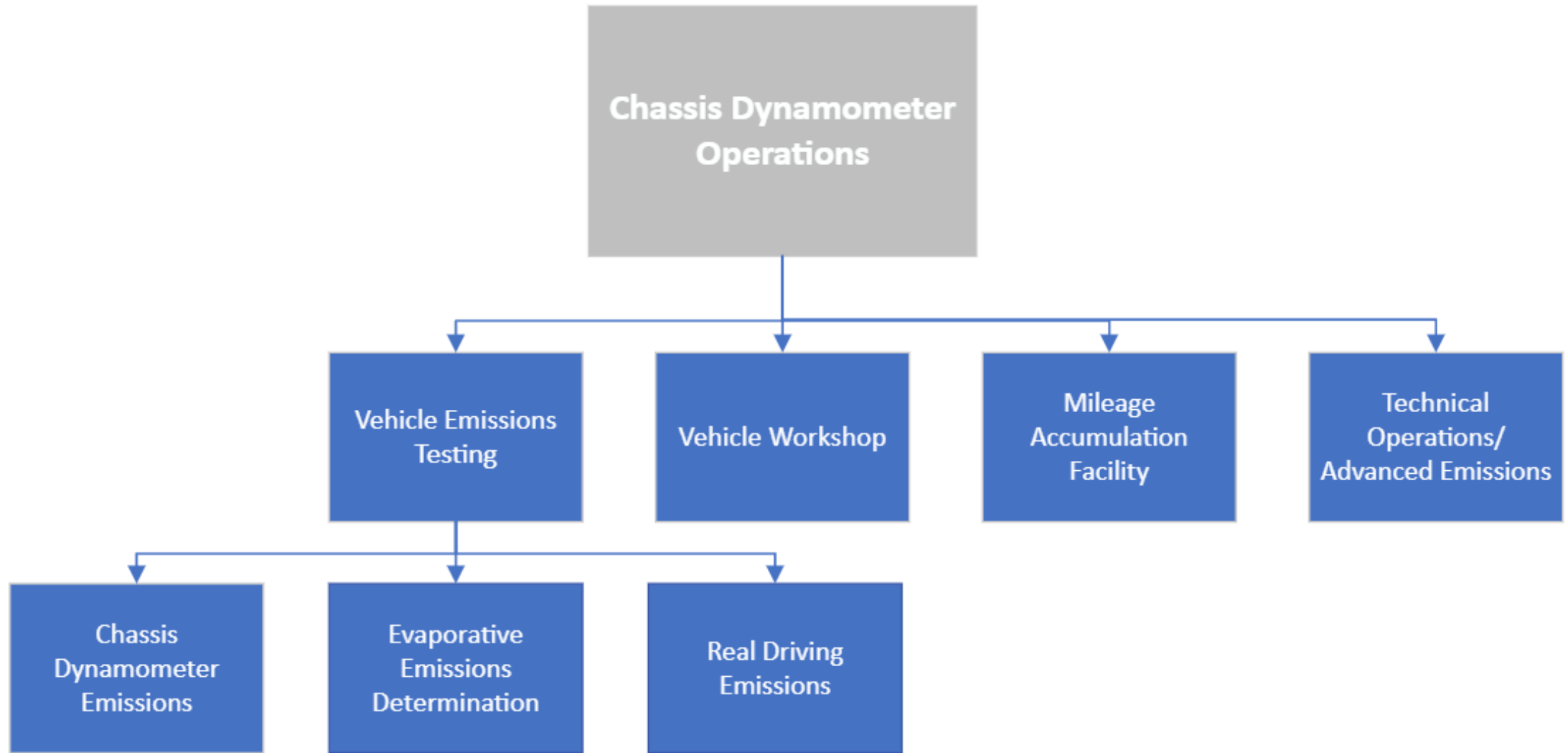


# CHASSIS DYNO OPERATIONS

27<sup>th</sup> November 2024



Chassis dynamometer testing

Building 31 (Churchill)



Building 12



Particulate number (PN) measurement (PN10)

- PN10 measurement has been our standard for many years.
- We use a combination of equipment:
- Measuring principle -
- Laser scattering condensation particle counting (CPC)

