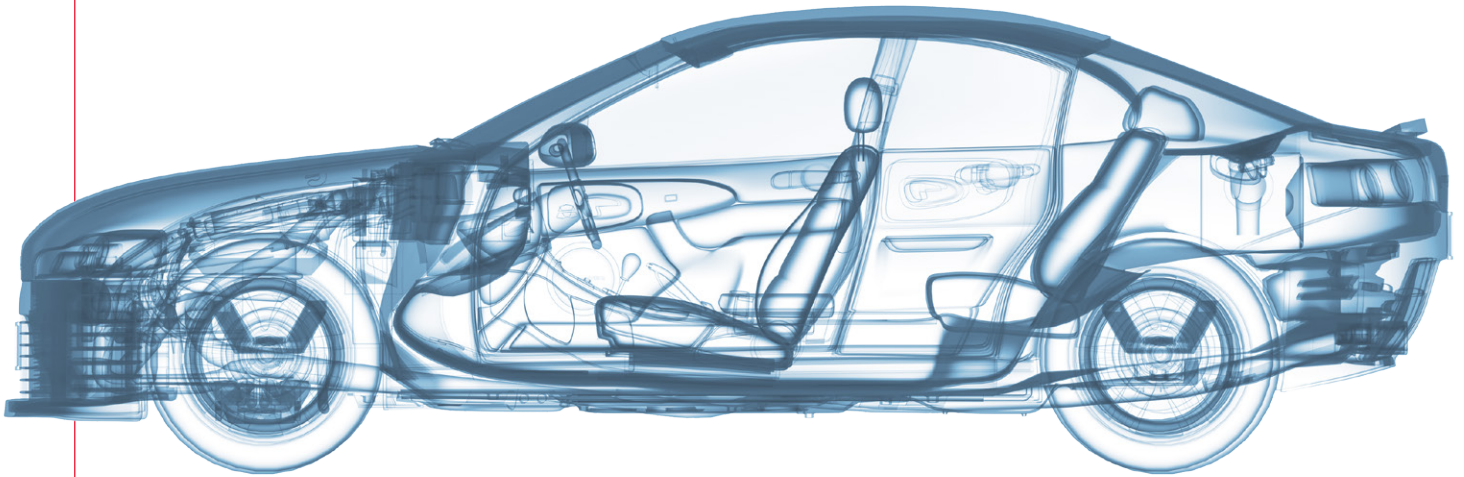


# Keysight Technologies

## Test and Measurement Tools for Automobiles

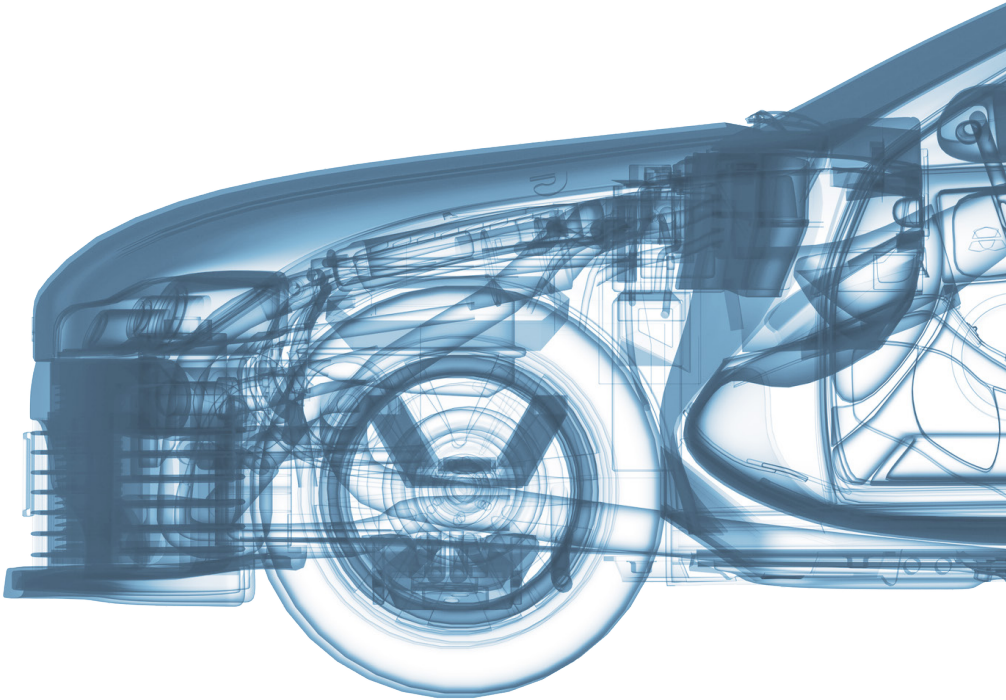
### Primer



# Test and Measurement Tools from Keysight for Automobiles

## ECU

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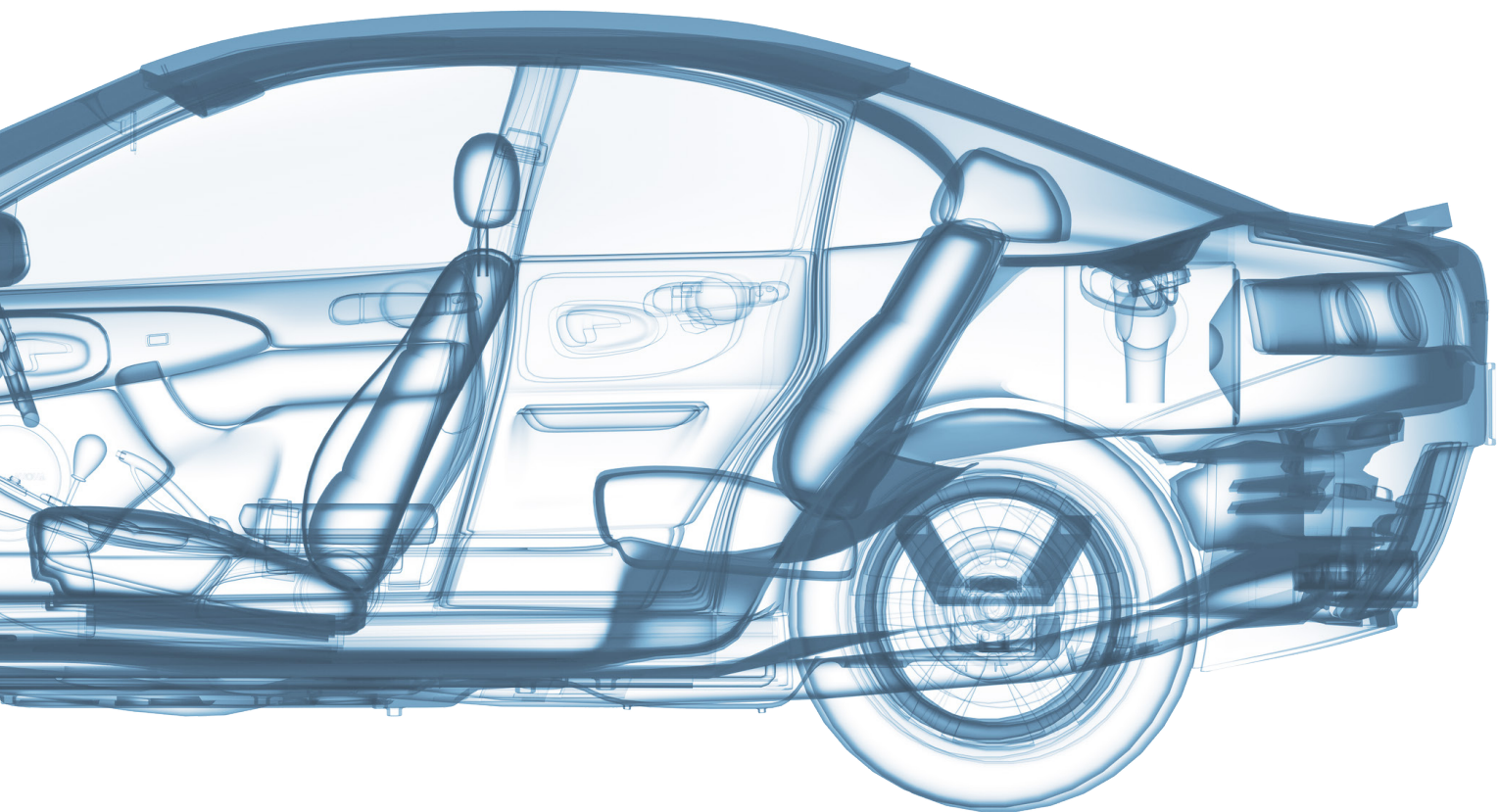


