material.
Piramid heights from 50mm through 1000mm have been made in series, covering a wide range, from 200MHz millimetric waves to over 100GHz submillimetric wave bands. Heights are selected based on operational frequency and absorbing performance.
With its closed cell structure, superb environmental resistance can be maintained for long periods.

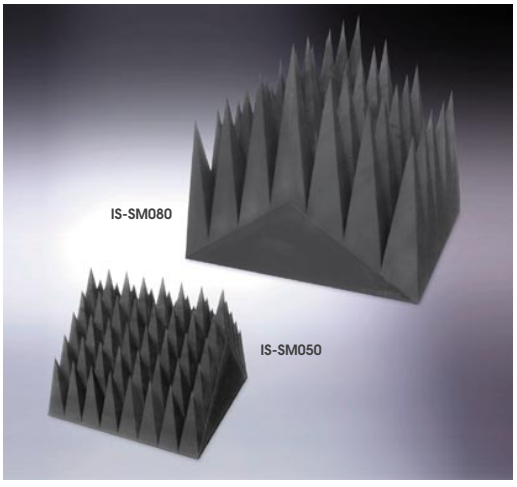
L600 x W600mm
IS-005A : H50mm / IS-012A : H120mm / IS-030A2 : H300mm
IS-045 : H450mm / IS-060 : H600mm / IS-100 : H1000mm
Fire resistance: UL94 HBF



For microwave
IK-030

Piramidal electromagnetic wave absorber optimized for the ceilings, floors, and walls of microwave anechoic chamber.
The carbon ohmic loss provides superb absorption characteristics for microwaves over 1GHz, which is ideal for floor-installed absorbent in EMC measurement/evaluation (Supports new high-frequency regulation S-VSWR).
The use of polypropylene foam promises long operational life.

L600 x W600 x H300mm
Fire resistance: UL94 HBF



For microwave - millimetric wave
Oblique incidence type
IS-SM050, IS-SM080

Electromagnetic wave absorbers exclusively designed for oblique incidence. Superb electromagnetic environment can be made by mounting it at the center of side walls of microwave anechoic chamber.
Formed polyethylene base material, which is also used in the IS series, is molded into a custom designed multi-axial pyramid shape, providing superior oblique incidence characteristics. These out-perform conventional piramidal electromagnetic wave absorbers in a wide range covering microwave-millimetric waves.

IS-SM050 : L600 x W600 x H500mm
IS-SM080 : L840 x W600 x H800mm
Fire resistance: UL94 HBF

For antenna design/evaluation
Electromagnetic wave absorber

SPECIFICATION EXAMPLES OF STANDARD TYPE

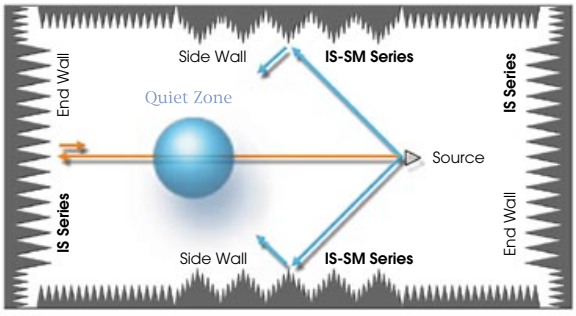
For FM band - microwave

IP-100BX, IP-130BX, IP-175BX, IP-200BX

Microwave-compatible electromagnetic wave absorber made of graphite-containing formed polystyrol.
Through combinations of ferrite electromagnetic wave absorbers, superior wave absorbing characteristics from the FM band (70MHz and higher) through the microwave range are provided.

L600 x W600mm
IP-100BX : H1000mm
IP-130BX : H1300mm
IP-175BX : H1750mm
IP-200BX : H2000mm
Fire resistance: UL94 HBF

Design concept of electromagnetic wave anechoic chambers for antenna evaluation



IS-SM series – high-performance oblique incidence-dedicated electromagnetic wave absorbers – and IS series – high-performance vertical incidence electromagnetic wave absorbers – were applied.

⇆ : Vertical incidence characteristics and ↙↖ : oblique incidence characteristics were improved and reinforced to reduce the level of unwanted incident wave into the quiet zone, realizing the world's best measurement accuracy.

Quiet Zone: A space where the level of unwanted waves reflected from the walls, floors, and ceilings is always under a preset value. The quietness guarantees the measurement of the actual performance of the chambers.

