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**Vehicle particulate emissions club:
on-road vehicle particle emissions**

Chase Study Particle Measurements

Zurich 2001

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VPEC - Vehicle Particle Emissions Club



Shell Global Solutions

Background

- **In-cabin work suggested high particle number emissions from Gasoline Vehicles**
- **High particle number emissions from gasoline engines at high speed (120km/h)**
- **Measurement of high numbers from a Gasoline vehicle**



Test Program

- **Sampling from behind vehicle on road**
- **Particle number and size (SMPS + UPM)**
- **Log vehicle speed, acceleration, inter-vehicle separation**
- **Controlled cycle with steady state and transients**
- **Measurements on test track**



Test Vehicles

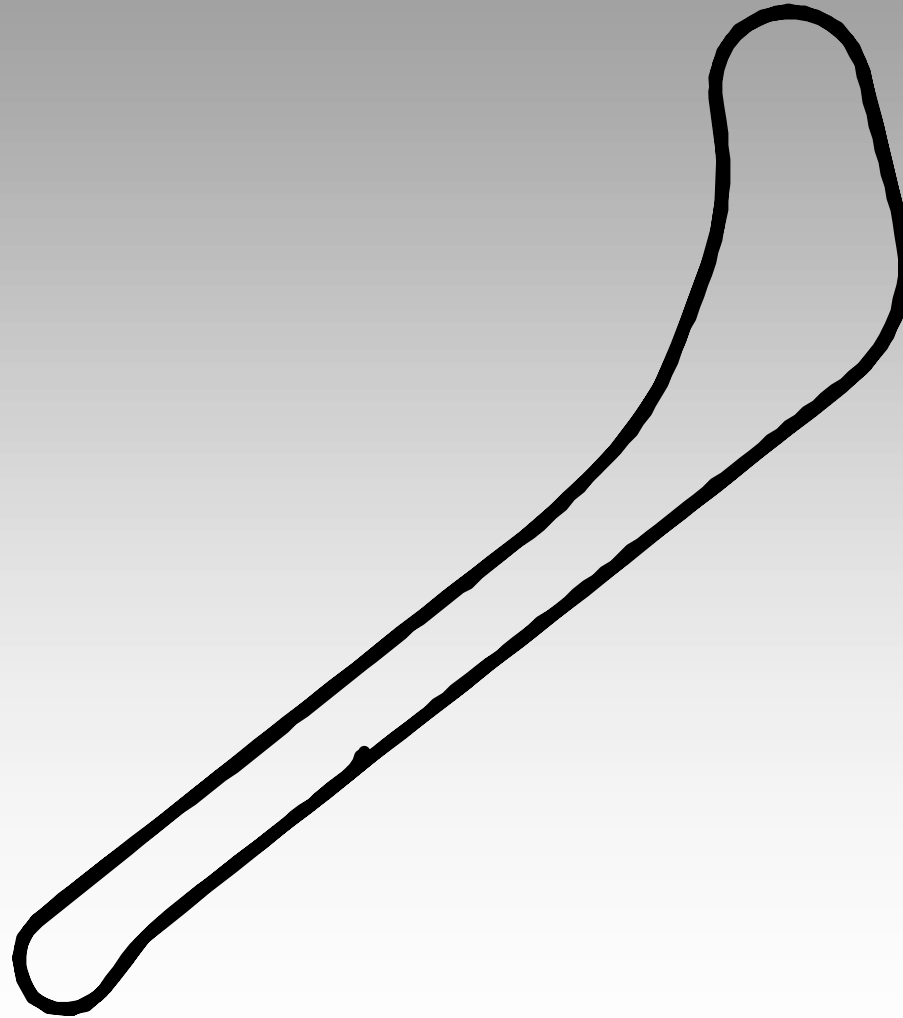
Gaydon

- **Citroen Xsara 1.6 V reg - Gasoline**
- **Bedford Astra Van 1.6L E Reg Gasoline (No Cat)**
- **Landrover Discovery - DI Diesel**

