The novel frontiers for materials in automotives: intelligent, eco-sustainable, electrical and autonomous vehicles

Material Engineering Methods & Tools
CRF- FCA

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Outline

I. Main drivers and targets for integrated electronics

II. Where and Why electronics integration

III. Conclusions

Mission

To develop and transfer innovative powertrains, vehicle systems & features, materials, processes and methodologies together with innovation expertise in order to improve the competitiveness of FCA products

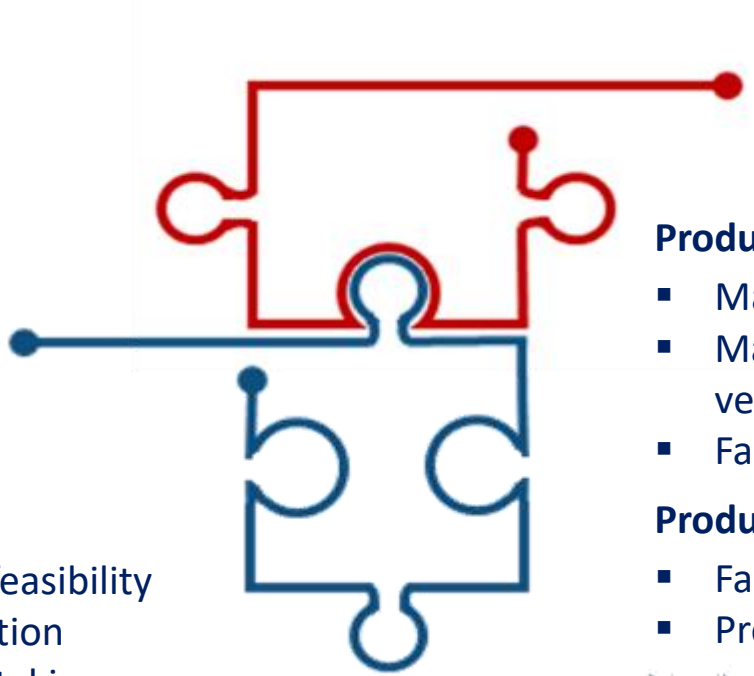
To represent FCA in European and National collaborative research programs, joining pre-competitive projects and promoting networking actions

To support FCA in the protection and enhancement of intellectual property

Core activities towards product development

DECOUPLED
Innovative Actions

- Research
- Innovation
- Methodologies
- Materials application feasibility
- Materials characterization
- Materials environmental issues



COUPLED
Activities on Products

Product Development:

- Materials engineering
- Materials Testing on components/ vehicles
- Failure analysis

Product in production:

- Failure analysis
- Product materials compliance

Automotive Brands

DECOUPLED: Collaborative Research projects

CORNET

Multiscale modelling and characterization to optimize the manufacturing processes of Organic Electronics materials and devices

FLEX FUNCTION 2 SUSTAIN

Open Innovation Ecosystem for Sustainable Nano-functionalized Flexible Plastic and Paper Surfaces and Membranes

smartonics

Development of smart machines, tools and processes for the precision synthesis of nanomaterials with tailored properties for Organic Electronic

GRAPHENE FLAGSHIP

G+BOARD

Automotive Wireless Dashboard based on Multifunctional Graphene Composites

MICELI

Micro Quantum Dot-Light Emitting Diode/Organic Light Emitting Diode - Direct patterning

MIcro QD-LED/OLED DIrect micro patterning

SPIDER

Safe and PrelithiatedhIgh energy DEnsity batteries based on sulphur Rocksalt and silicon chemistries

Smart line

Smart in-line metrology and control for boosting the yield and quality of high-volume manufacturing of Organic Electronics

Delivering the 3b generation of LNMO cells for the xEV market of 2025 and beyond

REAL NANO

In-line and Real-time Nano-characterization technologies for the high yield manufacturing

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Needs, Targets, Priorities & Challenges

