

UTAC














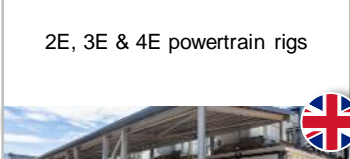
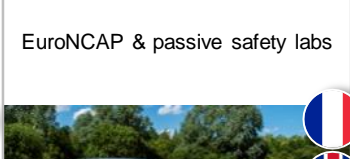
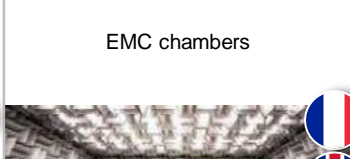
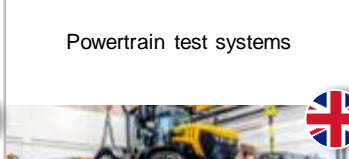









UK Atomic Energy Authority

Connected and Autonomous Vehicles



STATE OF THE ART TECHNICAL TESTING ASSETS TO MEET ALL YOUR REQUIREMENTS

 Conventional Powertrain	 Future Powertrain	 Safety	 Comfort & Quality	 Reliability & Durability	 Connected Mobility
 <p>Engine test cells</p>	 <p>2E, 3E & 4E powertrain rigs</p>	 <p>EuroNCAP & passive safety labs</p>	 <p>EMC chambers</p>	 <p>Powertrain test systems</p>	 <p>Simulation</p>
 <p>Light & heavy-duty chassis dynos</p>	 <p>12 battery pack test chambers</p>	 <p>ADAS & active safety labs</p>	 <p>NVH chambers</p>	 <p>Heavy duty structures lab</p>	 <p>5G CAV Village</p>
 <p>PEMS laboratories</p>	 <p>E-machine / EDU systems & test labs</p>	 <p>Indoor & outdoor winter testing</p>	 <p>NVH brake dyno</p>	 <p>Shock and vibration test rigs</p>	 <p>TEQMO test centre / 5G</p>

WORLD CLASS PROVING GROUNDS TO MEET ALL YOUR VEHICLE TESTING REQUIREMENTS

Linus-Monthéry PG



- >23km of test tracks
 - High Speed Oval
 - Dynamic platforms
 - Acoustic track
- TEQMO test center
 - 12km hi-tech tracks
 - 5G CAV specialisms
 - ADAS expertise

Millbrook PG



- 70km of test tracks
 - High Speed Oval
 - Alpine Handling
 - 4x4 Off Road
 - Mile straight
 - Special Surfaces
- 5G CAV Test Bed

Ivalo



- 100km outdoor tracks
 - Snow & Ice handling
 - Split friction tracks
 - Split friction slopes
- Indoor Circuits x6
 - Snow & Ice (x4)
 - Wet & Dry Asphalt (x2)

Mortefontaine PG



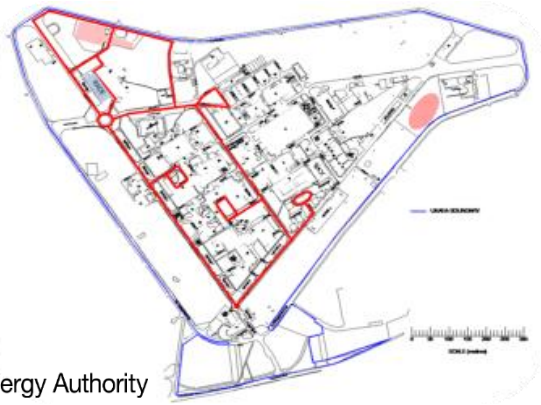
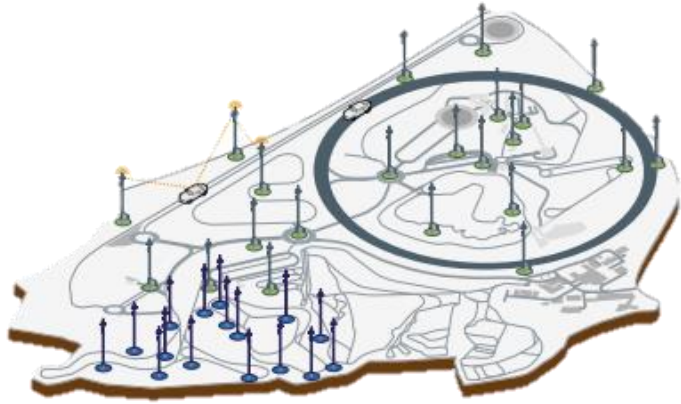
- >19km of test tracks
 - High Speed Oval
 - Urban & Off Road
 - Special Surfaces
 - Dynamic platforms
 - Acoustic tunnel

Oued Zem PG



- Hot climate testing
 - High Speed Track
 - 4km Coast Down
 - Low grip wet braking
 - Dynamic platforms
 - Special surfaces
- Opening Q4 2022

THE UK'S CONTROLLED URBAN CAV & 5G TRANSPORT TESTBED



Centre for Connected & Autonomous Vehicles



Department for Digital, Culture, Media & Sport



 UK Atomic Energy Authority

TEST AREA, MILLBROOK



EXTENSIVE TRACKS



TEST AREA CULHAM



 UK Atomic Energy Authority

Culham Science Centre and test site, Oxfordshire

Former Royal Navy Airfield

Site of the UK's nuclear fusion experimental reactor

Remote Applications in Challenging Environments

TEST AREA CULHAM



1. Your Project

- ✓ • Test services to the CAV industry
- ✓ • **New test facilities**
- ✓ • Improved physical infrastructure
- ✓ • **Simulation suite**
- ✓ • V2X capability / 5G

2. What's innovative about it?

- ✓ • Clear path to on-road operation
- ✓ • **Open to all players**
- ✓ • Link to other UK testbeds
- ✓ • **No IP threat or compromise**

3. The services you can offer?

- ✓ • **Development, trials, test, demonstration**
- ✓ • Vehicles, components and systems
- ✓ • 80km tracks, 900 acres. Endless scenarios - with and without other road users

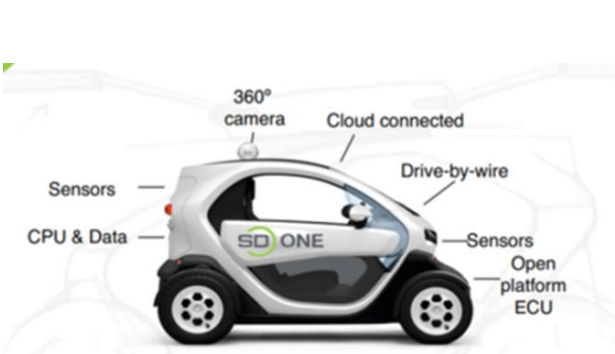
4. The customers you seek?

