



Evaluation of the Draft UNECE EVE Power Determination Test Procedure – Results

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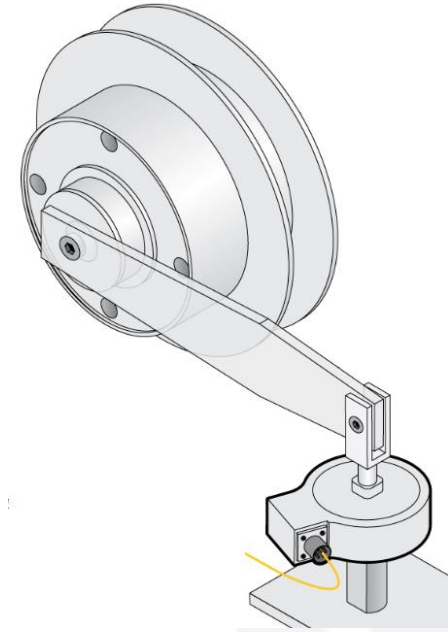
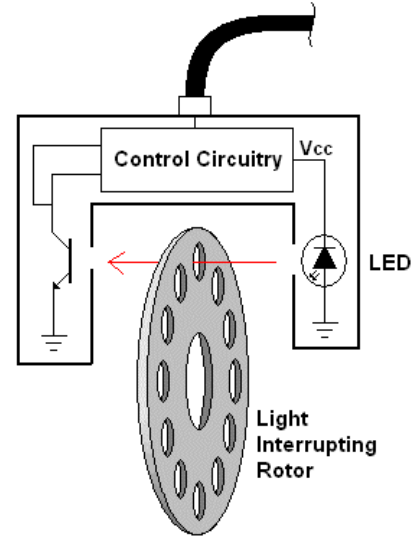
Test Specimens

Metric	2018 BMW 530e	2016 Chevrolet Volt	2018 Prius Prime	2009 Saturn Vue
Engine	2.0 TwinPower Turbo I-4	1.5L DOHC I-4 DFI	1.8L AI DOHC 16VVT-i i4	L4 DOHC 16VVT 2.4L i-4
Combined Motor-Engine Power (kW)	185	110	90	127
Type	Lithium-ion	Prismatic NMC-LMO Pouch	Lithium-ion	NiMH
Capacity (kWh)	9.2	18.4	8.79	
Voltage (V)	351	360	351.5	36
Drivetrain Structure	Parallel	Series/Parallel	Series/Parallel	BAS
All-Electric Range (km)	24	85	40	0
Fuel Consumption (L/100km)	8.11	5.74	4.4	8.4
GVWR (lb)	5470	4438	3946	4900
Curb Weight (lb)	4385	3560	3365	3789

