

The Future of Mobility



The best way to predict the *future* is to design it.

Buckminster Fuller

Christoph Wagner

The Future of Mobility

Automated



- smooth traffic
- Less accidents
- Higher safety
- Higher efficiency

Connected



- Early warning
- Optimized routing
- Better positioning
- Entertainment services
- Garage services

Electrified



- No Emissions
- Noise reduction
- Use of renewable energy

Secured



- Secured connection to clouds and other vehicles
- Protected entry hubs
- Message verification

The Future of Mobility

Förderbekanntmachungs-Abonnement des
Bundesministeriums für Bildung und Forschung

06.02.2017 - 16.06.2017

Bekanntmachung

Um den Straßenverkehr der Zukunft noch sicherer, effizienter, intelligenter und nachhaltiger zu gestalten, **ist die Verbindung der Elektromobilität mit der Fahrzeugautomatisierung und -vernetzung**, besonders in urbanen Gebieten mit hoher Verkehrsdichte, ein erfolgversprechender Ansatz.

Federal Ministry of Education and Research of Germany

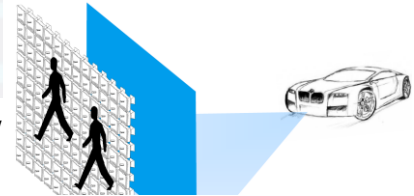
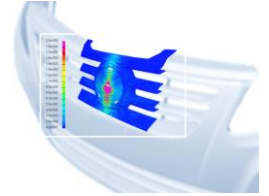
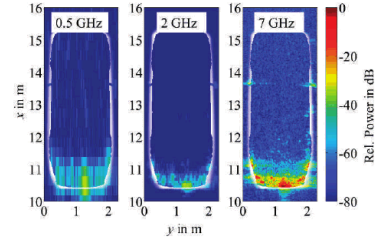
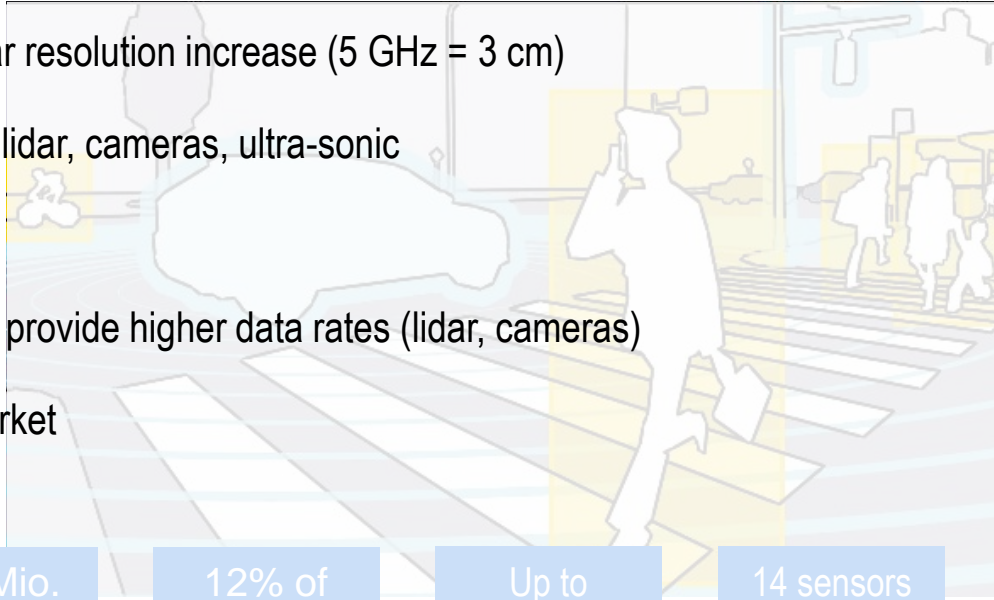
Announcement

In order to make road traffic even safer, more efficient, more intelligent and more sustainable, **the combination of electro-mobility with autonomous driving and connectivity**, especially in urban areas with high traffic density, is a promising approach.



