Autonomous driving

MEMT/ E/E & Multifunctional Materials

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Group Materials Labs: worldwide operations

Automotive Brands

900+
MATERIAL ANALYSIS EQUIPMENTS

350
QUALIFIED RESOURCES AS ENGINEERS, CHEMISTS, PHYSICIST AND MATHEMATICIANS

65
RESEARCH PROJECTS

50
YEARS EXPERIENCE

28
SUBJECT AREAS

16
RESEARCH LABORATORIES ALL OVER THE WORLD

5
TECHNICAL DEPARTMENTS

27
COMPETENCE CENTERS

Started on May 1st 2010

Headcount EU 193 I WW 350

Locations EU 9 I WW 16

Assure up-to dated **competences**

Share best practices

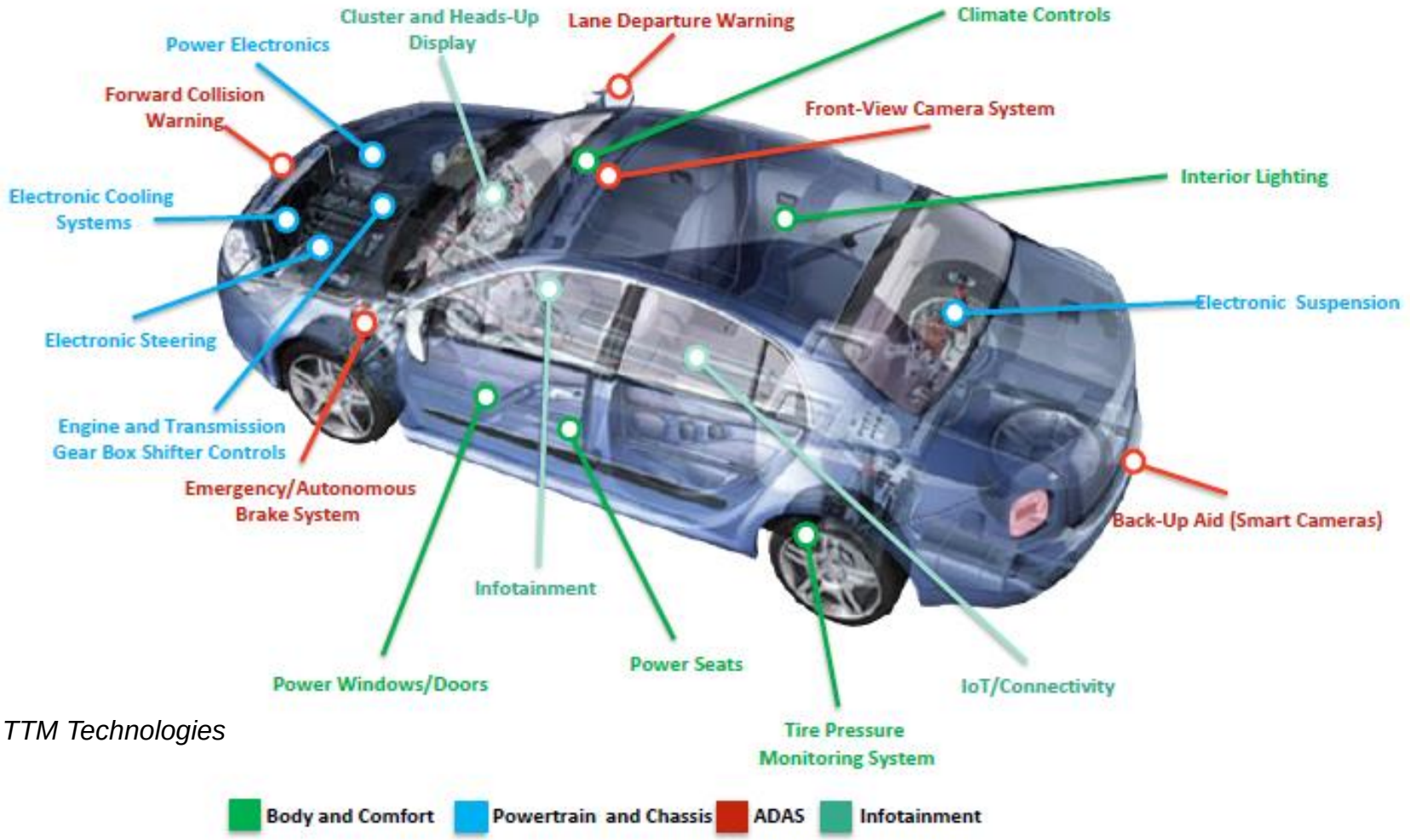
Assure **equipment sharing and saturation**

Efficient labs activities

Electronic content in automotive

Increasing of electronics contents in automotive:

- Development of **new materials**
- New material' requirements in terms of **mechanical, EE and optical performance**
- Integration of electronic connections and switches into the materials → embedded electronics



