

Test results of Validation test 1b and Cycle modifications

Prepared by Japan

the 12th DHC group
under GRPE/WLTP informal group

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Joint Research Centre, Ispra

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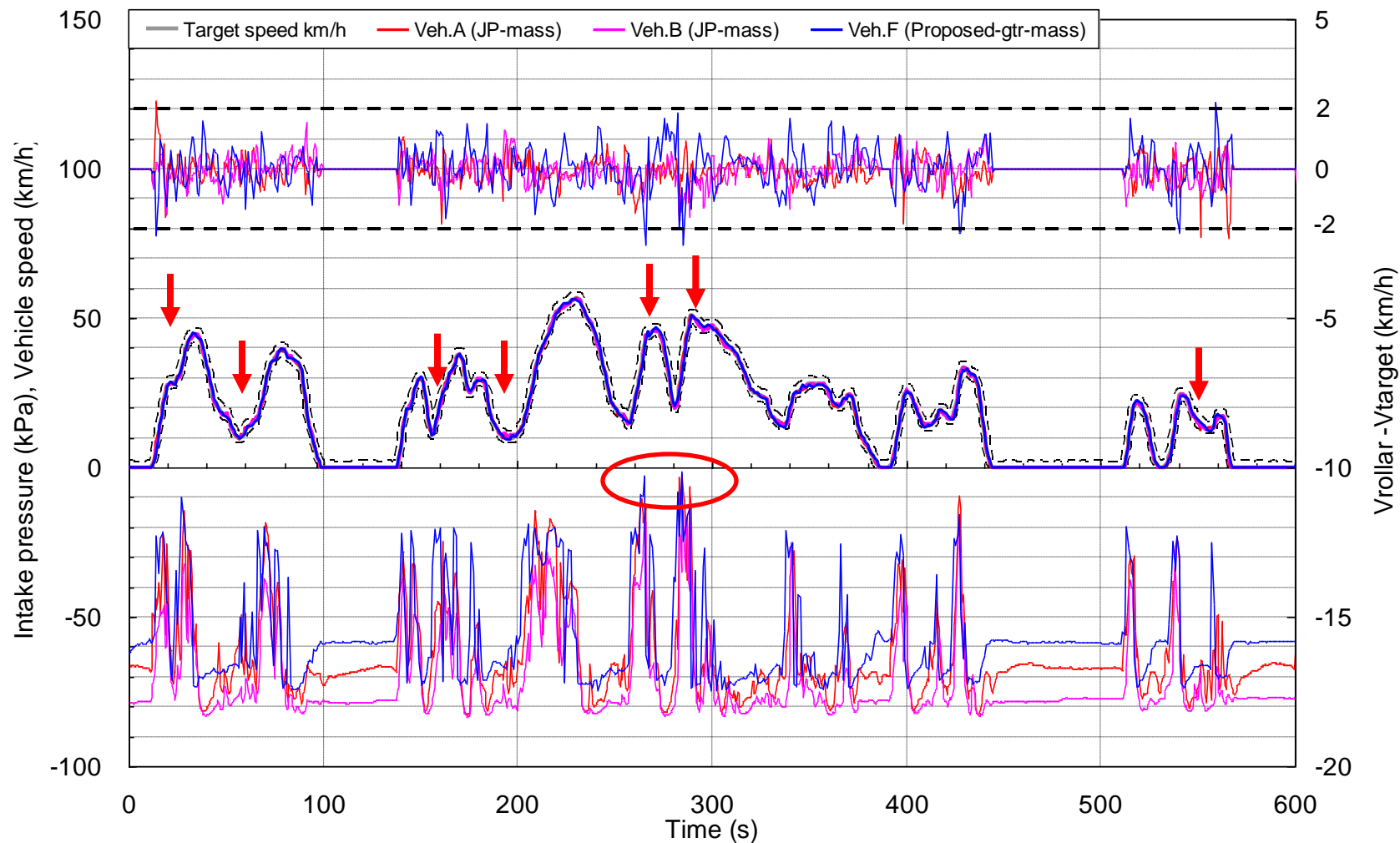
1.1. Overview of Validation test 1b in Japan

- Test mass: A~E: Current JPN regulation test mass (Curb mass + 110 kg)
: F: Proposed gtr test mass (almost same as JP-mass)
- Gear shift: fixed gear shift (by Japan)

Vehicle No.	A	B	C	D	E	F
Vehicle category	PC	PC	LDCV	LDCV	LDCV	PC
Fuel type	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol
Engine capacity (cc)	658	1339	658	1495	1998	1000
Max. rated power (kW)	43 / 7200	73 / 6000	36 / 5800	71 / 6000	98 / 5600	50/6000
Curb vehicle mass (kg)	710	1000	960	1120	1760	910
Test mass (kg)	820	1110	1070	1330	1870	1046 (1020*)
Gross vehicle mass (kg)	930	1275	1430	2030	3340	1250
Power to mass ratio (KW/t) (Curb mass basis)	60.6	73.0	37.5	58.2	55.7	54.9
After treatment	TWC	TWC	TWC	TWC	TWC	TWC
Emission standard	2005	2005	2005	2005	2005	EURO V
Transmission	5MT	5MT	5MT	5MT	5MT	4AT

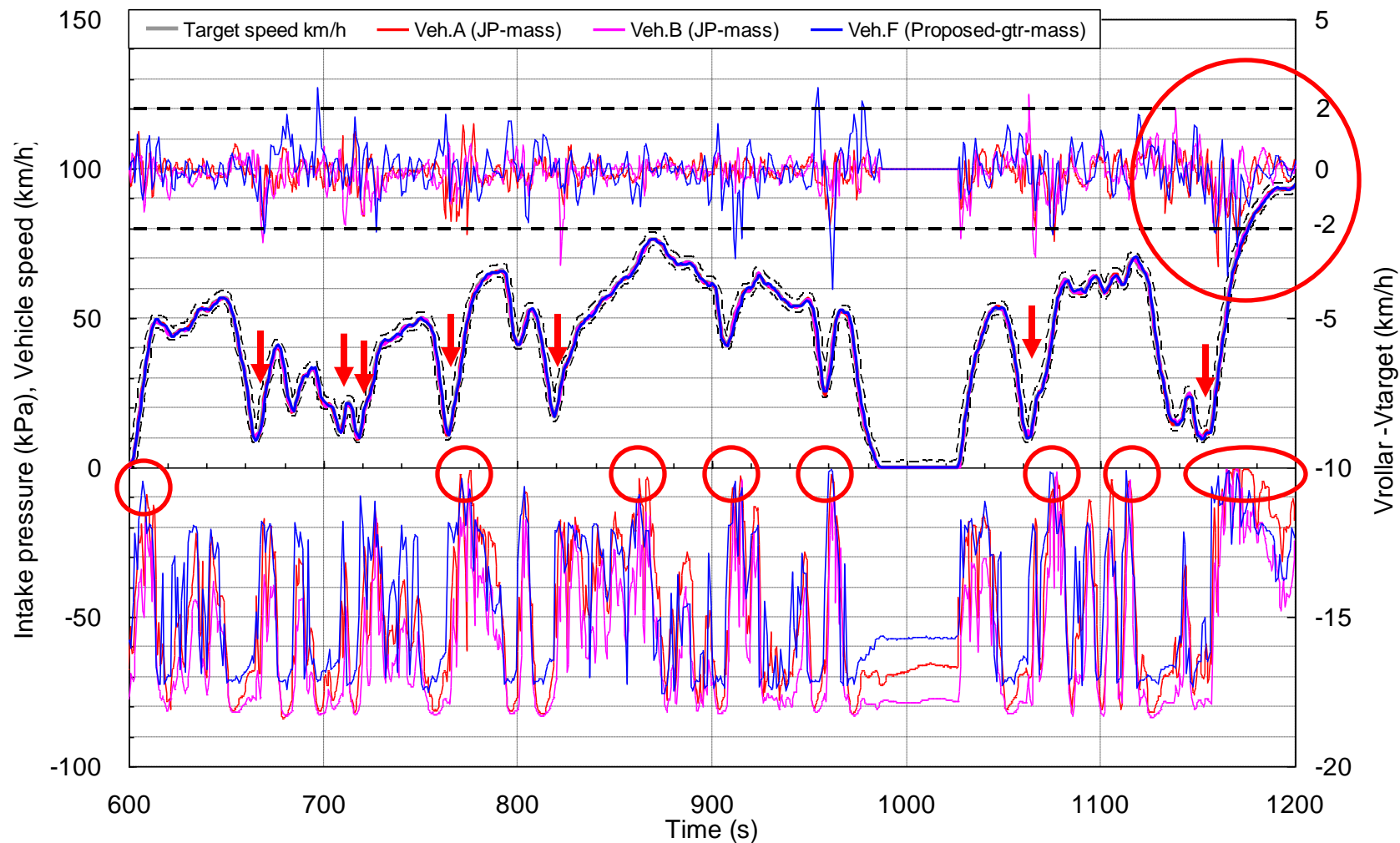
Vehicle F: Current JPN reg. mass: 1020 kg, Proposed gtr test mass: 1046 kg

1.2. Test result of Passenger car



ARROW (↓): Require precise acceleration pedal/clutch operation
CIRCLE (○): Hard to follow the trace (require close to W.O.T. operation)

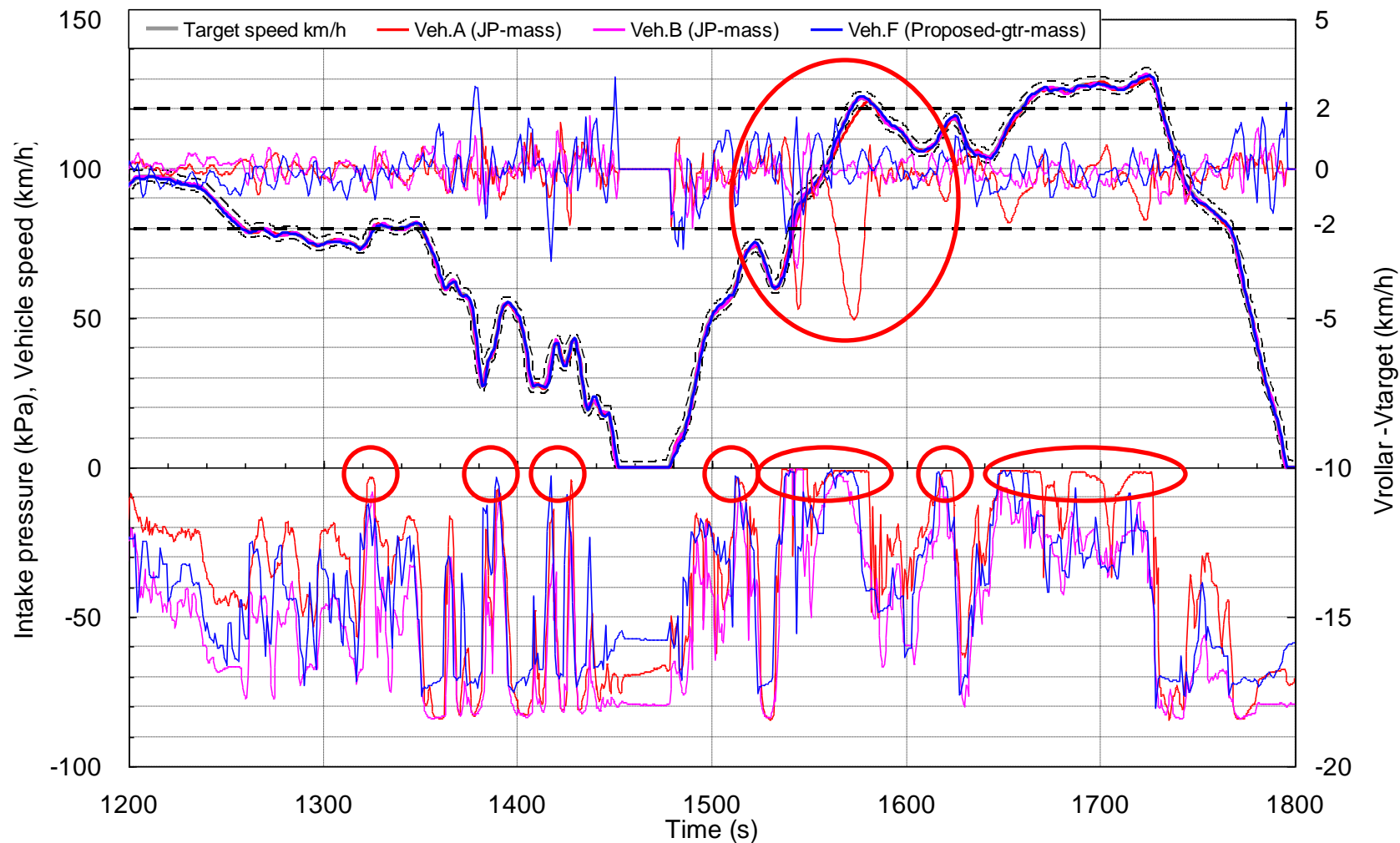
1.2. Test result of Passenger car



ARROW (↓): Require precise acceleration pedal/clutch operation

CIRCLE (○): Hard to follow the trace (require close to W.O.T. operation)