HIOKI



Dynamometer



Wheel torque sensors



Instrumentation

OBD Scantool



Instruments and Accuracy

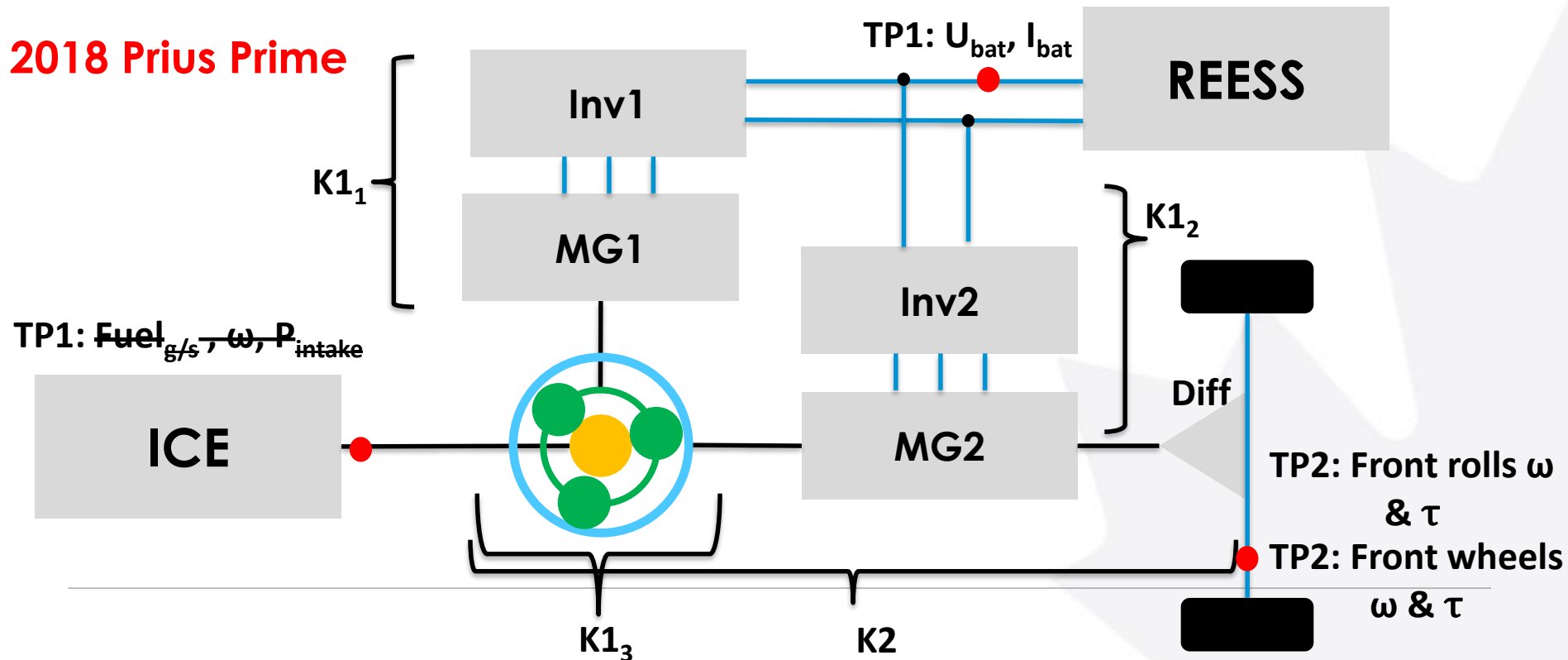
Metric	Units	Accuracy	Instrument
Engine Speed	min ⁻¹	±0.5%	OBD Scantool
Intake Mainfold Pressure	Pa	±50Pa	OBD Scantool
Atmospheric Pressure	Pa	±0.3kPa	Vaisala
Humidity	%	± 1.0 %	Vaisala
Fuel Flow Rate	g/s	± 3%	OBD Scantool
Electrical Voltage	V	± 0.3%	HIOKI
Electrical Current	A	± 0.3%	HIOKI
Electrical Energy	Wh	± 1%	HIOKI
Room Temperature	K	± 0.2 °C	Vaisala RTD
Chassis Dyno roller Speed	Km·h ⁻¹	± 0.2kph	Optical Speed Sensor on dyno shaft
Time	s	± 10ms	Dyno computer
Axle/Wheel rotational speed	s ⁻¹	± 0.05 s ⁻¹ or 1% (greater)	Wheel Torque Sensors
Axle/Wheel torque	Nm	± 6Nm or 0.5% of max total toque, (greater)	Wheel Torque Sensors

Instrumentation Summary

Metric	2018 BMW 530e	2016 Chevrolet Volt	2018 Prius Prime	2009 Saturn Vue
Wheel Torque Sensors	Front Passenger & Rear Driver side	Front Axle	Front Axle	Front Axle
OBD	Diagra D (partial)	GM MDI (partial)	Techstream (full)	GM MDI (partial)
Dynamometer	All pertinent metrics	All pertinent metrics	All pertinent metrics	All pertinent metrics
HIOKI	U and I at battery	U and I at battery	U and I at battery	U and I at battery