Main supplemental facilities

EXAMPLES OF 10m TEST RANGE ELECTROMAGNETIC WAVE ANECHOIC CHAMBER

Sliding is completed
barrier-free open status

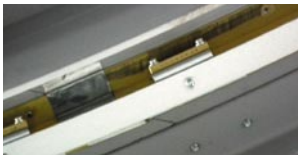
Fully shielded/closed
Example of shielding door size
Width: 3.6m x Height: 3m

Elevating threshold
with nickel-plated shield fingers

The opening is sealed to provide
a barrier-free floor.

View of the lower structure
from the pit. This entire structure
rotates in the new system.

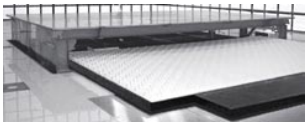
The gap between the floor and
turntable can strictly be set de-
pending on the performance of
the anechoic chambers.



The unique brush structure
of the rotor provides excel-
lent electrical conductive
properties at the ground
plane on the floor and electromagnetic shield.

The hatch is fully open after
remote-control operation.

View of the stairway seen from the pit side.
Safety-first electric open/close structure.



Elevation of storage
device → Wave
absorber cart
moves forward

Mounted wave absorber
ICM-006
L100 x W100 x H60mm

Installation of wave
absorber is completed.

Outside sliding barrier-free shielding door

- Fully-automated electrically opening/closing shielded door. Unlike the conventional structure which lifts and lowers the threshold on the floor to provide a barrier-free environment, this original structure drives the shield pieces, which are installed between the door surfaces, with a motor. With moveable shielding pieces fastened with the shield fingers of the entire doorframe, seamless, superior shielding performance is realized.
- Shield fingers with reinforced anti-wear properties and environmental resistance via robust nickel plating are attached. Initial shield performance can be maintained for a long period.
- Connecting this to an emergency power source allows opening/closing of the door during power failures just by switching.

Swinging barrier-free shielding door

- Motorized opening/closing, tightening operations provide superior shielding performance.
- The electric threshold descends when opening, providing a barrier-free floor.
- The shield fingers are plated with nickel to protect them from corrosion and abrasion. This feature maintains the initial shield performance for a long period.
- As a safety feature, the brake on the tightening rotation handle motor is automatically released during power failures so that the door can be manually opened.

Turntable

- We selected a motor with the most appropriate specifications, such as rotational speed and control accuracy, for desired turntable performance. Appropriate noise countermeasures depending on motors are implemented, so minimizing interference with the anechoic chamber performance.
- Installation of high-precision AC servo motors is also available.
- A wide range of requests for diverse facilities and devices, such as special power sources, chamber exhaust systems, water drainage facilities, and chassis dynamometers, can be fulfilled.

Turntable pit access hatch

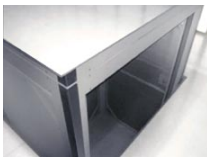
- Electric open/close hatch structure can be operated with a remote controller. Safety is our priority.
- Through the double-action tightening action, the hatch stops at a certain position before it's fully closed, and additional button on the remote controller must be pushed. This double action safety feature prevents unforeseen accidents.
- An escape door is installed in the center of the hatch so that one can escape safely in case of emergency, such as power failures, and so forth.

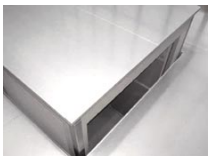
Automatic storage system for EMS absorbers

- Taking out and storing wave absorber panels with a floor-installed wave absorber can be performed safely and quickly in a fully-automated way, shortening operational period and improving measurement accuracy.
- The remote controller allows fine-tuning of the position of the pulled-out absorber panels back and forth accoording to the EUT size (Option).

Main supplemental facilities

EXAMPLES OF 10m TEST RANGE ELECTROMAGNETIC WAVE ANECHOIC CHAMBER





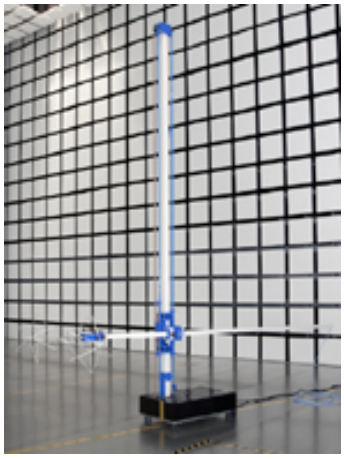
Storage system for associated equipment

- This electric storage unit transfers diverse equipment, such as operational computers connected to EUT on the turntable, directly from the chamber to the pit.
- The double-action operation, in which additional switching is required when it is tightened provides safety.

