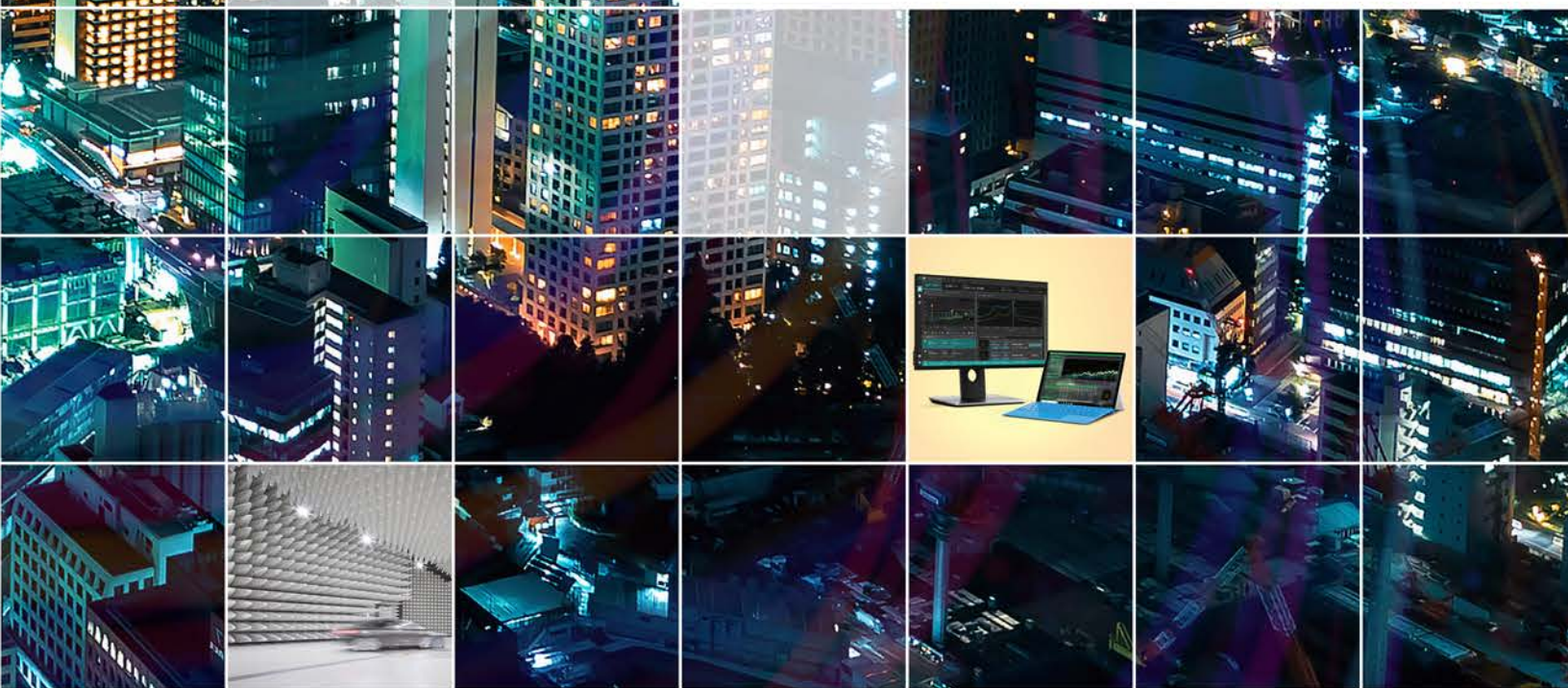
TOYO Corporation

Quest for Precision

EMC SELECTION CATALOG

2022



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TOYO EMC Solutions

With more than 40 years of experience and achievements in the field of EMC testing, we continue to provide EMC solutions not only domestically but internationally, including in regions such as China, Southeast Asia, and the US. Our EMC solutions help you conduct the EMC tests compliant with industry standards. These standards range from those for consumer electronics, automobiles, wireless devices, and information equipment, to those of the United States military (MIL-STD).

Emissions (EMI) Measurement Solutions

From the simplified tests for EMI evaluation and mitigation at the R&D stage to final certification measurements according to standards done in the anechoic chamber, we provide the optimal systems, products, and accessories to meet a variety of user needs.

Measurement Systems (for Compliance)

- Consumer (CISPR, EN, ETSI, FCC, VCCI, etc.)
- Vehicle (each radiation / conducted emissions standard, each vehicle manufacturer's standard)
- Aircraft, MIL
- Medical care (IEC60601-1-2, CISPR 11)
- Wireless device TS51.010-1, TS34.121 (3GPP) Mobile phone EN300 328, EN301 893 (ETSI) Wireless LAN, etc.

Measurement Software

- EPX series
- ES10 series
- EP series

Simpler Measurements

- G-Cell, G-TEM

EMI Test Receiver (CISPR16-1-1 Compliant) Accessories

- Antenna: 20Hz~40GHz
- Preamplifier: 9kHz ~40GHz
- Artifical mains network
- ISN, AAN
- Absorbing clamp
- Comb generator

Harmonic / Flicker Measurement Systems

Immunity Test Solutions

Test Systems optimal in accordance with product standards and those which control equipment such as signal generators, electric field probes, power meters, and antenna masts, will help improve test efficiency. A wide variety of products for pulse immunity testing are also available.

Measurement Systems

- Consumer (IEC, EN, CISPR, JIS, national standards, etc.)
- Vehicle (ISO, standard of each vehicle manufacturer)
- Aircraft, Military
- Medical care
- Mobile phone (EN 301 489) and others

Measurement Software

- IM5 series

Power Amplifiers

- 9kHz~40GHz

Accessories

- Antenna: 10kHz~40GHz
- Power meter / sensor: 9kHz~40GHz
- CDN (CISPR16-1-2 compliant)
- Electric field sensor: 10kHz~40GHz
- Current probe
- Fiber optic link system, camera

Pulse Immunity Systems

- ESD tester (IEC61000-4-2, ISO10605 compliant)
- Pulse immunity simulator (Compliant with IEC61000-4-4, IEC61000-4-5, etc.)
- Pulsed immunity test system for on-vehicle devices

Vehicle-related Immunity Test System

- Radiation immunity test system
- Radar pulse compatible immunity test system
- Microwave radiated immunity test system
- Cell method (G-TEM, TEM CELL, TriPlate, Strip Line) immunity test system
- BCI method immunity test system
- Portable transmitter immunity test system
- Reverberation chamber test system

Other Solutions

- Shield effect measuring device
- EMC test equipment certified calibration service

Global Business

( ) indicates sales terrority

TOYO EMC Overseas Business Locations

Global Business Focused on Asia and North America

In just about anywhere in the world. TOYO Corporation is the clear choice if your requirements call for EMC testing systems and solutions. We provide:

- The highest quality of solutions and service
- English versions of our acclaimed EMC testing software
- Close communications with customers
- Ability to propose a wide variety of products and systems based on our business dealings with numerous suppliers

We began selling EMC systems in Southeast Asia in 1995 and have expanded our sales area to include South Korea, the People's Republic of China, and the U.S. In 2002, we partnered with Singapore's JS Denki and South Korea's Eretec and together we have sold and delivered more than 350 systems.

In 2010, we established TOYO Corporation China in Shanghai. This is a subsidiary that is wholly funded by TOYO Corporation. A couple of years later, we opened a Beijing office. In China, we have a strong track record of supplying clients including national laboratories and emerging car makers with state-of-the-art solutions.

In 2015, TOYOTech LLC, a wholly-owned U.S. subsidiary, was established in California; the new organization began selling EMC systems to support the important and growing markets of North America.

New Products

NEW

New Product: AI-powered Software Helps Reduce EMI Noise Efficiently

EMI Mitigation Assistance Software “EMINT”

EMINT is a software product that provides timely assistance to product developers. EMINT helps find effective measures against EMI noise emitted by products under development, using historical EMI measurement data saved from the past.

Revolutionary EMI Measurement Solution

PXE & EPX

▸ Pages 8-9

The latest compliance EMI measurement solution uses the most-advanced FFT-based measurement technique proposed by TOYO and Keysight. By using this solution, you can avoid missing any noise, which realizes the most efficient measurement.

Next-Generation DeFacto Standard

New Emissions Measurement Software “ES10”

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The industry standard EMI software, TOYO’s “EP” series, has been completely redesigned. Leveraging the same UI as the high-end “EPX” software, the usability of the software has been significantly improved.

The time-domain-based graph that helps identify the noise source and the difference spectrum graph allows for comparisons of multiple sets of measurement data. This enables a smoother transition from the measurement phase to the mitigation phase.

Emissions Measurements for Consumer Electronics

Summary

With the shift to digital and mobile electronic devices with the change to high-density packaging, identifying noise sources and taking mitigating measures for EMC have become increasingly difficult. Solutions for responding to yearly revisions in standards such as increases in frequencies at the upper measurement limit and maximizing the amount of data that is collected and saved for complicated noise fluctuations are in demand.

TOYO developed the “EPX” and “ES10” software series to respond to these demands. We supply and propose EMI measurement systems that suit a variety of users.

Our refined user interface dramatically improves ease of use, satisfying beginners and experts alike. From simplified tests for electronic device EMI mitigation to final compliance tests performed in accordance with standards, our automation of EMI measurement allows you to realize a clear increase in measurement efficiency. Basic measurement features include:

- Collection of spectrum data
- Selection of noise that needs the final measurement (QP, PK, AV)
- Measurement of a location at the maximum radiation (azimuth, height pattern, clamp location)
- QP and AV measurement of noise level
- Time-domain scan measurement
- Display, output, and saving of measurement results
- Support of latest Windows OS: most suitable hardware configuration

EMI Measurement Software Versions include:

- EPX/RE - Radiated Emissions Measurement and Analysis Software
- EPX/CE - Conducted Emissions Measurement and Analysis Software
- ES10/RE - Radiated Emissions Measurement Software
- ES10/CE - Conducted Emissions Measurement Software
- EP5/RFP - RF Power Emissions Measurement Software
- EP5/NSA - Site Attenuation Measurement Software
- ES10/LE - EMI Measurement Software Limited Edition
- EP5/RSE - Radiated Spurious Emissions Measurement Software

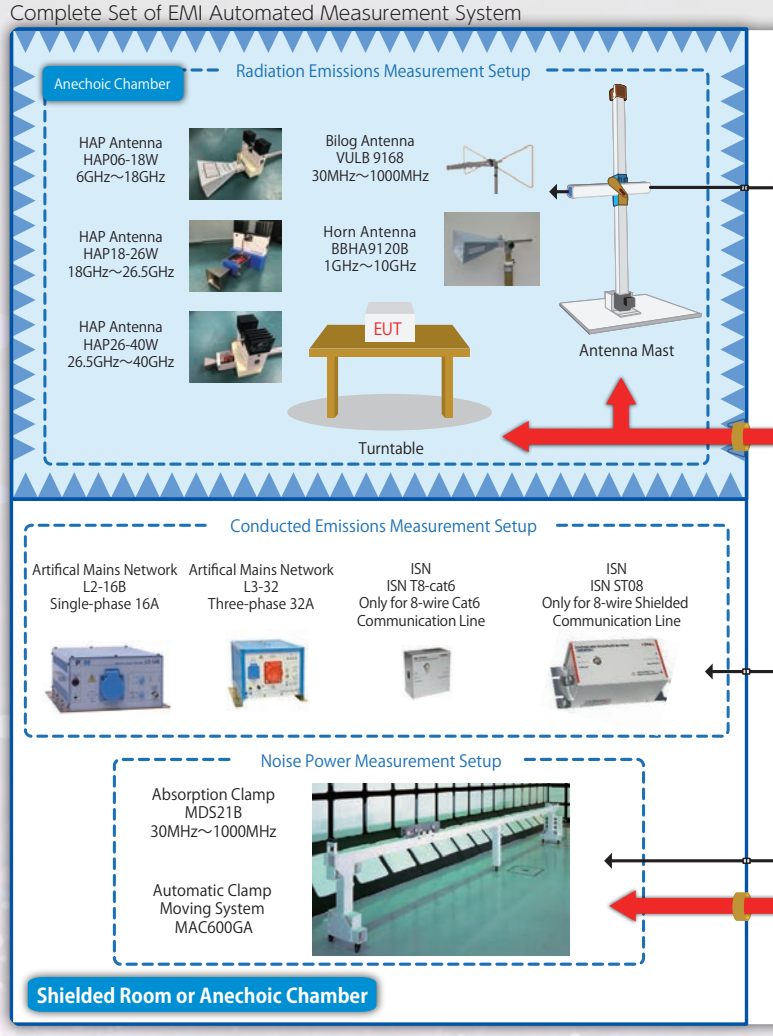
Viewer Software include:

- EPX/VIEW Series
- ES10/VIEW Series
- EP9/VIEW Series
- EP7/VIEW Series
- EP5/VIEW Series

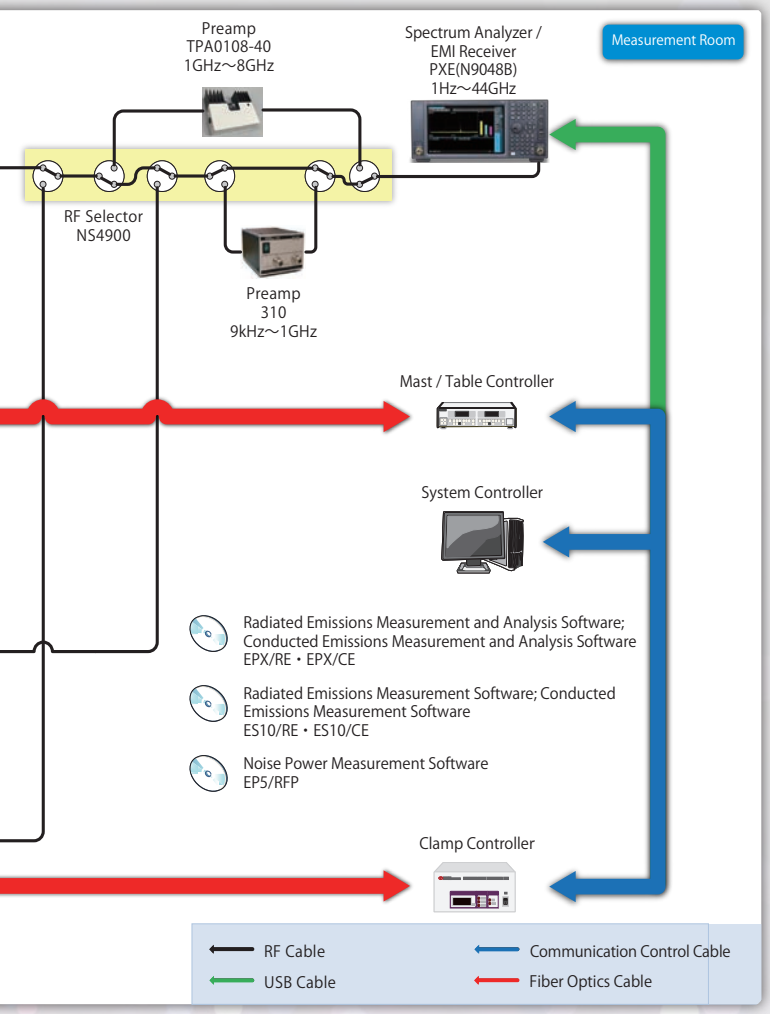
Supported Standards include:

- For consumer electronics: CISPR, EN, ETS, FCC, VCCI, and others

Complete Set of EMI Automated Measurement System



Radiated Emissions Measurement and Analysis Software;
Conducted Emissions Measurement and Analysis Software
EPX/RE・EPX/CE



EMI Receiver — 「N9048B PXE」

Measurement Systems

1. Automated Radiated Emissions Measurement System (30MHz – 40GHz)

Noise emitted from the equipment under test (EUT) is picked up by an antenna and passes through a spectrum analyzer, from which data can be obtained, or undergoes QP measurement on the EMI receiver. Features such as these allow this system to be used for applications including noise mitigation measurements or final compliance tests. For frequency expansion in the 1 GHz-40 GHz range, we propose a measurement system with an optimal combination of antenna, preamp, spectrum analyzer, and receiver.

2. Automated Conducted Emissions/ Radiated Magnetic Field Measurement System (9kHz – 30MHz)

Conducted noise from the EUT is measured with equipment such as an artificial mains network and a current probe. This system is also compatible with ISN and AAN, networks for communication ports that meet CISPR 22/32 requirements.

3. Noise Power Measurement System (30MHz – 1GHz)

Noise power from the EUT is detected with an absorbing clamp, and the frequency and level are measured with a spectrum analyzer and an EMI receiver. This system is also compatible with the automatic absorbing clamp moving system.

4. SVSWR Measurement System

This system is designed for carrying out the SVSWR method, which evaluates the test site in a GHz range. The use of a specialized transmitting antenna positioner allows for highly reproducible measurements.

5. Radiated Spurious Emission Measurement System

This system measures radiated spurious emissions from electromagnetic radiation emitting devices such as cell phones and wireless LANs. This system can perform effective radiated power and spurious emission measurements defined in the 3GPP and ETSI standards.

Latest EMI Measurement Solutions

EMI Receiver “N9048B PXE” + Emissions Measurement and Analysis Software “EPX”

Are these problems all too familiar to you?
An FFT-based EMI Receiver may help.

- ✓ A wide variation in measurement values, no repeatability
- ✓ Measurement values differ every time even when the same DUT is measured
- ✓ Noise that exceeds the limit cannot be found easily or whether the measures taken are effective cannot be determined
- ✓ Being inexperienced to operate the EMI receiver, you have difficulty in measuring the target noise

Keysight Technologies’ Latest EMI Receiver – “N9048B PXE”

- Frequency range: 1Hz – 44GHz
- Fully compliant with CISPR 16-1-1 and MIL-STD-461
- Industry’s most advanced sensitivity / dynamic range
- Accelerated Time Domain Scan (A-TDS) feature option available
  - Widest (350MHz) FFT band
  - Gapless measurement that enables constant monitoring at all frequencies in the measurement bandwidth and that avoids missing any noise
- Designed based on the high-end spectrum analyzer “PXA”
- Intuitive multi-touch user interface

TOYO Corporation’s Emissions Measurement and Analysis Software – “EPX”

- Highly reliable automated measurement sequence with A-TDS embedded
- Prescan using QP detector
- Noise analysis is possible, removing impulse noise (PK/Maxhold) that covers a wide band
- Suitable Dwell Time can be automatically configured by analyzing the noise behavior
- Time-domain-based noise data evaluation
- Customizable reporting function

New Keysight EMI Receiver – "N9048B PXE"

EMI Receiver with World's First TDS Option – A-TDS (Accelerated Time Domain Scan) – Supporting the Industry's Widest Bandwidth of 350MHz

The EMI receiver "N9048B PXE" supports the latest TDS function (A-TDS) with a 350MHz FFT bandwidth – the frequency range in which measurement data can be converted into spectrum at one time, which is the widest FFT bandwidth in the world. Because it makes use of TDS, the FFT function is very different from that of an oscilloscope; it has a good pulse response, and it is also possible to perform evaluations with detectors with long time constants such as with QP detectors.