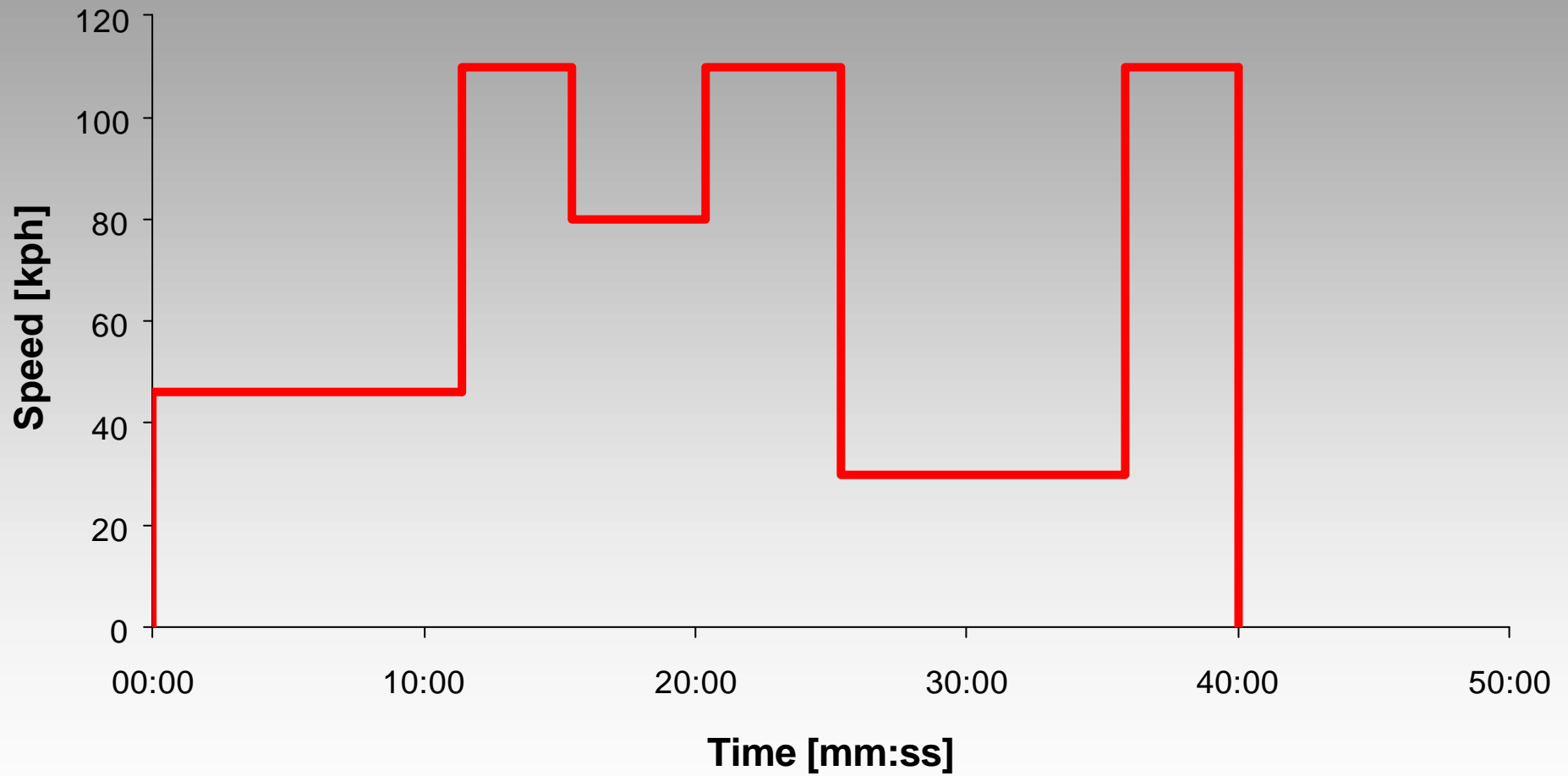
Culham

- **Ford Sierra 1.8 LX J Reg - Gasoline**
- **Rover 200 1.4Si S Reg - Gasoline**
- **Peugeot 405 GLD J Reg - IDI Diesel**
- **Citroen Saxo 1.1L S reg - Gasoline**

