Valeo

SMART TECHNOLOGY
FOR SMARTER CARS

SCANNING LIDAR AS ENABLER FOR AUTOMATED VEHICLES

Joachim MATHES
Director R&D and Product Marketing
Valeo Driving Assistance Systems

AUTONOMOUS DRIVING IS COMING

„We are on the verge of jumping to Level 3, which is our target for the next S class."

Ole Kaellenius, Daimler

„Ich glaube, dass wir da ganz, ganz vorne rauskommen und wir die ersten sind, die das gut auf die Straße bringen."

Harald Krüger, BMW

Our mission is to enable fully autonomous mobility services in urban environments by 2021.

Audi Investor Presentation

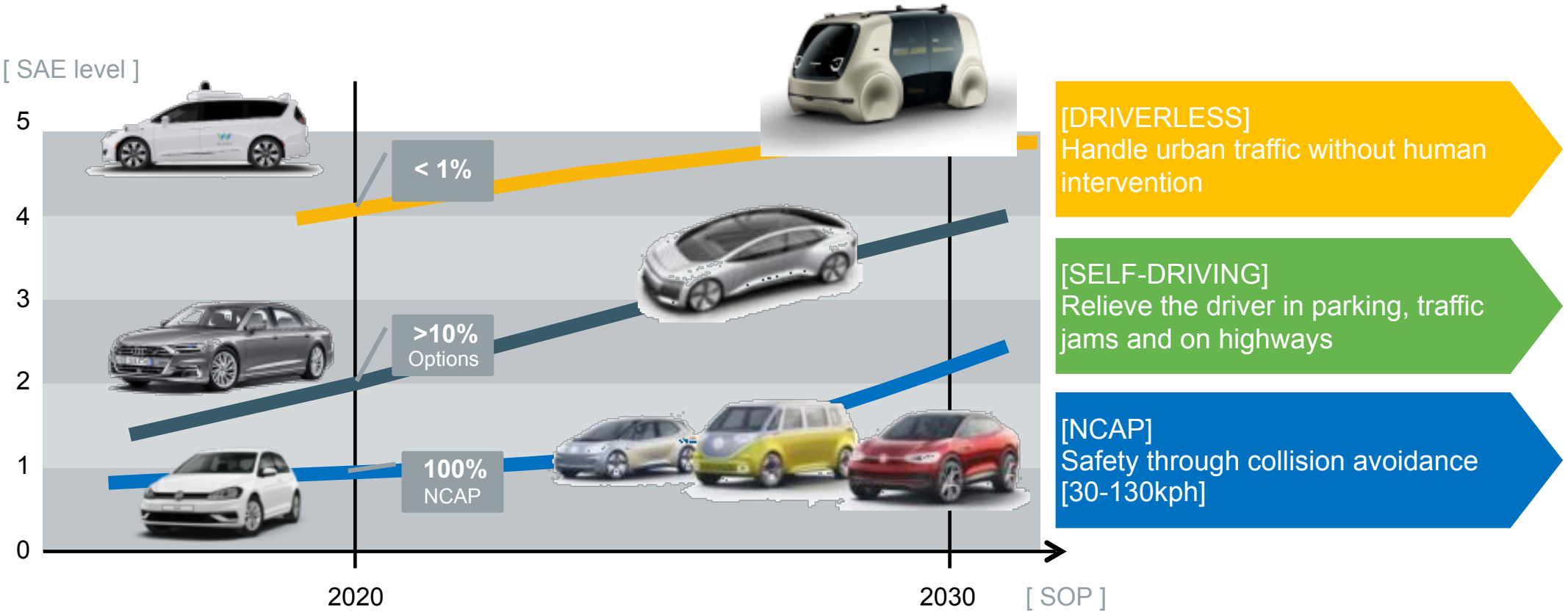
We are not in a race to be first to offer self-driving vehicles to the public. Our focus is on doing it correctly.

Ford Safety Assessment Report

GM plans to commercialize an Autonomous Vehicle from Cruise in 2019.