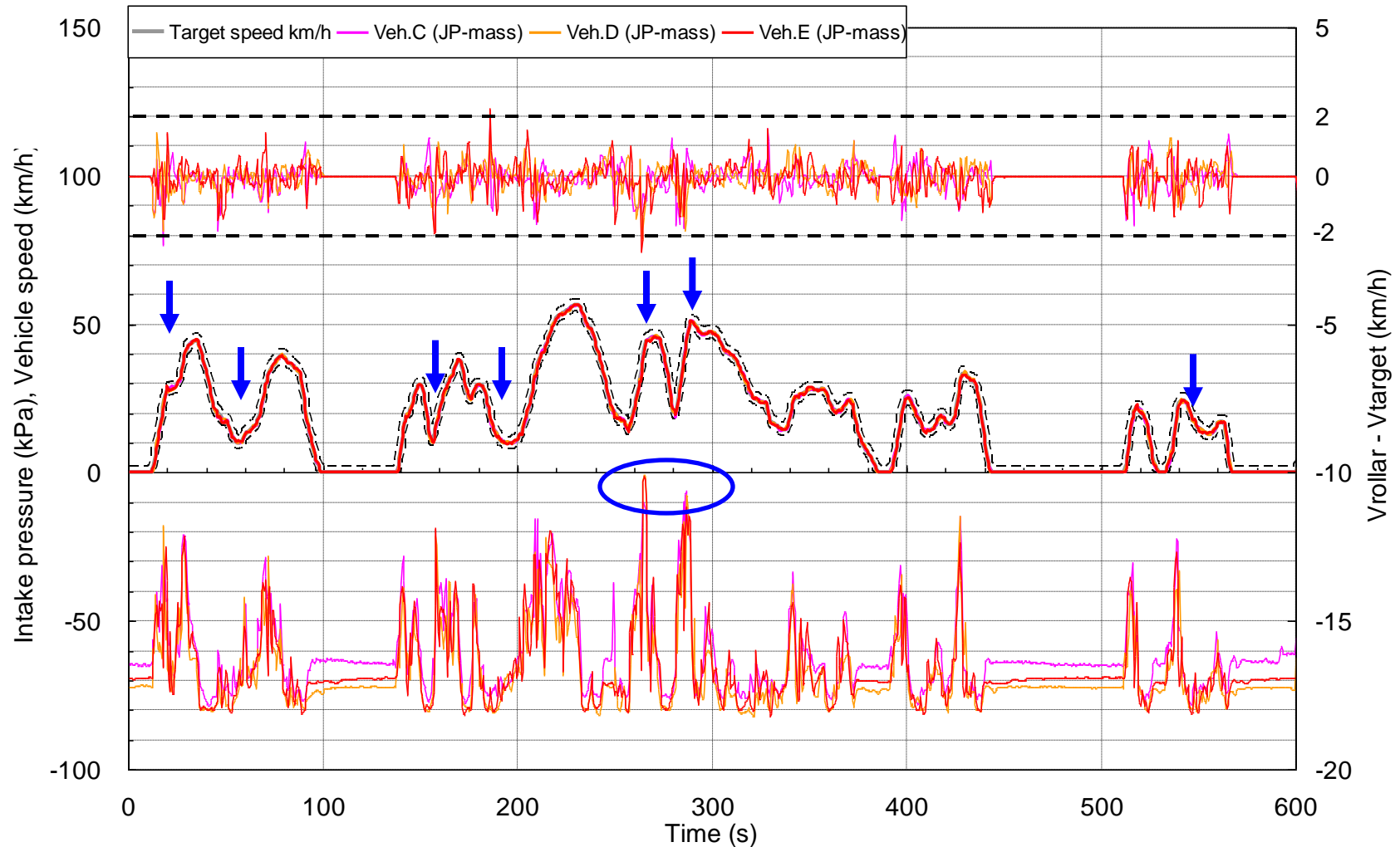
1.2. Test result of Passenger car



ARROW (↓): Require precise acceleration pedal/clutch operation

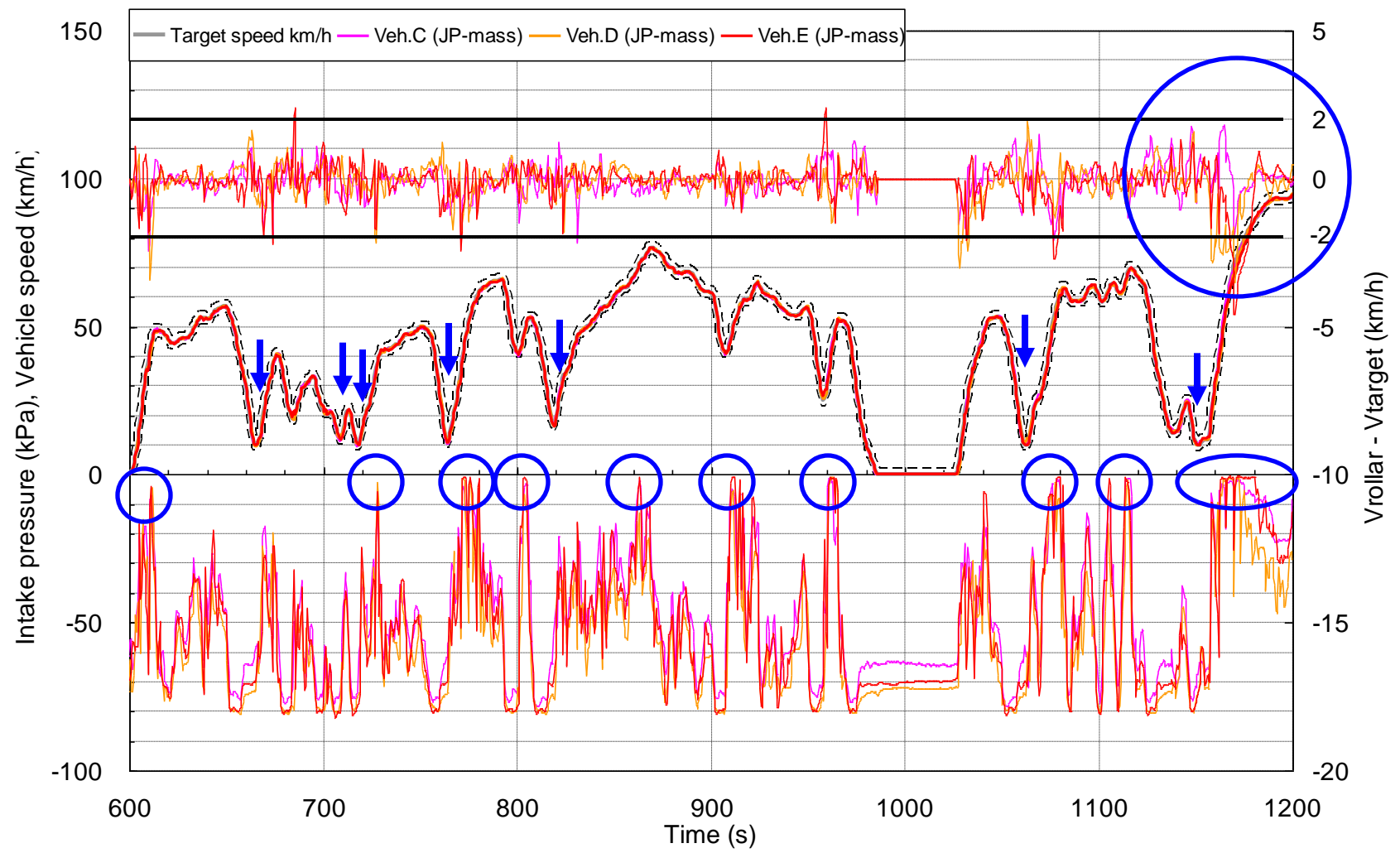
CIRCLE (○): Hard to follow the trace (require close to W.O.T. operation)

1.3. Test result of Light duty commercial vehicle



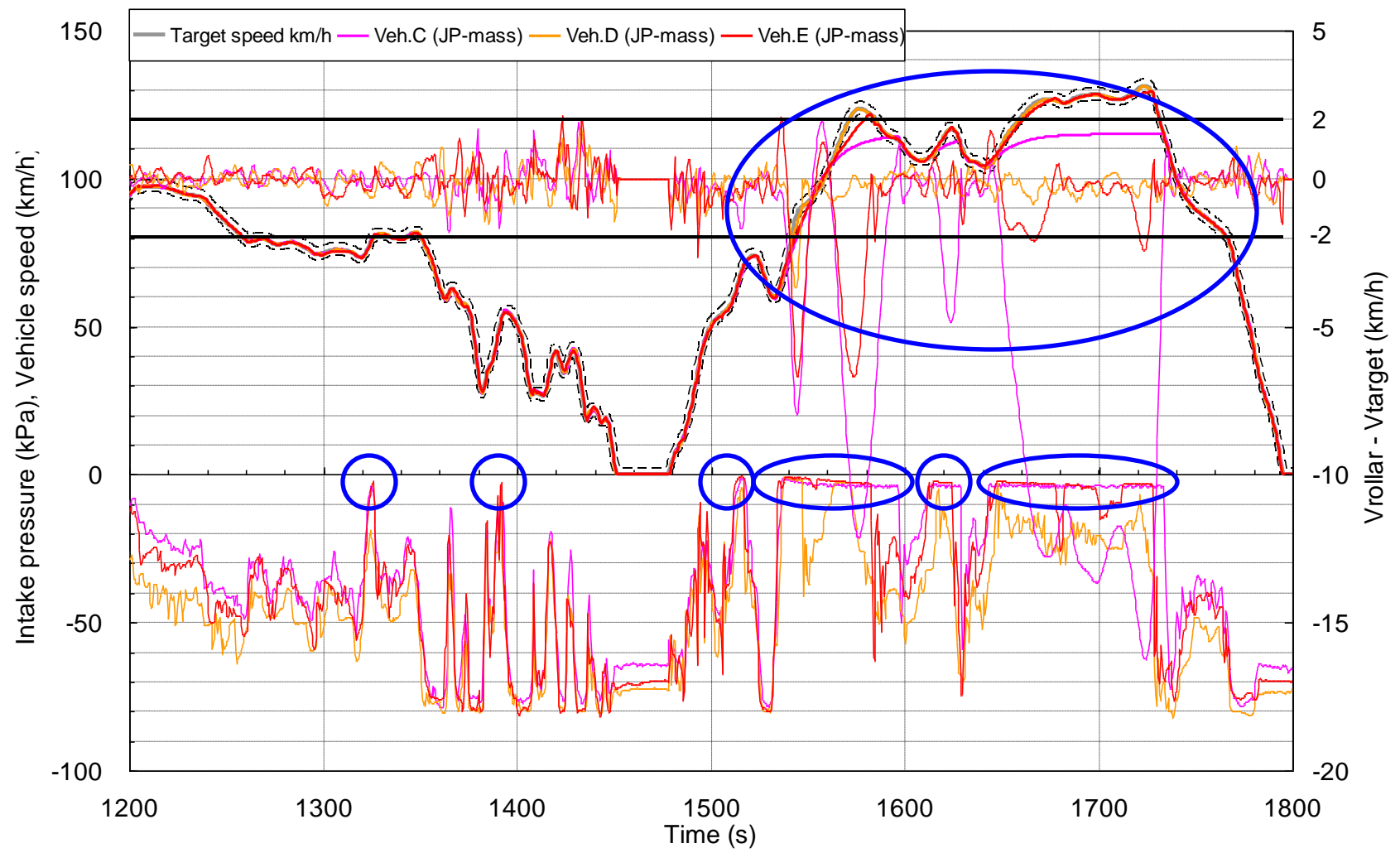
ARROW (↓): Require precise acceleration pedal/clutch operation
CIRCLE (○): Hard to follow the trace (require close to W.O.T. operation)