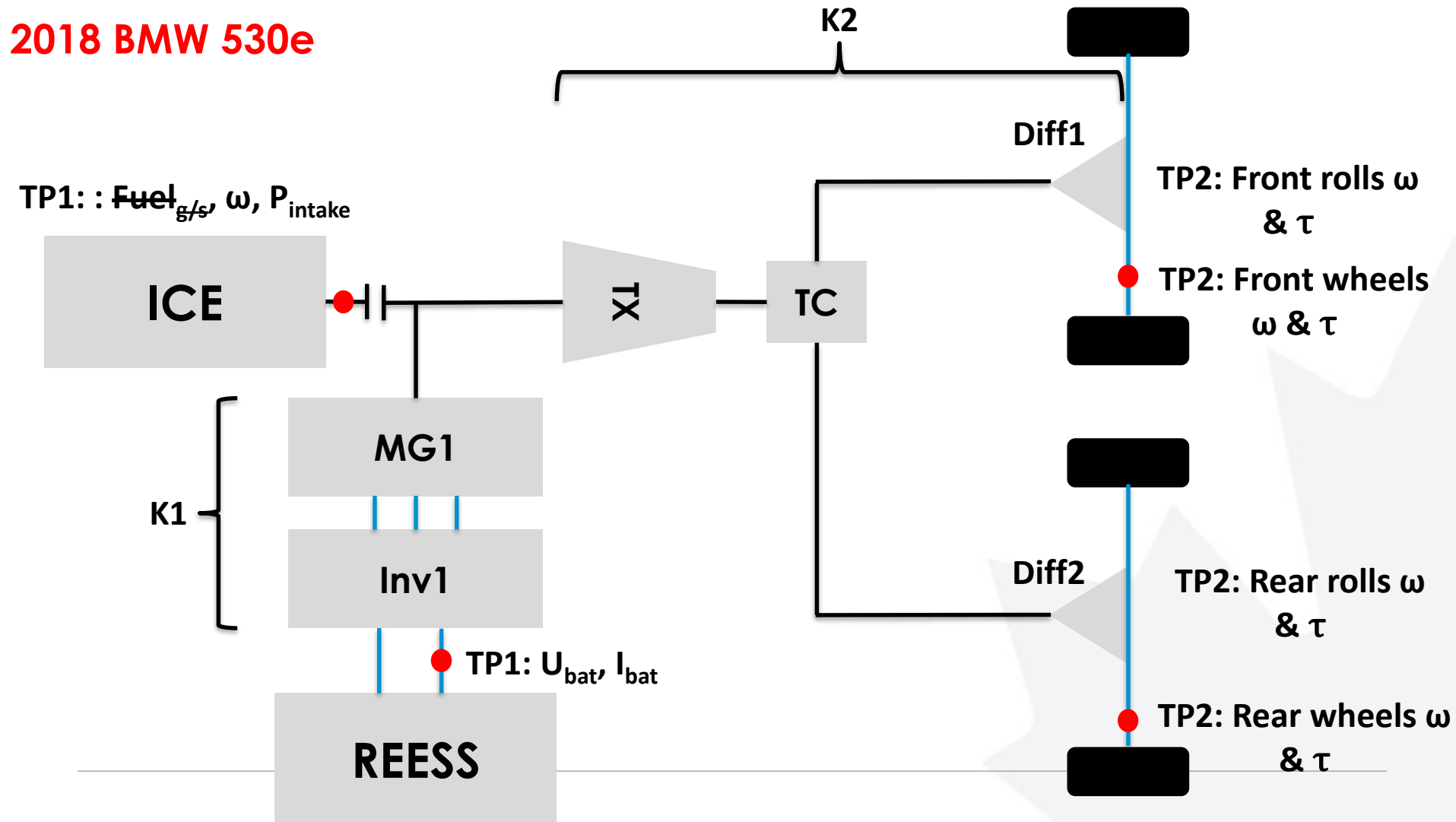
Experiences with the GTR – Section 6.5

3. Section 6.5 - Instrument the vehicle in the appropriate locations to measure TP1 AND TP2 (for purposes of this validation testing)