With A-TDS, Measurements in Only 3 Steps

In conventional radiated emissions measurements in a range of 30MHz to 1000MHz, scans using a peak detector is performed while the receive frequency is changed over 13 steps to cover the entire range. Using the A-TDS function, measurement can be taken in 3 steps. Scans using a QP detector that conventionally took 40 steps can be carried out in 3. This is particularly true for measurements using the QP detector; since scans can be completed in only 6 seconds, this leads to the reduction in the evaluation time when you perform EMI measurements for automobiles and on-vehicle electronic equipment.

Radiated Emissions Testing Using Real-Time Scan

Real-Time Scan (RTS) does not miss noise and detects all changes in fluctuating noise. As a result, RTS eliminates the problem of value discrepancies due to differences in measurement conditions or to the person taking the measurement, which is often seen in the measurement with conventional sweep-type spectrum analyzers and EMI receivers. In addition, with its simple operation, it can be used to observe noise behavior by R&D engineers focused on noise mitigation who may not be highly experienced at taking measurements, allowing them to concentrate on confirming the nature of and mitigating noise.

N9048 PXE Screen Shot

N9048 PXE Front View

Newest Solution: N9048 PXE and EPX Software

EPX Emissions Measurements Analysis Software

New EMI Measurement and Analysis Software Lead you to Success with the A-TDS Function

Integrating the automated measurements sequence on the "EPX Series" with the A-TDS function with the Keysight Technologies' newest EMI receiver, the "N9048B PXE," allows highly reliable EMI measurements to be made without missing noise. This EMI measurement analysis software is completely new. Time-domain analysis is possible on the measured noise data in addition to a frequency domain, making it an effective tool for noise mitigation. Moreover, the "Unwanted Impulse Removal" and "Standards Compliance Evaluation" functions developed using our company's patented technologies are included, making it possible for anyone to carry out international standards compliance tests.

Automated measurement Sequence using A-TDS

QP Prescan	Noise Characteristics Evaluation	RTS Final Measurements	Automated compliance verdict
Only the noise that requires the final evaluation are picked up using RTS and QP detector.	The noise behavior is accurately analyzed by making use of gapless measurements. The optimal parameters for final measurements for each noise are determined.	Peripheral noise is also measured using RTS so as not to miss high-level noise that may not be seen.	Even when it may be difficult to meet the pulse response characteristics requirement of CISPR16-1-1, one patented technology on the "EPX" makes sure that the measurement complies with the standard at all times.

Pre-compliance Spectrum Analyzers: X Series

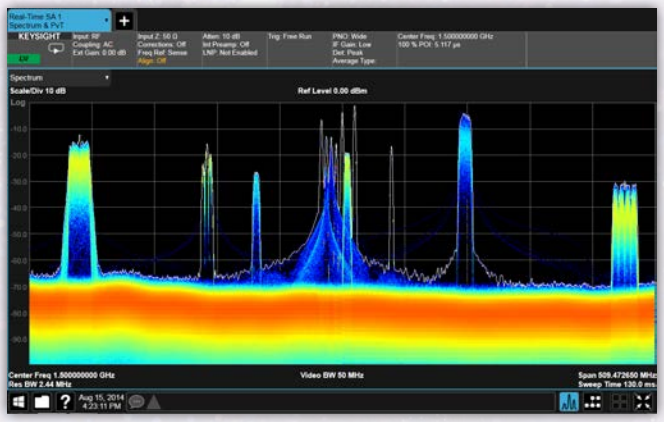
The addition of the EMI option to Keysight Technologies' X Series signal analyzer allows it to be equipped with EMI filters and detectors. The CPU, memory, hard drive, and I/O ports are upgradable. With license key-based upgrades, functions and applications can be added.





	N9000B CXA High-speed, low-priced model ideal for mass production	N9010B EXA Easy millimeter wave and microwave measurement	N9020B MXA R&D Optimal high performance	N9030B PXA Ultra-high performance for research	N9040B UXA Highest Performance
Frequency Band	9kHz ~ 26.5GHz	10Hz ~ 44GHz	10Hz ~ 50GHz	2Hz ~ 50GHz	2Hz ~ 50GHz
Analysis Bandwidth	25MHz BW	40MHz BW	160MHz BW	510MHz BW	1GHz BW
Real-time Analysis Bandwidth	N/A	N/A	160MHz	255MHz	510MHz
Long Time Streaming	N/A	40MHz	40MHz	255MHz	255MHz
2dB Step Attenuator	option	option	standard	standard	standard
Noise floor Reduction Function	N/A	option	option	standard	standard
TG / 75 Ω 2nd Input	option	N/A	N/A	N/A	N/A
Frequency Range	10Hz ~30MHz	30MHz ~ 300MHz	30MHz ~ 3GHz	30MHz ~3GHz	30MHz ~ 3GHz
			Equipped with a Real-time Spectrum Analyzer		

Function	EMI Measurement Application
CISPR 16-1-1 Detector	●
CISPR 16-1-1 Bandwidth	●
MIL-STD 461 Bandwidth	●
Log / Linear Display	●
Signal List	●
Scan Table	●
Simultaneous Detector	●
Automatic Limit Test	●
Marker Measuring Function	●
Difference from the Limit	●
Strip Chart	●
Step / Sweep Scan	●
Reporting Function	●
Time Domain Scan	●
Spectrum Monitor	●
Amplitude Probability Distribution	●
Interfering Wave Analyzer (click measurement)	●
UI Similar to MXE	●



By adding Realtime Spectrum Analyzer (RTSA) functions, noise that is difficult to find is captured in real time

- A signal of 3.33ns is detectable with 100% POI (Probability of Intercept)
- Realtime signal analysis is possible at a frequency up to THz range using an external mixer
- Spectrum in all frequency ranges of the analyzer is being monitored in Step Density Display
- A spurious-free dynamic range of up to 7dB allows display of small signals even while large signals exist

The software provides innovative user experience with multi-touch display

- Intuitive operations like with modern smartphones
- Time-consuming operations can be completed in two or less steps

Customer testimonials (using a multi-touch screen for the first time with UXA):

"The signal enlargement / reduction function is certainly convenient."

"Thanks to the tab function, you don't have to reset the settings to different settings."

"Since the complex menu structure is gone, it is easier to use."

EMI Test Receivers

PMM 9010F, PMM 9010/03P, PMM 9010/30P, ER8000

EMI Test Receiver – 9010 Series

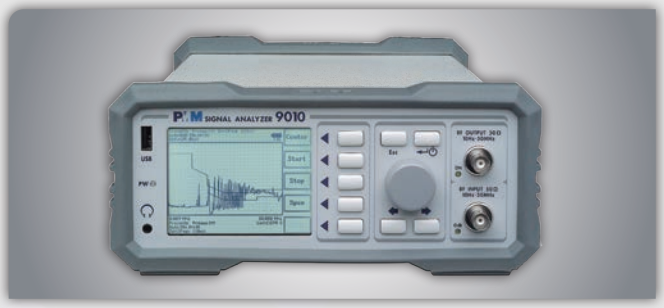
Narda Safety Test Solutions' EMI test receivers were developed with a design concept distinct from that of conventional EMI receivers. Their basic performance complies with CISPR 16-1-1. The 9010/9010F EMI receivers are compliance receivers specialized for conducted emissions measurements and have far better cost performance than conventional receivers used for radiated noise. Moreover, their design allows you to extend the basic models by adding functions such as frequency expansion and FFT, which helps reduce the measurement time, and can also be used for radiated noise measurement.

9010 Compliance EMI Test Receiver

- Receiver compliant with CISR16-1-1
- Measurement frequency band of 10Hz to 30MHz, which is for measuring conducted emissions, is supported.
- Cost-effective

ER8000 FFT Time-Domain Digital EMI Receiver with LISN Built-in

- High-speed QP Measurement is possible in a wide bandwidth using the FFT feature
- QP and AV values for the entire frequency band (10kHz to 30MHz) for conducted emissions are obtained in 2 seconds
- Receiver with LISN (single phase, 16A) built in
- Receiver compliant with CISPR16-1-1



9010F FFT Time-Domain Digital EMI Receiver

- High-speed QP measurement for a wide band is possible using the FFT feature
- Support a measurement frequency band of 10Hz~30MHz
- 9010/03P EMI Test Receiver

Frequency band: 10Hz~300MHz

- 10Hz – 30MHz: Compliance
- 30MHz – 300MHz: Pre-compliance

9010/30P EMI Test Receiver

- Frequency band: 10Hz~3GHz
- 10Hz~3MHz: Compliance
- 30MHz~3GHz: Pre-compliance
- Frequency can be extended up to 18GHz

Specifications/Model Number	9010F	9010/03P	9010/30P	ER8000
Frequency Range	10Hz~30MHz	30MHz~300MHz	30 MHz~3GHz	9kH~30MHz (or 3GHz)
Resolution	0.1Hz	100Hz		1Hz (100Hz for 30MHz & above)
Reference Frequency	<1 ppm	<2 ppm		<2.5ppm
RF Input	BNC fem., Zin 50 Ω	N fem., Zin 50 Ω		Zin 50 Ω , N fem.
VSWR:10dB RF att.	< 1.2			<1.2 (<2 for 1GHz and above)
VSWR:0 dB RF att.	<1.6	<2		< 2
Attenuator	0dB - 35dB (5dBステップ)	0dB-50 dB (2dB step)		0dB to 45dB (5dB step)
Preamp Gain	20dB	-	-	20dB (30MHz or more, 10dB)
Pulse Limiter	Built-in (switchable)	-	-	Built-in (30MHz or less)
Maximum Input	137dBμV (1 W)			140dBμV (2W)
Preselector	1 LP filter, 6 BP filter	-	-	7 BP filter, 15MHz BW to ADC
IF Bandwidth (3dB)	1, 3, 10, 100, 300kHz	3, 10, 30, 100, 300kHz, 1MHz (6dB)		
IF Bandwidth (6dB)	200Hz, 9kHz (CISPR16-1-1)	9kHz, 120kHz, 1MHz (CISPR 16-1-1) 100 kHz, 1 MHz (MIL-STD-461 option)		100Hz, 300Hz, 1kHz, 3kHz, 10kHz, 30kHz, 100kHz, 300kHz, 1MHz, 3MHz
Detector	Peak, QP, Average, RMS, RMS-Aperage, C-Aperage, APD			Peak, QP, Average, RMS, RMS Average (optional), C Average, Smart detection function (30MHz or more)
I/O interface	RS232C, USB, High Speed Optical (2ch)	RS-232, High Speed Optical		USB 2.0 type B, RS-232 DB9, user port DB15
	Bluetooth (optional), GPIB (optional)	Bluetooth (option)		
RF Output	BNC fem, 50 Ω CW: 10Hz-50MHz, Trackimg mode: 10Hz-30MHz			
Power	10-15VDC, 2.5A battery (8 hours), AC adapter, with charger			10-15 VDC, 2.5A, With AC universal adapter
Dimensions (mm)	235 x 105 x 335			235 x 105 x 300
Weight (kg)	4.3	4.95		5.2

Frequency Extension Modules

These are frequency extension modules for the 9010 Series receivers. An optical cable is used to connect to the 9010. By placing this module in an anechoic chamber, loss caused by the cable's frequency characteristics can be avoided.

- 9030: 30MHz~3GHz
- 9060: 30MHz~6GHz
- 9180: 30MHz~18GHz

Radiated Emission Measurement Software – ES10

Evolution from the EP5, EP7 and EP9 Series
New De-facto Standard with Enhanced Features and Improved Usability

The new “ES10” EMI measurement software is a further evolution of the widely used and well-received global standard “EP5,” “EP7,” and “EP9” software. Using the “Time Domain Scan (TDS)” function in addition to the basic EMI measurement function, it is possible and more accurately and speedily measure noise and evaluate noise mitigation. This version is also more user-friendly, with features such as the “Difference Spectrum Graph” function and customizable screen, which can be tailored in numerous ways to suit user preferences. Basic measurement functions include:

- Scan Measurement (spectrum data acquisition)
- Creation of noise list for final measurement (QP, PK, AV)
- Interference level measurement (QP, PK, AV measurement at the highest radiation location)
- Display, output, and saving of measurement result

Time-domain Display (Lower Part)

Quest for Reliability and Convenience

Difference Spectrum Graph

Multiple sets of spectrum data can be displayed in a graph at the same time, which helps understand the differences among them and how effective the noise mitigation measures taken are.

Time-domain Display

The noise fluctuation was displayed in a time domain just by clicking the spectrum.

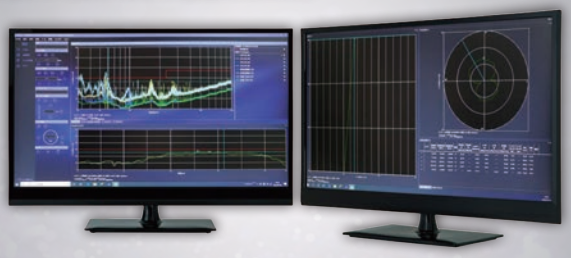
Noise Characteristics Evaluation

Frequency fine-adjustment; the frequency fine-adjustment using QP with TDS

Customizable display

The layout of the windows/panes can be flexibly changed according to user's preference.

Example of Customized Display (Extended)



Compact and Full-compliance Measurement System for Conducted emissions with PMM 9010F EMI Receiver

TEM Wave Wideband Transmission Line System – G-CELL

For Planning and Evaluation of EMC Countermeasures

A further development of a TEM cell, this cubical cell can easily measure radiated emissions and perform immunity tests on products (EUTs) via a transmission line placed on the floor. It can easily be installed in an office environment and is an optimal tool for performing preliminary measurements and countermeasures prior to final testing in an anechoic chamber or at an open test site. Features include:

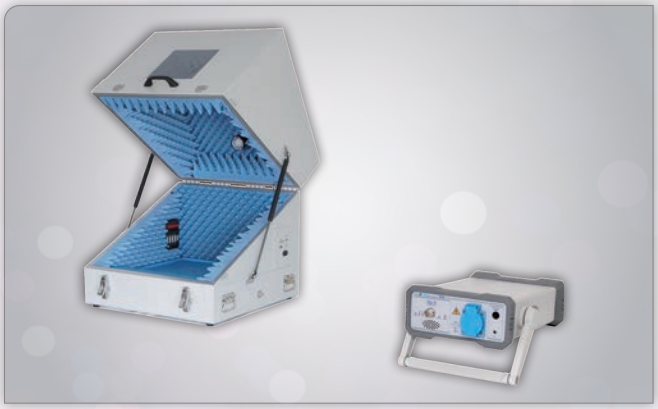
- Easy EMI measurement with a spectrum analyzer connected
- Radiated immunity test where uniformity is obtained
- EUT can be placed in G-CELL easily with a wide-opening system
- Customizable power/signal filter
- Easily take EMC mitigation measures using G-CELL installed in an office environment

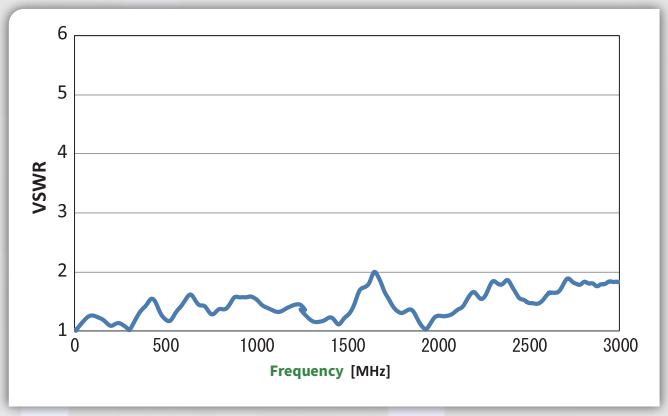
Specifications

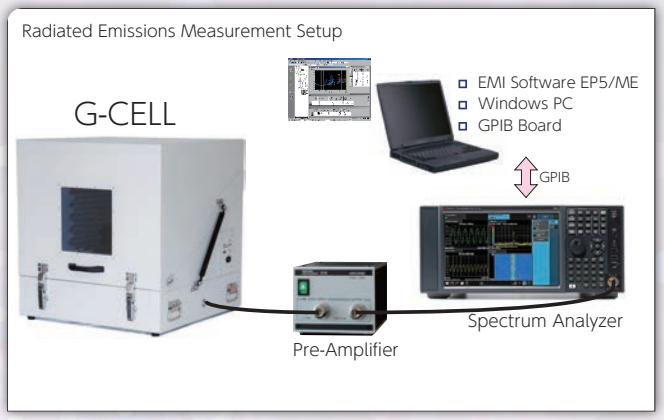
- Frequency range: 10k~1GHz (2GHz)
- Max. input power: 150W (N-type connector)
- Electric field strength: 30V/m@20W
- Outer size: 70 x 70 x 70cm (excl. protrusion)
- Max. EUT size: 40 x 40 x 40cm
- Equipped with: Shielded glass x 1 (Lighting x 1, AC filter (single-phase 20A) x 1, BNC terminal x 1, D-Sub 9-pin x 1, Optional panel x 1, Interlock function)
- Options: thru-hole, custom filter

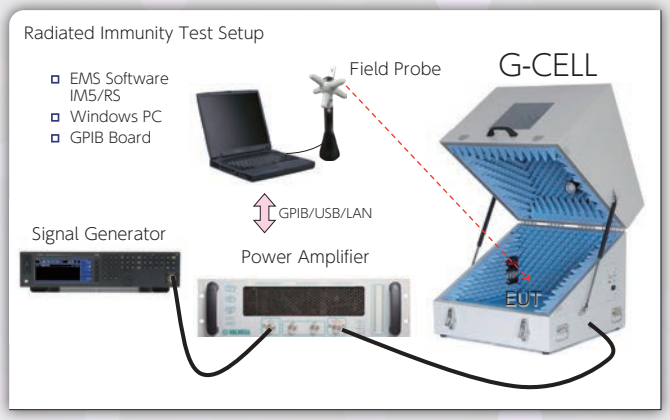
Applications

- Radiated emissions measurements
- Radiated immunity test









EMI Accessories

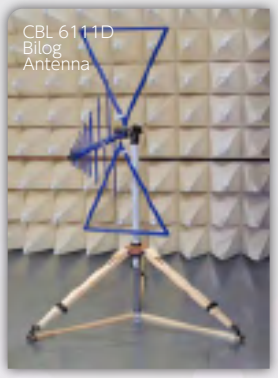
EMI Measurement Antennas (TESEQ)

