Euro 5 Effect Study: Update on the Pre-Study, experimental programme

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Euro 5 Effect Study

EU Regulation No 168/2013

Article 23 (4)

By 1 January 2016, the Commission shall carry out a comprehensive environmental effects study. The study shall evaluate the air quality and the share of pollutants contributed by L-category vehicles and shall cover the requirements of test types I, IV, V, VII and VIII ...

Article 23 (5)

Based on the findings referred to paragraph 4, the Commission shall by 31 December 2016 present to the European Parliament and the Council a report …

Euro 5 Effect Study

Pre-study: Experimental Test Programme

(Sep14-Mar15, Input to Phase 1)

Phase 1: Stocktaking and data mining, stakeholder consultation, literature survey, detailed planning (including costs) for phases 2 and 3.

Phase 2: Modelling, verification testing and analysis, impact assessment

Phase 3: Validation and reporting

Euro 5 Effect Study

JRC in charge of: Pre-Study + Effect Study Phase 1

Phase 1:

- **Stocktaking and data mining:**
  - **Latest KBA type approval dataset**
  - **Market data from ACEM / Eurostat**

  } **Statistical analysis**

- **Stakeholders Consultation: developing the questionnaire. Inputs are welcome.**
- **Literature survey (Inputs are welcome):**
  - **Scientific Reports**
  - **Peer-reviewed articles**
  - **Reports at national level**
- **Planning of Phase 2 and 3 (Call for tender)**

Euro 5 Effect Study

Simplified time-line

	Dec 2014	Jan 2015	Mar 2015	Jun 2015
Pre-study	On-going	Finish tests	X	
Data mining	Collecting	Collecting	Assessment	X
Consultation	On-going	Launch	End	X
Literature	On-going	On-going	Draft	X
Call for Tender	On-going	X		

Pre-Study - Background

Emission laboratory test cycles are based on vehicle speed

Vehicle speed weakly correlates with engine load

→ Identify a commonly applicable engine load variable

→ Comparison of engine operation over test cycles with real-driving

Pre-Study - Structure

September 2014 – March 2015

Theoretical identification of a commonly applicable **engine load variable**

Experimental verification and validation **test programme**

Identification of appropriate **miniature emission test equipment** (Literature + Companies)

Recommendations, **Call for Tender**

Pre-Study - Experimental

Tested Vehicles: 75 roller bench tests so far

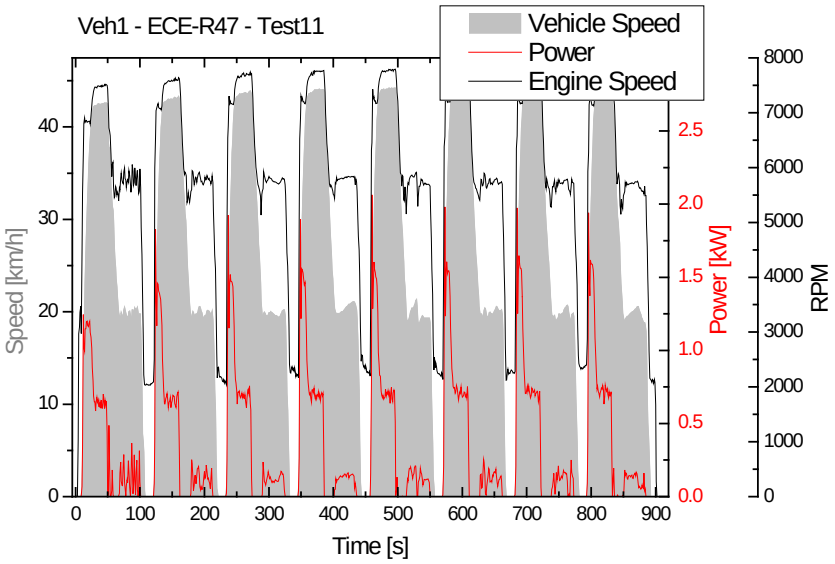
Vehicle	Cat	Stroke	Displacement [cm³]	Technology	Power [kW]	Mileage [km]	Year	Euro
1	L1e-B	4	49.9	Carburetor 2-way-cat	3.4	2500	2010	2
2	L1e-B (25 km/h)	4	50	Carburetor 2-way-cat	3.2	2000	2012	2
3	L3e-A2	4	400	I.E. 2-way-cat	24	27000	2013	3
4	L3e-A3	4	909	I.E. 2-way-cat	100	15000	2006	2
5	L7e-A1	4	496	I.E. 2-way-cat	14.4	500	2014	2