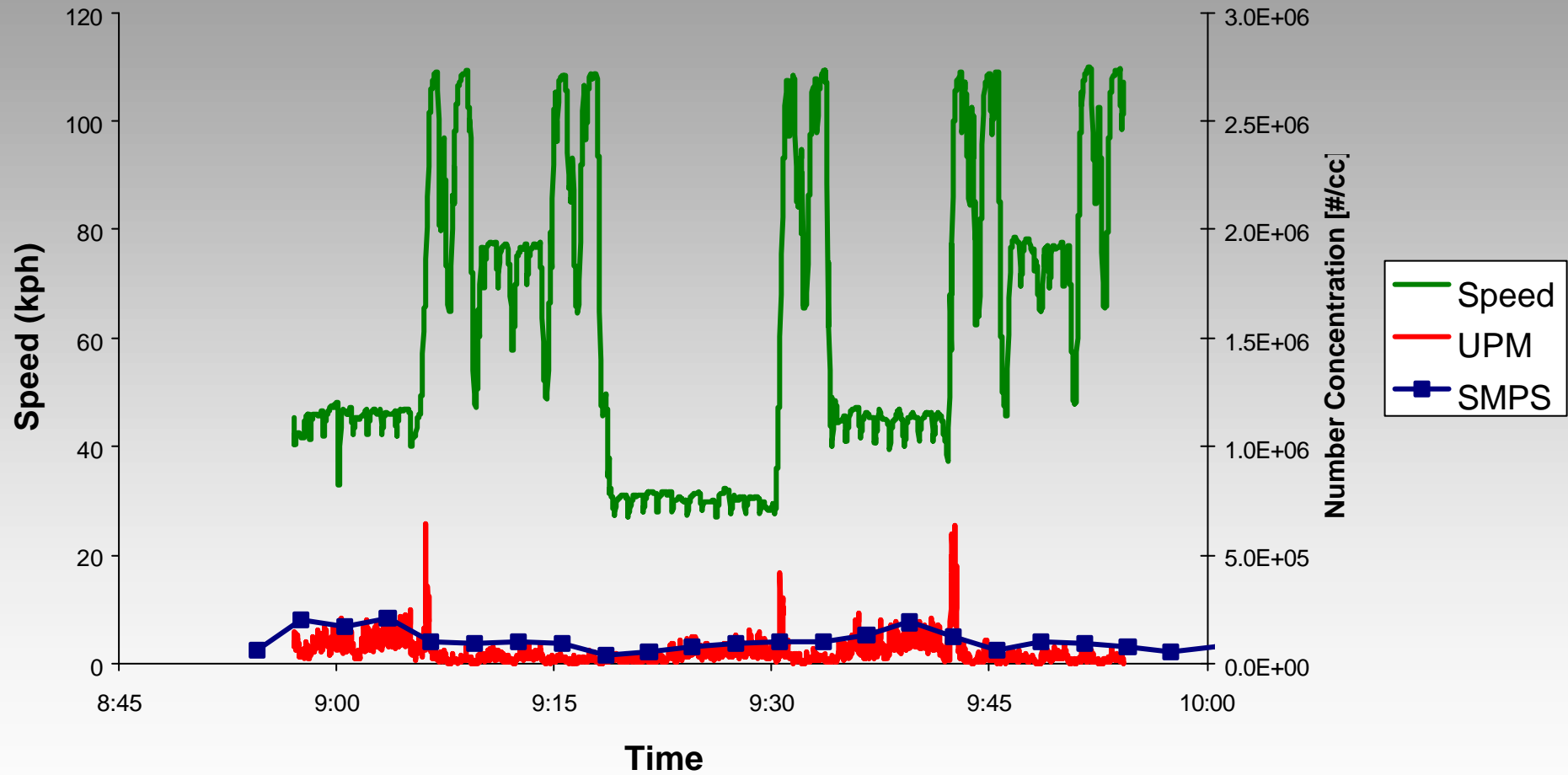
Gaydon test track



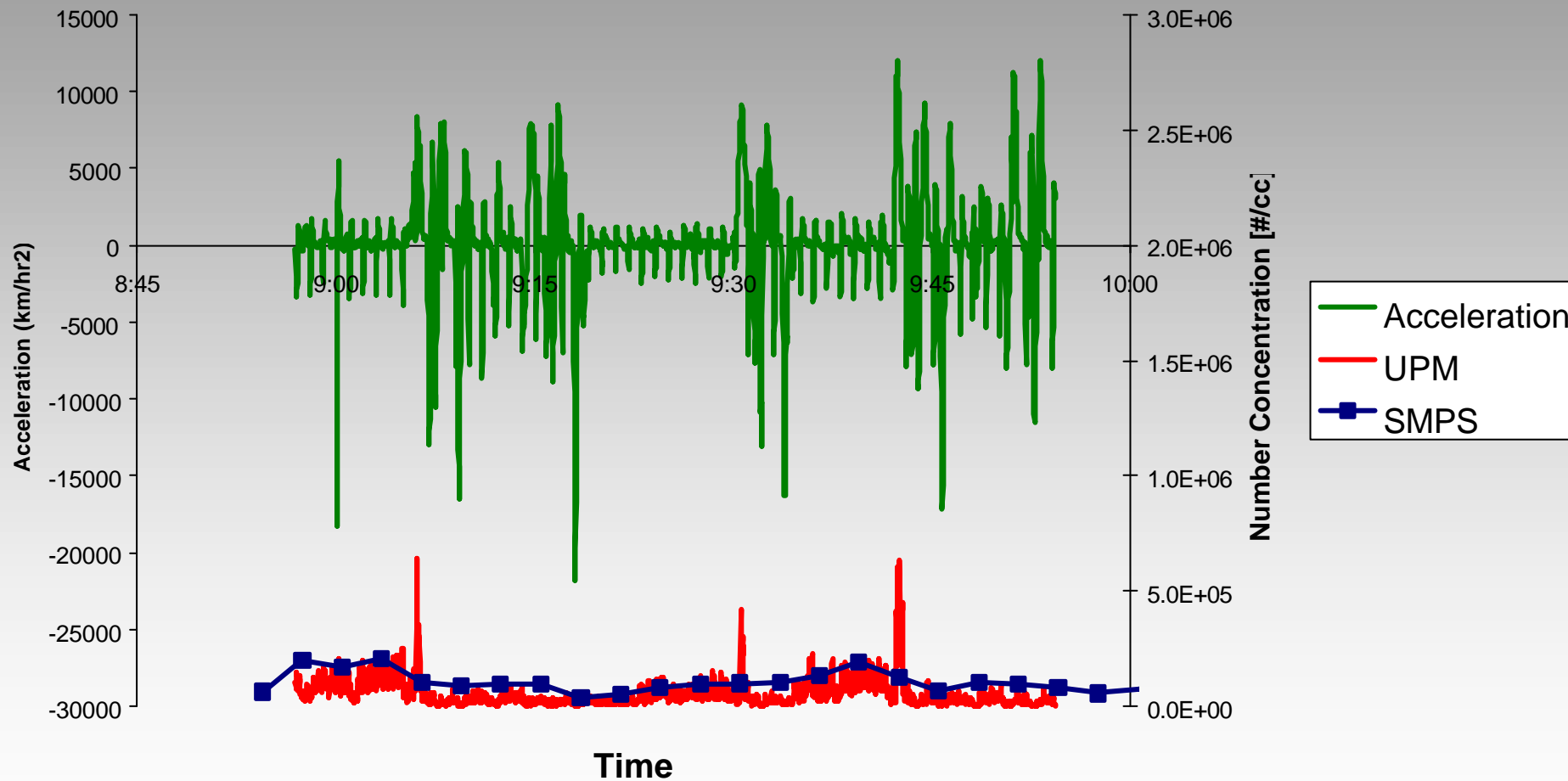
Test Cycle