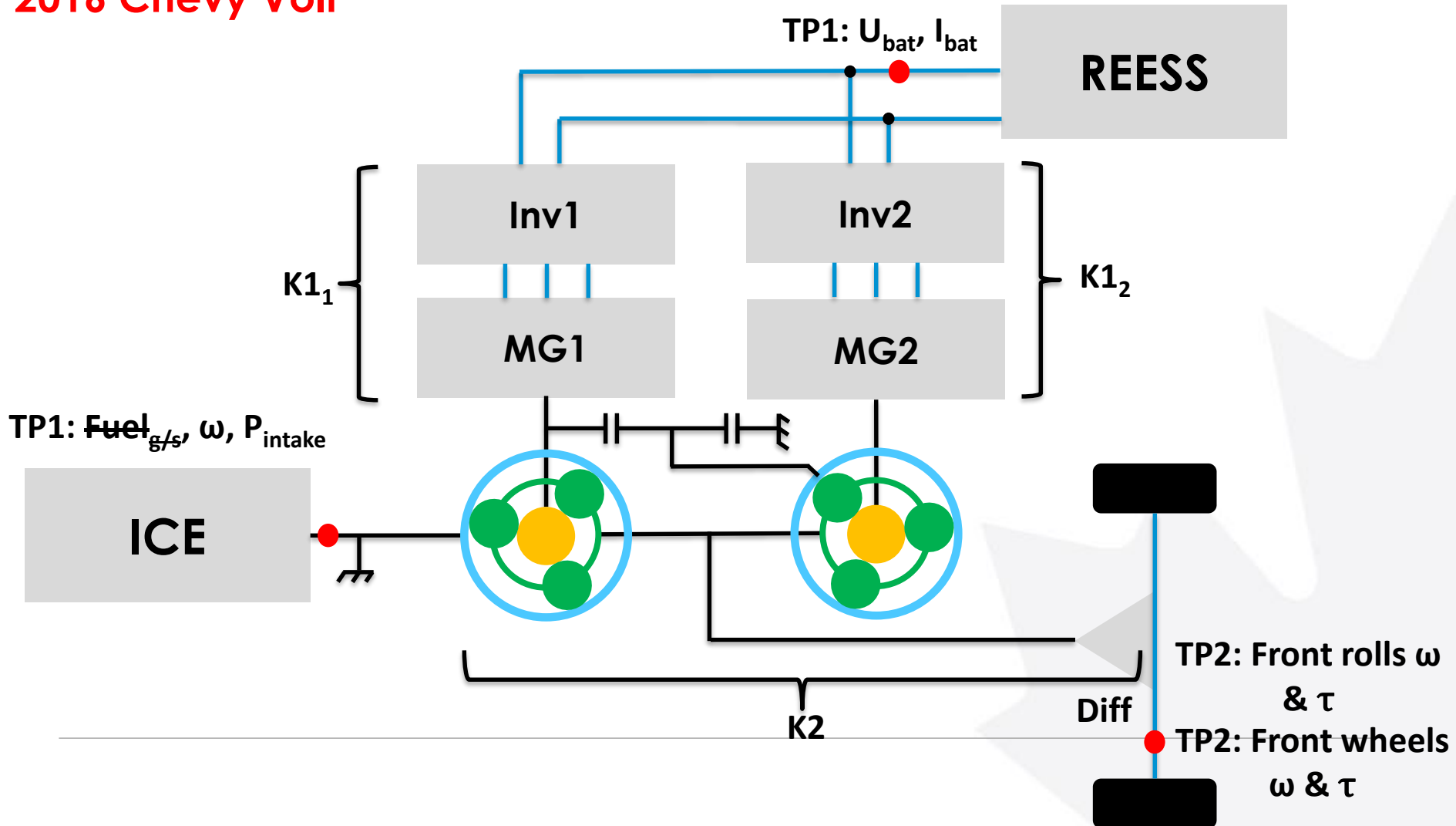
Experiences with the GTR – Section 6.5

2018 BMW 530e



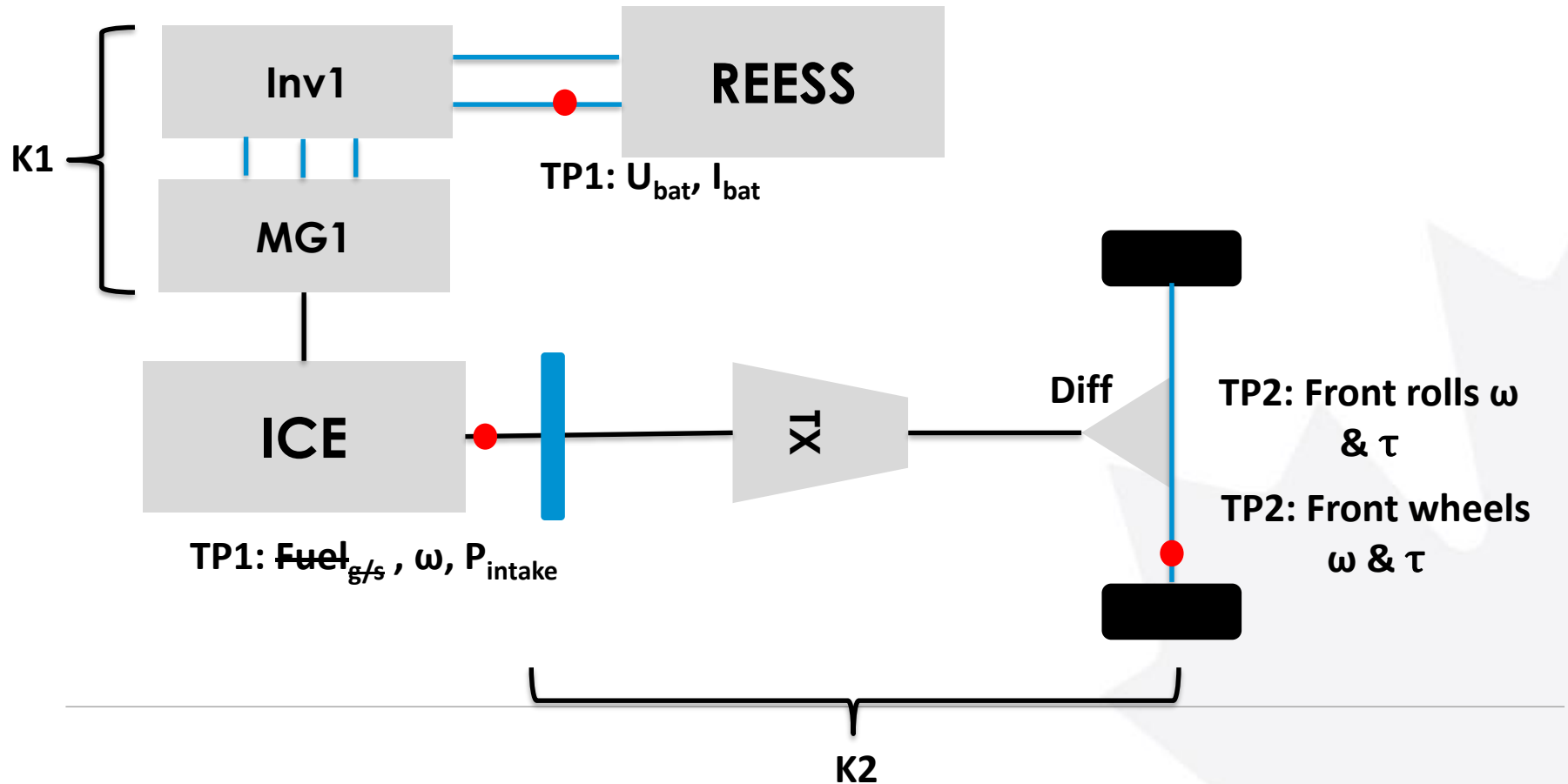
Experiences with the GTR – Section 6.5