Automated Driving - Trends

- Higher automotive radar resolution increase (5 GHz = 3 cm)
- Sensor fusion of radar, lidar, cameras, ultra-sonic
- 3D-object recognition
- Automotive Ethernet to provide higher data rates (lidar, cameras)
- New players on the market



1.5 billion
cars in
2025

500 Mio.
trucks in
2025

12% of
new cars
in 2025
partial automatic
Level 2

Up to
200 ECUs
in 2017

14 sensors for remote
parking in
2017

Connected Vehicles

- V2X break through expected in 2019
- Neutral analysis of V2X, incl. DSRC and LTE-V
- Cooperation between automotive and mobile comm industry (5GAA)
- Higher download rates due to streaming services/HD maps
- Extended EMC test scenarios



Source: engadget

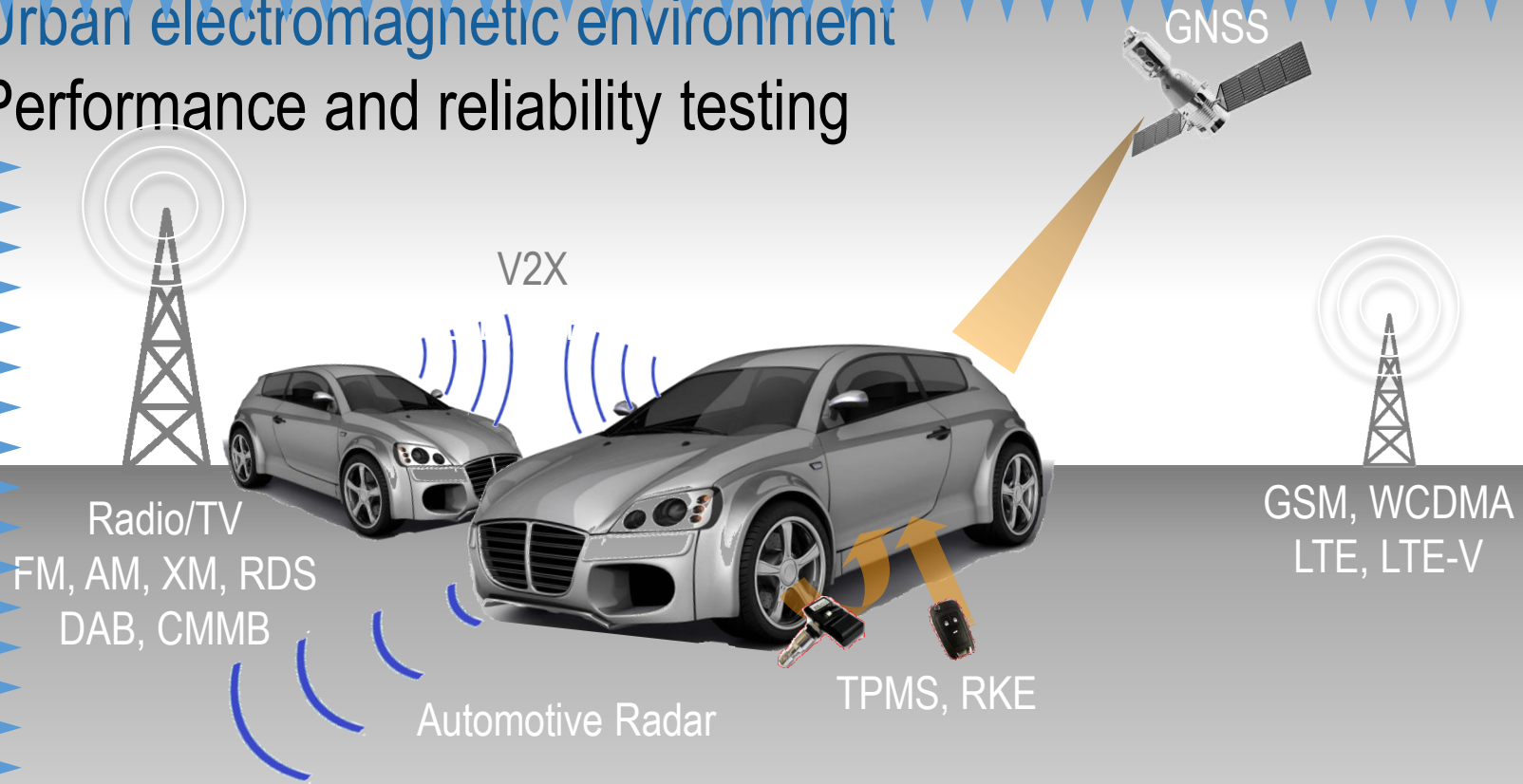
All new cars
connected
in 2025

Connected
cars growing
at 21.9%

80% of
customers
say it's a
"must have"

Urban electromagnetic environment

Performance and reliability testing



T&M Portfolio for Automotive

GNSS / eCall

R&S°SMBV
R&S°CMW
R&S°UPV
GNSS Simulation Solutions

EMC

R&S°TS9982
R&S°ESR
R&S°RTO
R&S°ESW
R&S°BBA
Complete EMC measurement solutions.