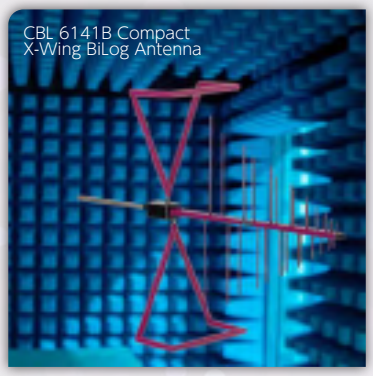
Model Number	Product Name	Frequency Range
BiLog® Antennas		
CBL 6111D	Ultra Wideband BiLog Antenna	30MHz~1GHz
CBL 6112D	Ultra Wideband BiLog Antenna	30MHz~2GHz
Compact X-Wing® BiLog Antenna		
CBL 6141B	Compact X-Wing BiLog Antenna	30MHz~2GHz
CBL 6143A	X-Wing BiLog Antenna	30MHz~3GHz
Log Periodic Antennas		
UPA 6108	Log Periodic Antenna	300MHz~1GHz
Verification Antenna for CISPR25		
RAD 6000	Modelled Long Wire Antenna	150k~1GHz
Dipole Antennas		
VDA 6116A	Dipole Antennas	30MHz~300MHz
UHA 9105	Dipole Antennas	300MHz~1GHz
Loop Antennas		
HLA 6120	HF Loop Antenna	9kHz-30MHz

EMI Measurement Antennas (ETS Lindgren)

Model Number	Product Name	Frequency Range
Biconical Antennas		
3104C	Biconical Antenna (50W)	20M~200MHz
3110C	Biconical Antenna (250mW)	30M~300MHz
Log Periodic Antennas		
3147	Log Periodic Dipole Array Antenna	200M~5GHz
3148B	Log-Periodic Dipole Array for CISPR16-1 Measurements	200M~2GHz
BiConiLog Antennas		
3142E	BiConiLog Antenna	30M~6GHz
3143B	BiConiLog Antenna	30M~1GHz
3149	Hybrid Log Periodic and Bowtie (BiConiLog) Antenna	80M~6GHz
Dipole Antenna		
3121D	Dipole Antenna	30M~1GHz
Double-Ridged Guide Antennas		
3106B	Double-Ridged Guide Antenna	200M~2.5GHz
3115	Double-Ridged Guide Antenna	750M~18GHz
3116C	Double-Ridged Guide Antenna	10~40GHz
3117	Double-Ridged Guide Antenna	1~18GHz
3160	Pyramidal Standard Gain Antenna	960M~40GHz
3161	Octave Horn Antenna	1G~8GHz
Conical Log Spiral Antenna		
3102	Conical Log Spiral Antenna	1~10GHz
Monopole Antennas		
3301C	Monopole Antenna	30Hz~50MHz
3303	Monopole Antenna	1k~30MHz
Loop Antennas		
6502	Loop Antenna	9k~30MHz
6507	Loop Antenna	1k~30MHz
6511	Loop Antenna	20Hz~5MHz
6512	Loop Antenna	9k~30MHz
7604	Shielded Coil Antenna (MIL applications)	20Hz~500kHz
7605/7606	Antenna/Shielded Coil (MIL applications)	30Hz~100kHz
Mini-Bicon Antenna		
3183B	Broadband Mini-Bicon Antenna for Measurements	1~18GHz


3117 Double-Ridged Waveguide Horn Antenna


CBL 6111D Bilog Antenna


CBL 6141B Compact X-Wing BiLog Antenna


3142E BiConiLog Antenna


3149 Hybrid Log Periodic and Bowtie


3102 Conical Log Spiral Antenna


3301C Active Monopole Antenna


3160 Pyramidal Standard Gain Antenna

EMI Accessories

EMI Antennas (Schwarzbeck)

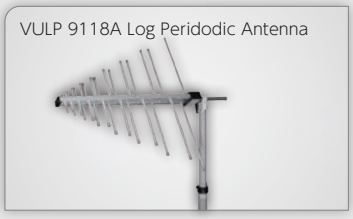
Model Number	Product Name	Frequency
Dipole Antenna / Balun		
VHAP	VHF Precision Half-Wave Dipole Antenna	30MHz~300MHz
UHAP	UHF Precision Half-Wave Dipole Antenna	300MHz~1GHz
VHA 9103	VHF Half-Wave Dipole	30MHz~300MHz
UHA 9105	UHF Half-Wave Dipole	300MHz~1GHz
UHA 9125C	UHF Half-Wave Dipole	0.75~2GHz
VHA 9103B	Balun with Collapsible Cone Elements	30MHz~300MHz
VHBA 9123	Antenna Holder/Balun 50 Ω /200 Ω	25~300MHz, 50W
VHBB 9124	Antenna Holder/Balun (BBA, BBAL, BBAK, BBVK)	25~300MHz, 10W
Biconical Antennas		
BBA 9106	Biconical Elements (VHA, VHBB , VHBA)	30~300MHz
BBAL 9136	Biconical Elements (VHA, VHBB , VHBA)	20~200MHz
BBAK 9137	Biconical Elements (VHA, VHBB , VHBA)	45~450MHz
BBVK 9138	Biconical Elements (VHA, VHBB , VHBA)	60~600MHz
BBUK 9139	Biconical Elements (UBAA9114/9115)	160~1200MHz
Wideband Biconical Antennas		
SBA 9119	Microwave Biconical Broadband Antenna	1~6GHz
SBA 9112	Microwave Biconical Broadband Antenna	3~18GHz
Log Periodic Antennas		
UHALP 9108A	Log Periodic Antenna	250~2400MHz, 1kW
VULP 9118A	Log Periodic Antenna	180~1500MHz, 1kW
USLP 9142	Log Periodic Antenna	0.7~5GHz, 50W
USLP 9143	Log Periodic Antenna	0.3~5GHz, 50W
VUSLP 9111 B	Log Periodic Antenna	200M~3GHz, 1kW
ESLP 9145	Microlog Periodic Antenna	1~18GHz
Wideband Antennas		
VULB 9160	TRILOG Broadband Antenna	30~1000MHz, 10W
VULB 9164	TRILOG Broadband Antenna	30M~3000MHz, 1kW
VULB 9168	TRILOG Broadband Antenna	30~1000MHz, 10W
Wideband Horn Antennas		
BBHA 9120A	Wideband Horn Antenna, N-type Connector	0.8~5 (10) GHz
BBHA 9120B	Wideband Horn Antenna, N-type Connector	1-10GHz
BBHA 9120C	Wideband Horn Antenna, N-type Connector	2~18GHz
BBHA 9120D	Wideband Horn Antenna, N-type Connector	1~18GH
BBHA 9120LF	Wideband Horn Antenna, N-type Connector	0.7~6GHz
BBHA 9170	Wideband Horn Antenna, SMA-type Connector	15~26.5 (40)GHz
Dual Polarization Wideband Horn Antenna		
CTIA 0710	Wideband Horn Antenna, SMA-type Connector	0.7G~10GHz
BBHX 9120 LF	Wideband Horn Antenna, N-type Connector	1G~8GHz
Magnetic Field, Loop Antenna		
HFRAE 5160	Receive VHF-UHF loop Antenna	ϕ 50 mm
HXYZ 9170	Triple Loop Antenna (CISPR 15)	ϕ 2 m

VHAP/UHAP Precision DiPole Antenna

BBA 9106/ VHBB9124 Biconical Antenna

BBHA 9120A Horn Antenna

VULP 9118A Log Peridodic Antenna



SBA 9119 Wideband BiConiCal Antenna for SVSWR Measurements

POD16 Wideband Dipole Antenna for SVSWR Measurements

EMI Measurement Antenna (SEIBERSDORF)

Model Number	Product Name	Frequency
POD16	SVSWR Broadband Dipole Antenna	1~6GHz
POD618	SVSWR Broadband Dipole Antenna	6~18GHz
PRD	Dipole Antenna for Site Validation Measurements	30M~1GHz
PCD3100	Precision Conical Dipole Antenna for Site Validation Measurements	30M~1GHz
PCD8250	Precision Conical Dipole Antenna for Site Validation Measurements	80M~3GHz

EMI Accessories

Artificial Mains Network (AMN) (Narda STS)	
Model Number	Product Name/Specifications
L2-16B	(2 x 16A), Single-phase16A
L3-32, 64, 00, 500	(4 x 32, 64, 100, 500A), Three-phase 32, 64, 100, 500A
L1-150M	DC150A (100kHz~200MHz)
L1-500	DC150A (9kHz-30MHz)

Artificial Mains Network (AMN) (TESEQ)	
Model Number	Product Name/Specifications
50 Ω AMN	
NNB 51	(2 x16 A), Single-phase16A
NNB 52	(4 x32 A), Three-phase 32 A
Single-phase AMN	
DC-LISN-M2-25-V2	V-LISN (GCPC) 150k~30MHz, 25A

CDN for CISPR15 - 30MHz~300MHz (TESEQ)	
Model Number	Product Name/Specifications
CDNE M210	CDNE M2 10A
CDNE M310	CDNE M3 10A

CDNE M310

L2-16B

NNBM 8124

ISN-T8

Artificial Mains Network (AMN) (Schwarzbeck)	
Model Number	Product Name/Specifications
50 Ω AMN	
NSLK 8126	(4 x 16A) AC 10A, 3 phase 25A
NSLK 8127	(2 x 16A) AC Schuko socket
NSLK 8128	(4 x 32A) AC 10A, 3 phase 50A
NNLK 8121	(4 x 100A) Wing Terminal option 1 Large current option 2:400V/700V
NNLK 8129	(4 x 200A) Wing Terminal, Low voltage drop option:400V/700V
NNLK 8130	(4 x 400A) Wing Terminal, cooling fan
HF- Probe	
TK 9421	HF - probe, 150 Ω High voltage probe 1.5k Ω , 4pF
TK 9422	HF - probe, 1.5k Ω High voltage probe 5k Ω , 4pF
TK 9417	HF - probe, 2.5k Ω
VT 9420	High voltage probe 1.5k Ω , 4pF
Single phase AMN	
NNHV 8123	5 μ H/50 Ω , 70(100)A, CISPR25Ed.4, BMW GS 95025-1
NNBM 8124	5 μ H/50 Ω , 70A, For automobiles, BCI
NNBM 8126A	5 μ H/50 Ω , 70A, DC600V, AC270V
NNHV 8123	5 μ H/50 Ω , 70(100)A, For automobiles
NNHV 8123-200	5 μ H/50 Ω , 200A, For automobiles
NNBL 8225	50 μ H/50 Ω , 10(16)A, Mil.Std 461/462
NNBL 8226	50 μ H/50 Ω , 100A, Mil. Std 461/462
HVSE 8600/8601	NNHV Shield box for 2 units

HVSE 8600/8601

ISN/AAN for CISPR22	
Model Number	Product Name/Specifications
TESEQ	
ISN T8 cat 6	Only for 8-wire Cat6 communication line
ISN T8	For 8-wire communication line (ADS T800, T8x0 adapter, cable (Cat.3,5) attached)
ISN ST 08	Only for 8-wire shielded communication line
ISN T4A	For 4-wire communication line (ADS T 411, 442, 443, 444, 445, 4X0 Adapter, case, cable (Cat.3,5) attached)
ISN T2A	For 2-wire communication line (ADSADS T246 , ADS T2X0 Adapter, case, cable (Cat.3, 5) attached)
FCC	
F-110729-1057-1	For 8-wire communication line

Capacitive Voltage Probe for CISPR22	
Model Number	Product Name/Specifications
CVP 2200A	CISPR22 ISN For alternative methods,150k~30MHz

EMI Accessories

Preamp (SONOMA)			
Model Number	Frequency Range	Gain	N.F.
310	9kHz~1GHz	32dB	1.8dB typ. (5~500MHz)
317	10kHz~2.5GHz	38dB	4.8dB (10M~2GHz)
330	10kHz~2.5GHz	20dB	7.3dB typ. at 100MHz
315	10kHz~1GHz	51dB	1.8dB typ. at (10~500MHz)
352	10kHz~5GHz	26dB	6.0dB typ at (10M-2.5GHz)
354	10kHz~3GHz	19dB	4.8dB (10M~2GH z)

Pulse Limiter		
Specifications/Model	CFL 9206A	VTSD 9561F
Insertion loss	10dB ± 0.5dB	10dB ± 0.5dB
Frequency Range	9Hz - 30MHz	DC - 200MHz
Continuous Allowable Input	2.5A	—
Allowable Pulse Input	—	—
RF Connector	BNC, 50 Ω	BNC, N(f/m), 50 Ω

Comb Generator / Wideband Noise Generator				
Model Number	Frequency Range	Line Spacing	Connector	Dimensions (L x W x D) mm
Seibersdorf				
RefRad X	10kHz~3GHz	10kH z,1MHz, 5MHz	N	134 (diameter) x 110
COM POWER				
CGO-501	1MHz~1500MHz	1MHz	BNC (f)	177 (diameter) x 19
CGO-505	5MHz~1000MHz	5MHz	BNC (f)	177 (diameter) x 19
CG-515	1MHz~1500MHz	1MHz or 5MHz	BNC (f)	74 x 79 x 79
CGO-515	1MHz~1500MHz	1MHz or 5MHz	BNC (f)	177 (diameter) x 19
CGO-520	20MHz~4500MHz	20MHz	SMA (f)	177 (diameter) x 25
CGC-255E	50kHz~115MHz	50k/250kHz		132 x 5.9 x 5.9
CGC-510E	100kHz~115MHz	100k/500kHz		132 x 5.9 x 5.9
York Wideband Noise Generator				
CNE V	9kHz~1GHz	Continuous	BNC (f)	177 (diameter) x 19
CNE V +	9kHz~3.5GHz	Continuous	N	120 x 120 x 41
CNE V I	30Hz~6GHz	Continuous	BNC	120 x 120 x 60
YRS01	5kHz~1GHz	Continuous, 10kHz, 100kHz, 1MHz, 5MHz	N	76 (diameter) x 81
YRS02	20MHz~4500MHz	Continuous, 10kHz, 100kHz, 1MHz, 5MHz	N	120 x 120 x 60

Microwave Comb Generator (York)					
Model Number	Frequency Range	Step Size	Connector	Dimensions (D x H) mm	Weight (kg)
CGE01	50MHz~18GHz	50MHz	SMA	76 x 64	0.55
CGE05	434MHz~26GHz	434MHz or 500MHz	SMA	56 x 17.5 x 65	0.75
CGE06	915MHz~40GHz	915MHz or 1GHz	2.92mm	56 x 17.5 x 65	0.75

310

317

CFL 9206A

VSQ 1000

CG-515

CGE01

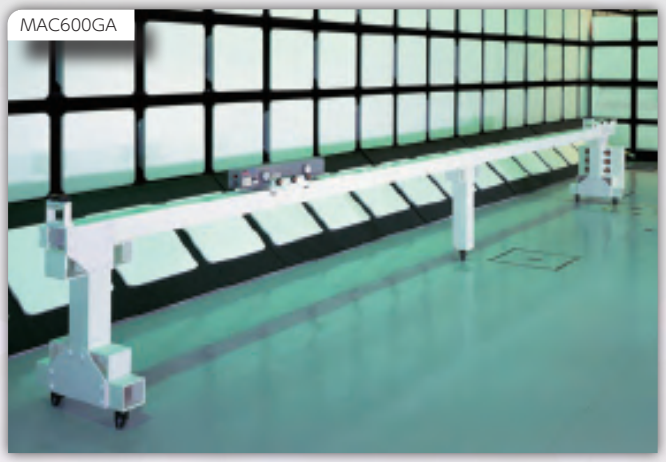
CGE05

EMI Accessories

Automatic Clamp Moving System - MAC600GA

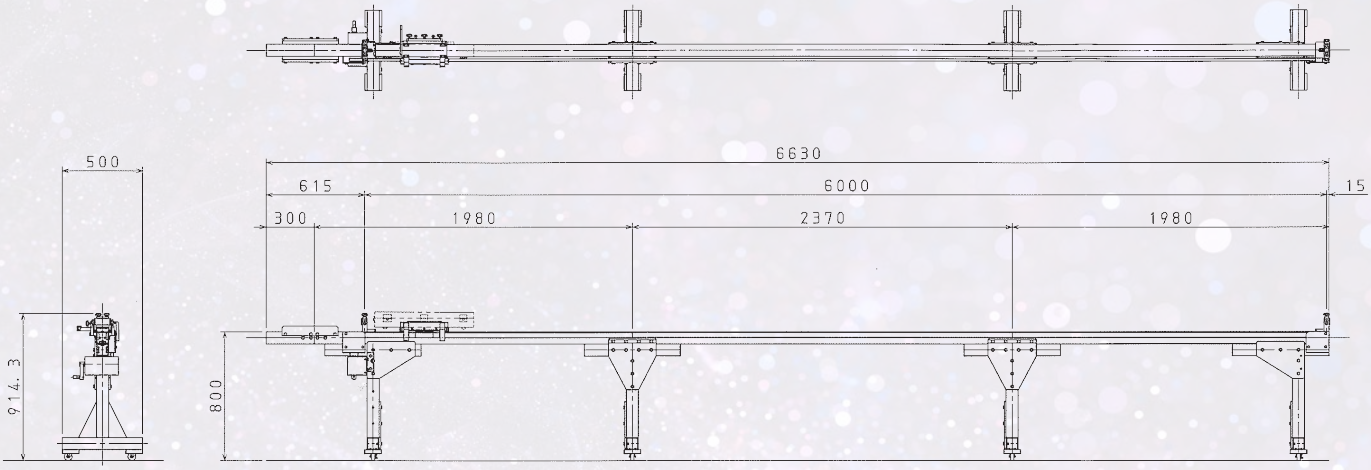
The system is suitable for measurements using absorbing clamps such as CISPR14, Denan Law, EN55020 (main material: FRP), and can be operated manually from the controller and automatically run by GPIB control.

- Main material of traveling equipment: FRP (reinforced glass fiber plastic)
- Caster: With adjust hook
- Drive method: Timing belt drive method
- Material: Non-metal (excluding drive train and casters)
- Load capacity: 30 kg in the vertical direction


MAC600GA

External Dimensions (W x D x H) mm

- Base Unit: 215 x 280 x 88
- Operation Unit 75 x 130 x 40 (because it is inclined, it is 40mm at high places and 40 mm at low places. 25mm
- Drive unit 380 x 170 x 340
- Driving platform



RF selector NS4900 series

An RF selector consisting of 8 (or 10) switches (SPDP). All band switches are installed on the rear panel and are connected via external terminals. The measurement path can be set according to your needs and can be automatically selected by the software. It can also be controlled manually using the changeover switch on the front panel.