1.3. Test result of Light duty commercial vehicle



ARROW (↓): Require precise acceleration pedal/clutch operation
CIRCLE (○): Hard to follow the trace (require close to W.O.T. operation)

1.3. Test result of Light duty commercial vehicle



ARROW (↓): Require precise acceleration pedal/clutch operation
CIRCLE (○): Hard to follow the trace (require close to W.O.T. operation)

2. Result of Validation 1b by India and JRC

➤ India

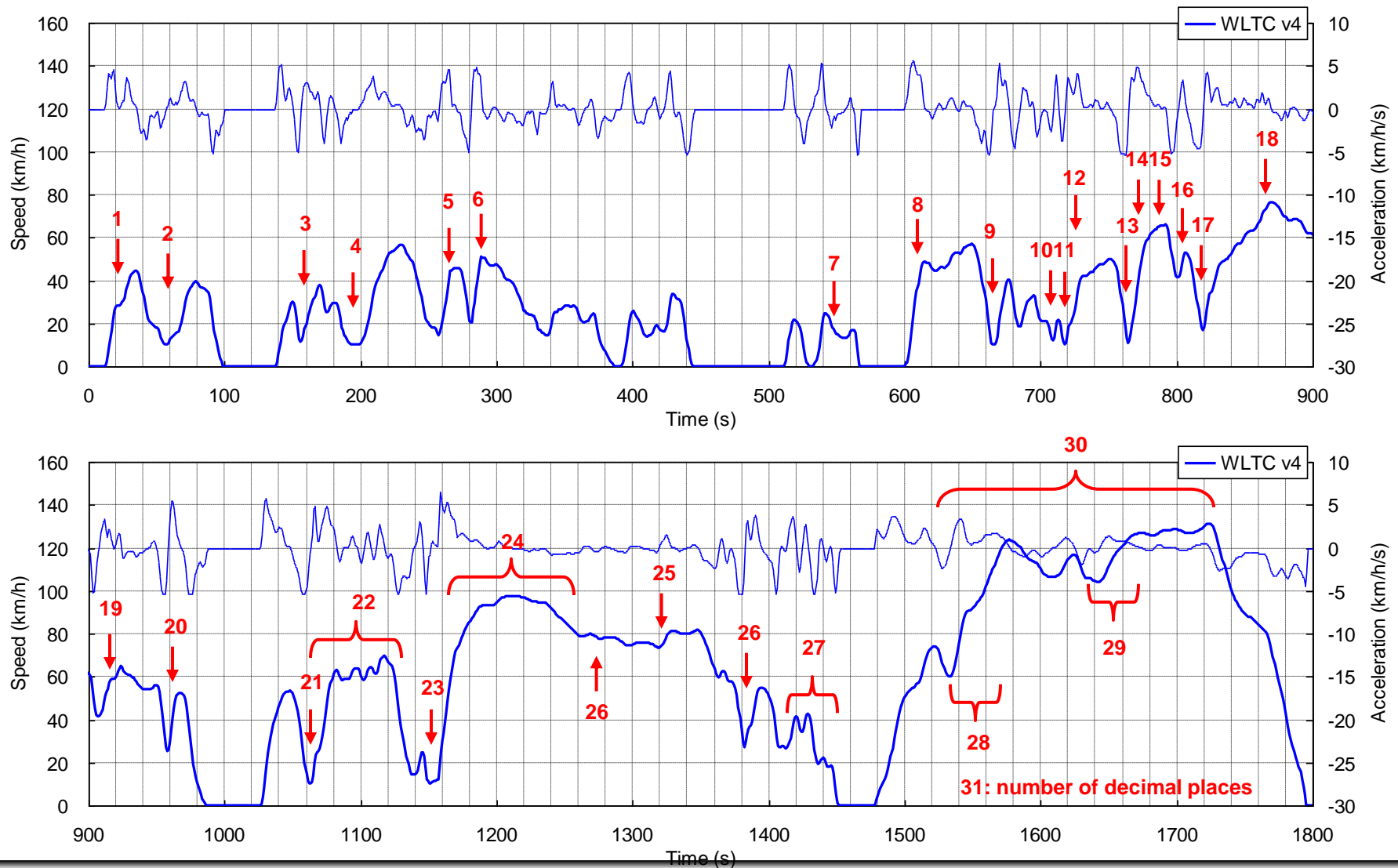
- Dynamic concerns (difficult to follow the cycle)
 - 48-67, 140-160, 250-265, 275-295, 660-670, 760-770, 815-825, 1060-1065, 1080-1123, 1140-1180, 1375-1385, 1420-1450, 1530-1585, 1640-1675
- PMR concerns (Vehicles of 35 to 65 kW/t have difficulty)
 - 780-804, 1165-1210, 1180-1250, 1530-1740
- Difficult to follow the lower speeds of 10km/h

➤ JRC

- Observed difficulty to drive the low speed parts (~10 km/h) with the 1st gear
- With typical European vehicles, there seems to be few problem to follow the trace (accelerations and top speed portions of WLTC ver.4).

3. Summary of validation 1b

From the viewpoints of drivability, traceability and reproducibility, the following 31 portions are pointed out by India, JRC and Japan.



3. Summary of validation 1b

No.	Time	Comments	by
1	24 - 28	Need to be smoothness	Japan
2	48 – 67	Difficult to drive the low speed parts	JRC/India/Japan
3	140 – 160	Difficult to drive the low speed parts	JRC/India/Japan
4	185 - 210	Difficult to drive the low speed parts	JRC/India/Japan
5	250 - 270	Need to be smoothness	India/Japan
6	275 - 295	Need to be smoothness	India/Japan
7	545 – 560	Need to be smoothness	Japan
8	600 - 615	Require close to W.O.T. operation	Japan
9	660 - 670	Difficult to drive the low speed parts	JRC/India/Japan
10	709	Difficult to drive the low speed parts	JRC/India/Japan
11	715 – 718	Difficult to drive the low speed parts	JRC/India/Japan
12	720 – 730	Require close to W.O.T. operation	Japan
13	760 - 770	Difficult to drive the low speed parts	JRC/India/Japan
14	770 – 785	Require close to W.O.T. operation	Japan
15	780 -804	Difficult to drive (PMR concern)	India
16	800 – 810	Require close to W.O.T. operation	Japan

3. Summary of validation 1b

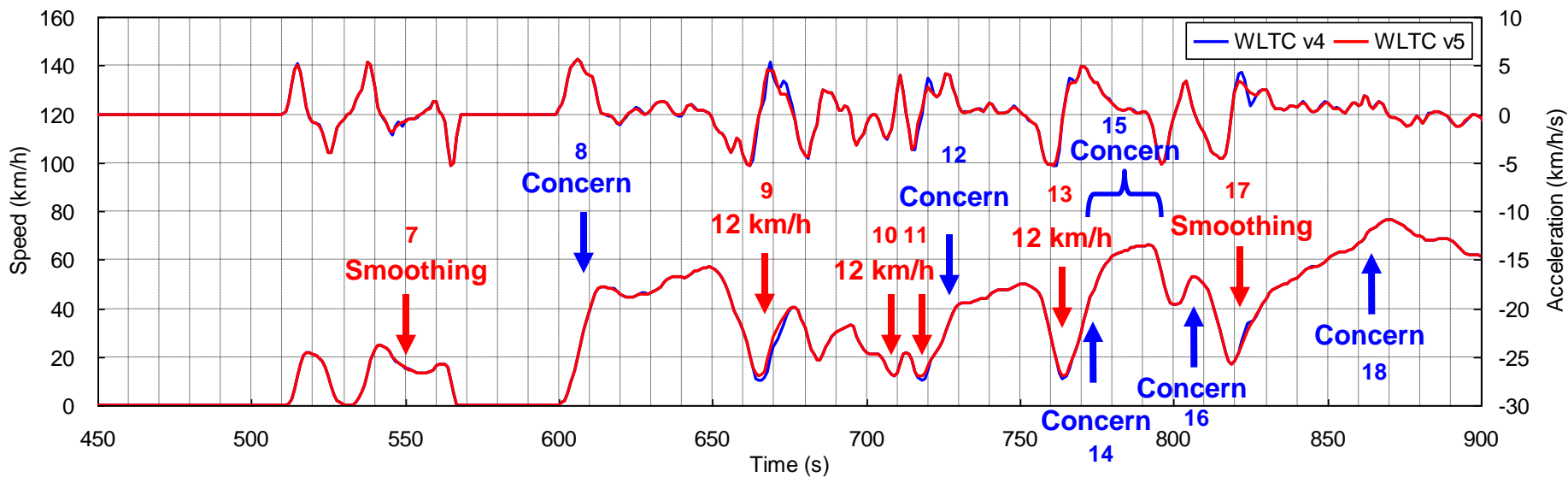
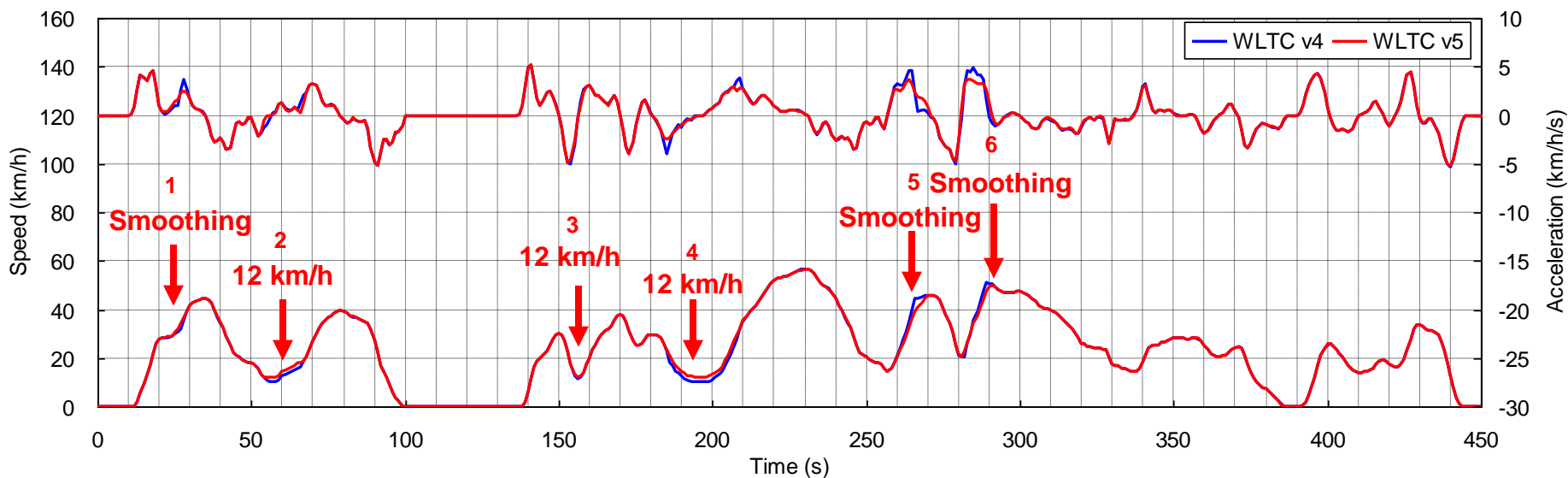
No.	Time	Comments	by
17	815 – 830	Need to be smoothness	India/Japan
18	860 – 870	Require close to W.O.T. operation	Japan
19	910 – 925	Require close to W.O.T. operation	Japan
20	950 – 980	Require close to W.O.T. operation	Japan
21	1060 – 1065	Difficult to drive the low speed parts	JRC/India/Japan
22	1070 – 1125	Difficult to follow the target speed Require close to W.O.T. operation	India/Japan
23	1140 - 1155	Difficult to drive the low speed parts	JRC/India/Japan
24	1155 - 1250	Difficult to follow the target speed Require close to W.O.T. operation	India/Japan
25	1310 – 1325	Require close to W.O.T. operation	Japan
26	1375 - 1385	Require close to W.O.T. operation	India/Japan
27	1420 - 1450	Difficult to follow the target speed	India
28	1530 - 1585	Require close to W.O.T. operation	India/Japan
29	1640 - 1675	Require close to W.O.T. operation	India/Japan
30	1530 - 1740	Difficult to drive (PMR concern)	India
31	All	to be one decimal point (to XX.X km/h)	Japan