**Horiba MEXA-2000SPCS**



**AVL APC**



## STÄHLE SAP2000



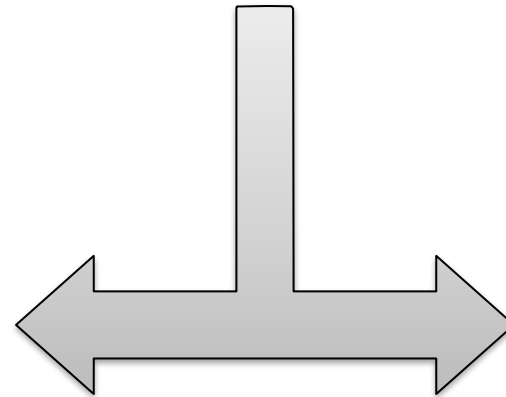
- BEV EV range and PHEV charge deplete only
- All cells to be equipped
- Written approval from:
  - EPA (USA)
  - IDIADA (EU + UN + India + Japan + RoW)
  - Brazil
  - South Korea
- Provisional Approval from:
  - VCA (EU + UN + India + RoW)

### Particulate mass (PM) measurement

- Controlled temperature, dew point and monitored atmospheric pressure within the weighing chamber
- High Precision scales (accurate to 0.1 $\mu$ g)



- Automated PM filter weighing process; taking away chances of human error
- Easy traceability of filters using RFID



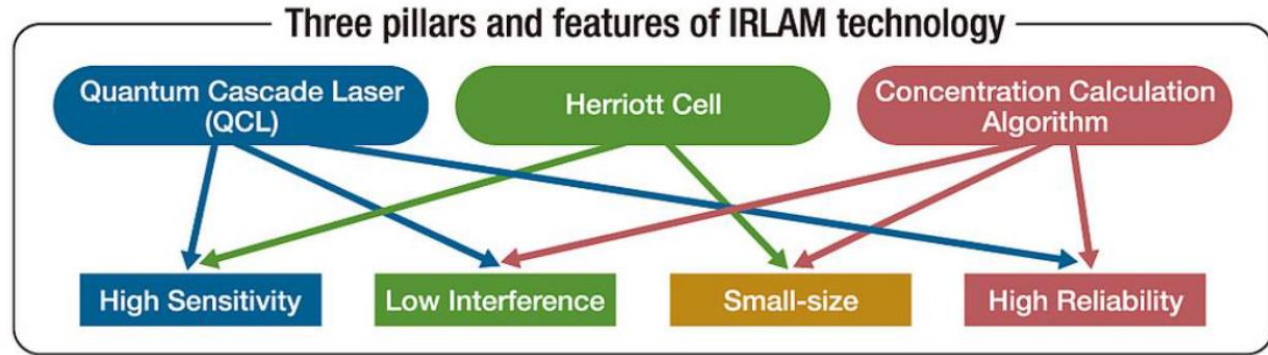
## Real Driving Emissions (RDE)

### Facility Resources

- Portable Emissions Measurement Systems (PEMS)
  - Gaseous Components - CO, CO<sub>2</sub>, NO, NO<sub>2</sub>
  - Particulate Number (PN)
  - Exhaust Flow
  - Ambient Temperature & Humidity
  - GPS Speed & Altitude
- Vehicle Soaking from -10°C to 50°C
- Artificial Payload Testing



HORIBA VERIDRIVE



Principle | Quantum cascade laser infrared spectroscopy (QCL-IR) + FID

Single Range [ppm]	NH <sub>3</sub>	1500ppm
	CO (Low)	8000 ppm
	CO (High)	12 vol%
	CO <sub>2</sub>	20 vol%
	NO	2000 ppm
	NO <sub>2</sub>	800 ppm
	N <sub>2</sub> O	1000 ppm
	NH <sub>3</sub>	1500 ppm
	HCHO	50 ppm
	CH <sub>4</sub> (Low)	2000 ppm
	CH <sub>4</sub> (High)	10000 ppmC
THC	10000 ppmC	



### SPN10 – Condensation Particulate Counter

Particle Diameter	10 – 1000nm
Measurement Range	0 – 5x10 <sup>7</sup> #/cm <sup>3</sup>



## Facility Resources

- Climatic Controlled 4WD Dynamometer \* 2
  - (Ambient to 42 °C)
- Ambient 4WD Dynamometer \* 4
- Ambient RWD Dynamometer \* 2
- Automated Robot Drivers \* 8
- Vehicle Fuelling
- EV Charging



## Sealed housing for evaporative determination (SHED)

- YORK SHED \* 2 (B12)
- AVL SHED (B31)
- Measure Hydrocarbons from:
  - Fuel systems
  - Tyres
  - Other components
- Hot Soak, Diurnal, Onboard Refuelling Vapour Recovery (ORVR)
- Carbon Canister Loading (x3 B12 / x3 B31)



- EO10023 Possess 3 x Vehicle workshops with 23 Ramps.
- Supporting various teams such as Certification, Robustness, Warranty and Powertrain Gasoline and Diesel Calibration
- All workshops are reactive and prepared to support requests e.g.
  - Certification Preps
  - Warranty investigations
  - Electrical diagnosis and investigations
  - Emission test preparations
  - Major and minor component changes

