

Revision of ECE R41

First analysis of the Informal GRB R41 TF database

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Content and structure

- **44 vehicles**
 - 11 from Japan,
 - 5 from ACEM,
 - 11 from INDIA,
 - 2 from USSMA,
 - 15 from BASt
- **No results from INDIA for current ECE R41,**
- **Detailed results (single measurements) for**
 - ECE R41 from Japan and ACEM,
 - ISO 362-2 from Japan and ACEM,
 - ASEP from Japan, ACEM, INDIA, USSMA,
 - Roadside enforcement from Japan, ACEM
- **The following tables show the technical data of the vehicles.**

Technical data

testing body	Idveh database	transmission type	veh number	veh class	veh cat	no of gears	eng cap in cm ³	rated power in kW	rated speed in min-1	idling speed in min-1	v_max in km/h	kerb mass in kg	pmr in kW/t
JAPAN	1	m	J1	L3	3	6	498	33	8300	1300	160	200	120.0
JAPAN	2	m	J2	L3	3	5	660	35.3	6000	1400	160	189	133.7
JAPAN	3	CVT	J3	L3	3		499	32.6	7500	1200	165	225	108.7
JAPAN	4	CVT	J4	L3	3		400	25	7300	1450	145	215	86.2
JAPAN	5	m	J5	L3	3	6	656	57	10100	1200	200	224	190.6
JAPAN	6	m	J6	L3	3	6	996	69	8000	1200	200	272	198.8
JAPAN	7	m	J7	L3	3	6	599	80	12500	1300	254	199	292.0
JAPAN	8	m	J8	L3	3	5	1552	54	5300	950	185	317	137.8
JAPAN	9	CVT	J9	L3	1		49	3.6	8000	1300	60	77	23.7
JAPAN	10	CVT	J10	L3	3		249	16	7500	1400	120	171	65.0
JAPAN	11	m	J11	L3	3	5	399	24	8000	1300	135	264	70.8
ACEM	12	m	ACEM-1	L3	3	6	674	90.5	12500	1200	260	186	347.0
ACEM	13	m	ACEM-2	L3	3	5	2298	103.5	6000	750	216	350	242.0
ACEM	14	m	ACEM-3	L3	3	6	998	89	9250	1300	245	203	320.0
ACEM	15	CVT	ACEM-4	L3	2		125	10.63	8750	1725	110	166	42.1
ACEM	16	CVT	ACEM-5	L3	2		125	10.1	9000	1500	100	135	48.1

Table 1a

Technical data

testing body	Idveh database	transmission type	veh number	veh class	veh cat	no of gears	eng cap in cm ³	rated power in kW	rated speed in min-1	idling speed in min-1	v_max in km/h	kerb mass in kg	pmr in kW/t
INDIA	17	m	ID1	L3	2	4	124.5	8.47	8000			125	42.4
INDIA	18	m	ID2	L3	2	4	99.3	6.03	7500			109	32.8
INDIA	19	m	ID3	L3	2	4	124.7	6.72	8000		90	117	35.0
INDIA	20	m	ID4	L3	2	5	149.1	9.5	8000		101	141	44.0
INDIA	21	m	ID5	L3	2	4	106	5.59	7500		85	113	29.7
INDIA	22	m	ID6	L3	2	5	125	6.5	7000		90	120	33.3
INDIA	23	m	ID7	L3	3	5	499	16.5	5500			180	64.7
INDIA	24	m	ID8	L3	3	5	223	12.7	7000		125	150	56.4
INDIA	25	CVT	ID9	L3	2		94.8	5.38	7500			99	30.9
INDIA	26	CVT	ID10	L3				8.5	7500			136	40.3
INDIA	27	CVT	ID11	L3	2		87.8	3.68	6500		60	95	21.6
USMMA	28	m	USMMA-	L3	3	5	1450	87.6	8300	1000		381	229.7
USMMA	29	m	USMMA-I	L3	3	5	1130	55.8	5300	1000		377	147.9

Table 1b

Technical data

testing body	Idveh database	transmission type	veh number	veh class	veh cat	no of gears	eng cap in cm ³	rated power in kW	rated speed in min-1	idling speed in min-1	v_max in km/h	kerb mass in kg	pmr in kW/t
Bast	30	m	G1	L3	3	5	599	57	10500	1100		219	193.9
Bast	31	m	G2	L3	3	6	599	72	12000	850		221	243.2
Bast	32	m	G3	L3	3	6	1352	140	9500	950		252	428.1
Bast	33	m	G4	L3	3	5	680	48	8000	1220		258	144.1
Bast	34	m	G5	L3	3	5	1284	85	7500	1000		252	259.9
Bast	35	m	G6	L3	3	6	1157	123	10250	1210		248	380.8
Bast	36	m	G7	L3	3	6	798	62.5	8000	1220		204	224.0
Bast	37	m	G8	L3	2	5	125	11	11000	1500		162	46.4
Bast	38	m	G9	L3	3	6	998	72	8000	1210		250	221.5
Bast	39	m	G10	L3	3	5	1157	72	8500	890		242	227.1
Bast	40	m	G11	L3	3	6	897	63	7500	1160		221	212.8
Bast	41	m	G12	L3	3	5	660	35	6250	1500		191	131.6
Bast	42	m	G13	L3	3	6	656	57	10100	1200		229	187.5
Bast	43	CVT	G14	L3	3		244	16	8500	840		153	70.2
Bast	44	CVT	G15	L3	2		125	10	8750	1000		166	41.5

Table 1c

Results

- The following figures show the detailed results for all methods versus engine speed per vehicle.