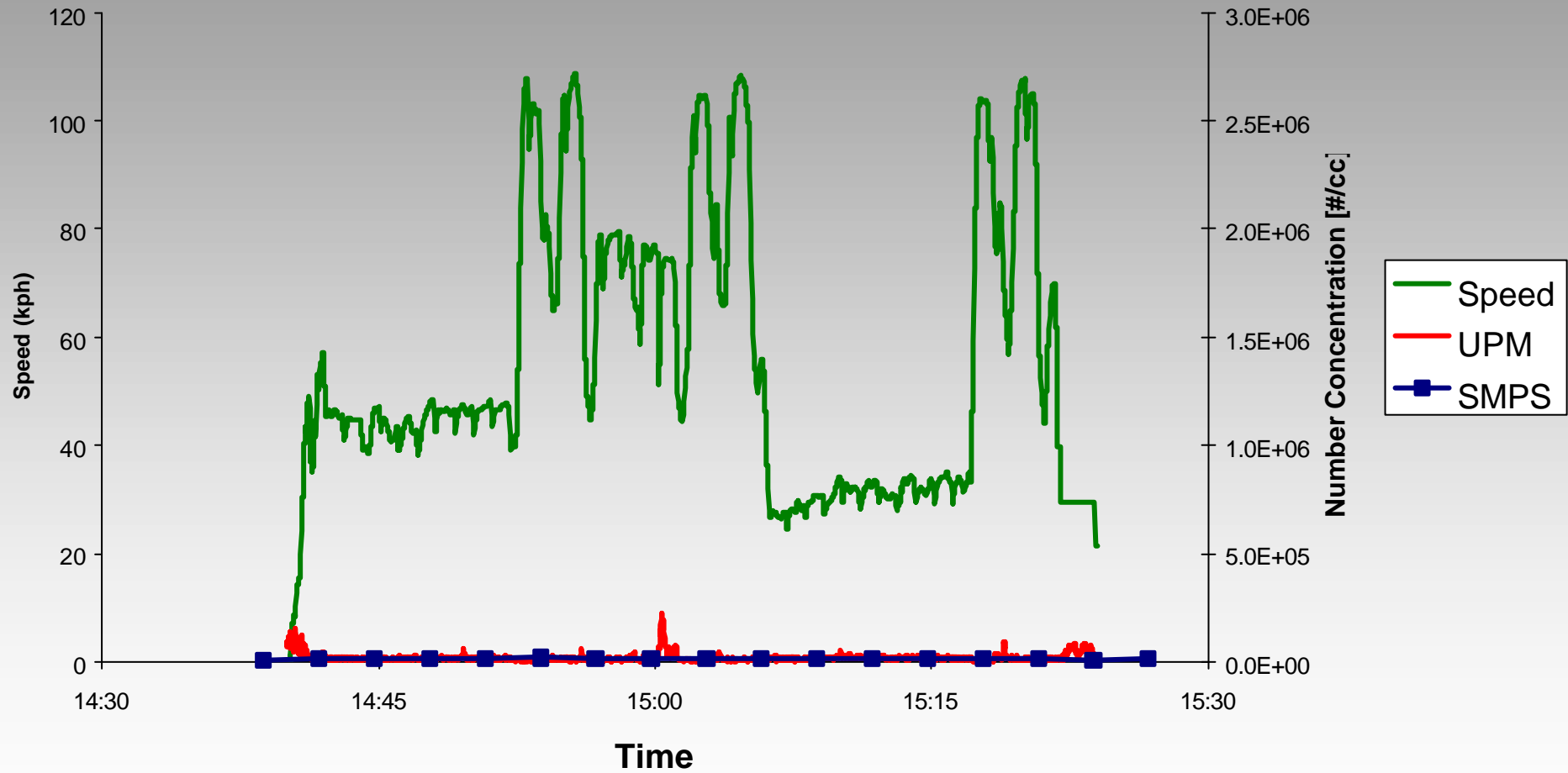
DI Diesel vehicle



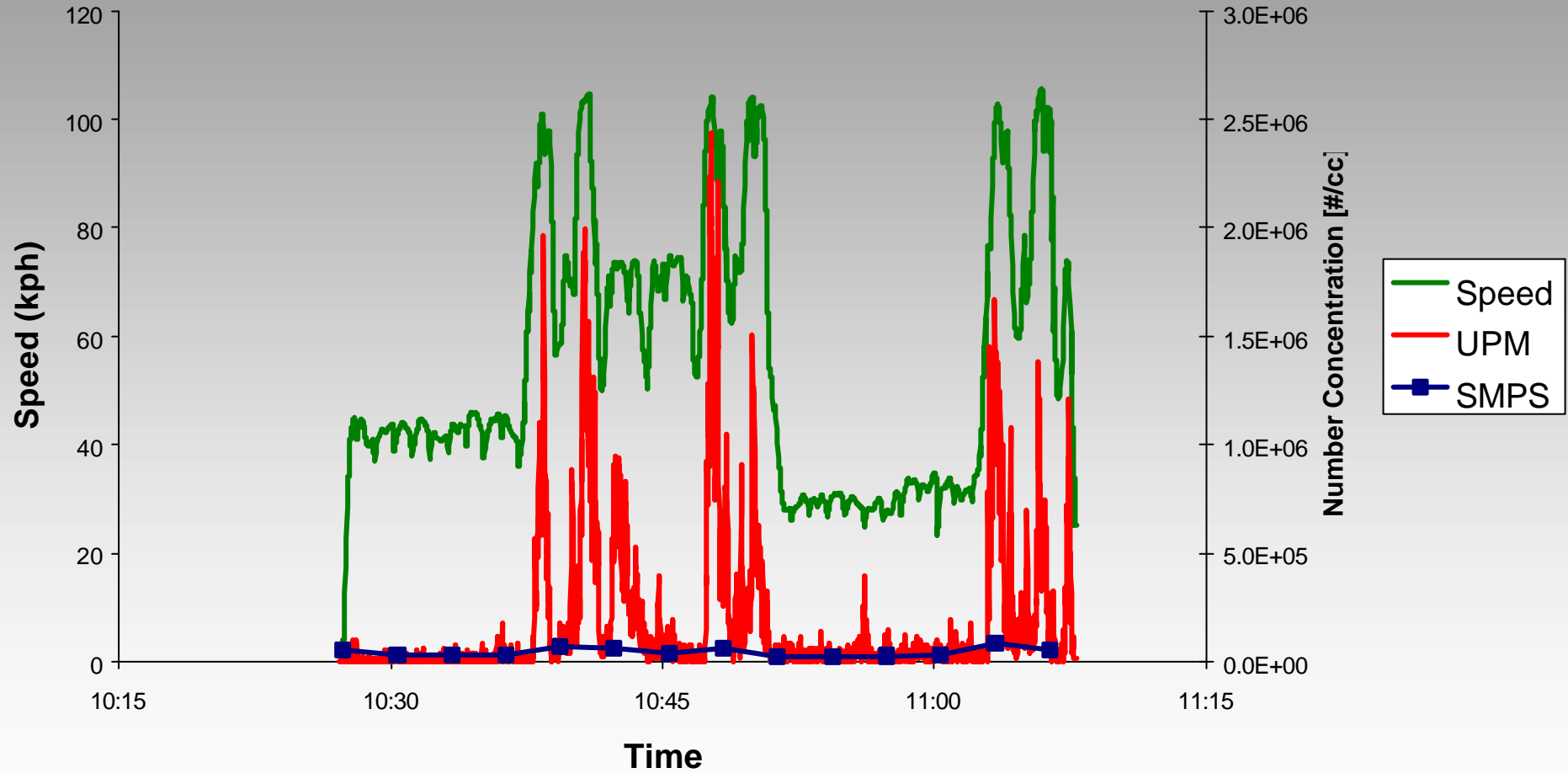