GM Press Release

AUTOMATED CARS ARE ON THE ROAD



SEGMENTS DRIVE TECHNICAL CHOICE

[NCAP]
Safety through collision avoidance

[SELF-DRIVING]
Relieve the driver in parking, traffic jams and on highways

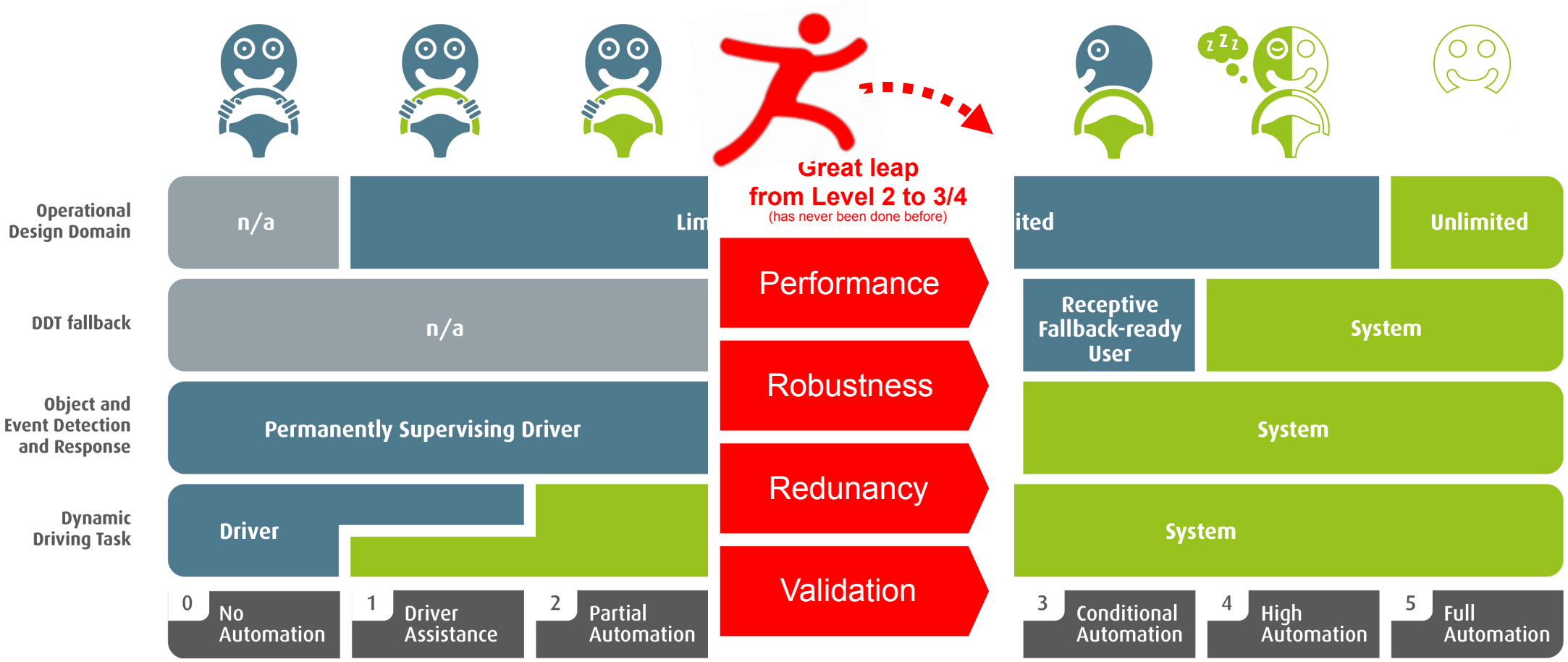
[DRIVERLESS]
Handle urban traffic without human intervention