2016 Chevy Volt

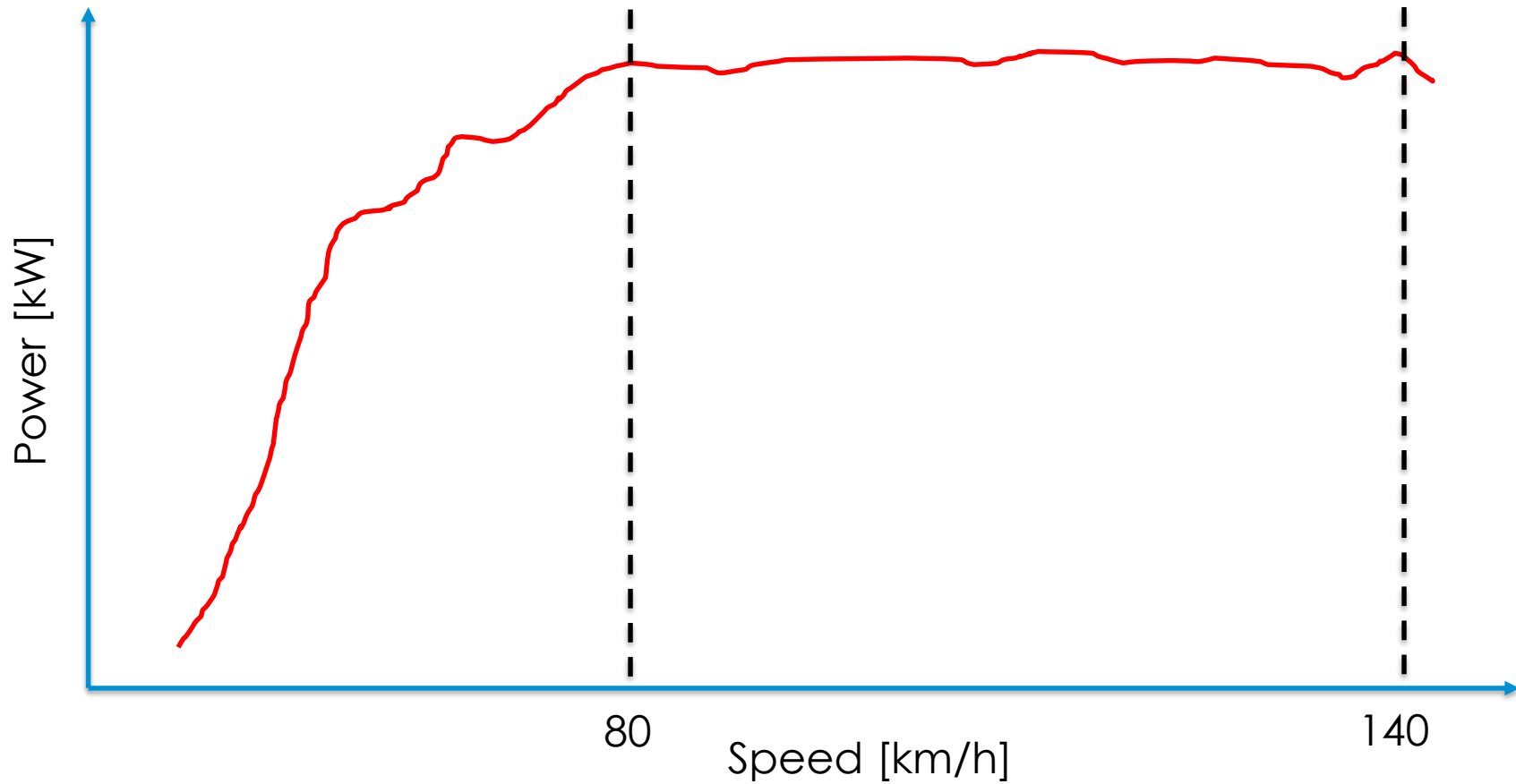


Experiences with the GTR – Section 6.5

2009 Saturn Vue



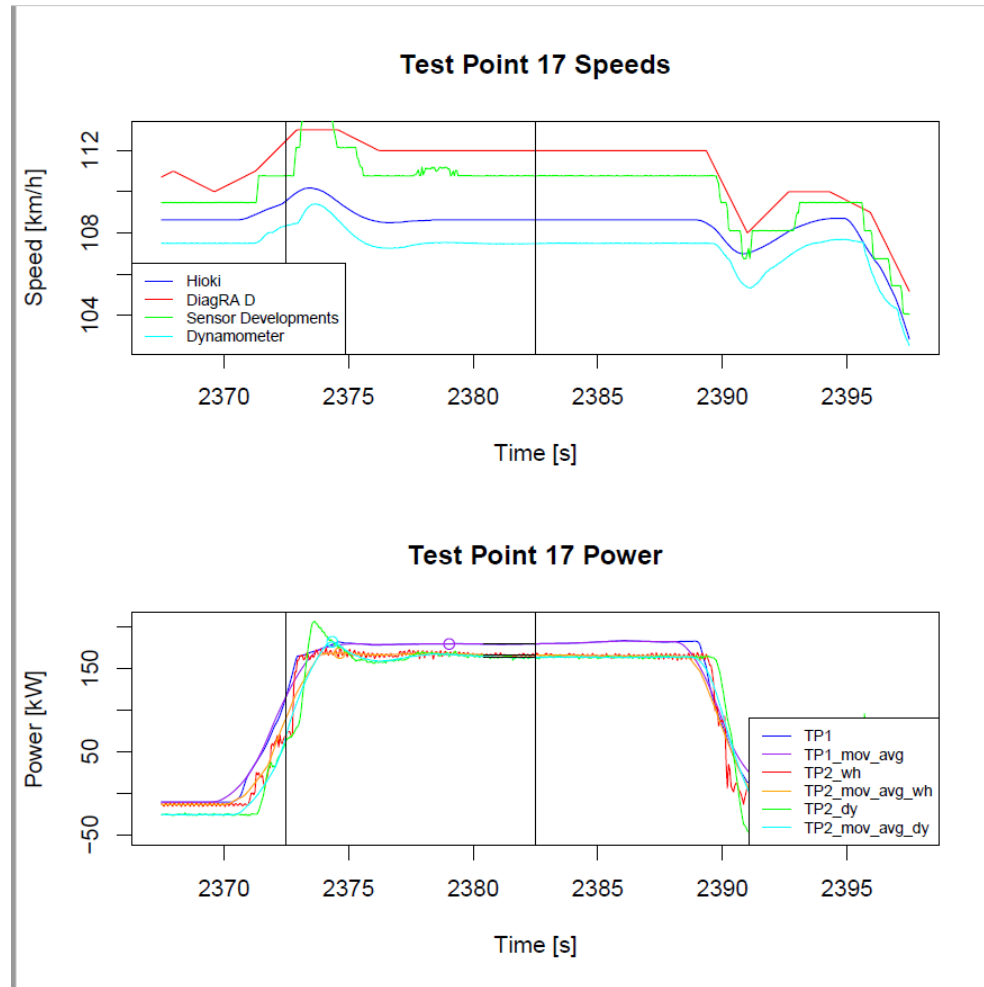