Audio / Video / Infotainment

R&S°BTC
R&S°CMW
R&S°SMBV
R&S°SFE
R&S°ETL
R&S°VTC
R&S°UPV
R&S°UPP
Evaluate the quality of infotainment systems

Automotive Radar Solutions

R&S°FSW
R&S°SMW
R&S°SMZ
R&S°FSWP
ARTS
R&S°ZVA
Verification of Advanced Driver Assistance Systems

V2V / V2X

R&S°TS-ITS100
R&S°FSW
R&S°SMW
R&S°CMW
Communication and Interference

Automotive Bus Systems

R&S°RTO
R&S°RTH
R&S°RTM
R&S°ZND
Bus analysis with dedicated options for CAN/LIN, FlexRay, SENT and BroadR-Reach

Secured Communication - Trends

- Cloud based connected car / services (Maps, Hazard announcement)
- Pay by wireless (Parking, Tolls, Fuel)
- Increasing number of attack surfaces (Cellular, BT, WLAN, V2X, RKE, TPMS, Wireless DM)
- Apps need protecting (remote car start)
- OTA Firmware updates to patch issues
- Autonomous vehicles



1.4M FCA
Cars and 8k
Jeeps
Recalled

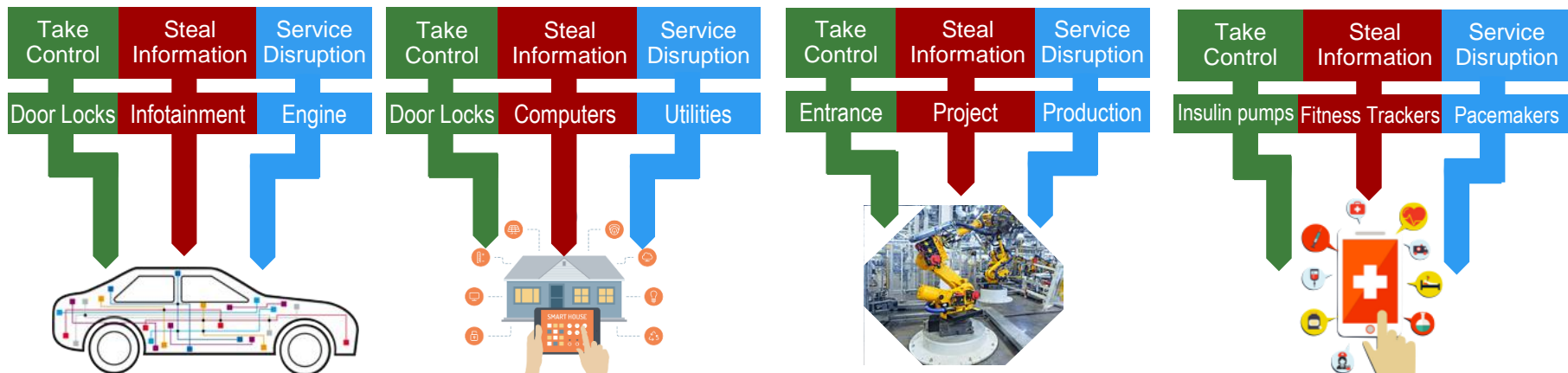
BMW
Connected
Drive
Hacked

>\$2Bn
invested
2016 -
2018

90M dealer
communication
transactions
per month. 50
service
providers



Secured Communication – How to solve the Nightmare?