DI Diesel vehicle - Acceleration



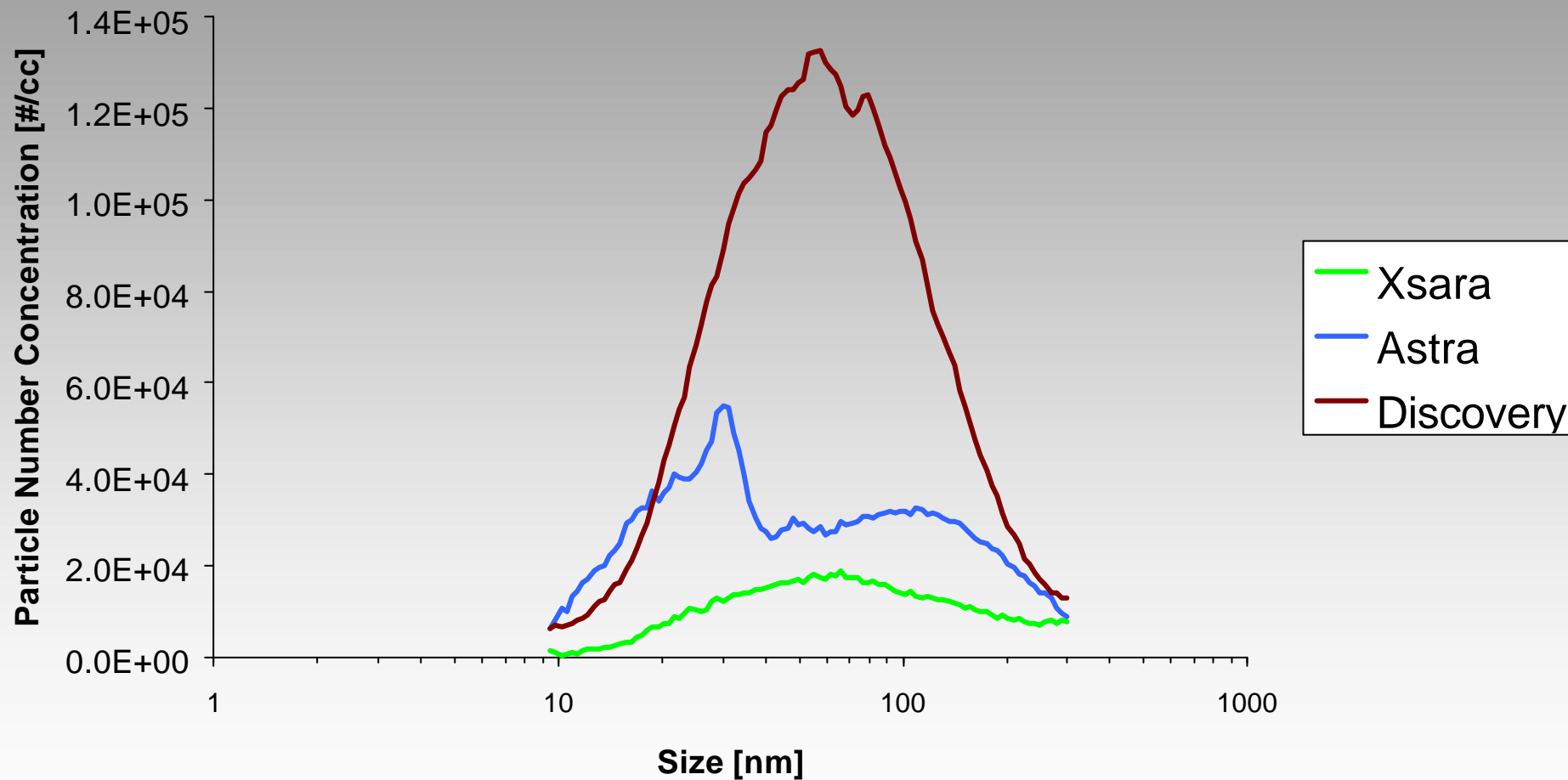
Cat Equipped Gasoline



Gasoline (lead replacement)