Detailed results versus engine speed

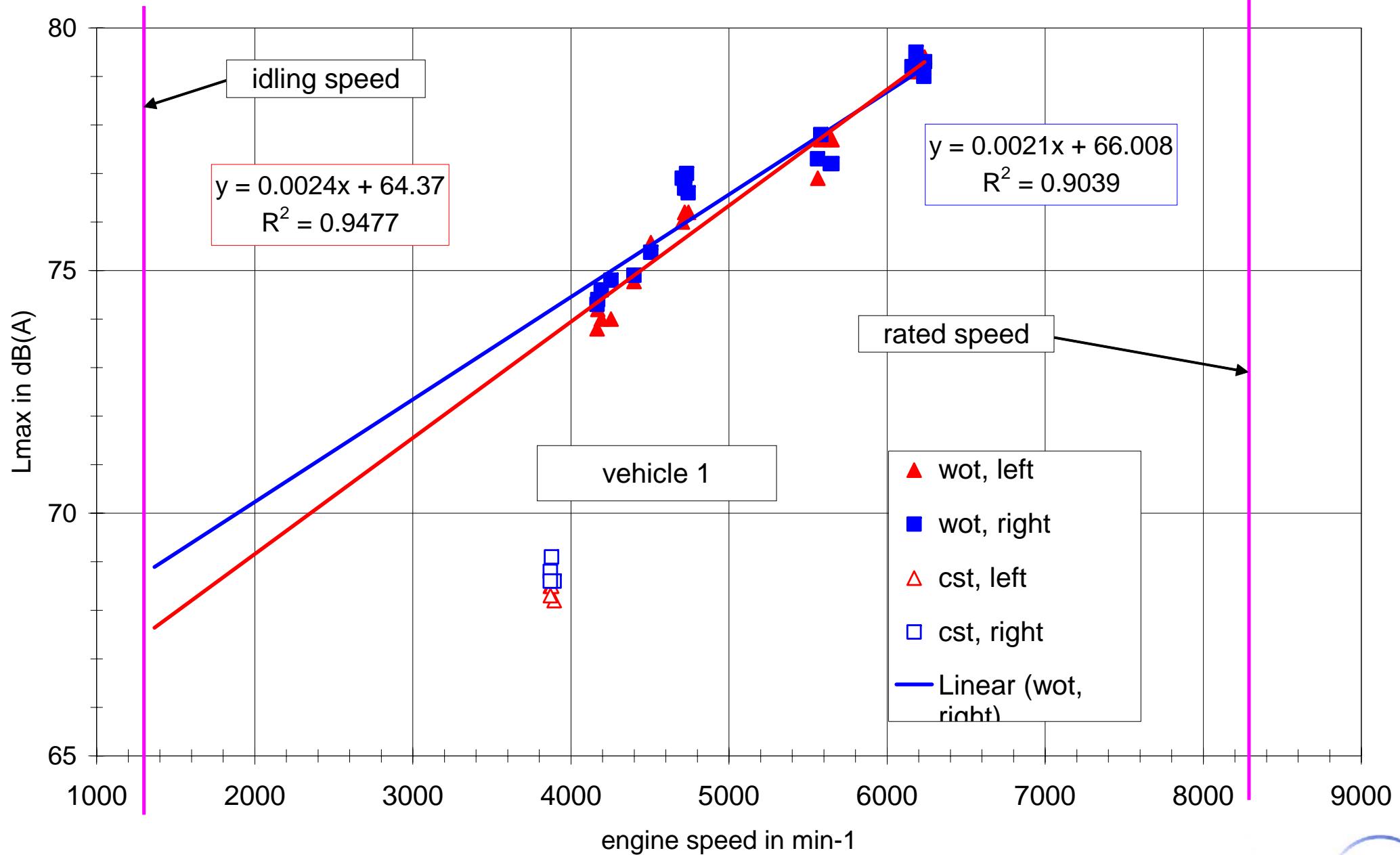


Figure 1

Detailed results versus engine speed

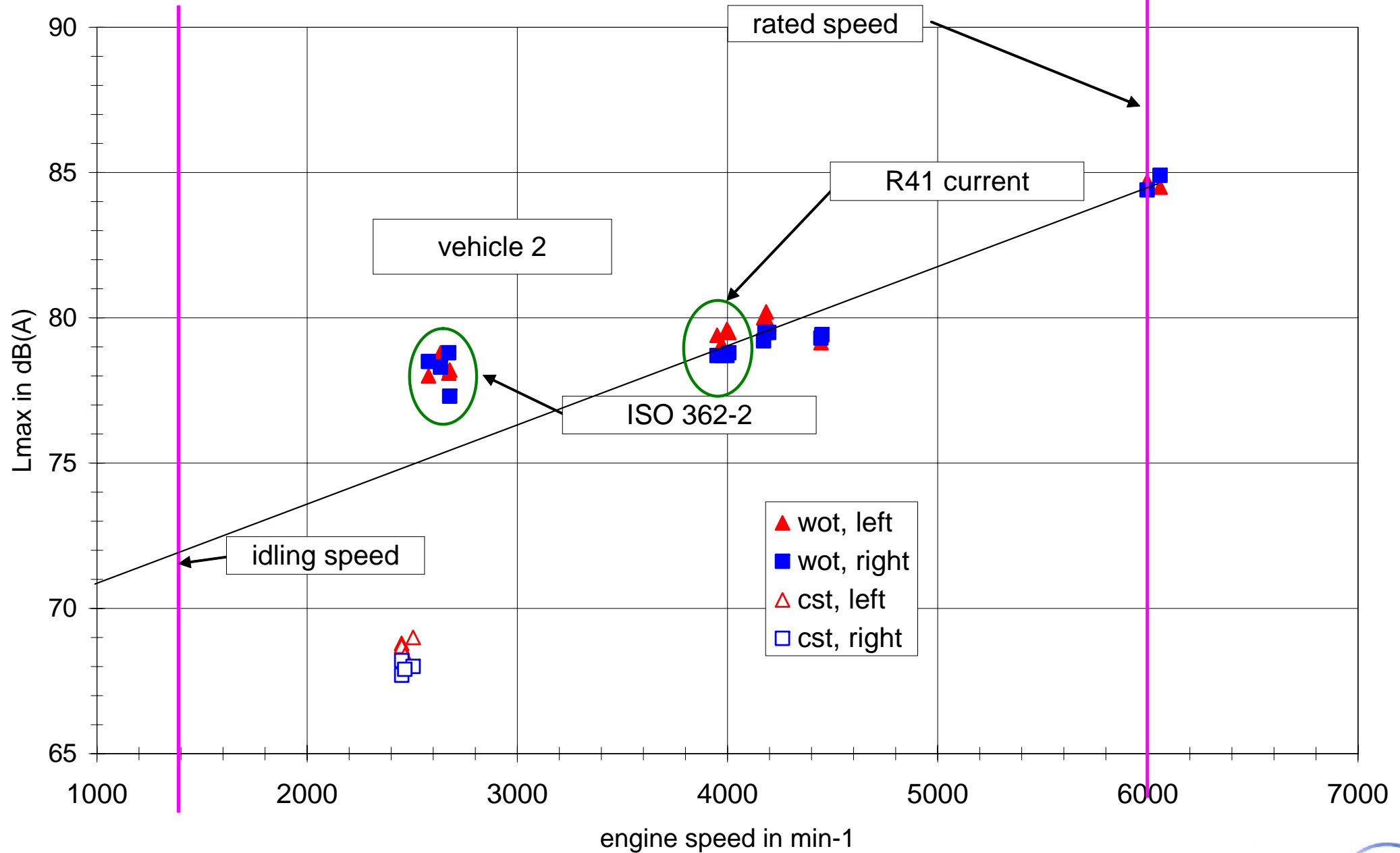


Figure 2

Detailed results versus engine speed

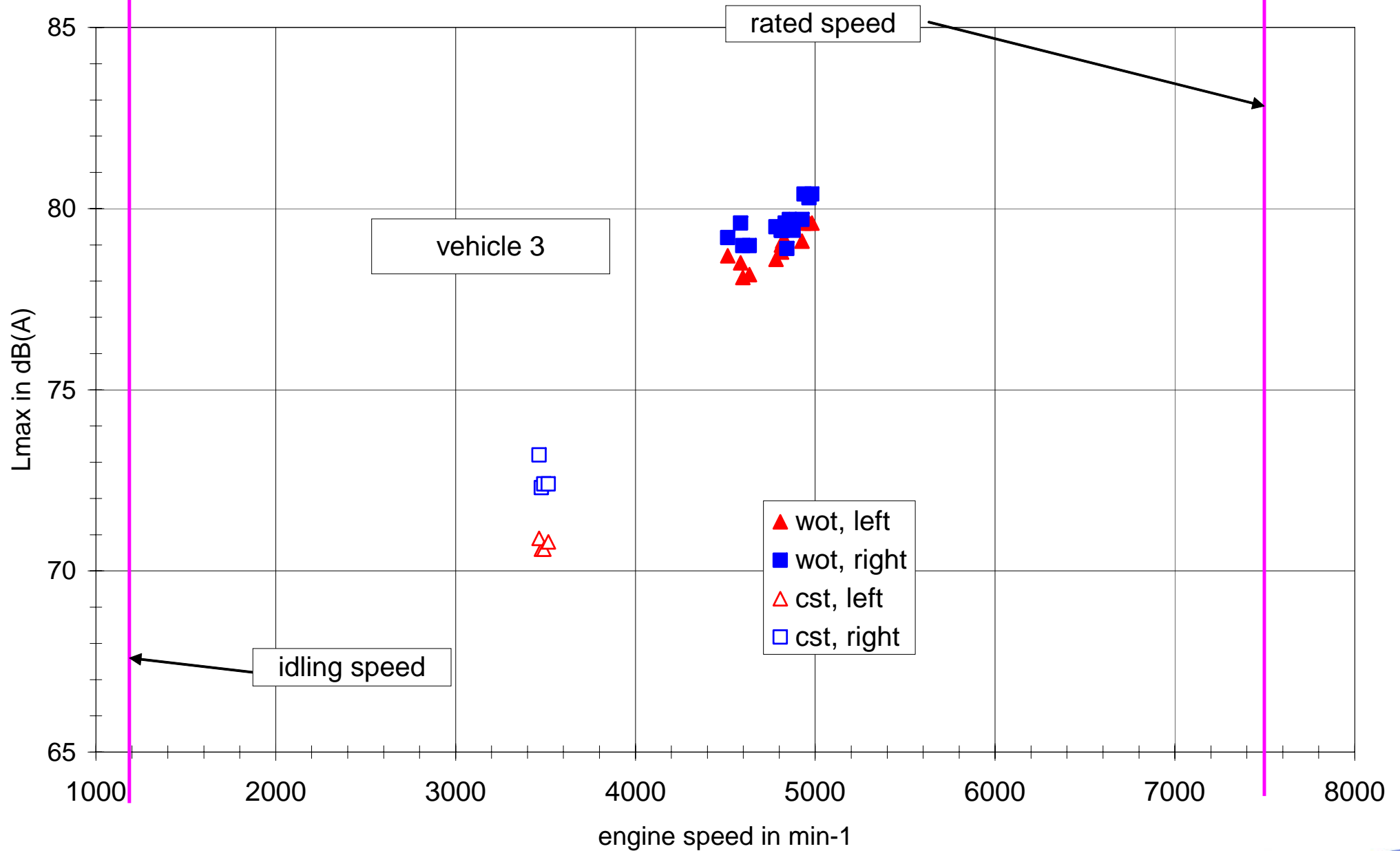


Figure 3

Detailed results versus engine speed