COST SCALABILITY PERFORMANCE

DRIVERLESS = LIDAR

SAE LEVELS OF AUTOMATION

(*) Definitions of Automated Driving Level according to SAE J3016™



AUDI A8 HAS BEEN DESIGNED FOR LEVEL 3 AUTOMATION

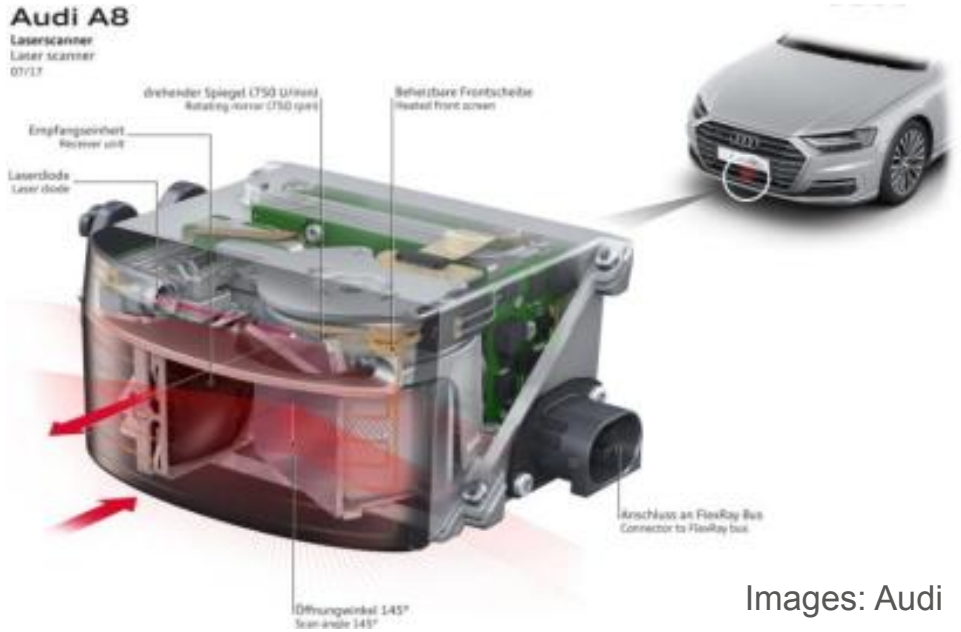
Image: Audi

SCANNING LIDAR IS AN ENABLER FOR LEVEL 3

“The new A8 is the first production automobile to have been developed specially for highly automated driving (level 3). … Audi is the first car manufacturer to use a laser scanner.”

Audi press release

- The new A7, A6 and Q8 also feature the laser scanner



Images: Audi

VALEO SCALA® PRODUCT ROADMAP

SCALA® Gen. 1	SCALA® Cocoon	SCALA® Gen. 2	SCALA® Gen. 3
2017	**2020**	**2020**	**202x**
World's 1st			
Automotive qualified	**360° detection cocoon**	**Triple vertical field of view**	**Solid-state LiDAR**
Large detection range with wide horizontal field of view	Compiled of several SCALA®		
Launched in 2017	**Customer project**	**Customer project**	**Customer project**

SIGNIFICANT INVESTMENT – SUSTAINABLE ENGAGEMENT

2010 Start of laser scanner development at Valeo in cooperation with Ibeo:
Develop a laser scanner that fully complies with fierce automotive specifications

- Finding the right compromise between sensing performance, package size and cost
- Wide horizontal field of view with a high angular resolution combined with a large detection range
- Ability to „cleanly“ integrate the sensor into the vehicle body design
- Main challenge: Maintaining the required high mechanical precision over temperatur and mechanical vibration/shock

2015 Start of an automotive qualified small volume production line

- Prototype production line in operation since 2013
- Over 5,000 SCALA® produced before market launch in Nov 2017
- Main challenge: Optical alignment with a µm accuracy that is unprecedented in the automotive industry

2017 Market debut of the world‘s first laser scanner compliant with the specifications for automotive volume production

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	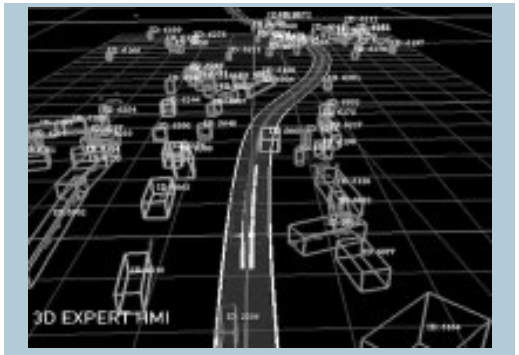		
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Valeo Drive4U® • LIDAR COCOON FOR LOCALIZATION AND DETECTION

Car is exclusively fitted with sensors from Valeo production

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	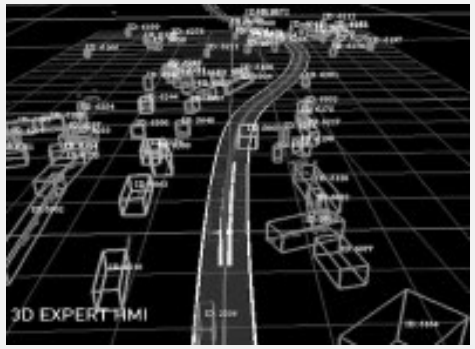		
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BE EFFICIENT WITH YOUR PHOTONS