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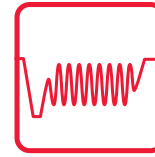
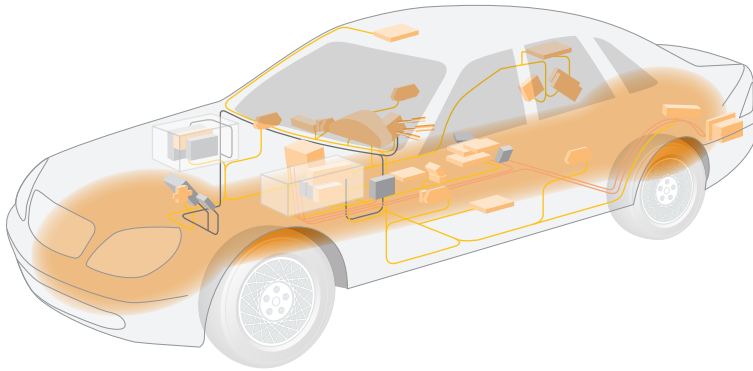
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## ECU

# ECU Power Supply Noise Evaluation and Thermal Analysis Solutions



Debugging tool for line regulation with easy editing and generation of output waveforms

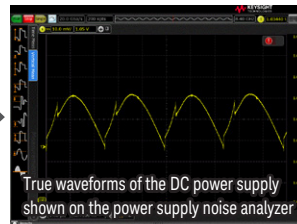
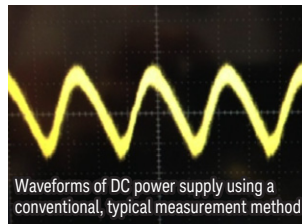
### ECU design and verification

- Power supply noise evaluation
- Temperature distribution analysis
- Thermal analysis simulation

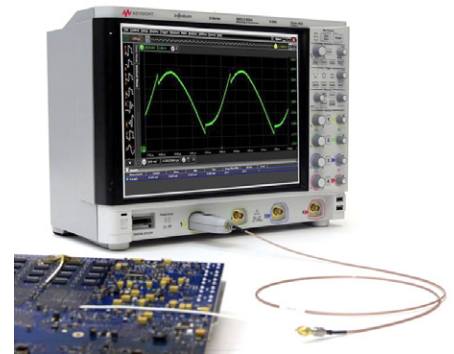
## Measurement of true noise waveforms superimposed on the output from the ECU power supply

Keysight's S-Series Oscilloscope has the industry's best low-noise performance and 10-bit resolution. It can be combined with a Power Rail Probe to provide a specialized solution for the observation of power supply noise.

- Pursuit of reduction of noise to make the measurement system as low noise as possible
- Easier observation of noise components on the order of few mV
- Repeatable and accurate measurements to determine whether the supplied voltage meets the specifications
- 2 GHz wide-bandwidth measurement



Easier observation of subtle ripple noise whose level is as low as a few mV or tens of mV



S-Series Oscilloscope with Power Rail Probe

## 5-meter long cable probe allows you to easily measure signal waveforms even from a distance at measurement points inside an automobile

- 200-MHz frequency bandwidth
- Differential voltage up to  $\pm 100$  VDC + peak AC

N2805A High-Voltage Differential Long Cable Probe

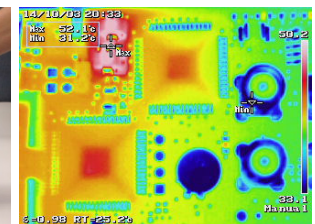


## TrueIR Thermal Imager

Temperature distribution analyses can be performed for any item from individual PCBs to an entire ECU

- Its compact body is suitable for quick-checks
- Time series recording of heat transfer across an entire PCB (data logging)

TrueIR Thermal Imager U5855A

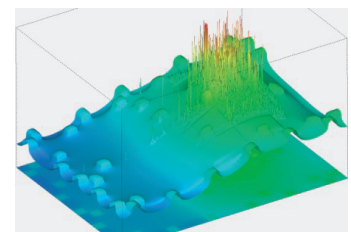


## Thermal analysis of inside of SiPs and ICs installed in ECUs

### HeatWave High-resolution electro-thermal analysis tool for circuitry design

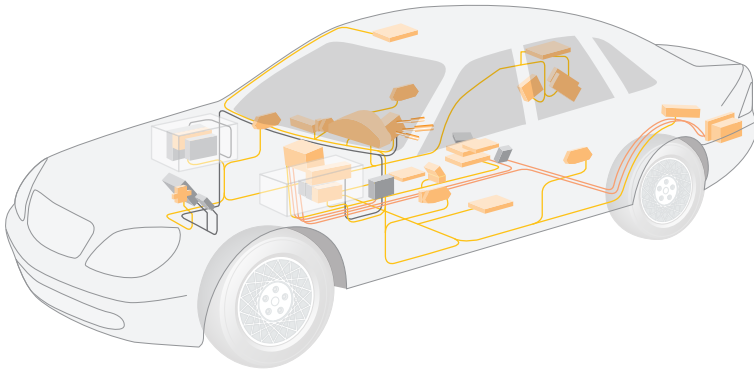
The higher an IC's performance becomes, the more intensely electric power is concentrated in specific areas in the IC, causing various problems due to the heat generated by the power concentration. Smaller ICs tend to prominently show more serious problems.

HeatWave is a high resolution thermal analysis solver. It allows you to observe the temperature distribution inside ICs.



## Evaluation and Verification of Automotive Networks

ECU



ECU design and verification  
Automotive networks such as  
automotive Ethernet, CAN, CAN FD,  
SENT, LIN, FlexRay, and MOST

- Evaluation of signal waveform quality
- Protocol error verification

As automobiles become more and more computerized, the number of ECUs mounted in vehicles is increasing. CAN has been commonly used for networking ECUs for powertrains, bodies, and communication systems. More recently, industry has begun looking to CAN FD to fill this purpose. In communication systems, automotive Ethernet is now being introduced to realize fast and stable communications for the use of ADAS\*.

The environment in vehicles is very harsh for communications because of the high noise levels. Verification of communication protocols and waveform quality is essential to satisfy high-quality standards.

\* ADAS: Advanced Driving Assistance System

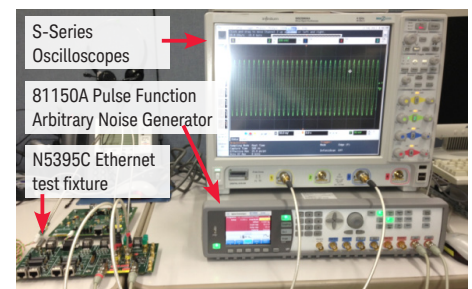
### Waveform quality evaluation for automotive Ethernet Essential for next-generation high-speed communications

- S-Series Oscilloscope equipped with an ultralow-noise 10-bit ADC to realize true waveform quality evaluation
- Support for compliance tests for communication standards such as BroadR Reach, Ethernet, and MOST
- Just one click to start accurate measurements for necessary tests required by each standard

More information:

<http://www.keysight.com/find/S>

<http://www.keysight.com/find/N5392B>

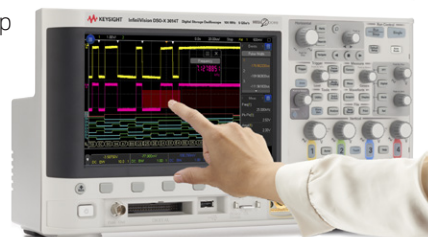


BroadR Reach transmitter test  
Example of measurement system configuration

### Analysis to correlate signal waveforms and protocol errors in systems such as CAN, SENT, FlexRay, and LIN

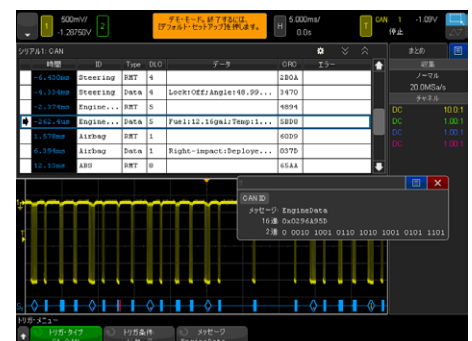
- Amazing waveform update rate of one million waveforms per second allows quick detection of error signals that seldom occur.
- The latest standard, CAN FD, is also supported. Dedicated hardware enables real-time decoding and triggering of signals in systems such as CAN, FlexRay, LIN, and SENT.
- Intuitive understanding of data: CAN-dbc files are fed to the oscilloscope to display the decoded data.
- Intuitive zone touch trigger allows you to set up a trigger in 3 seconds to watch and solve complex problems.