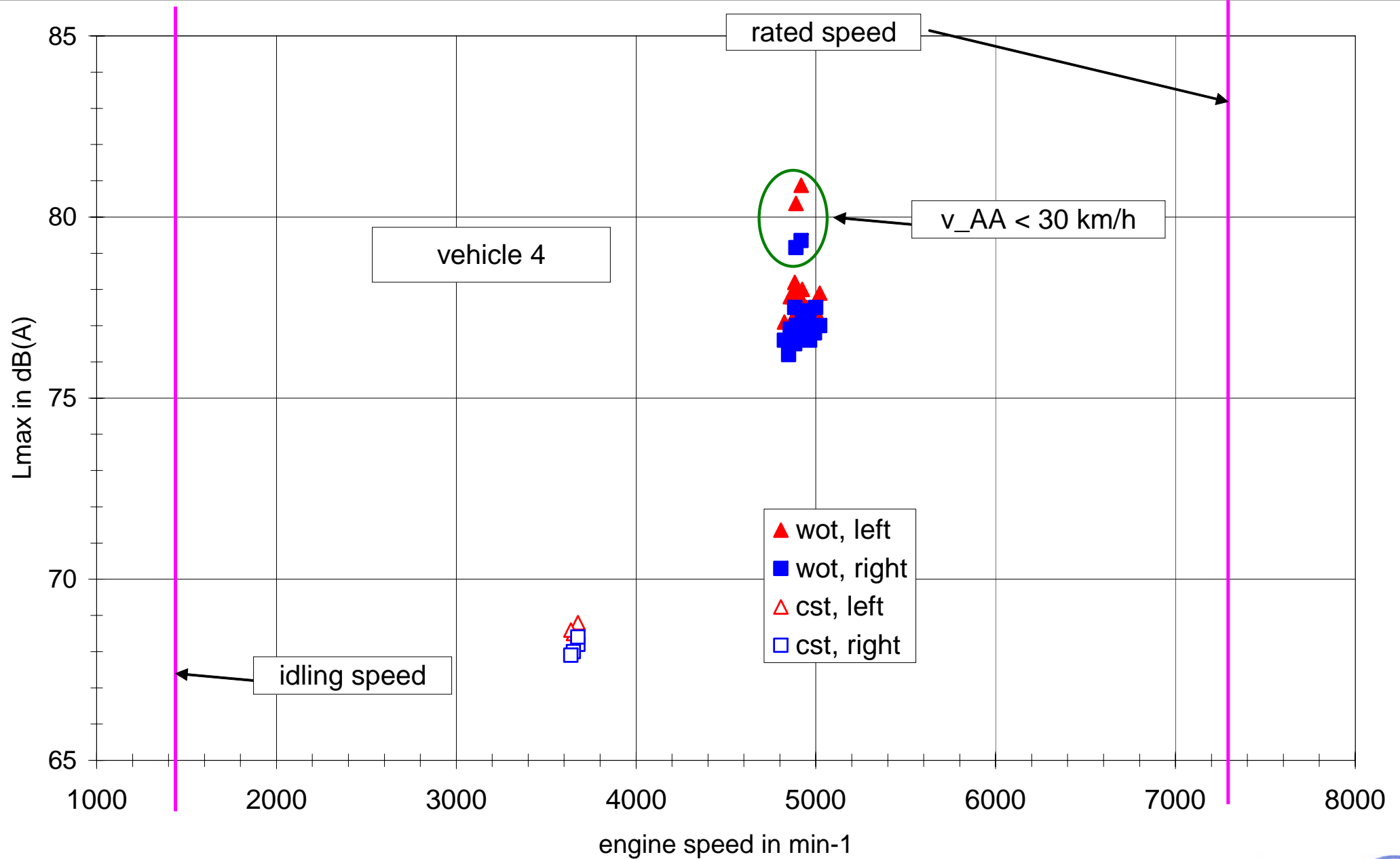


Figure 4

Detailed results versus engine speed

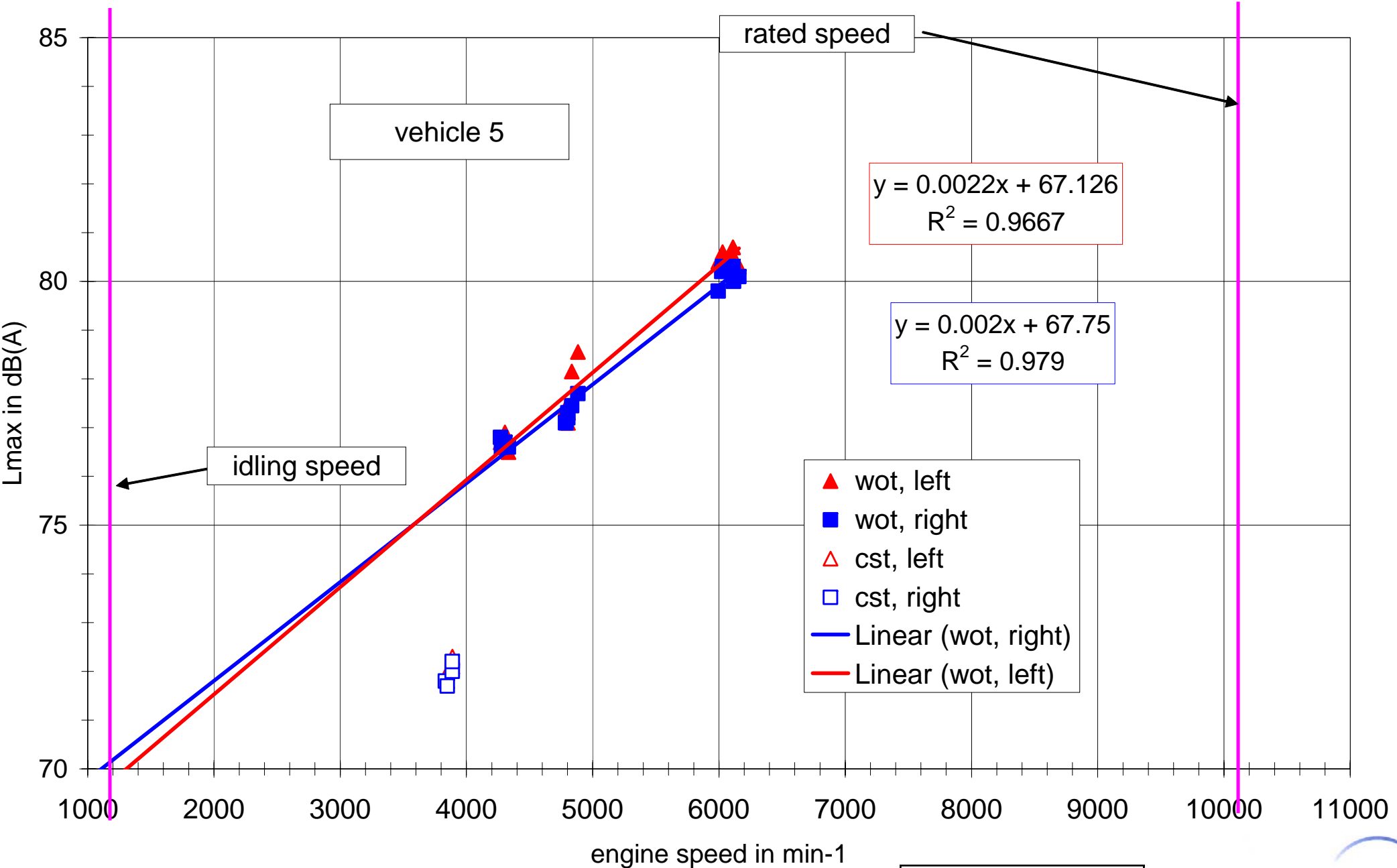


Figure 5

Detailed results versus engine speed

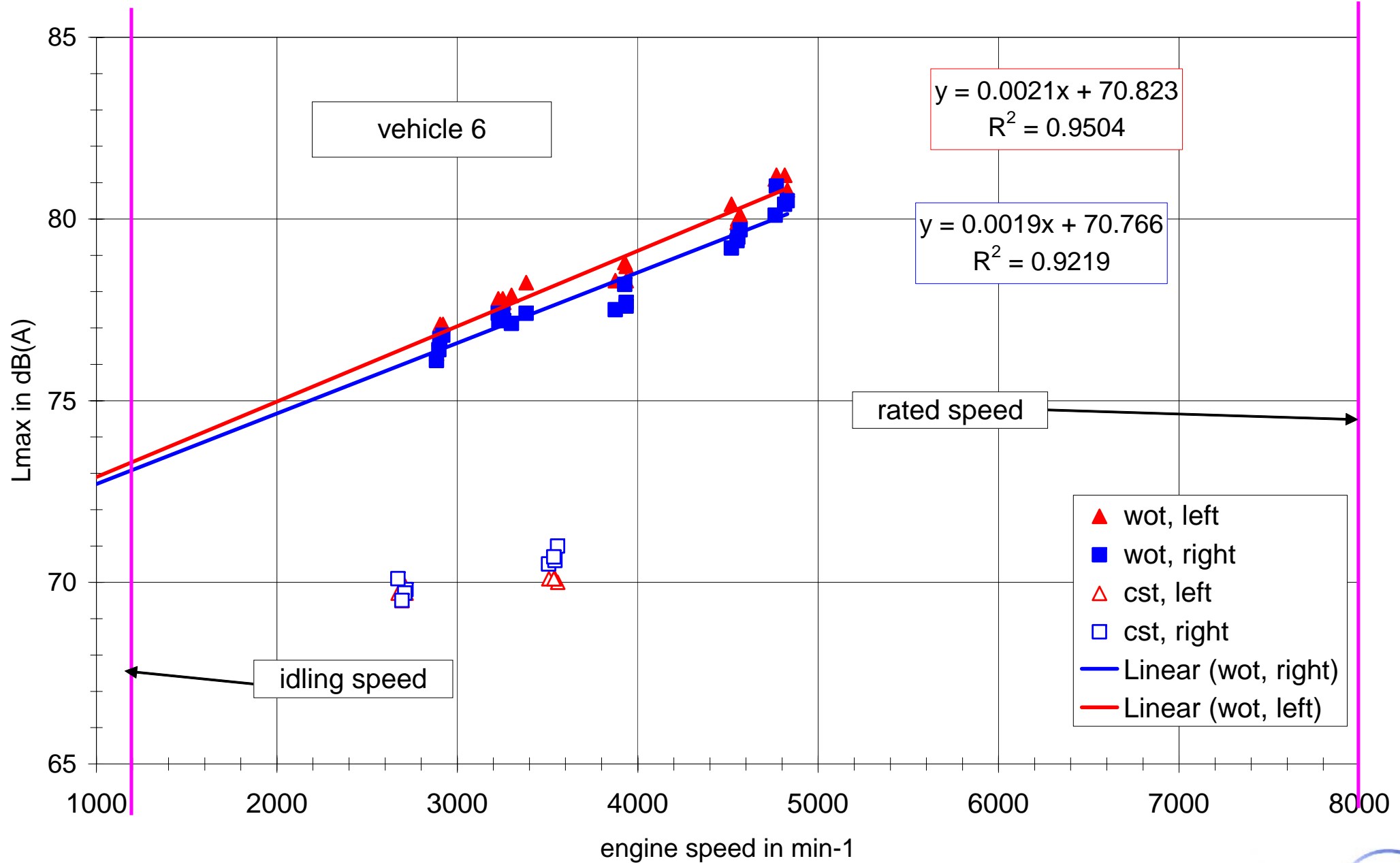


Figure 6

Detailed results versus engine speed