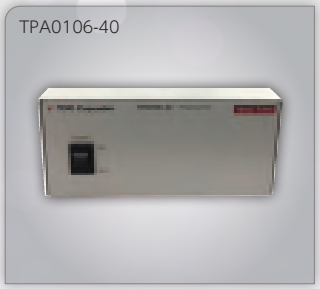

NS4900

Model Number	NS4900NA-JE	NS4900SA-JE
Input/ OutputConnector	50 Ω N-type	50 Ω SMA-type
Frequency Range	DC - 12.4GHz	DC - 18GHz
Maximum Input Power	100W	
Number of Switch Channels	2-8ch	2-10ch
Attenuation per Switch	≤1dB	
Control I / F	GPIB	
Power	AC100V, 50 - 60Hz	
Dimensions	426(W) x 430(D) x 143(H) mm	
Weight	8kg	

Microwave EMI Measurement Accessories

High-Gain Preamp – TPA Series

TPA Series preamps have the high gain and low noise figure demanded for EMI measurement above 1 GHz. Designed with the specifications listed to the right, they have the sensitivity to carry out EMI measurements in a measurement room. Due to their small form-factor, they can be placed in the pit of an anechoic chamber or directly under a receiving antenna.


TPA0106-40


TPA0108-40

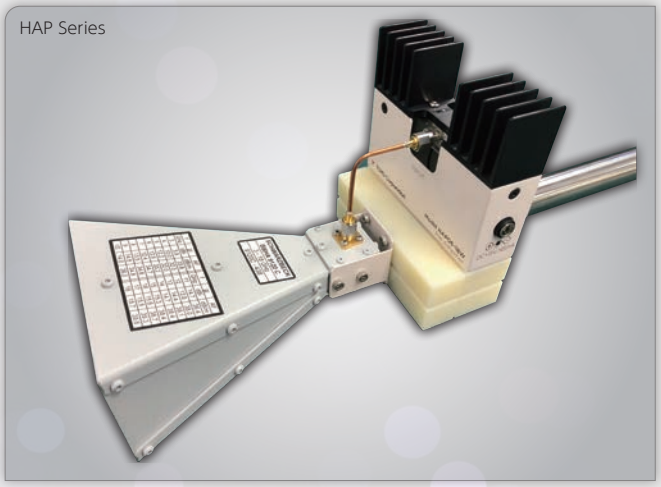
Model Number	TPA0106-40	TPA0108-40	TPA0118-35
Frequency	1~ 6GHz	1 ~ 8GHz	1 ~ 18GH z
Gain	40dB (Min)	42dB (Min)	35dB (Min)
Flatness	± 2.5dB (Typ)	± 1.5dB	± 2.7dB
Noise Figure (NF)	2.1dB (Typ)	1.8dB (Typ)	2.5dB (Typ)
Saturation Output Level @ 1dB	+13dBm (Min)	+13dBm (Min)	+10dBm (Min)
Input/Output VSWR	2.1 : 1 (Max)	2.0:1 (Max)	2.5:1 (Max)
Input/Output Connector	SMA (F)	SMA (F)	SMA (F)
External Dimensions (cm)	15.3(W) x 7.1(H) x 14.5 (D)	6.5(W) x 8.5(H) x 7.0(D)	14 (W) x 6(H) x 7(D)

* DC power supply included as standard

Horn Antenna Preamp Assemblies – HAP Series

By directly attaching a receiving antenna to a preamp, a received signal can be amplified, maximizing measurement sensitivity. A horn assembly is available for each frequency band (6-18GHz, 18-26.5GHz, 26.5-40GHz), so by simply changing the antenna, users can set up an optimal measurement system. Moreover, the antenna and preamp can be separated, allowing for things such as separate calibration of the antenna and preamp or the insertion of a filter.

- Antenna and preamp directly connected
- Maximize measurement S/N
- For EMI measurement in a GHz band
- DC power supply included


HAP Series

TYPE	WIDE BEAM TYPE		
Model Number	HAP06-18W	HAP18-26W	HAP26-40W
Frequency Range (GHz)	6-18	18-26.5	26.5-40
Antenna Gain (dBi)	5 ~ 16	16.8	17
E-side 3db bandwidth	29 (1.55m)	27 (1.44m)	27 (1.44m)
H-side 3db bandwidth (Size of EUT)	26 (1.38m)	27 (1.44m)	27 (1.44m)
Preamp Gain db (Min)	45	47	60
Preamp N/F db (Max)	1.5	2	3.2
P1dm (dBm)	10	8	8
Cable Connector	SMA (M)	3.5mm (M)	K (M)
Low Loss Cable	SF 104A 5.5m	SF 104A 5.5m	SF 102A 5.5m

Immunity Test for Consumer Electroni

Summary

This system is used to evaluate elimination capability (tolerance) in response to electromagnetic interference waves from electronic devices. This system controls equipment that is necessary for immunity testing such as the signal generator, power amp, field strength meter, power meter, and antenna mast, ensuring tests can be efficiently performed by anyone. The test results can be printed and saved to a hard drive or another storage device. Supported standards include:

- IEC61000-4-3:2020 Ed4.0
- IEC61000-4-6:2013 Ed4
- EN61000-4-3:2020
- EN61000-4-6:2014
- JIS C 61000-4-3:2021
- JIS C 61000-4-6:2017
- JEITA ET-2201

Basic Features

Uniformity Measurement

The field uniformity method that was added in IEC 61000-4-3 Ed. 2 can be selected, and the independent window method, an equivalent test method for frequencies 1 GHz and above that is defined in Annex J, can also be performed using this system.

System / Linearity Verification

This feature carries out the test system linearity verification added in IEC 61000-4-3 Ed. 3. Test systems unable to achieve 2 dB of gain compression cannot be used.

Immunity Test

Using reference factors obtained from uniformity measurements and factors obtained from electric field measurements, a specified electric field is applied to EUT, and immunity testing is performed.

Test Results View

The test results screen corresponding to the selected test type is displayed and can show measurement results. Data from the screen can be printed or saved in CSV format.

Report Generation

The results obtained from each test are exported as a report with a format specified in the wizard.

Software

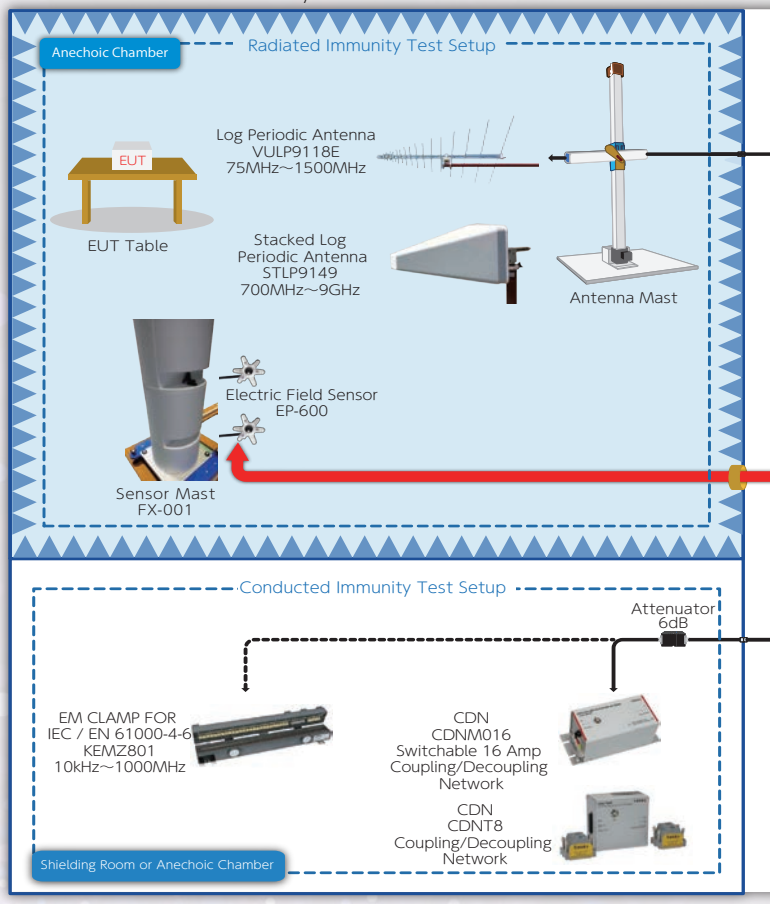
Immunity Test Software

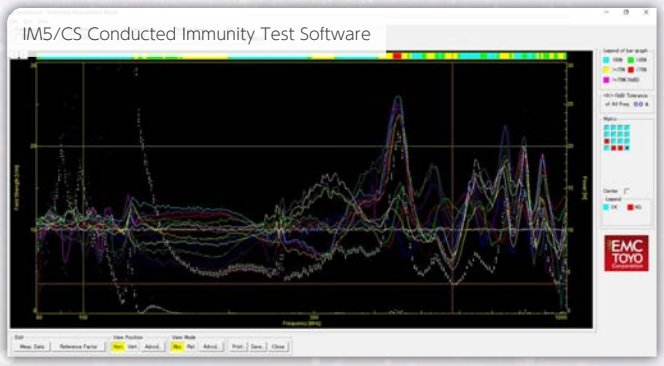
IM5/RS Radiated Immunity Test Software
IM5/CS Conducted Immunity Test Software (see image on the right)

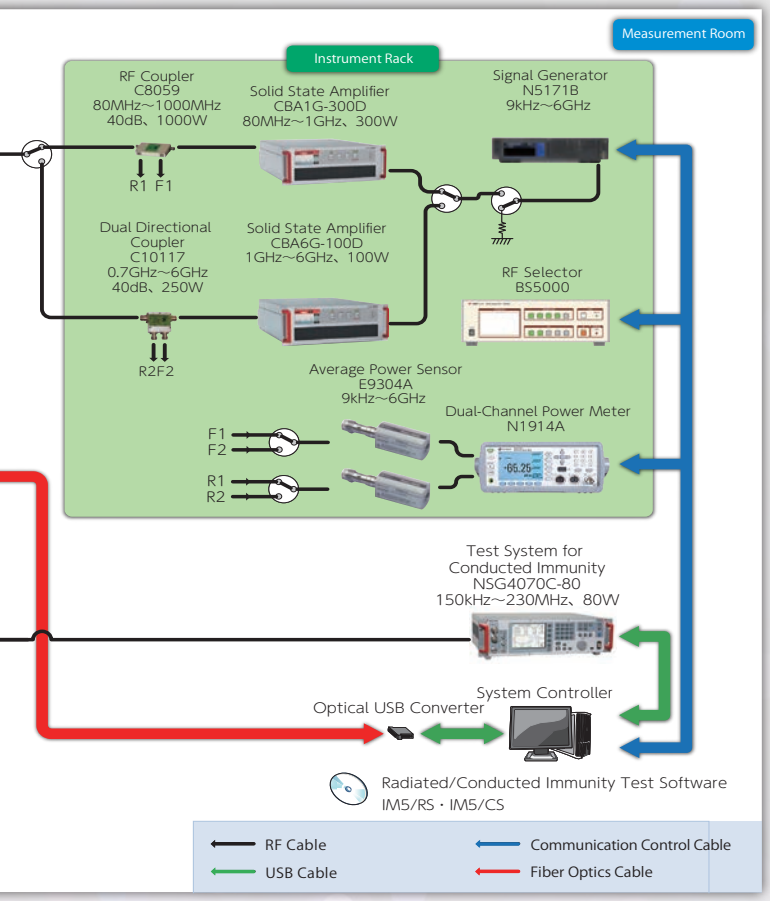
Software for Audio/Video Equipment

IM5/A Audio Immunity Test Software
IM5/V TV/Video Immunity Test Software
IM5/S4 Screening Effectiveness Measurement Software

EMS Automatic Measurement System







3. TV/Video/Audio Immunity Test System

This system automatically measures characteristics of immunity to interference from waves emitted by television, video, and audio-related devices. Compared to a typical immunity test, this test is relatively time-consuming and complex due to the large number of test items. But the specialized software prevents time from being wasted and allows for highly efficient measurements. In addition, you can reduce the work needed to create lists and graphs of the test results. Two separate basic systems are available: one for televisions and video devices, and the other for audio devices.

- EN55020 compliant, Support S1, S2, RFI, S3, S4 automatic measurement
- CISPR20 Ed6.1 compliant
- Support multiple standards (6 types) corresponding TV broadcasting systems of various countries
- Improved reliability, Automatic calibration feature
- IM5/A, IM5/V software supporting the latest Windows OS
- IM5/S4

Test Systems

1. Radiated Immunity Test System

With the radiated immunity test software IM5/R5 at its core, we tailor systems optimally suited to each customer's needs. So that you can obtain a strong and uniform electric field, we select an antenna, power amp, electric field sensor, and RF cable, and we will recommend a test system tailored to your preferences and budget.

- IEC61000-4-3 Ed3 compliantSupport Automotive Standards: 2004/104/EC, ISO11452-1/2, SAE, JASO
- Field strength: 10V/m or above, Distance 1m – 3m
- Frequency: 80MHz – 6GHz (up to 40GHz)
- Feature to measure field uniformity, Automatic check function
- IM5/RS software supporting the latest Windows OS

2. Conducted Immunity Test System

Including the selection of a signal generator, an RF amp, and CDN, we will recommend systems, with the IM5/CS conducted immunity test software at the core, tailored to each customer's needs.

- IEC6100-4-6 compliant
- Test Level: 10V (EMF) or above
- Frequency: 150k~80MHz (9k~230MHz)
- IM5/CS software supporting the latest Windows OS
- Support Automotive BCI immunity test: 2004/104/EC, ISO11452-4
- Automotive BCI 2004/104/EC, ISO11452-4

RF/MW Power Amplifiers

3 Year Warranty

RF Power Amplifiers 10 kHz – 6 GHz (TESEQ)

TESEQ's CBA series comprises solid-state Class A and Class AB amplifiers supporting frequency and power range optimal for immunity testing. Tough and reliable, the amplifiers in the series have achieved stable operation and low running costs. There are plans to continue expanding the model lineup with the addition of new power and frequency ranges. For immunity tests on devices such as wireless communication equipment, the CBA-D series has a low-noise design that minimizes the influence of noise produced by the amplifier itself on communication.

- Solid-state, Class A, AB amps
- Frequency range: 10kHz – 6GHz
- Quality amps specifically designed and tested for EMC testing
- Safe operation at open circuit/short circuit
- Output suitable for EMC test purposes

CBA Series (10kHz - 6GHz, 25W - 1.2kW)

NEW CBA4G Series

Model Number	Frequency 範囲	出力
CBA 1G-030D	1 MHz~1 GHz	30W
CBA 1G-100D	1 MHz~1 GHz	100W
CBA 1G-150D	80 MHz~1 GHz	150W
CBA 1G-300D	80 MHz~1 GHz	300W
CBA 1G-600D	80 MHz~1 GHz	600W
CBA 1G-1200D	80 MHz~1 GHz	1200W
CBA4G-030D	0.8GHz~4.0GHz	30W
CBA4G-060D	0.8GHz~4.0GHz	60W
CBA4G-100D	0.8GHz~4.0GHz	100W
CBA4G-200D	0.8GHz~4.0GHz	200W
CBA4G-400D	0.8GHz~4.0GHz	400W
CBA4G-800D	0.8GHz~4.0GHz	800W
CBA 4G-900/600R	800 MHz~4 GHz	800 MHz~4 GHz: 400W 1.2 GHz~1.4 GHz: 900W 2.7 GHz~3.1 GHz: 600W
CBA 6G-030D	1 GHz~6 GHz	30W
CBA 6G-050D	1 GHz~6 GHz	50W
CBA 6G-100D	1 GHz~6 GHz	100W
CBA 6G-200D	1 GHz~6 GHz	200W
CBA 6G-400D	1 GHz~6 GHz	400W
CBA 100M-110	10kHz~100 MHz	110W
CBA 100M-400	10kHz~100 MHz	400W
CBA 230M-035	150kHz~230 MHz	35W
CBA 230M-080	150kHz~230 MHz	80W
CBA 250M-2500	150kHz~230 MHz	2500W
CBA 400M-110	10kHz~400 MHz	110W
CBA 400M-260	10kHz~400 MHz	260W

CBA 4G-900/600R

CBA-1G-1200D

RF Power Amplifiers / RF Band Selectors

RF Power Amplifiers (BONN Elektronik)

BONN Elektronik is a long-established amplifier maker and designs and produces wideband, high-power amplifiers that can meet a variety of needs. The company provides three types of wideband amplifiers: solid-state, hybrid (solid-state and tube), and TWT.

- BSA Series Solid State 4kHz~1,000MHz, 1W~10Kw
- BTA Series Hybrid 9kHz~220MHz, 2,000W~3Kw
- BLWA Series Solid State 1MHz~1GHz, 1W~20Kw
- TWAL Series Travelling Wave 1GHz~50GHz, 20W~1Kw

BLWA 0810-10

TWAL Series (Traveling Wave Tube, 1GHz~50GHz, 20W~1kW)					
Model Number	Frequency Range	Output Power P1dB (min.)	Gain (Typical)	Size (Height, Depth)	Weight (kg)
TWAL 0103-250	1~2.5 GHz	250W	62 ± 7.5 dB	5 HU, 660 mm	48
TWAL 0103-500	1~2.5 GHz	500W	62 ± 7.5 dB	15 HU, 800 mm	140
TWAL 0208-250	2~8 GHz	250W	62 ± 7.5 dB	5 HU, 660 mm	45
TWAL 0208-500	2.5~7.5 GHz	500W	62 ± 7.5 dB	4 HU, 630 mm	38
TWAL 0818-250	8~18 GHz	250W	62 ± 5 dB	3 HU, 630 mm	34
TWAL 0818-500	8~18 GHz	500W	62 ± 5 dB	12HU, 700 mm	115
TWAL 1826-40	18~26.5 GHz	40W	52 ± 6 dB	3+3 HU, 630 mm	40
TWAL 2640-40	26.5~40 GHz	40W	52 ± 6 dB	3+3 HU, 630 mm	40

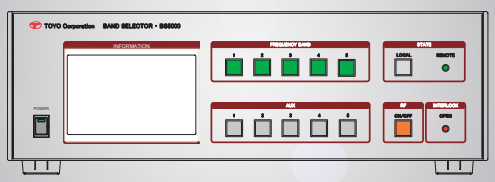
RF Band Selector – BS5000 Series

The BS5000 series frequency band selector changes the route of the RF signal used in EMS testing. It is composed of a multichannel RF switch and can be controlled either manually or via the GPIB interface. It comes standard equipped with an interlock function, which stops tests when the door to the anechoic chamber is opened during testing.

