

2021 KOREA MURATA WEBINAR

Sensor Product

ADAS 기능을 지원하는 MEMS 센서

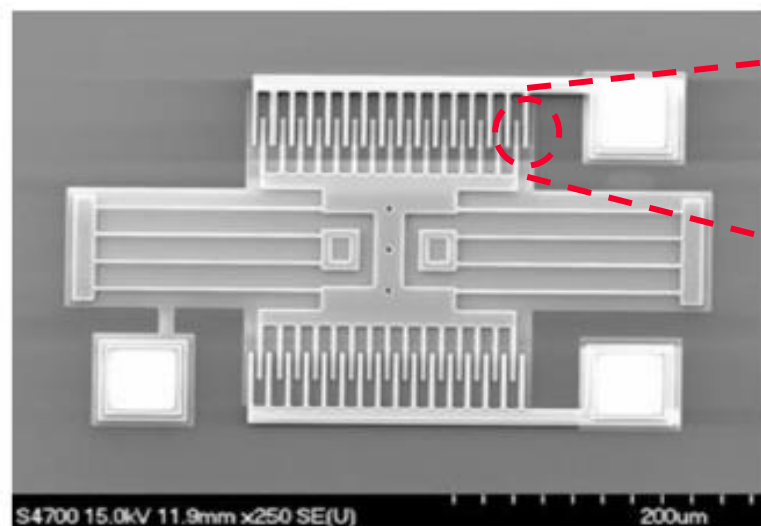
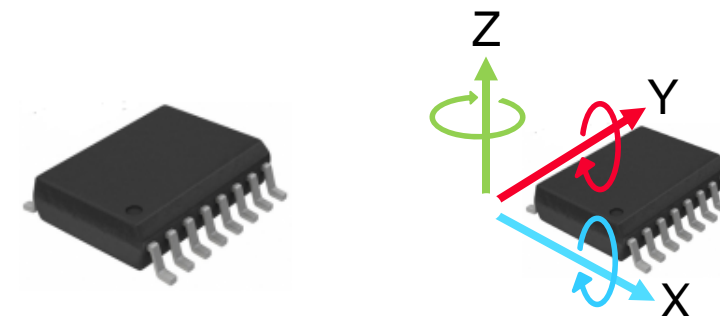


Agenda

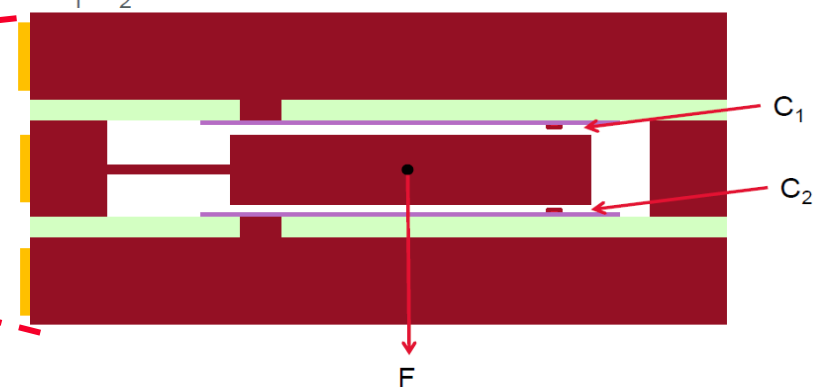
- About MEMS Sensor
- MEMS Sensor for Automotive market
- ADAS & IMU
- Ultrasonic Sensor

MEMS

- **M**icro
- **E**lectro-**M**echanical
- **S**ystems



Output signal C_1 - C_2



Murata Sensor Line up

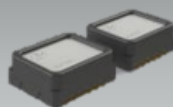
Accelerometers & Inclinometers



SCA3300



SCA8x0
/21x0
/3100

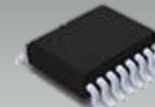


SCL3300

Gyroscopes and Combined Sensors



SCC2000



SCC3000



SCHA600
SCHA63T

High performance accelerometers, inclinometers, gyros and combined accelerometer and gyro sensors for safety critical automotive and industrial as well as healthcare applications

AUTOMOTIVE

Leading supplier
for automotive
active safety
systems



Electronic Stability
Control (ESC)



Autonomous Driving
and Advanced
Driver Assistance
Systems (ADAS)



Headlight levelling,
Perception sensor
(Camera, Radar,
Lidar) levelling



Electronically
Controlled
Suspension (ECS)



Transmission
Control (TCM)



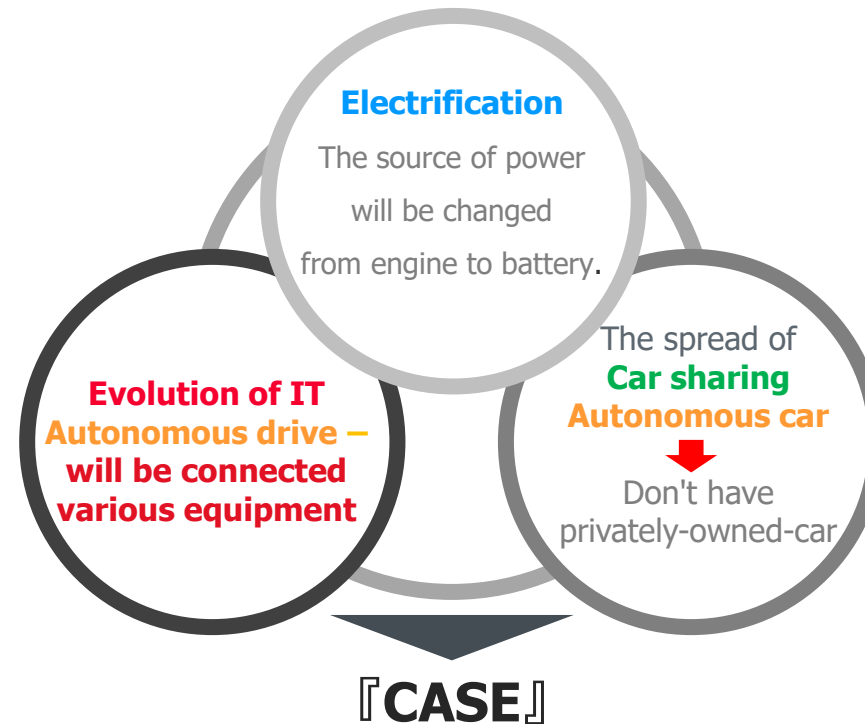
	ABS&ESC / Combo2		ACU / Combo3
Function		Function	
Use for	ABS + ESC	Use for	X Gyro for Roll-Over and Z Gyro for ESC.
	Head-Lamp Leveling / Combo2		Alignment for ADAS / Accel.
Function		Function	
Use for	As Vehicle balances tilted by passenger or luggage loaded, Lamp Auto-leveling operates by Sensor Signal.	Use for	To detect Radar tilting (Gyro for alignment) Status: Looking for needs