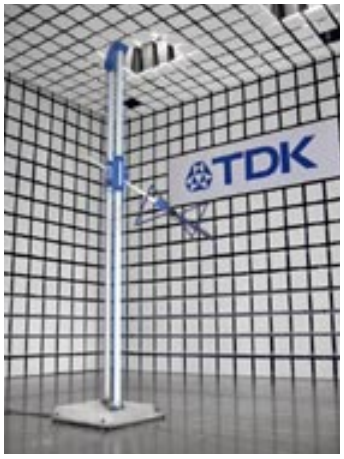
Left : Associated equipment storage is fully ascended.
Right : Safely tightened through the double action

LED lighting

- EMC design is in place for the use in the anechoic chamber. Its extensively long life can reduce the costs for maintenance works such as replacement.
- Its great luminous efficiency and low power consumption for required illumination reduce electric power cost and CO_2 emissions.
- Blink response time is short, and controlling is easy.
- Indoor air conditioning cost can also be reduced because of low thermal load.
- No hazardous substances to the environment and human such as mercury are included.



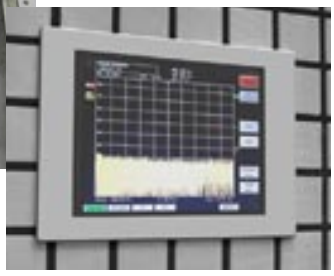
Horizontal elevation type
(Base size : L95 x W60 x T30cm)



Tilting type
(Base size : L140 x W120 x T24cm)

Antenna positioner

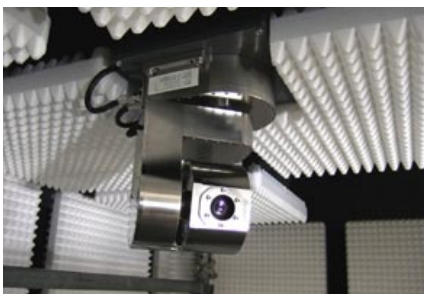
- Downsizing the base unit reduces electric wave reflection. The top and four side surfaces are covered with ferrite absorber materials to minimize the influence on the chamber performance (Horizontal elevation type).
- With our optimized base design, operational stability is assured for both the horizontal elevation type and tilting type when attaching antennas.
- The angles of the tilting type can accurately be adjusted in units of 1 degree to any degree between horizontal plus/minus from minus10 to plus 45. The antenna tilt measurement (reduced uncertainty) of CISPR16-4-2 will be available.



Underfloor-stored projector system

- This system allows real time measurement and countermeasure of the data sent from the measurement room, such as analyzer waves.
- The projector unit is stored under the floor to reduce the influence on the anechoic chamber characteristics.
- The projection angle can be adjusted from the turntable pit under the floor. Controlling the power is also possible inside the anechoic chamber.

White-colored materials are used for the projection panel in consideration of electromagnetic wave reflection.



ITV system (monitoring camera)

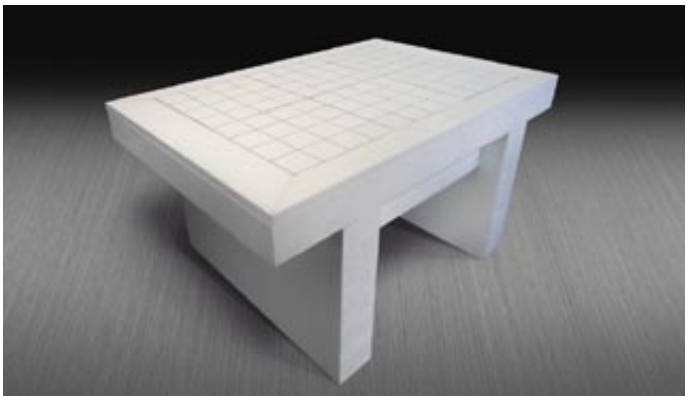
- The body size was downsized to reduce its influence on the anechoic chamber characteristics.
- Detailed operational conditions of small EUT, such as mobile phones, can be inspected.

Ceiling-installed type : 35x zooming capacity
(Main body : L18 x W18 x H22cm)

Floor-installed movable type : 10x zooming capacity
(Main body : L26.3 x W13.6 x H12.3cm)

Main supplemental facilities

EXAMPLES OF 10m TEST RANGE ELECTROMAGNETIC WAVE ANECHOIC CHAMBER



Low-reflection EUT setup desk compatible with GHz band

- EUT setup table ideal for measuring 1GHz and higher, using low dielectric constant foam body
- The surface of the gridded tabletop is composed of individually-replaceable six panels, allowing easy repair when it's damaged or dented.

Withstand weight : 100kg / Heatproof temperature : 100℃

Width : 150 x Depth : 100 x Height : 80cm

EMC automated measurement system

TDK has accumulated an extensive history of achievements in EMC automated measurement system for consumer devices, information communication devices, and automobiles in Europe, the United States, and Asia.

