Solutions Partner Catalog

Keysight Technologies & TOYO Corporation

EMC Measurements

KEYSIGHT TECHNOLOGIES

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About TOYO Corporation

TOYO Corporation, as an expert in measurement technology, has been proactively breathing fresh life into the sunrise industry such as energy and environment, along with its mainstream business including electromagnetic interference measurement and communication measurement. Striving for a name trusted in the market innovation technology, not only a measurement technology provider, we, at TOYO, redouble our efforts to expand the laboratories, impart technical knowledge, improve the training facilities and enrich technical training for employees.

In recent years, TOYO has been delivering carefully needs-matched solutions to each customer through self-developed system products and will be committed to promptly catering to the demand for technological innovation with a reinforced development group.

"Measurement"echnology constitutes the mainstay of all businesses – this is what TOYO believes.

Technology Interface Center

EMC Measurements

Emission Measurement Software

Overview

With electronic devices going digital and mobile through high-density implementation, it is getting more difficult to isolate noise sources, and more cost- and time-consuming to implement appropriate EMI remedies against them. TOYO EP7 software, which is designed for EMI evaluation measurements, collects and saves a greater-than-ever amount of data on the complicated noises emitted by such digital devices, thereby detecting noises that could not be captured before through automated measurements with enhanced speed and reliability. Furthermore, the EP7 has reinforced functionality for the post-measurement evaluation and analysis of DUT through multi-angle visualization of an enormous amount of measurement data among other means.
TOYO EP9 software, which is meant for automobile EMI measurements, has been developed to be compliant with diversifying international and automobile manufacturers' own standards. The EP9 adopts a matrix system that allows users to narrow down measurement conditions simply by selecting a standard and a transducer.

Software

- EP5/RE : Radiated emission measurement software
- EP9/CE : Conducted emission measurement software
- EP5/REP : RF power emission measurement software
- EP5/NSA : Site attenuation measurement software
- EP7/RE : Radiated emission measurement software
- EP7/CE : Conducted emission measurement software
- EP5/RSE : Radiated Spurious emission measurement software
- EP9/VE : Radiated emisson measurement software for vehicle

Applicable standards

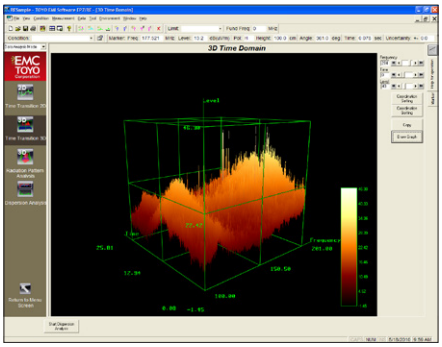
- Consumer product standards : CISPR, EN, ETS, FCC, VCCI
- Wireless Application standards : TS51.010-1, TS34.121 (3GPP), Cellular phones (GSM, WCDMA), EN300 328, EN301 893 (ETSI)
- Automotive standards : UN/ECE R10, CISPR12, CISPR25, SAE, JASO

Basic measurement function

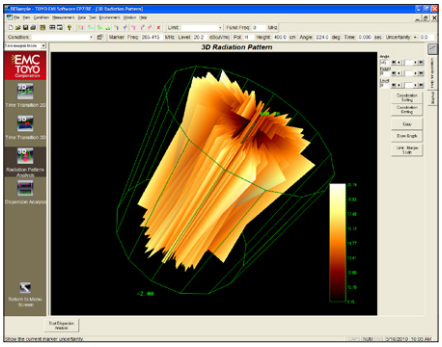
- Spectrum data acquisition
- Maximum radiation position measurement (azimuth/height pattern, clamp position)
- Quasi-peak(QP)/Average(AV) measurement according to CISPR Pub. 16
- Measurement result display/output/edit/save

Feature

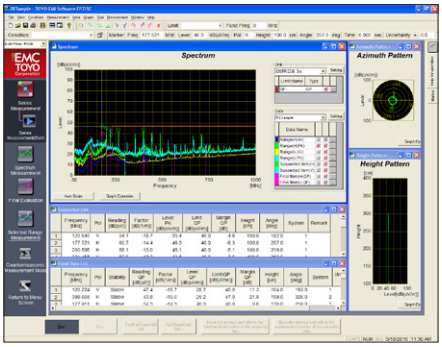
- Sophisticated user interface
- Flexibility in window layout setting
- Measurement procedure reduces measurement time
- Instrument and system self-diagnostic function
- Spectrum overwrite function efficient for corrective action
- Measurement result data aditable by MS-Word and Excel
- Capable of saving standard limits, factors, measurement system gain/loss, and measurement conditions to files, enabling them to be set, edited, and created easily.
- Capable of changing limits freely after measurement
- Template feature allowing icons to be assigned to individual tests
- Support for many types of hardware products of various manufactures
- Assorted password function for distinguishing between measurement operator and administrator



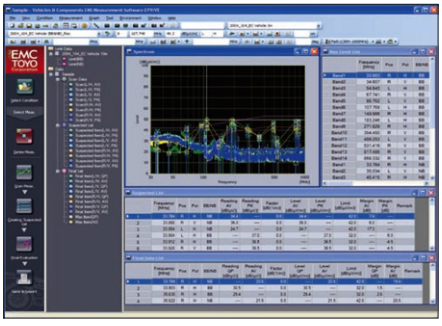
EP7/RE : radiated emission measurement software
Display of 3D Time Domain



EP7/RE : radiated emission measurement software
Display of 3D radiation pattern



EP7/RE : Radiated emission measurement software
Display of measurement

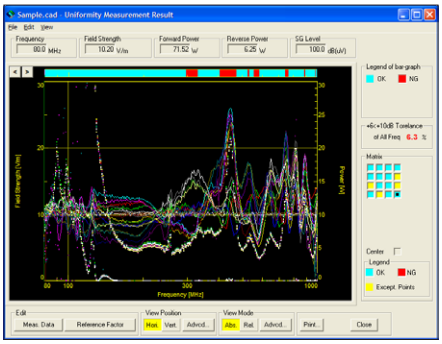


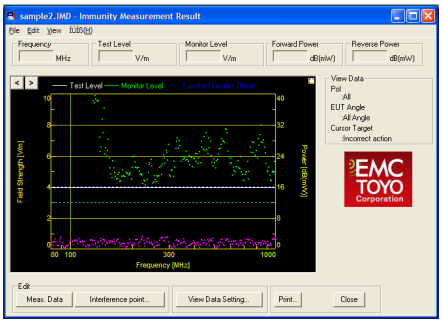
EP9/VE : Radiated emission measurement software for vehicle
Display of measurement