Changes Automotive Market trend

Automotive market comes round the change of once in **100 years**

"The Mobility Revolution"

「Big revolution! All change - Role, Usage, User of car」



 **Connected**

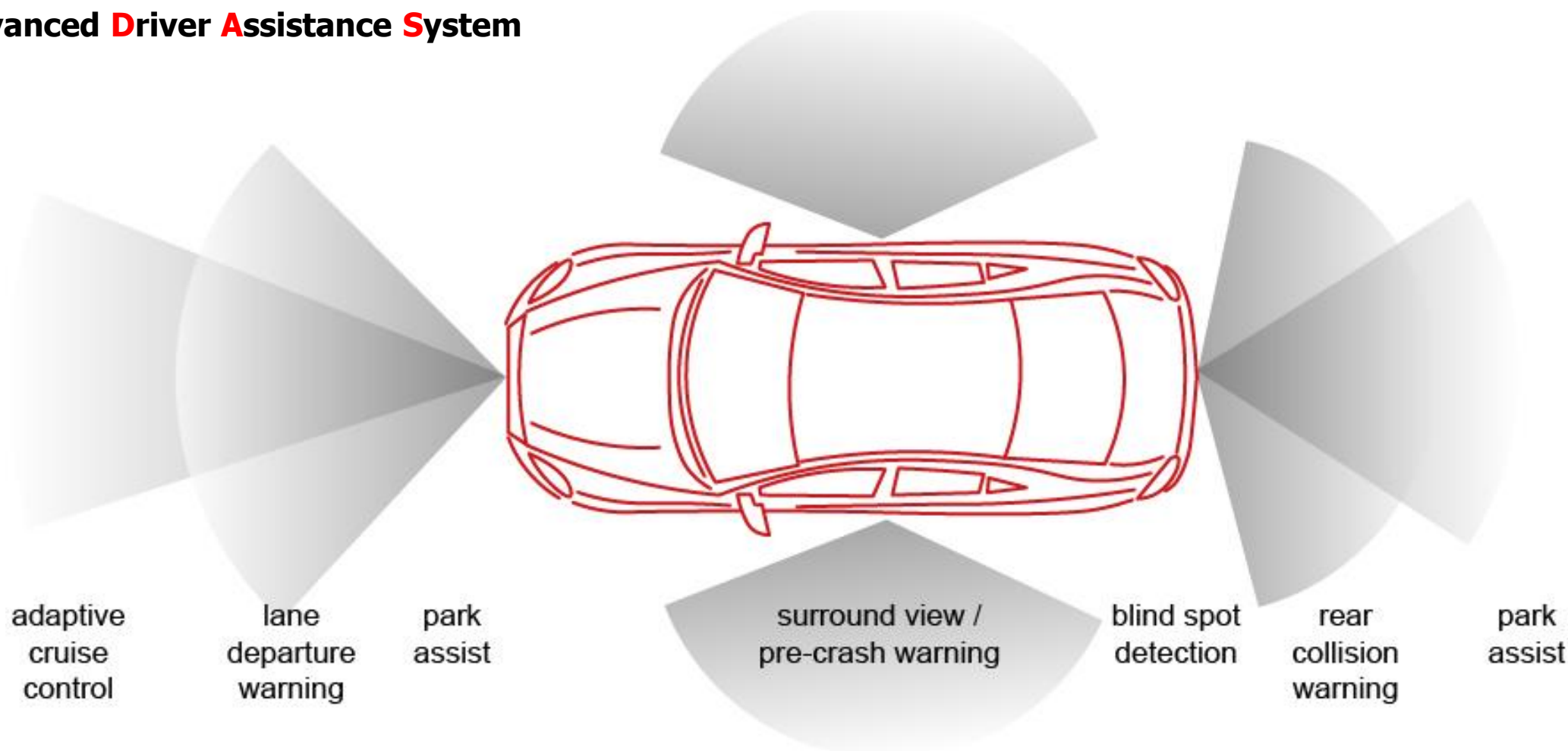
 **Autonomous**

 **Shared & Service**
+Safety/Security

 **Electronic**

ADAS(Autonomous Driving Market)

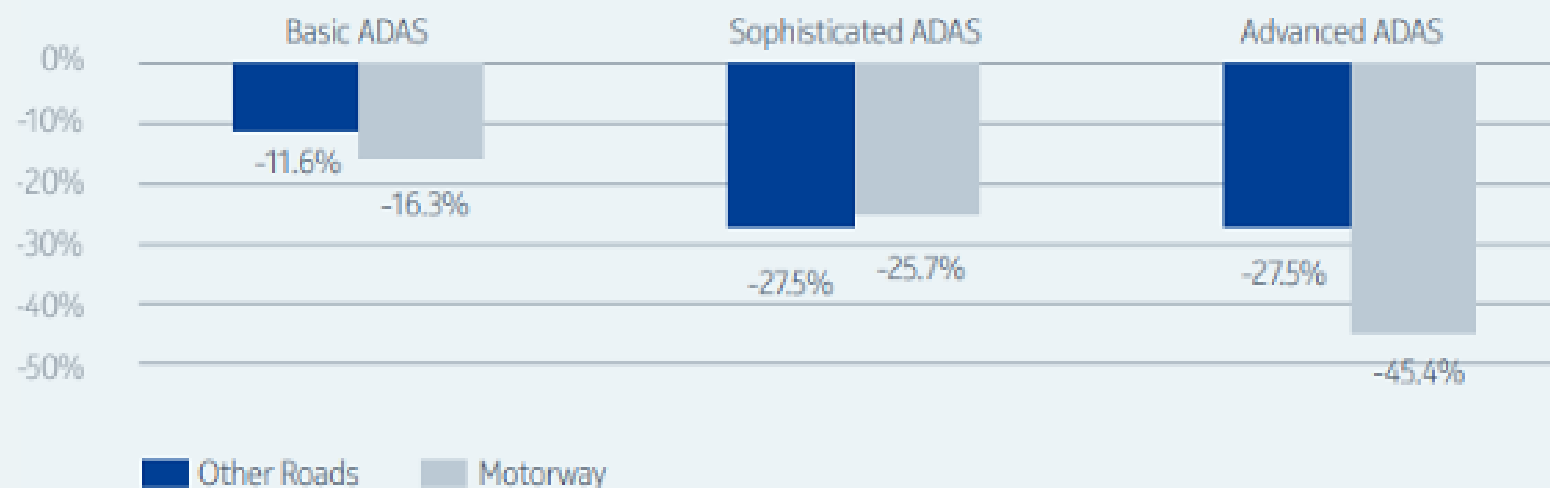
Advanced Driver Assistance System



ADAS(Autonomous Driving Market)



Accident reduction rate by selected features,
assuming 100% adoption and usage rate for each
feature in 2020