- ✓ • **Start up's, SME's, OEM's, consortia**
- ✓ • On or off road testing. Static or dynamic
- ✓ • City, urban, interurban users, virtual players



UTAC Millbrook customer accommodation





CULHAM CUSTOMER ACCOMODATION



AUTOAIR: THE 5G TRANSPORT TESTBED

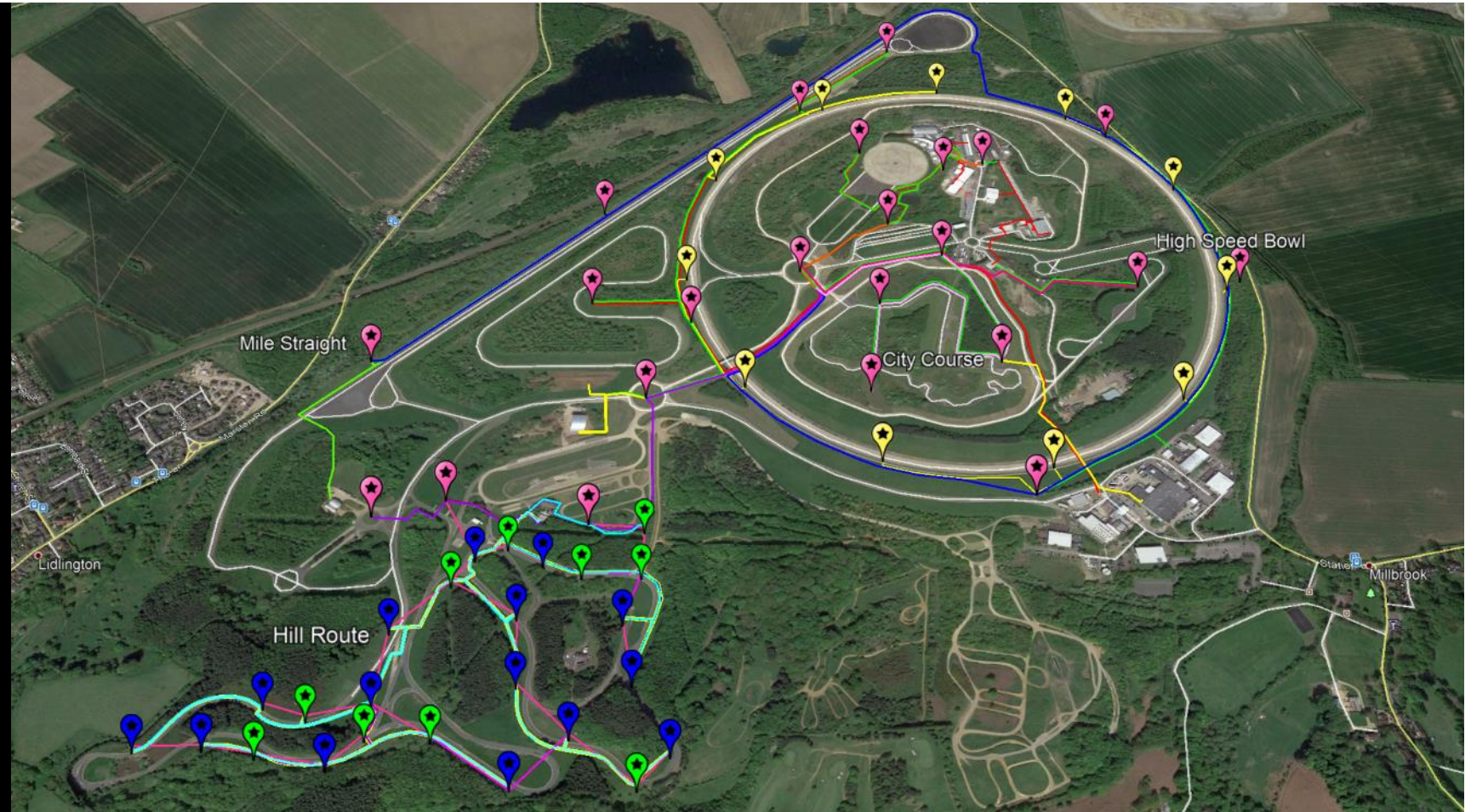


Total of 59 masts:

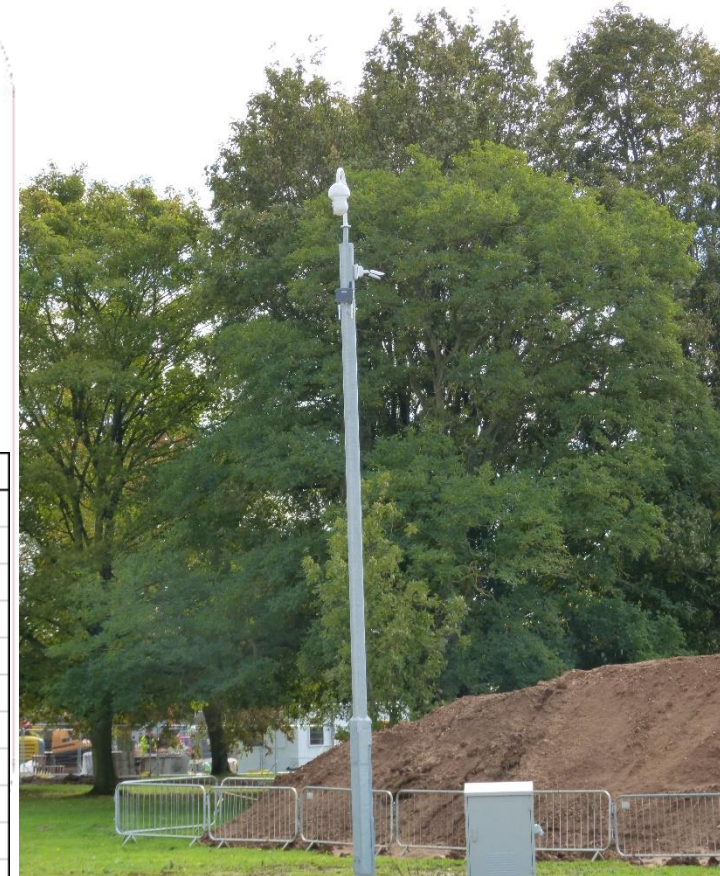
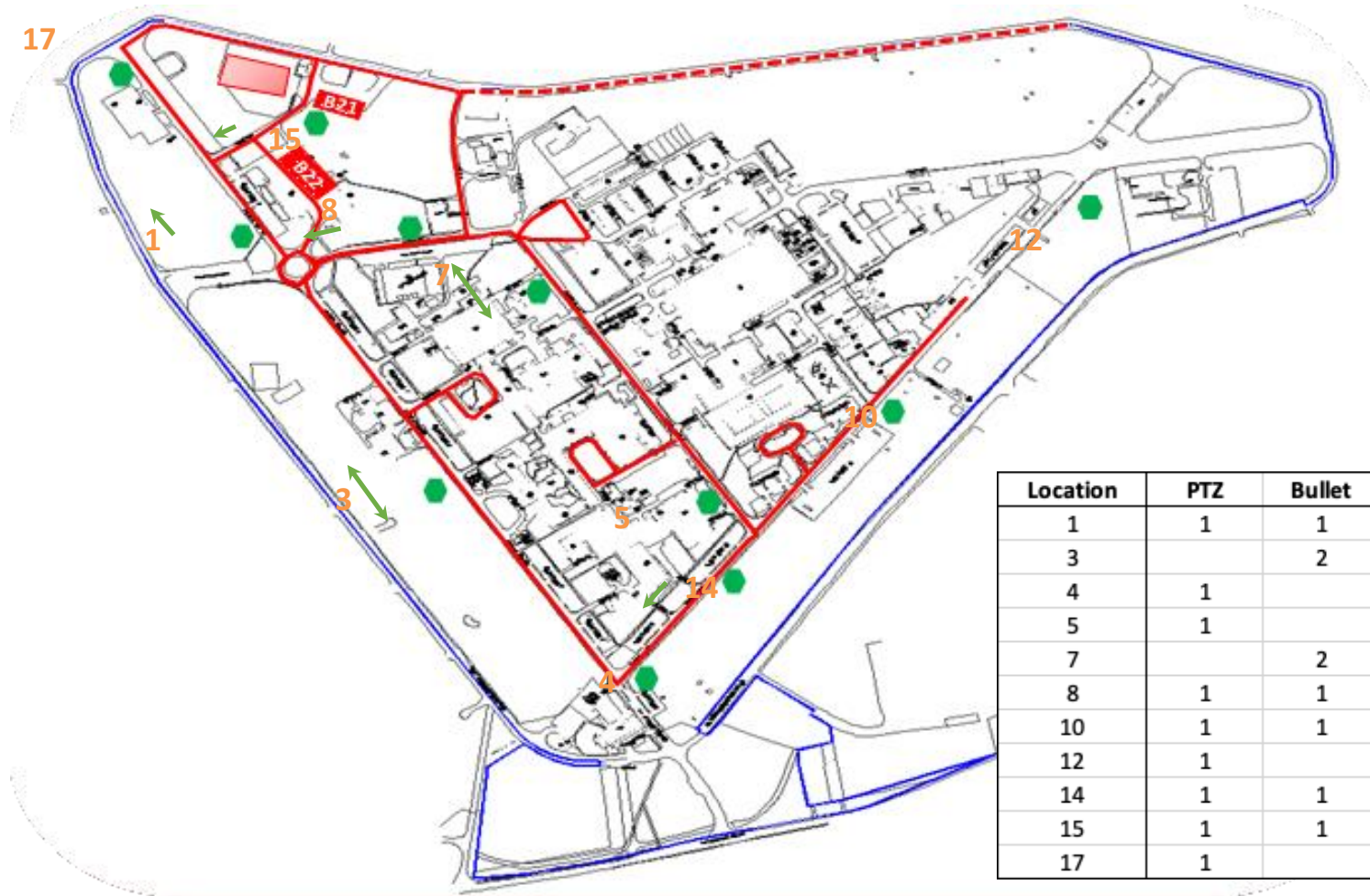
- 23 tiltable masts flat area
- 15 cellular masts in "hilly area"
- 11 70GHz mmWave masts
- 10 60GHz mesh stations

Total of 100 base stations

- 38 x 2.3GHz 4G LTE
- 38 x 3.6GHz 4G LTE
- 22 x 70GHz V2X mmWave
- 19 x 3.8GHz 5G Stand Alone
- 10 x 60GHz mesh backhaul
- 166 pieces of radio equipment
- 40 DSRC 802.11p RSU's
- 30km fibre & power
- CCTV
- 1cm positioning