Immunity Test Software

Overview

TOYO IM5 series software, which performs automated immunity testing, has been developed to evaluate the immunity of electronic devices against electromagnetic interference. The IM5's capability to automatically control the instruments required for immunity testing (e.g. a signal generator, power amplifier system, electric-field strength meter, power meter, and antenna mast) allows any users to conduct EMI measurements in an efficient and secure manner, as well as to output measurement data to a printer and to save such data on a hard disk drive.
With an error detection option installed, the IM5 monitors the DUT being subjected to an immunity test and, if any limit setting is exceeded, detects it as an error.
TOYO VI5 series software, which also is for automated immunity testing, has been developed specifically to test automobiles for their immunity against electromagnetic interference. As is the case with all other TOYO EMC/EMI software applications, the VI5 is constantly updated and upgraded to better serve customer needs, an example of which is the implementation of an error detection function utilizing CAN/LIN bus monitor and image recognition.





IM5/RS : Radiated immunity test software
Immunity measurement result window

Software

- M5/RS : Radiated immunity test software
- IM5/CS : Conducted immunity test software
- IM5/A : Audio immunity test software
- IM5/V : TV/Video immunity test software
- VI5/RS : Vehicle radiated immunity test software

Applicable standards

- Consumer product standards : IEC61000-4-3,-6, CISPR24, EN
- Automotive standards : UN/ECE R10, SAE, JASO, GM/Ford standards (radar pulse)
  Standards in other auto manufacturers
- MIL standards : Standards for medical device

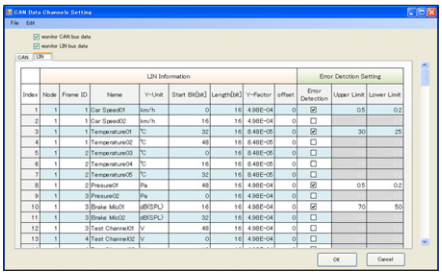
VI5/RS : Vehicle immunity test software
Display of image-recognition error detection

Basic measurement function

- Electric field uniformity measurement
- System linearity testing
- Electric field reference measurement/ Electric field check
- Immunity test
- Display of measured results
- Report generation

Feature

- Sophisticated user interface
- Measurement procedure that dramatically reduces measurement time
- Capable of exporting measurement data in CSV format
- Capable of saving standard values, factors, and measurement conditions to files, enabling them to be set, edited, and created easily
- Support a wide range of hardware of various manufactures
- Various password function are provided for a range of password levels, from the staff in charge of making measurement and to the system administrator



VI5/RS : Vehicle immunity test software
Display of CAN measurement error detection

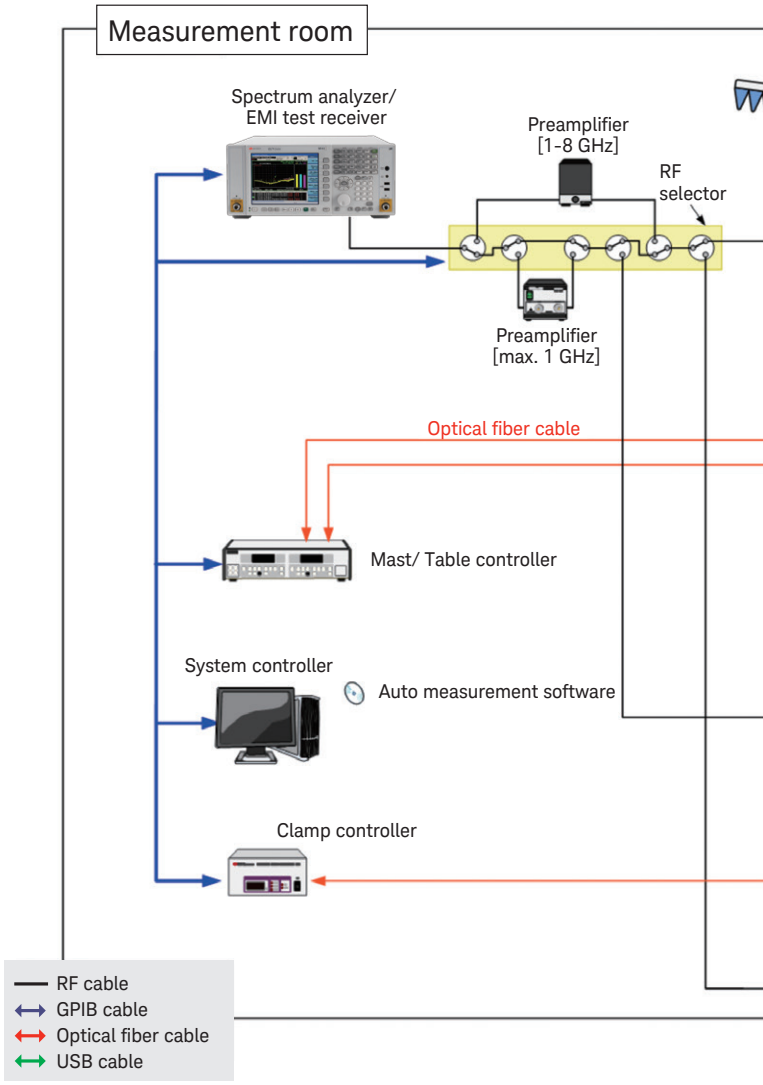
EMC Measurements

EMI Measurement System – CISPR-approved system –

EMI measurement system best suited to customer needs

Overview

The electronics industry moves toward the digitalization and mobilization of equipment with higher density packaging, making the determination of noise source and EMC control more challenging.
There are increasing demands to expand upper limited frequency, adhere to frequently-revised standards, and acquire and store data on more complex noise to the greatest extent possible.
TOYO's 30 years of technical expertise has trickled down to its automatic systems based on impressive records of supplying hundreds of systems to various businesses from public test laboratories through commercial EMC test houses.
TOYO's time-proven systems offer the user a wide choice of options, from full compliance fully-automatic measurement to preliminary simplified measurement.



Basic measurement functions

- Capable of acquiring spectrum and QP detector measurement with a single click.
- Endowed with functions effective for manual measurements.
- Capable of exporting data.