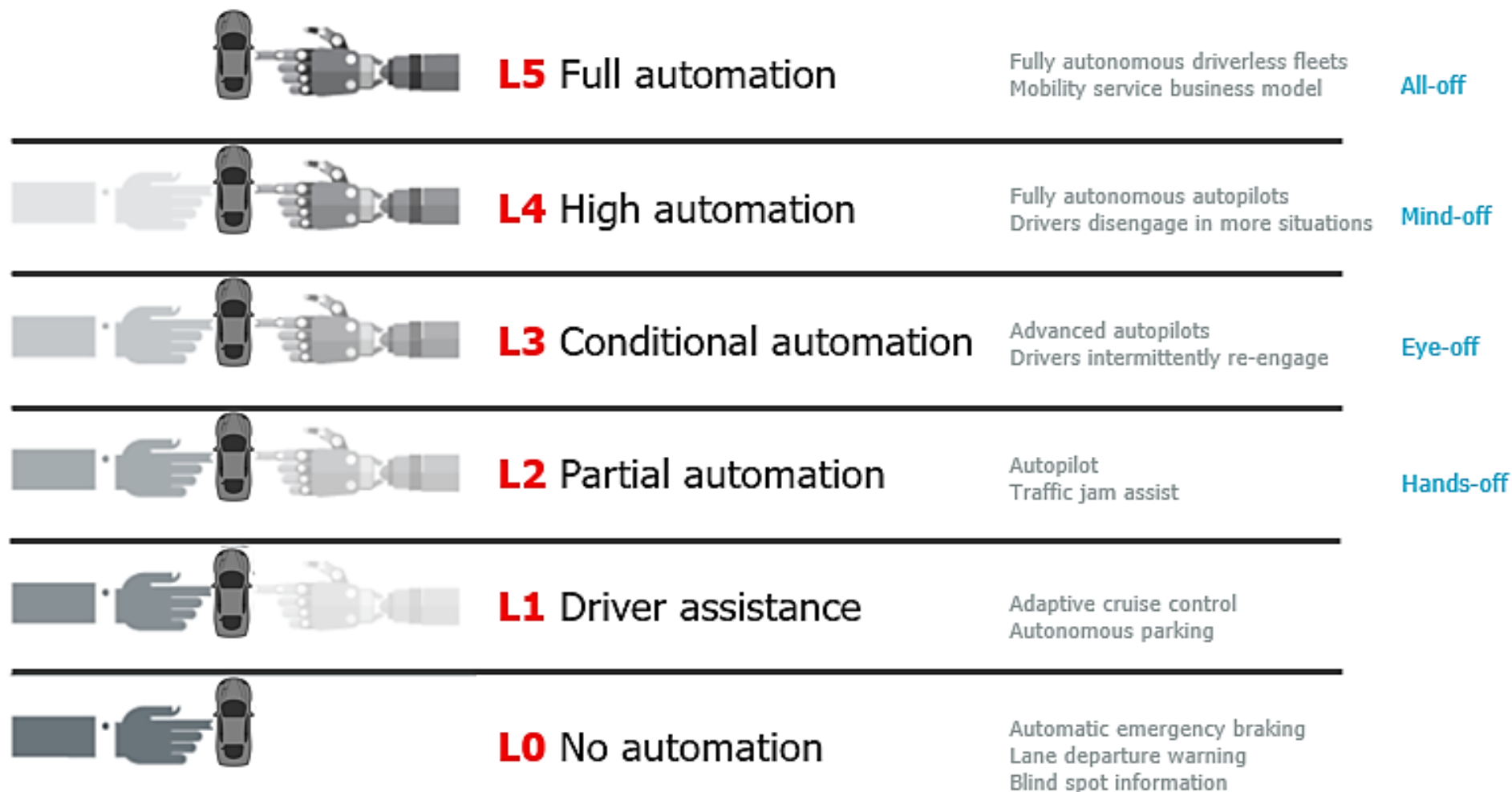


adaptive
cruise
control

lane
departure
warning

A 2017 report by wholesale insurance provider Swiss Re


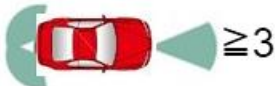


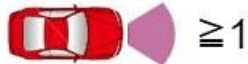









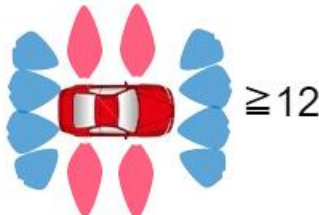
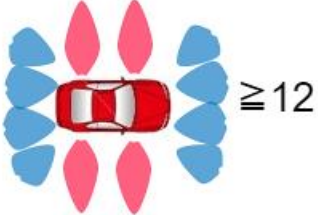
Automation Levels



※Source : Murata Original from several market research

Automation Levels

The Higher the level of automation is, the more sensors are needed to make it happen.

	Level 1	Level 2	Level 3	Level 4
RADAR	 ≥ 1	 ≥ 3	 ≥ 6	 ≥ 10
Camera	 ≥ 1	 ≥ 2	 ≥ 6	 ≥ 8
LiDAR			 ≤ 1	 ≥ 1
★ IMU			 $= 1$	 ≥ 1
Ultrasonic Sensor	 ≥ 4	 ≥ 8	 ≥ 12	 ≥ 12



muRata

Progression of ADAS
(Average Driver Assistance System)

Why IMU

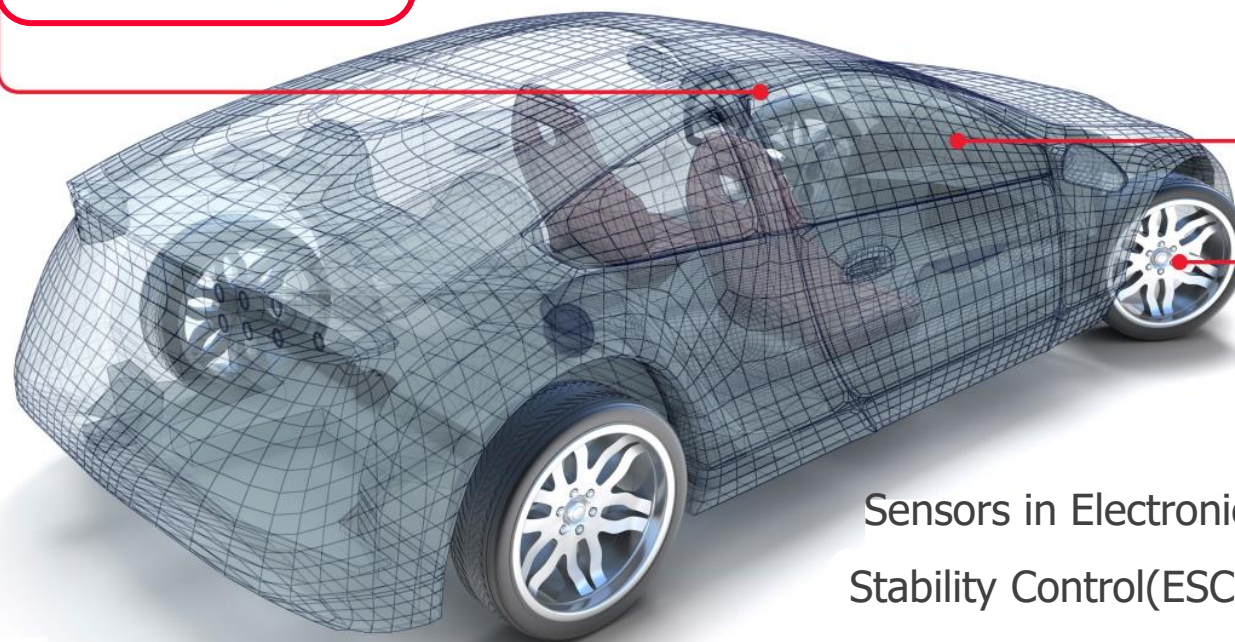
- Always available
- Positioning algorithm can run faster
- Less processing
- Provides positioning when GNSS is not available
- Enhances landmark based positioning