Flash is great
at short ranges

…but need range in
wide field of view

BE EFFICIENT WITH YOUR PHOTONS

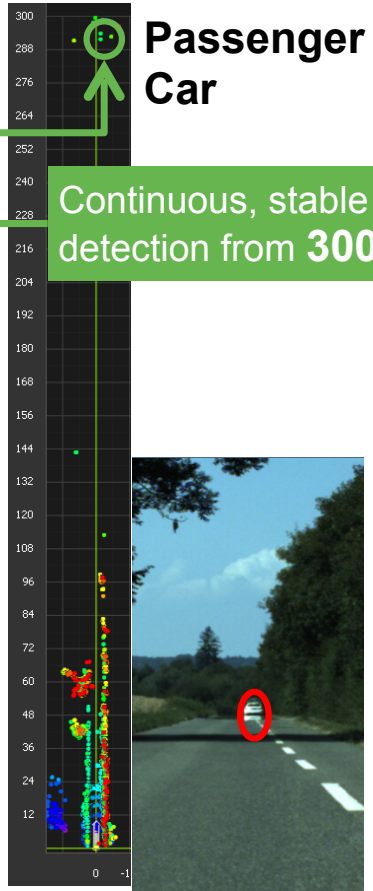
Focusing the energy
lets you see further

Focusing the attention
lets you see further

SCALA2 Gen2 • DETECTION RANGE

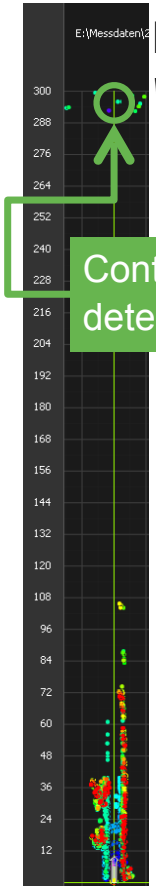
Passenger Car

Continuous, stable detection from **300m**.



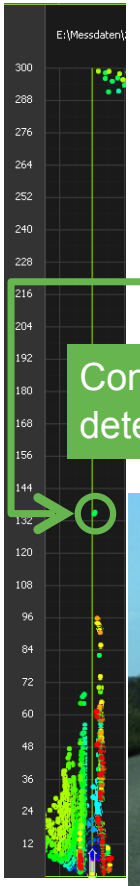
Pedestrian *with safety vest*

Continuous, stable detection from **300m**.