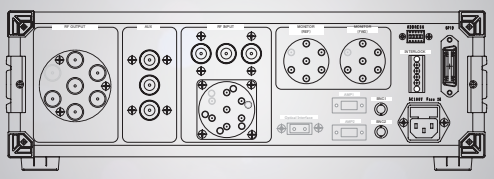
Item	Specifications
Connector	50-ohm N
Input Frequency Range	DC-10GHz
Input / Output Power	500W (< 1GHz) ※
	500W (1~5GHz)
	300W (5~10GHz)
Number of Bands	1~5 (selectable)
Control I / F	GPIB
Power	AC100V, 50-60Hz
Attenuation per channel switch	≤1dB
Dimensions (mm)	426(W) x 430(D) x 143(H)
Weight (kg)	8

※Please consult with us before using a power amplifier with an output of 1 kW.

Front Panel



Back Panel

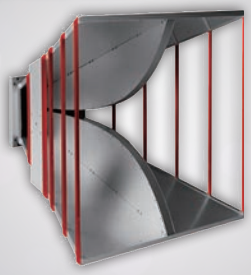


Immunity Accessories

Antennas for Radiated Immunity (ETS)		
Model Number	Product Name	Frequency Range
Log Periodic Antennas		
3144	Log-Periodic Dipole Array Antenna	80MHz~2GHz, 1kW
3148B	Log-Periodic Dipole Array Antenna	200MHz~2GHz, 1kW
BiConiLog Antennas		
3140B	Hybrid Log Periodic and Bowtie (BiConiLog) Antenna	26MHz~3GHz, 1kW
3142E	Hybrid Log Periodic and Bowtie (BiConiLog) Antenna	30MHz~6GHz, 1kW
Double-Ridged Guide Antennas		
3106B	Double-Ridged Guide Antenna	200MHz~2.5GHz, 800W
3115	Double-Ridged Guide Antenna	750MHz~18GHz, 300W
3119	Double-Ridged Guide Antenna	400MHz~6GHz, 1500W
3160	Pyramidal Standard Gain Antenna	0.96GHz~40GHz, 10W-550W
Passive Loop Antenna		
6509	Passive Loop Antenna	1~30MHz, 1kW

Antenna for Radiated Immunity (TESEQ, Schwarzbeck)		
Model Number	Product Name	Frequency Range
Dipole Antenna / Antenna Balun		
VHBC 9133	High Power Broadband Balun (BBA, BBAL, BBFA, FBAB)	25~300 MHz, 1 kW
Collapsible or Open Conical Elements		
BBFA 9146	Foldable Conical Elements (4m)	20~200 MHz
FBAB 9177	Collapsible Biconical Elements	30~300 MHz
BBA 9106	Biconical Elements (VHA, VHBB, VHBA)	30~300 MHz
BBAL 9136	Biconical Elements (VHA, VHBB, VHBA)	20~200 MHz
Log Periodic Antennas		
VULP 9118A	Log Periodic Antenna	180~1500 MHz, 1 kW
VULP 9118B	Log Periodic Antenna	160~1500 MHz, 1 kW
VULP 9118C	Log Periodic Antenna	100~1400 MHz, 1 kW
VULP 9118D	Log Periodic Antenna	95~1500 MHz, 1 kW
VULP 9118E	Log Periodic Antenna	75~1500 MHz, 1 kW
VULP 9118F	Log Periodic Antenna	55~1500 MHz, 1 kW
VULP 9118G	Log Periodic Antenna	40~1500 MHz, 1 kW
STLP 9128C	Stacked Log Periodic Antenna	200~1500MHz, 2kW
STLP 9128E	Stacked Log Periodic Antenna	80~1500MHz, 2kW
STLP 9149	Stacked Log Periodic Antenna	0.7~9GHz, 150W
BiLog/TriLog Antennas		
CBL 6144	X-Wing BiLog for RF EMC Immunity Testing Antenna	26MHz~2GHz, 600W
VULB 9161	TriLog Broadband Antenna	30~1000MHz, 1KW
VULB 9166	BiLog BroadBand Antenna (BBAL Elem)	20~1500MHz, 1kW
Broadband Horn Antennas		
BBHA 9120A	Broadband Horn Antenna, N-Type Connector	0.8~5(10) GHz
BBHA 9120B	Broadband Horn Antenna, N-Type Connector	1~10 GHz
BBHA 9120C	Broadband Horn Antenna, N-Type Connector	2~18 GHz
BBHA 9120D	Broadband Horn Antenna, N-Type Connector	1~18 GHz
BBHA 9120LF	Broadband Horn Antenna, N-Type Connector	0.5~6 GHz
BBHA 9120E	Broadband Horn Antenna, N-Type Connector	0.5~6(8) GHz
BBHA 9170	Broadband Horn Antenna, SMA-Type Connector	14~40 GHz
Helmholtz-Coils; Loop Antennas		
HHS 5210	Helmholtz Coils 1 m x 1 m, 10 turns	100 A/m
HHS 5215	Helmholtz Coils 1.5 m x 1.5 m, 10 turns	9 kHz~30 MHz

3106B - Double-Ridged Guide Antenna



6509 - Loop Antenna

VULP 9118E - Log Periodic Antenna

STLP 9149 - Stacked Microwave Log-Periodic Antenna

Immunity Accessories

Coupling/Decoupling Network (CDN) for Conducted Immunity Test (FCC, TESEQ)

CDN for Power Line
FCC – 801 – M1 (M1 Current capacity 16A/25A/32A/50A/100A/200A)
FCC – 801 – M2 (M2 Current capacity 16A/25A/32A/50A/100A/200A)
FCC – 801 – M3 (M3 Current capacity 16A/25A/32A/50A/100A/200A)
FCC – 801 – M4 (M4 Current capacity 16A/25A/32A/50A/100A/200A)
FCC – 801 – M5 (M5 Current capacity 16A/25A/32A/50A/100A/200A)
CDN M116 (M1 Current capacity 16A)
CDN M016 (M2/M3 attachment current capacity 16A)

CDN for Unscreened, Unbalanced Lines
FCC – 801 – AF2/AF3/AF4/AF5/AF7~AF25
CDN A201/A301/A401

CDN for Screened or Coaxial Cables
FCC – 801 – S1/S2/S4/S9/S15/S25/S36/S44
CDN S150/S200/S250/S400/S900

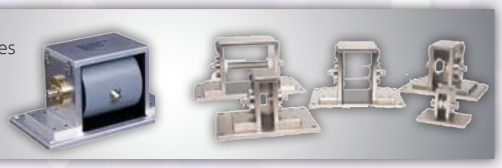
Communication Lines CDN
FCC – 801 – T2/T4/T6/T8
CDN T240A/T440A/T8

TESEQ CDN

FCC CDN

Bulk Current Injection Probe (FCC)			
Model Number	Frequency Range	Power	Inner Diameter (mm)
F-120-6A	10kHz~400MHz	100W	40
F-120-8	10kHz~400MHz	200W	40
F-120-9A	10kHz~230MHz	125W	40
F-130A-1	1MHz~400MHz	100W	40
F-140	1MHz~1GHz	100W	40mm
F-150	800MHz~2.1GHz	250W	32mm

Injection Probe & Calibration Fixtures



Current Probe (ETS, FCC)			
Model Number	Frequency Range	dB Ω	Power (CW)
91550-1(L)	(20H)10k~100MHz	5	42W
94111-1(L)	(20H)1M~1GHz	1-10	20W
F-14	10Hz~500 kHz	-18	50W
F-33-2	1kHz~250 MHz	0	2W
F-65	100kHz~1GHz	0	3W
F-52B	10kHz~400MHz	13	2W
F-2000-32mm-1	10MHz~2.1GHz	22	3W

ETS Current Probe

FCC Current Probe

Tubular Wave Coupler Supporting 3GHz

These couplers are used for ISO11452-4-compliant test at up to 3GHz and also as a current probe for emissions measurement in a range of 150kHz to 3GHz.

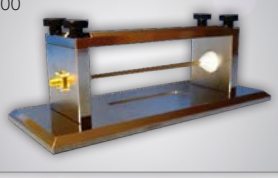
Frequency Range: 400MHz~3GHz (EMS)
150kHz~3GHz (EMI)

Tubular Wave Coupler				
Model Number	Insertion Loss (average)	Insertion Loss (<20dB)	Inner Diameter (mm)	Outer Diameter (mm)
BI30410	7	0.15~3GHz	10	40
BI30413	8.5	0.15~3GHz	13	40
BI30416	10	0.2~3GHz	16	40
BI30520	12	0.15~2.5GHz	20	50
BI30526	15	0.2~2.5GHz	26	50

Calibration Fixture			
Model Number	Frequency Range	Maximum Input Power	Dimensions (mm)
CF30000	400MHz~3GHz	4W	230 x 95 x 90

BI30416

CF30000



Immunity Accessories

Wideband electric field probes (Narda STS) EP-600/EP-601/EP-602/EP-603/EP-604

Features

- High sensitivity, wide dynamic range
- Excellent isotropy (0.3dB)
- Operational with a battery for up to 80 hours (battery replacement possible locally)
- Directly connected to PC with an RS0232C/USB conversion adapter using an optical cable
- Ultra compact, lightweight (25g)

Specifications / Model Number	EP-600	EP-601	EP-602	EP-603	EP-604
Frequency Range	100kHz~9.25GHz	10kHz~9.25GHz	5kHz~9.25GHz	300kHz~18GHz	300kHz~26.5GHz
Flatness	0.4dB: 0.3MHz~7.5GHz	0.4dB:0.05MHz~7.5GHz	0.4dB:0.05MHz~7.5GHz	0.4dB:0.3MHz~18GHz	0.4dB:0.3MHz~26.5GHz
Dynamic Range	0.14-140V/m (60dB)	0.5~500V/m (60dB)	1.5-1500V/m (60dB)	0.14-170V/m (60dB)	0.4-800V/m (66dB)
Linearity	0.4dB@50MHz/ 0.3~100V/m	0.4dB@50MHz/ 1~500V/m	0.4dB@50MHz/ 2.5~1000V/m	0.4dB@50MHz/ 0.3~170V/m	0.4dB@50MHz/ 0.8~800V/m
Isotropic Deviation	0.5dB[0.3dB typical]@50MHz			0.4dB[0.2dB typical]@50MHz	
Maximum Electric Field Strength	300V/m	1000V/m	3000V/m	350V/m	1600V/m
Measurement Data	Measurable for each X-Y-Z axis				
Built-in Battery	3V-5mAh Lithium Battery (Li-Mn)				
Operable Time	80 hours (rechargeable lithium battery)				
Communication	Bidirectional fiber optic link (RS232, USB)				
Fiber Optic Length	Standard: 10m, Option: 20m / 40m				
PC Connection From Fiber Optics	Optical / RS232 converter, RS232 / USB converter				
Operating Temperature Range (℃)	-10~+50				
Dimensions	Overall: 53mm; Diameter: 17mm				
Weight	25g				

Directional Electric Field / Magnetic Field RF Probes (ETS Lindgren)

Ideal for applications demanding levels of measurement accuracy and speed that standard wideband probes cannot provide, this isotropic (X-, Y-, and Z-axis) probe has a unique design with features such as display of the electromagnetic field strength along each axis independently, vector sum display, and continuous auto-zero adjustment (which eliminates things such as the need for internal zero adjustment and errors due to temperature drift). Electromagnetic field disturbances are minimized thanks to the isolation provided by the optical fiber connection, allowing you to obtain accurate measurement results.

The laser-powered model eliminates the inconvenience of charging batteries, and this model can reliably be used for measurement tests taking prolonged periods of time. There are a variety of ways to retrieve data for the measurement values. For example, data can be retrieved via the RS-232C port or USB output on a Windows PC connected to the fiber optic modem.

Specifications/ Model Number	EMSense™10	HI-6006	HI-6023	HI-6053
Frequency Range	10 kHz~10 GHz	100 kHz~6.0 GHz	10 kHz~1 GHz	10 MHz - 40 GHz
Frequency Response	10 kHz~10 GHz: ± 1dB (with internal correction)	500kHz~2GHz: -2.5, +1.0dB 2GHz~5.5GHz: -4.5, +3.5dB 5.5GHz~6GHz: -6.0, +2.0dB	10kHz~30kHz: -2.5, +0.5dB 30kHz~1 GHz: ± 1.0dB	10MHz - 100MHz: -4.0, + 3.0dB 100MHz - 1GHz: -0.5, +3.0dB 1GHz - 18GHz: -2.0, +4.0dB 18GHz - 40GHz: -4.5, +3.5dB
Response Time	–	< 1 msec.		500 msec.
Isotropic Deviation	± 0.3 dB @ 1 GHz ± 0.5 dB up to 3 GHz ± 1.0 dB up to 6 GHz ± 2.0 dB up to 10 GHz	± 0.5 dB typical		± 1.0 dB typical
Dynamic Range	1-750V/m	0.5~800 V/m typical	2~800 V/ m typical	
Damage Level	1,000V/m	1500 V/m	1500 V/m	–
Sampling rate	100 / sec.	> 70 / sec.	> 70 / sec.	> 70 / sec
Power	Laser-powered	NiMH Battery Operating Time 8 hrs.	NiMH Battery Operating Time 8 hrs.	NiMH Battery Operating Time 30 hrs.
Dimensions	49 x 49 x 49mm	43mm Sensor cap	32mm Sensor cap	438mm x 57mm (L x W)
Weight (g)	65	80		
Operating Temperature (℃)	0~40	10~40		
Controller	EMCenter 1, EMCenter	EMCenter, HI-4413usb		

Immunity Accessories

Immunity Test – Malfunction Detection System

A camera designed to tolerate strong electromagnetic fields is integrated into this measurement system, which can monitor the EUT during immunity tests.

- Find the malfunction of EUT in combination with TOYO's Immunity test software and automatically record it
- Build a system with up to 4 analog/HD cameras
- Controller capable of sending both video and audio data
- Possible to build a camera system via TCP/IP

Cam8 EMC Shielded Color Camera

A camera designed to tolerate strong electromagnetic fields is integrated into this measurement system, which can monitor the EUT during immunity tests.

- Radiated immunity test
- ISO 11452: 200V/m up to 18GHz (upgradable up to 40GHz)
- FIRF RTCA DO 160 G: >3000V/m
- EMC CISPR25 Class 5 compliant
- Automatic/manual focus
- Image stabilizer installed
- Compact 100mm (D) x 190mm (L)
- Pan/tilt feature available as an option

Optical Fiber Shielded Converter – fo Series

- Radiated immunity test 200V/m (18GHz)
- EMC CISPR 25 Class 5 compliant
- Powered by a battery or AC power line
- Data sent via optical fiber between the anechoic chamber and measurement room – no use of electric signals

Communication interfaces supported by fo Series

- Ethernet/LAN
- USB
- CAN
- HDMI
- RS232
- General I/O
- Automotive Ethernet
- Car charger

Shielded Projector

This instrument can project the screens of the EMI test receiver and spectrum analyzer in an anechoic chamber. Its body is completely shielded, and it sends its video signal through an optical cable, so no modifications need to be made to an anechoic chamber.

System for IEC / EN 61000-4-31 and -39

Horn Antenna for Near-field Immunity Tests – TEM HORN

This horn antenna is used for the near-field immunity tests required by IEC / EN 61000-4-39

Specifications/Model	TESEQ TEM HORN	Schwarzbeck TEMH6000
Frequency Range	600MHz~6GHz	380MHz~6GHz
Maximum Input	250W	300W
Others	Matching Network Using TRTRA 400 and GM RS4 60 / FRS 460 Expandable to use	Dimensions: 260x300mm (500) x210mm

Loop Antenna and Sensor for Near-field Immunity Tests

This set includes the antenna and sensor antenna required by IEC / EN 61000-4-39

Loop Antenna
LAS6100/6120 (TESEQ)

- Spacer for level setting included
- 13.56MHz matching network included
- Frequency range: 9kHz~150kHz (LAS6120) 150kHz~30MHz (LAS6100)

HFSP 5132/HFRA 5164 (Schwarzbeck)

- Frequency range: DC – 50MHz (FERA 5164) DC – 250kHz (FESP 5132)

Broadband Immunity Test System – NSG 4031

Equipped with a white noise generator with four different broadband filters, this broadband immunity test system was designed for the tests conforming to IEC / EN 61000-4-31. Its built-in firmware is powerful and user-friendly and can be used without a PC or control software.

- Designed to support IEC/EN 61000-4-31
- Perfect white noise generator 150kHz – 80MHz
- 3 Power meter inputs
- Class A power amp with >80W, covering 150kHz to 80MHz

Full-Vehicle Emissions Measurement System

Summary

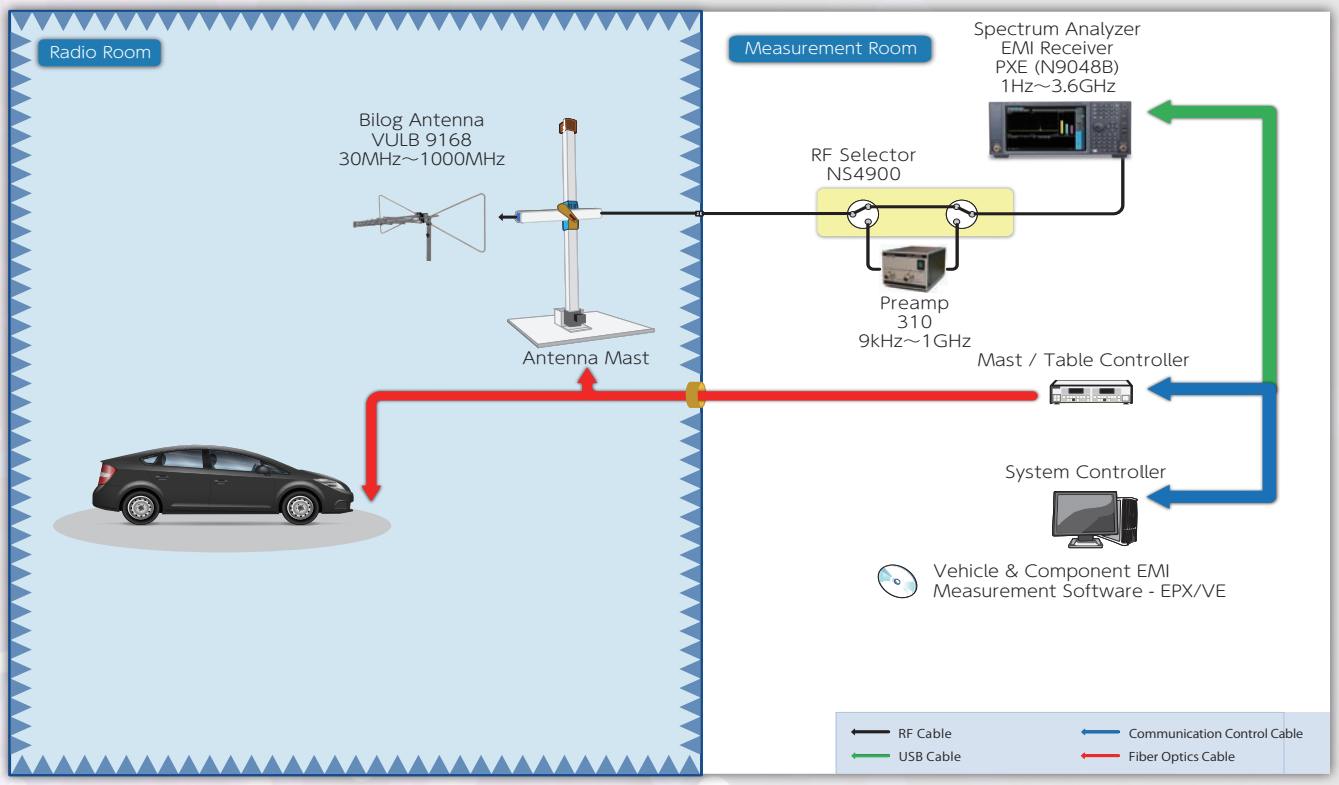
Over a measurement frequency range of 150 kHz - 18 GHz (40GHz), electromagnetic noise radiated from vehicles is received by an antenna placed in an anechoic chamber and measured by an EMI test receiver. Supported standards include:

- CISPR12:2007 (Ed6)
- CISPR25:2016 (Ed4)
- ECE R.10
- Automakers' standards

Emissions Measurement Software for Vehicle

- EPX/VE - Emissions Measurement and Analysis Software for Automobile and On-vehicle Equipment
- ES10/VE - Vehicles and Components Emission Measurement Software

Full Vehicle EMI Measurement Solution



Emissions Measurement and Analysis Software for Vehicle and On-vehicle Equipment - EPX/VE

EMI Receiver – PXE

Full-Vehicle Immunity Test System

Summary

Radiated immunity tests are performed on vehicles over a 10 kHz-18 GHz frequency range. We will propose an appropriate system conforming to the following regulations and standards.