Based on these achievements, we give suggestions for system arrangement best suited your requests.

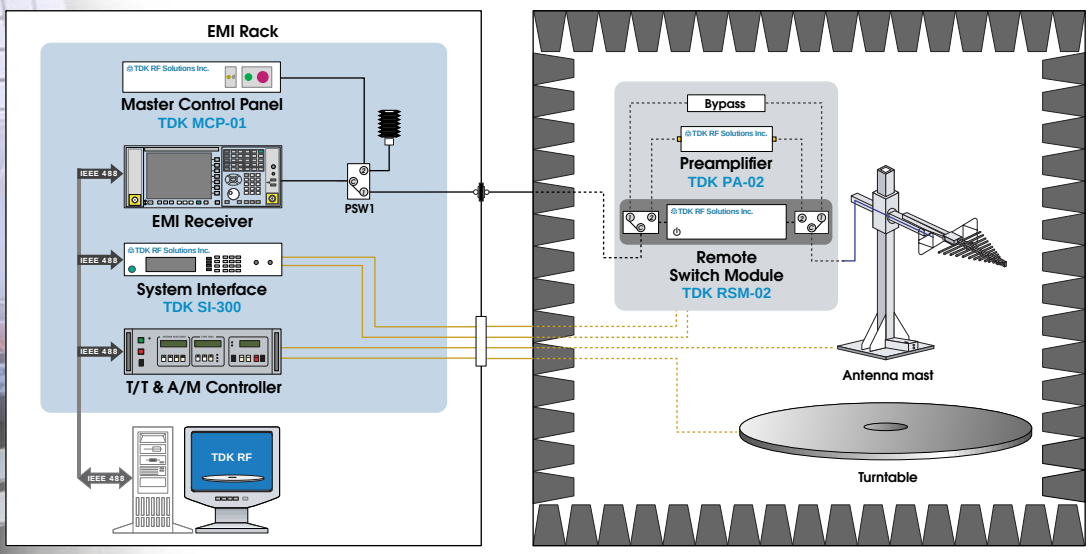
By combining TDK original hardware and automated measurement software such as system interface, antenna, and such, we realize efficient EMC measurement and superior measurement repeatability.

Automatic measurement system for EMI and EMS

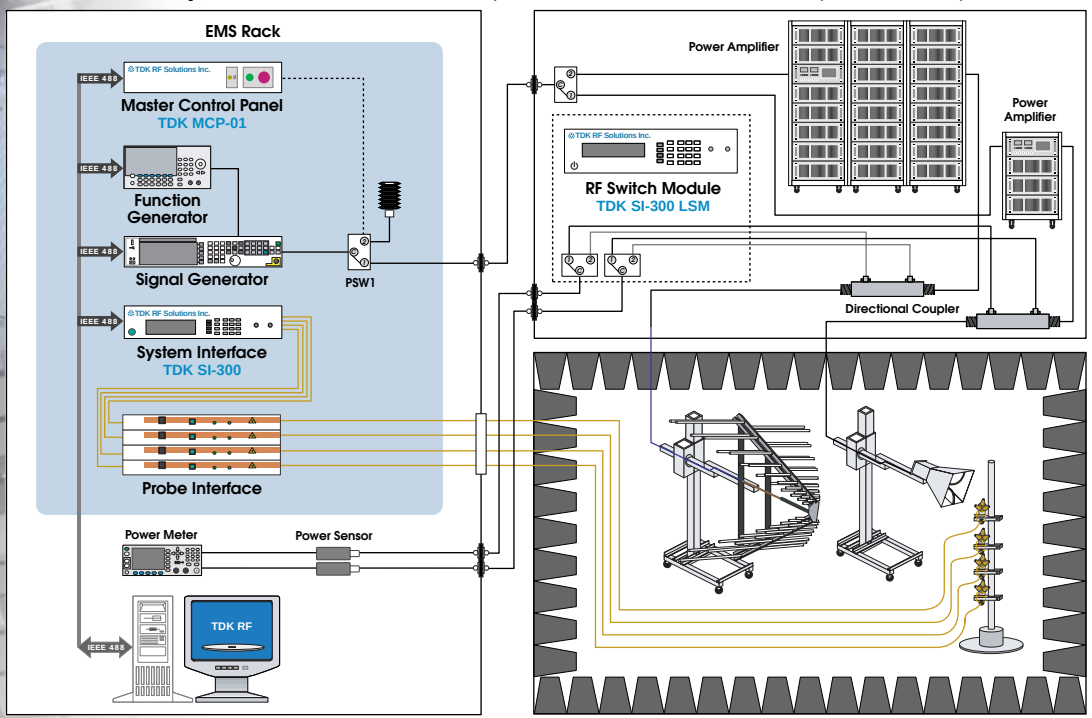
The system is designed to provide high efficiency and accuracy for radiation/conduction emission measurement test and radiation/conduction immunity test, whether it's done automatically, semi-automatically, or manually.