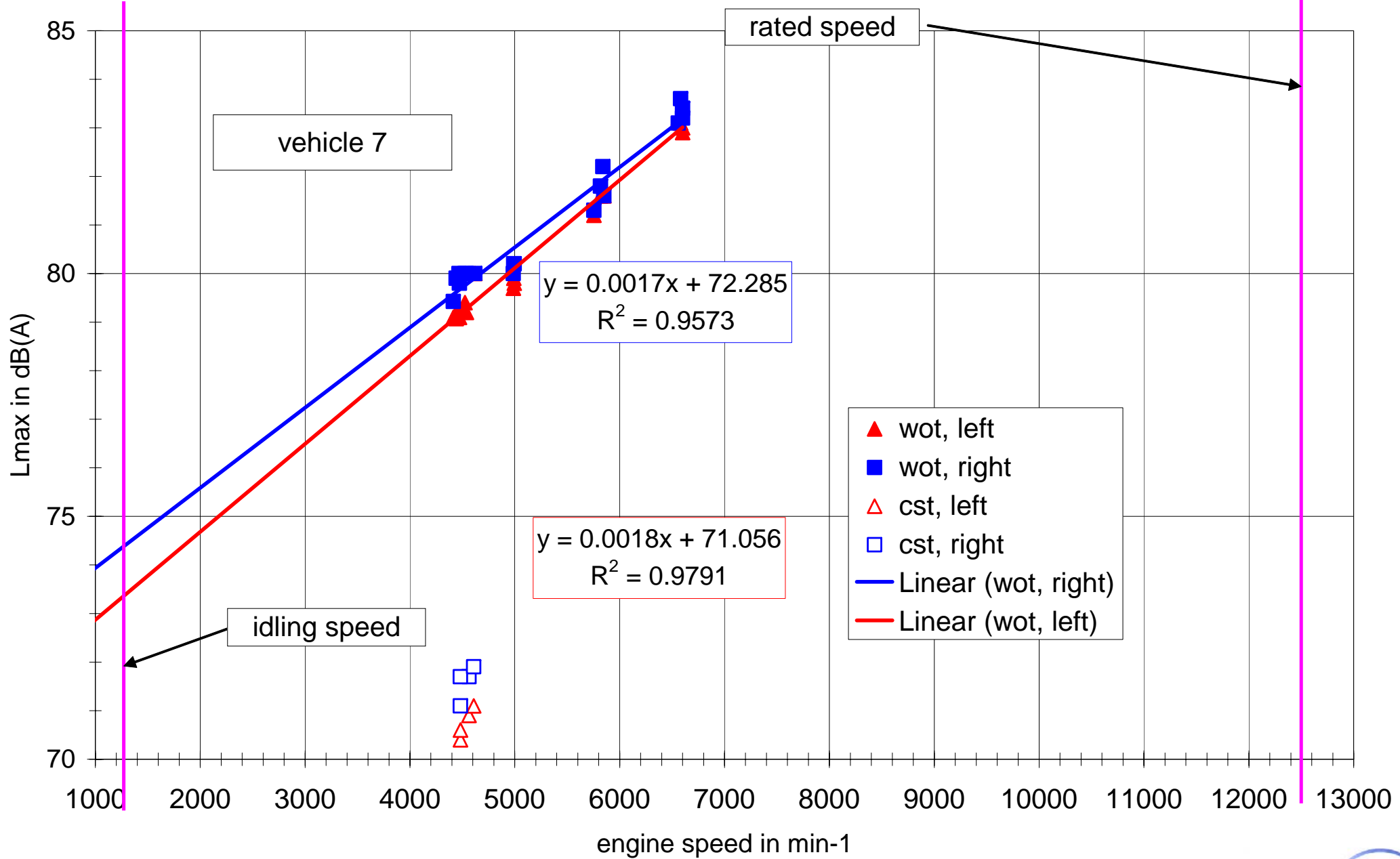


Figure 7

Detailed results versus engine speed

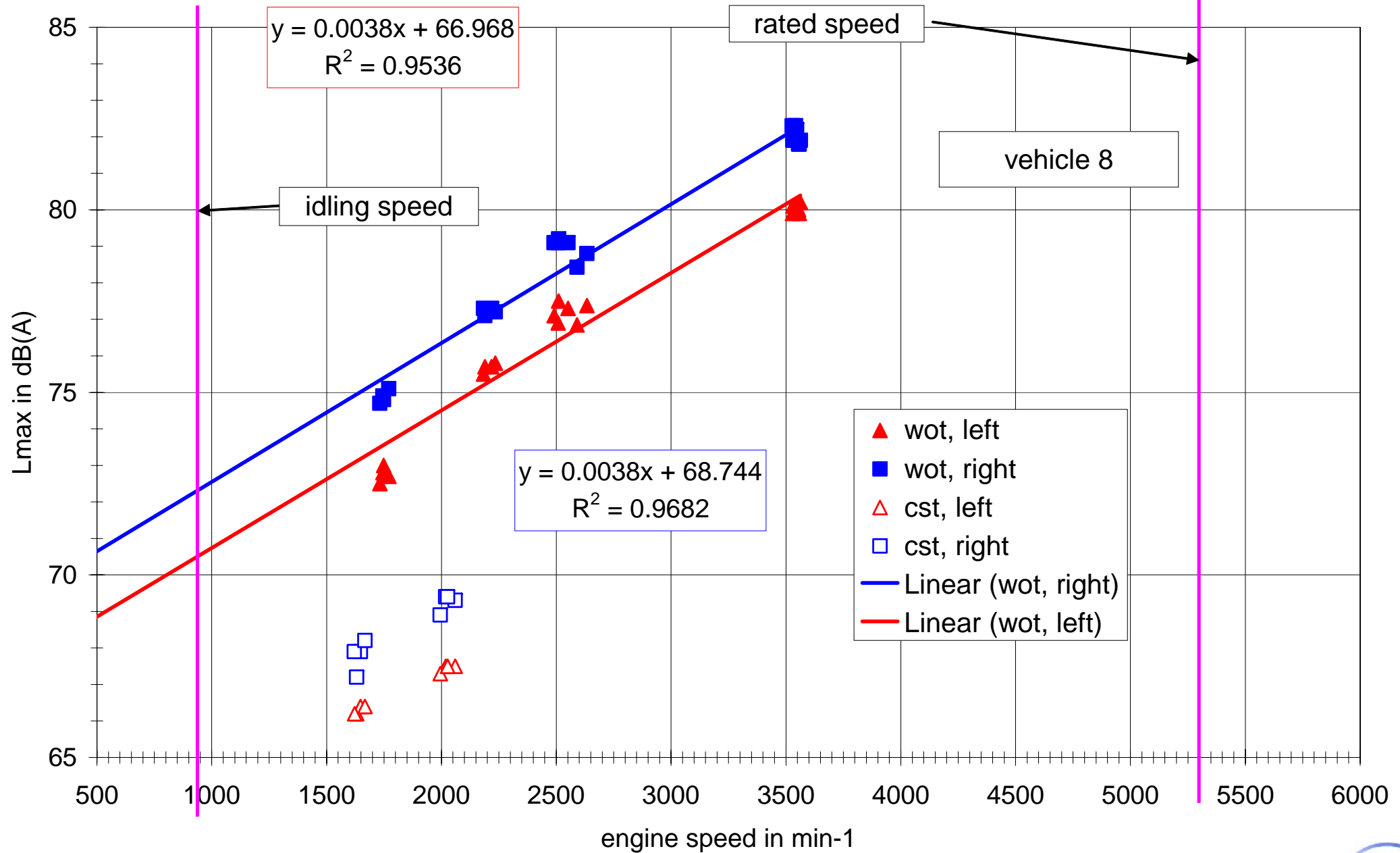


Figure 8

Detailed results versus engine speed

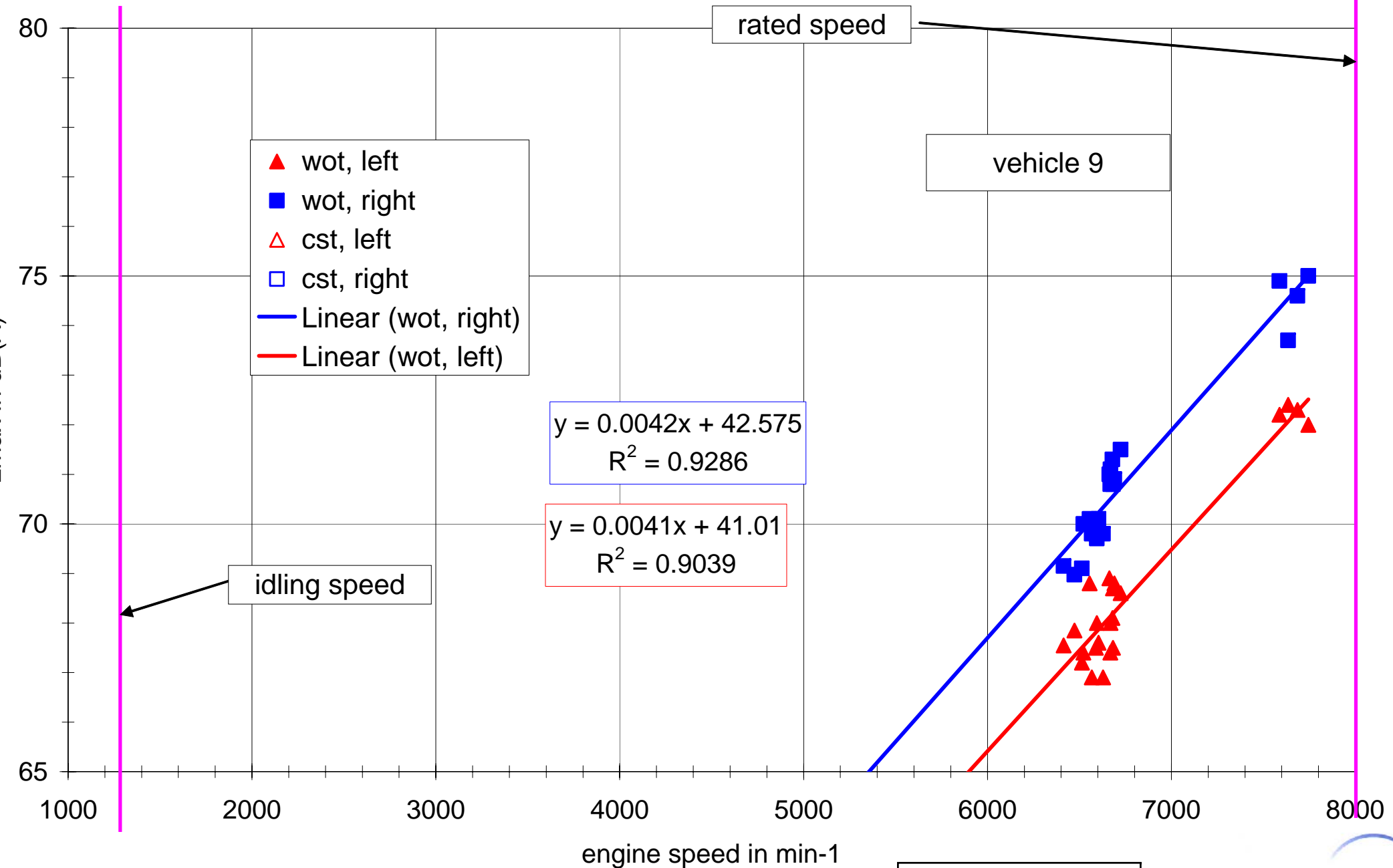


Figure 9

Detailed results versus engine speed

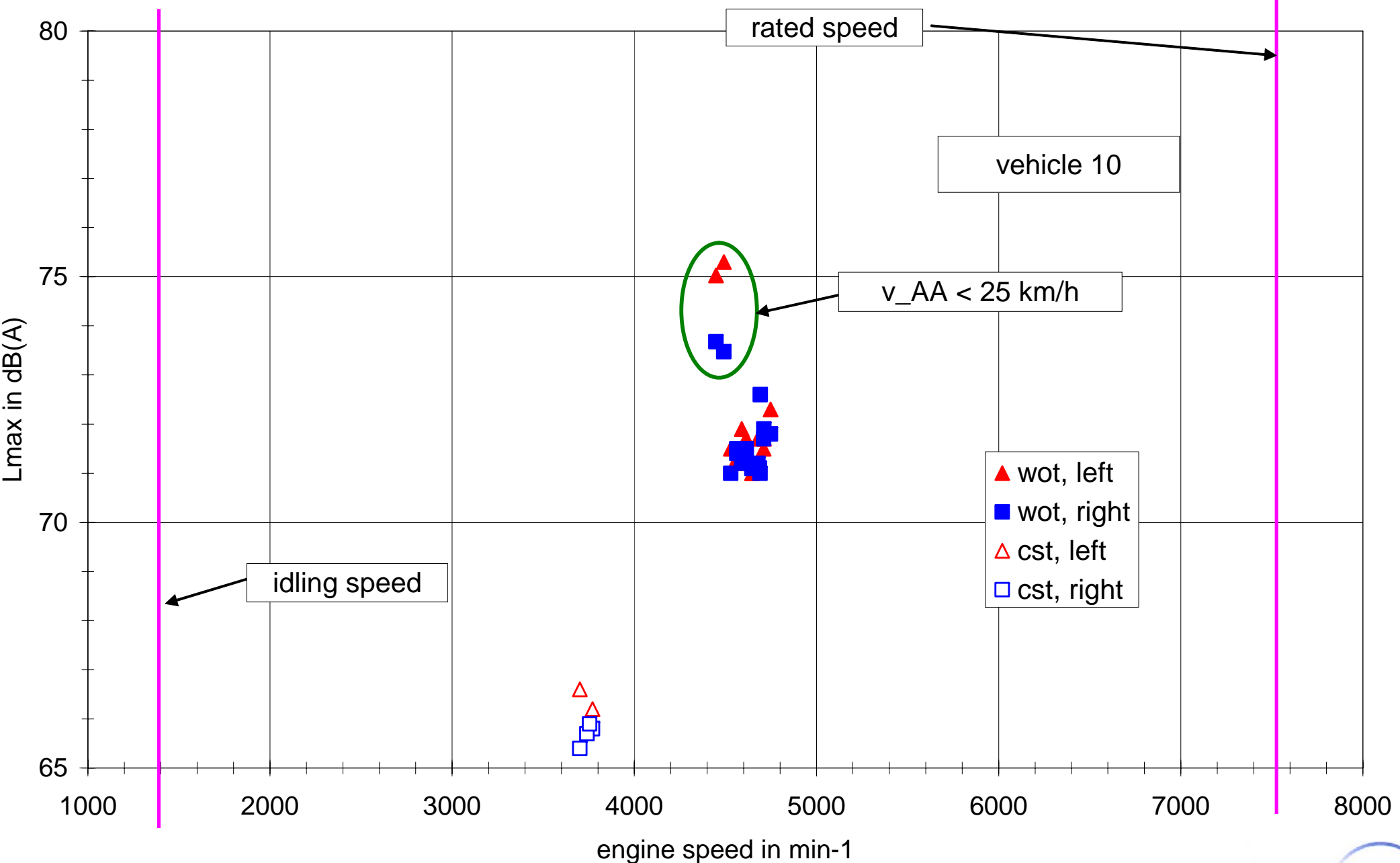