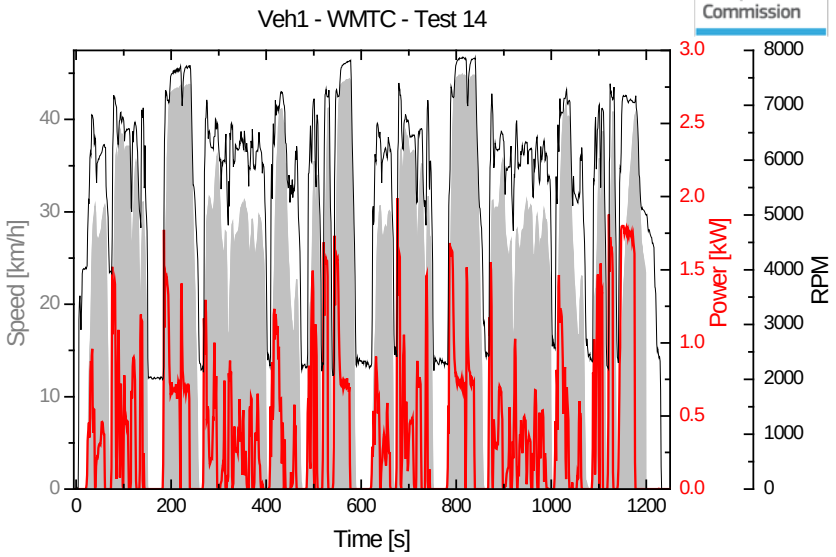
Pre-Study - Experimental

Planned Tests

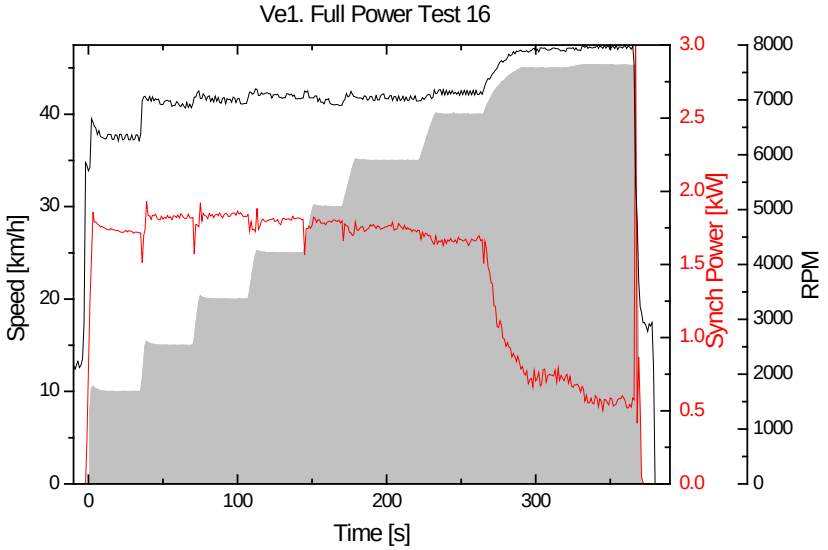
Vehicle	Cat	Stroke	Displacement [cm³]	Technology	Power [kW]	Mileage [km]	Year	Euro
6	L1e-B	2	50	Carburetor 2-way-cat	2.6	2500	2010	2
7	L3e-A2	4	278	I.E. 2-way-cat	16.4	3000	2012	3
8	L7e-A1							
9	L1e-B (gear-shift)							
10	L3e-A3							