TOWARDS autonomous Driving …

- Individualization: more choices for consumers
- Connectivity and data-driven services
- Lightweighting
- Sustainable Materials
- New Materials Processing Technologies

Needs, Targets, Priorities & Challenges

Every day our cars are being coming more like …

Movable living rooms:

- Entertainment
- Relaxing
- Autonomous Driving
- …

Movable batteries:

- Battery Electric Vehicle
- Tesla model S: 100kWh
- Nissan Leaf to Home
- …

Movable Computers:

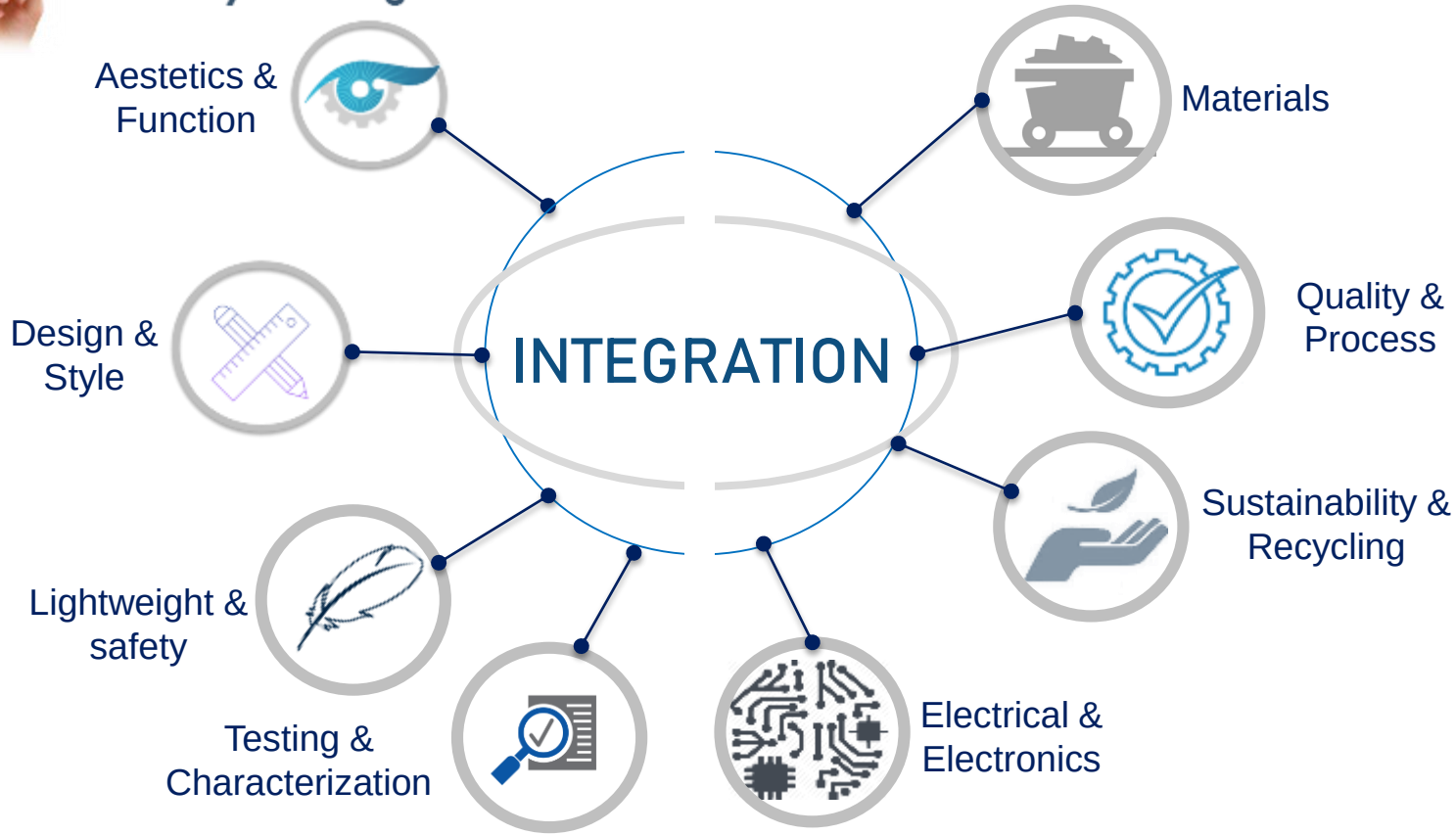
- Autonomous driving
- ADAS
- Cameras
- RADAR
- LIDAR
- …