Source: TTM Technologies

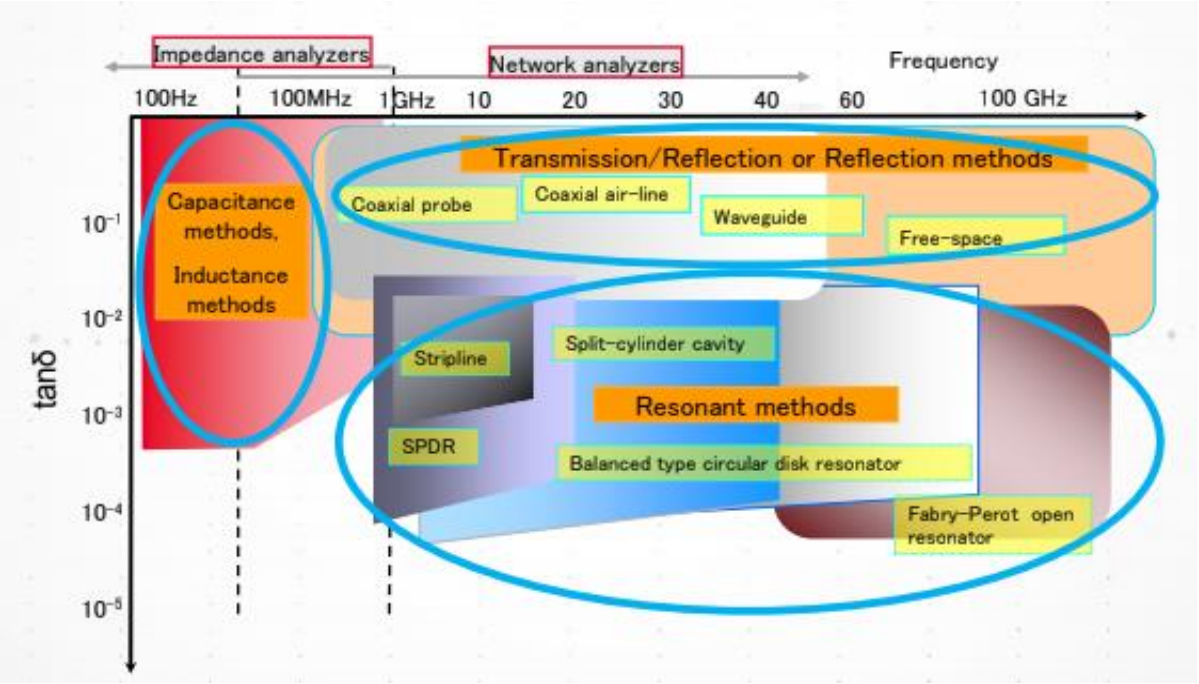
Automotive frequencies and tests methods

Common automotive technologies and their frequencies ranges (*Source: Rhode & Schwarz)*:

- Infotainment – most are in the kHz to MHz range
- Body electronics – MHz to 100 GHz
- GNSS (Global navigation satellite systems): MHz to GHz range
- Electrical drive train – The wireless EV charging system is within kHz
- Connectivity – eCall solutions tag along 2G to 5G protocols, C-V2X is at 5.9 GHz, NFC at 13.56 MHz

Tests methods:

- Materials used for *different applications* must have different performances
- The method used for testing is *dependent from the frequency*



Source: Keysight Technologies

5G & ADAS sensors: Development of test methodology

- 5G and ADAS requires **development and achievement/ setting** of new testing methods
- Antenna in package (AiP) devices require a **radical change** to the existing design test solutions
- RF Front end modules require new SLT (system level test) concepts due to multitude of bands and carrier aggregation

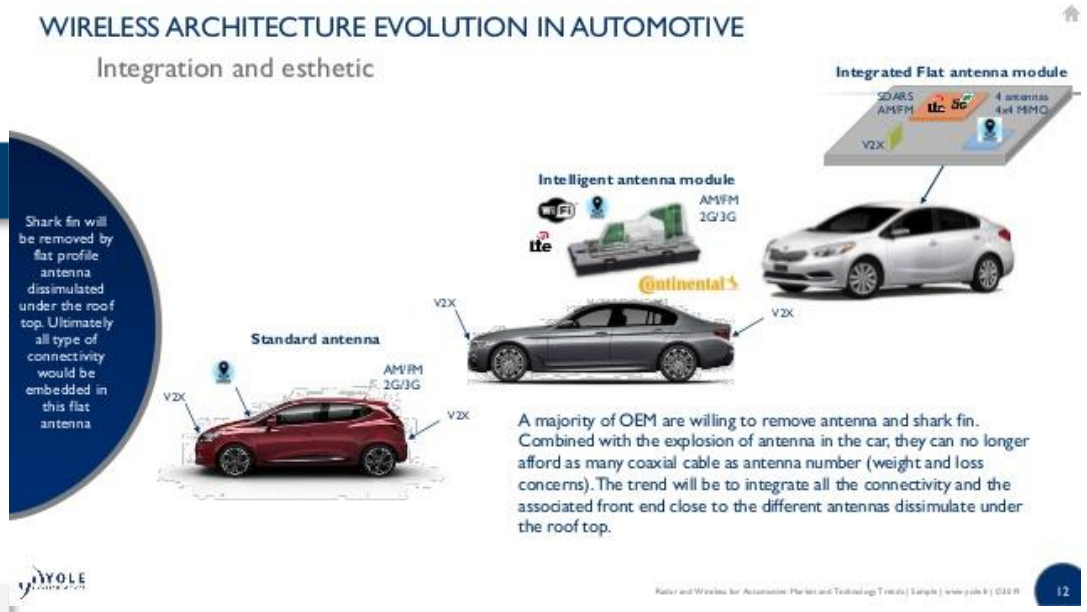
Vehicle Automation

More ADAS Sensors = More Interconnects

- *Cameras*
- *Short & long range RaDAR*
- *3D Flash LiDAR*
- *Ultrasonic Sensors*

- Reliability is a critical concern with >50,000 interconnections – many critical to safety in ADAS systems hardware

Source: MacDermid Alpha Automotive



Development of reference standard for 5G - mmWave materials assessment and characterization is necessary.

Conclusions

Intelligent

Connected

Sustainable

- A collaborative approach among the whole supply chain is crucial to **exploit the new materials**
- A larger adoption of **innovative solutions will need the definition of new requirements, standards, and new testing procedures** to guarantee reliability, performances and safety