Software

EP7 Series (3D display with a detailed noise analysis function)

- EP7/RE type : Radiated noise weighting and measurement software
- EP7/CE type : Terminal noise weighting and measurement software

EP5/EP9 Series (With a standard noise analysis function)

- EP5/RE type : Radiated noise measurement software
- EP5/RFP type: Noise power measurement software
- EP5/RSE type: Radiated spurious emission measurement software
- EP9/CE type : Terminal noise measurement software

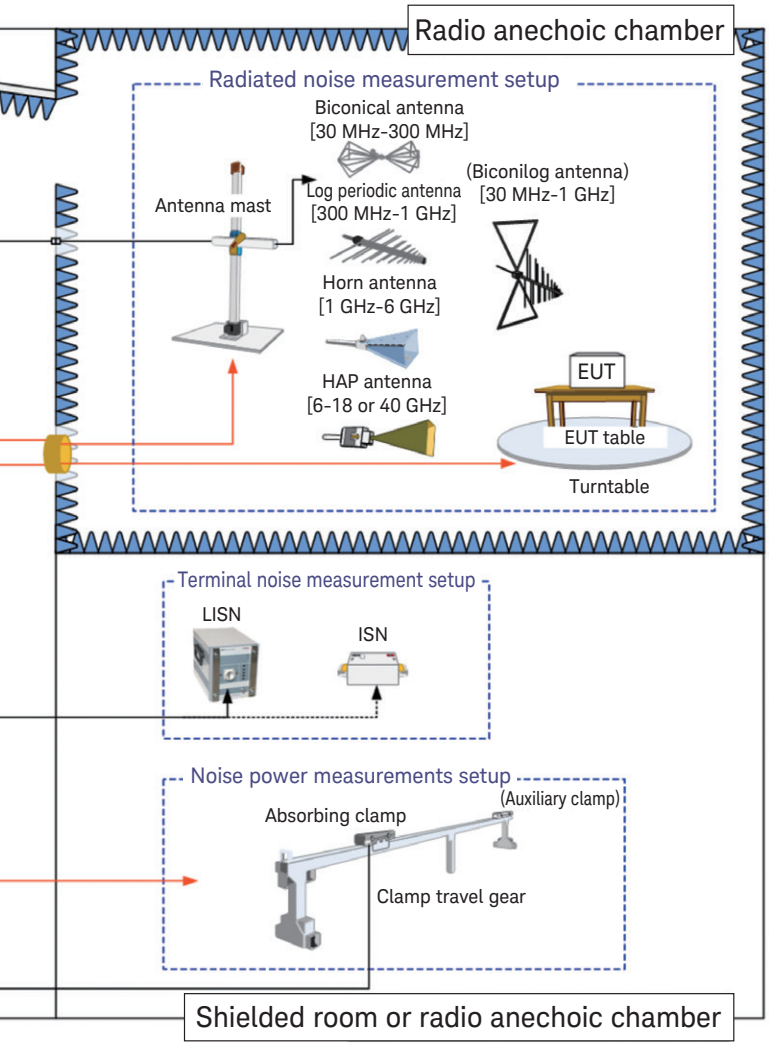
Applicable standards

- Consumer product standards :
  CISPR, EN, FCC, VCCI
- Wireless Application standards :
  TS51.010-1, TS34.121 (3GPP)
  Cellular phones (GSM, WCDMA)
  EN300 328, EN301 893 (ETSI)
- Automotive standards :
  CISPR12, CISPR25, UN/ECE R10, SAE, JASO

CISPR-compliant EMI test receiver
with an integrated preselector

N9038A MXE EMI receiver
Frequency : 3 Hz – 3.6/8.4/26.5/44 GHz

EMI Measurement System



Keysight Technologies M940X Series PXIe Optical Extenders

The M940X series PXIe optical extenders convert RF and microwave signals into optical signals and transmit them more than 1000 meters. Since optical fibers are superior to coaxial cables in transmission loss and noise resistance, the M940X optical extenders allow you to build a high-sensitivity radiated emission measurement system.

Specification

Model	
M9403A	PXIe optical transmitter: 300 kHz to 26.5 GHz or 50 GHz
M9404A	PXIe optical receiver: 300 kHz to 26.5 GHz or 50 GHz
M9405A	PXIe amplifier: 300 kHz to 26.5 Gz or 50 GHz
M9406A	PXIe optical to USB 2.0
M9407A	PXIe optical to 4 port USB 2.0 hub
M9408A	PXIe remote RF reflectometer

M940X Series PXIe Optical Extenders

Pre-compliance spectrum analyzer X Series

N9030B PXA signal analyzer
Frequency : 3 Hz – Max. 50 GHz
FCC standard (1-40 GHz)-compatible model

N9020B MXA signal analyzer
Frequency : 10 Hz – Max. 26.5 GHz
CISPR standard (Min. 1 GHz)-compatible model

N9010B EXA signal analyzer
Frequency : 10 Hz – Max. 44 GHz

EMC Measurements

TEM-wave Large-bandwidth Transmission Line System G-CELL

Designed for EMI measurement and analysis and assessment of radiated immunity test

Overview

TOYO's G-CELL is a cubic cell upgraded from TEM CELL, enabling easy radiated EMI measurement and immunity test of EUTs in the transmission line installed on the floor. User-friendly G-CELL is favorable for immunity control and preliminary measurements before authentication tests in a radio anechoic room andopen site.

G-CELL

Feature

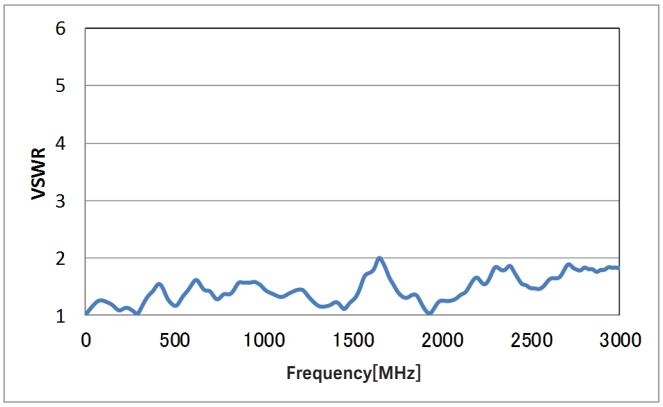
- Capable of easy EMI measurement with the spectrumanalyzer.
- Enables radiated immunity test assuring consistency.
- Large opening design allowing easy EUT installation.
- Customizable power/signal line filters.