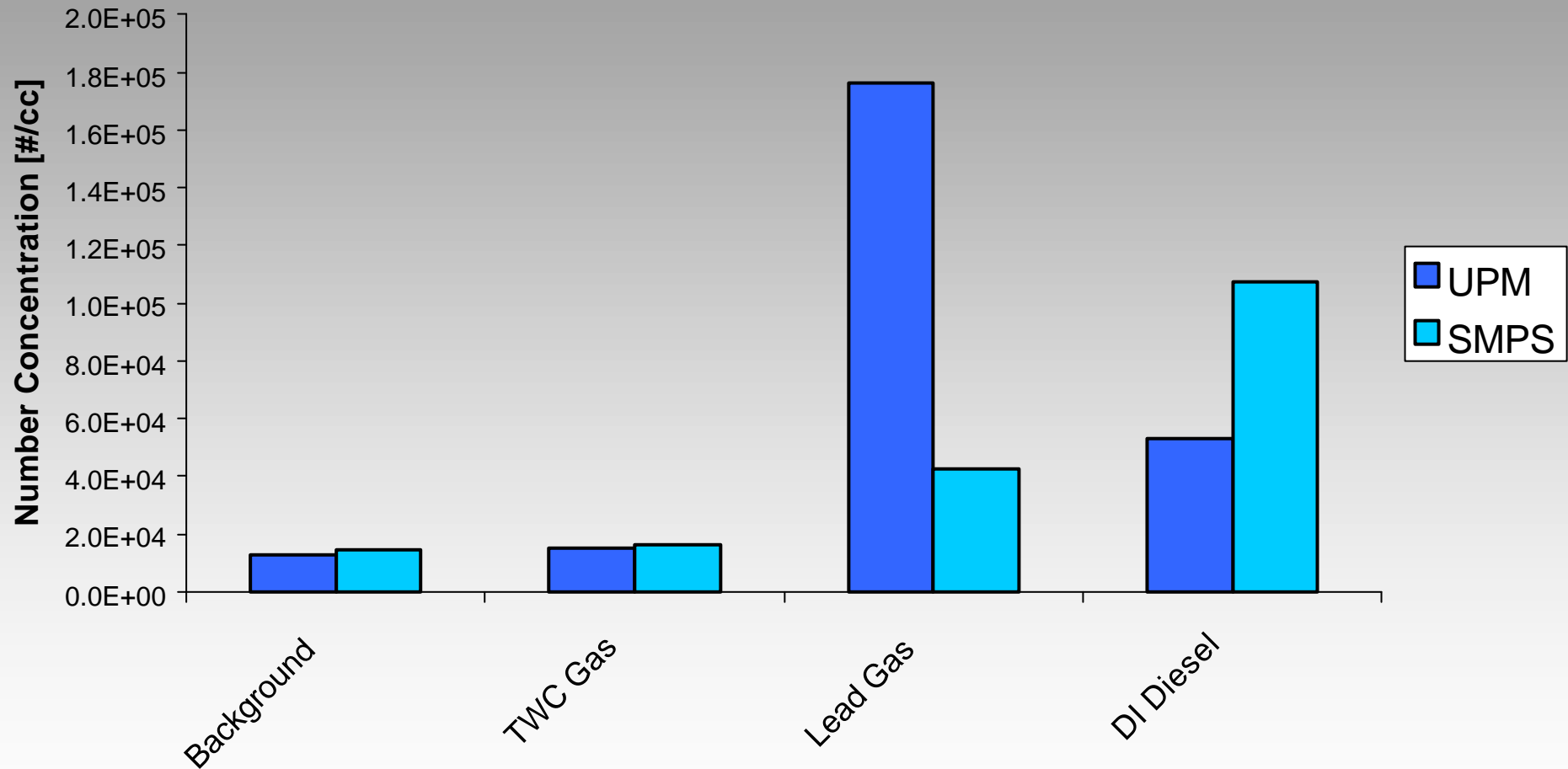
SMPS Size Distribution



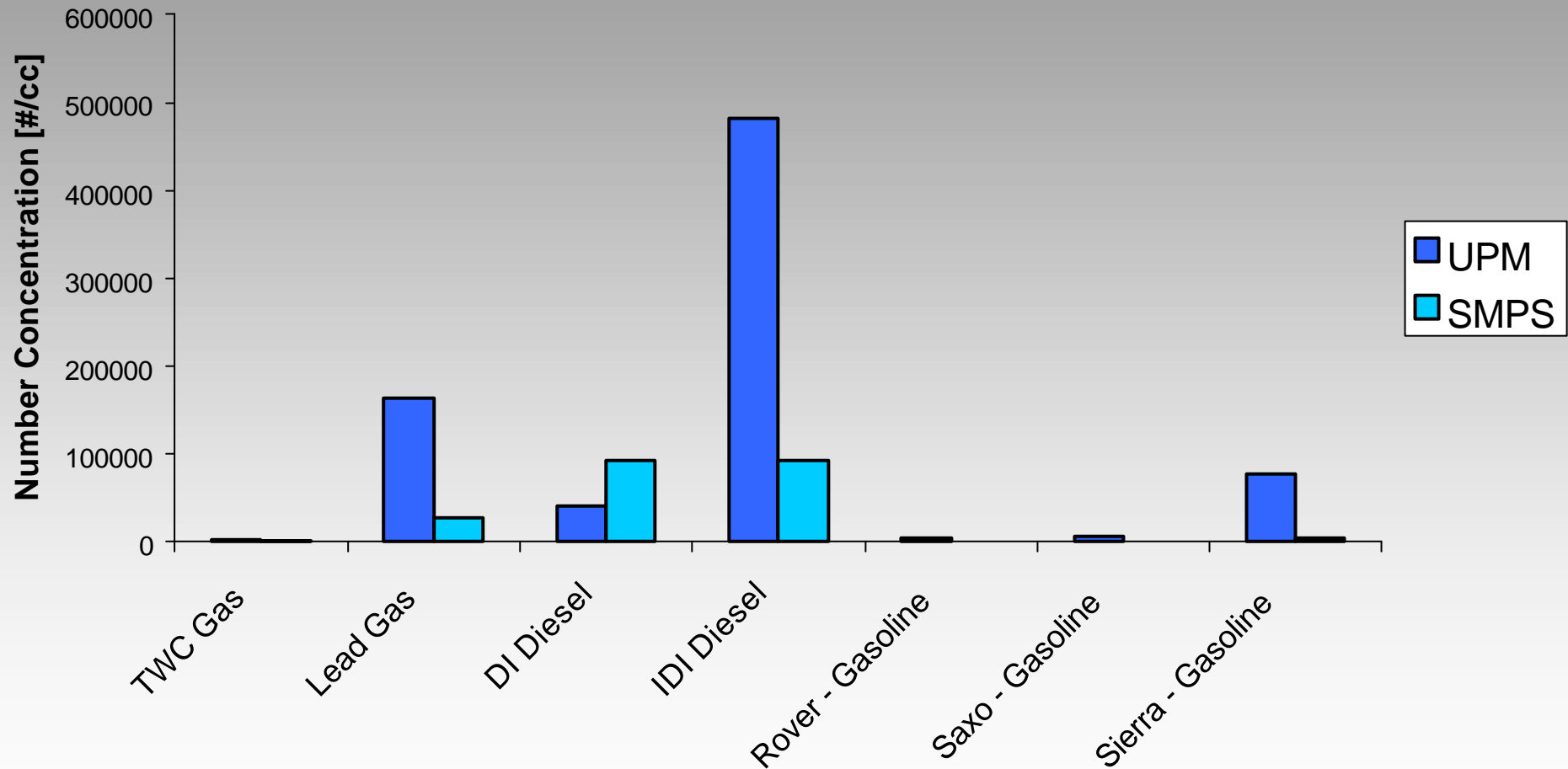
Database

- **20 thousand lines of data x 25 data types**
- **Vehicle**
- **Test track**
- **Speed**
- **Acceleration**
- **Target - chase car separation (time)**
- **Max speed 1.5 minute previously**