CONNECTIVITY AT CULHAM

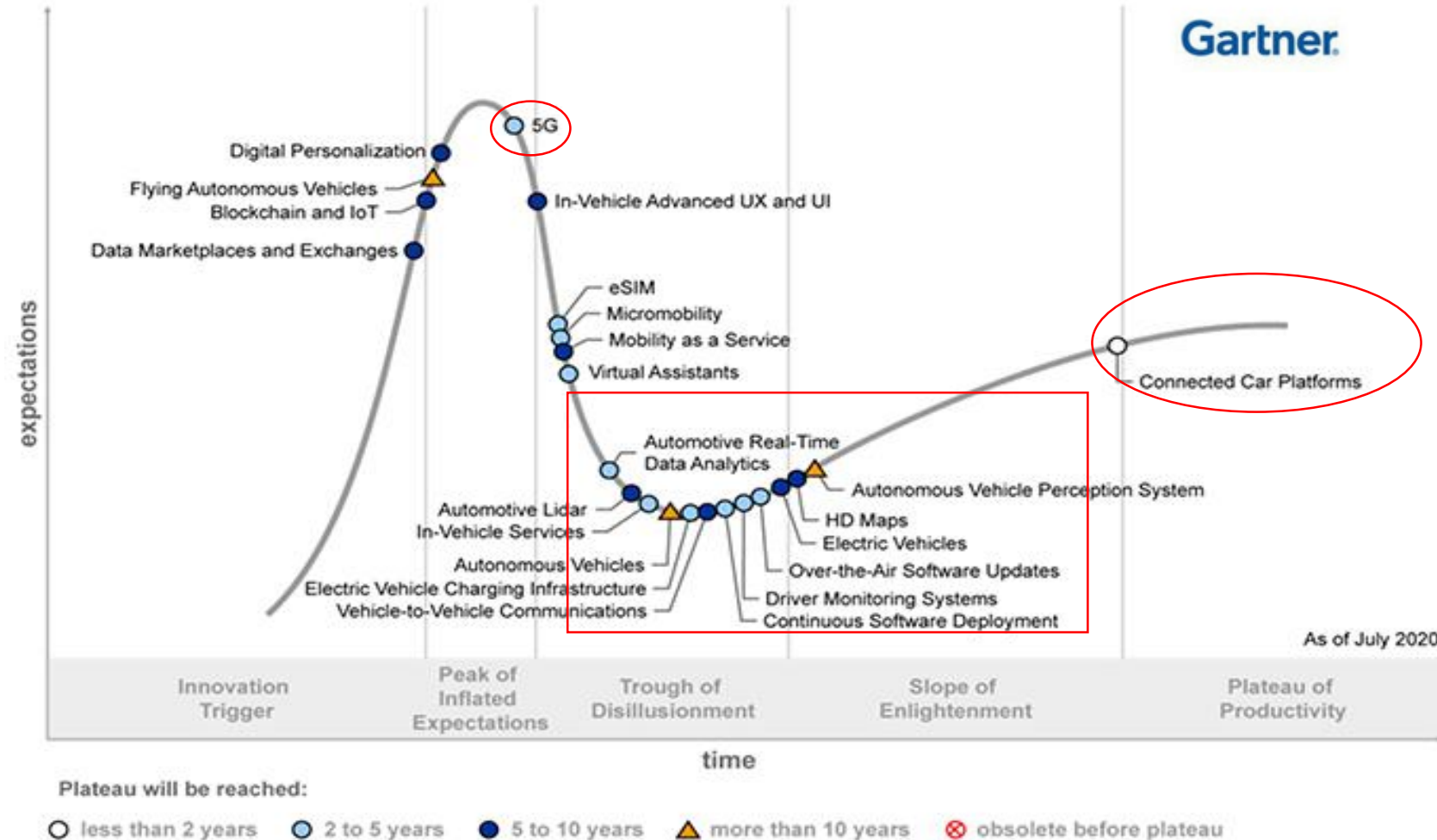


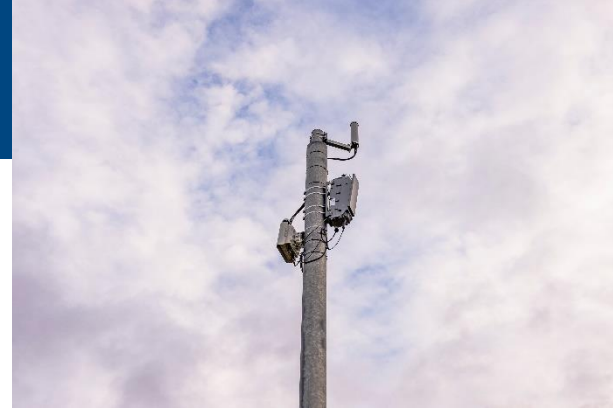
WHAT ARE THE MARKET FORCES?



- Connected services
- EuroNCAP Roadmap
- Regulatory roadmap
- Virtual testing
- Virtual certification
- Increasing automation
- Demonstrations