Applications

- Radiant emission measurement
- Radiant immunity test

Specifications

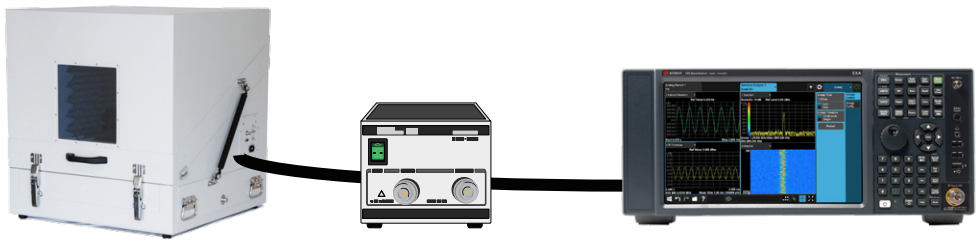
- Frequency range : 10k-1GHz(2GHz)
- Max. input power : 150W(Type N connector)
- Dimensions : 70x70x70cm (protrusion excluded)
- Applicable EUT size : 40x40x40cm
- Shielding performance : Min. 70dB



Software

- EP5/ME : Simplified EMI measurement software
- IM5/RS : Radiated immunity test software

Connection diagram for radiated emission measurement

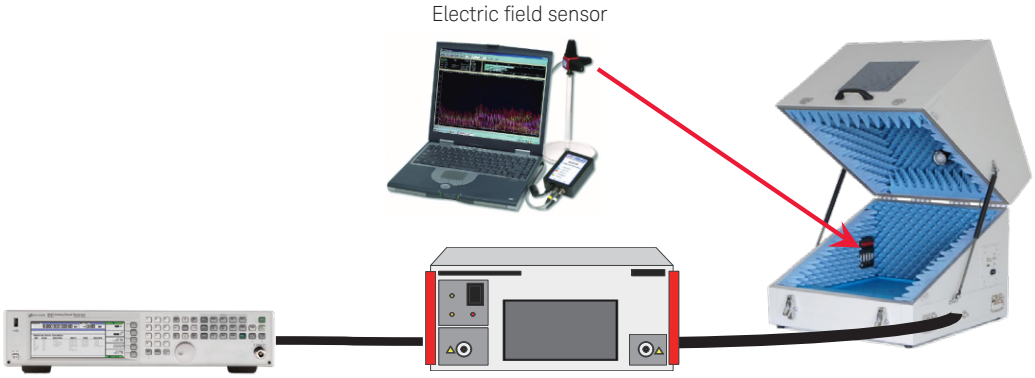


G-CELL | 310N preamplifier | N9010B EXA signal analyzer (recommended)

Standard components

Model	Equipment
G-CELL	TEM-wave large-bandwidth transmission line system
EP5/ME	Simplified EMI measurement software
N9010B EXA	Signal analyzer (10 Hz – 3 GHz)
310N	Preamplifier
	50 Ω termination
	Computer, a set of cables (RF, GPIB)

Connection diagram for radiated immunity test



N5181A MXG signal generator (recommended) | RF power amplifier | G-CELL

Standard components

Model	Equipment
G-CELL	TEM-wave large-bandwidth transmission line system
IM5/RS	Radiated immunity test software
N5171B	Signal generator (9 kHz – 3 GHz)
	power amplifier
	Electric field sensor
	50 Ω termination
	Computer, a set of cables (RF, GPIB)

EMC Measurements

GTEM CELL

Excellent for analysis and assessment of EMI and immunity control

Overview

Our GTEM CELL is apt for EMC applications, antenna/ magnetic field probe and cellular phone tests in tandem with an upgrade frequency band from TEM (Transverse Electro Magnetic) CELL. The extended frequency band also lends itself to part sorting and measurements.

GTEM CELL

Features

- Stable shielded environment for EMI measurement and immunity test
- Compliant with the IEC/EN61000-4-20 and FCC ANSI C63.4 standards.
- Designed for broad spectrum (DC-20 GHz).
- Offers a rich lode of GTEM CELL models (septum height ranging from 250 mm to 2000 mm)
- Outstanding VSWR over the entire frequency band
- Customizable power/signal line filters

Software

- EP5/ME type: Simplified EMI measurement software
- IM5/RS type: Radiated immunity test software

Applications

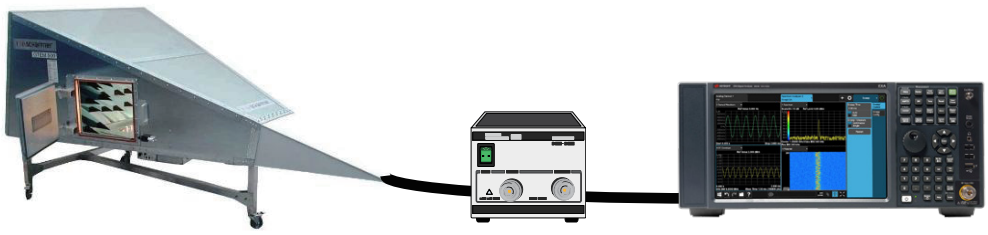
- Radiant emission measurement
- Radiant immunity test

Specifications

	GTEM250	GTEM500	GTEM750	GTEM1000
Septum height (mm)	250	500	750	1000
Dimensions (m)	1.25 x 0.65 x 0.45	2.95 x 1.48 x 1.61	3.95 x 2.02 x 1.95	4.95 x 2.54 x 2.30
Dimensions of test product (m)	0.15 x 0.15 x 0.08	0.30 x 0.30 x 0.15	0.45 x 0.45 x 0.22	0.60 x 0.60 x 0.30
Max. input power (w)	50 W	100 W	200 W	1000 W

	GTEM1250	GTEM1500	GTEM1750	GTEM2000
Septum height (mm)	1250	1500	1750	2000
Dimensions (m)	5.95 x 3.06 x 2.52	6.95 x 3.58 x 2.55	7.95 x 4.10 x 2.90	8.95 x 4.62 x 3.24
Dimensions of test product (m)	0.70 x 0.70 x 0.38	0.85 x 0.85 x 0.45	1.00 x 1.00 x 0.50	1.15 x 1.15 x 0.60
Max. input power (w)	1000 W	1000 W	1000 W	1000 W