InfiniiVision 3000T X-Series  
Compact Oscilloscope with Touch Screen



More information:

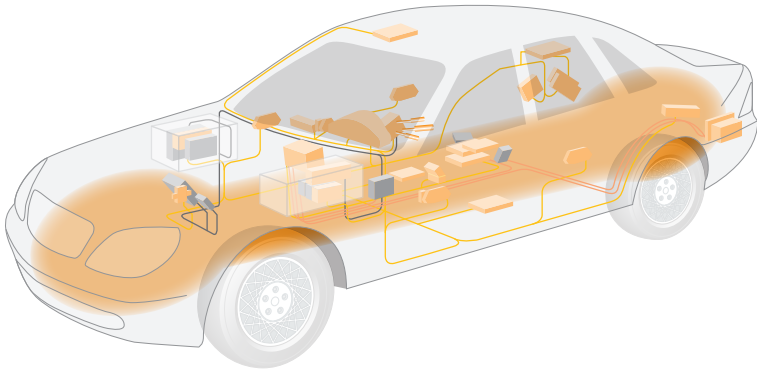
<http://www.keysight.com/find/3000T>



Example of triggering detection with CAN message ID  
"Engine Data"  
Real-time decoding and triggering with dedicated hardware  
Easy to distinguish problems using the time correlation between protocol and waveform data

ECU

ECU Function Tests



- ECU function tests
- Individual function check at the design phase (R&D)
  - Integrated function test just before volume production (QA)
  - Final test at volume production line (MFG)

There are two approaches to ECU function tests. Which one do you take?

If you build your own from scratch!

“I hate black boxes!”

“I need to ensure its expandability!”

“I need to build specialized test equipment having a single function!”

If you prefer to purchase a complete solution!

“I need compact test equipment!”

“I need to have the equipment ready in a short time!”

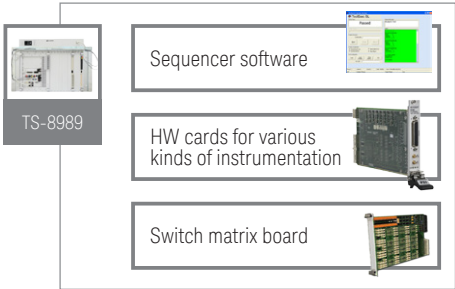
“I want to use a single piece of equipment for testing various ECUs!”

We recommend you choose your favorite ones from Keysight’s lineup of electronic instruments. Keysight’s rich product lineup and experience in measurement, exemplified by its more than 60 years of experience delivering electronic measurement products, can significantly contribute to the development of automotive ECUs, which are rapidly being computerized.



If you customize from scratch, where does each item come from?		If you purchase a complete solution, where does each item come from?
Customer	Project management	Keysight
Customer	Sequencer software	Included
Individual purchase	Controller	Included
Individual purchase	Arbitrary signal generator	Included
Individual purchase	DC power supply	Included
Individual purchase	DAC	Included
Individual purchase	Digitizer	Included
Individual purchase	DMM	Included
Individual purchase	Switch matrix	Included
Individual purchase	Electronic load	Can be built-in
Individual purchase	Data logger	Can be built-in

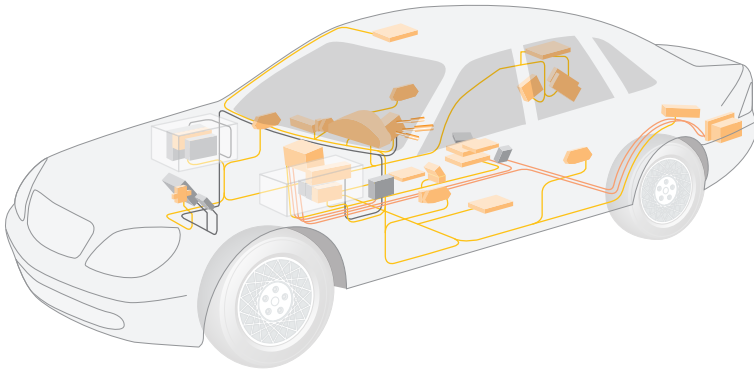
We recommend you choose test systems specialized for ECUs. You just need to change the sequencer software and test fixtures to adapt to new DUTs, which allows you to look forward to the effects of your long-term investment. Our record of shipping more than 600 units all over the world proves our superiority.



## Evaluation of Automotive Wire Harnesses

### Solutions to communication failures

Automotive Communications and  
Wireless Technologies



Ethernet  
(BroadR-Reach)  
CAN  
LIN

FlexRay  
MOST  
LVDS

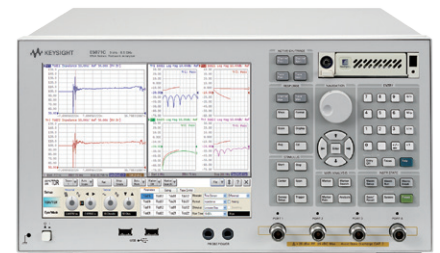
### Wire harness communication performance test solutions

The E5071C ENA Option TDR provides simple and easy evaluation of high-speed, reliable wire harnesses for automotive control systems, with a single instrument. Various communication standards are supported, so you do not need to worry.

[www.keysight.com/find/ena-tdr\\_compliance](http://www.keysight.com/find/ena-tdr_compliance)

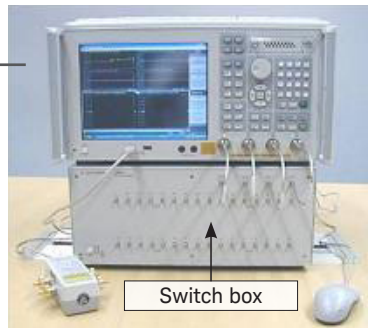
- Provides measurements in the time domain and frequency domain with a single instrument
- Supports tests required by various communication standards
- Supports multi-channel measurements (or multi-lane measurements) when connected to a switch box

Simultaneous measurements in  
time and frequency domains

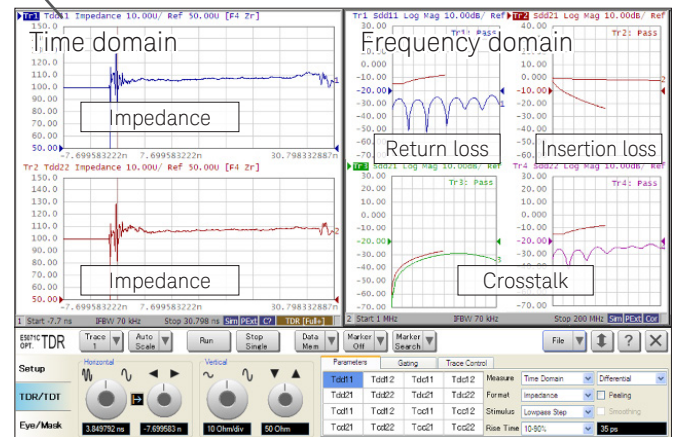


E5071C ENA Option TDR

Multi-channel  
measurement



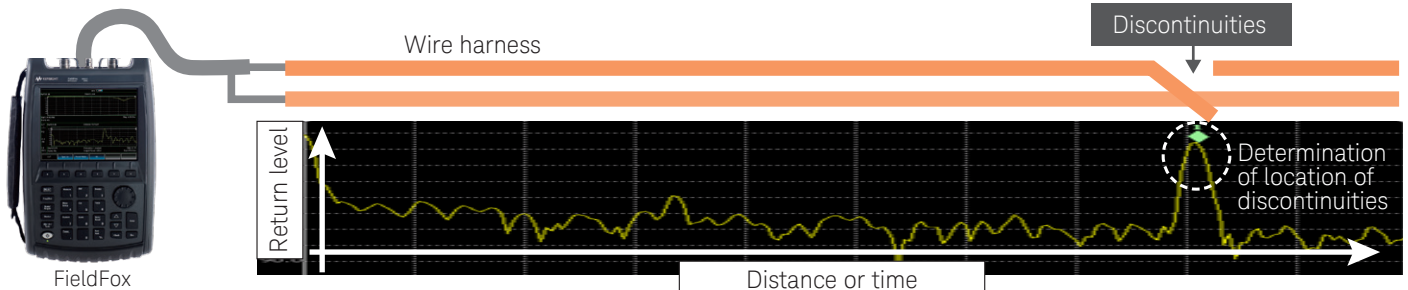
Switch box



### Wire harness defect diagnostic test solutions

FieldFox helps you easily diagnose wire harnesses and determine the location of discontinuities and faults.

- Easy determination of the location of discontinuities and short circuits in harnesses
- Handheld instrument, weighs 2.8 kg, with a built-in battery! It is easy to bring into vehicles.
- Excellent environmental resistance and impact resistance! Use it also outdoors with no trouble.
- FieldFox can also be used as a network analyzer, spectrum analyzer and signal generator!