4. Proposed cycle modification for Validation 2

- As a first step to move forward to validation 2, Japan propose to modify the following items (15 portions).
 - the minimum speed set to 12km/h
 - Smoothing to improve repeatability
 - Set vehicle speed one decimal point
- Other 16 remaining portions regarding dynamic concerns which was indicated by India and Japan should be considered during Validation 2.

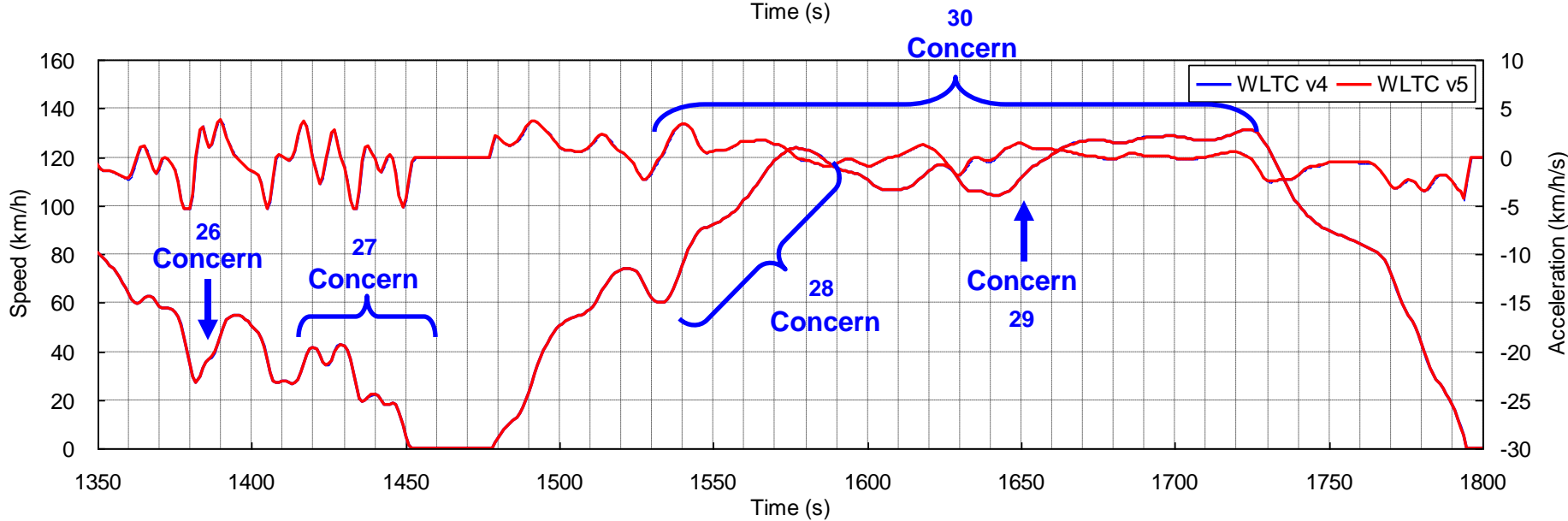
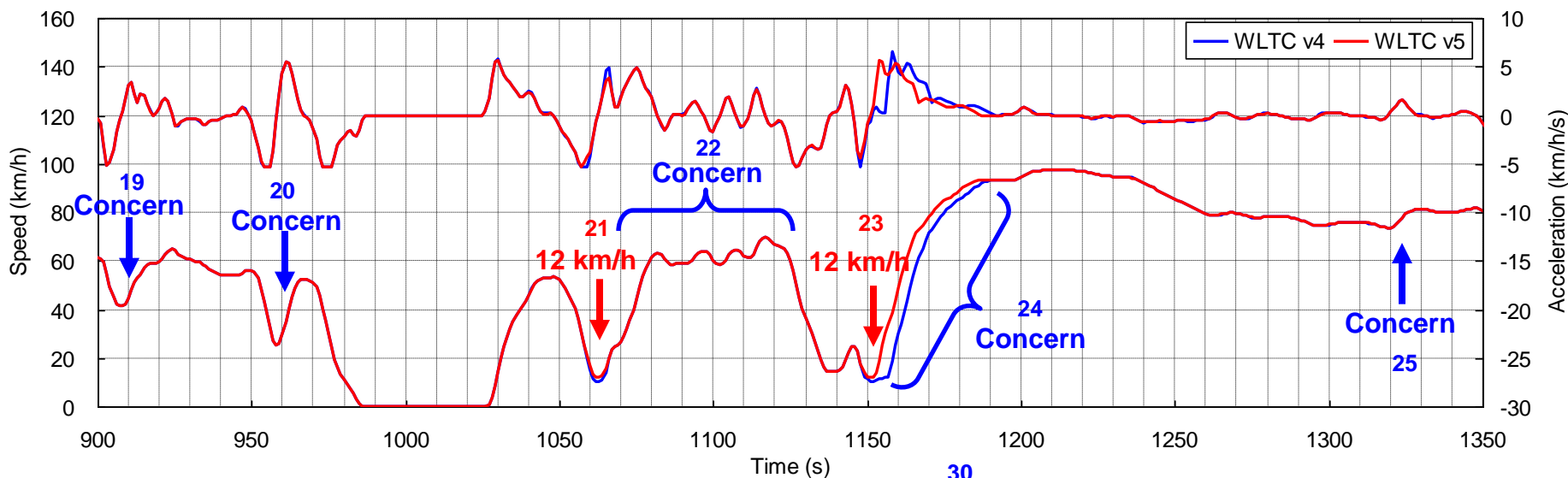
5. Proposed WLTC ver.5 for Validation 2

31: Time chart was changed from two decimal point to one decimal point



5. Proposed WLTC ver.5 for Validation 2

31: Time chart was changed from two decimal point to one decimal point



6.1. List of issues

No.	Time	Comments	by	Action
1	24 - 28	Need to be smoothness	Japan	Smoothing
2	48 – 67	Difficult to drive the low speed parts	JRC/India/Japan	Minimum speed to 12 km/h
3	140 – 160	Difficult to drive the low speed parts	JRC/India/Japan	Minimum speed to 12 km/h
4	185 - 210	Difficult to drive the low speed parts	JRC/India/Japan	Minimum speed to 12 km/h
5	250 - 270	Need to be smoothness	India/Japan	Smoothing
6	275 - 295	Need to be smoothness	India/Japan	Smoothing
7	545 – 560	Need to be smoothness	Japan	Smoothing
8	600 - 615	Require close to W.O.T. operation	Japan	Evaluated during validation2
9	660 - 670	Difficult to drive the low speed parts	JRC/India/Japan	Minimum speed to 12 km/h & Smoothing
10	709	Difficult to drive the low speed parts	JRC/India/Japan	Minimum speed to 12 km/h
11	715 – 718	Difficult to drive the low speed parts	JRC/India/Japan	Minimum speed to 12 km/h
12	720 – 730	Require close to W.O.T. operation	Japan	Evaluated during validation2
13	760 - 770	Difficult to drive the low speed parts	JRC/India/Japan	Minimum speed to 12 km/h
14	770 – 785	Require close to W.O.T. operation	Japan	Evaluated during validation2
15	780 -804	Difficult to drive (PMR concern)	India	Evaluated during validation2
16	800 – 810	Require close to W.O.T. operation	Japan	Evaluated during validation2