Connection diagram for radiated emission measurement

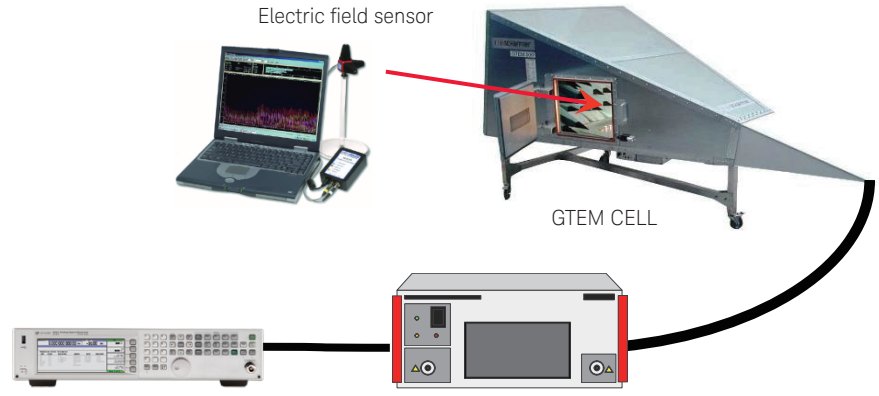


GTEM CELL | 310N preamplifier | N9010B EXA signal analyzer (recommended)

Standard components

Model	Equipment
GTEM CELL	
EP5/ME	Simplified EMI measurement software
N9010B EXA	Signal analyzer (10 Hz – 26.5 GHz)
310N	Preamplifier
	Computer, a set of cables (RF, GPIB)

Connection diagram for radiated immunity test



N5171B EXG signal generator (recommended) | RF power amplifier

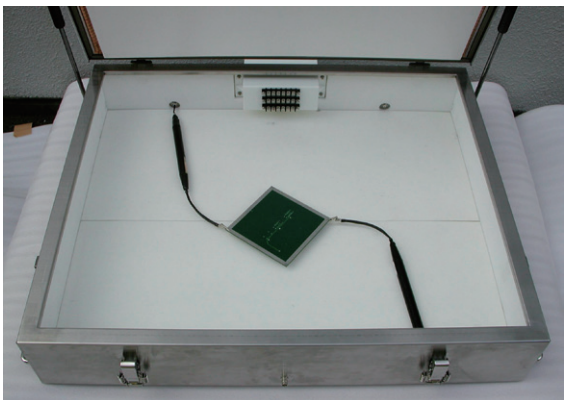
Standard components

Model	Equipment
GTEM CELL	
IM5/RS	Radiated immunity test software
N5171B	Signal generator (9 kHz – 6 GHz)
	Power amplifier
	Electric field sensor
	Computer, a set of cables (RF, GPIB)

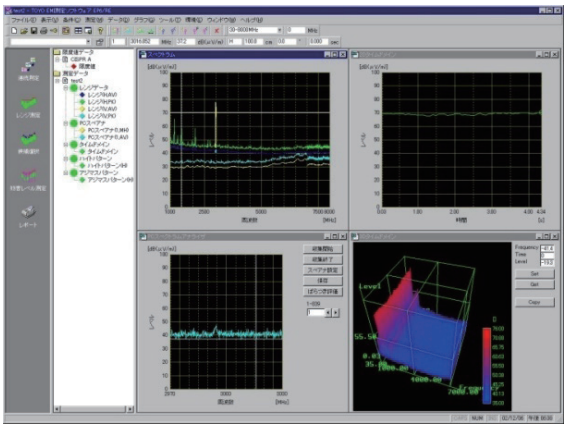
EMC Measurements

Common Mode Noise Measurement System TS1000

Easy noise suppression achieved in common mode noise measurement



Inside of FC-1000



EP6/FC Faraday gauge measurement software

Overview

TOYO's savvy has made it possible to attain the accuracy of common mode noise measurement closest to that of spurious noise measurement in a radio anechoic room, using the Workbench Faraday Cage (IEC61967-5), an EMC performance assessment method of a semiconductor. Sporting reproducibility superior to conventional measurements in a radio anechoic room, our TS1000 is effective in EMI control during the product development stage.

Features

- Unsusceptible to radiated noise, delivering high data reproducibility.
- Capable of measurements in a low-noise floor level.
- Speedy, fuss-free measurements as compared with noise measurements in a radio anechoic room
- Allows common mode noise measurements in any office environments.

Applications

- Radiant emission measurement

FC-1000 Main Specifications

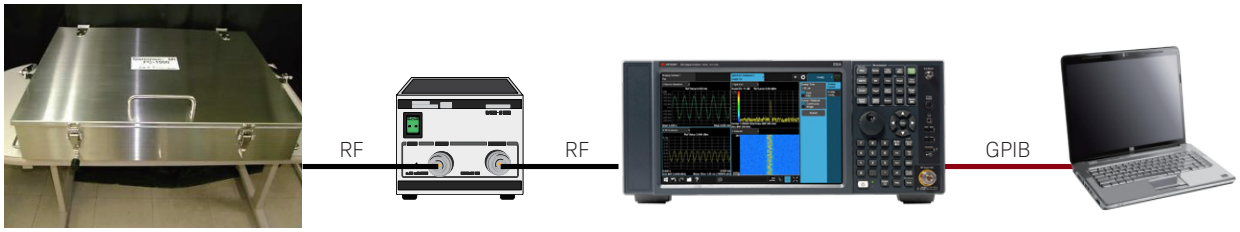
- Mmeasuring frequency range: 30-1000MHz
- Max. outer dimensions: 950mm (L) x 780mm (w) x 220mm (H)
- Weight: 29.2kg
- I/O voltage range : -48~48VDC
- I/O current range : 0-2ADC
- Number of power input terminals : 6 systems
- Number of signal I/O terminals : 3 systems

*No AC input and output enabled

Standard components

Model	Equipment
FC-1000	Faraday cage
EP6/FC	Faraday cage measurement software
N9010B EXA	Signal analyzer (9 k-3.6 GHz)
310N	Preamplifier
	Computer, a set of cables (RF, GPIB)

Connection diagram



FC-1000 system | 310N preamplifier | N9010B EXA signal analyzer | PC

EMC Measurements

Oscilloscope for Immunity Pulse Waveform Observation

Software-controlled instantaneous waveform check

Overview

The IEC-defined immunity standards provides for a pulse shape check in calibration and daily inspection. ESD waveforms which have the quick leading edge of sporadic pulse especially require the utilization of a wide band oscilloscope.