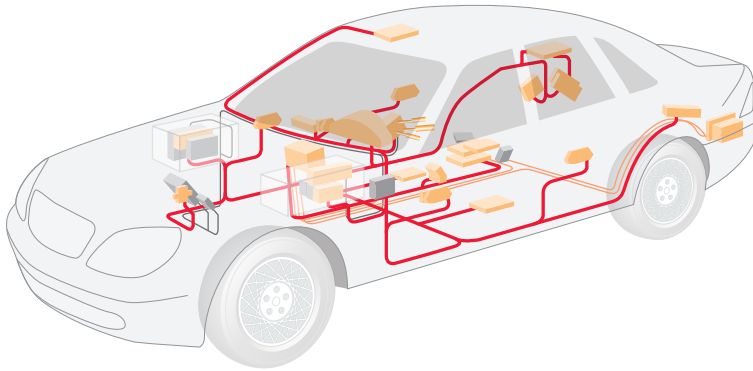




## Automotive Communications and Wireless Technologies

## Optical Communication Measurement Tools

Measurement solutions that provide highly reliable automotive communication

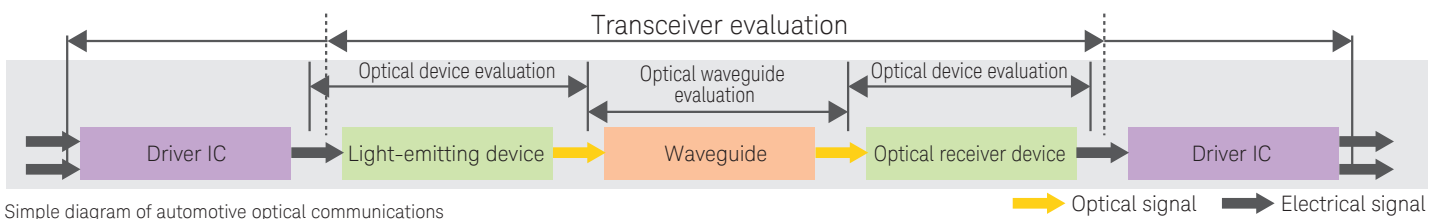


Automotive optical communications components

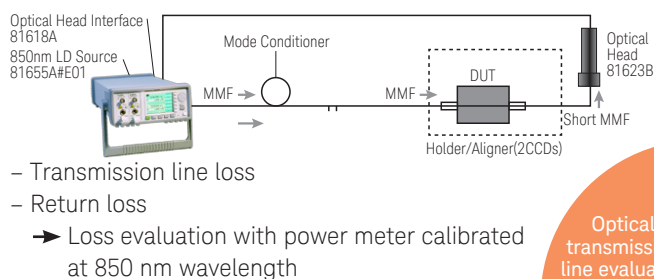
System transmission quality evaluation and debugging

The automotive industry is continually working to improve the safety and convenience of automotive communication environments. What makes this task challenging, however, is that existing communications relying on electrical signals have a number of technical limits in terms of being able to accelerate transmission speed, reliability, miniaturization, and power savings. To overcome these limitations, optical communication is being eyed as the expected replacement.

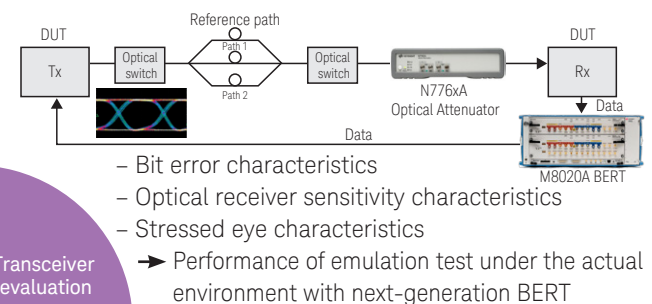
Keysight provides solutions for transceiver transmission evaluation and optical component measurement for optical fibers (optical waveguides), light-emitting devices, optical receiver devices, and other devices for automotive communication.



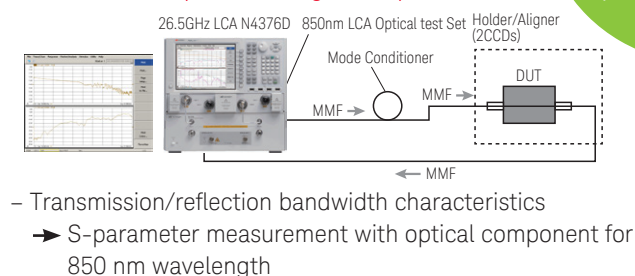
### Simple diagram of optical waveguide insertion loss evaluation



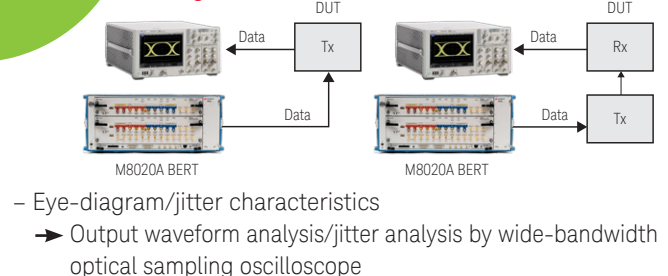
### Simple diagram of transceiver transmission evaluation



### Simple diagram of frequency bandwidth evaluation for optical waveguide/optical device



### Simple diagram of optical device eye diagram evaluation

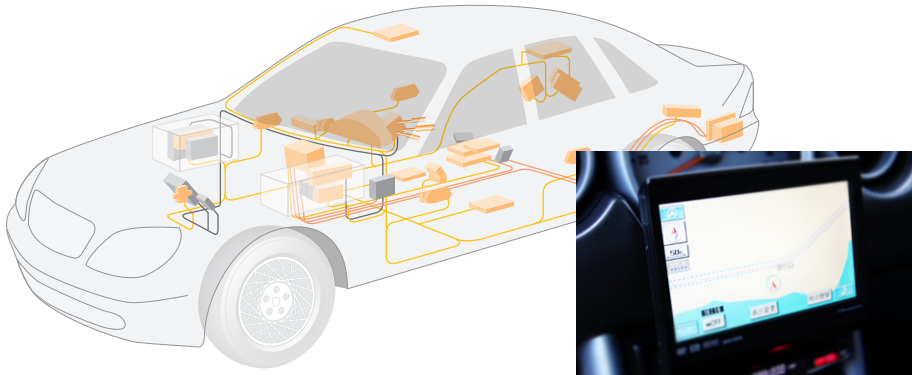




## Measurement Tools for HDMI, MHL, USB, and Other Interfaces

Best suited for performance validation and compliance tests for in-vehicle audio/visual devices such as car navigation systems

Automotive Communications and  
Wireless Technologies



Car audio/video (AV) device  
validation

Car navigation systems

### Performance validation and compliance tests for high-speed digital AV interfaces

AV devices such as in-vehicle displays and car navigation systems use high-speed serial communication interfaces like HDMI, MHL, and USB. Such interfaces, originally developed for home electronics and PCs, are required to work in the harsh electrical environment of automobiles without fail. Furthermore, it is also assumed that consumer devices such as video cameras may sometimes be brought into an automobile to connect with the automotive system; therefore, interconnectivity and compliance tests will be important as well.

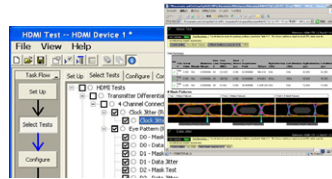
Keysight's measurement tools can realize easy and flexible, yet precise performance validation and compliance tests for today's high-speed digital AV interfaces.

In addition, Keysight's measurement tools allow you to perform compliance tests under the same conditions and with the same software as Authorized Test Centers (ATCs), because HDMI ATCs and MHL ATCs have also adopted the same measurement tools.

### Equipped with outstanding signal integrity and powerful analysis/debugging functions



Infiniium 90000A/90000X Series



N5399C HDMI Electrical Performance  
Validation and Compliance Software

### Acceleration of video signal speed making debugging more important

Since the resolution of images has increased, as represented by 4K resolution, high-speed AV interfaces exceeding 5 Gbps are now becoming available.

Keysight Infiniium Oscilloscopes provide measurement software that can perform the compliance tests specified by standards organizations.

In addition, they are sufficiently equipped with various kinds of debugging functions such that you can easily identify the cause if the DUT fails a test.

### Performance of flexible receiver stress tests

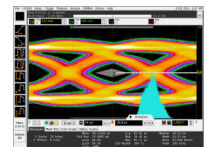
Receiver stress tests for HDMI and MHL signals use waveforms whose amplitude, jitter, and skew are precisely adjusted to represent the worst-case conditions.

Using the Keysight M8190A Arbitrary Waveform Generator makes it possible to generate not only waveforms under the worst-case conditions specified in the standards but also arbitrary waveforms by calculating the amplitude and jitter on demand every time. This allows you to evaluate the maximum performance of the receiver flexibly and efficiently.

### High signal fidelity and a large sample memory allow highly precise and flexible tests.



M8190A Arbitrary Waveform Generator



Waveforms under worst-case conditions  
used for receiver stress tests

### Hot TDR measurements with ENA Option TDR

For HDMI 2.0 and MHL 1.x/2.x/3.x, it is mandatory to perform TDR impedance measurements (Hot TDR measurements) under the actual operating conditions for the device.