Security Solutions at R&S



IP Traffic Monitoring



End to End Encryption

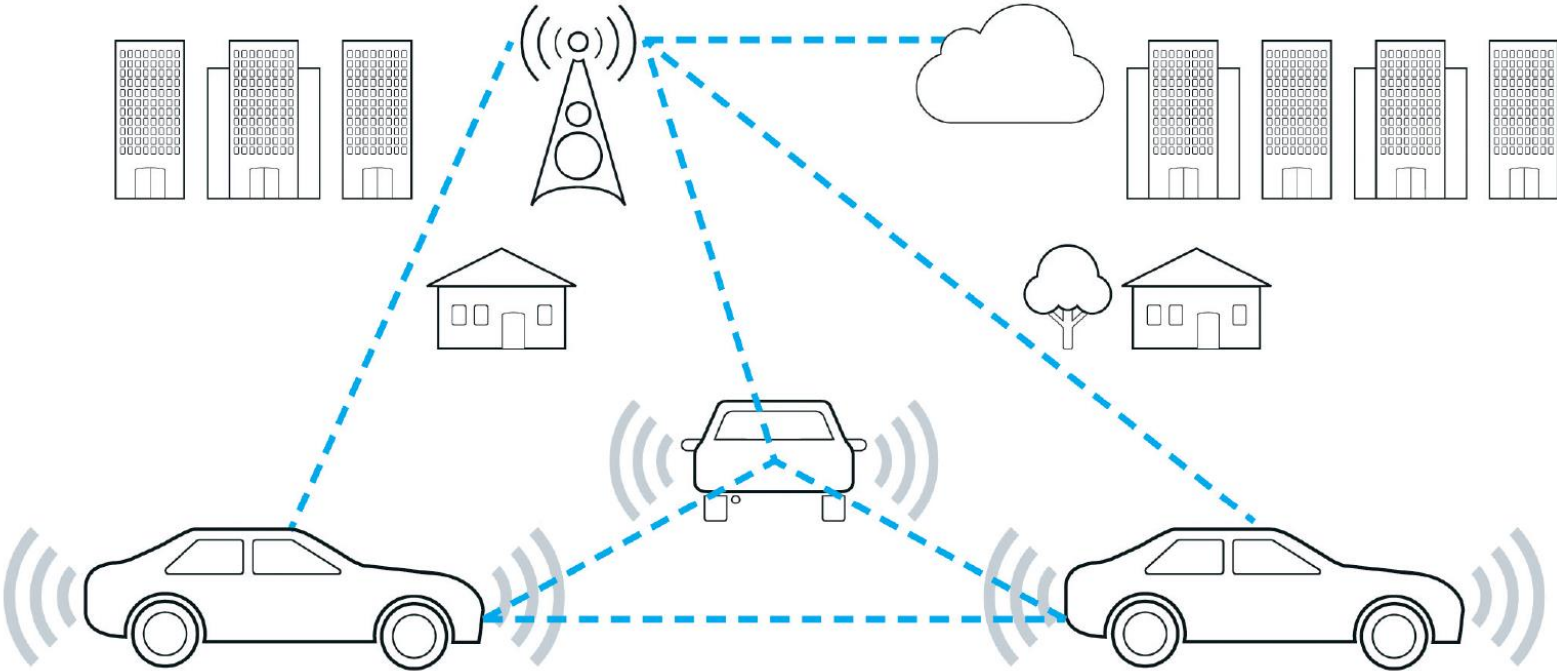


Next Generation Firewalls



Trusted network solutions

Autonomous Driving requires Sensors and Communication



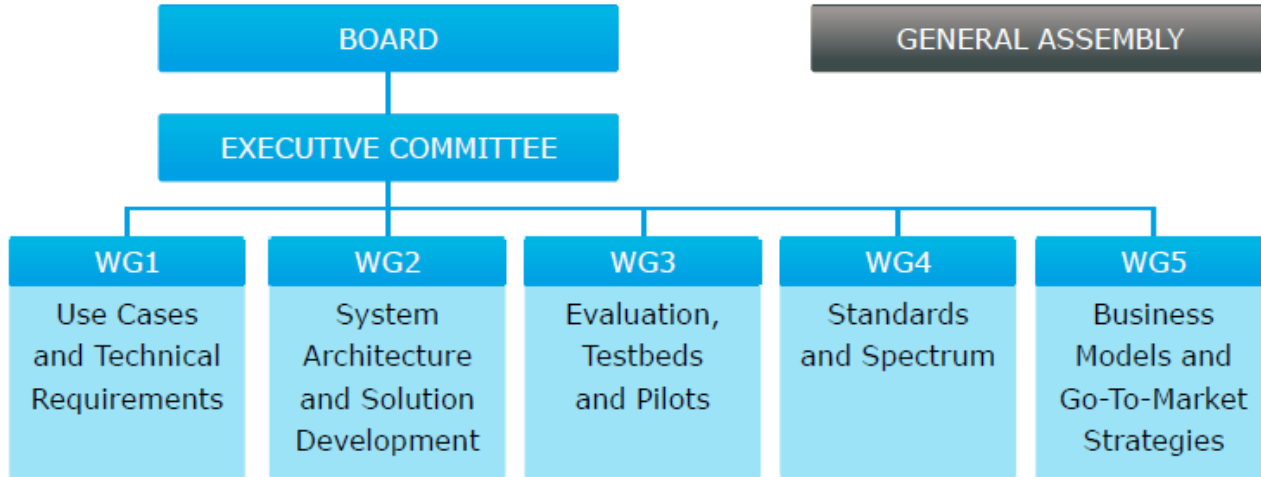
Getting Automotive and Wireless connected