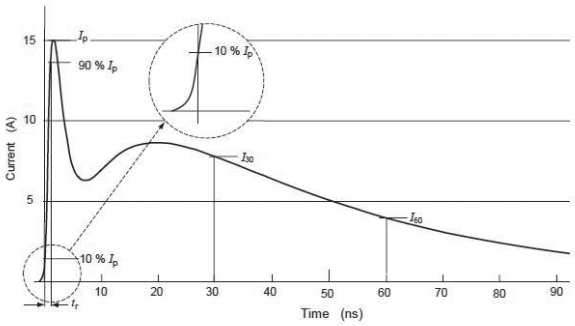
Features

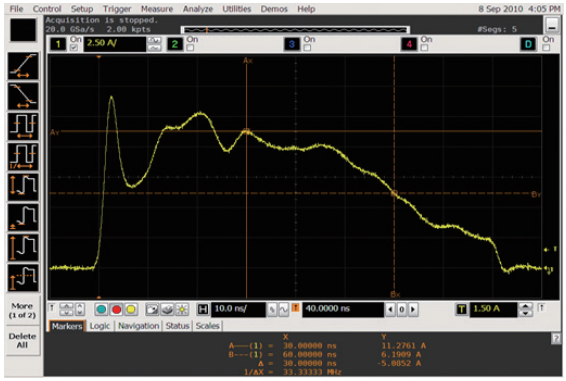
– Designed to meet a sample speed and frequency band
– Software-controlled automatic waveform measurement and report generation

Applications

– Waveform calibration and daily inspection

TESEQ Model NSG437
Discharge voltage 200 V-30 kV (IEC61000-4-2-compatible)





ESD oscilloscope waveform

Standard components

Model	Equipment
Infiniium S Series DSO/MSO9000A Series	Oscilloscope
MD103	ESD waveform observation target (IEC61000-4-2)
CAS3025	EFT/ burst observation attenuator (IEC61000-4-4)
MD200	Surge waveform observation probe (IEC61000-4-5)
MD300	Surge waveform observation probe (IEC61000-4-5)

Recommended oscilloscope

Infiniium S Series oscilloscope

DSO/MSO9000A Series oscilloscope

EMC Measurements

Radiated/Conducted Immunity Test System
– Compliant with international and company standards –

Immunity test system best suited to customer needs

Overview

TOYO offers a valuable test system to assess electromagnetic interference in electronic equipment. Installed with Radiated Immunity Test Software IM5, our immunity test system automatically controls the signal generator, power amplifier system, electric field sensor, power meter and antenna mast. It also supports outputting and saving of test results.

Basic measurement functions

- Electric field uniformity measurement
- System linearity testing
- Electric field reference measurement/ Electric field check
- Immunity test
- Display of measured results
- Report generation

Software

M5/RS type: Radiated immunity test software
IM5/CS type: Conducted immunity test software
VI5/RS type: Vehicle radiated immunity test software

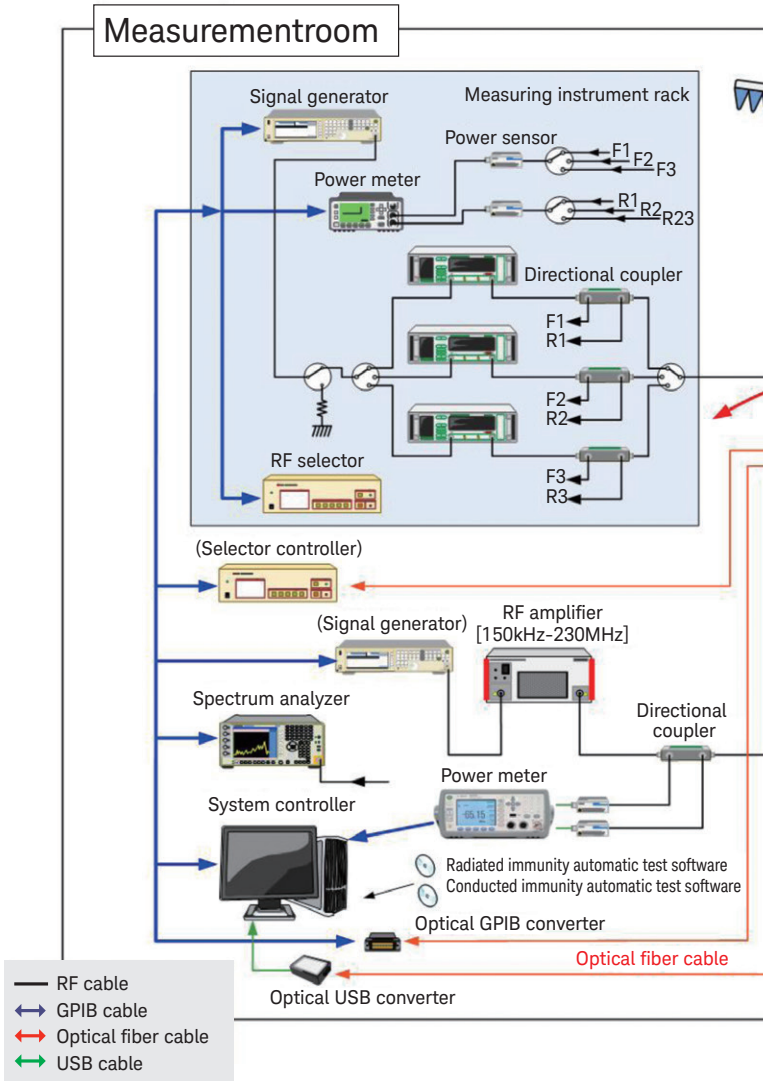
Applicable standards

Consumer product standards
- IEC61000-4-3,6
- CISPR24
- EN

Automotive standards
- UN/ECE R10
- ISO11452-1/2
- SAE
- JASO
- GM/Ford standards (radar pulse)
- Standards in other auto manufacturers