The Keysight E5071C ENA Option TDR can perform fast and accurate Hot TDR measurements for transmitting and receiving circuits/ICs for HDMI, MHL, USB 3.0, and other interfaces.



E5071C ENA Option TDR

Simple and easy-to-understand operation,  
high-speed yet accurate measurement, and high ESD robustness

### Simultaneous measurement of frequency, AC voltage, and THD+N with multiple channels for audio system evaluation for car stereos, etc.

Audio system evaluations for car audio and car navigation systems require the verification of the balance between multiple speakers, from 6 channels (5.1 ch systems) to 16 channels. Simultaneous measurement combined with noise evaluation can improve measurement efficiency, especially for systems with more speakers.

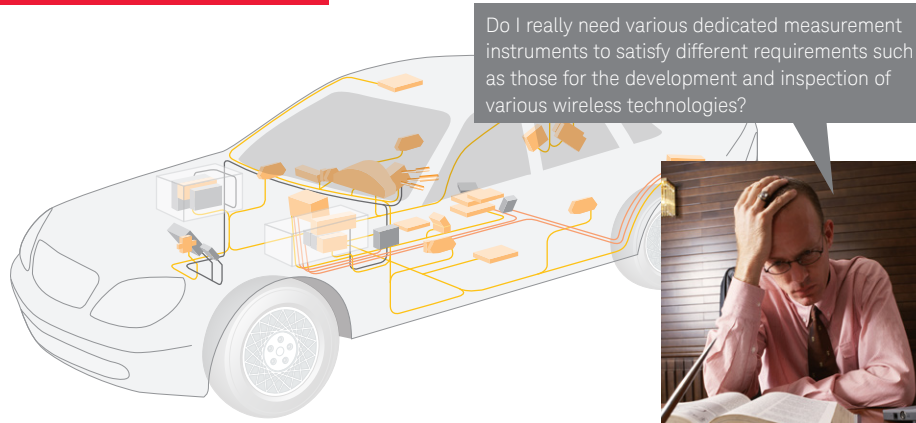
The U8903B Analyzer can handle up to 8 channels with a single unit and perform multiple measurements at the same time.



U8903B Analyzer

## Automotive Communications and Wireless Technologies

## Wireless Communications Evaluation Tool

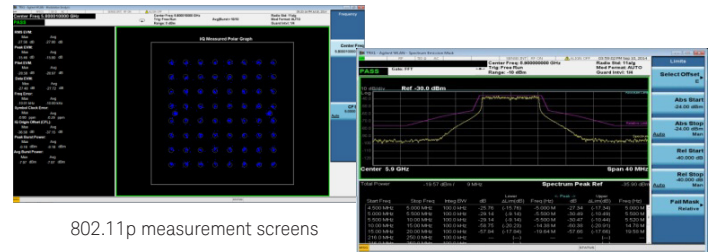


Bluetooth®	3GPP
802.11ac	LTE
GSM	802.11p
Galileo	GPS

Wide range of wireless communications tests supported by a single instrument



E6640A EXM Wireless Test Set

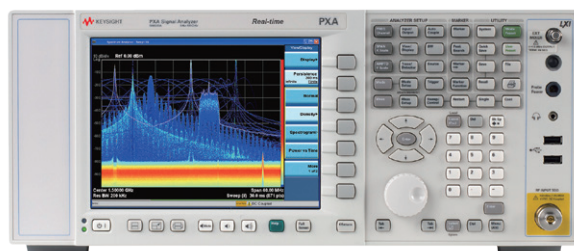


802.11p measurement screens

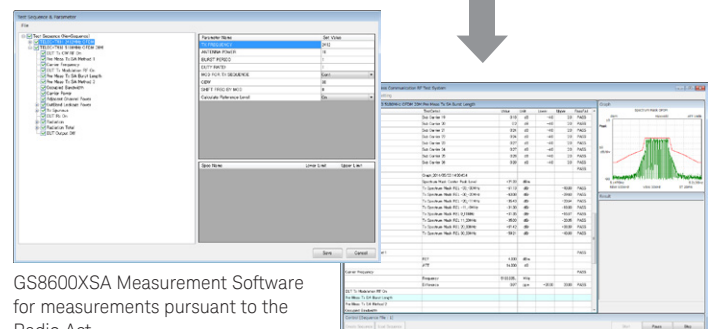
- Supports broad range of radio formats with a single instrument
  - Cellular: LTE/LTE-A, W-CDMA, GGE, C2K, 1xEV-DO, and TD-SCDMA
  - Short-range wireless communications: 802.11a/b/g/n/ac, BT 1.0-4.0, GNSS, Digital Video
- Enables transmitter/receiver tests
- User-friendly GUI suitable for both development and manufacturing
- Realizes the best throughput and productivity

The E6640A and the X-Series Signal Analyzer share the same GUI and command system. You can use both products, which provide the same usability.

Signal analysis solutions evolved to fit best for development sites

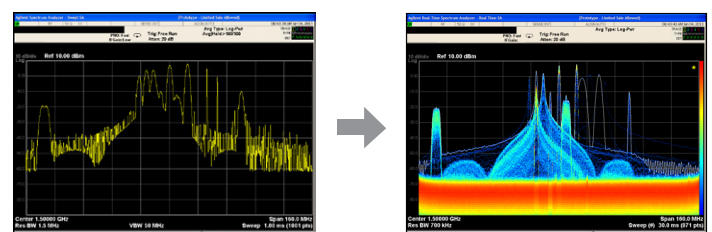


X-Series Signal Analyzer



GS8600XSA Measurement Software for measurements pursuant to the Radio Act

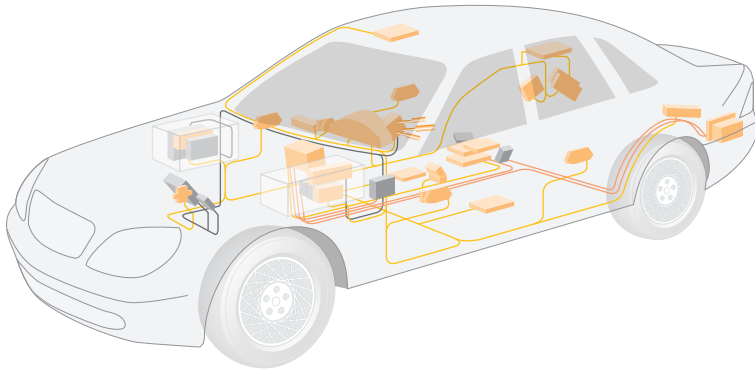
- Provides various measurements including noise figure, phase noise, modulation analysis, and EMI in a single instrument
- Covers broad range of radio formats in a single instrument
- Supports spurious measurements pursuant to the Radio Act
- Also enables noise analysis with the Real Time SA feature



The Real Time SA feature can capture and display quickly-changing signals

## Power Device Design and Evaluation Tool

Power Device



Power Device Evaluation  
for HEVs/EVs

### Drives improvements in fuel consumption of HEVs/EVs

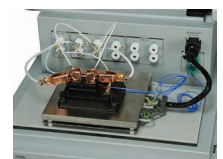
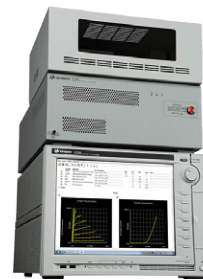
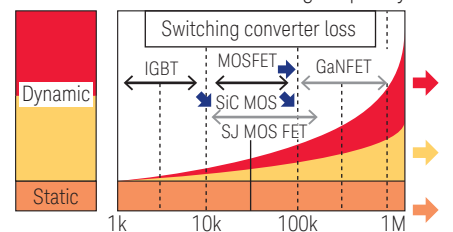
- Minimizes the procedures for configurations and settings for selection of devices with low power loss, which directly affect improvements in fuel consumption.
- Supports not only on-resistance / withstand voltage evaluation but also device capacity / gate charge measurement essential for power loss evaluation
- Calculates power loss using measurement results: Efficiently selects low power-loss devices

### Verifies behavior in actual use environment: Reduces the risk of market recall

- Significantly improves efficiency of tests under an environment in the temperature range of actual use essential for automotive devices (-50 °C to 250 °C)
- Screens out non standard-compliant devices that cannot be differentiated at room temperature