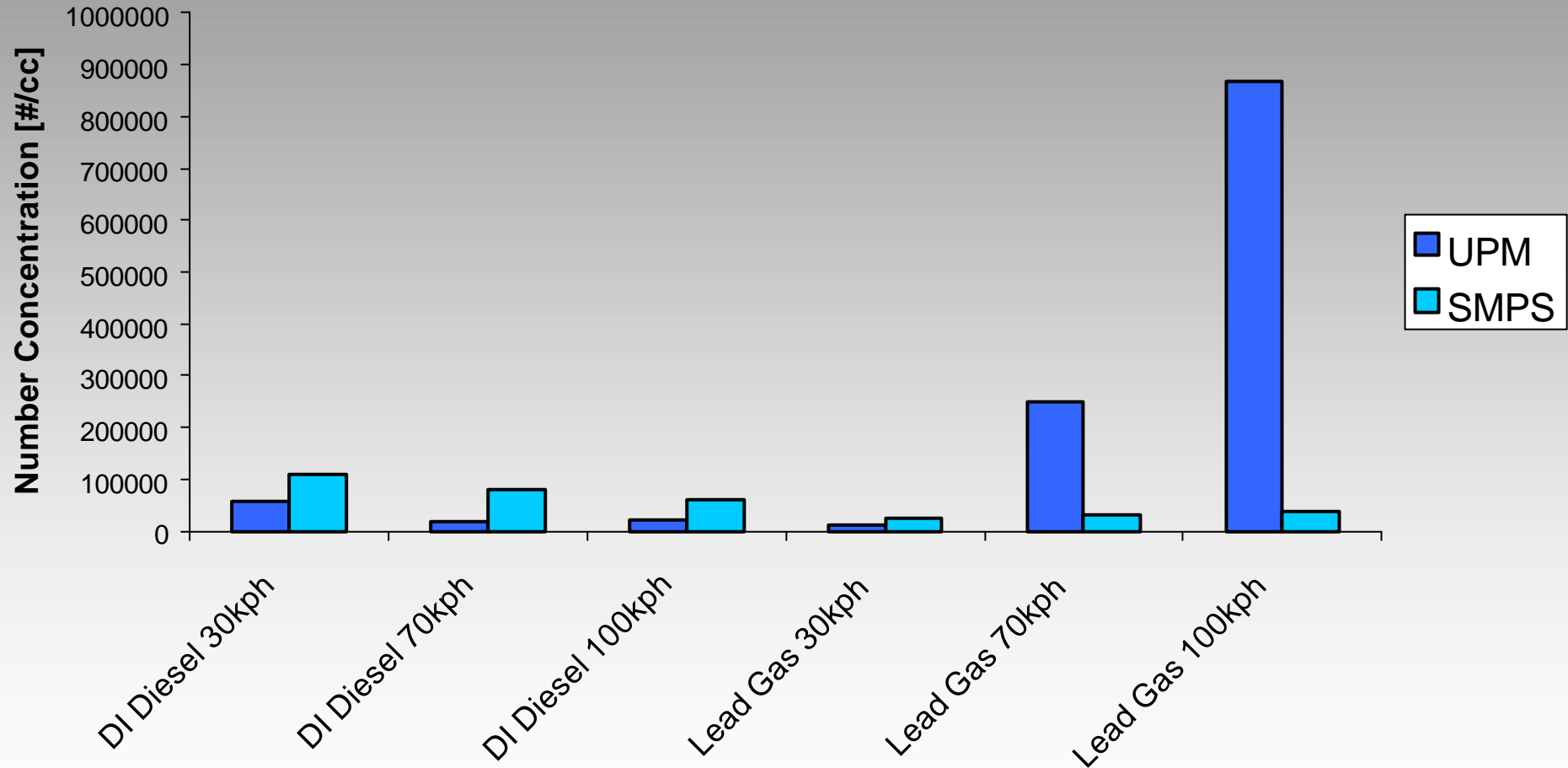
Vehicle Type - Mean Particle Number Concentration



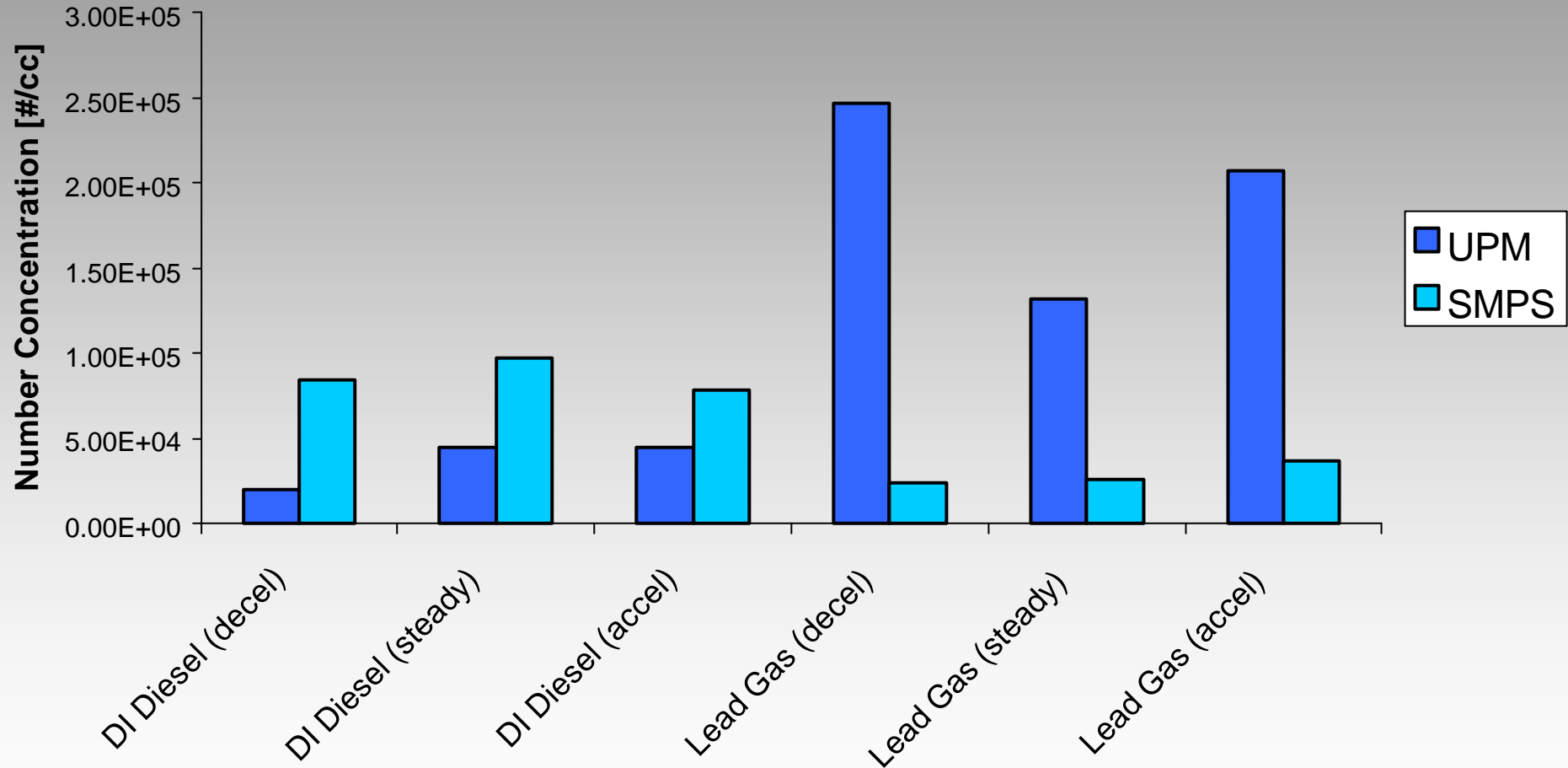
Vehicle Type - Mean Particle Number Concentration