We provide solutions meticulously responding to diverse needs from customers such as precautional measurement in the product development stage and EMC standard certification measurement and such.

TDK EMI Test System (Radiation emission automatic measurement system example)

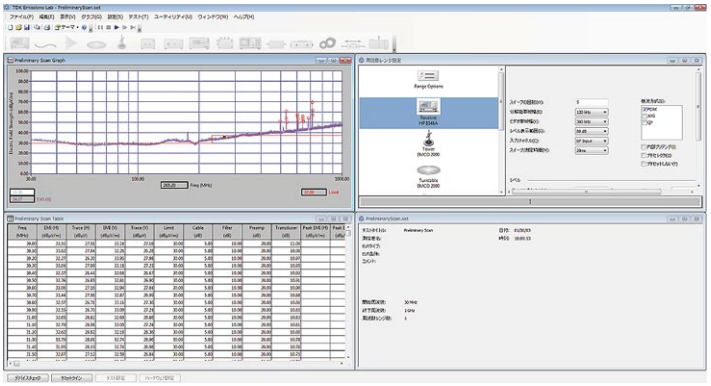


TDK EMS Test System (Radiation immunity automatic measurement system example)



EMC automated measurement system

EMC automatic measurement software

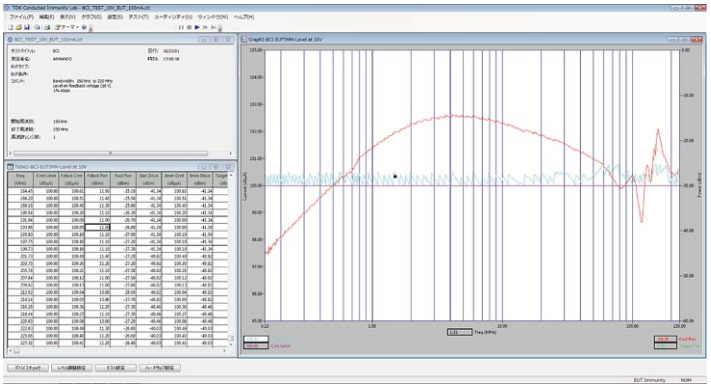


Emission Lab software: EMI-LAB

Measurement of radiation emission and conduction emission is automated.

- Supported standards: Compatible with almost all EMI standards such as CISPR, FCC, MIL-STD, ETSI, and such.
- Supporting diverse controllers for turntables and antenna positioners.
- Compatible with the automation of preliminary measurement, final measurement, site attenuation measurement, and such.
- Table/graph views of experimental data*

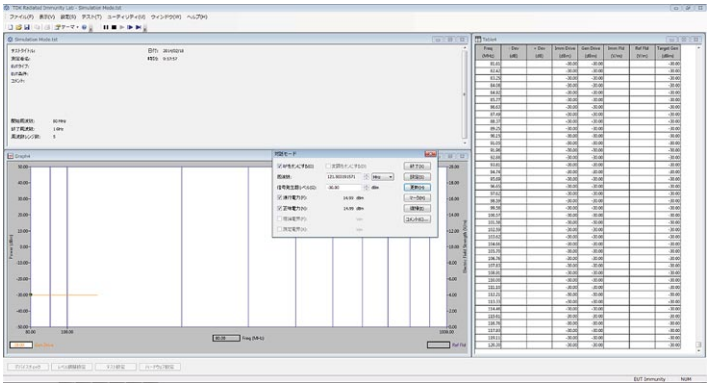
* Amplitude vs. Frequency: x-y plot / Amplitude vs. Antenna height and turntable position: Color mapping / Amplitude vs. Turntable position: Circular plot / Amplitude vs. Antenna height: x-y plot



Conduction immunity Lab software: CON-LAB

Supporting automation of conduction immunity test and BCI (Bulk Current Injection) test