Autonomous Control Technology MEMS Inertial Sensor

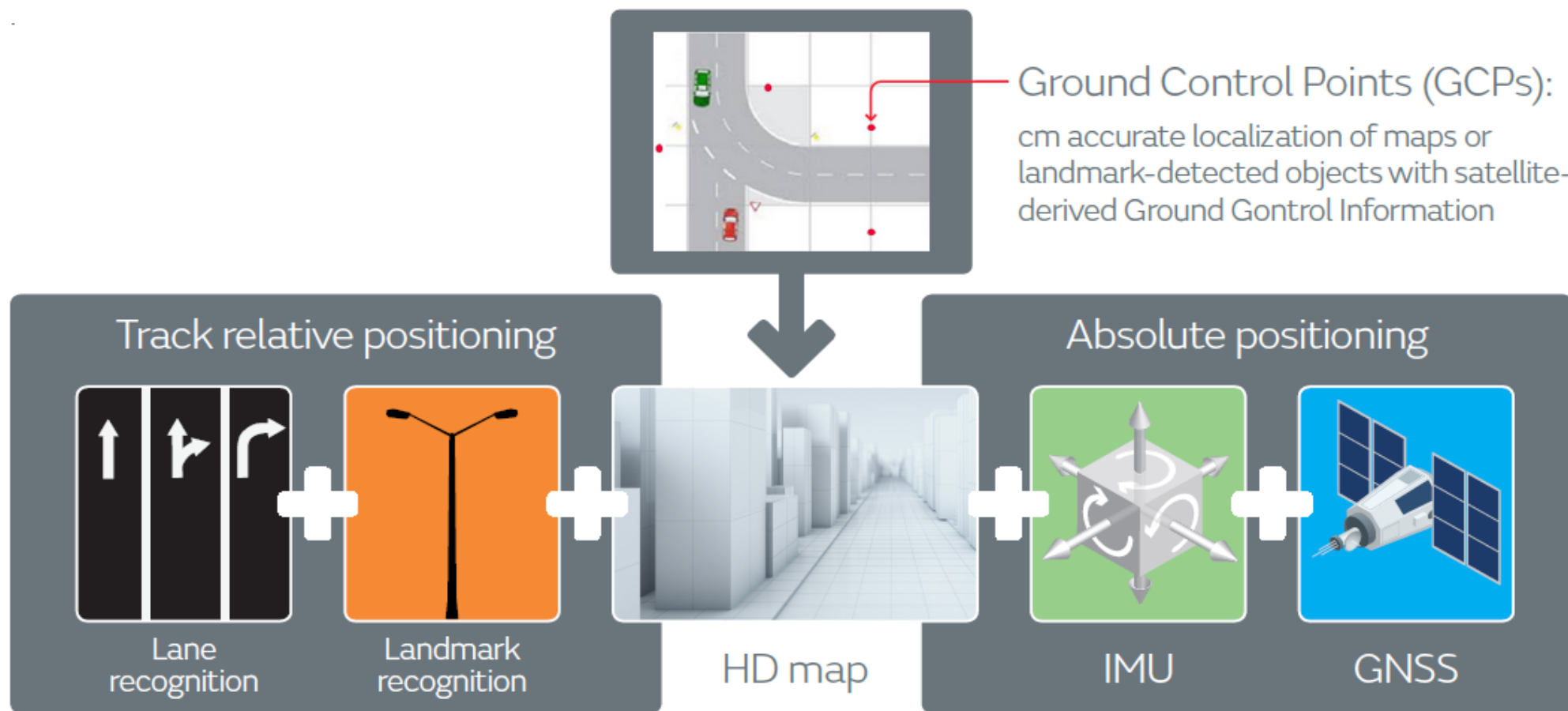
Supporting IMU for
in-dash navigation

Acceleration/crash
sensors for airbag
systems

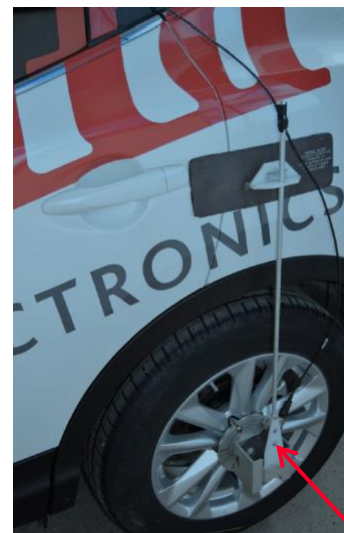


Sensors in Electronic
Stability Control(ESC)
systems

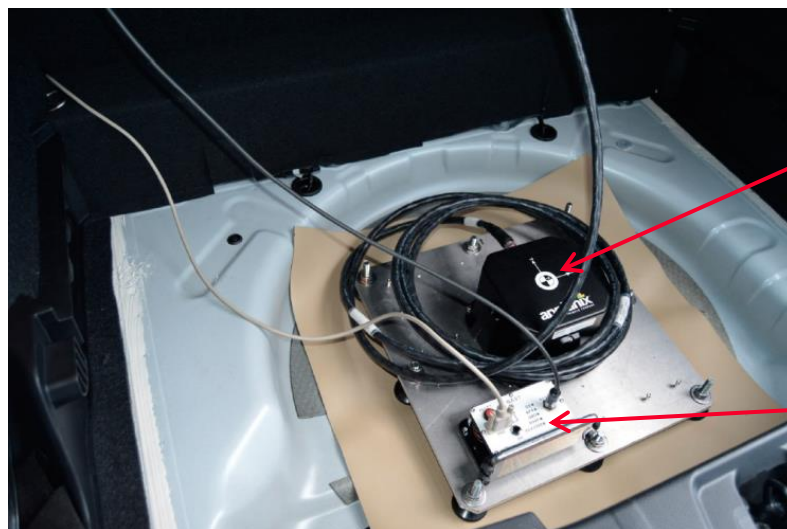