More information: <http://www.keysight.com/find/b1506a>

Power device loss vs. switching frequency

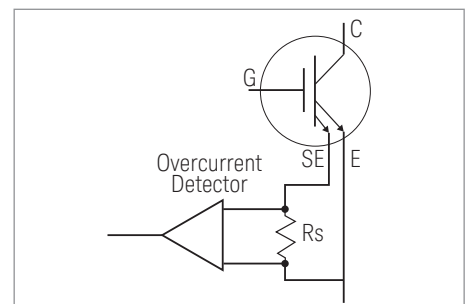


B1505A/06A Power  
Device Analyzer

### Up to 1500 Amp! Intelligent Power Module evaluation

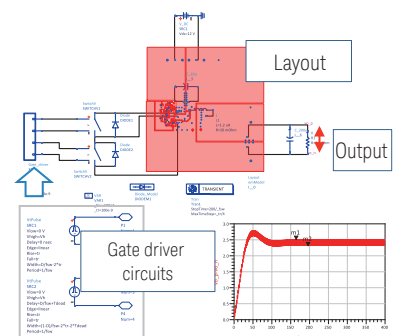
- Is adapted for evaluation of increasingly common Intelligent Power Modules (IPMs)
- Realizes evaluations of the overcurrent detect features and the temperature measurement features of IPMs
  - Accurately evaluates each feature at a high current without a dedicated tester
  - Simultaneously measures both current and voltage at multiple terminals on an IPM
  - Realizes simultaneous measurements for sense emitters, temperature measurement diodes, etc., while applying a high current of up to 1500 A

More information: <http://www.keysight.com/find/b1505a>



### Improves design of high-speed switching converters/inverters

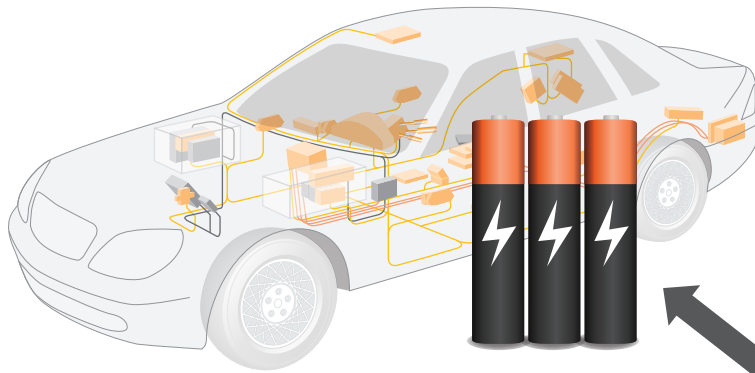
When designing converters/inverters, securing an ideal layout can be hard to achieve due to increases in switching frequency for the sake of efficiency and miniaturization. As a result, problems related to the characteristics of high frequencies, such as problems with noise and coupling, become all the more critical. The use of new SiC and GaN devices requires further improvement of design accuracy. Keysight ADS enables highly accurate analysis of converter/inverter circuits with simulations that combine the parts layout and circuits in an integrated environment for circuit/electromagnetic analysis.



Integrated environment for  
circuit/electromagnetic analysis  
Keysight Advanced Design System

## Power Device

## Making HEV/EV Battery Tests Simple and Accurate



## Storage Devices

Charging and discharging test  
Internal resistance measurement  
Simple output simulation



N7900 Series

## Make charging and discharging tests simple

Charging and discharging tests used to require a complicated system consisting of a power supply, electronic load, switch box, etc. Keysight N7900 Series DC Power Supplies can resolve the complexity.

- Highly accurate, high-speed 2-quadrant power supplies that enable the supply and consumption of current
- No DMM is needed (measurement feature equivalent to DMM is included)
- Easy to connect and compact (easy system maintenance enables easy performance maintenance)

## Make accurate internal resistance measurements

When it comes to making accurate measurements, Keysight's N7900 Series DC Power Supplies can meet your needs. In addition to the above, the following features are available.

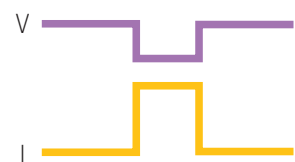
- Capture of precise voltage and current waveforms with 18-bit sampling capability
- Easy transfer of measured data to PCs



## Also useable for output characteristics simulation

- Simple simulation of degraded batteries possible with the variable output resistance feature

For example, assuming that the internal resistance value is 300 milliohms, entering that value for the power supply drops the output voltage to the appropriate level based on an internal resistance of 300 milliohms in real time.

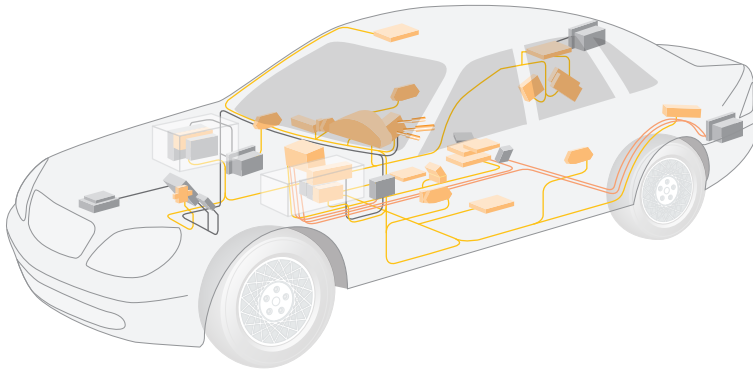


Output example



## High-Resolution and Wide View Angle Millimeter-Wave and Wideband Radar

### Collision Avoidance Radar and Antennas



Collision avoidance radar design

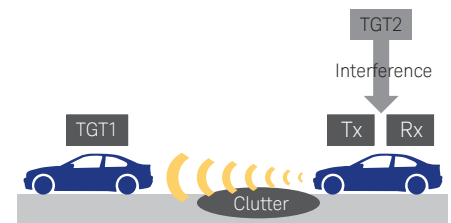
Evaluation of components for 79 GHz band

Contribution to radar system design and relevant component evaluation for high resolution/accuracy in distance measurement and wide view angle / angular resolution / accuracy used for pre-crash safety and cruise control  
Striving to realize the required performance

- Millimeter-wave 79 GHz band radar
- Wideband up to 4 GHz, FMCW radar, pulse compression radar
- Phased array antenna

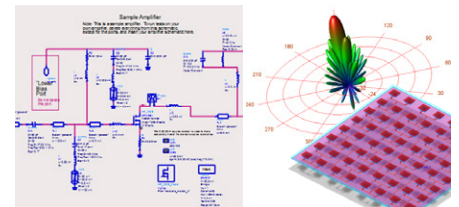
### Radar system design

In the design of a radar transceiver, analysis of the whole system including propagation routes is important. Keysight's SystemVue/EMPro enables analysis of the whole system including various disturbances along propagation routes, as well as analysis for antenna models used for transmission/reception using analysis results from EMPro that are close to reality prior to prototyping. Also, linking the simulation environment with the measurement instrument enables analysis of the whole system including the prototype.



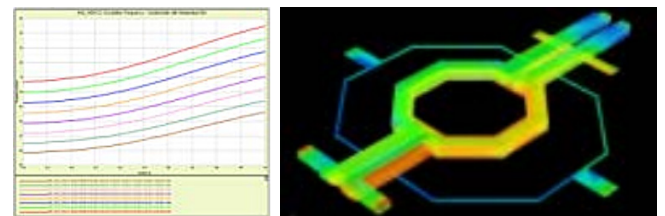
### Millimeter-wave radar circuit design

When designing millimeter-wave ICs and circuit modules for millimeter-wave radar systems, it's absolutely critical to consider the characteristics of the wiring. To sufficiently understand the effects of wiring on the layout, electromagnetic analysis is necessary. Keysight's ADS/Golden Gate is a circuit/electromagnetic simulation environment that allows highly accurate design.



### Millimeter-wave device modeling

Accuracy of simulation is determined by the model for simulation. For the design of millimeter-wave circuits, preparation of a SPICE model that supports millimeter waves is required. Keysight provides SPICE model extraction and verification services for millimeter waves, and enables highly accurate simulations.



### 24 GHz/77 GHz/79 GHz

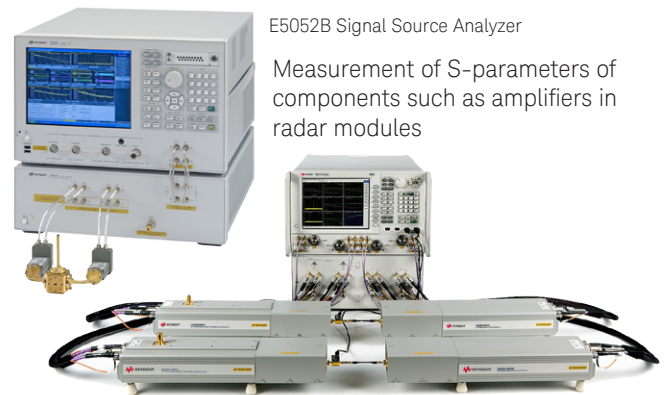
### Evaluation of components for wideband radar

You can count on us. Keysight's RF microwave measurement solutions will respond to various issues.