Standards of the
Automotive Industry

Committees and Standards of the
Mobile Communication Industry

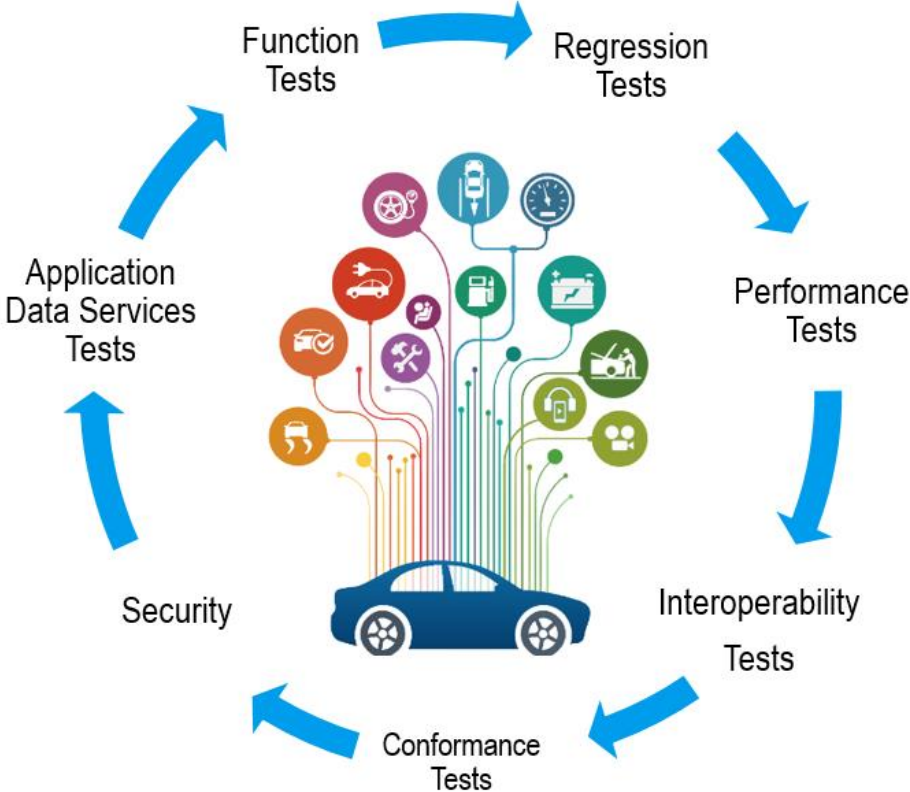


Founder	<p>BMW GROUP Audi DAIMLER</p>	<p>NOKIA</p>	<p>intel QUALCOMM</p>	<p>NTT docomo verizon</p>	<p>SoftBank Laird</p>	
	<p>北汽集团 BAIC Group Ford JAGUAR LAND-ROVER SAIC 上汽集团 SAIC MOTOR</p>	<p>SAVARI™ BOSCH Technik fürs Leben Valeo FEV FICOSA Continental DENSO</p>	<p>HUAWEI ERICSSON ZTE</p>	<p>SAMSUNG LG Panasonic infineon</p>	<p>vodafone Designing The Future KDDI SK telecom T Telefonica AT&T 中国移动 China Mobile</p>	<p>ROHDE & SCHWARZ INTERDIGITAL Vtari P3 SAKO TECHNOLOGIES DANLAW gemalto security to be free KEYSIGHT TECHNOLOGIES</p>
	OEM	Tier 1	Telco Infrastructure	Tier 2	Operator	Telco Enabler



WI name	Survey on ITS Testbeds, Trials, Simulation Frameworks
Proposed by	Rohde & Schwarz
Rapporteur	<ul style="list-style-type: none"> • Rosier, Holger (Rohde & Schwarz) - Europe area • He, Chao (Huawei) - Asia area • Vukovic, Ivan (Ford) - North America
Supporting members	Viavi Solutions, Huawei, Ford, Vodafone, Qualcomm, Intel, FEV, DoCoMo, BMW Group, LGE, Ficos, Keysight, Samsung, SKT, Rohde & Schwarz

Vehicle Certification



Technology Leadership

- I World Market leader in EMC test receivers
- I World Market Leader in Mobile Phone Production Testing
- I Setting Mile Stones in Cutting Edge Technology
- I Expertise in Cyber Security



Summary

Certification provides the framework for regulatory and operator specific requirements ensuring economy of scale

Automotive will require complete real-world test scenarios and are in the need for security solutions

Rohde & Schwarz is committed to supporting the industry with the solutions needed to investigate, standardize, develop and implement autonomous driving.