Figure 10

Detailed results versus engine speed

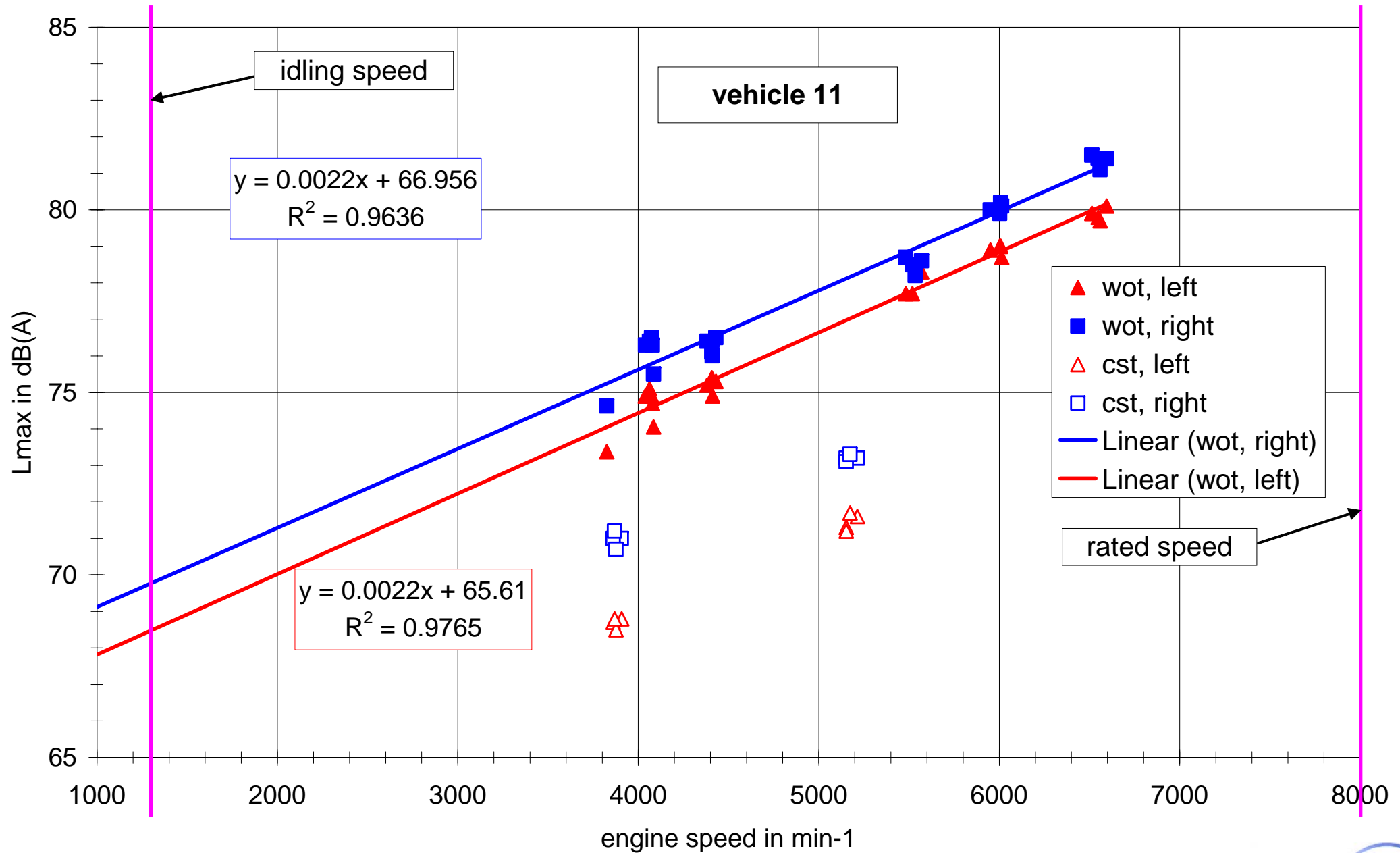


Figure 11

Detailed results versus engine speed

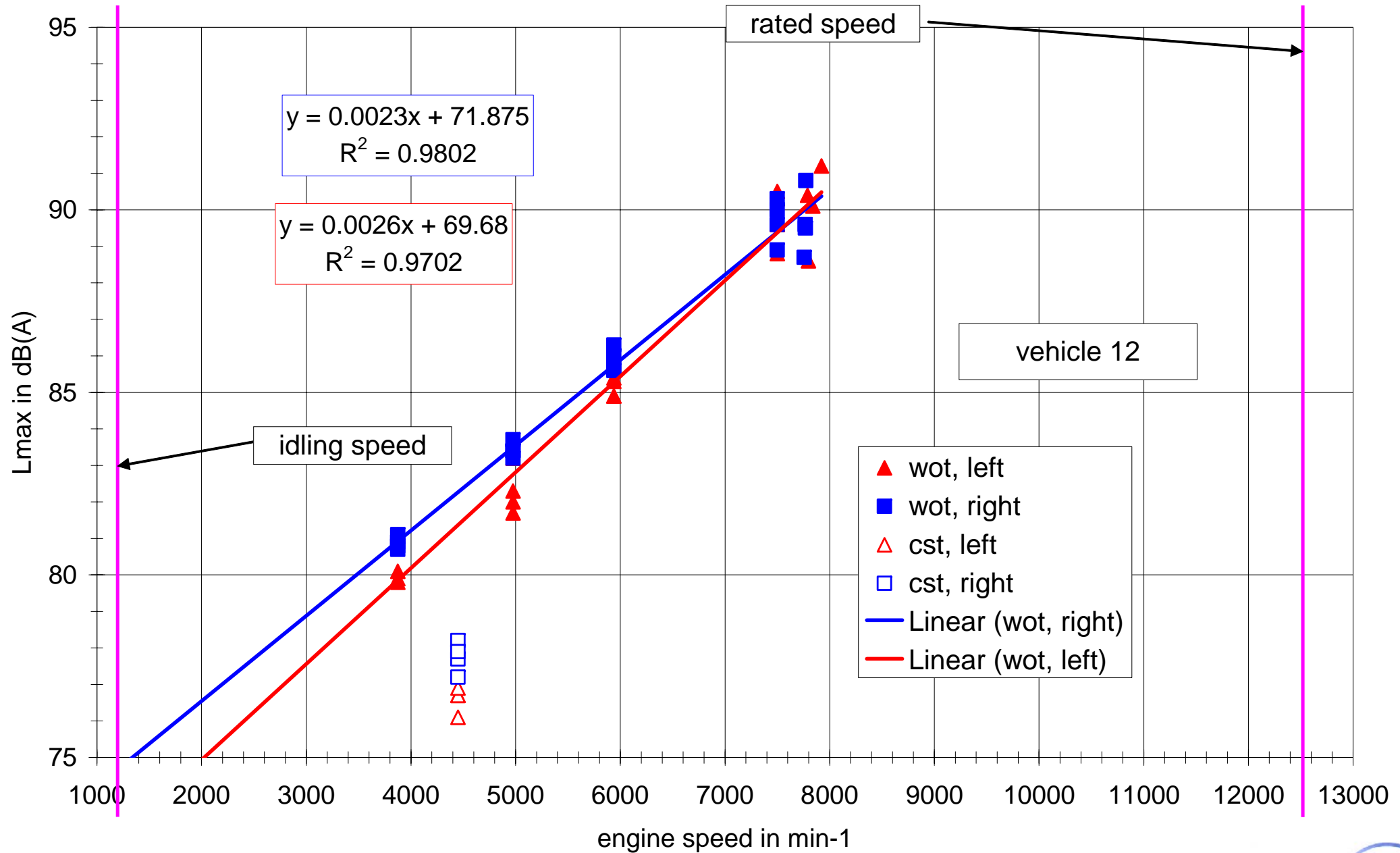


Figure 12

Detailed results versus engine speed

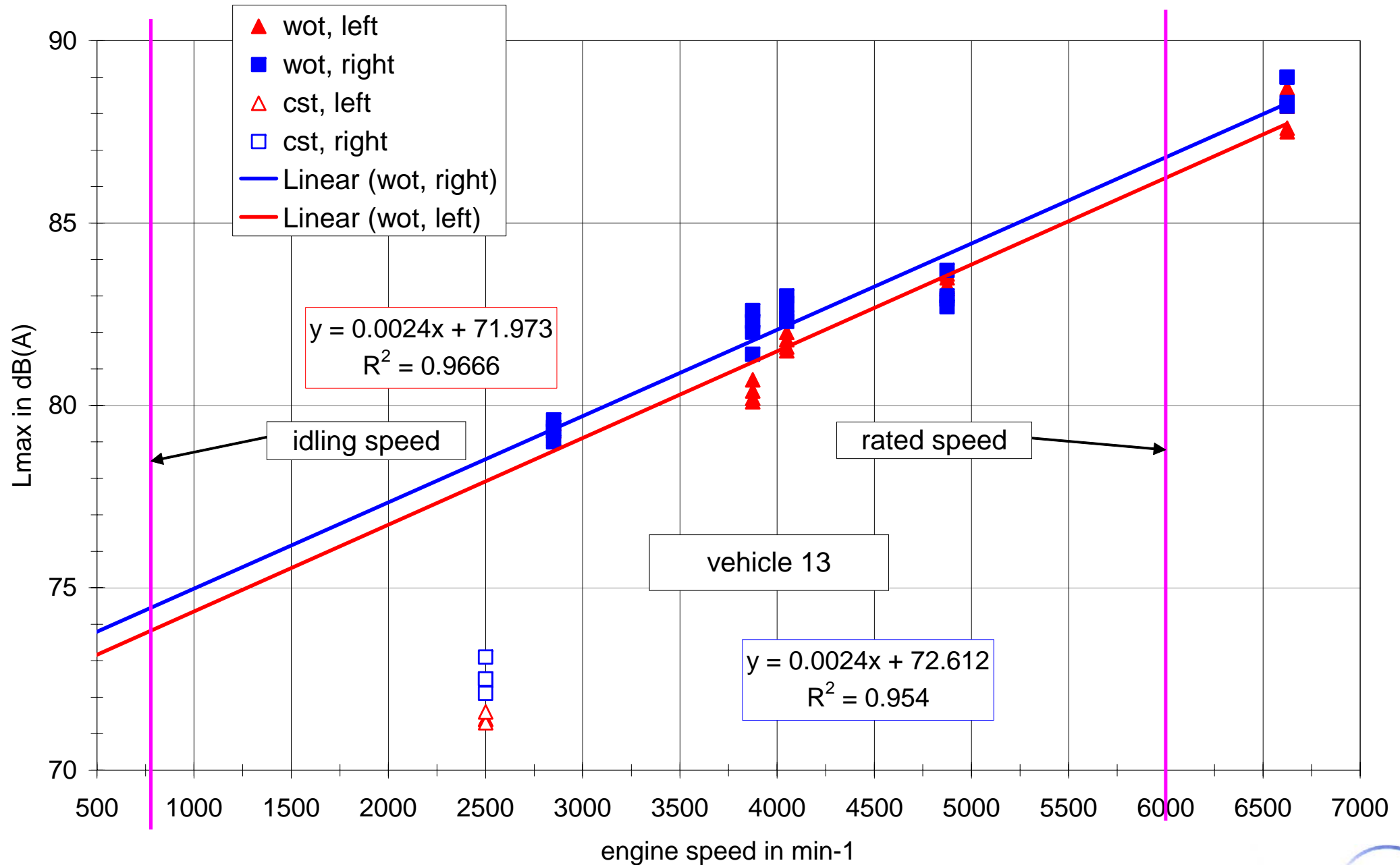


Figure 13