Experiences with the GTR – General



K factors used

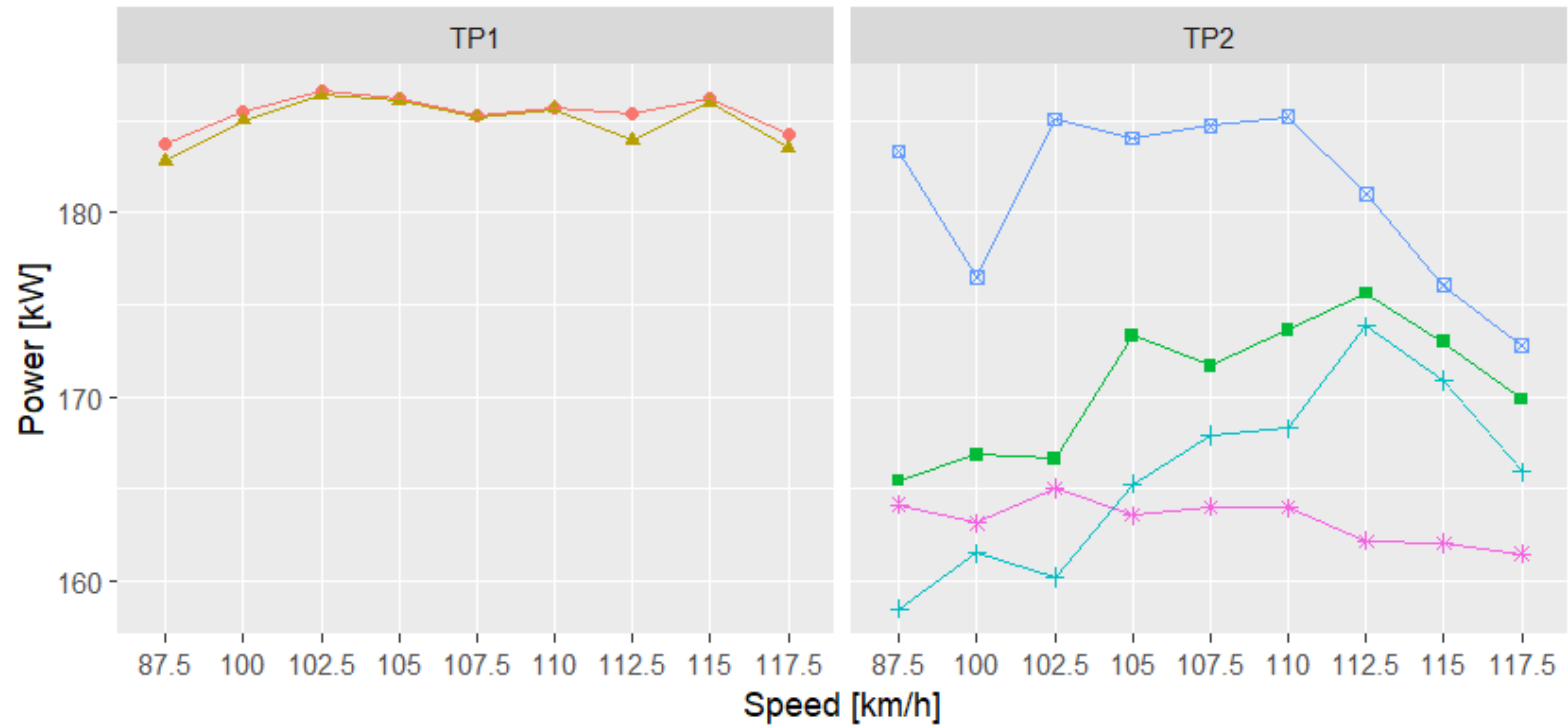
- BMW 530e, $K1 = 0.85$, $K2 = 0.96$
 - Chevrolet Volt, $K1 = 0.85$, $K2 = 0.93$
 - Prius Prime, $K1 = 0.85$, $K2 = 0.93$
 - Saturn Vue, $K1 = 0.85$, $K2 = 0.96$
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Speed and Power Peaks during procedure



