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cea tech

LETI INNOVATION DAYS

JULY 4-5, 2018
GRENOBLE, FRANCE

MOBILITY: A NEW ERA FOR THE INDUSTRY

A NEW ERA FOR MOBILITY

Infrastructures

Services

Vehicles

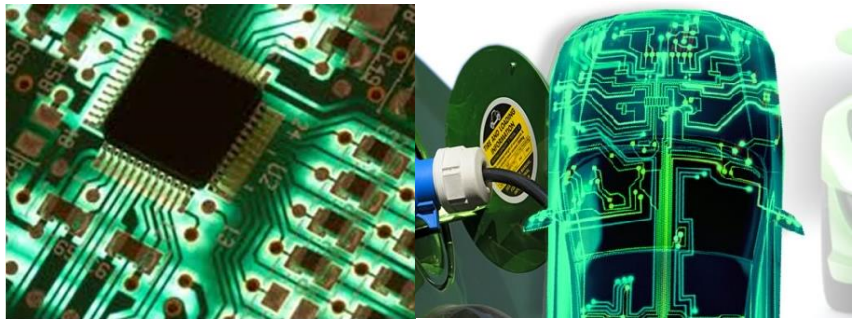
Electrification

Robotisation

Dispossession

BASED ON SEMICONDUCTOR TECHNOLOGY !

- 80% of all core innovation
- Electronics: 50% of vehicle production cost in 2030 (30% in 2015)
- Shorter time gap consumer vs automotive



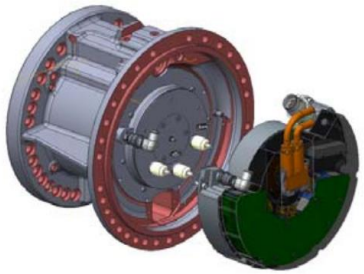
GAN POWER ELECTRONICS FOR E-MOBILITY

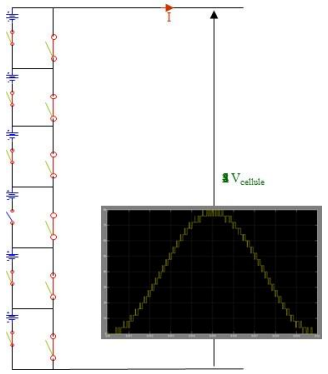
From GaN power components…

- Cascode transistors
- Diodes, N.OFF transistors
- Bidirectional N.OFF transistors

200 mm wafer GaN / Si

…to innovative systems

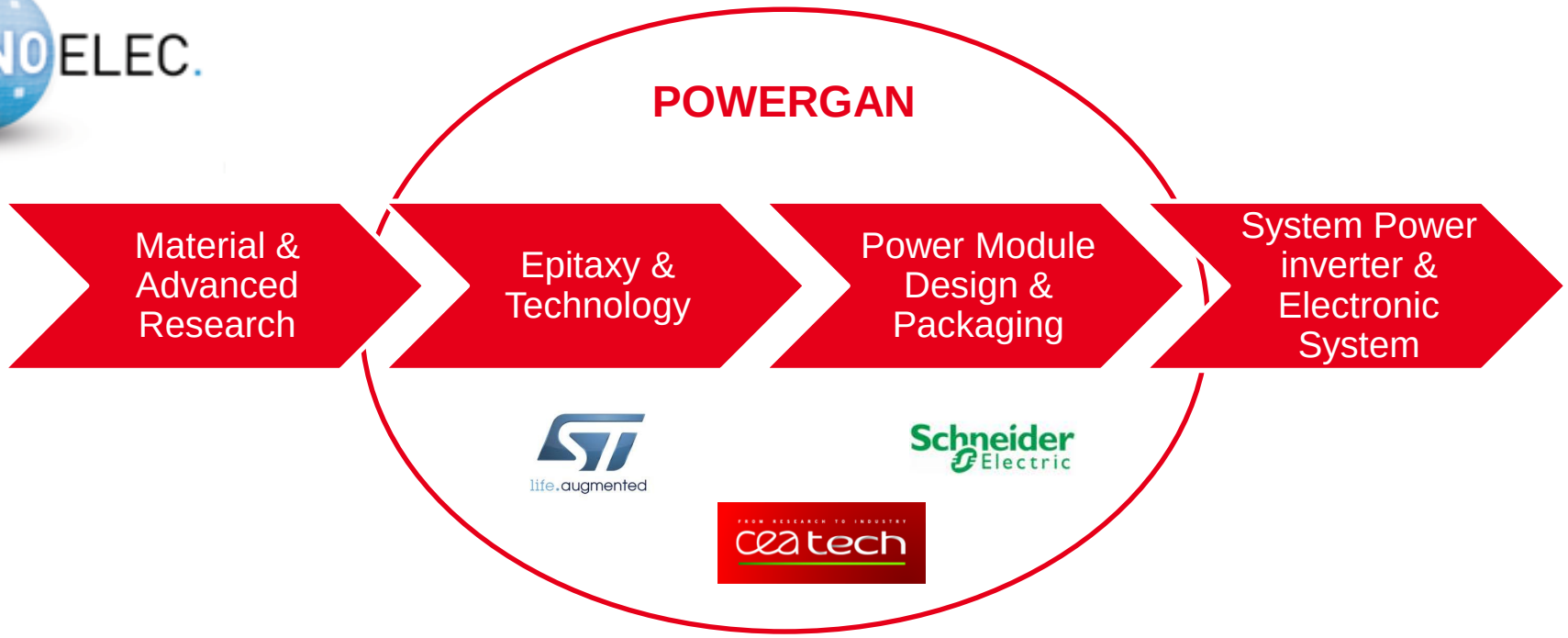




- GaN to get direct inverters integration in motors
  - New motors architectures
  - Full flexibility in driving
- Disruptive electrical architectures with « all in one » concept
  - Optimized BMS
  - Remove charger and inverter
- GaN to enable bi-directionnal charger
  - Perfect adequation for Smart Grid scenario
  - Conversion capability > 10kW per litre

BUILDING & LEVERAGING ECOSYSTEMS:

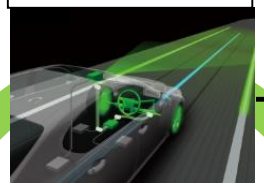
<u>IRT NANOELEC POWERGAN</u>: A French ecosystem platform from GaN/Si power devices to innovative system architectures that will allow major breakthroughs in terms of power converter energy efficiency and power density.