Preliminary Results



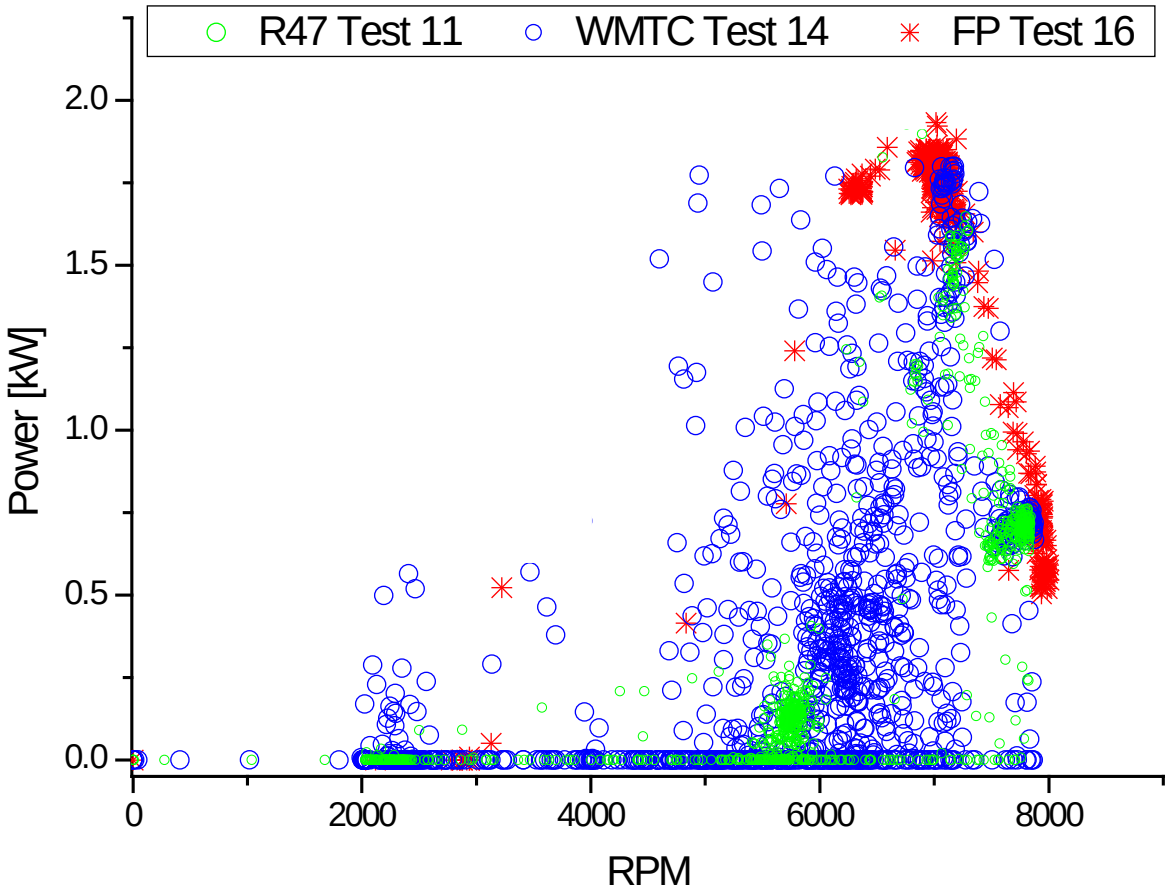


Vehicle 1 on different driving cycles

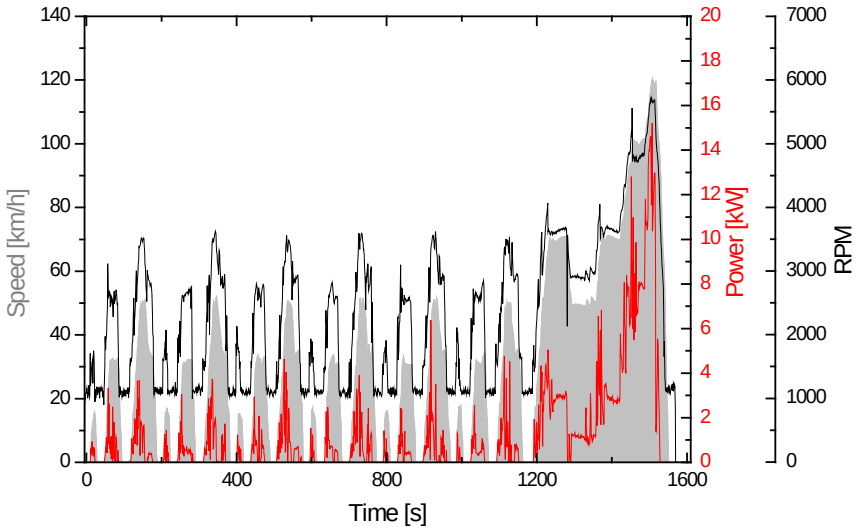


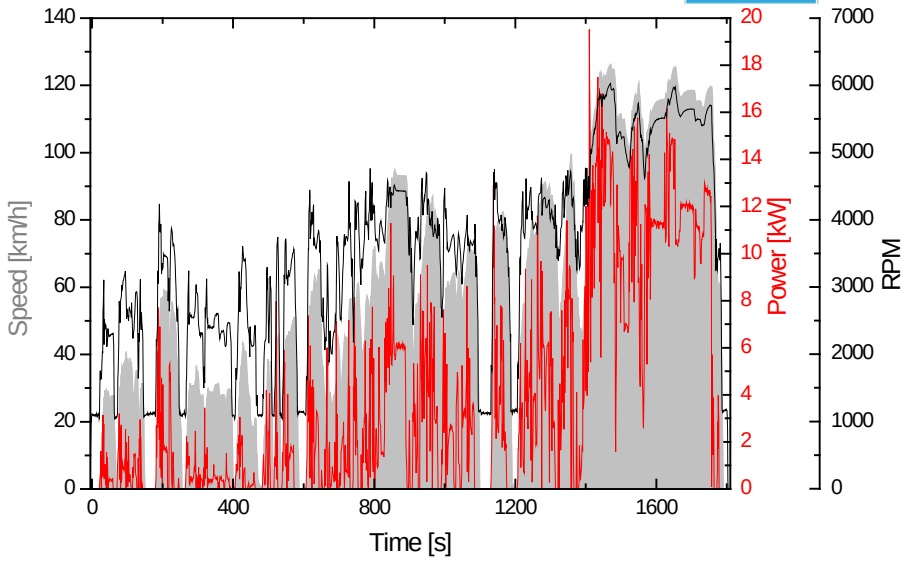
Preliminary Results

Veh1. Comparison of Power at the wheel VS engine speed for different cycles. Vehicle with CVT.