6.2. List of issues

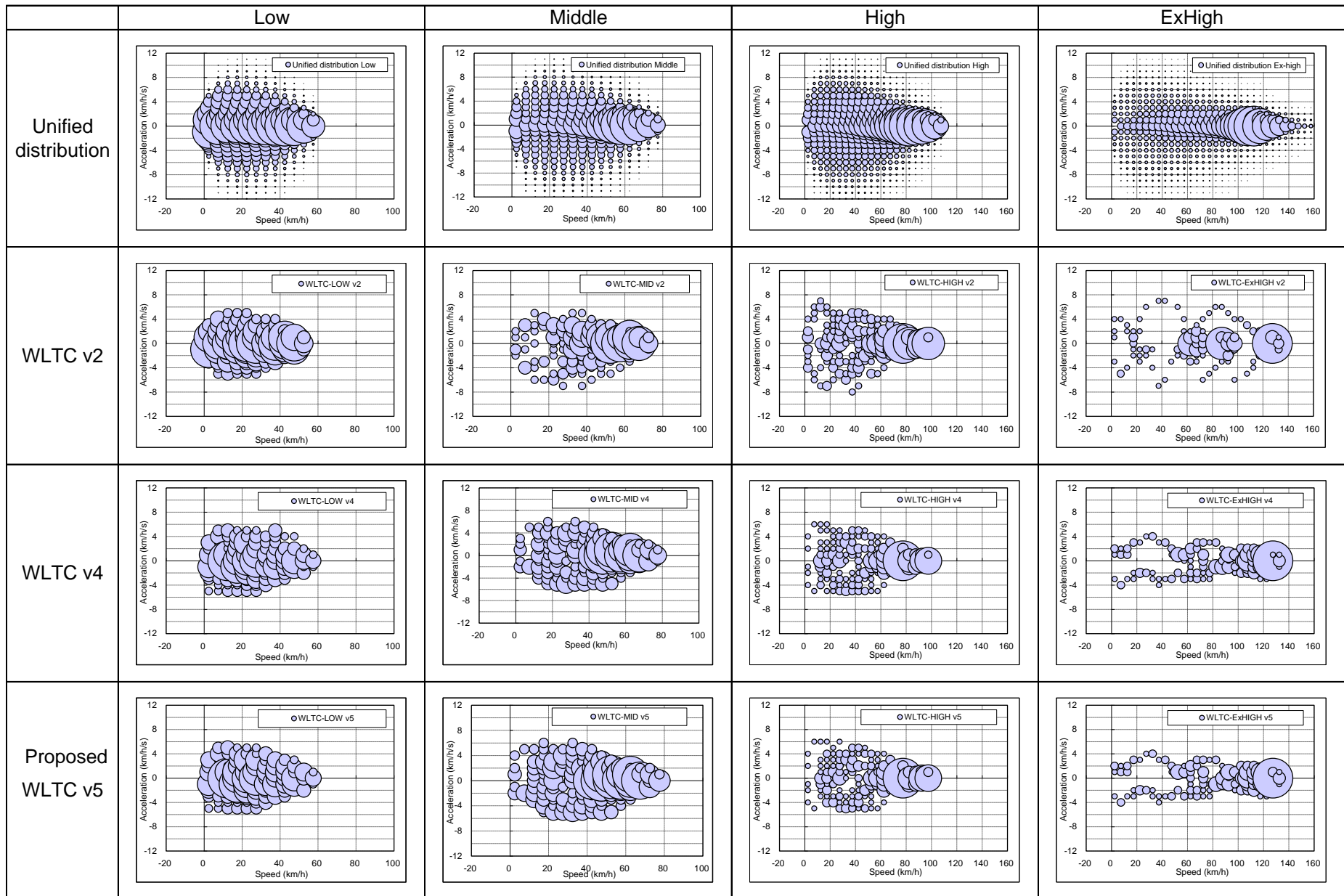
No.	Time	Comments	by	Action
17	815 – 830	Need to be smoothness	India/Japan	Smoothing
18	860 – 870	Require close to W.O.T. operation	Japan	Evaluated during validation2
19	910 – 925	Require close to W.O.T. operation	Japan	Evaluated during validation2
20	950 – 980	Require close to W.O.T. operation	Japan	Evaluated during validation2
21	1060 – 1065	Difficult to drive the low speed parts	JRC/India/Japan	Minimum speed to 12 km/h
22	1070 – 1125	Difficult to follow the target speed Require close to W.O.T. operation	India/Japan	Evaluated during validation2
23	1140 - 1155	Difficult to drive the low speed parts	JRC/India/Japan	Minimum speed to 12 km/h
24	1155 - 1250	Difficult to follow the target speed Require close to W.O.T. operation	India/Japan	Evaluated during validation2
25	1310 – 1325	Require close to W.O.T. operation	Japan	Evaluated during validation2
26	1375 - 1385	Difficult to follow the target speed Require close to W.O.T. operation	India/Japan	Evaluated during validation2
27	1420 - 1450	Difficult to follow the target speed	India	Evaluated during validation2
28	1530 - 1585	Difficult to follow the target speed	India/Japan	Evaluated during validation2
29	1640 - 1675	Difficult to follow the target speed	India/Japan	Evaluated during validation2
30	1530 - 1740	Difficult to drive (PMR concern)	India	Evaluated during validation2
31	All	to be one decimal point (to XX.X km/h)	Japan	one decimal point

7.1. Characteristics of proposed WLTC ver.5

Parameter		Cycle duration	Driving distance	Average speed	Max. speed	Max. acceleration	Max. Deceleration	RPA	Acceleration ratio	Deceleration ratio	Cruise ratio	Idling ratio	χ ² value	Normalized χ ² value
		s (h)	km	km/h	km/h	km/h/s	km/h/s	m/s ²	%	%	%	%	V-A distribution	V-A distribution
LOW	WWW database	(6107)	114440	19.8	60.0	-	-	0.192	27.5	25.4	22.7	24.5	-	-
	WLTC v2	589	2.98	18.2	50.9	5.3	-5.3	0.165	26.3	27.8	19.5	26.3	0.244	0.0008
	WLTC v3	589	3.19	19.5	56.5	5.9	-5.3	0.176	25.1	29.2	20.9	24.8	0.289	0.0009
	WLTC v4	589	3.08	18.8	56.5	5.3	-5.3	0.209	27.0	31.1	17.1	24.8	0.608	0.0019
	Proposed WLTC v5	589	3.09	18.9	56.5	5.3	-5.3	0.205	28.4	31.1	15.8	24.8	0.586	0.0019
MID	WWW database	(3136)	120162	38.4	80.0	-	-	0.188	31.4	27.5	28.8	12.2	-	-
	WLTC v2	433	5.01	41.6	72.5	5.4	-7.4	0.155	37.0	24.2	27.7	11.1	0.629	0.0015
	WLTC v3	433	4.95	41.1	76.6	5.7	-5.3	0.184	33.7	29.6	26.1	10.6	0.613	0.0014
	WLTC v4	433	4.74	39.4	76.6	5.6	-5.3	0.198	36.0	30.3	23.1	10.6	0.649	0.0015
	Proposed WLTC v5	433	4.76	39.5	76.6	5.7	-5.4	0.196	36.0	30.3	23.1	10.6	0.650	0.0015
HIGH	WWW database	(3358)	192595	58.0	110.0	-	-	0.156	31.3	27.2	35.5	6.0	-	-
	WLTC v2	455	7.01	55.5	97.4	6.5	-7.7	0.144	29.0	28.8	35.2	7.0	0.962	0.0017
	WLTC v3	455	7.05	55.8	97.4	6.5	-5.3	0.143	28.8	28.8	36.0	6.4	0.869	0.0015
	WLTC v4	455	7.06	55.9	97.4	6.5	-5.3	0.137	27.0	27.3	39.3	6.4	1.065	0.0018
	Proposed WLTC v5	455	7.16	56.6	97.4	5.7	-5.4	0.135	26.8	27.9	38.9	6.4	1.113	0.0019
Ex-HIGH	WWW database	(3144)	282188	86.8	194.7	-	-	0.108	25.7	23.4	48.9	2.0	-	-
	WLTC v2	323	7.72	86.0	132.0	7.4	-6.8	0.127	25.4	25.4	47.7	1.5	5.312	0.0060
	WLTC v3	323	7.67	85.4	130.4	6.1	-5.3	0.126	26.9	25.7	45.8	1.5	4.413	0.0050
	WLTC v4	323	8.25	92.0	131.3	3.7	-4.4	0.125	36.2	31.6	30.7	1.5	2.779	0.0031
	Proposed WLTC v5	323	8.25	92.0	131.3	3.7	-4.4	0.125	37.2	32.2	29.1	1.5	2.678	0.0030

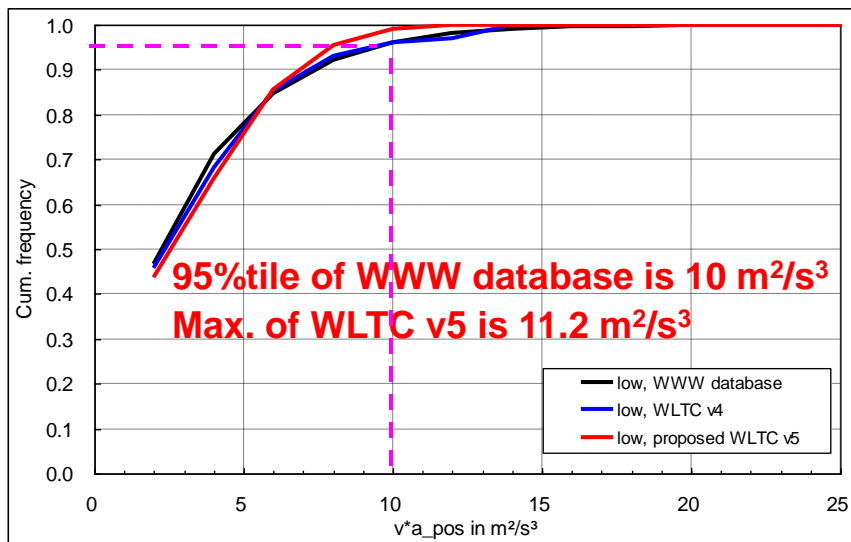
Chi squared value of proposed WLTC v5 is identical to that of WLTC v4