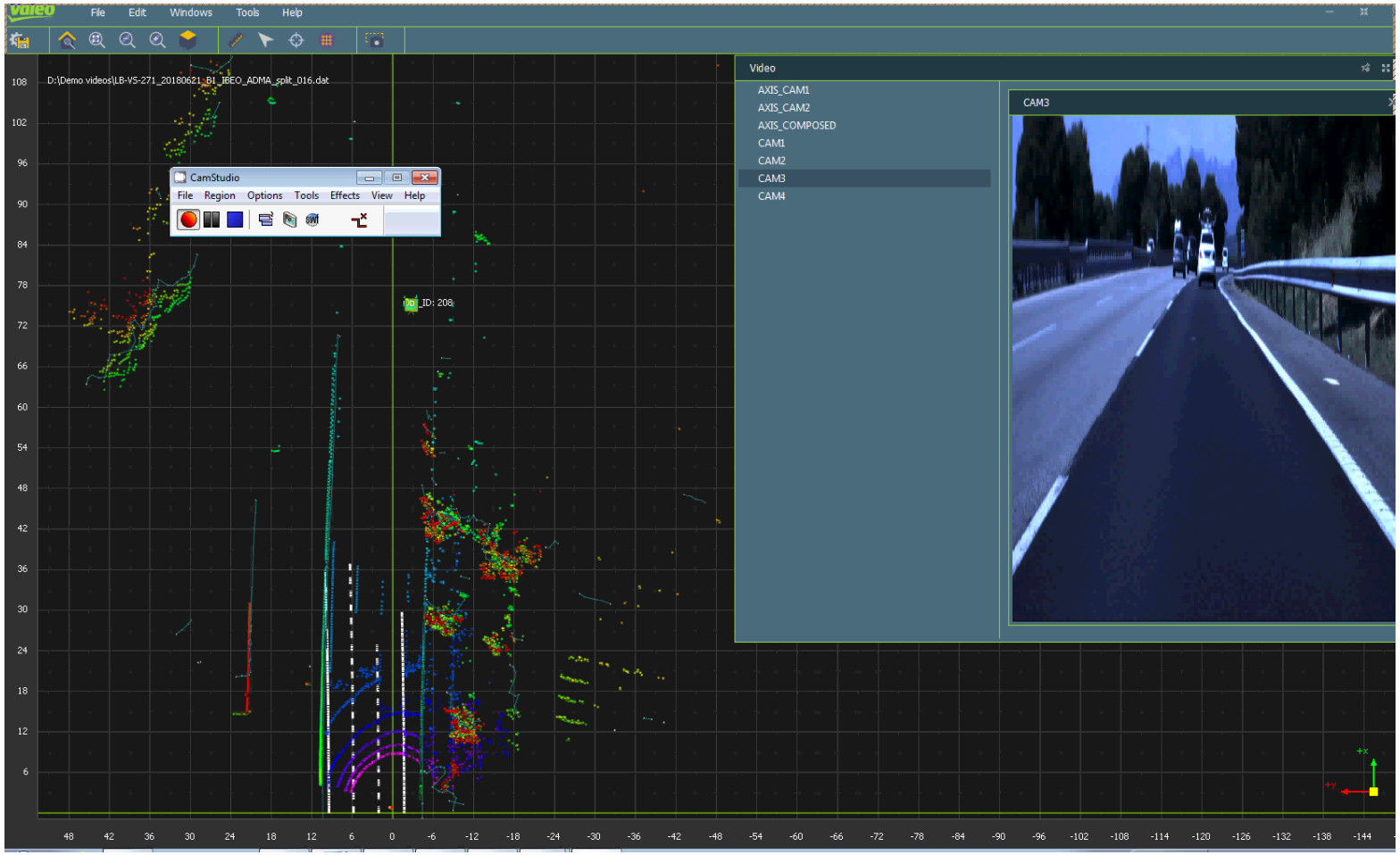


Pedestrian *without safety vest*

Continuous, stable detection from **135m**.



