Testing passive remote keyless entry systems

Due to recent security concerns, ultrawideband (UWB) technology is making its way into automotive key fobs. Rohde&Schwarz offers a flexible test solution for the high demands of R&D and high-throughput production environments.

Your task

The development and production of keyless access systems requires a large variety of tests to ensure that the key fobs function properly.

Wireless key fob usage has grown over the past few years, migrating from high-end vehicles to just about every new car sold. The increased volume of key fob usage means an increased necessity for more sophisticated algorithms.

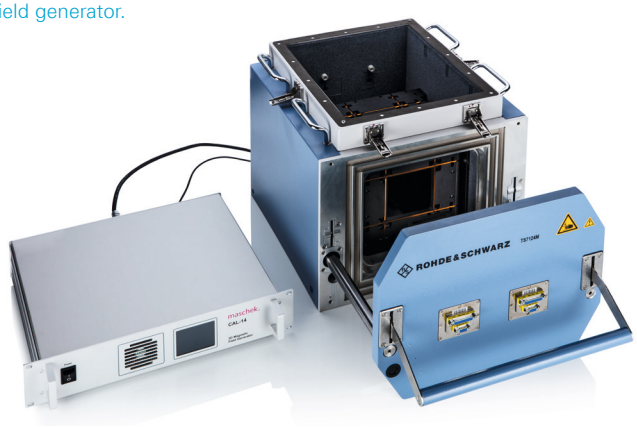
These algorithms allow additional functionality such as matching the key to the car, accurately determining the position of the key relative to the car, keeping the key from accidentally being locked into the trunk by the user and preventing electronic theft of the key fob's transmitted signal.

In order to determine the key's position, the magnetic field of the car and the actual runtime of the signal are measured. After initiating the link in a low-frequency band, an RF signal is used to exchange the encrypted key necessary for unlocking or starting the vehicle. To reduce the attack vector, the latest smart keys usually use ultrawideband (UWB) communications in the non-licensed range between 3.1 GHz and 10.6 GHz . Time of flight algorithms allow precise positioning of the key fob and could replace the complex magnetic field technology.

T&M solution

Rohde&Schwarz offers flexible solutions that cover all technologies and fulfill the high requirements of interference-free function testing in development and production. The highly customizable solution thoroughly checks the strict requirements during R&D and can be optimized for high throughput in the production phase.

R&S®TS7124 shielded box equipped with Helmholtz coil and magnetic field generator.



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The RKE test system solution comes with a fully automatic R&S®TS7124 RF shielded box, providing a shielded environment for testing devices. The box can be equipped with an application-specific DUT mount and an adapted antenna system.

A Rohde&Schwarz signal and spectrum analyzer receives the transmitted signals and measures parameters such as the occupied bandwidth, channel power, spurious emissions and adjacent channel leakage. Range tests to measure the time of flight between two ultrawideband DUTs, require an additional electronic programmable delay.

A Helmholtz magnetic coil and a corresponding 3D magnetic field generator are used to test and calibrate traditional magnetic-field-based smart key systems.

The test system is controlled by an R&S®TSVP PXI-based platform with an optional embedded PC. The supply current in the various operating modes can be measured and synchronized to RF bursts from UWB signals. Communications with the DUT can be handled, for instance, via LIN, CAN, I²C or SPI.

The test conditions can be monitored and adjusted using the powerful R&S®Quickstep test sequencer software. Test data can be collected for further processing, even outside the test system. The modular design of the solution allows easy adaptation to current and future customer requirements.