Hype Cycle for Connected Vehicles and Smart Mobility, 2020

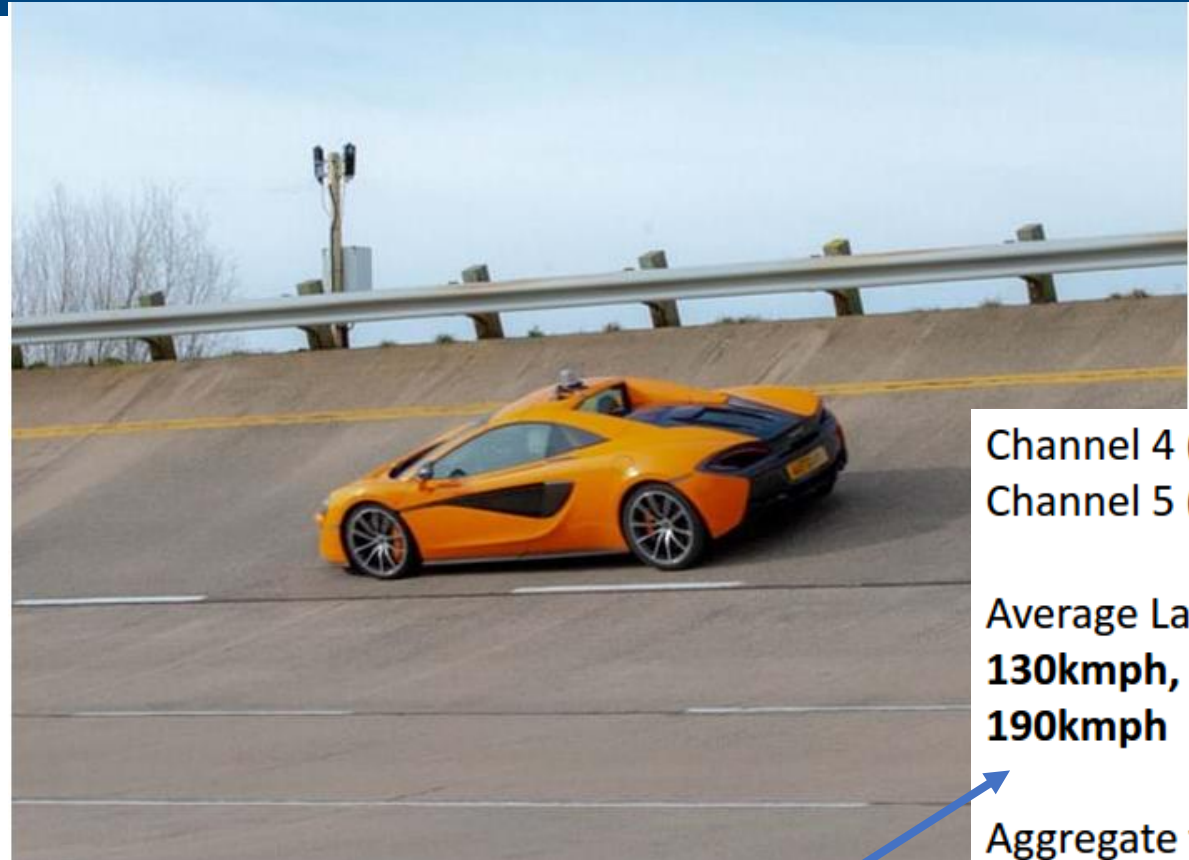




HIGH SPEED mmWave (70GHz)



BBC Click: 5G Whiz

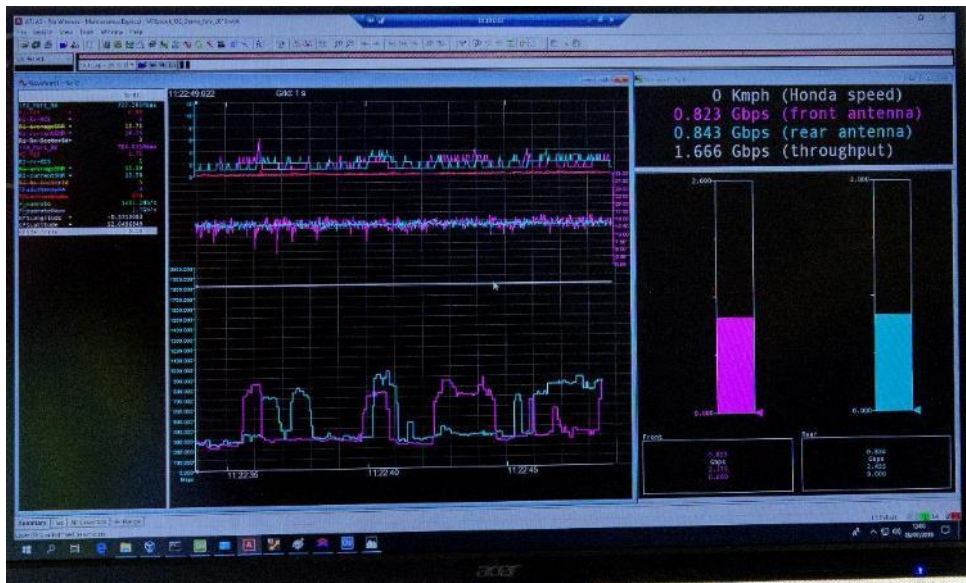


Channel 4 (65 GHz) &
Channel 5 (67 GHz)