- Optimization of radar transmission and reception power
- Spurious-free evaluation of spectrums in millimeter-wave bands and support of x2 frequencies to meet requirements based on the Radio Act
- Improvement in distance resolution
  1. Highly accurate evaluation of frequency deviation and phase noise for signal sources
  2. Signal sources capable of changing output frequency at high speed
- Millimeter-wave network measurement with longer calibration cycle and high temperature stability
- Millimeter-wave network measurement that captures the loss and phase for each element of a phased array antenna
- Verification of signal attenuation and degree of angle change during radar signal transmission

E5052B Signal Source Analyzer

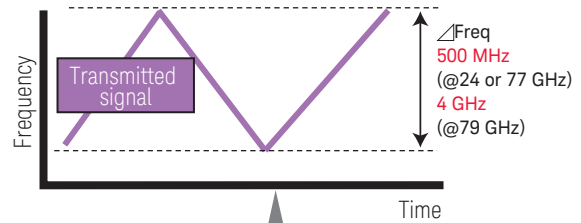
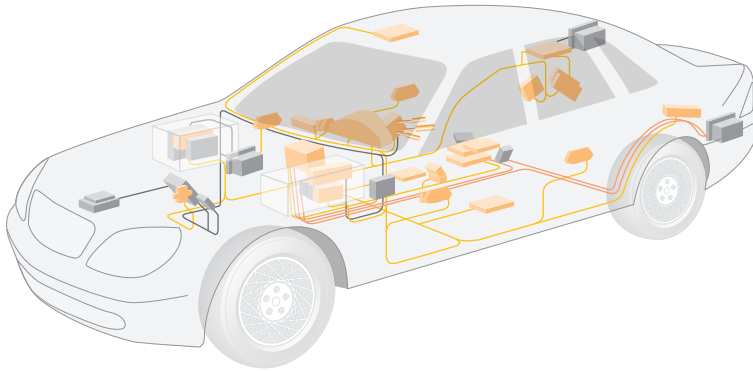
Measurement of S-parameters of components such as amplifiers in radar modules



N5251A Millimeter-Wave Network Analyzer

## Collision Avoidance Radar and Antennas

## 24 GHz/77 GHz/79 GHz Automotive Radar Performance Evaluation



500 MHz? 4 GHz bandwidth?  
Can we generate such ultra-wideband signals?  
Can we measure them?

Example of a next-generation FMCW system (approx. 10 cm distance resolution)  
Critical challenge : Ultra-wideband FMCW signals of 500 MHz or 4 GHz are necessary to improve distance resolution of radar.

Ultra-wideband total solution for evaluating a broad range of devices including transmitters, receivers, and relevant components

### Signal source for transmitting signals

FMCW/pulse signal generator, etc.

#### Greater than 4 GHz bandwidth

- Excellent signal quality
- General-purpose signal generation
- Radar signal source beyond the concept of a generator



N5193A UXG Signal Generator

- Easy output of ultra-wideband signals with front panel operations

#### Greater than 4 GHz bandwidth

- Capable of multichannel support
- Flexibility to apply intentional distortion
- Combination with customizable converter
- Flexible support for frequency filtering for pulse radar, etc.



M8190A Arbitrary Waveform Generator

### Analyzer to receive signals

FMCW linearity evaluation, pulse signal quality, etc.

#### Supports up to 510 MHz bandwidth

- Works also as a swept spectrum analyzer
- Best for occupied bandwidth and spurious measurements



N9040B  
UXA Signal Analyzer

#### Supports up to 3.6 GHz bandwidth

- Works also as an ultrahigh-sensitivity phase noise measurement instrument
- Best for stability evaluation for millimeter wave generators



E5052B  
Signal Source Analyzer

#### Supports Greater than 4 GHz bandwidth

- Industry's highest performance low-noise oscilloscope
- Capable of multi-channel support



Oscilloscope 9000 Series

### Up-converters and down-converters that work with millimeter waves

Extends output frequency of signal generators to 75 GHz – 110 GHz band  
(Module for up to 1.1 THz is also available)



E8257DV10 Millimeter-Wave Signal Generator Frequency Extension Module

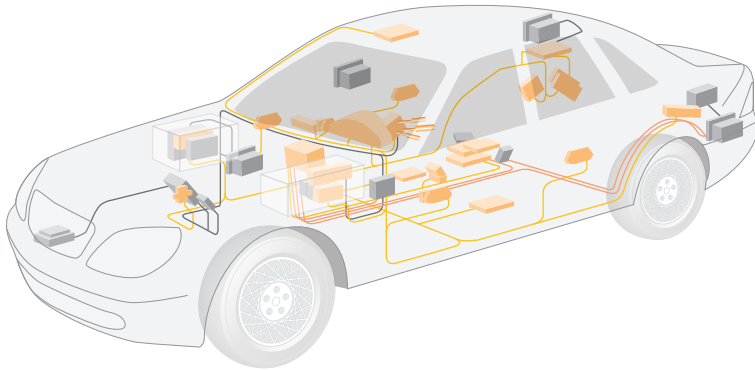
Extends measurable frequency range for UXA Signal Analyzer to 60 GHz – 90 GHz band  
(Module for up to 110 GHz is also available)



M1970E  
Smart Mixer

## Antenna Design and Evaluation

Collision Avoidance  
Radar and Antennas



Antenna design and evaluation

### Automotive antenna design

Electromagnetic analysis is used in antenna design. Keysight's EMPro enables evaluation of the characteristics of not only antenna units but also antennas that are actually currently installed in vehicles.

### Evaluation of characteristics of transmission and reception channels including antennas

Keysight's SystemVue enables the overall evaluation of transmitter and receiver systems, taking the propagation characteristics of antennas into account. Using antenna analysis data from EMPro, transmitter and receiver systems can be evaluated for applications such as communications between automobiles and the use of wireless in a vehicle.

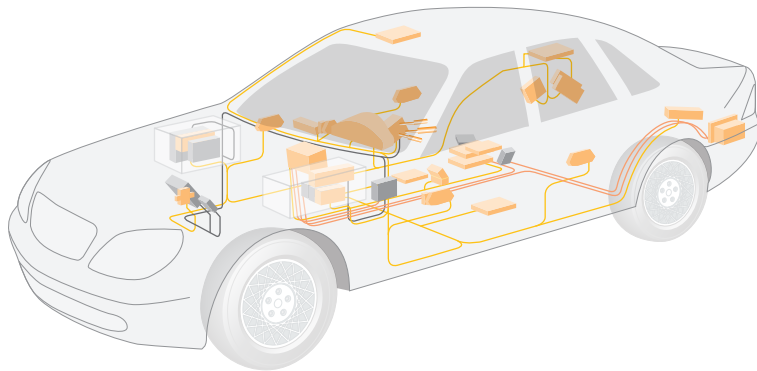


### Return loss evaluation for independent antenna units

Enables return loss evaluation to evaluate reception characteristics for antenna units  
Benchtop and handheld network analyzers enable easy evaluation.

## EMI/noise evaluation

## EMI/Noise Evaluation



EMI  
Radio noise evaluation

### EMI receiver for certification tests

- Fully compliant with CISPR 16-1-1:2014 Ed 3.2
- Capable of measurements for CISPR 12/25 as defined for vehicles and devices installed in vehicles
- Capable of not only receiver scans but also high-speed time domain measurements
- Capable of displaying Pk/QP/Ave time waveforms in addition to certification tests, which allows you to understand noise behaviors and to determine appropriate residual times

More information:

<http://www.keysight.com/find/N9038A>

### New 3 GHz Model



N9038A MXE EMI Receiver

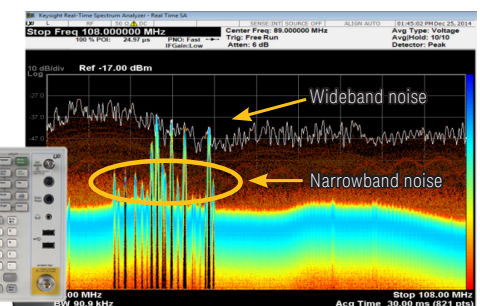
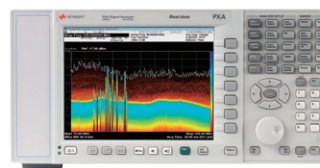
### Evaluation of intermittent noise/wideband noise

The real-time analysis feature enables easy observation of random noise/intermittent noise and extremely intermittent noise like that which coexists with wideband/narrowband noise, detection of which used to be difficult with traditional spectrum displays.

More information:

<http://www.keysight.com/find/RTSA>

N9040B/30A/20A  
X-series Signal Analyzer



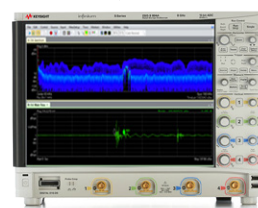
You can record\* only the noise that appears within the range defined by a mask by hardware-triggering the oscilloscope with a real-time spectrum analyzer.