BMW TP1 and TP2 results

Power Determination

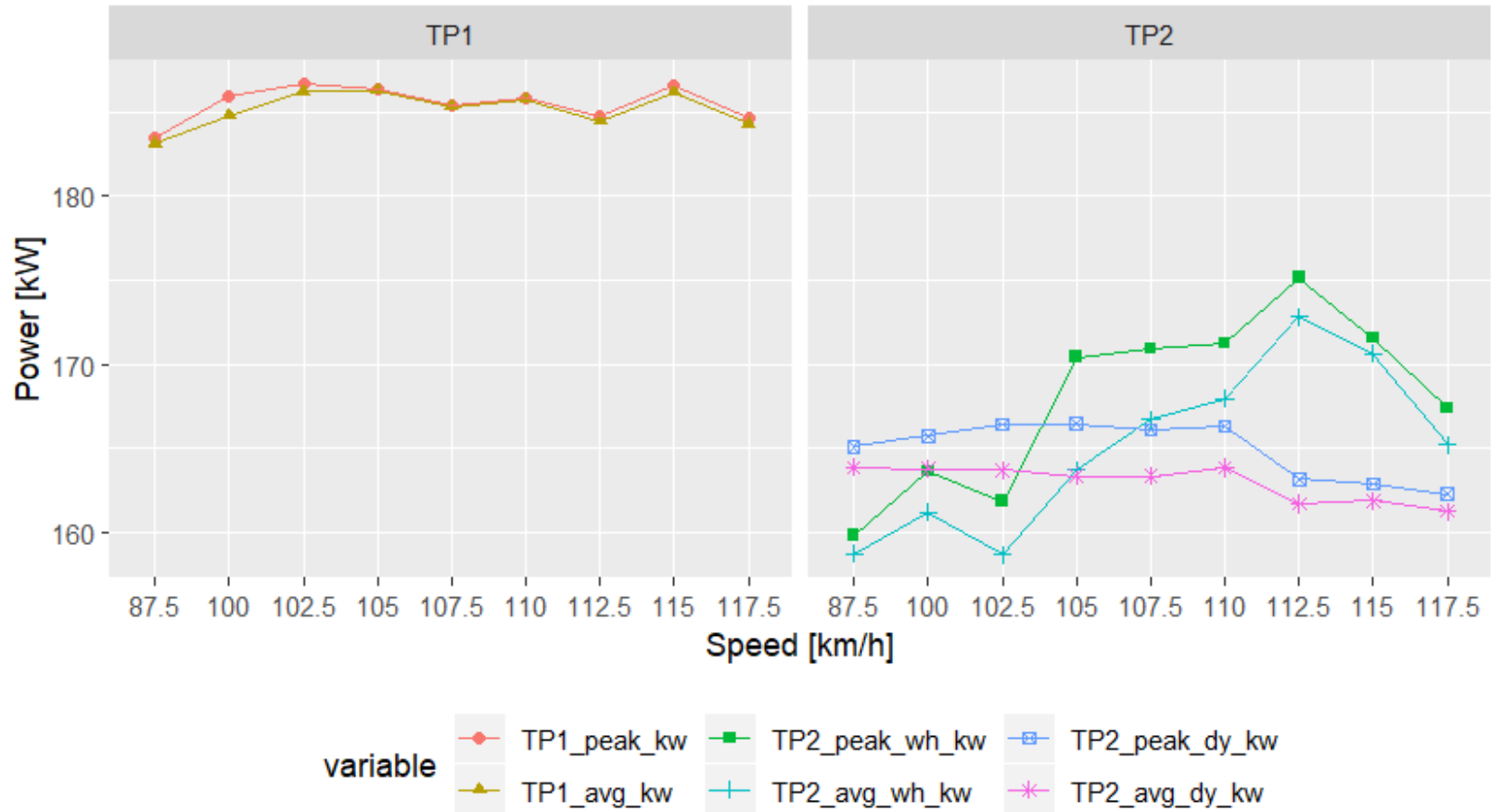


variable

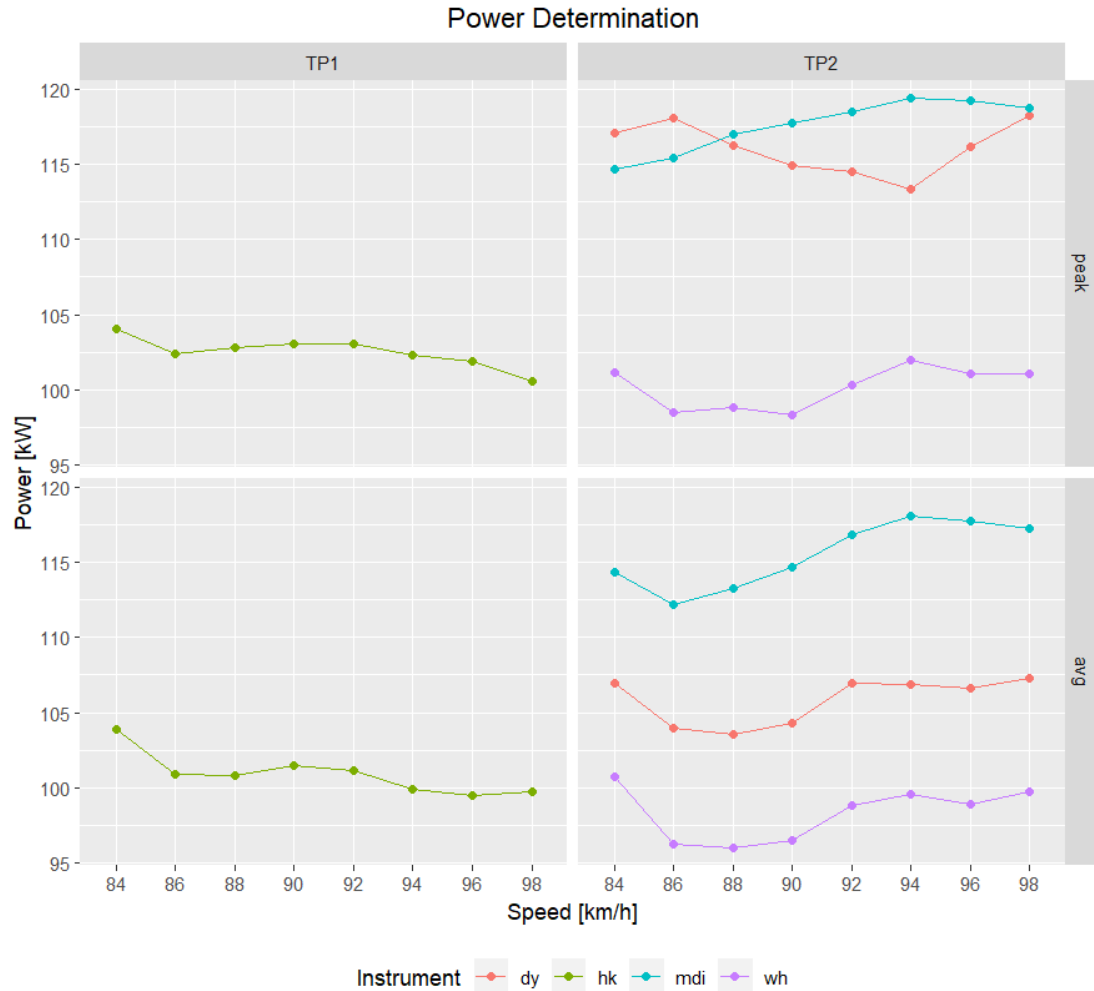
TP1_peak_kw	TP2_peak_wh_kw	TP2_peak_dy_kw
TP1_avg_kw	TP2_avg_wh_kw	TP2_avg_dy_kw

BMW TP1 and TP2 results with delay

Power Determination



Chevrolet Volt TP1 and TP2 results



Summary

- Default K-factors were used (K1 generally 0.85 and K2 between 0.93 and 0.96)
 - Large discrepancies between TP1 and TP2 results indicate that instruments may not have been accurate, or K-factors could have been incorrect, or both
 - TP1 generally appears to line up best with published data on vehicle rated power
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