MIL standards

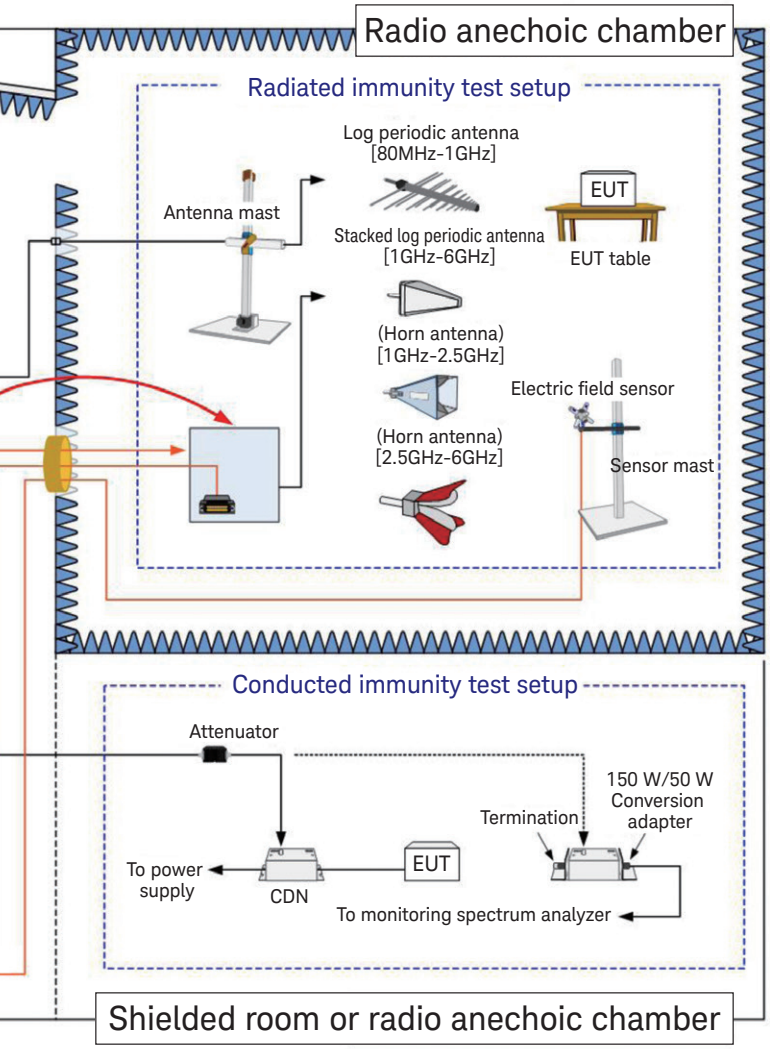
Standards for medical devices



Recommended signal generator

N5171B ·N5173B
MXG signal generator

Immunity Test System



RF power amplifier TA series(10kW/5kW/2.5kW)

RF power amplifier TA series is a solid state (semiconductor device)-laden high power amplifier, delivering output linearity and stability as fundamental performance. TA series is designed for high reliability and quality.

Features

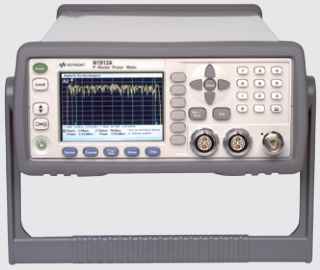
- 10 kW of high power output (7 kW@1 dB comp.)
- Easy maintainability through RF unit replacement
- Equipped with the internal data storage function which is capable of easy cause analysis of a malfunction.

Specifications

Model	Frequency	Output
TA0122-10K	10 k-225 MHz	10 kW
TA0122-5K	10 k-225 MHz	5 kW
TA0122-2.5K	10 k-225 MHz	2.5 kW

TA0122-10K

Recommended power meters



P Series Power Meter
N1912A

EPM Series Power Meter
N1914A

EMC Measurements

For Shielding Material Permeation Loss Measurement

JSE-KEC System (for shielding effect measurement by KEC method)

JSE-KEC6G System (for GHz-band shielding effect measurement)

These systems enable you to evaluate shielding materials in a relative manner in a short time and with no sweat!

Outline

JSE-KEC and JSE-KEC6G systems are developed by KEC Electronic Industry Development Center to measure the permeation loss of sheet and film shielding materials in an easy way.

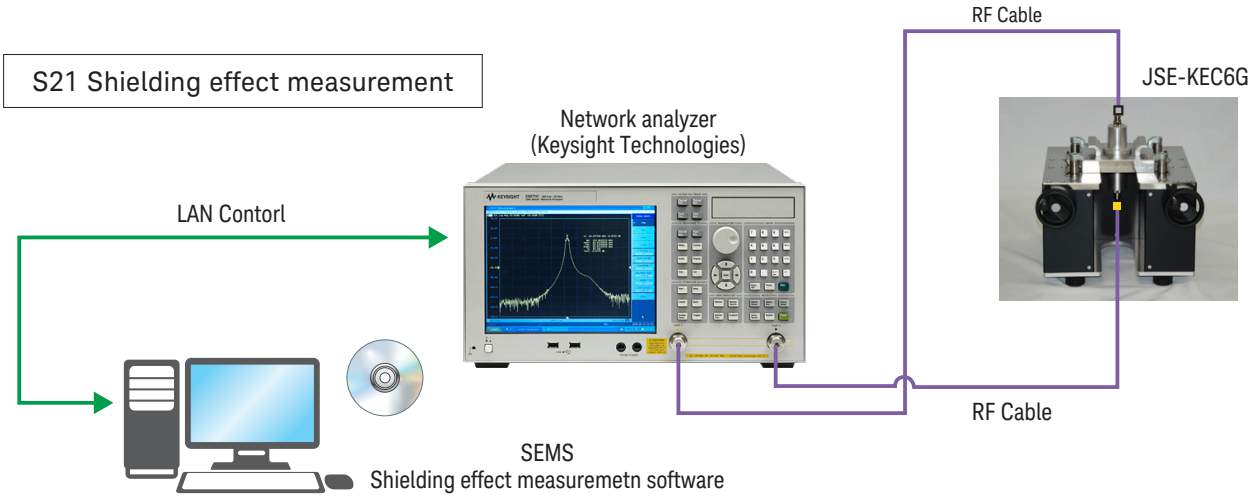
Outstanding features

- No need for complicated material processing
- All it takes is to insert a sample into a jig
- Wide frequency coverage
  100kHz~1GHz, 1GHz~6GHz
- Dedicated software enables automatic shielding effect measurement
- Offered as a system with a network analyzer and measurement software