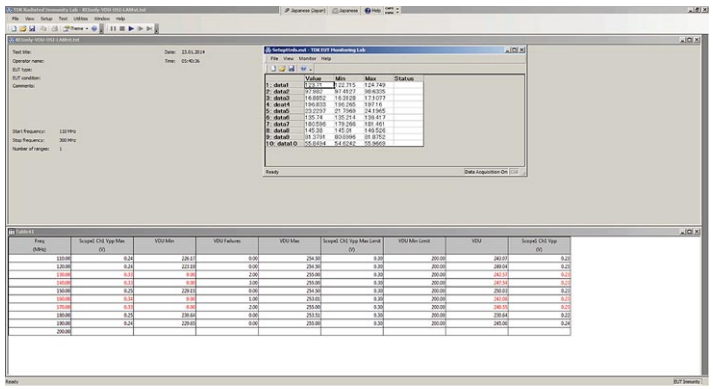
- Supported standards: IEC61000-4-6, ETSI, ISO11451, ISO11452, JASSO, SAE, and such
- Automating tolerance tests for conducted interference in the power source, signals, and control lines
- Supporting conduction immunity tests and BCI tests, using CDN (Coupling Decoupling Network) and ISN (Impedance Stabilization Network)
- Research on EUT immunity threshold is available by shifting to the dialog mode during the immunity test.



Radiation immunity Lab software: RAD-LAB

Radiation immunity tests, using electromagnetic wave anechoic chambers, GTEM, strip lines, are supported.

- Supported standards: IEC61000-4-6, ETSI, ISO11451, ISO11452, JASSO, SAE, and such
- Supporting two test methods: "Substitution method" and "Closed loop method"
- Research on EUT immunity threshold is available by shifting to the dialog mode during the immunity test.
- Supporting electric field uniformity tests using the calibration method (constant electric field method) of IEC61000-4-3



EUT monitoring software: EUT-LAB

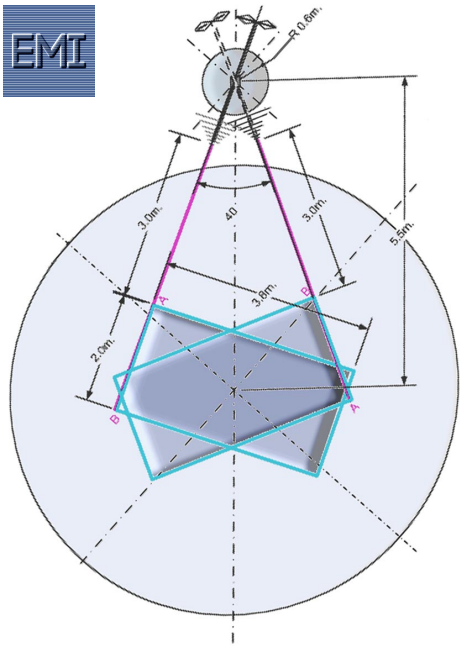
Monitoring EUT status and automating the detection of EUT malfunction during the immunity test

- EUT status information is obtained through measuring instrument such as oscilloscopes, receivers, and audio analyzers.
- The obtained EUT status information is sent to the conduction immunity Lab software or radiation immunity Lab software, and is recorded together with test data.
- EUT malfunction detection is automatically performed during the immunity test by defining EUT malfunction criteria.