Detailed results versus engine speed

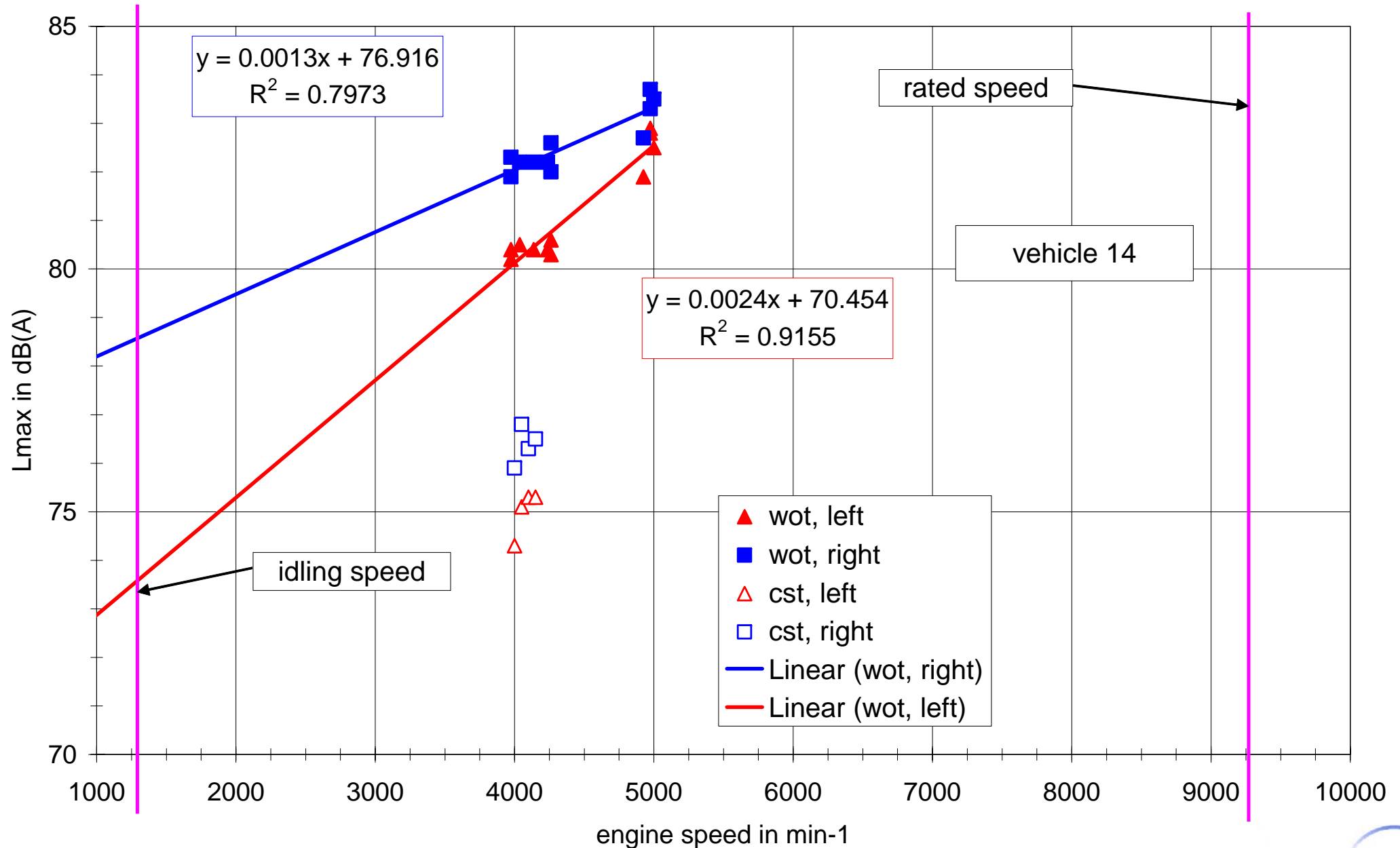


Figure 14

Detailed results versus engine speed

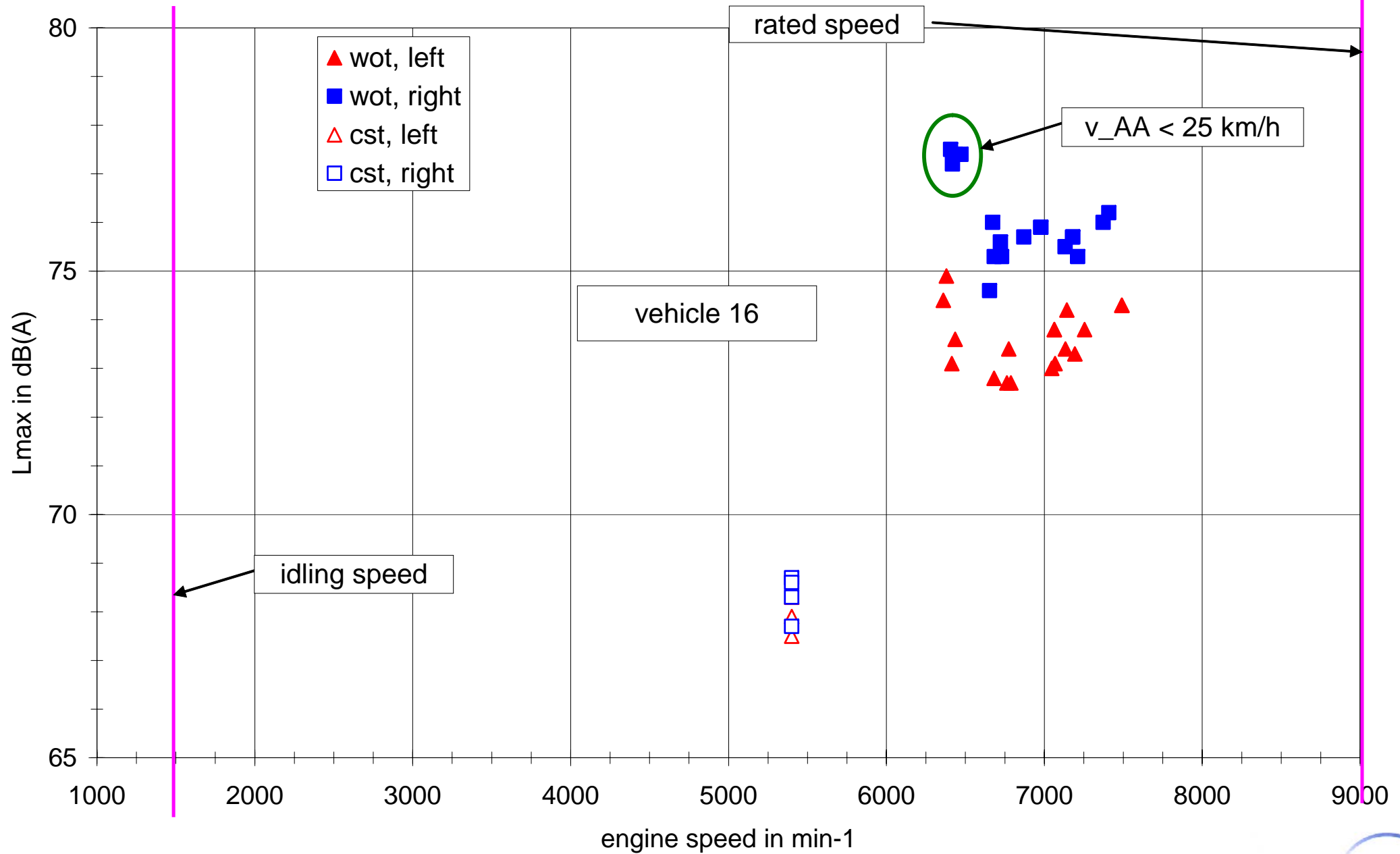


Figure 15

Comparison of results

- The following figures contain comparisons of the results for different methods.