Average Lap Speeds:
**130kmph, 170kmph,
190kmph**

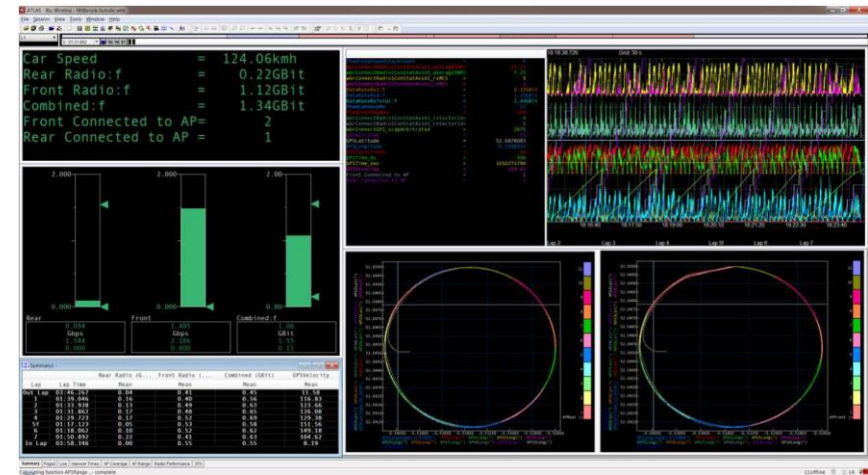
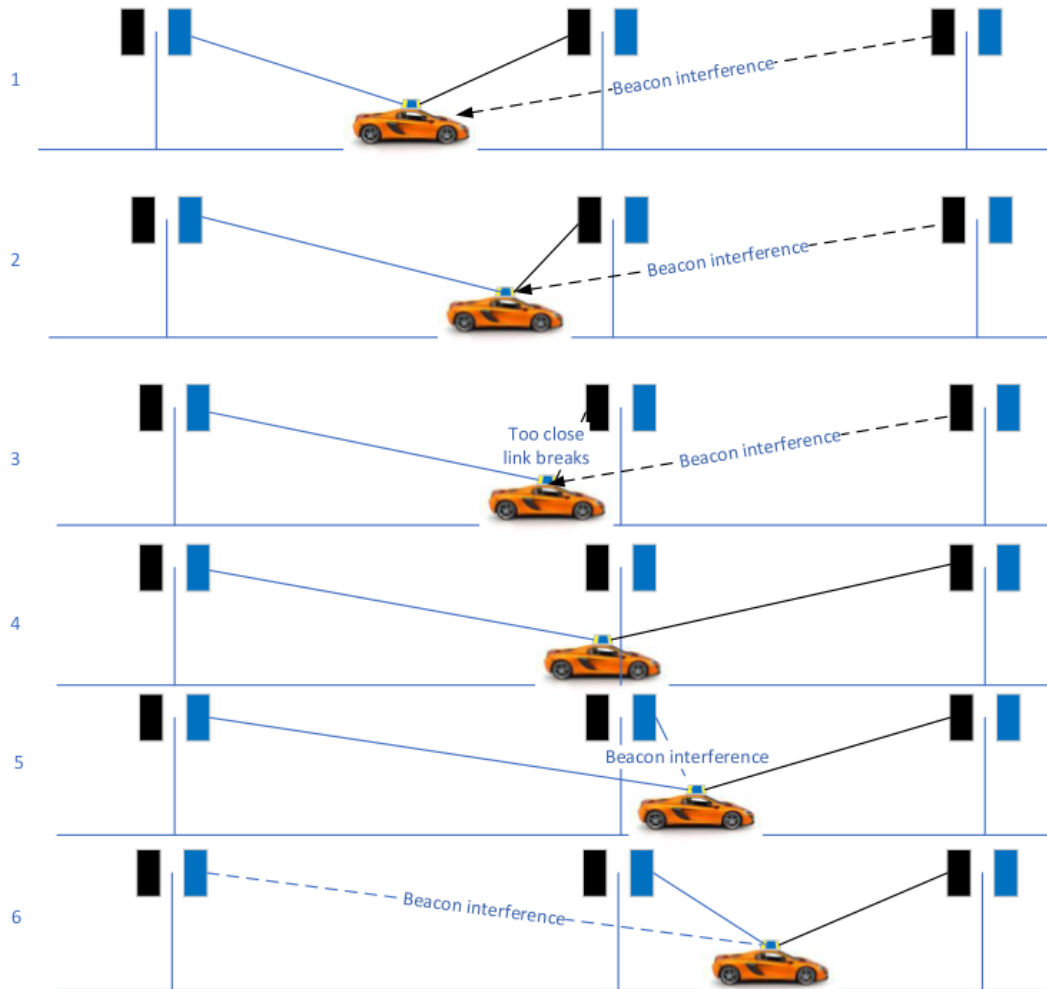
Aggregate throughput of
**1.6 Gbps (average) and
3.1 Gbps (peak)**

80mph, 100mph, 115mph



End to end round trip
latency to/from gateway
of **0.7 to 0.9 msec**

COMPLEX HANDOVERS AT HIGH SPEED



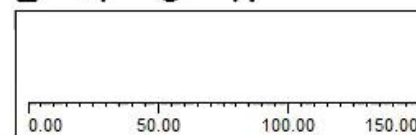
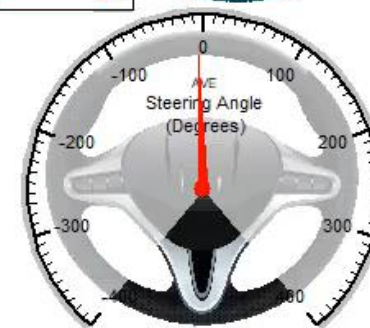
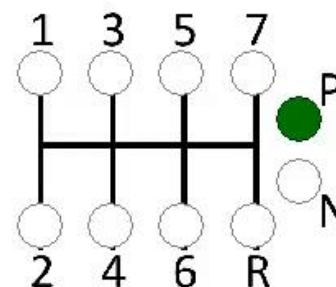
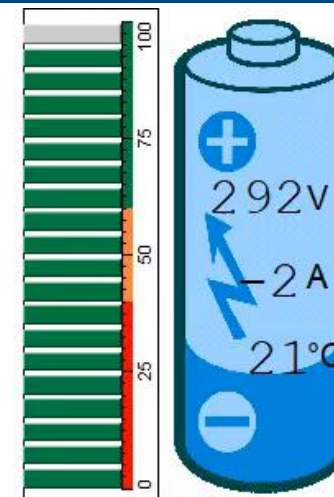
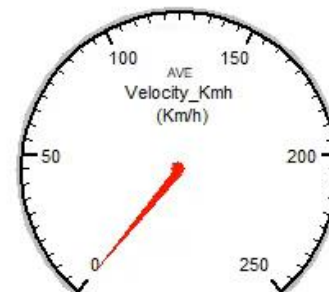
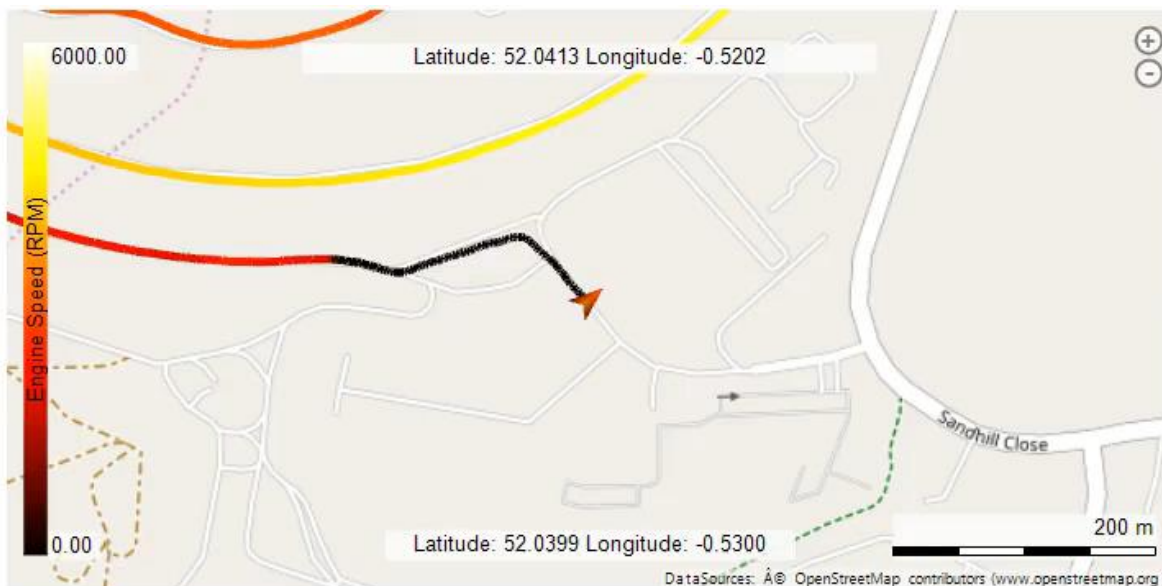
AMBULANCES... AND DATA STREAMING (LIVE)