Key benefits

- PXI-based solution supporting a wide range of automotive communications protocols
- Multi-DUT test setup for up to eight keys
- Helmholtz magnetic coil for 3D magnetic field calibration of the DUT
- R&S®Quickstep for intuitive graphical adaptation of the test sequence

See also

www.rohde-schwarz.com/automotive
www.rohde-schwarz.com/product/TS7124
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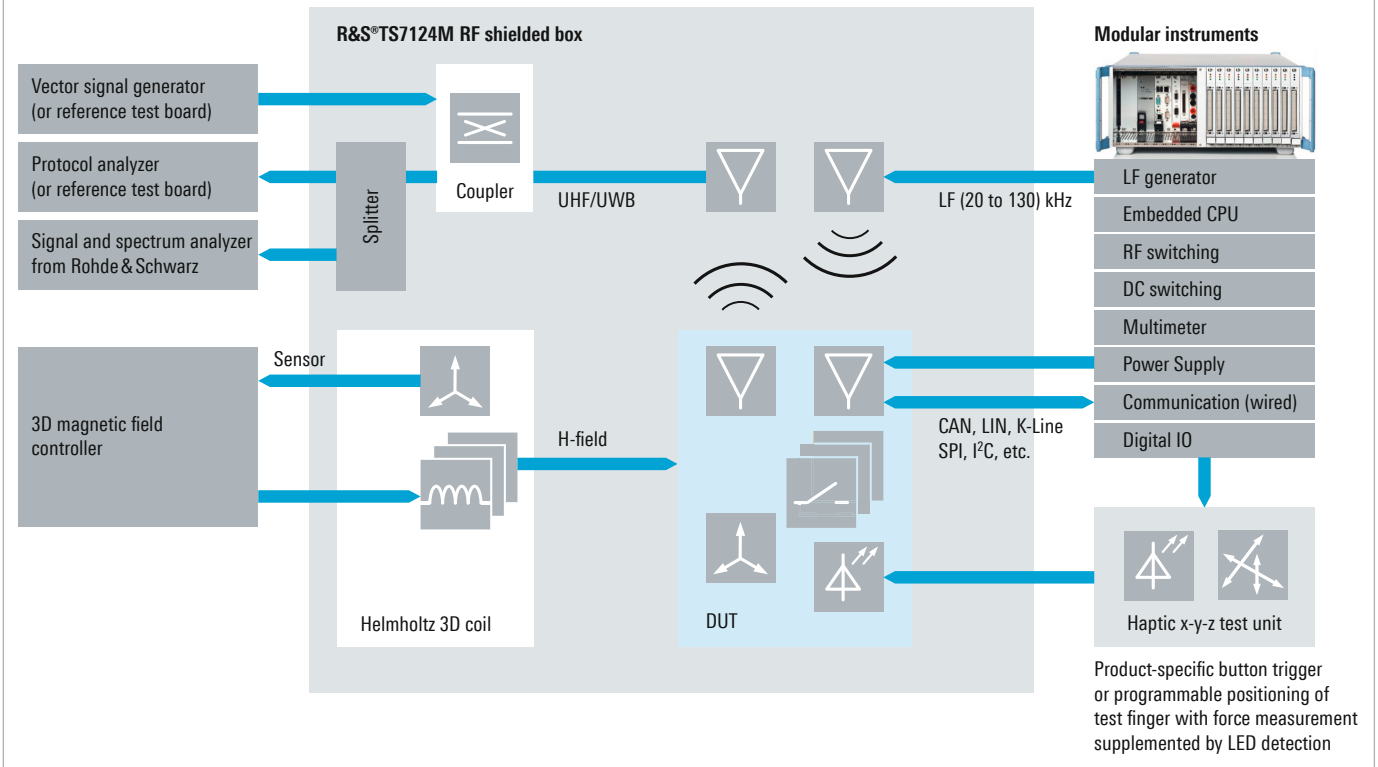
Flexible test setup to analyze both traditional LF/UHF-based and UWB-based DUTs



Rohde&Schwarz GmbH&Co. KG
Europe, Africa, Middle East | +49 89 4129 12345
North America | 1 888 TEST RSA (1 888 837 87 72)
Latin America | +1 410 910 79 88
Asia Pacific | +65 65 13 04 88
China | +86 800 810 82 28 | +86 400 650 58 96
www.rohde-schwarz.com
customersupport@rohde-schwarz.com

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