EMC automated measurement system

Antenna positioning system

EMI



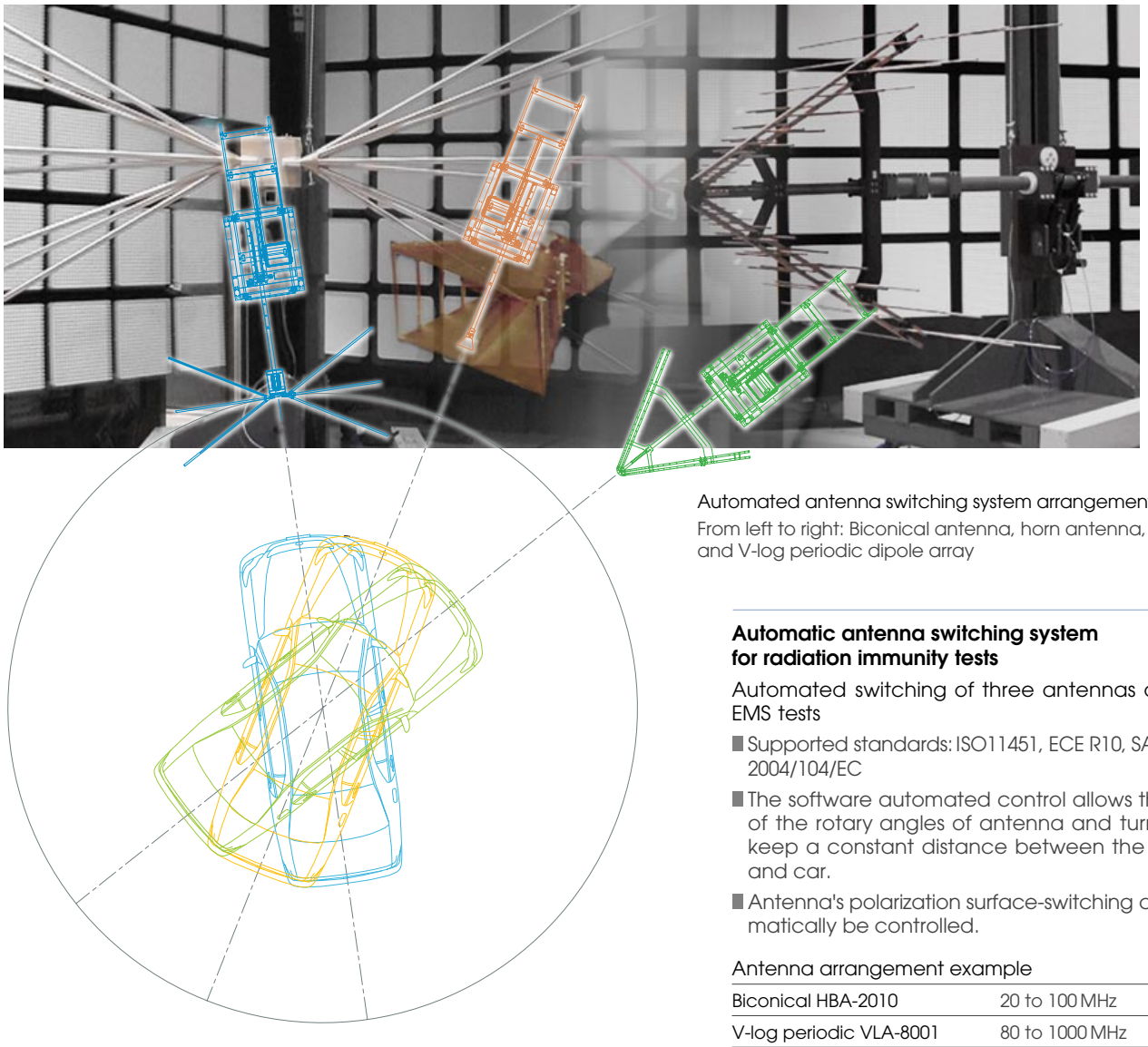
Dual antenna positioning system: DAPS

Two reception antennas can automatically be switched with one mast.

- Supported standards: CISPR12, SAE J551, 2004/104/EC
- The software automated control allows the linking of the rotary angles of antenna and turntable to keep the right-angled corresponding positions of the antenna and car.
- Antenna's polarization surface-switching can automatically be controlled.

Specification example

Control	Optical fiber cable
Driving method	Azimuth rotation : 0.5RPM / Polarization surface-switching : Air driving 30PSI (2.1k/cm^2)
Height control	Manual operation
Dimensions	ϕ60 x H200 cm
Power source	Single phase AC100-270V
Weight	10 kg



EMS

Automated antenna switching system arrangement example
From left to right: Biconical antenna, horn antenna, and V-log periodic dipole array

Automatic antenna switching system for radiation immunity tests

Automated switching of three antennas optimizes EMS tests

- Supported standards: ISO11451, ECE R10, SAE J551, 2004/104/EC
- The software automated control allows the linking of the rotary angles of antenna and turntable to keep a constant distance between the antenna and car.
- Antenna's polarization surface-switching can automatically be controlled.

Antenna arrangement example

Biconical HBA-2010	20 to 100 MHz
V-log periodic VLA-8001	80 to 1000 MHz
Horn HRN-0106	1 to 6 GHz

EMC automated measurement system

High-performance antenna / E-field generator

Hybrid log periodic antenna: HLP-2006C

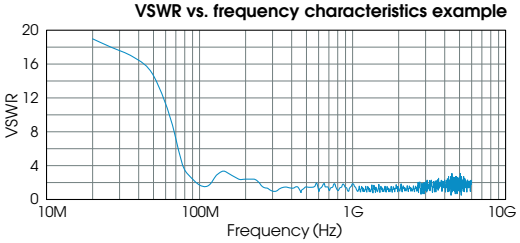
EMI EMS

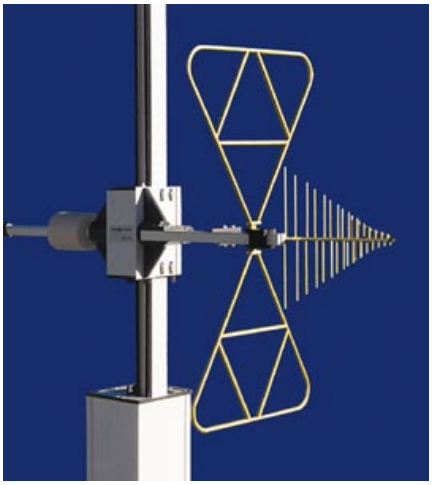
Supported standards
Automobile: CISPR12, CISPR25, ECE R10, 2004/104/EC, JASO
Consumer product: FCC Part15 (ANSI C63.4), CISPR22, VCCI, IEC61000-4-3

- Wide range antenna supporting frequencies from 20MHz to 6GHz.
- Special balun internal structure provides stable performance.
- It weighs only 2.2kg, and the low-frequency element can also be detached.
- N-shaped connectors are used.