L_urban versus L_ECE R41

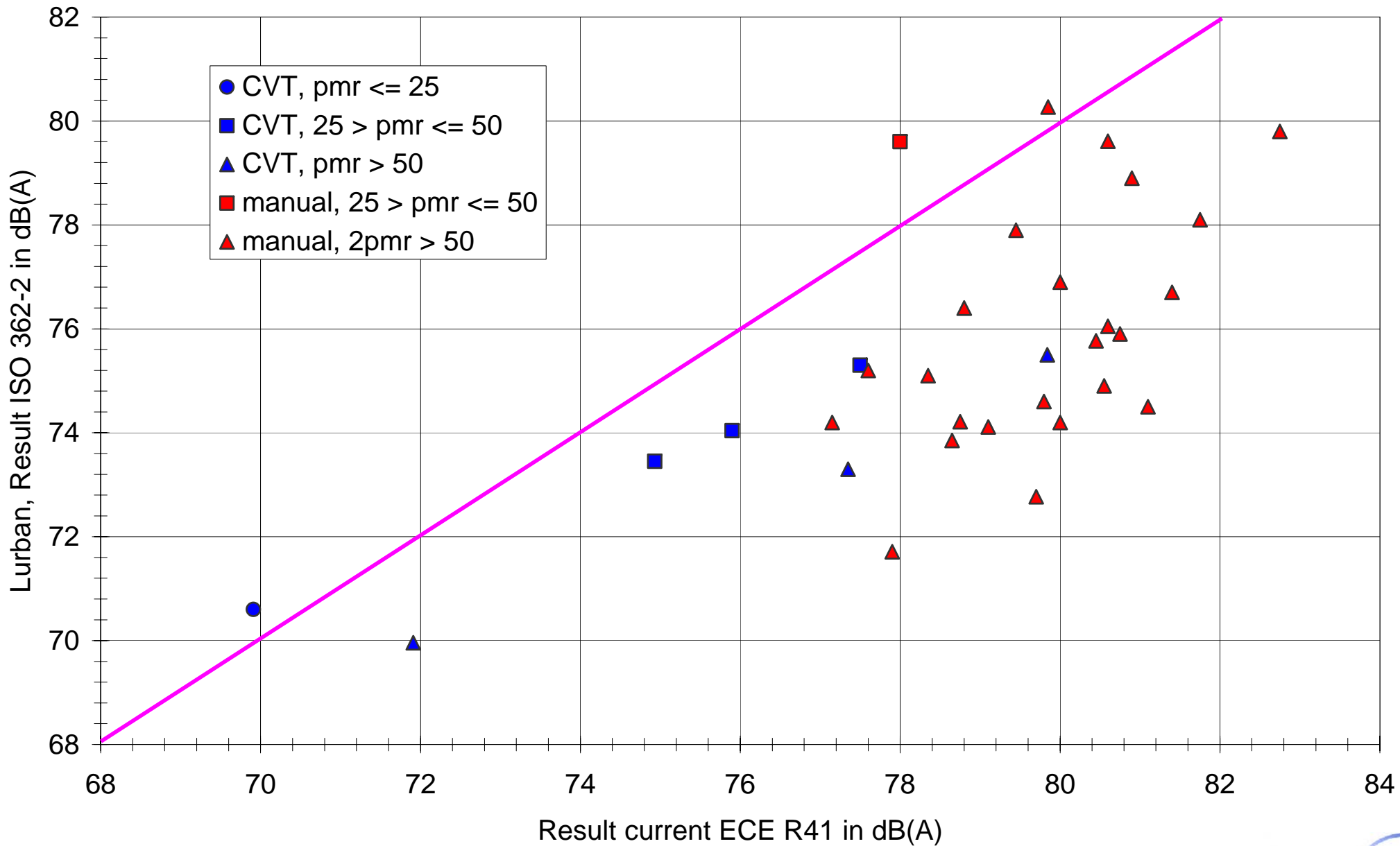


Figure 16

L_{urban}, L_{ECE R41} versus power to mass ratio

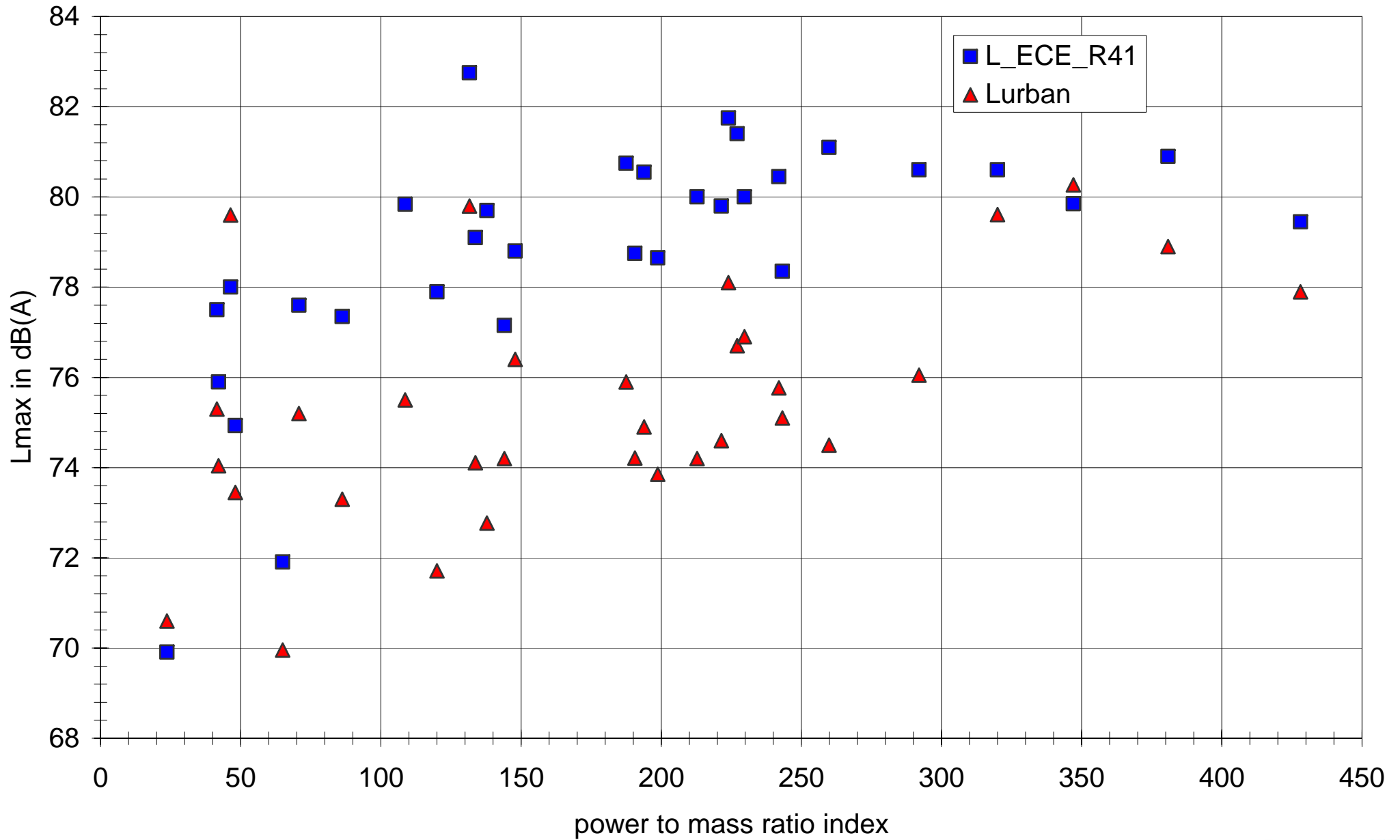
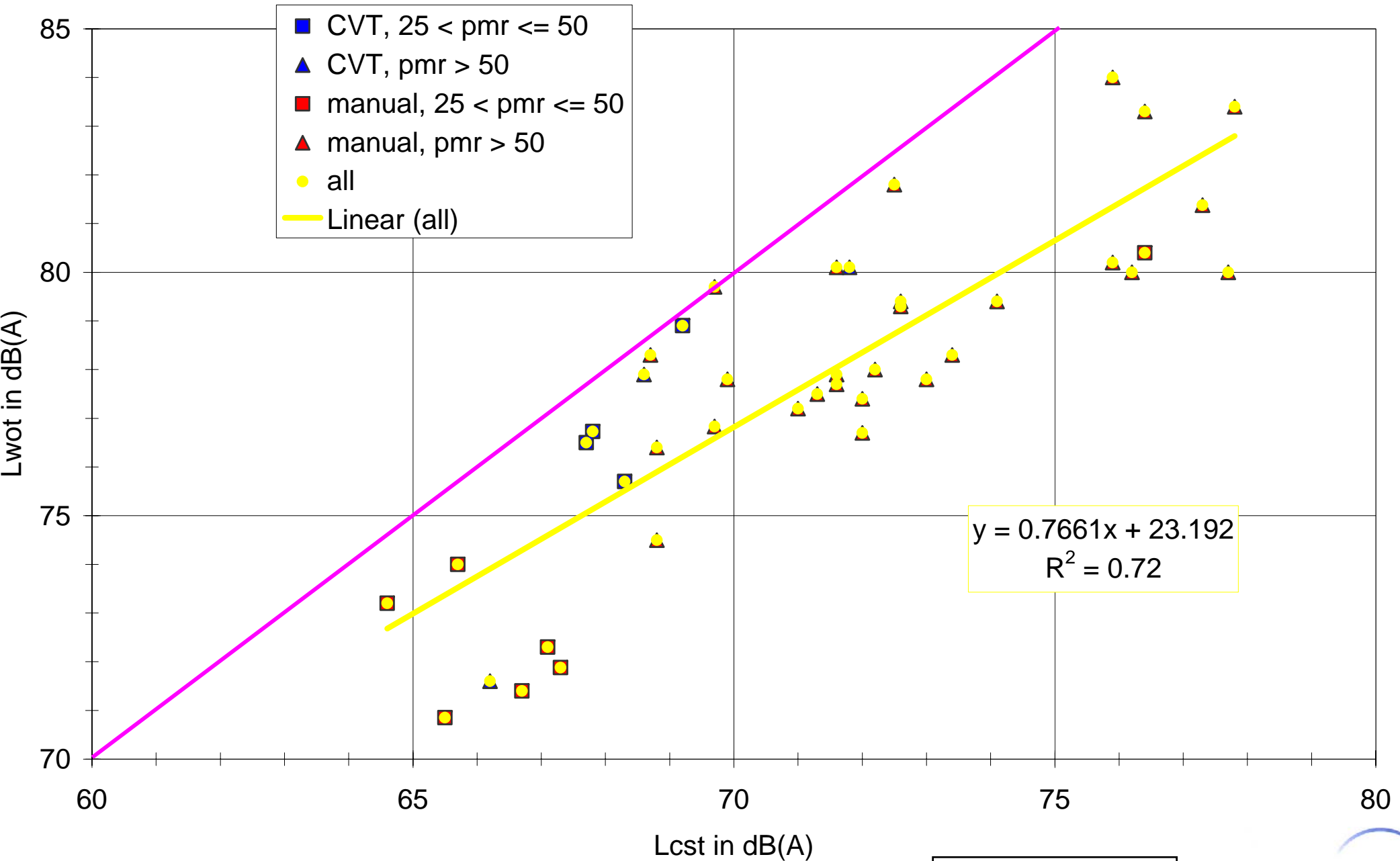


Figure 17

ISO 362-2: Lwot versus Lcst



$y = 0.7661x + 23.192$
 $R^2 = 0.72$

Figure 18

L_ASEP, L_enforcement versus Lwot (ISO 362-2)

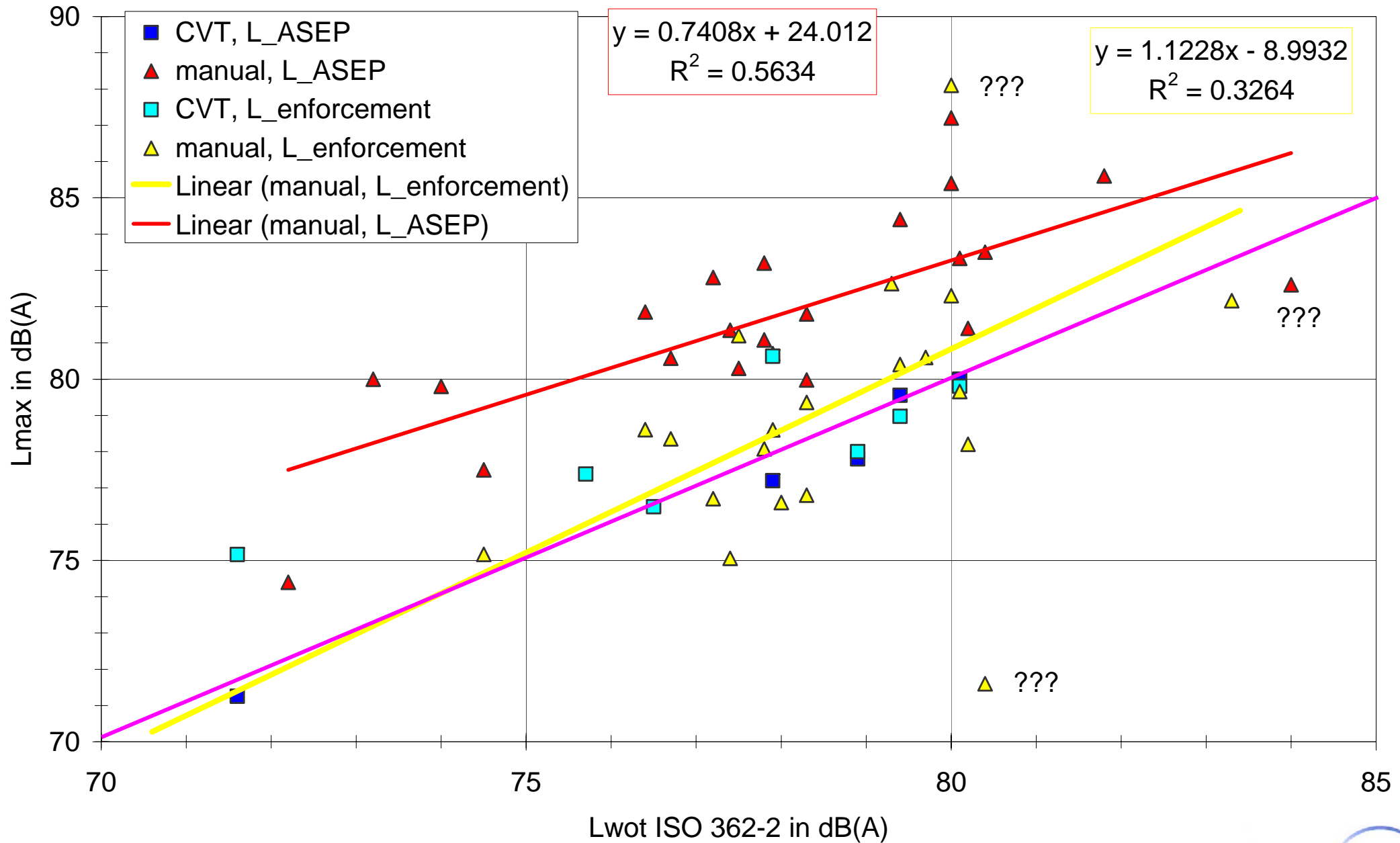


Figure 19

Slope of Lmax versus engine speed

- For 14 vehicles of the TUEV Nord motorcycle database (derived within UBA projects) and 9 vehicles of the Informal GRB R41 TF database the slopes of the linear regression lines of Lmax versus engine speed and versus normalised engine speed ($((n - n_idle)/(s - n_idle))$) were calculated for each side of the vehicle.
- The results show an influence of rated engine speed as demonstrated in the following figures.
- The slopes decrease with increasing rated_speed for the absolute engine speeds and increase with increasing rated speed for the normalised speeds.
- Tolerance bands can be determined that could be used for ASEP requirements.