Absolute & Relative positioning



Murata Test Vehicle with Reference IMU and Test Setup



Applanix POS LV 420 Reference



Murata IMU
Combo2 x3

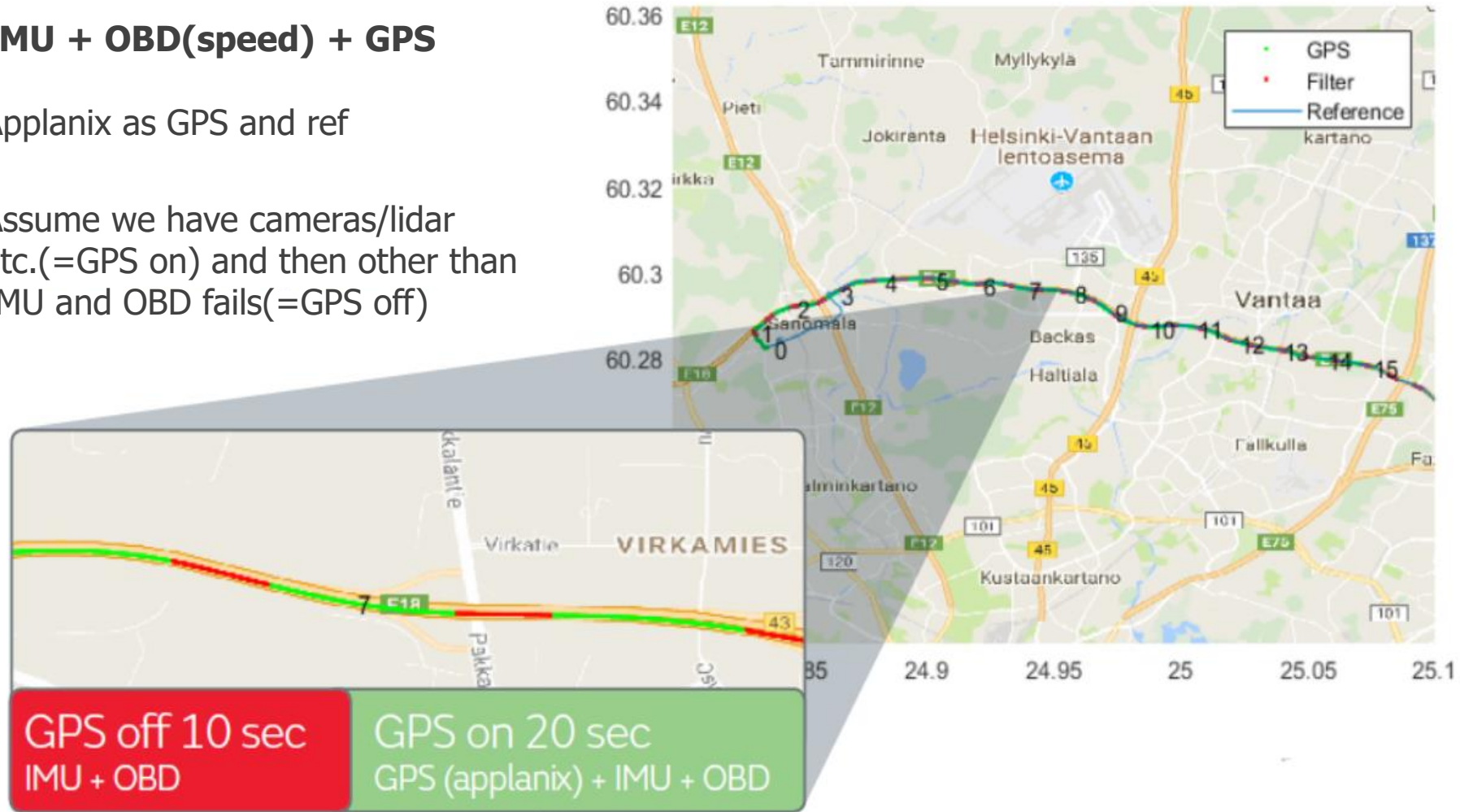


Highway ~80 km/h = 50 mph

IMU + OBD(speed) + GPS

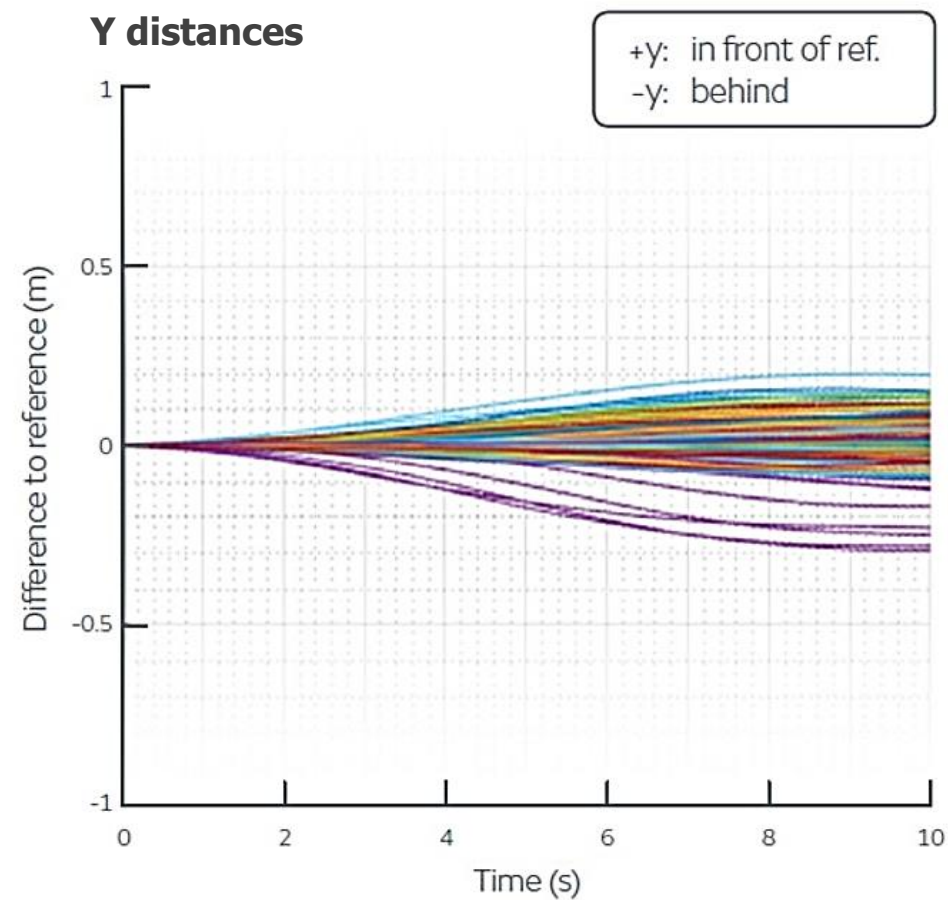
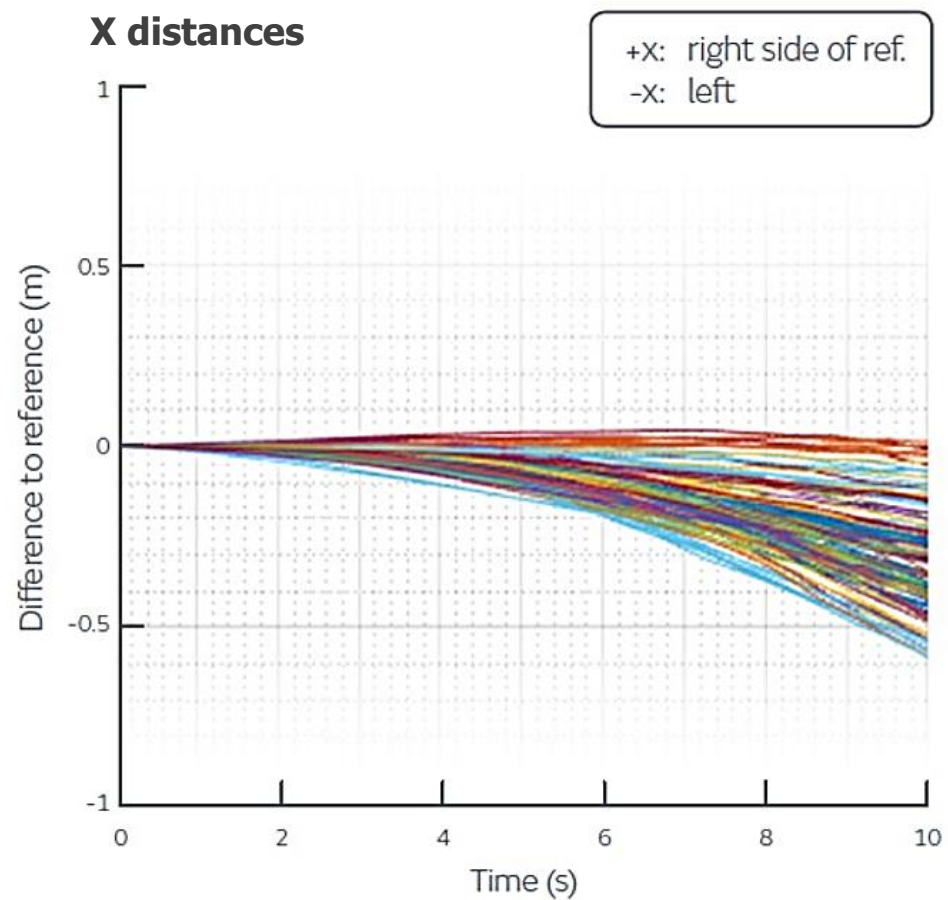
Applanix as GPS and ref