- ISO11451-2, ISO11452-2
- ISO11451-4/11452-4, 7, 8
- ECE R.10
- Automakers' Standards

Software

- VI5/RS Radiated Immunity Test Software for Vehicles
- IM5/CS Conducted Immunity Test Software

Test System / Equipment

1. Radiated Immunity Test System (ISO 11451-2 for Vehicles)

This system exposes an automobile's body to strong electromagnetic field noise while it is running, and tests its tolerance to interference. Based on the international standard ISO 11451-2, this system can be built to meet the standards of every automobile maker. We will select the equipment, including the antenna, power amplifier, electric field sensor, and RF cable, according to the needs of each customer.

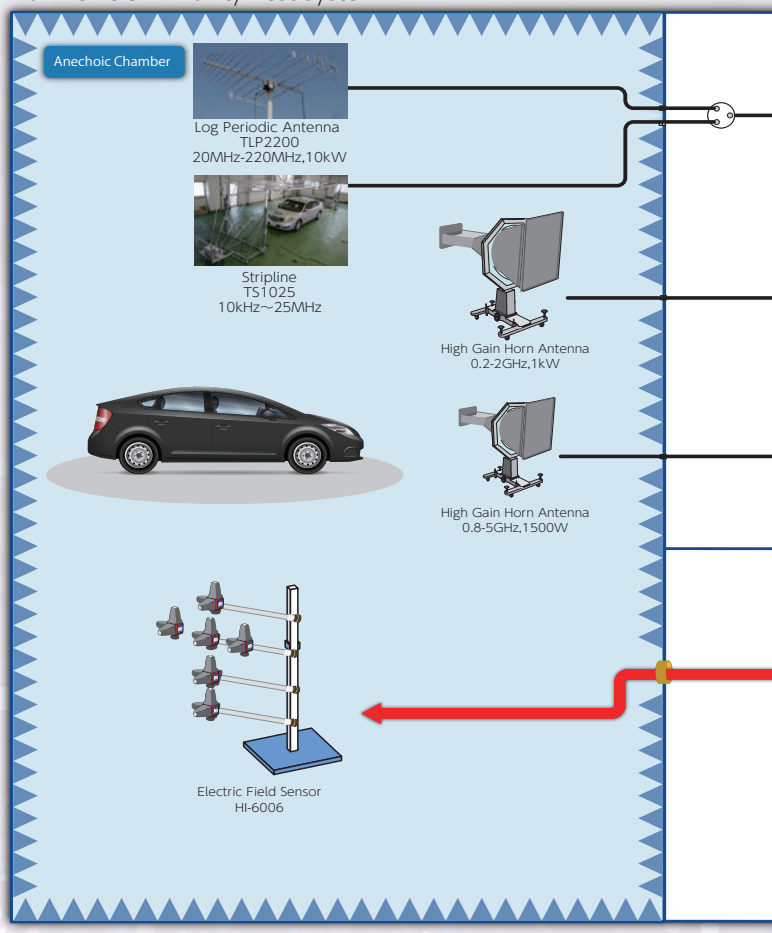
- Supported standards: ISO11451-2, ECE R.10, automakers standards
- Supported spec:
  - Frequency range; 10kHz – 18GHz
  - Electric field strength: 200V/m, distance d=2m
- Propose the most suitable antenna and power amp for your needs
- Stable operation at short/open circuit
- Automatic control is possible with the latest Windows OS
- Frequency and strength of generated electric field are easily changed

2. Vehicle Monitoring System for Radiated Immunity Tests

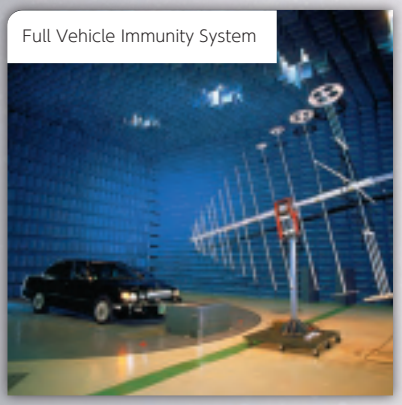
Normally, deciding whether the EUT is malfunctioning during an immunity test is done by humans. With TOYO's "Malfunction Detection Immunity Test System," this can be done automatically. Malfunctions are determined based on the tolerances set in advance, and the monitor values are displayed in the test software, eliminating the ambiguity involved in determinations made by humans and reducing the workload for testers.

- This system is able to control and retrieve data from each type of hardware, such as chassis dynamometers, masts, and turntables. We will propose an all-around system, built around radiated immunity test software, that works together with the measuring devices and the PC that determines malfunctions.
- Supported monitoring equipment
  - CAN/LIN BUS
  - Digital / Analog Signal
  - Camera Images
  - Voice

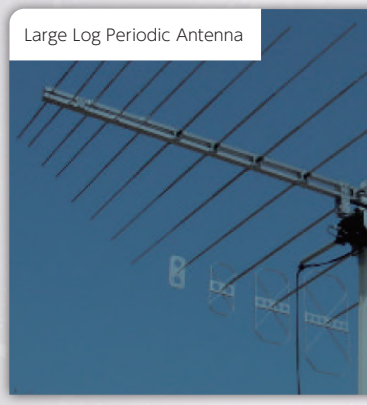
Full Vehicle Immunity Test System

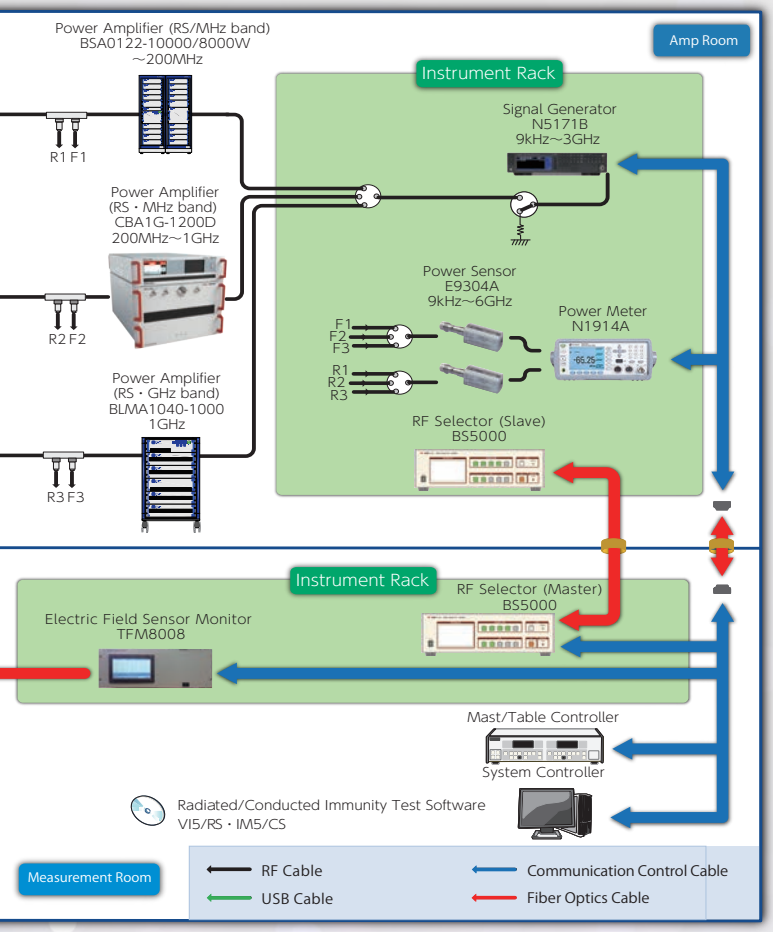


Full Vehicle Immunity System



Large Log Periodic Antenna



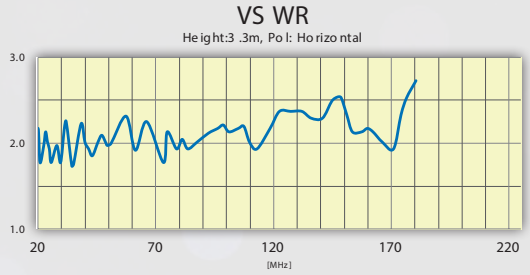


Strip Line for Vehicles (self-supporting)

3. Large Log-periodic Antenna

The TLP2200 is a large log-periodic antenna applicable for vehicle immunity tests (ISO 11451-2). To increase the electric field strength in the low range, this antenna achieves particularly low VSWR (average: below 2:1) from 20MHz~30MHz.

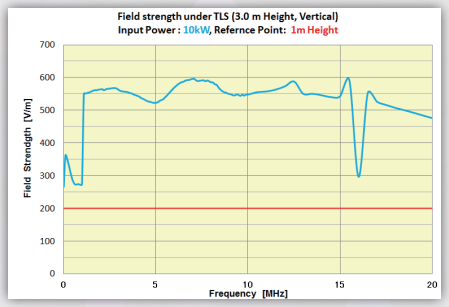
- Frequency range: 20MHz~220MHz
- VSWR (nominal): 2.0:1
- RF tolerance: 10kW (LC Connector)
- non-metal mast included
- The height, polarization and tilt (elevation) can be adjusted or switched automatically
- RRotary joint to support heavy and hard high voltage cable



4. Stripline for Automobile (Self-Standing)

The TS1025 is a TLS (transmission line system) applicable for vehicle immunity tests (ISO 11451-2). Because it is freestanding, it does not need to be hung from the ceiling of an anechoic chamber and can be assembled and installed in your current chamber without any modifications.

- Frequency range: 10kHz~25MHz
- VSWR (nominal): 2.0:1
- RF input tolerance: 10kW
- Stripline height: 2.0~3.0m variable
- Generated field strength: 200V/m or higher (at a 10kW input)



5. Other Immunity Test Systems

There are a wide variety of vehicle tests other than radiated emission and immunity tests (see list below), and we will propose a system in accordance with your preferences. In addition, the tests for electric and hybrid automobiles are often based on standards for consumer appliances. If you are looking for a test system for such applications, please contact us.

- Full vehicle tests
- ISO11451-3 On-board transmitter simulation test
- ISO11451-4 BCI test
- ISO10605 ESD test

Emissions Measurements and Immunity Test for On-vehicle Equipment

Emission Measurement System (CISPR 25, Automaker's Own Standards)

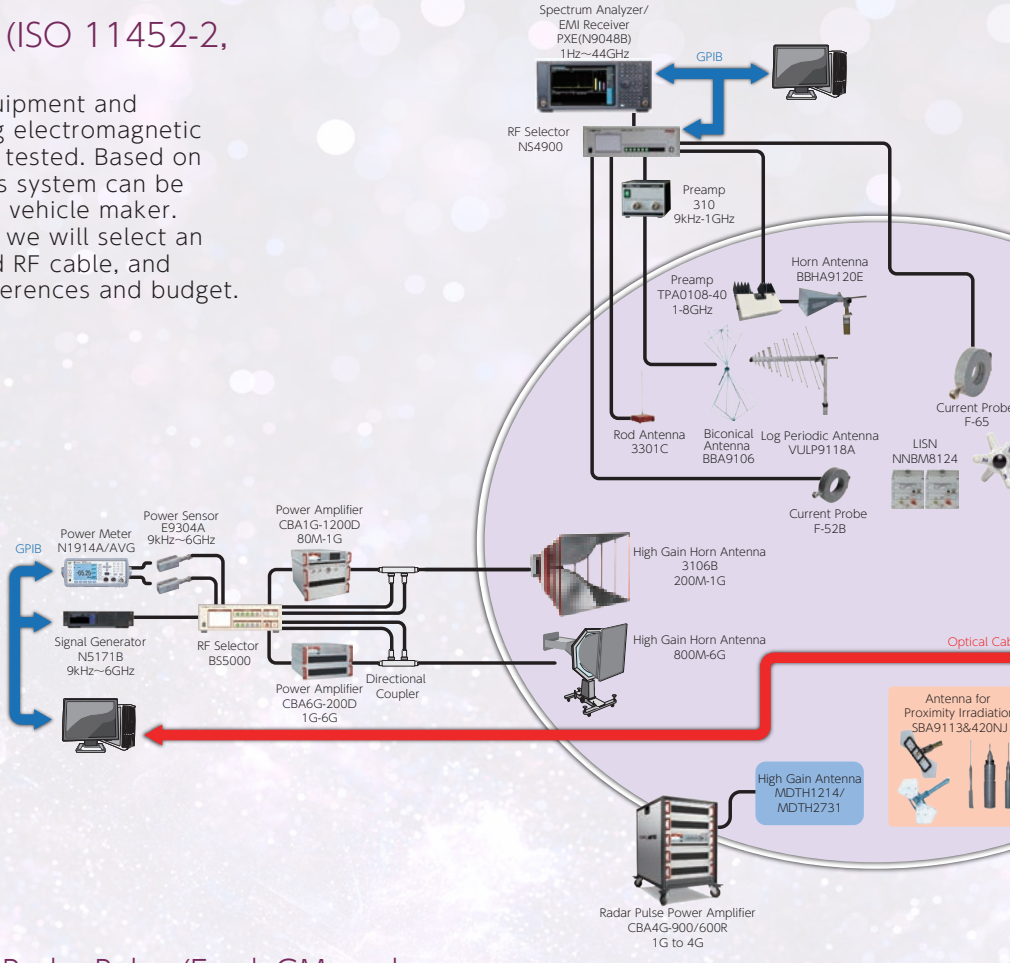
Electromagnetic noise in the 150 kHz to 18 GHz (40GHz) frequency range emitted from on-vehicle electronic equipment is received by an installed device such as an antenna, LISN, or current probe and measured by an EMI receiver. Supported standards include:

- CISPR25
- ECE R.10
- Automaker's own standards

Radiated Immunity Test System (ISO 11452-2, Automaker's Own Standards)

Using this system, on-vehicle electronic equipment and connected harnesses are exposed to strong electromagnetic field noise, and tolerance to interference is tested. Based on the international standard ISO 11452-2, this system can be constructed to meet the standards of every vehicle maker. In accordance with each customer's needs, we will select an antenna, amplifier, electric field sensor, and RF cable, and propose a test system tailored to their preferences and budget.

- Support ISO11452-2 and Automakers' Standards
- Test frequency: 200MHz~6GHz
  - Test distance: 200V/m at 1m
  - Consult with us for other frequencies
- Stable operation at open/short circuit
- Automatic control on latest Windows OS
- Easily changeable frequency and strength of the generated electric field
- Support malfunction detection with CAN/LIN Bus, digital/analog signal, image recognition
- A system to monitor EUT's condition during immunity testing can be proposed



Radiated Immunity Test System for Radar Pulse (Ford, GM, and other Requirements)

This system achieves a strong electric field of 600 V/m in the radar pulse band, which is required by companies such as Ford and GM. There are requirements for a 600 V/m electric field in the radar pulse band (1.2~1.4 GHz, 2.7~3.1 GHz) at a test distance of 1 m. We will propose specially designed and built amplifiers capable of producing this strong electric field at the lowest cost possible.