VALEO SCALA® Gen2 • ON THE ROAD



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	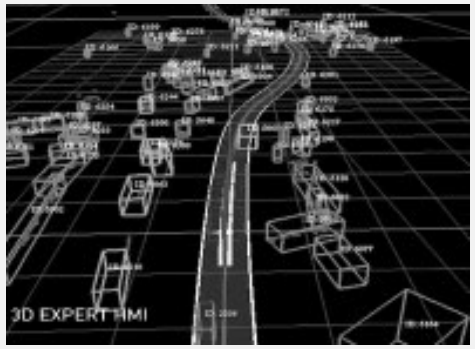		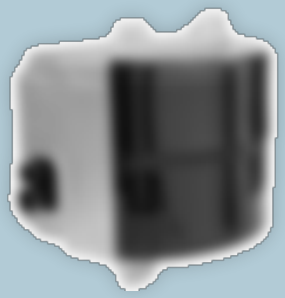
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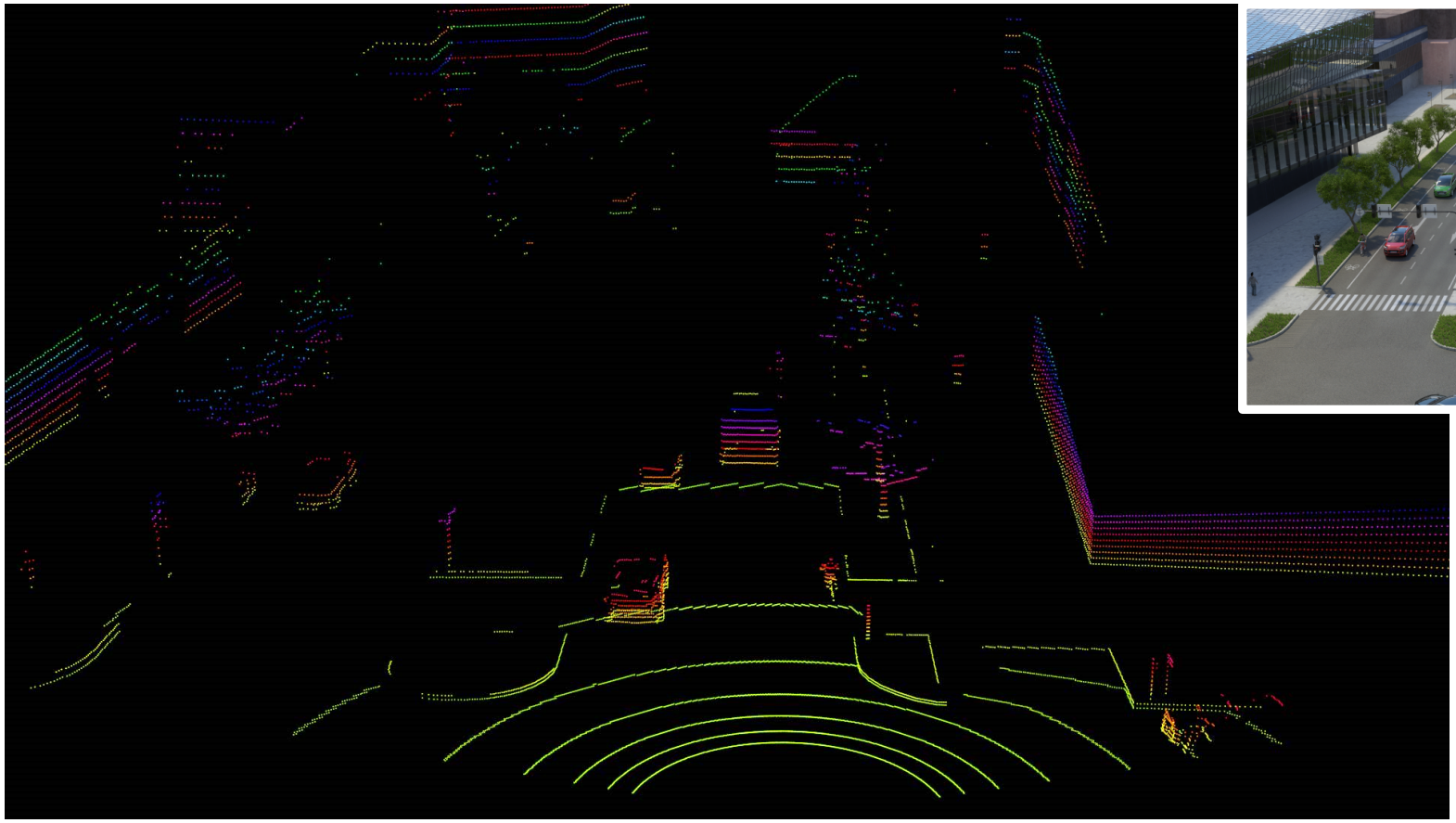
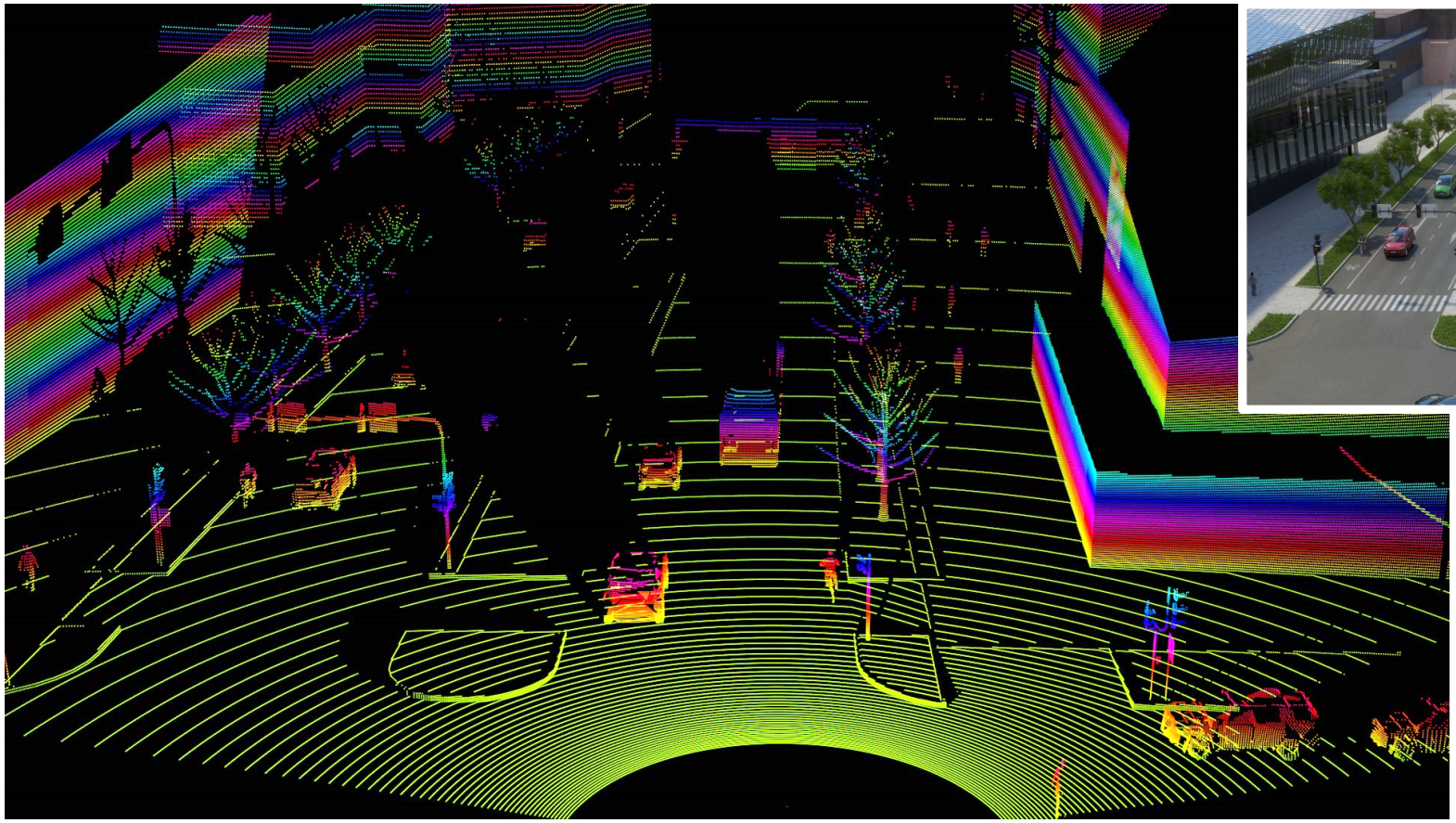
VALEO SCALA® Gen1 • URBAN SCENE POINT CLOUD