Movable smatphone:

- IoT
- Large area infotainment
- Entertainment devices
- Connectivity
- Touch
- …

Needs, Targets, Priorities & Challenges

"The key challenge is non-technical. OEMs will need an overall culture shift."



Vehicle's display – Today vs. tomorrow

Alfa Romeo Giulia
Project 952, 2016

Tomorrow

Alfa Romeo Stelvio
Project 949, 2017

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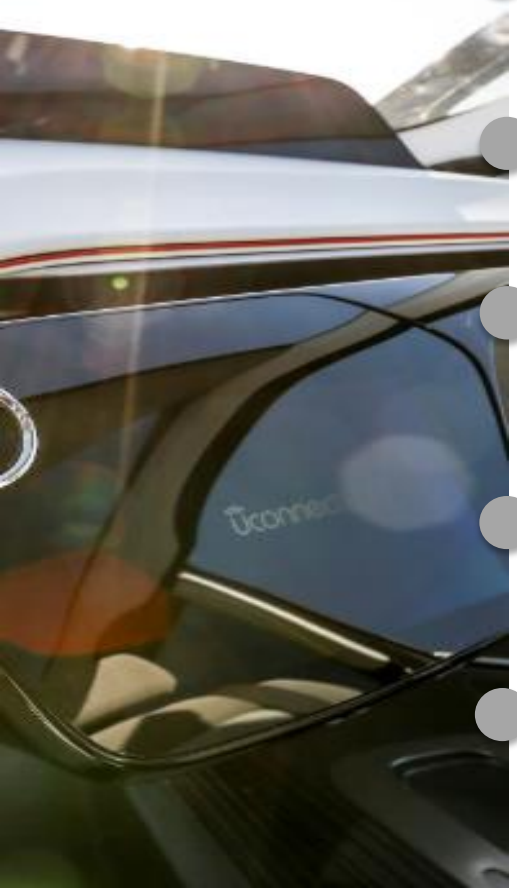
Integrated functionalities

Vehicle's displays future trends



Larger Displays

Direct view 20+''
Non standard aspect ratio (16:9)
Head-up towards contact analogue (AR)

Higher Resolution

FHD in the near future;
UHD might come;
Higer ppi towards «Retina»

Higher Display Quality

Largere gamut
Faster response time for LCD
Lower power
Sunlight readability

Flexible Displays with seamless integration

More Displays

Today's luxury cars displays are tomorrow intermediate
Instrument cluster, infotainement, controls HUD,
rear seat, smart mirror…

Source DFF, prof. Karlheinz Blankenbach

Freedom in decoration and style

for functional and fashionable interiors

New domains of expertise

Augmented interior-reality
- HUD
- Virtual reality in interior trims

Deco-interaction HMI
- E-decoration : fusion of HMI components with decoration
- Seamless integration of displays in surface
- Larger & distributed screens
- Fusion of plastics & electronics & disappearance of traditional switches

Interior Lighting
- Functional Decolight
- Subjective HMI for ambience versatility & empathy

Connectivity
- Smart nomadic devices integration
- Wireless charging / NFC+ / antenna coupling

HMI Transformer
- Mechanism
- Mechatronics
- Sensors

Needs, Targets, Priorities & Challenges

Why? … in cabling

The **microelectronics and microsytems** today represent the 15-20% of the overall cost