Assume we have cameras/lidar
etc.(=GPS on) and then other than
IMU and OBD fails(=GPS off)

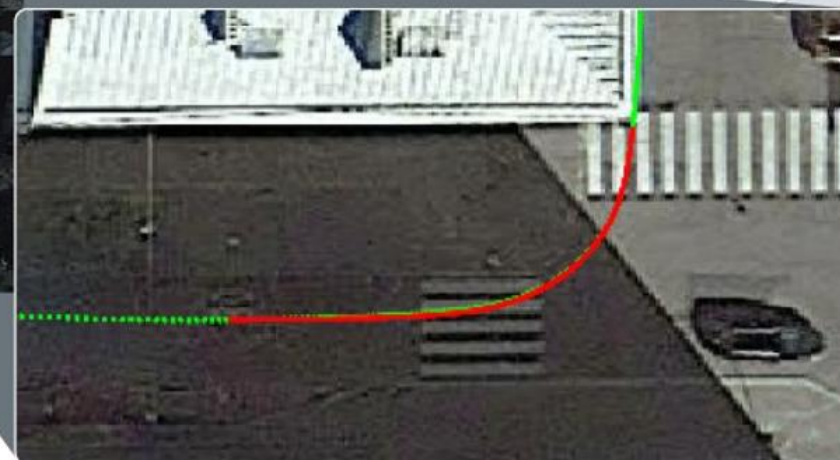


※map data@Google®

Distance between filter & Ref GPS



② Distance between filter & Ref GPS



Tunnel data (Video)



※ map data@Google®

SCHA(6DoF) Sensor brief summary

- **Component**

- 6DOF in one package
- AEC-Q100 (-40...110deg.C)
- Two ASICs in component with functional safety

- **Gyro / Accelerometer**

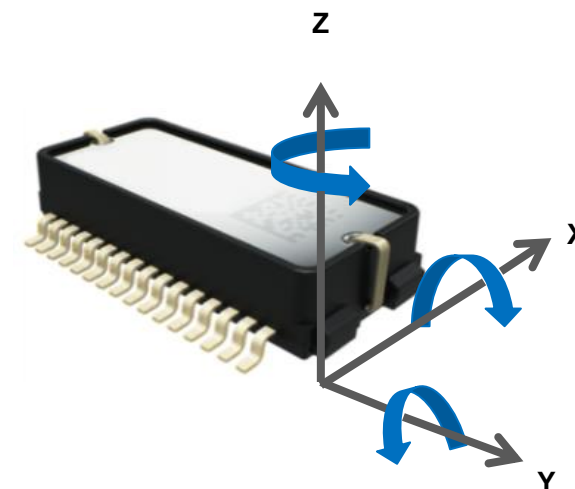
- Gyro measurement range : +/-125dps or +/- 300dps
- Gyro sensitivity : 160LSB/dps
 - * Z-gyro performance is most important for target application.
- ACC measurement range : +/- 6g
- ACC sensitivity : 4905LSB/g

- **Functional safety**

- The sensor is developed according to ISO26262 for use in systems up to **ASIL D(B)**.
 - * Depends on TSR (Technical Safety Requirements)