VALEO SCALA® Gen2 • URBAN SCENE POINT CLOUD



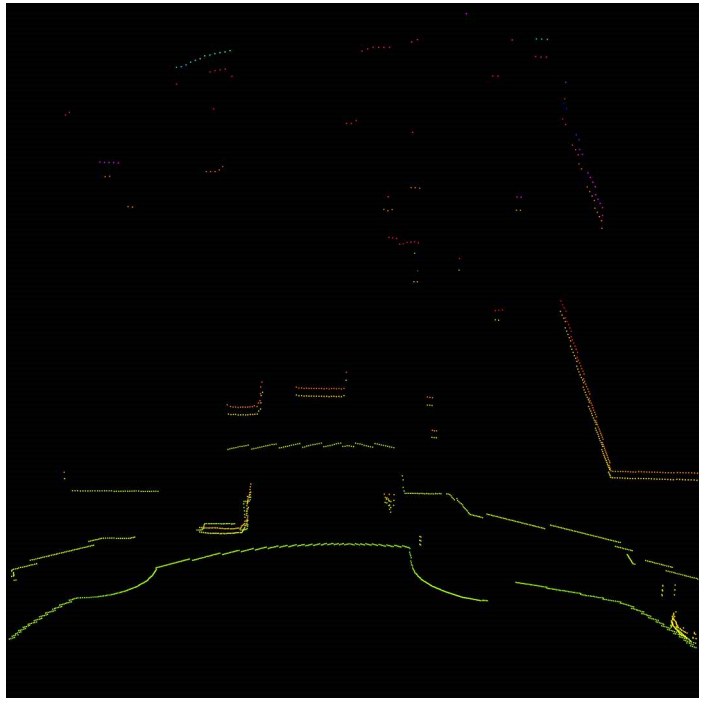
VALEO SCALA® Gen3 • URBAN SCENE POINT CLOUD