ROBOTISATION: AUTONOMOUS VEHICLE ARCHITECTURE

REALITY

Environment



INTER-ACTIONS

Vehicle

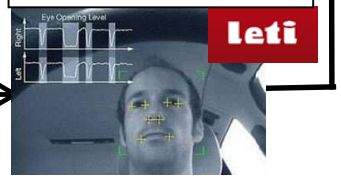
Driver

SENSORS

Perception Sensors

Vehicle Sensors

Driver State Sensors



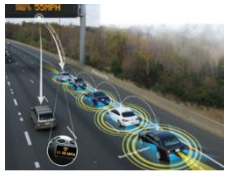
PERCEPTION DECISION

Data Fusion

Decision making apps

ACC
FCW
PCW
IHC
Others…

CONNECTIVITY



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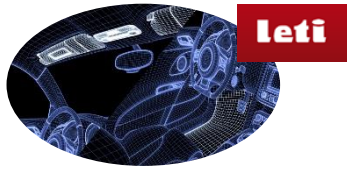
802.11p **5G**

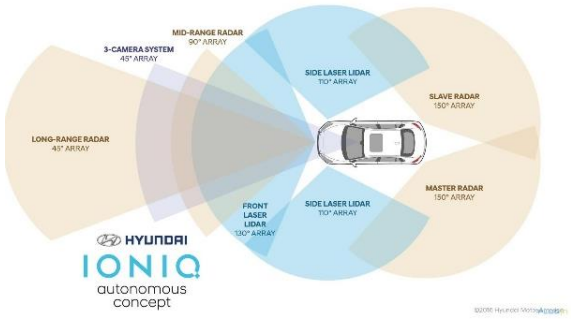
SECURITY

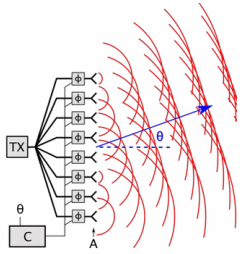
ACTUATION & HMI



SELF-DRIVING VEHICLES WILL NEED IR SENSORS

LIDAR





- Cost reduction:
  - Solid state
  - Heterogeneous integration
- Size reduction:
  - Towards LIDAR on chip

IIIV laser, SOA, PD

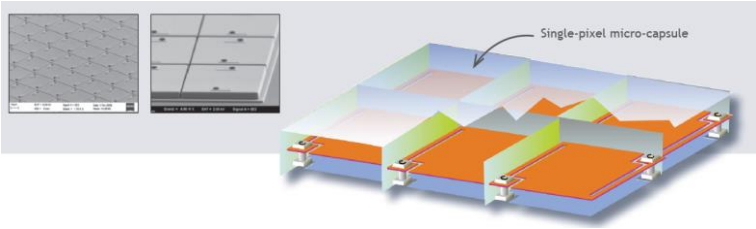
- Higher performance:
  - Lower power: towards smart LIDAR
  - Long distance / Low R object detection

IR CAMERA

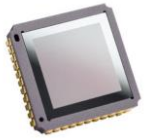
AWARE
ALL WEATHER ALL ROADS ENHANCED VISION

Navigation in bad weather condition requires Visible RGB, NIR & Thermal Infrared camera fusion

- Cost reduction / high volume production:
  - Packaging, CMOS compatible process
- Smaller Form factor:
  - Pixel size reduction
- Without compromise on performances:



ULIS
Infrared for you



Atto320
320x240 - 12 µm
NETD <60mK
Operating Temp: -40°C +85°C

IMPACT OF AI ON PROCESSING REQUIREMENT

State of the art based on GPUs

High-end computing architecture:
cost, power consumption, low SIL…

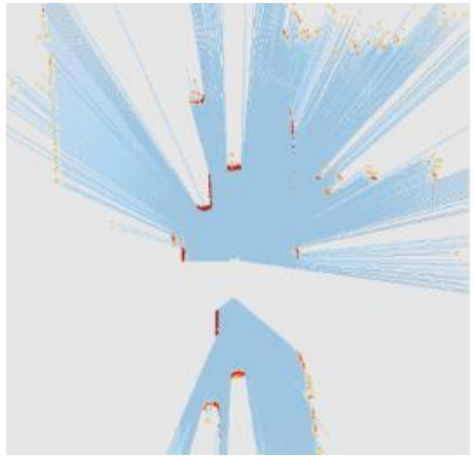
Requirement of short loop « safety checker»

SigmaFusion

- ✓ **Errorless** computing
- ✓ **Fusion** of 2x Velodyne VLP 16 LIDARs + 1 stereo camera
- ✓ **Bayesian fusion** based on **integer arithmetic**
- ✓ **Compatible w existing automotive HW** & **high SIL**
- ✓ **3 patents**

360Fusion:

- ✓ **low-power 3D fusion embedded in drones**



Thanks

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