Harness for:

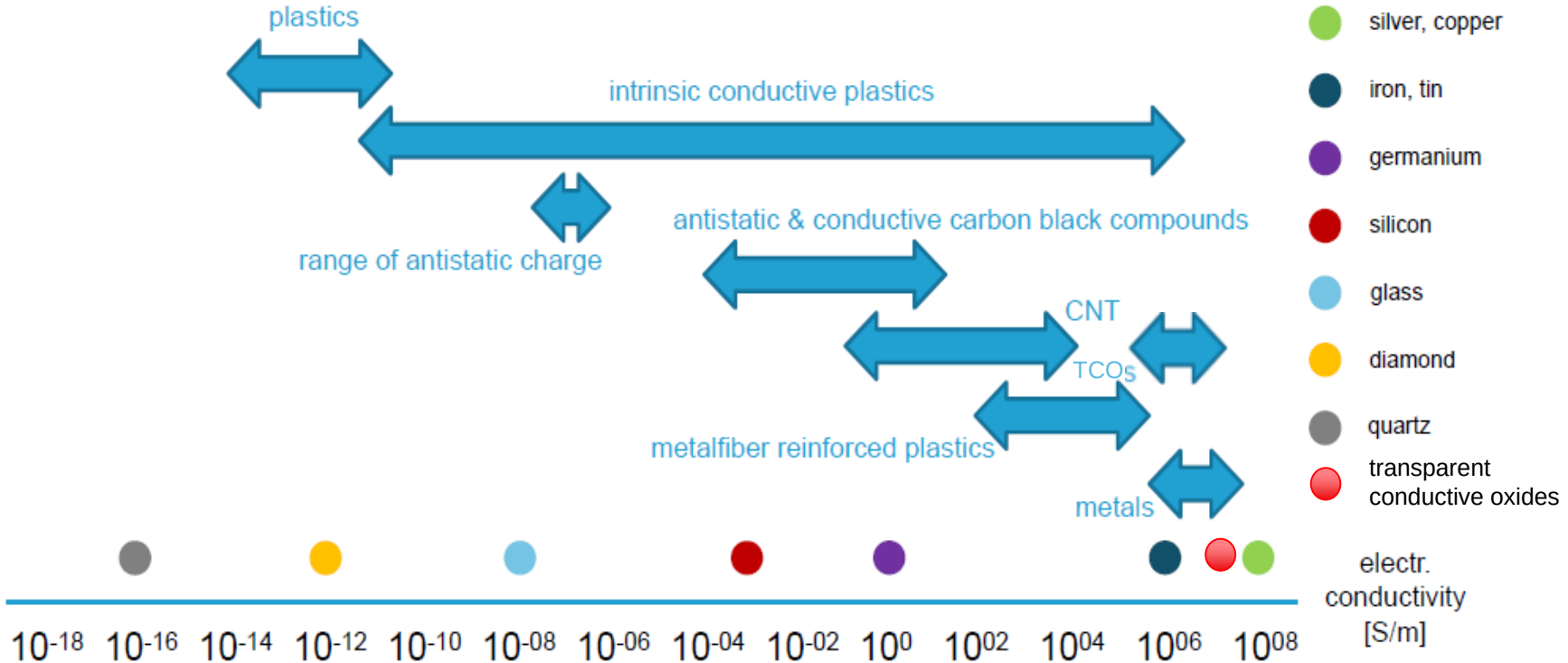
- Lighting
- Navigator
- Conditioner
- Sensors
- Engine
- Cameras
- …

In single vehicle:

- 2-3 km of cables
- 40 kg of overall weight of cabling
- 80-100 sensors
- 50-80 processors
- 80-100 actuators