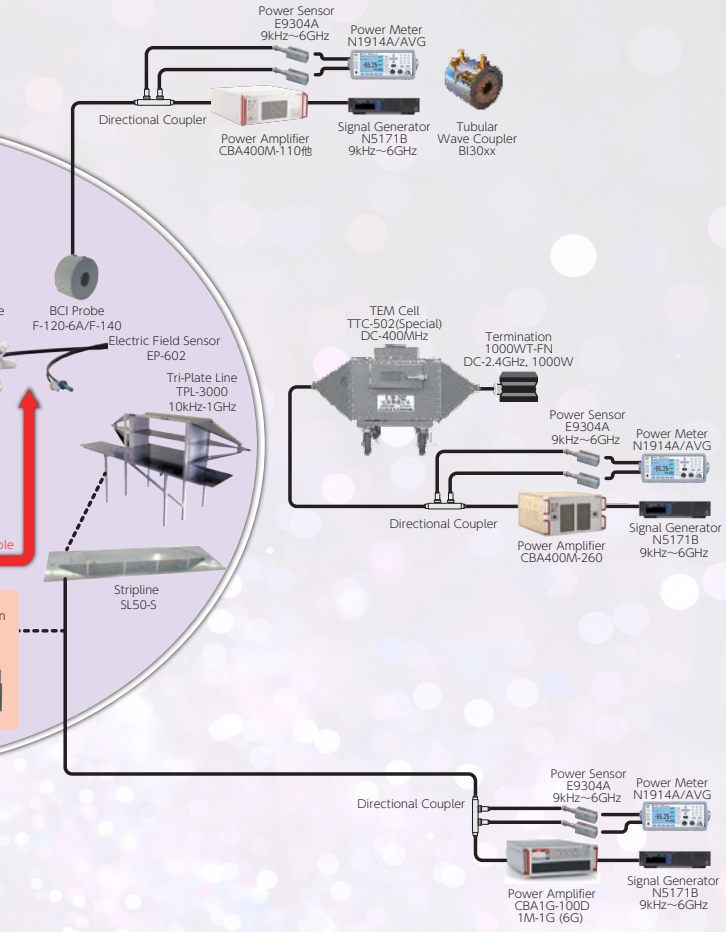
TESEQ

- CBA4G-900/600R
- CBA6G-400D
- Power amp supporting radar pulse testing

BCI Immunity Test System (ISO 11452-4, Automaker's Own Standards)

This BCI (bulk current injection) immunity test system for in-vehicle electronic equipment complies with standards including ISO 11452-4, ECE R.10, SAE, and JASO. With a BCI probe, noise is injected into each line (harness). Tolerance is confirmed to ensure there are no malfunctions. In the IM5/CS conducted immunity test software, the substitution method, which makes use of a correction value (factor) measured in advance, and the feedback method, in which the noise injection level is monitored via a current probe during the test, can be selected. In case the device being tested malfunctions during an immunity test, a variety of automatic error detection functions and measurement sequences are available. Supported standards include:

- ISO11452-4
- Automakers' standards



TEM Cell Method (ISO 11452-3)

In a TEM cell, the equipment being tested is placed in the space between the parallel plates of the central and peripheral conductors and exposed to an electromagnetic field generated there, and malfunctions and degradation are evaluated. The upper limit frequencies are determined by the distance between the conductors in the TEM cell, and we recommend that the test area be 1/3 of the distance between the conductors. Supported standards include:

- ISO11452-3
- Automakers' standards

G-TEM

Stripline Method (ISO 11452-5, Automaker's Own Standards) Tri-plate Method (SAE 1113/25)

This is one of the test systems in which on-vehicle electronic equipment and connected harnesses are exposed to a strong electric field, and tolerance to interference is evaluated. The test sample or harness is placed in the space between two parallel plates, and tolerance tests are conducted. A stripline or triplate method system are available. Supported standards include:

- ISO11452-5
- SAE1113/25
- Automakers' standards

Portable Transmitter Immunity Test System (ISO 11452-9)

In this test system, electromagnetic fields simulating those emitted by things such as wireless devices or portable transmitters are generated, and immunity tests are performed. An EUT is placed in the vicinity of antennas (mobile antennas, helical antennas, sleeve antennas, etc.) supporting the frequency required by individual automaker's requirements, and tests are conducted in a strong electric field of hundreds of V/m. Supported standards include:

- ISO11452-9
- Automakers' standards

EMC Test System for On-vehicle Electronic Equipment

Portable Transmitter Immunity Test System (ISO 11452-9)

This system is used to perform immunity tests, generating electromagnetic fields that simulate those emitted by things such as wireless devices or portable transmitters. The EUT is placed in the vicinity of antennas (mobile antennas, helical antennas, sleeve antennas, etc.) generating each required frequency, and a strong electric field of hundreds of V/m is applied. This test method conforms to automobile maker requirements for immunity tests of wireless devices and cell phone antennas in close proximity and of portable transmitters. The calibration function can be used to decide the antenna's input power so that the required electric field strength can be achieved, and to control the signal generator so that the proper amount of power is provided.

- Conform to Automakers' requirements for close proximity immunity test of wireless devices and cell phone antennas
- Conform to the requirements for immunity test for portable transmitters (simulating transmitter is available)
- Measure power required to generate the expected electric field in pre-test calibration
- Immunity test using the Substitution method/Closed loop method
- Wizard-type test report
- Burn-in for amp prior to tests
- Support new standard, ISO11452-9:2012

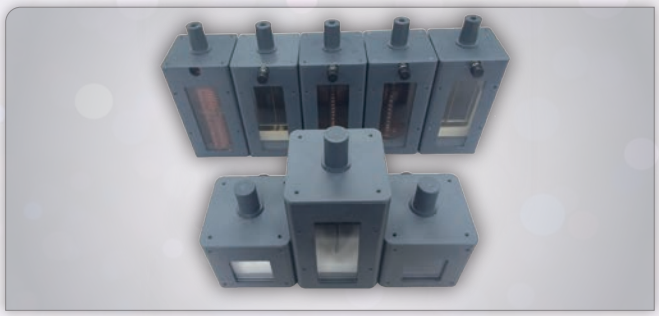
Sleeve Antennas for Close Proximity Immunity Test of Wireless Device Antennas (recommended by ISO11452-9)		
Model Number	Frequency	Product Name
CV07-114	144MHz	1/4 Sleeve Antenna
CV07-430	430MHz	1/4 Sleeve Antenna
CV07-835	835MHz	1/4 Sleeve Antenna
CV07-900	900MHz	1/4 Sleeve Antenna
CV07-940	940MHz	1/4 Sleeve Antenna
CV07-1280	1280MHz	1/4 Sleeve Antenna
CV07-1440	1440MHz	1/4 Sleeve Antenna
CV07-1750	1750MHz	1/4 Sleeve Antenna
CV07-1880	1880MHz	1/4 Sleeve Antenna
CV-1000SA	2590MHz	1/2 Sleeve Antenna
CV-5800SA	5800MHz	1/2 Sleeve Antenna
		Contact us for other frequencies

CV07-430 430MHz 1/4 λ Sleeve antenna
CV07-1880 1880MHz 1/4 λ Sleeve antenna
CV07-835 835MHz 1/4 λ Sleeve antenna

Biconical Antennas for Immunity Test of Portable Transmitters (recommended by ISO11452-9)		
Model Number	Frequency	Product Name
420NJ	360MHz~2.7GHz	Flat, Broadband Antenna Elements for the SBA 9113 Balun
422NJ	800MHz~6GHz	Flat, Broadband Antenna Elements for the SBA 9119 Balun

420NJ + SBA9113 Biconical Antenna

Antennas/Cable for Immunity Test of Portable Transmitters (recommended by ISO11452-9)	
Model Number	Product Name & Frequency
EGG 900	Monopole Antenna for 890~915MHz
EGG 1860	Monopole Antenna for 1710~2025MHz
PCD 2440	Monopole Antenna for 2402~2480MHz
HLC 27	Monopole Antenna for 26,96~27.4MHz
HLC 146	Monopole Antenna for 144~148MHz
HLC 170	Monopole Antenna for 168~173MHz
Ferrite cable	Cable with ferrites to block braid currents evolving during the test especially with the HLC antennas
FAN 405	Monopole Antenna for 380~430MHz
FAN 450	Monopole Antenna for 430~470MHz



Antennas for Immunity Test of Portable Transmitters		
Model Number	Frequency	Product Name
EMC-28	28MHz	28Mhz Helical Antenna 20W
EMC-40	40MHz	40Mhz Helical Antenna 20W
EMC-52	52MHz	52Mhz Helical Antenna 20W
EMC-75	75MHz	75Mhz Helical Antenna 20W
EMC-125	125MHz	125Mhz Helical Antenna 20W
EMC-145	145MHz	145Mhz Helical Antenna 20W
EMC-155	155MHz	155Mhz Helical Antenna 20W
EMC-165	165MHz	165Mhz Helical Antenna 20W
EMC-190	190MHz	190Mhz Helical Antenna 20W
EMC-223	223MHz	223Mhz Helical Antenna 20W
EMC-350	350MHz	350Mhz Helical Antenna 20W

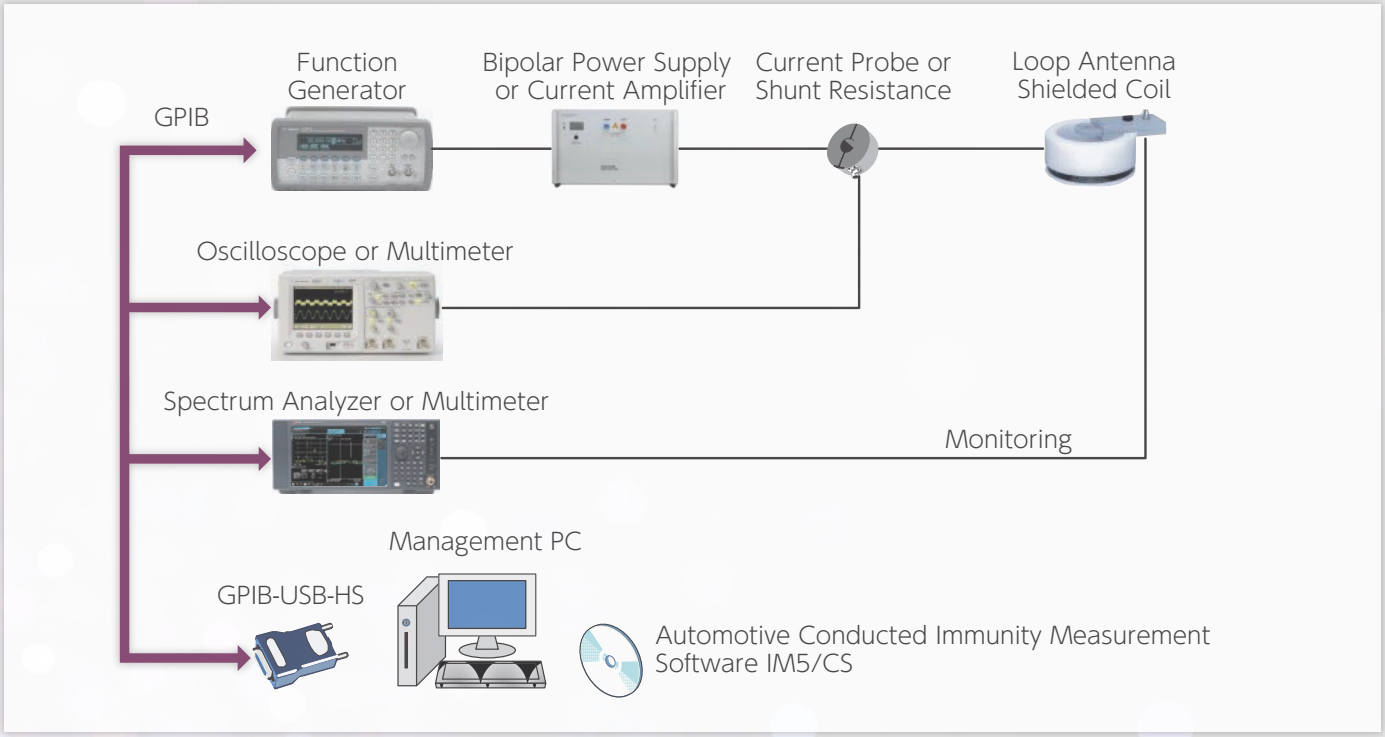
- AT5000: Simulating transmitter unit (BS5000 or NS 01-B is required.)
- FS1000: Interlock fit switch (BS500 or NS 01-B is required.)
- NS01-B: 1CH coaxial switch for A T5000/FS1000
- BS5000: RF band selector
- Contact us for other frequencies

AT5000 Simulating Transmitter Unit

EMC-145 145MHz 1/4 λ Helical Antenna

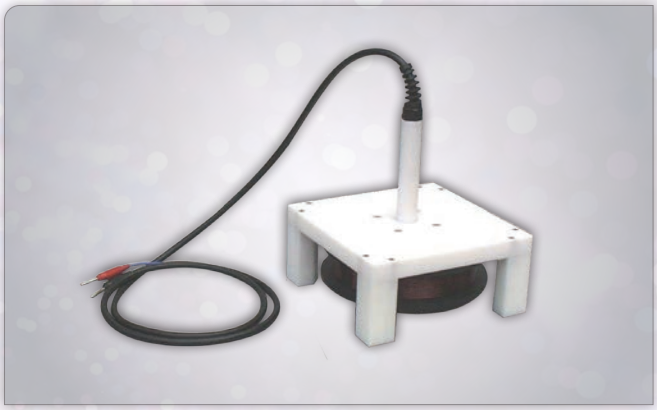
Magnetic Field Immunity Measurement System

The magnetic field immunity test system we offer can conduct tests at DC-150 kHz or even up to 200kHz (optional), which is in accordance with ISO 11452-8. In addition, we will propose an optimal system that conforms to the requirements of each automobile maker. We can also offer loop coils and gauss meters specially designed for DC tests.



FESB5133-1330 Radiating Loop

- Number of Turns: 225
- Max coil current: 20A
- Magnetic field strength per 1A (a distance of 50mm): 858.2A/m
- Dimensions: 190 x 190 x 290mm
- Weight: 5.3kg



IM5/CS: Magnetic Field Immunity Test Software

- Measurement steps that substantially reduce measurement time
- Measurement results in CSV format
- Easily create, save, edit the settings including the limit values, factor values, measurement conditions in separate files
- Support hardware from various suppliers
- Support versatile password function that separates test engineers from administrators
- Start measurement with a single mouse click
- Easily conduct additional measurements

Transient Test for Equipment on Electric / Hybrid Vehicles

Summary

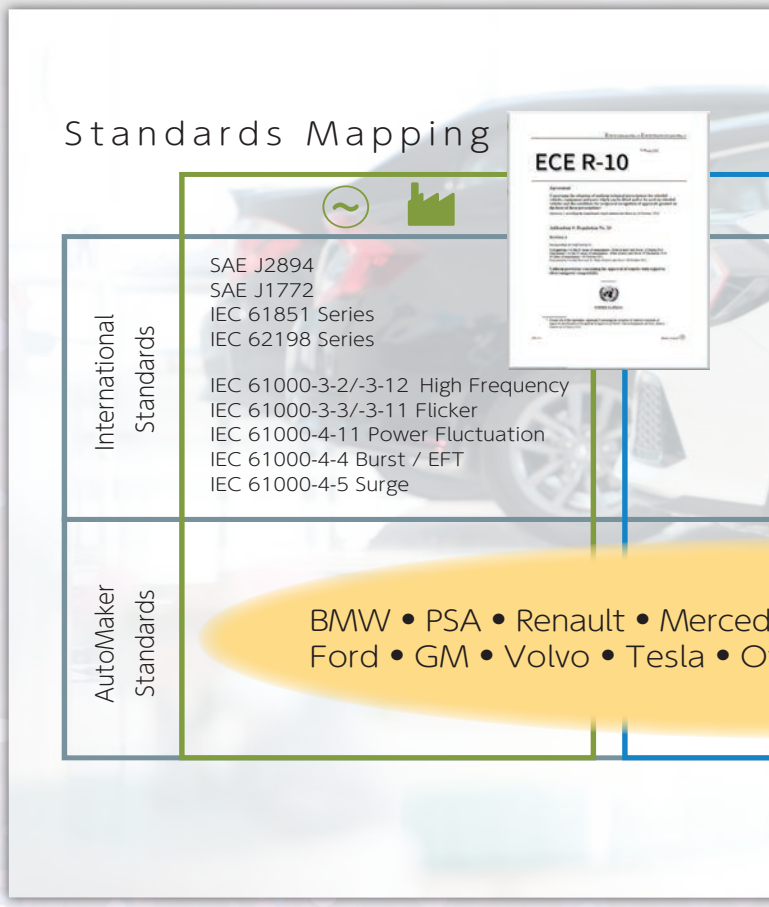
Standards including ECE-R10, IEC 61851-1, and IEC 21498-2 are placing increasing focus on the transient immunity of electric vehicles, charging systems, and high-voltage battery lines. AMETEX (TESEQ) has been working toward providing immunity and emission solutions for motor ripples and high-voltage switching by motor drives. They provide a full range of simulation solutions, from internal battery cell monitoring and charging station immunity tests to emission tests for high-voltage lithium battery voltage ripples and transient phenomena.

Harmonics / Flicker Test

This harmonics and flicker test system conforms to the most recent IEC/EN standards and is highly cost-effective. The AC/DC power supply can also be used for a wide range of power quality immunity tests other than harmonics and flicker tests.

Burst / Surge / Power Fluctuation Test

The NSG3000A (NSG3060A, NSG3040A, NSG3150) series, a general-purpose series that conforms to international and product family standards, is the most economical solution for CE marking tests. For numerous applications such as magnetic field tests, a variety of accessories are available.



ISO 7637-1/-2/-3: Transient Test

The NSG5500 is the most compact test system intended for immunity tests for automobile components. Based on the requirements in ISO 7637-2 and -3, it conforms to the standards of a wide range of makers.

LV124, LV148

NSG5500 + PA5840

This can be used for transient test, low-frequency tests of up to 200 kHz, battery simulation tests, and low-frequency magnetic field tests. It conforms to LV 124, LV 148, and ISO 16750.

ISO7637-4: Ripple & Switching Transient

The NSG4070 ISO simulates the ringing brought about by the operation of high-voltage semiconductor switching.

- ISO7637-4:1MHz ~ 10MHz
- MBN10284-3:50KHz ~ 50MHz

NSG4070C-ISO Op1+BAL4070

ISO7637-4 DRAFT: HV Line Burst

This coupling network is for fast transient burst tests on EV high-voltage power line. It can be used at up to DC 1000V/200A and also works with AC/DC charge lines.

PCD 8 b-3-690-1000-100 (100A)

ISO7637-4 DRAFT: HV Line Surge

This is a coupling network for surge pulses on EV's high-voltage power lines. It can be used at up to DC 1000V/200A and also works with AC/DC charge lines.

PCD 8 s-3-690-1000-100 (100A)

Conducted Immunity Testers for Consumer and Industry Electronics

IEC61000-4-4, 4-5, 4-8, 4-9, 4-11, 4-12, 4-29 Burst/Surge/Power Fluctuation Tester

The NSG3060A tester is applicable to immunity tests conforming to IEC/EN standards. A ring wave can be installed for IEC 61000-4-12.

- Compliant with IEC/EN standards
- Support burst tests of up to 4.8V, surge tests of up to 6.6kV, dips, interrupts, and variations tests, and magnetic field tests
- Built-in single-phase, AC/DC300V, 16A, and full-automatic CDN
- Externally extendable to single or 3-phase AC480V, 32A/63A/100A

NSG3060A

The NSG3150 is the most compact 15 kV surge tester that complies with IEC/EN 61000-4-5. Fully automatic coupling between the specialized coupling circuit (CDN 3153-S63) and the single-phase/three-phase line (AC690V/63A) is possible.

- No mercury switch is used
- Dimensions: W550mm x H260mm x D500mm
- CDN315-S63 supports 3 ranges from 0 to 63A of IEC standards' current category
- Support DC 1000V/63A by adding INA3151 DC Coupling Option

NSG3150

IEC61000-3-2, -3/IEC61000-4-13, 4-14, 4-17, 4-28 Power Harmonics/Flicker Measurement System – ProfLine2100

This powerful harmonics/flicker measurement system is for use with single-phase or 3-phase electric power that complies with the most current EC, EN, and JIS standards.

- Fully compliant with the latest version of IEC61000-3-2/ IEC61000-4-7 standards
- Realizes real-time and gapless measurement of harmonics and inter-order harmonics

ProfLine2100

IEC/EN61000-4-6, IEC/EN61000-4-16, IEC/EN61000-4-19 Conducted / Radiated Immunity Test System – NSG4070C

This is an immunity test system for EMC in the 9 kHz to 1 GHz range. Within its compact housing, a signal generator, power amplifier, power meter, directional coupler, and EUT monitoring interface are installed. The system is suitable for tests based on IEC/EN 61000-4-6, ISO 11452-4 (BCI), and other standards applicable to the same frequency band.