7.1. Speed frequency distributions

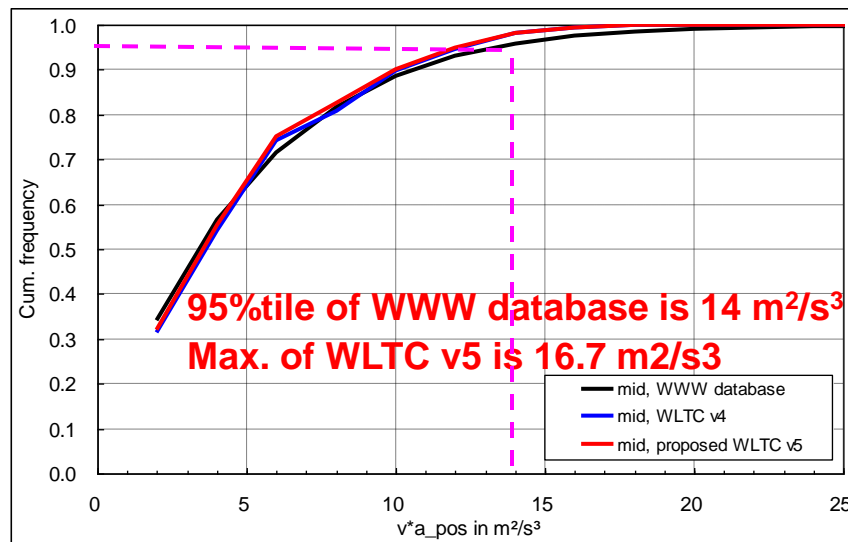


7.3. $v^* a_{pos}$ frequency

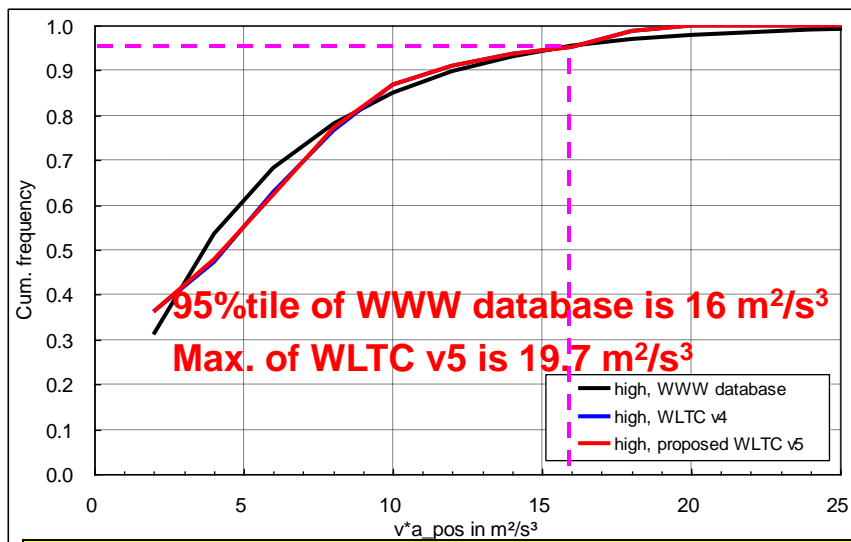
◆ LOW



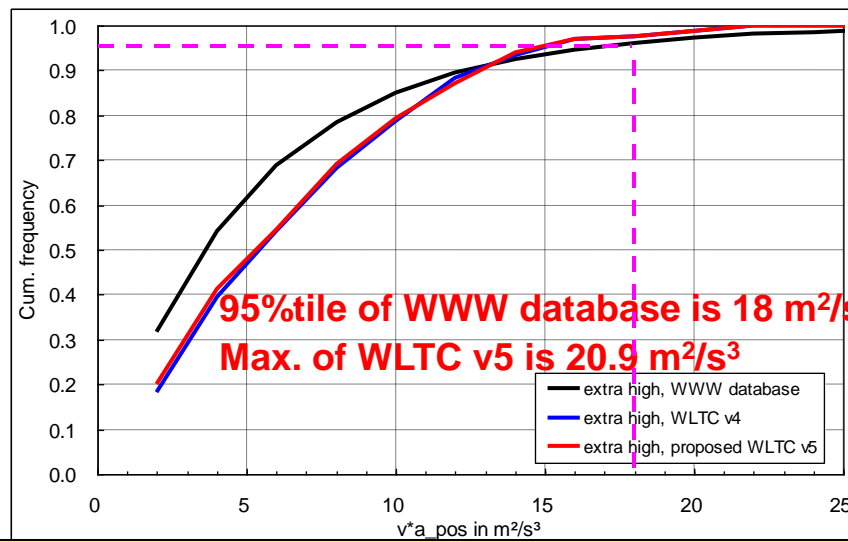
◆ MIDDLE



◆ HIGH



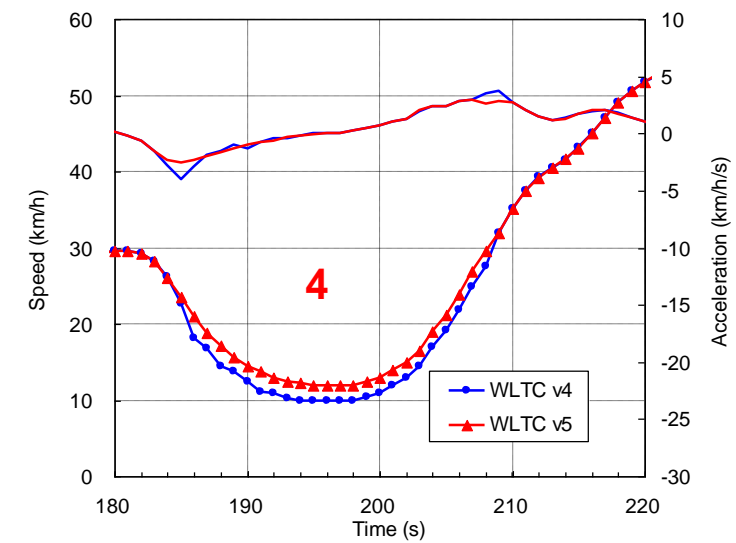
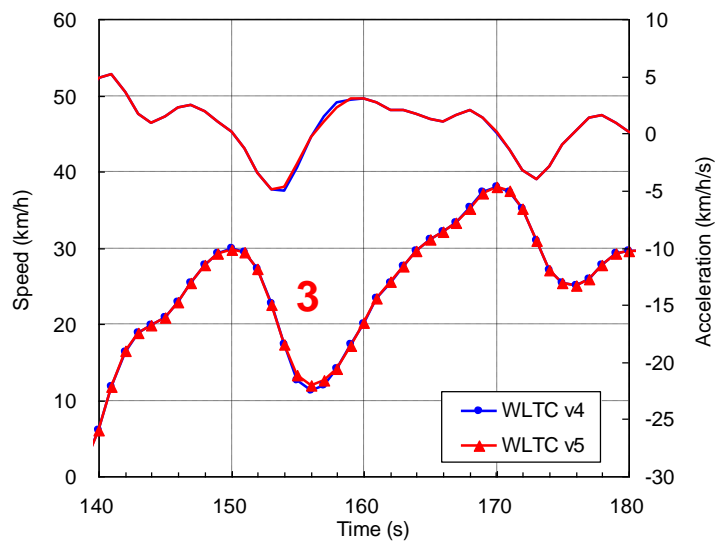
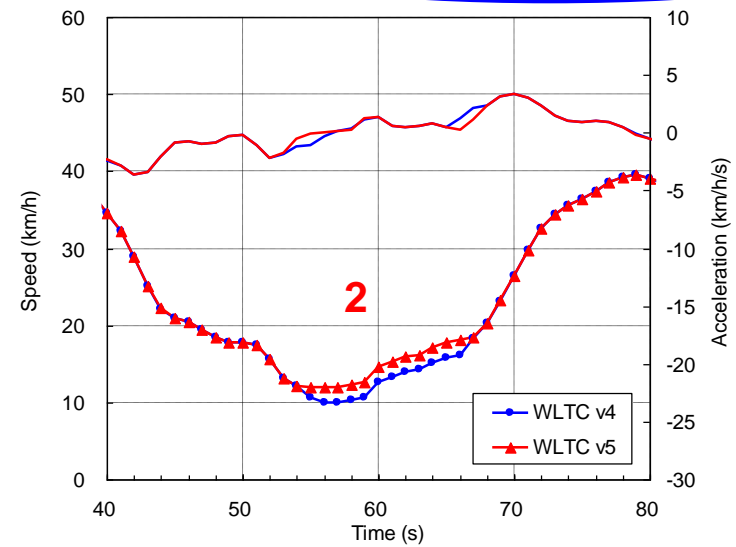
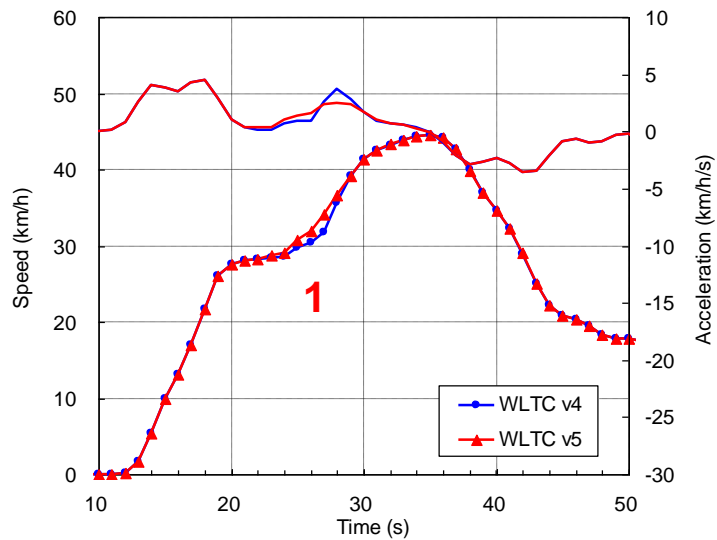
◆ Extra-HIGH



The maximum $v^* a$ of WLTC ver.5 exceed 95%tile of WWW database

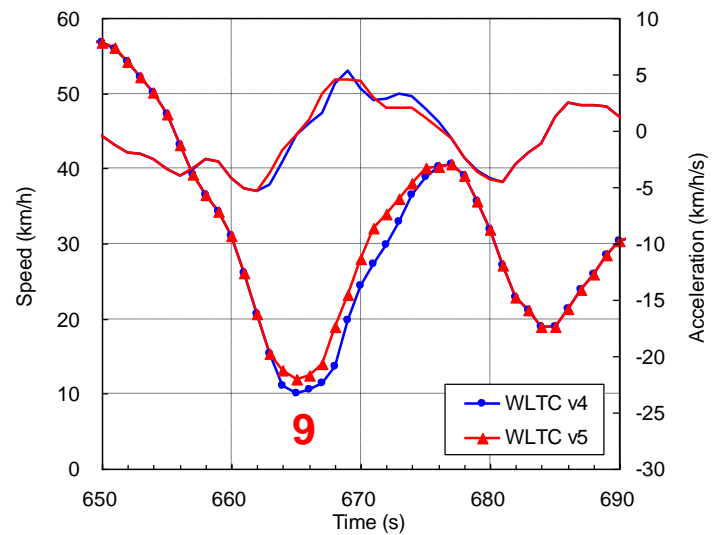
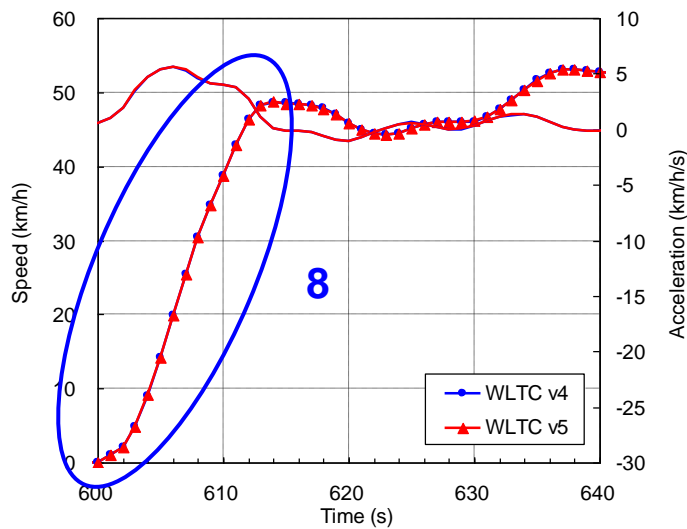
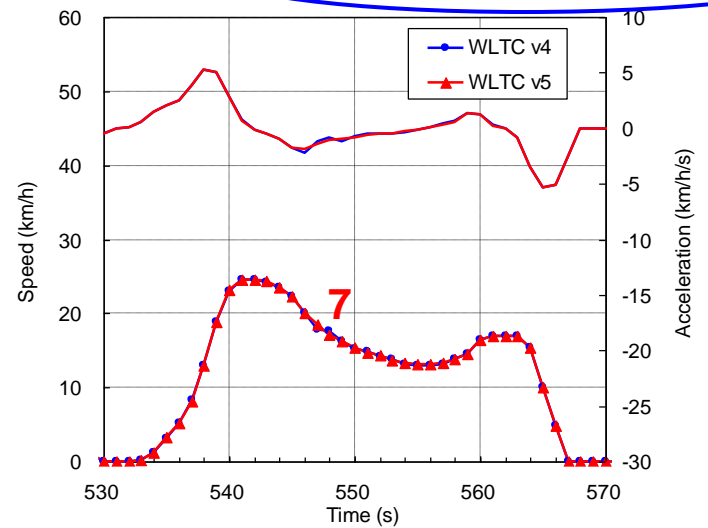
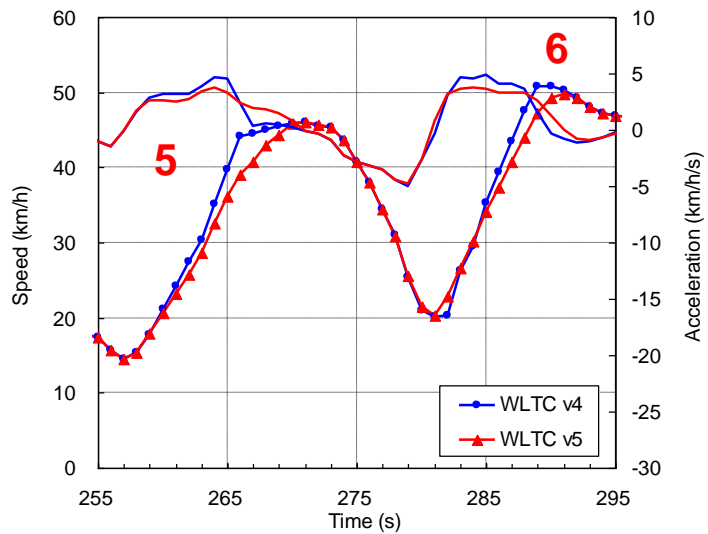
8. Detail of modification