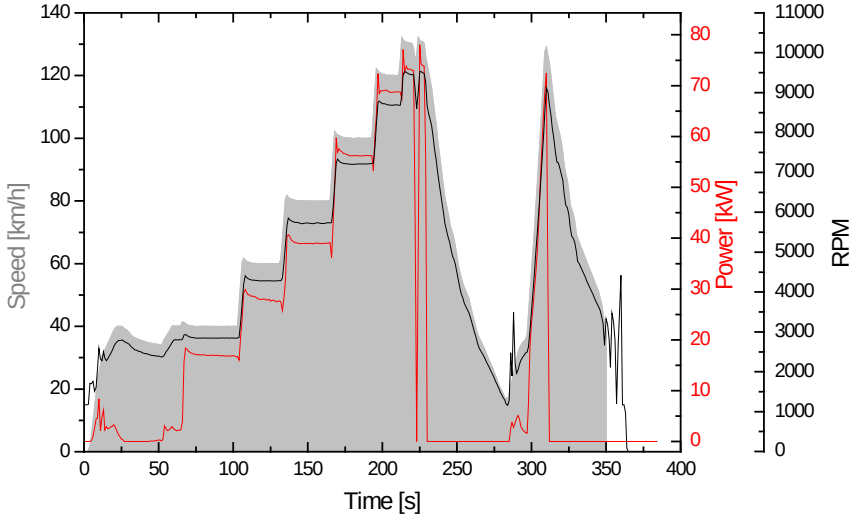


Preliminary Results



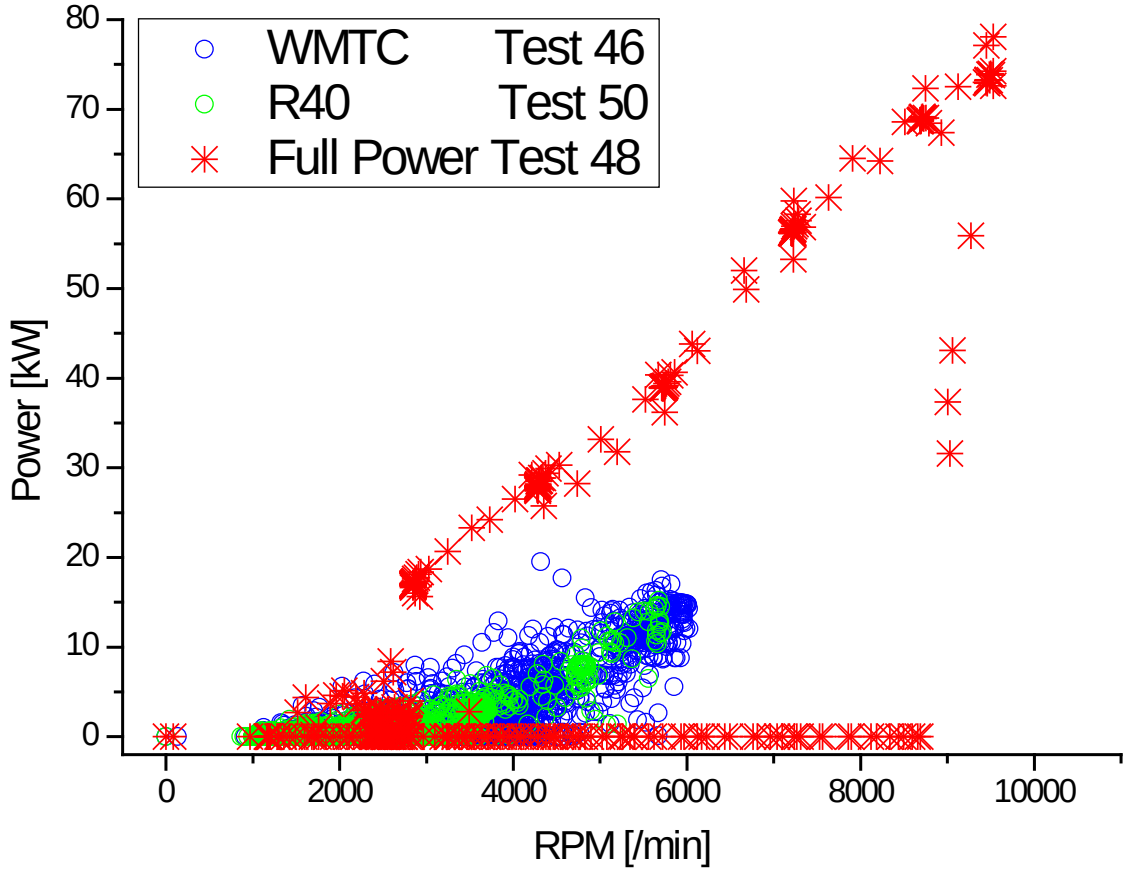


Vehicle 4 on different driving cycles: ECE-40, WMTC, Full Power



Preliminary Results

Veh4. Comparison of Power at the wheel VS engine speed for different cycles. Vehicle with gear shift.