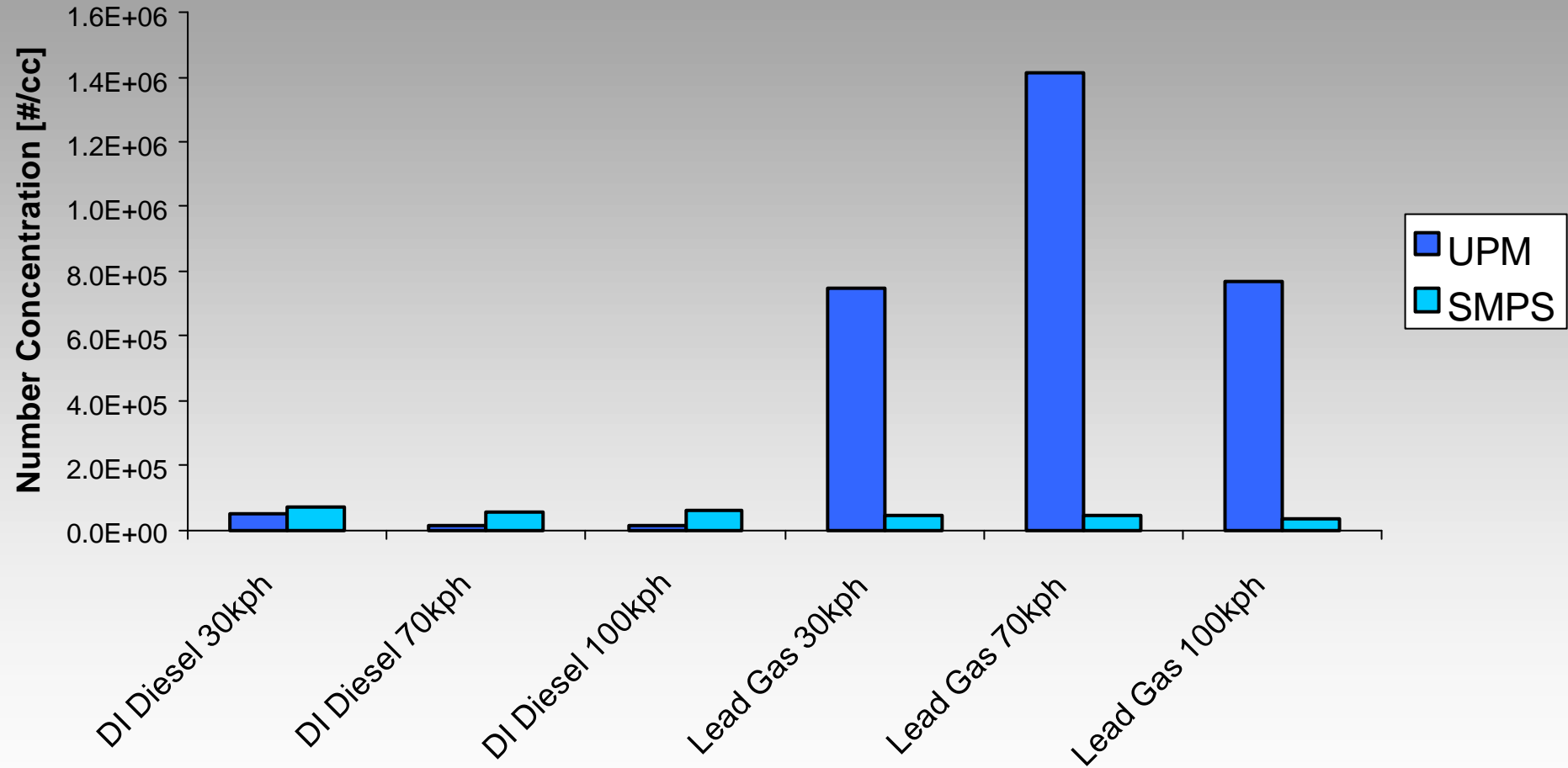
Vehicle Speed - Mean Particle Number Concentration



Vehicle Acceleration - Mean Particle Number Concentration



Vehicle near history



Conclusions

- Chase data doesn't contradict dyno work
- TWC gasoline - low particle emissions
- DI diesel - high ultrafine emissions
- Old gasoline - high nano-particle levels
- IDI diesel - high ultrafine & nano levels
- DI diesel levels decreased with speed
- Old gasoline levels increased with speed
- Gasoline levels related to “near history”

<http://www.aeat.co.uk/vpec>