- Built-in signal generator 9kHz~1GHz
- 3ch Power meter
- Saturation output check (monitor the saturation level at modulation)

NSG4070

Low-Frequency Immunity Test System – NSG4060

This is an immunity test system for EMC in the 15 Hz-150 kHz range. It is built with a sine wave generator, power amplifier, and EUT monitoring interface. This system is suitable for tests based on IEC/EN 61000-4-16, IEC 61000-4-19, and other standards applicable to the same frequency band.

- Signal generator and built-in power amplifier for 15kHz -150kHz
- Compliant with IEC/EN61000-4-16 with a suitable extension unit
- Compliant with IEC/EN61000-4-19 and other standards

NSG4060

Emission / Immunity Testers for On-vehicle Equipment

Transient Emissions Measurement System – AES5500

This system, which includes an electronic switch, a mechanical switch, an artificial mains network, and a control station, is compliant with ISO 7637-2 for emission measurements. It provides an unprecedented level of user-friendliness and quality.

- Max. 100A
- Completed system
- 4-unit system: 5μF AMN, 300ns electronic switch, voltage drop, mechanical switch, system controller
- Exchangeable relay according to your needs
- 12, 24 or 42V relay voltage

AES5500

Pulse Immunity Tester – NSG5500

The NSG5500 has an internal capacitive generator circuit and a unique pulse generator function that utilizes TESEQ's exclusive Gemini technology. As a result, it fully satisfies all immunity-related requirements in ISO 7637-2:2004.

- Built-in 100A battery switch and coupler (peak: 250A)
- Gemini technology-based modular structure allows for easy upgrade
- Conform to the requirement for "capacitive discharge into pulse shaping network
- JT5510/JT5550 JASO module and NT5510 module (for automaker N)
- Pulse 3a/b generator supporting two pulse widths based on the old and new standards (5/100ns and 5/150ns)
- Pulses 6 and 7 are added for compatibility with the old standards while Pulses 1 and 2 are generated to cover all the latest standards
- Pulse 5 generator – only generator that satisfies all the requirements for load dump

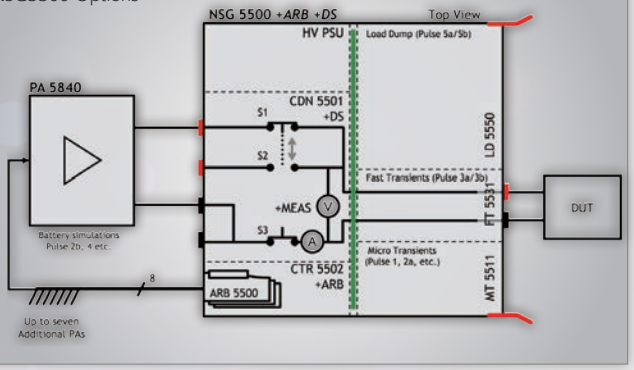
NSG5500

Enhancement Option for NSG5500

On the back of the NSG5500, a programmable signal generator and a power line interruption switch module can be installed. With these, the starting voltage fluctuation, voltage dip and interruption, and trans-coupling transient and ripple noise tests can be carried out. This option is compliant with ISO 16750, VDA 320, and LV standards.

- Powerful function generator with graphical display and flexibility
- Up to 8 signal generators can be installed and synchronized
- "Clone" function for digital capture and duplication from an oscilloscope, or import from MathCAD and Excel
- Support direct programming for sine wave, rectangular wave and triangle wave, exponential function, DC offset, ramp
- Interrupt switch instantaneously shuts down Hi/Low line with a minimum width of 1usec

NSG5500 Options



Battery Simulator / Power Amplifier – PA5840

The PA5840, with a unique capacitive stability mode installed, puts to use years of automotive industry experience with high-speed power amplifiers. It has a variety of features including low impedance, large current, extremely high inrush current, a wide band, and stability in the presence of the complex load changes that occur in on-vehicle electronic systems.

- Capacitive stability mode and unique features developed for on-vehicle electronics testing are mounted
- Output range: -15V - +60V
- Bandwidth: ~ 150kHz
- Rise time of 10 μs or shorter does not require a switch for most voltage dip or interrupt tests
- 3 current types are available: 25A, 50A or 100A continuous
- Peak inrush current of three times higher than the continuous rated current (up to 200ms)

PA5840

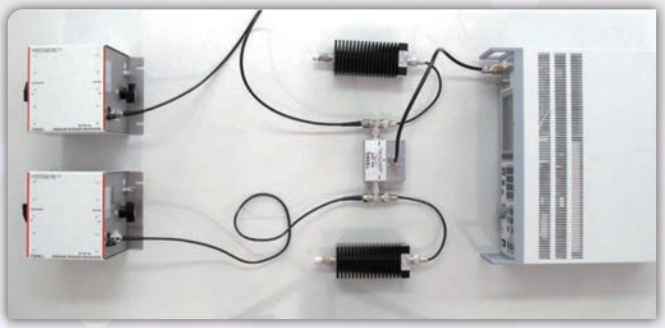
Immunity Tester for HV On-vehicle Electronic Equipment

ISO/TS 7637-4

In high-voltage supply lines, the types of switching occurring between various devices result in different types of transients, such as the ringing caused by high-voltage semiconductor switching. Transients including grid harmonics and sine waves resulting from electric propulsion motor rotation are also typical ones. This tester can be used with all types of electric road vehicles, including battery-powered electric vehicles (BEVs), hybrid electric vehicles (HEVs), and plug-in hybrid electric vehicles (PHEVs).

HV/EHV high-voltage line sine wave transient system

- NSG4070C ISO Op1/ signal generator, power amp
- HV-AN150 / High-voltage Artificial Mains Network
- BAL4070 / Balun 50kHz – 50MHz
- 50-ohm attenuator



High Voltage Artificial Mains Network Shielded Box

This shielded metal enclosure (SME), designed to hold two HV-AN150 high voltage artificial mains networks, conforms to ISO/DTS 7673-4 and the high voltage part of the CISPR 12 (draft), CISPR 25, and ECE No. 10R05/06.

ISO61851-21

This new surge CDN uses an auto-adaptive back filter, allowing it to satisfy the decoupling filtering and voltage drop requirements over the full range of 1 to 100A. TESEQ' s auto-adaptive choke technology eliminates the need for switching between multiple CDNs. It can be used at up to DC 1500V/400 A.

Fast Transient CDN	8kV model, 100A max
PCD8 b-3-690-1000-100	8kV coupling / decoupling network Line current (max) 100A (AC and DC)
EUT AC Voltage	3 x 690V (p-p)
EUT AC Voltage	1,000V
EUT AC/DC Voltage	100A
Burst Coupling	Common mode (all power lines)

Slow Transient CDN	8kV model, 100A max
PCD8 s-3-690-1000-100	8kV coupling / decoupling network Line current (max) 100A (AC and DC)
EUT AC Voltage	3 x 690V (p-p)
EUT DC Voltage	1,000V
EUT AC/DC Voltage	100A
Surge coupling	Surge coupling EC61000-4-5 Ed.3 Fig. 5/6 ・18uF capacitor via 2 Ω ・9uF capacitor via 12 Ω

ESD Testers

IEC61000-4-2 & ISO10605

ESD Tester – 16.5 kV (Contact 9 kV) - NSG435

A battery pack can be attached to the grip, eliminating the need for a capacitor charging power supply and providing outstanding portability.

- Support IEC/EN standards
- All settings are displayed on large LCD
- A circuit conforming to the standard is used, and the voltage is maintained for 5 seconds or longer (not affected by temperature or humidity)
- Flexible lead eliminates the need to move the discharge gun

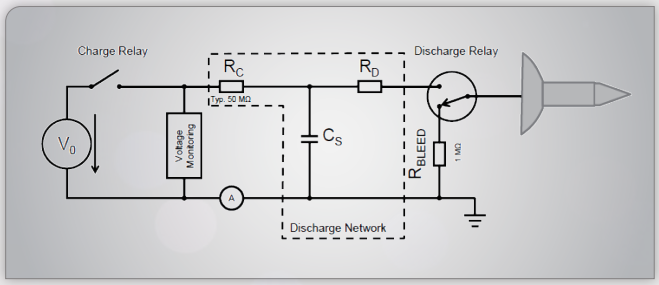
NSG435

NSG438

ESD Tester – 30 kV (Contact / Air) – NSG438/NSG437

It has a large, easy-to-see color LCD display and provides necessary data from the discharge gun during tests.

- Support IEC/EN standards and ISO10605 automotive standard
- Improves the test efficiency with its automatic discharge function
- A circuit conforming to the standard is used, and the voltage is maintained for 5 seconds or longer (not affected by temperature or humidity)
- Flexible lead eliminates the need to move the discharge gun



30 kV ESD Tester for Robot Application – NSG439A

This ESD tester has an automatic static elimination function and is intended for use in fully-automatic robot systems. ESD tests for on-vehicle electronic equipment can be automated.

- Fully compliant with IEC/EN 61000-4-2, ISO 10605
- Chassis can be discharged using an external discharge relay
- A robot controls the discharge method to the connector pin (contact or air)
- Automated and robot-controlled application and removal of electricity to the connector or chassis are provided

Compact Multi-function Tester for Consumer and Industry Electronics

IEC61000-4-4, 4-5, 4-8, 4-9, 4-11, 4-29

Burst / Surge / Power Fluctuation Multi-Function Tester – NSG3040A

This product is available in either single-function type or multi-functional type – a combination of burst, surge, and power fluctuation tests. Its compact housing fits in a 19-inch rack and is 3U high.

- Compliant with IEC/EN standards
- Support burst tests of up to 4.8kV, surge tests of up to 4.8kV, dip & interrupts tests, variation tests, magnetic immunity tests
- Built-in single-phase AC/DC300V, 16A full-automatic CDN

NSG3040A

Magnetic Field Generator MFG40-100

This has an output range of 80mA - 4.1A at 50 Hz/60 Hz. It can operate at up to 130 A/m with the MFC300 multi-turn magnetic field antenna and up to 40 A/m and a pulse magnetic field of 1200 A/m with the MFC30.

MFG40-100

MFC30

MFC300

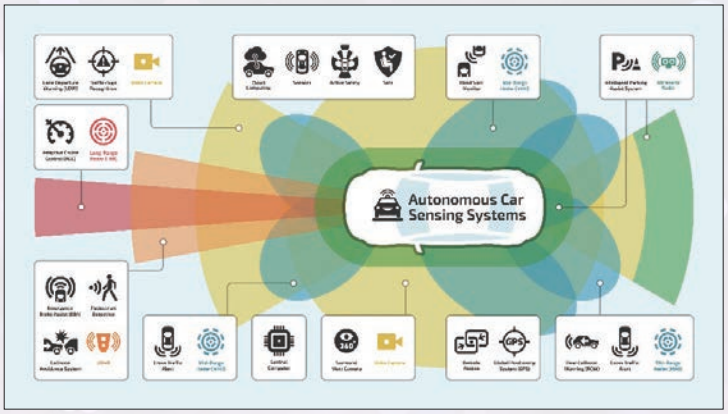
Reverberation Chamber

Summary

In recent years, noise sources inside EVs and HVs have continued to increase, causing a more complex and severe environment for EMC. However, the sources of difficulty are not limited to vehicle interiors. For example, automobiles run close to radio towers with high transmission power and air traffic control stations that radiate strong radar waves, drivers that have picked up static charge touch electronic devices inside the vehicle, and lightning strikes can occur near an EV that is charging. In the actual environment, exposure to unintended electromagnetic interference has become the norm.

Small malfunctions in vehicles such as automobiles can lead to serious accidents. Immunity tests designed for automobiles must verify safety in an electromagnetic environment in which strong electromagnetic stress is applied at levels tens to hundreds of times stronger than that in tests for information processing equipment or home appliances. Moreover, EMC tests, which are based on estimates of a wide range of noise types and sources that automobiles may encounter, are extremely important.

In radiated immunity tests using a reverberation chamber, the electric field applied to the object being tested is not unidirectional but radiates in a number of directions, allowing for immunity tests that match the environment we currently live in. To prepare for the coming age of self-driving vehicles, the reverberation chamber, which can create an environment of complex electromagnetic interference, can realize more sophisticated and accurate tests for automobile safety and reliability.



By mixing up the output of an RF antenna placed in the interior of the reverberation chamber using the stirrer and with the reflections off the shielded room's surface, the cavity boundary condition of the chamber's interior can be changed to create statistically isotropic RF field conditions having homogeneous electric fields in the test area.

- Create a larger test area than that created by conventional direct radiation of electric field in an anechoic chamber
- Test area having a isotropic and homogeneous RF field, which is said to be similar to actual electromagnetic interference environment

ETS Reverberation Chamber

The software used include:

- Immunity Test Software
- IM5/Rrvc Reverberation Test Software

Model Name	Chamber Size (m)	Tuner	LOF	Test Area
SMART™ 200 In-vehicle electronic device immunity test support	4.8 x 3.5 x 3.05	Z-type tuner horizontal	200MHz	5.3m³
SMART™ 700	2.0 x 1.2 x 1.5	Z-type tuner horizontal	700MHz	0.4m³
SMART™ 800/1000	1.5 x 1.0 x 0.7	Z-type tuner horizontal / vertical	1000MHz	0.1m³

LOF: Lower limit operation Frequency (Low Operation Frequency)
Test area: A test volume with uniform electric field performance that complies with ISO11452-11.
Supported Standards: SAE J551-16, ISO11452-11, GMW3097GS, FORD FMC1278, IEC61000-4-21, MIL-STD-461G, RTCA DO-160G

EMI Shielding Effectiveness Testing Equipment

JSE-KEC6G /JSE-KEC

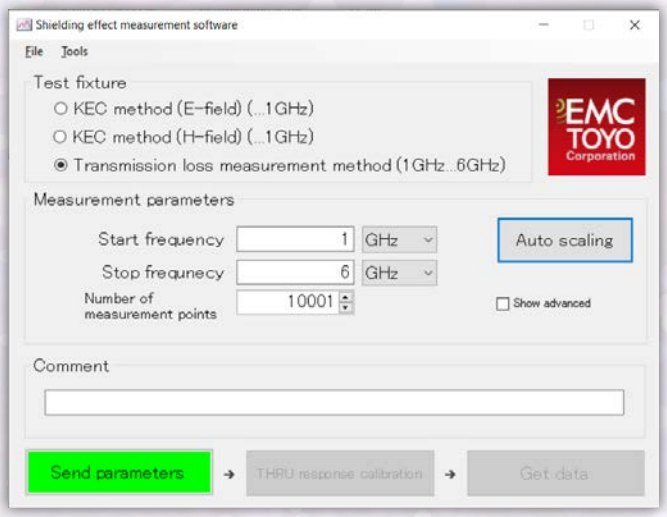
Readily and quickly perform relative evaluations of shielding materials. With shielding material evaluation equipment developed by organizations such as the KEC Electronic Industry Development Center, the transmission loss of shielding film and shielding sheets can be easily evaluated. Features include:

- Require no complicated processing of the materials under test
- Can evaluate the materials easily just by placing them between the measurements
- Cover wide frequency ranges of 100kHz to 1GHz and of 1GHz to 6GHz
- Support automatic measurement of shielding effect using TOYO's measurement software
- A system with a network analyzer and measurement software together with this evaluation equipment can be proposed

Measurement Fixture Specifications		
	JSE-KEC	JSE-KEC6G
Compliant Standard / Measurement Method	KEC Standard	GHz KEC Standard
Frequency Range	100kHz-1GHz	1GHz-6GHz
Dynamic Range	80dB (Nominal, depending on input level and receiver measurement limits)	
Sample Dimensions	Approximately 110X100mm-Thickness 6mm or less	Approximately 30 to 50 mm square Thickness 1 mm or less
Fixture Dimensions (W x D x H) (mm)	350 x 350 x 500 (Excluding protrusions)	300 x 350 x 350 (Excluding protrusions)
Weight (kg)	~25	
Accessories	Blind plate: 1 sheet Thickness calibration plate: 3 each	Blind plate: 1 sheet

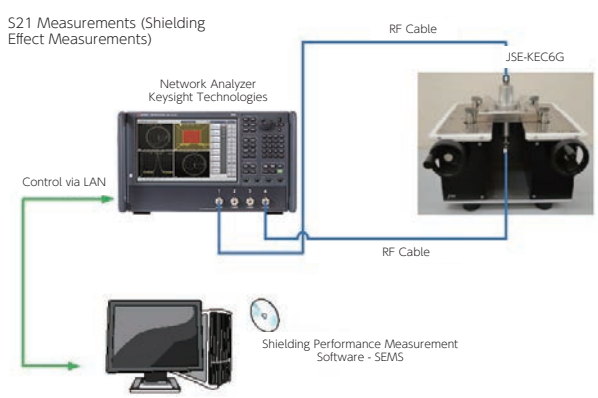
SEMS Measurement Software

With this software, you can select the measurement fixture to be used and make the initial settings of a network analyzer. Measurement results, displayed as "Shielding effect (dB)" on an Excel sheet, can be confirmed at a glance.



Standard Configuration of Measurement System	
Model Number	Description
JSE-KEC	Shield effect measuring Fixture
JSE-KEC6G	
SEMS	Measurement Software
3dB Attenuator, Coaxial Cable	
E5071C	Network Analyzer

System Wiring Example for JSE-KEC6G (for Transmission Loss Measurements S21)



ABOUT TOYO CORPORATION

TOYO Corporation (TSE: 8151) is a Japanese technology company headquartered in Tokyo, Japan, with subsidiaries in the United States and China. Since its founding in 1953, TOYO has become the leading distributor of advanced measurement instruments and systems in Japan. TOYO also engages in original product designs and develops advanced solutions for many of markets that its serves including automotive, sustainable energy, and cyber security industries. TOYO's innovative products are used by many leading companies in Japan, the United States and APAC countries, helping TOYO's customers accelerate development, reduce time-to-market, and improve product quality.

The company serves major market segments including:

- Automotive Test and Measurement
- Information Communication Technology/Cyber Security Services
- Mechatronics/Noise & Vibration/Sensors
- Materials/Energy
- Electromagnetic Compatibility/Antenna Systems
- Ocean/Defense & Security
- Software Quality and Productivity
- Nano Imaging
- Medical Systems

TOYO Corporation has designed and developed EMC measurement software for more than 40 years. Throughout the world, more than 1,500 TOYO systems have been chosen by governmental, communications and regulating agencies, and major companies to form the core and standard of their test and evaluation installations.

Supporting a wide range of needs, from design improvement to final qualification test, TOYO continues as the world's first choice in integrated EMC test systems and software because TOYO places exceptional importance on user feedback.

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03/28/2022 (SCW)