Preliminary Results

Example of load variables

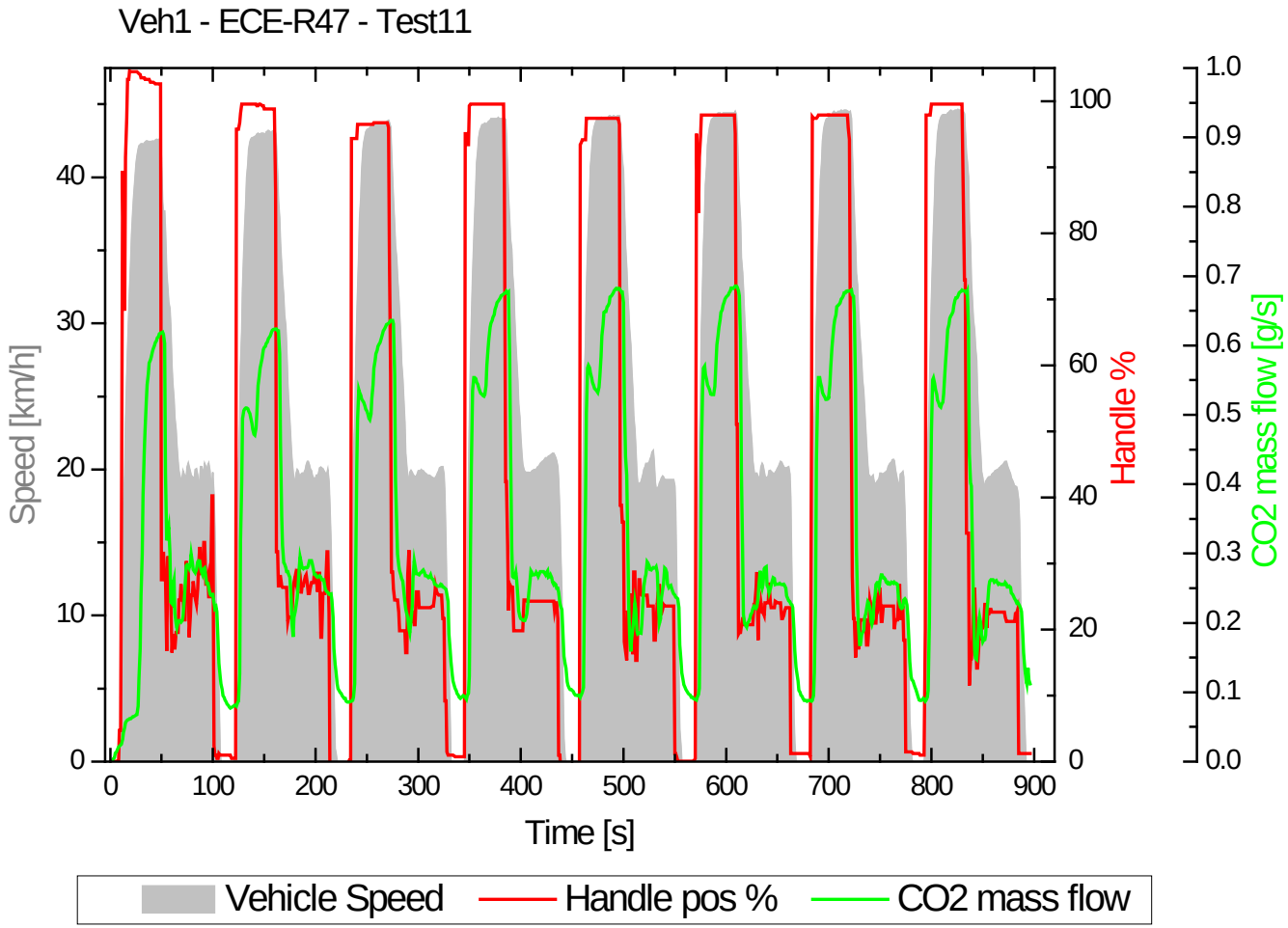
- CO2 tailpipe mass flow
- Exhaust flow rate
- Handle position sensor (most L-cat)
- Throttle Position Sensor (ECU)
- Fuel consumption
- …