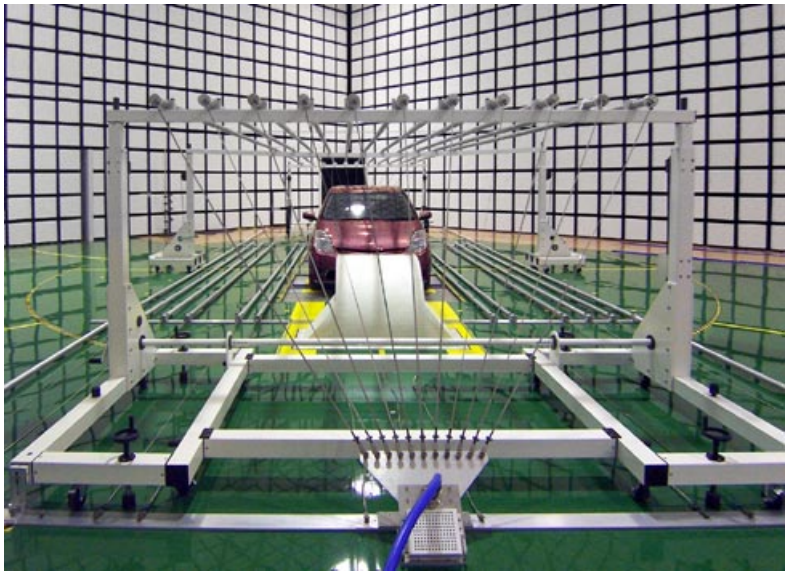
Frequency range	20MHz to 6GHz
Maximum input	100W
Average VSWR	2.0
Input impedance	50Ω

VSWR vs. frequency characteristics example





L156 x W69 x H71cm 2.2kg



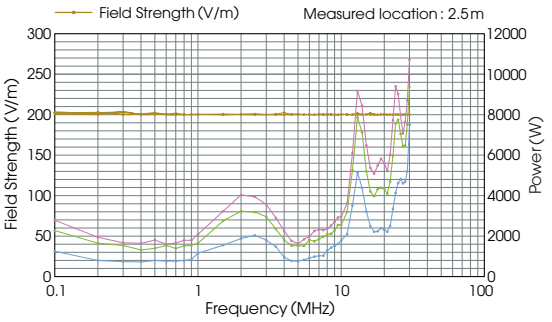
L15.6 x W5.7 x H2.1m 1500kg

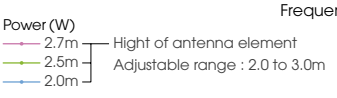
Strip line antenna: STL-03

EMS

- Strip line antenna generates 200V/m (DC to 30MHz) electric field
- With a great property in the TEM mode, it can be extensively used for multi-mode tests.
- Superb electric field uniformity in the longitudinal direction.
- Electromagnetic wave anechoic chamber can be used both on metallic floor and on earth e-quivalent floor.

Frequency range	DC to 30MHz
Polarization	TEM
Maximum input	10000W
Average VSWR	2.0
Input impedance	50Ω

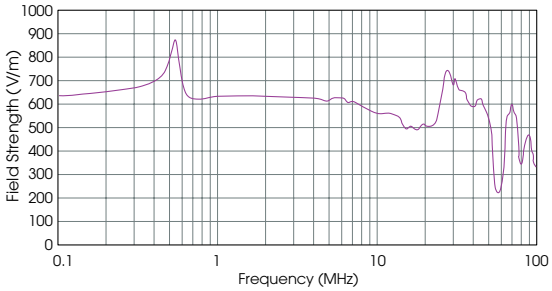




E-field generator: EFG-02

EMS

- It generates a strong electric field of 500V/m between 10kHz and 50MHz.
- It's designed to generate strong electric fields only between elements, and reduces incoming radiation around the device.
- Large DUT tests can be performed as the elements are large and their heights can be adjusted.



Electric field strength vs. Frequency characteristics example

Input voltage: 3500W

Frequency range	10kHz to 100MHz
Polarization	TEM
Maximum input	3500W
Input impedance	50Ω

L335.3 x W76.2 x H195.6cm
200kg