Not modified, but need further evaluation



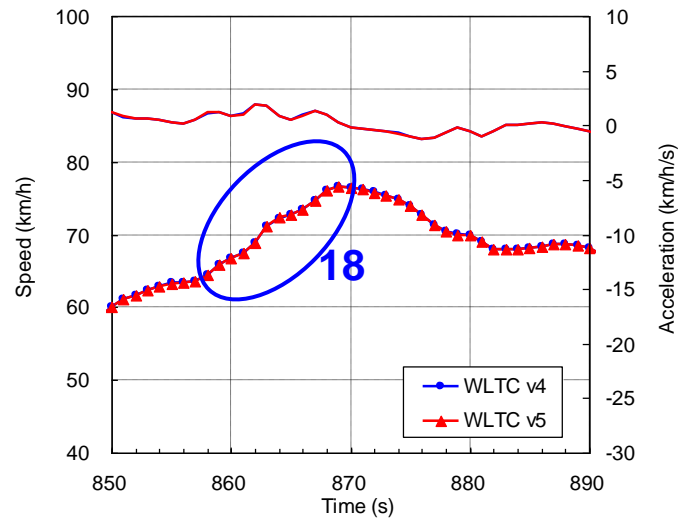
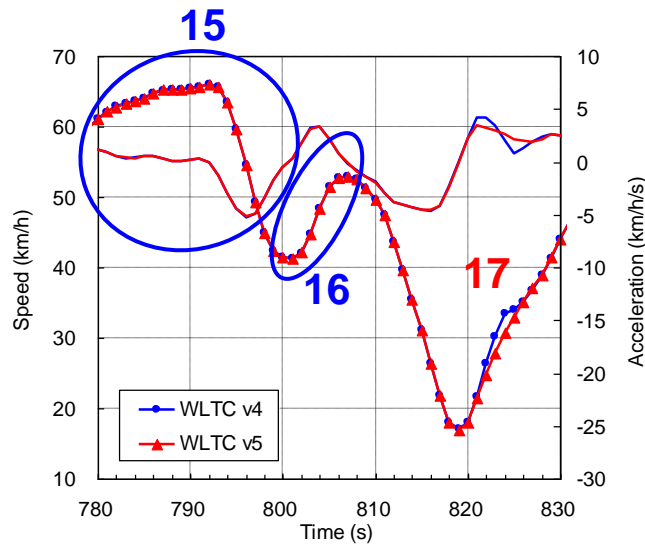
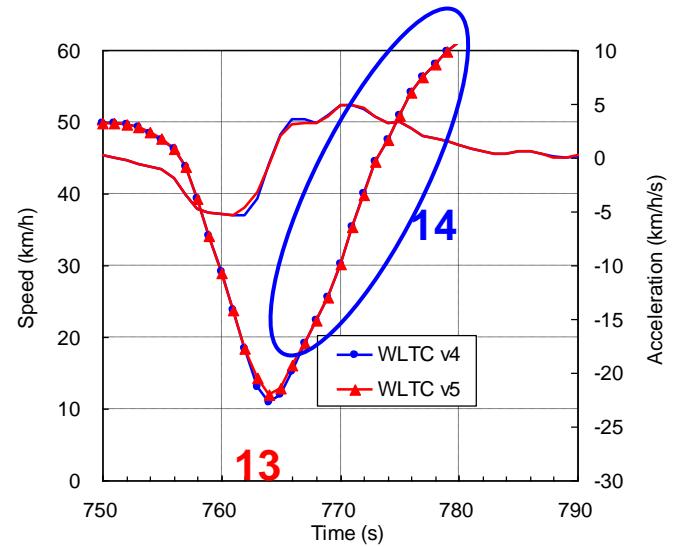
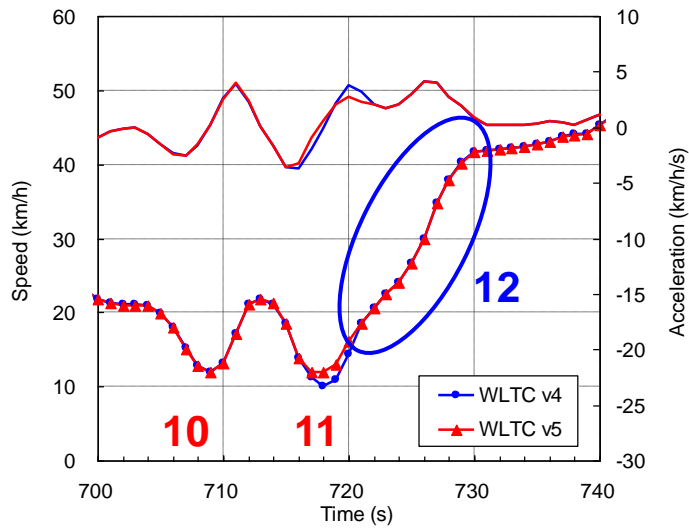
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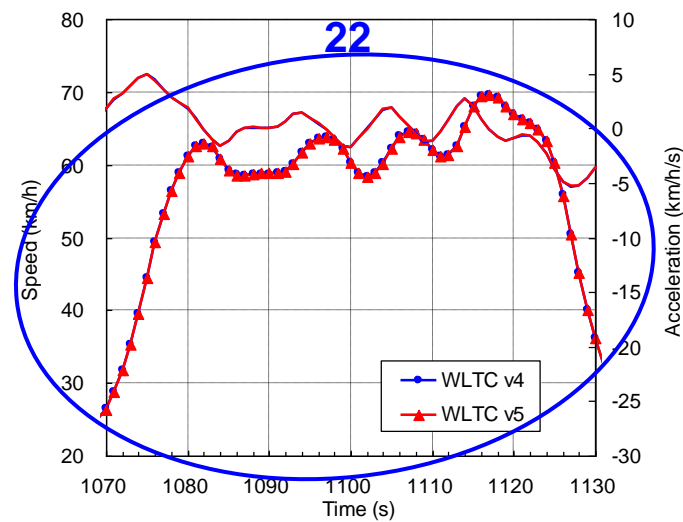
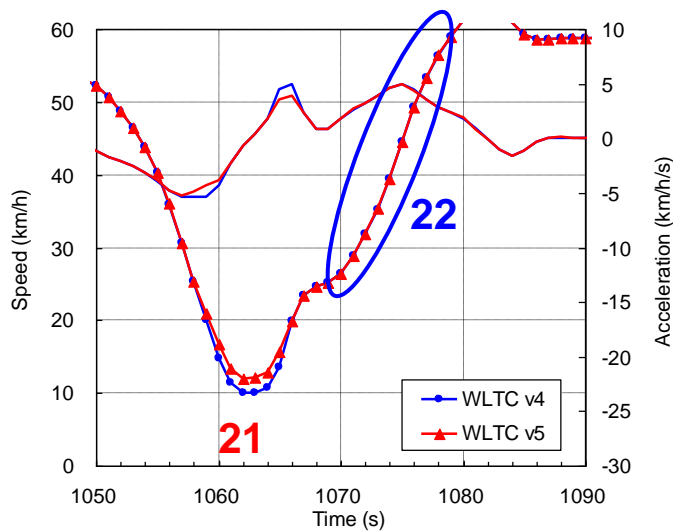
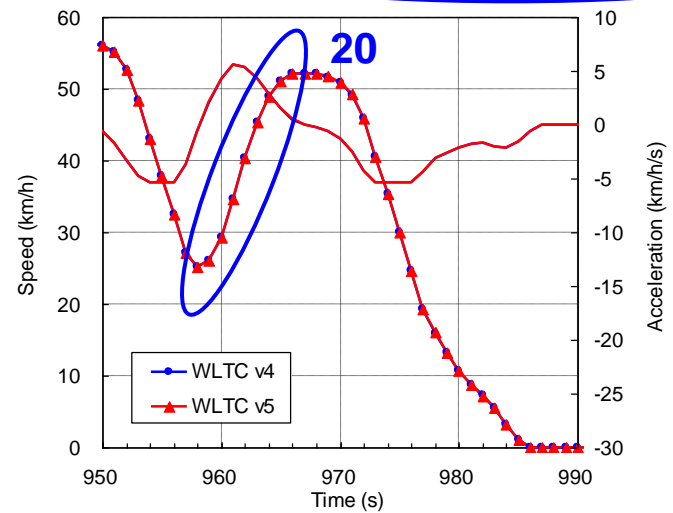
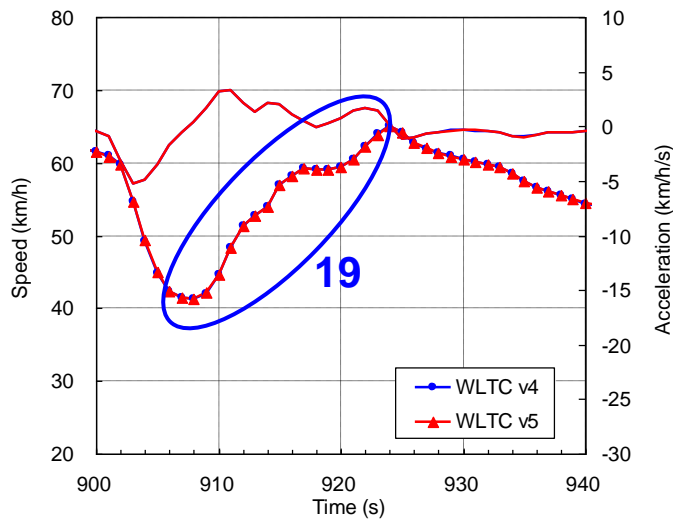
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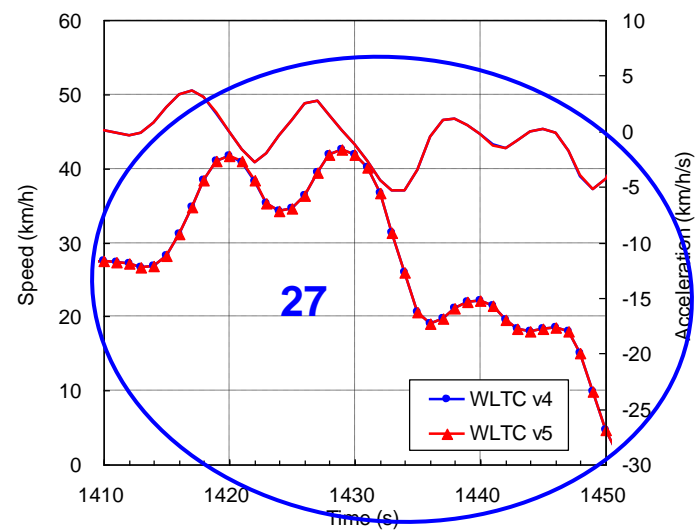
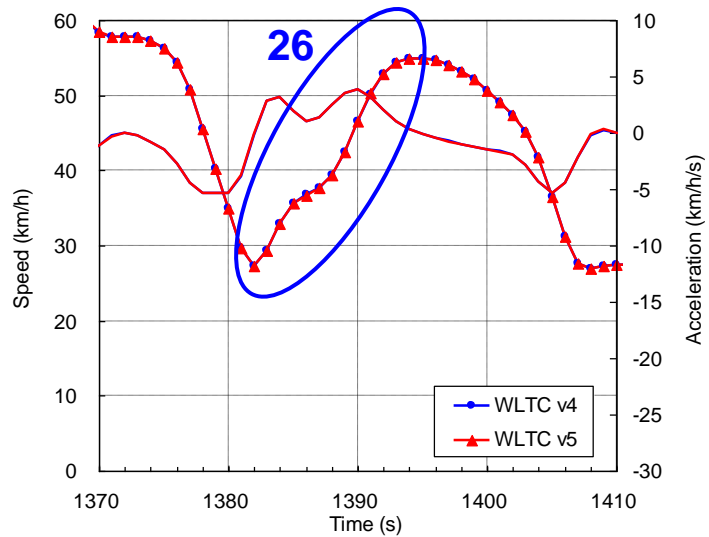
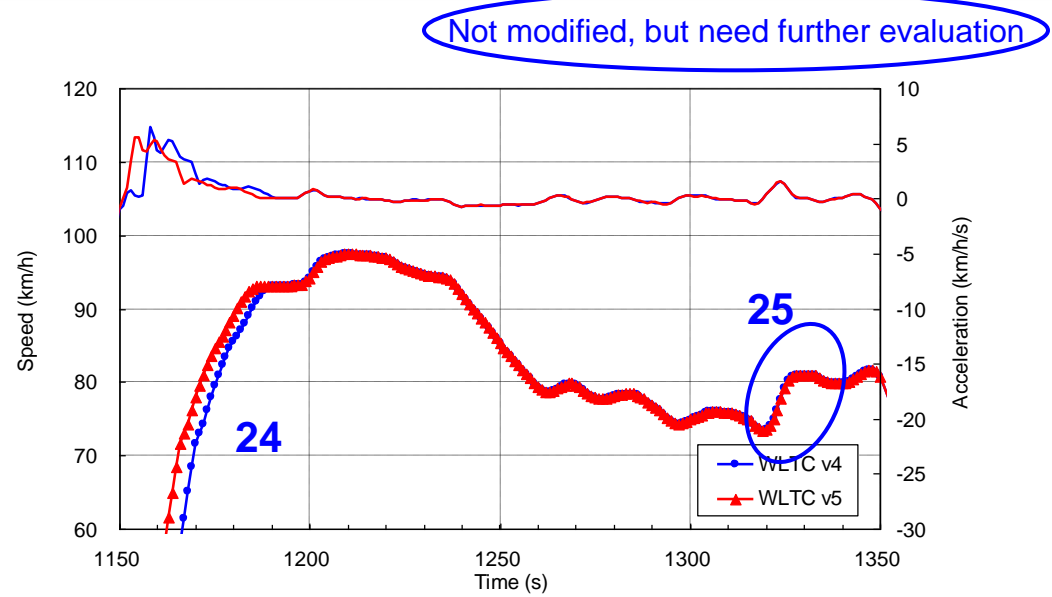
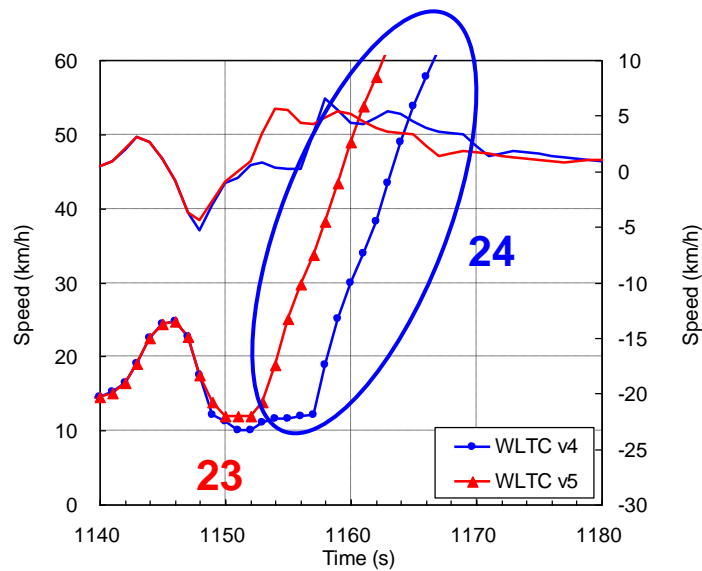