### Evaluation of intermittent noise/wideband noise

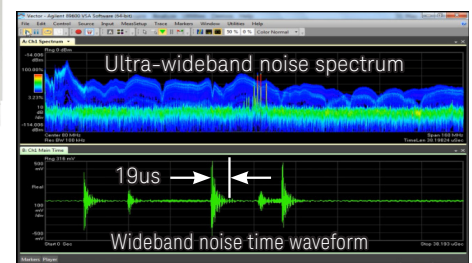
Oscilloscopes are best for observation of ultra-wideband noise. They record\* captured noise and perform multi-domain analysis for the frequency domain and time domain. Combining the oscilloscope with a frequency mask trigger from a real-time spectrum analyzer allows the analysis of random/intermittent noise.

More information:

<http://www.keysight.com/find/scopes>



S-Series/9000 Series  
Oscilloscopes

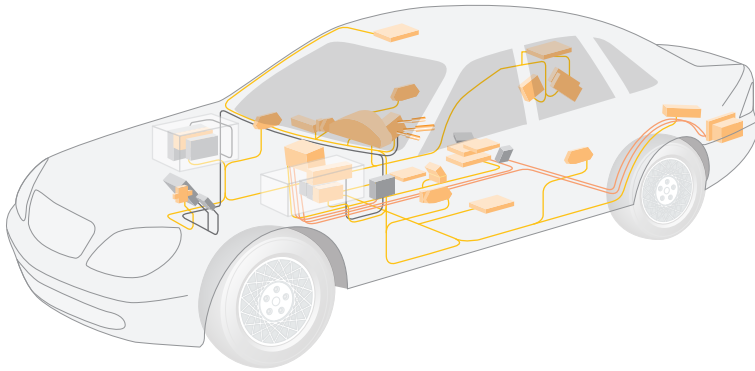


\* 89600B Vector Signal Analyzer Software is required for recording.



## Measurement Tools that Enable Easy Monitoring in Vehicles and during Actual Vehicle Tests

### Driving Test/In-Car Test



Actual vehicle test

In-car test



### Tool for noise analysis of real vehicles and harness tests

During a real vehicle test and in a prototype automobile, an RF spectrum analyzer and network analyzer can be used for noise analysis, evaluation of the impedance of harnesses, and to detect the locations of discontinuities. Keysight's solution is handy, running on battery power for 3 hours, is protected by a rubber exterior, and is hard to damage, even when bumped. The solution also boasts an IP53-certified chassis that is resistant against water droplets and dust, and is capable of remote operation through an iPad connection.



U5855A True/R Thermal Imager



### Thermal design verification, hot spot identifying tool – Infrared thermography

Thermography is ideal for making measurements by capturing heat distribution in two dimensions without overlooking hot spots in the thermal design of ECU boards, power components, and parts such as the engine, brakes, and wheels and in the performance of driving tests. For troubleshooting, this handy, easy-to-carry, tough, and compact model can be used to easily identify parts with abnormalities.

### Insulation resistance test tool for maintenance of motors and engines

Verification of insulation in motors and engines is necessary for safety reasons. In particular, insulation resistance tests are necessary for maintenance.

- Hard-to-damage IP67-rated protection, resistive to environments with contaminants such as oil, dust, and water
- Applied voltage range up to 1000 V including 500 V range
- Handy and easy to use even in a narrow space



U1461A Insulation Multimeter

### Tool for monitoring/data logging for multiple points to measure temperature and electrical characteristics of ECU boards

In automotive engine tests, it is necessary to simultaneously monitor many parameters such as temperature, oil pressure, fuel flow, RPM, and emissions. The switch and control unit with a built-in digital multimeter enable flexible and accurate logging of measurements. Also, temperature measurements for multiple points in the vehicle can be logged.

Digital multimeter  
34972A LXI Data Acquisition /  
Data Logger Switch Unit



34980A Multifunction Switch/Measure Unit

## Recommended New Products

# New Product Flash Keysight's New Solutions to Meet Next-Generation Test Needs

## New Industry-Standard Compact Touch 3000T-X Series



View → Capture → Analyze

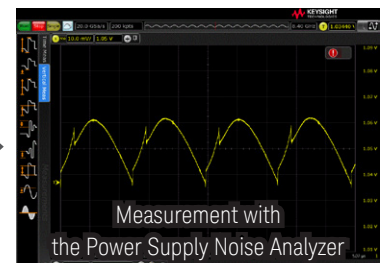
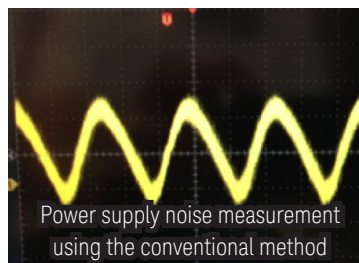
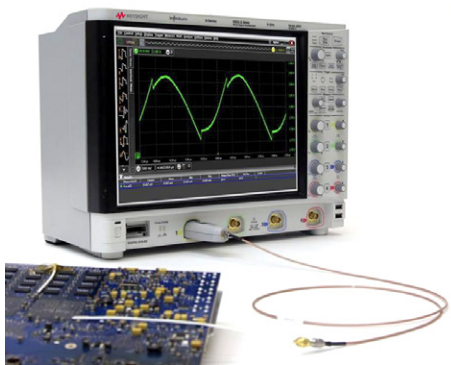
- 100 MHz to 1 GHz, 5 GSa/s, 4 ch
- Waveform update rate of a million waveforms/sec, 6-in-1 multi-function embedded
- Good deals on all options
- Application bundle option



Supports CAN symbol decoding  
Ultrahigh-speed for HW processing!

Zone touch trigger enables triggering of any waveform in **three seconds**.

## Power Supply Noise Analyzer for viewing the true shape of power supply noise



Enables clear measurement of ripple noise levels even as low as a few mV or tens of mV

- Combination of the Infiniium S-Series low noise 10-bit oscilloscope and a power rail probe specialized for power supply noise observation
- 2 GHz bandwidth,  $\pm 24$  V offset range, 50 k $\Omega$  DC load

## New Generation Power Analyzer PA2201A IntegraVision



Supports electric power measurements required for design and development towards realization of energy savings

- Supports improvement of electric power efficiency on the order of 1%: Electric power measurements with 0.01% accuracy
- Operates by utilizing current probes/transducers. Resolves accuracy problems
- Directly measures current up to 50 A
- Power meter and oscilloscope are combined into one instrument: significant improvement of evaluation efficiency

Accurately measures electric power parameters as if using an oscilloscope

- Easy operation with a large screen as if using an oscilloscope
- 16-bit resolution, 5 Ms/s (2 MHz bandwidth) digitizer base high-accuracy measurement
- Analysis of electric power parameters while displaying waveforms: Significant improvement of analysis efficiency

More information: <http://www.keysight.com/find/PA2201A>

## N8900-Series Large-Capacity/Wide Output Range DC Power Supply

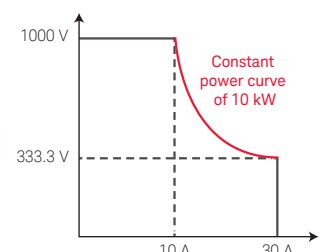
One instrument plays multiple roles:

Realizes efficient operation of large-capacity power supplies and supports a wide range up to 1500 V, 510 A/unit

- Significantly improves operating efficiency of large-capacity power supplies exceeding 5 kW
- Has large capacity of 5 kW to 15 kW, yet supports various voltage/current ranges in one instrument
- Affordable prices of approx. 1.38 million yen for 15 kW

More information:

<http://www.keysight.com/find/n8900>



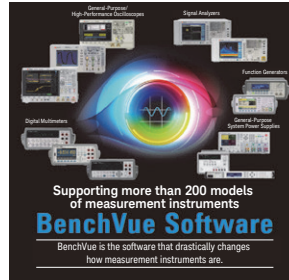
MEMO

## BenchVue Software (Free Basic Platform)

“Not worth programming. Programming is troublesome!”  
 “I wish I could put data onto a PC more easily...”  
 “I wish I could paste a screenshot into a report...”



**BenchVue Software (Free Basic Platform)**  
 Save data to a PC easily! Complete after a few clicks.



### Useful BenchVue features



Enables monitoring of measurement results from multiple models and multiple units by displaying them simultaneously. Save results to a PC all at once with only three clicks.



The library feature enables easy access to manuals, the latest firmware, and application notes with measurement hints.



Easily add notes to trace data from the Oscilloscope and Spectrum Analyzer and save them.

**Supports more than 200 models!**

Also supports the latest power meters, those from the U2040X-Series and the 34972A Data Logger.

Extension of supported models planned

Pro version capable of data logging is now available (paid option)

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: [www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

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Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
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Germany	0800 6270999
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Italy	800 599100
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You can download from <http://www.keysight.com/find/BenchVue>

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 Published in Japan, January 27, 2016  
 5992-0406EN  
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