Preliminary Results

Handle position sensor

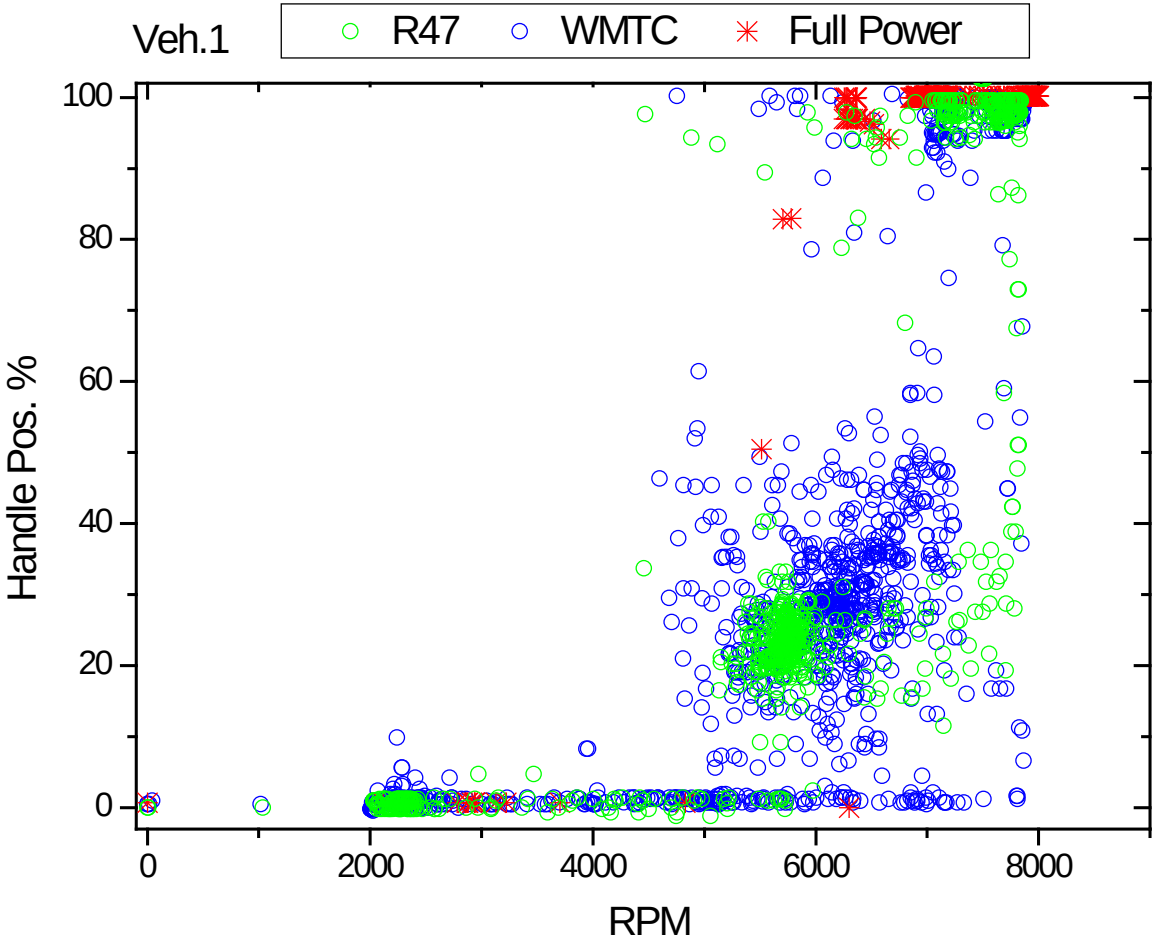
Preliminary Results

Example of load variables



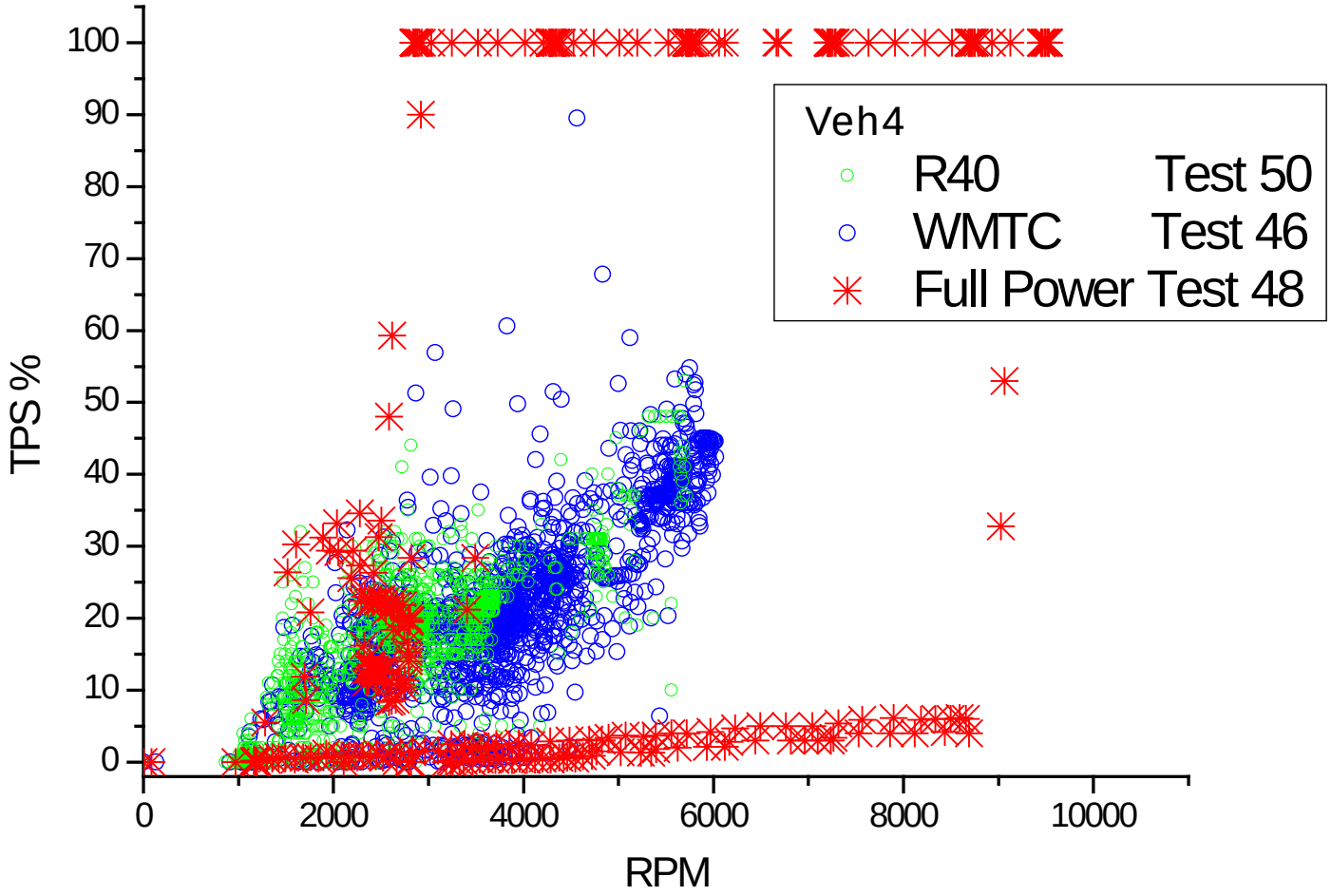
Preliminary Results