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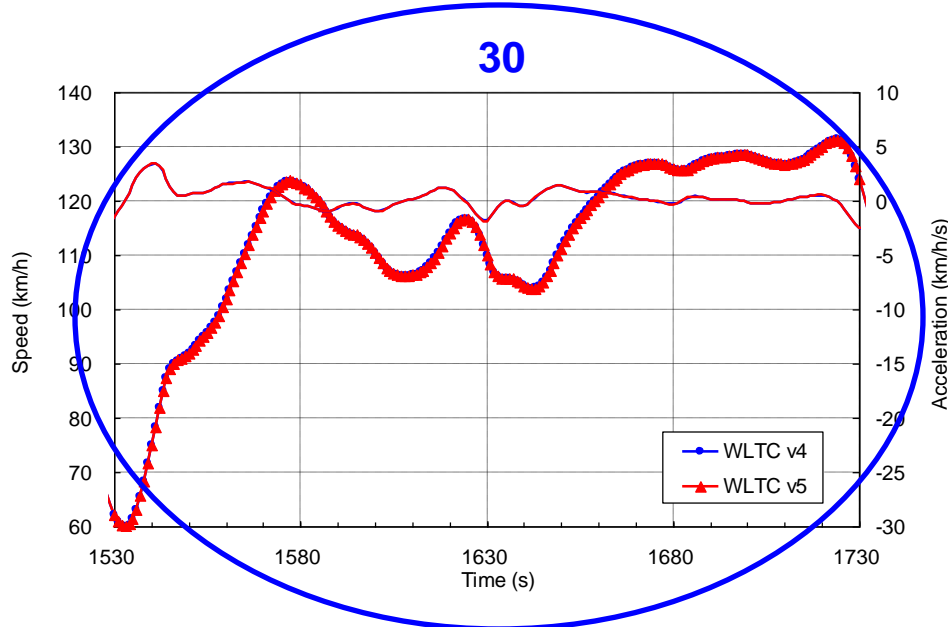
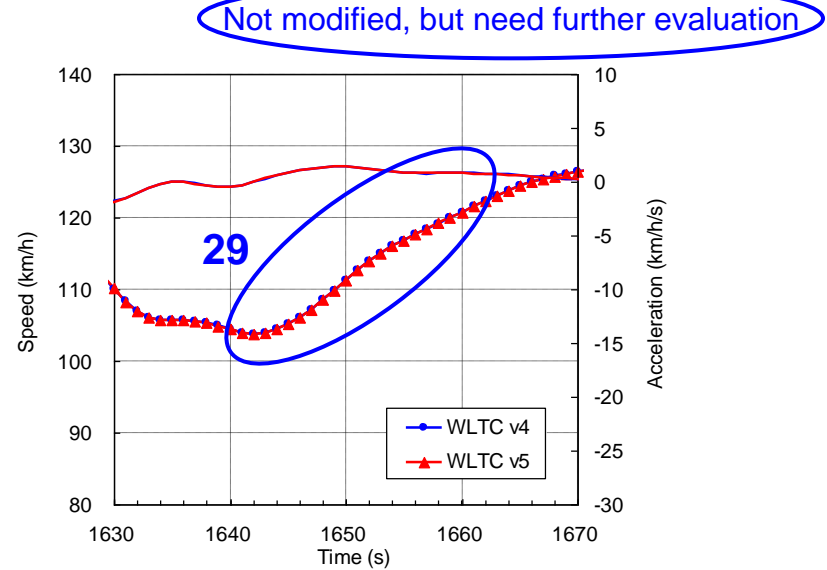
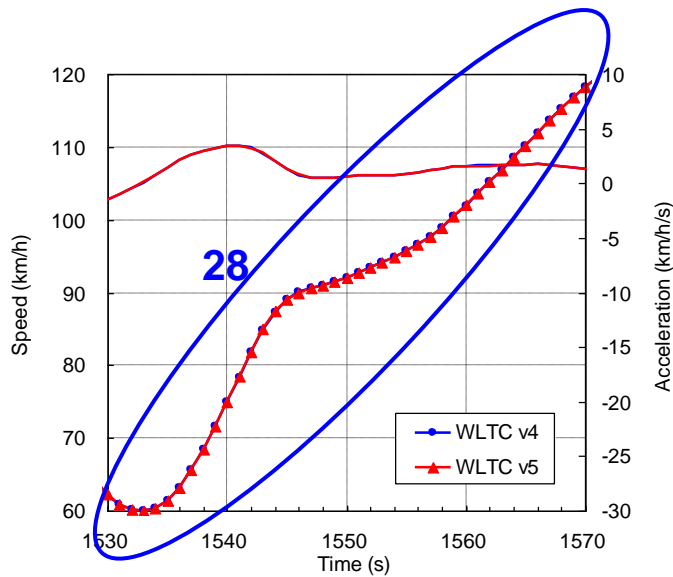
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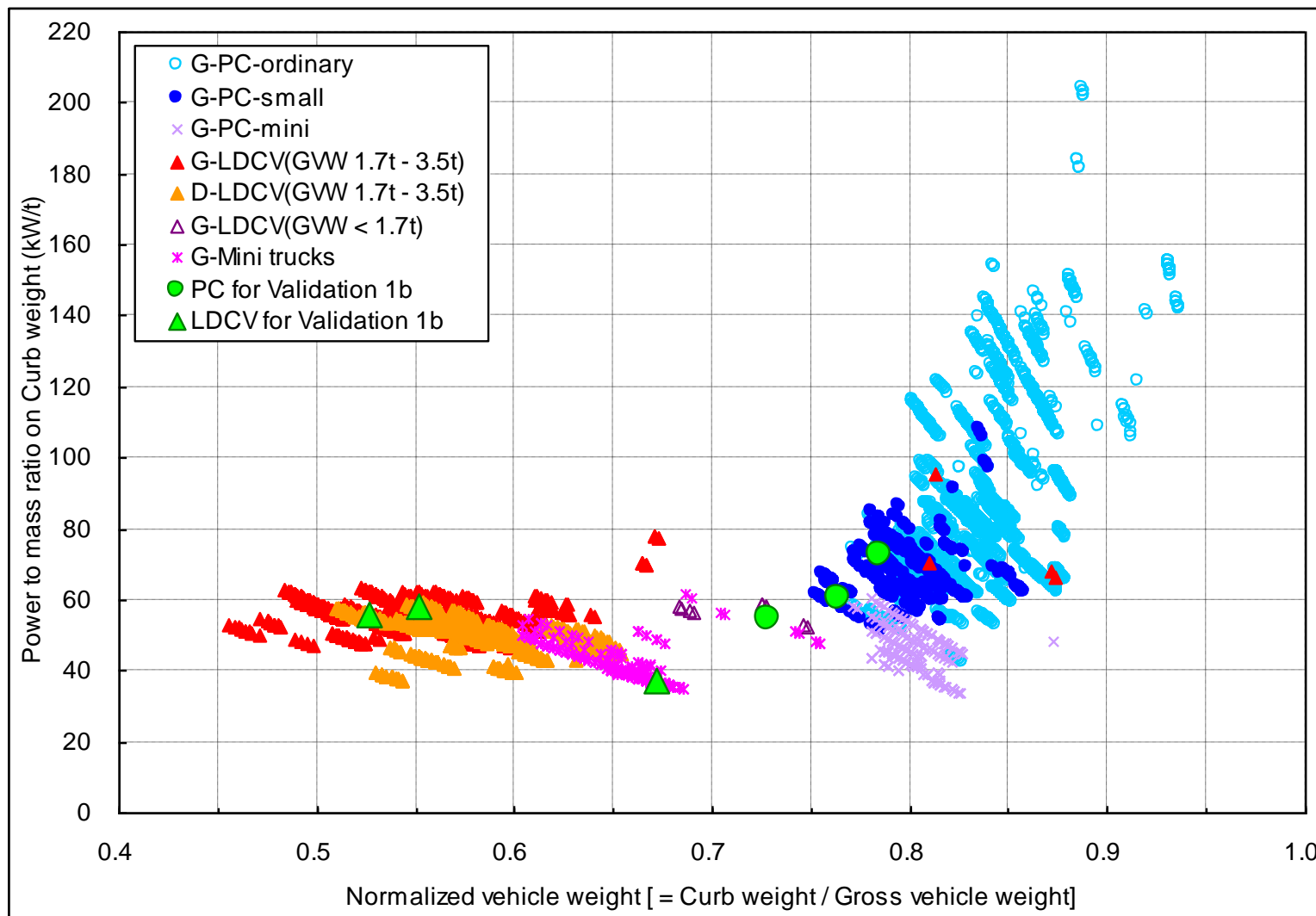


8. Detail of modification



8. Detail of modification





Source: JSAE 2008