Visionable video and voice collaboration platform

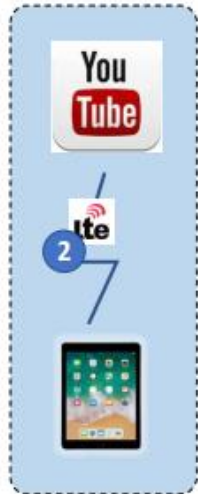


REAL TIME DATA ACQUISITION & STREAMING





Downlink Video Streams



Uplink Video Stream



Google Duo Video Call



PC Video Conference

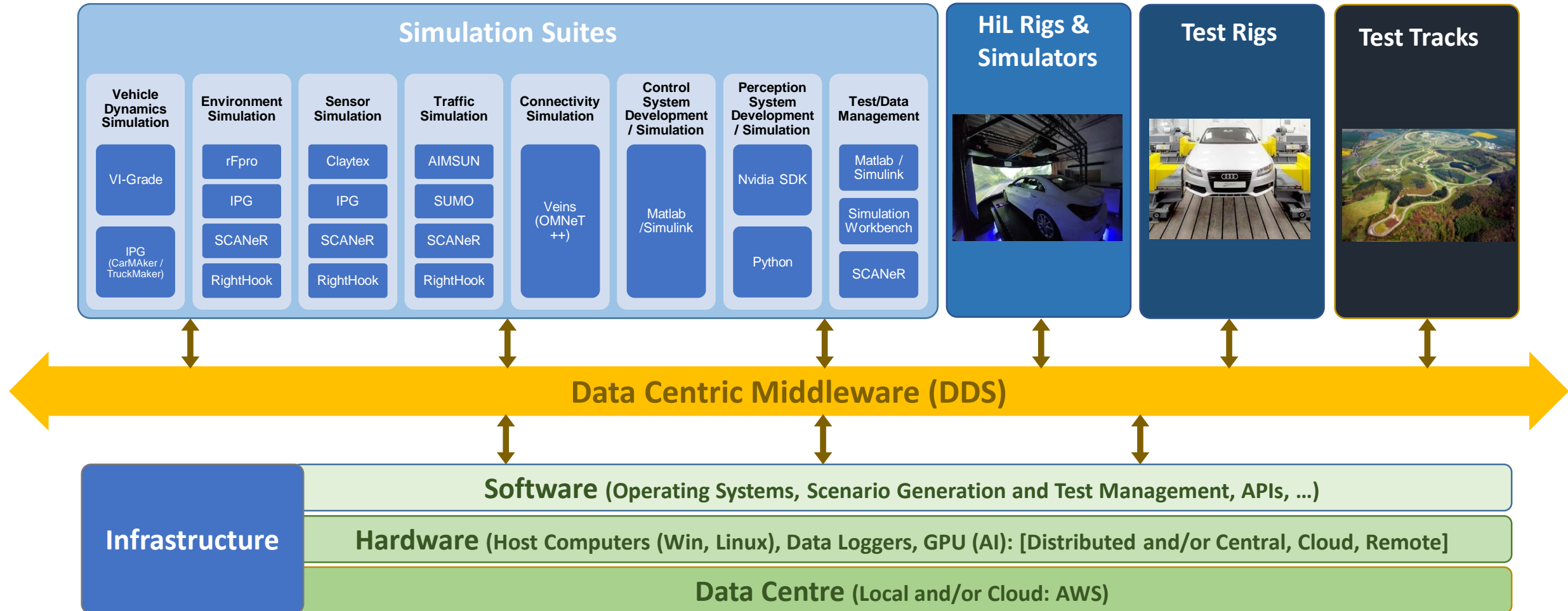


Use Case Trial on Millbrook High-Speed Bowl

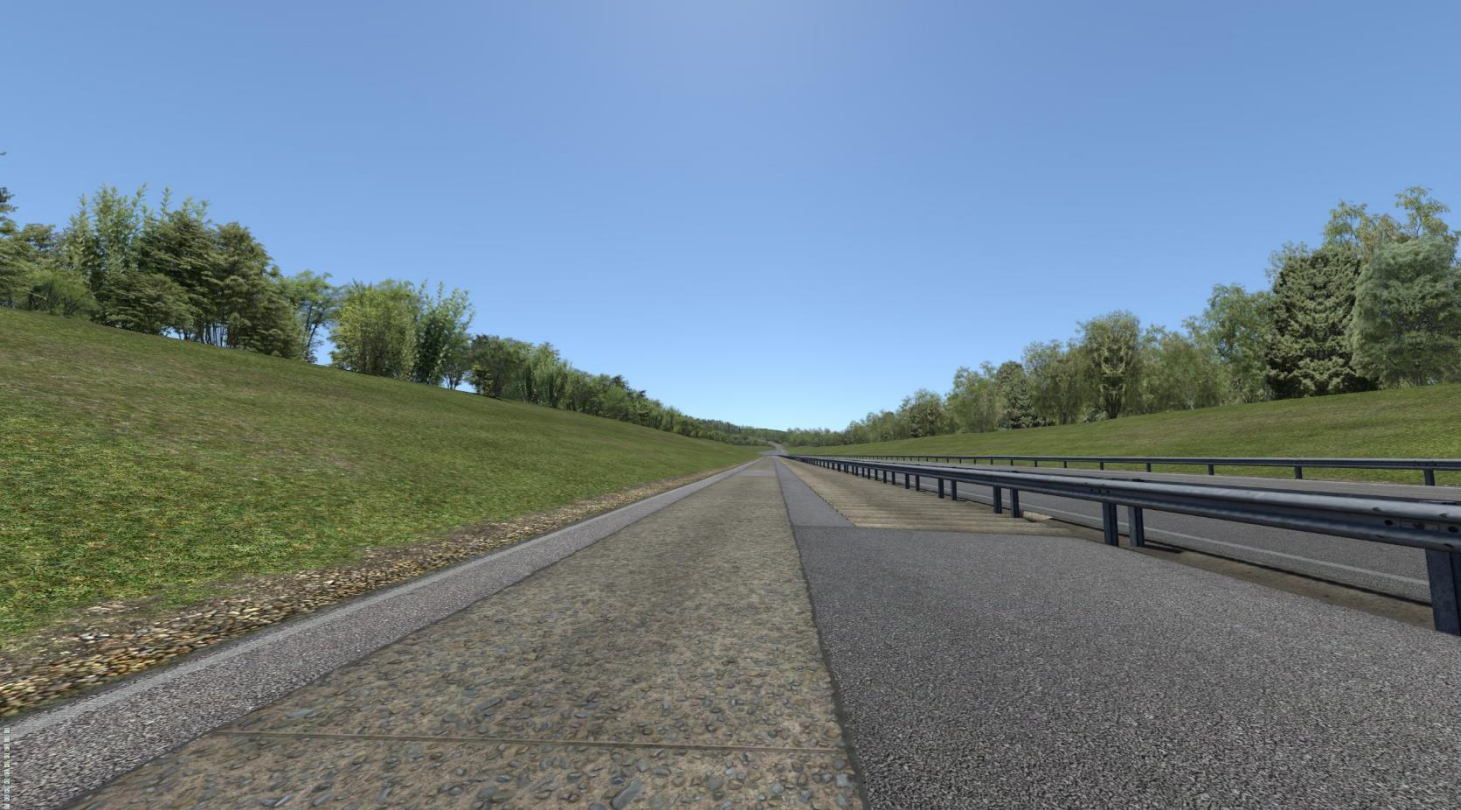
VIRTUAL.....



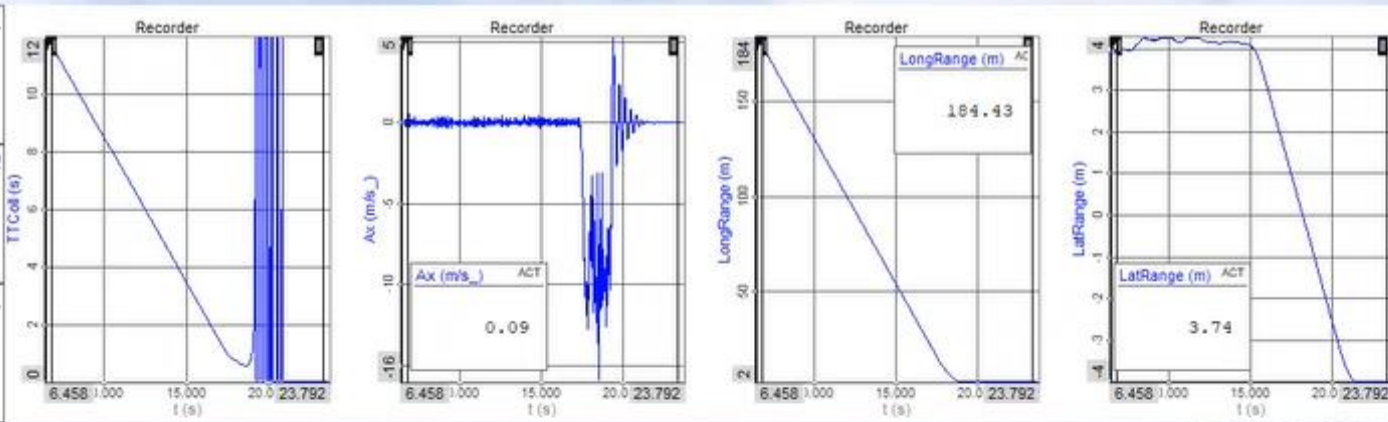
SENSORS IN THE LOOP AND SENSOR MODELS







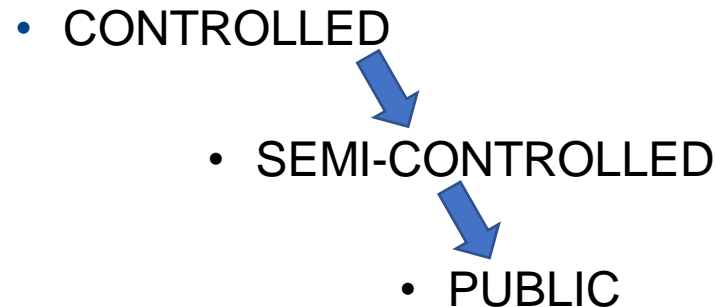
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FCW_CAN	Latch - FCW_Optical (s)	ACT	1.06
0			
FCW_Optical	Latch - FCW_CAN	ACT	1.00
0			





- WELCOME FOR START UP'S AND SME'S
- SINGLE POINTS OF CONTACT
- EASY ACCESS TO TEST FACILITY
- OPEN TO ALL
- CREDIT CARD ACCEPTED!
- ALL USE CASES CONSIDERED (WELL, NEARLY ALL.....)

- CLEAR CUSTOMER JOURNEY





UK Atomic Energy Authority

**U
T
A
C**

Find us on LinkedIn to start your journey!

**Peter Stoker
Garry Staunton
Steve Berry**