- **Application**

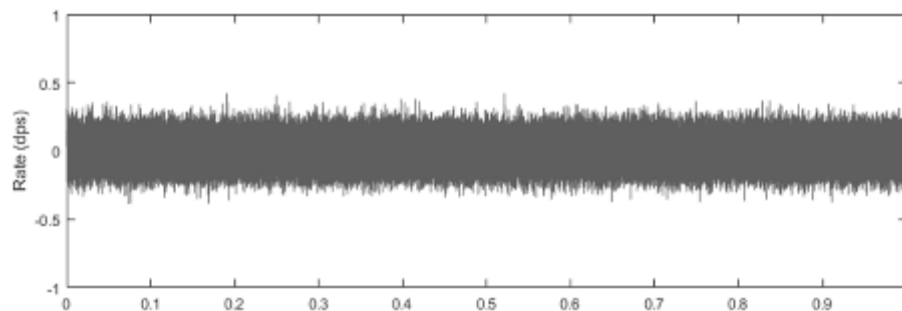
- Autonomous driving(AD) IMU



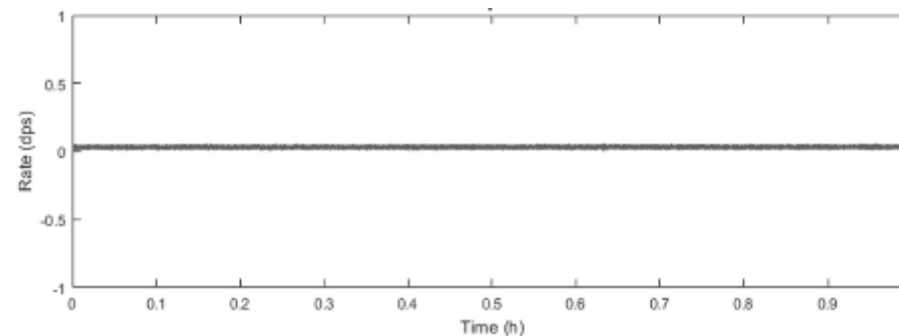
SCHA(6DoF) Z-Gyro



Competitor sensor (automotive)

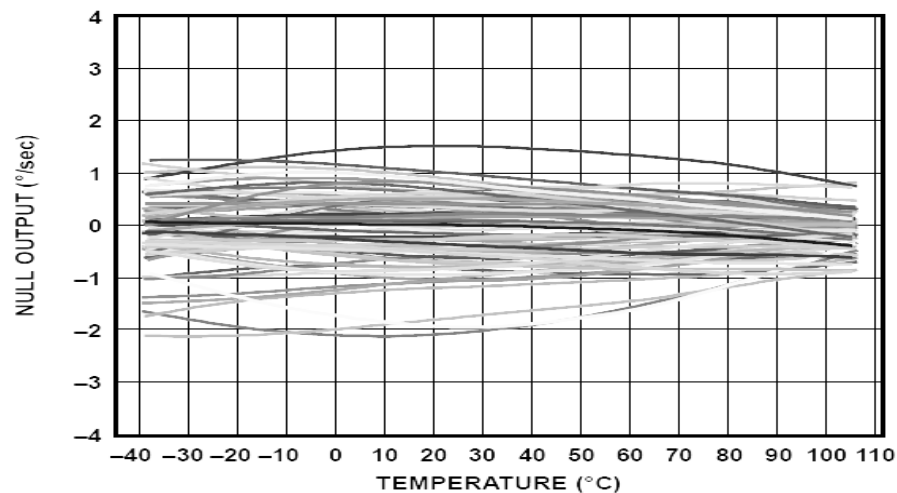


Murata SCHA

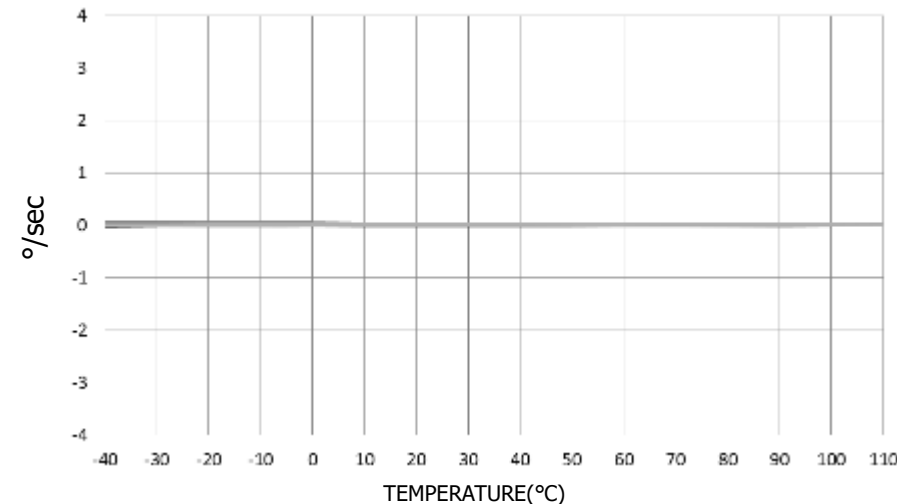


Super low noise!

Competitor sensor (automotive)