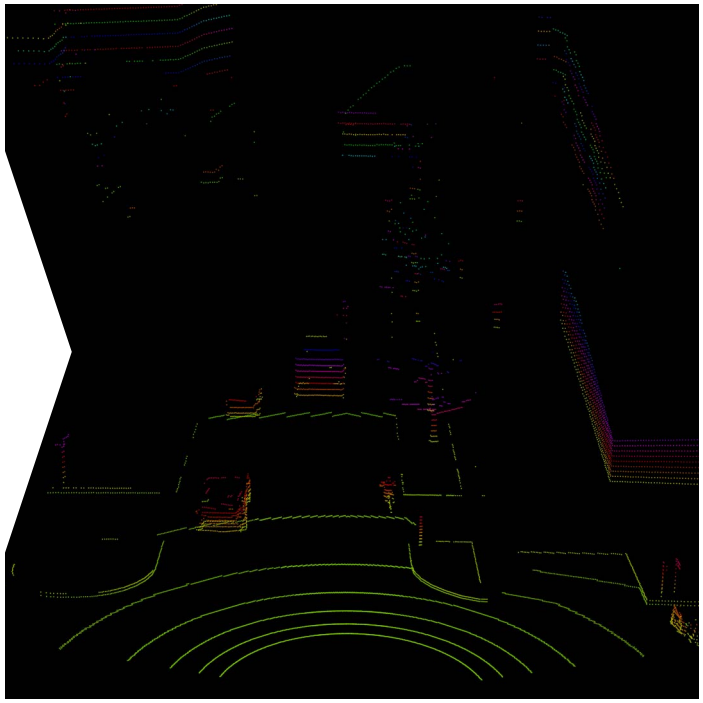
VALEO SCALA® • URBAN SCENE POINT CLOUD EVOLUTION

Valeo SCALA®

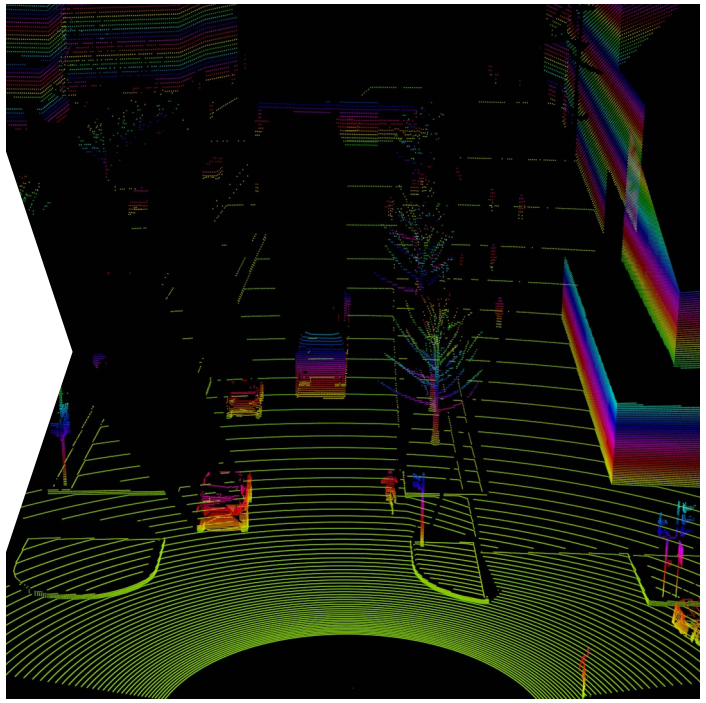
Generation 1



Generation 2



Generation 3



SUMMARY: LIDAR A CORNERSTONE FOR AUTOMATED DRIVING

- Active sensor, like radar – adding defined layers for elevation
- Optical sensor, like camera – adding capability to detect road marks
- New sensor generations provide camera-like pixels for classification – adding depth
- 3D Point clouds ideal for localization
- Complementarity makes lidar the missing element in camera and radar fusion

LIDAR AS KEY PILLAR IN VALEO'S PERCEPTION PORTFOLIO

Valeo SCALA®

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