Example of load variables



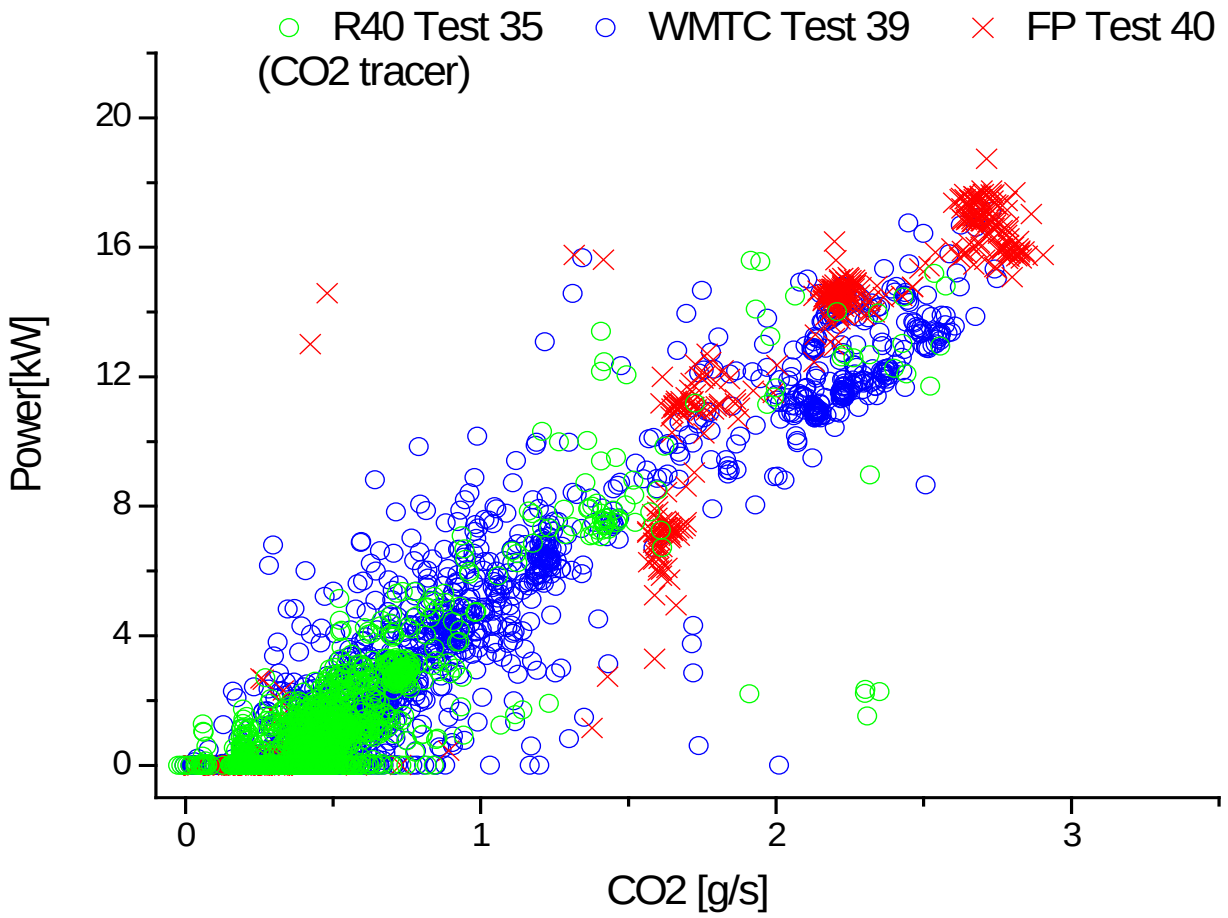
Preliminary Results

Example of load variables



Preliminary Results

Example of load variables: correlation exercise (Veh3)



Next steps

- Complete test matrix on chassis dyno
- Short-list the engine load variables

  based on test results
- Include other vehicles (mini-cars, diesel)

Thanks for your attention!