Murata SCHA

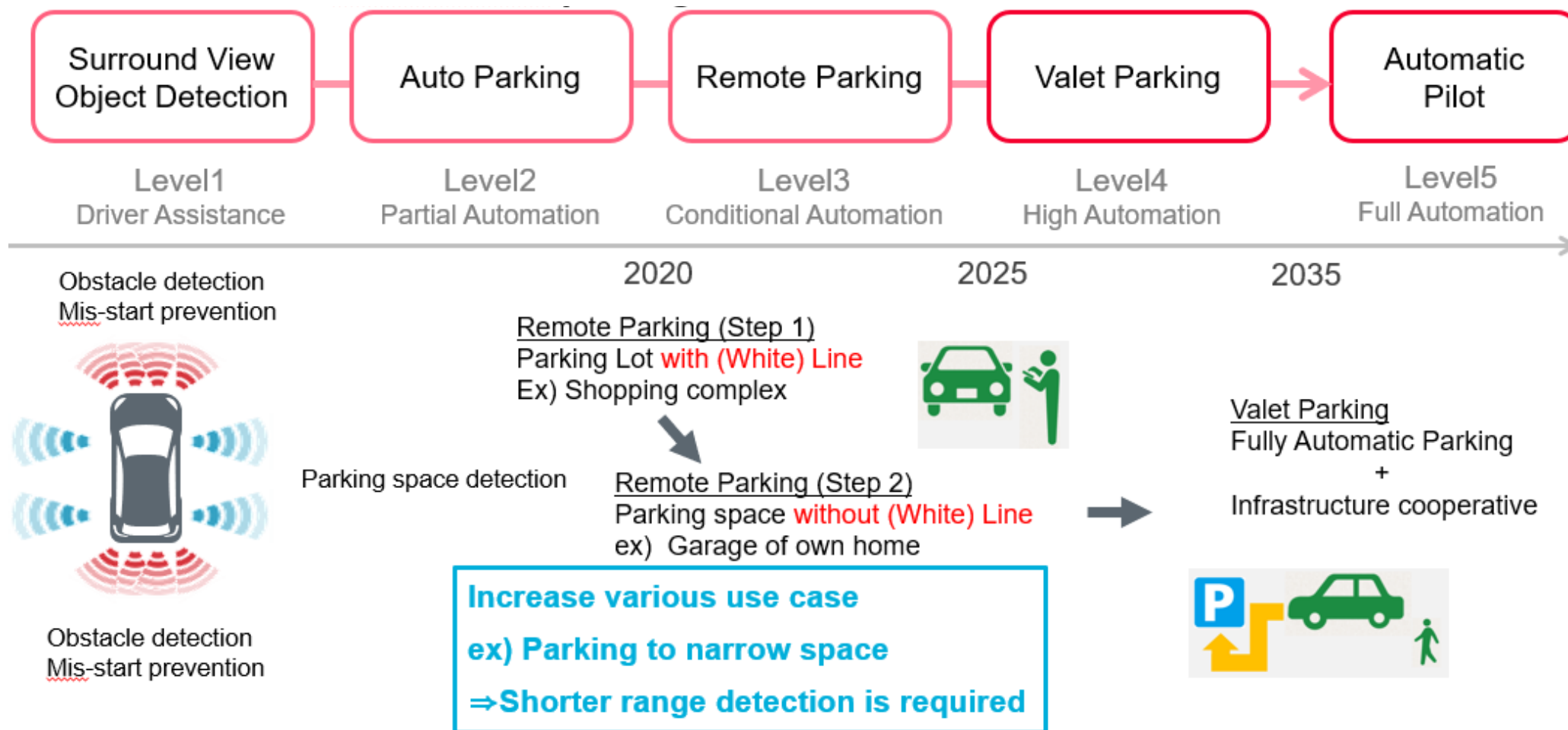


High stability over temperature

CONFIDENTIAL

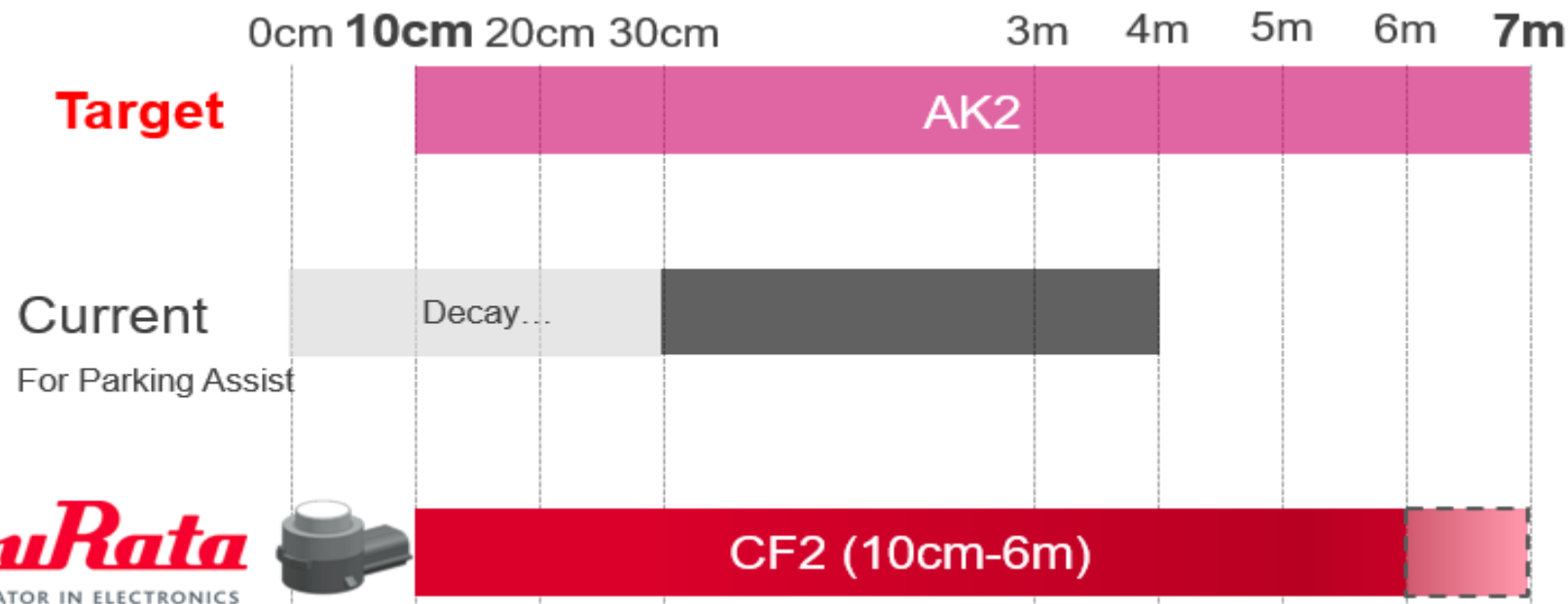
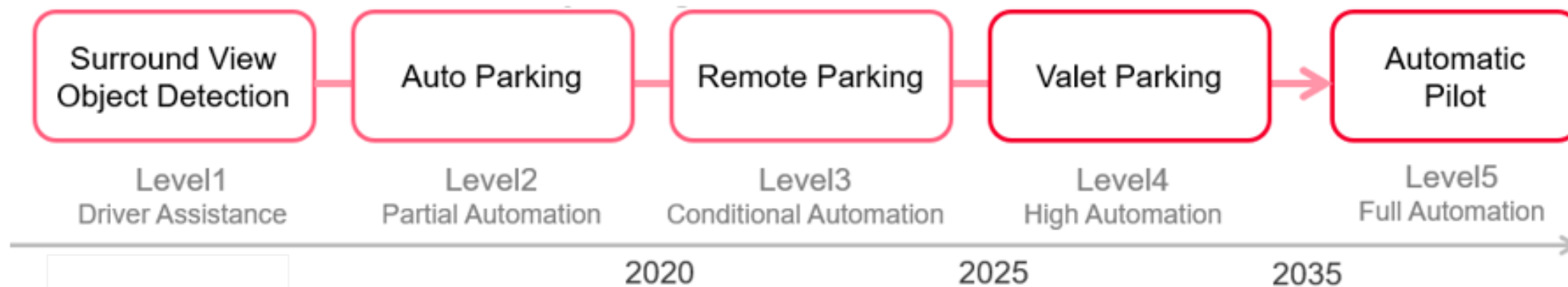
Market trends of automatic parking system

Market trend of Automatic Parking

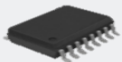
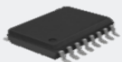

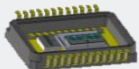



Ultrasonic Sensor Road Map

Market trend of Automatic Parking



Murata Sensor value proposition

WE DO		CUSTOMER GETS	EFFECT
#1 Combo3 Std. 4DOF/5DOF		Position and heading data: <ul style="list-style-type: none"> • up to 10s with ~1m accuracy 	Good performance for ESC functions L1
#2 Combo3 HP 4DOF/5DOF		Position and heading data: <ul style="list-style-type: none"> • Up to 15s with <0,3m accuracy 	Car knows its position on lane in all conditions L2+
#3 SCHA 6DOF		Position and heading data: <ul style="list-style-type: none"> • Up to several minutes with • <0,2m accuracy 	Car stays on lane in all conditions L3
#4 Under Dev. 6DOF		Position and heading data: <ul style="list-style-type: none"> • All the time with <0,2m accuracy 	Automated driving L4-L5
#5 Ultrasonic & Under Dev.		Various detection range	Parking Assistance & Valet Parking L1-L5

Thank you

감사합니다.