Slopes of the linear regression lines of Lmax versus engine speed

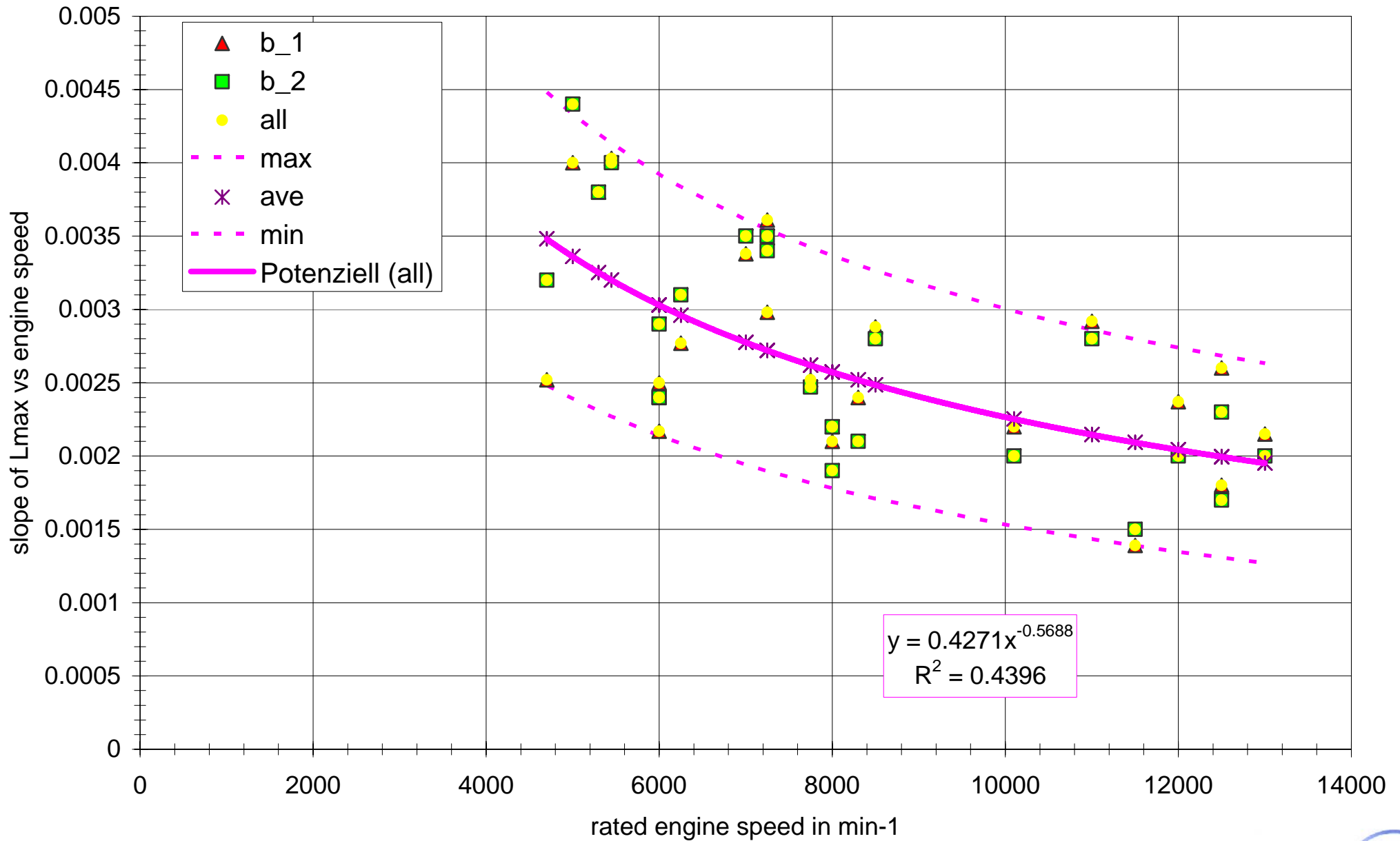


Figure 20

Slopes of the linear regression lines of Lmax versus engine speed

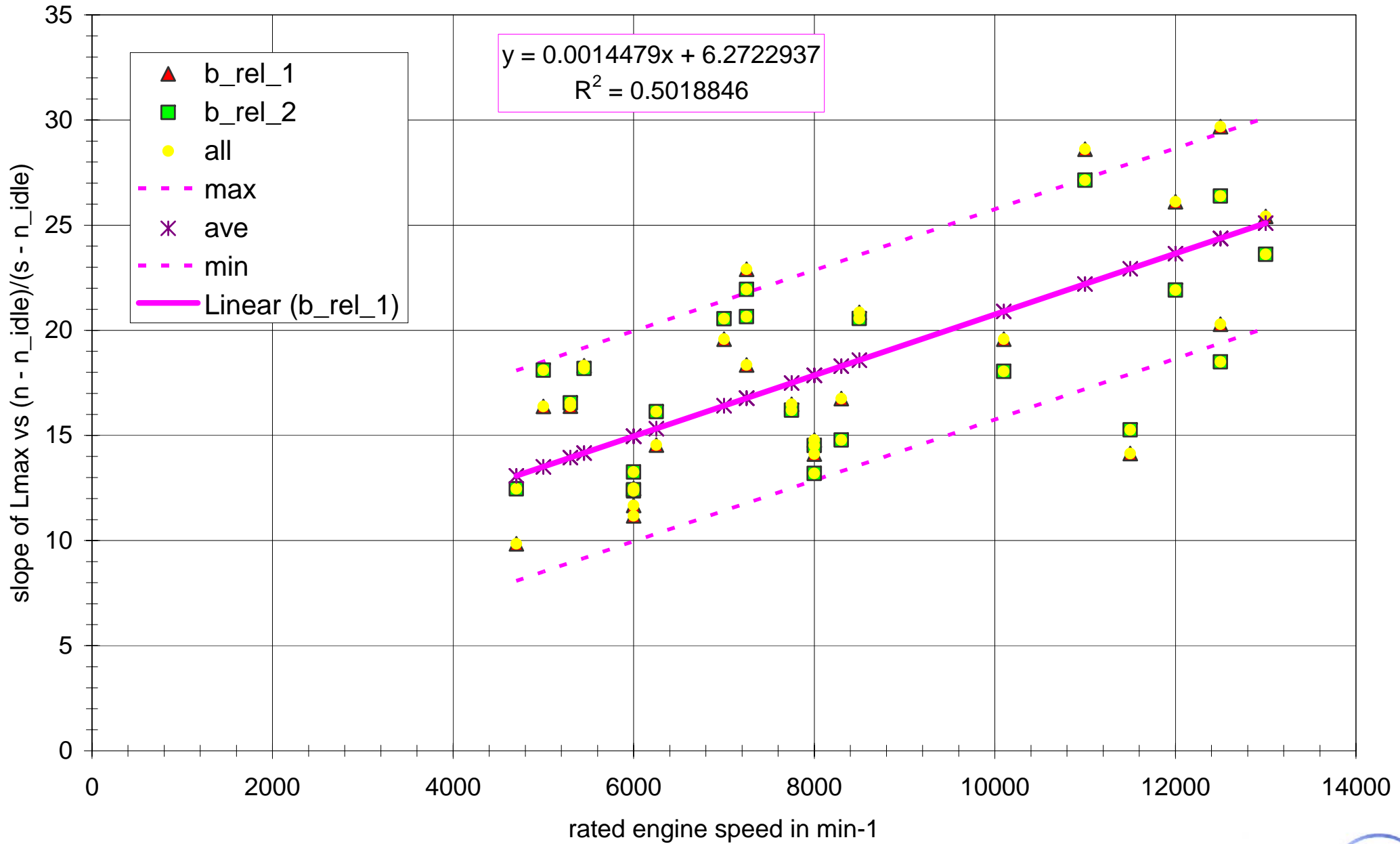


Figure 21

Example for ASEP

- **Within a project for the UBA TUEV Nord tested some motorcycles with original and replacement silencers.**
- **Some of the replacement silencers showed noise emissions that were similar to the original equipment but could be easily modified so that the noise emission was increased between 7 and 13 dB(A). This modification makes the silencer illegal.**
- **However, an advanced silencer whose noise emission up to engine speeds that are covered by ISO 362-2 are similar to the original equipment but switches to the illegal mode at higher engine speeds would no longer be illegal without ASEP**
- **The following figure shows an example based on measurement results.**

Example for the necessity for ASEP

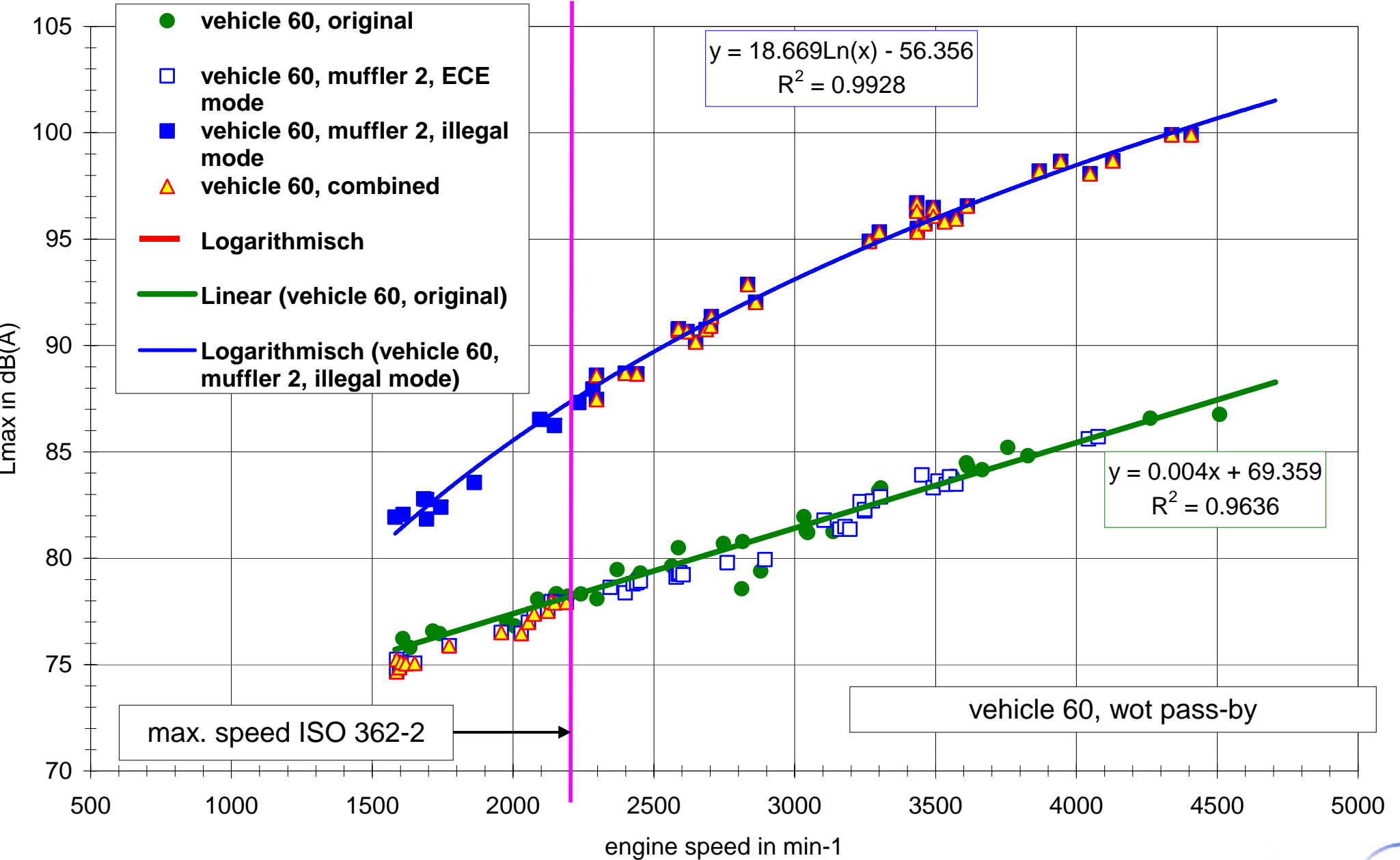


Figure 22

Revision of ECE R41

Thank You