Shielding effect measurement software

- SEMS

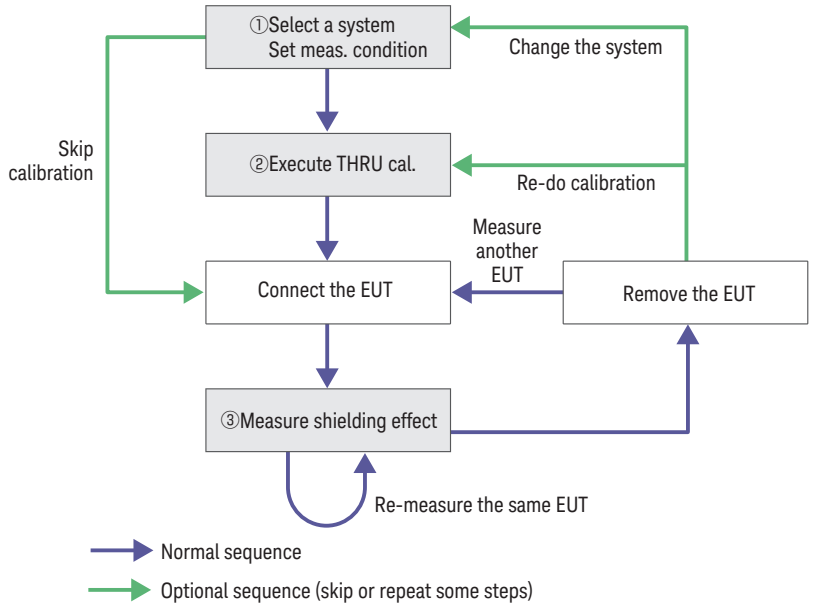
System configuration example with JSE-KEC6G [S21 permeation loss measurement]



Specifications

	JSE-KEC	JSE-KEC6G
Compliant standard/ method	KEC Method	ASTM D 4935-10 (2010 edition)
Frequency range	100 kHz – 1 GHz	1 GHz – 6 GHz
Dynamic range	80 dB (nominal, depends on input level and receiver's measurement limitations)	
Sample size	approx. 110X100 mm - 6 mm thick or less	approx. 30～50 mm square - 1 mm thick or less
Outer dimensions and weight	W350×D350×H500(excluding protrusions) approx. 25 kg	W300×D350×H350(excluding protrusions) approx. 20 kg
Accessories	Blind plate x 1, Thickness calibration plate x 3	Blind plate x 1

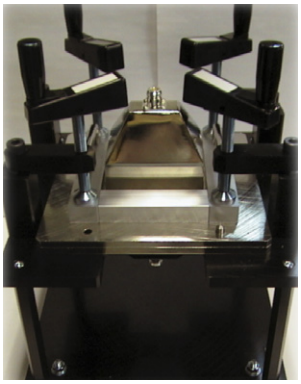
Basic operation sequence



You can return to "① Set meas. condition" from anywhere in the sequence.

Standard configuration

Model	Description
JSE-KEC	Shielding effect measurement system
JSE-KEC6G	
EP9/SH	Measurement software
3 dB attenuator, Coaxial cable	
E5071C	Network analyzer



JSE-KEC KEC method shielding effect measurement system (for electric filed)

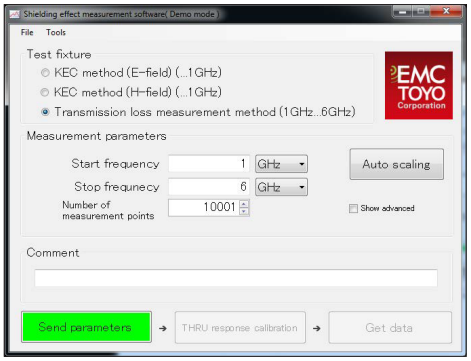
* JSE-KEC comes standards with a jig for the electromagnetic field.

SEMS Measurement Software

Allows you to select a jig and initialize the network analyzer.

Displays measurement results as《Shielding effect[dB]》on an Excel spreadsheet for review at a glance

Superimposes measurement results on a graph and outputs lists for individual measurements on separate sheets.

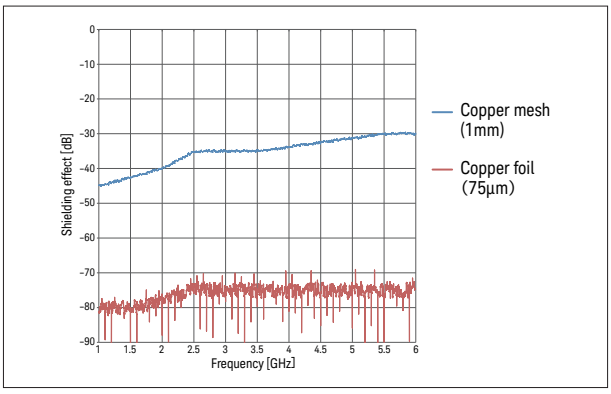


Measurement software setting screen for selecting a jig and initializing the network analyzer

	A	B
1	Measurement parameters	
2	Test fixture	Transmission loss measurement method
3	Sweep time (Auto)	ON
4	Sweep time [sec]	0.01 sec
5	IF Bandwidth [Hz]	70 kHz
6	Averaging	Averaging is dsabled
7	Smoothing	Smoothing is dsabled
8		
9	1/24/2017 18:12	
10		
11	Frequency [GHz]	Shielding effect [dB]
12	1	-20.25992273
13	1.0005	-20.24615363
14	1.001	-19.64305543
15	1.0015	-19.49405014
16	1.002	-19.86452439
17	1.0025	-20.91460578
18	1.003	-19.56279033
19	1.0035	-20.67233232
20	1.004	-20.47693868
21	1.0045	-20.23234684
22	1.005	-19.11149376
23	1.0055	-20.76891757

Excel data output example Measurement results are output as《shielding effect [dB]》.

*An English version of SEMS software is now under development.



Measurement graph example

M E M O

M E M O

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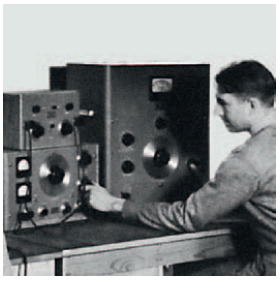

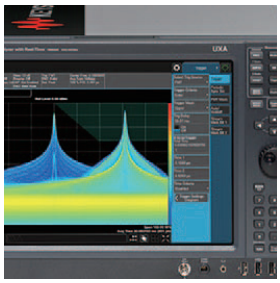

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Published in Japan, February 21, 2017
5990-9819ENJP
0000-08cS
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