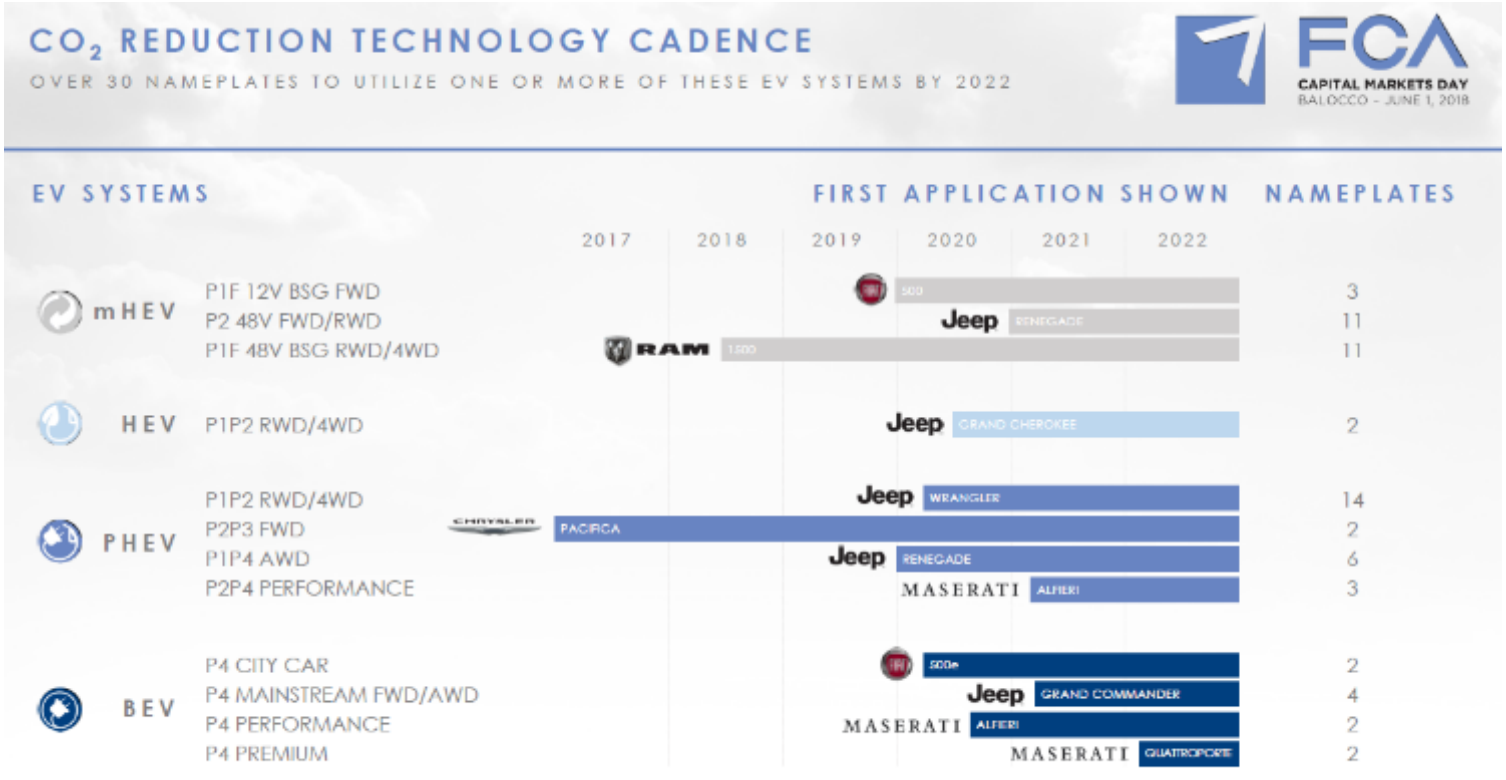
Multifunctional Materials

Electrically conductive products



Needs, Targets, Priorities & Challenges

Why? … for CO_2 reduction



Conclusions

Connected

Integrated

Intelligent

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

Make the car easy
Make the car intelligent

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