

Concept for introducing the Weighting Factors for L/M/H/ExH phase

Prepared by Japan

13th DHC group

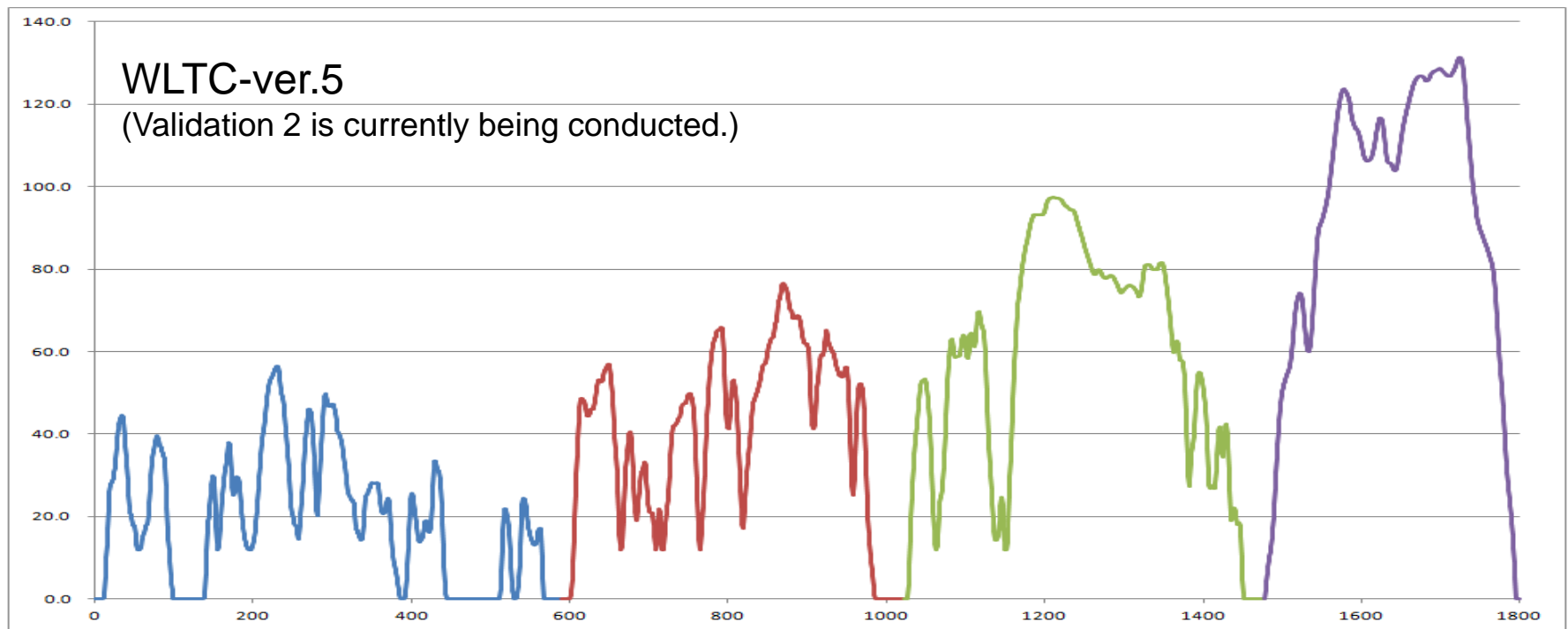
under GRPE/WLTP informal group

5 June 2012

the Palais des Nations (Geneva/Switzerland)

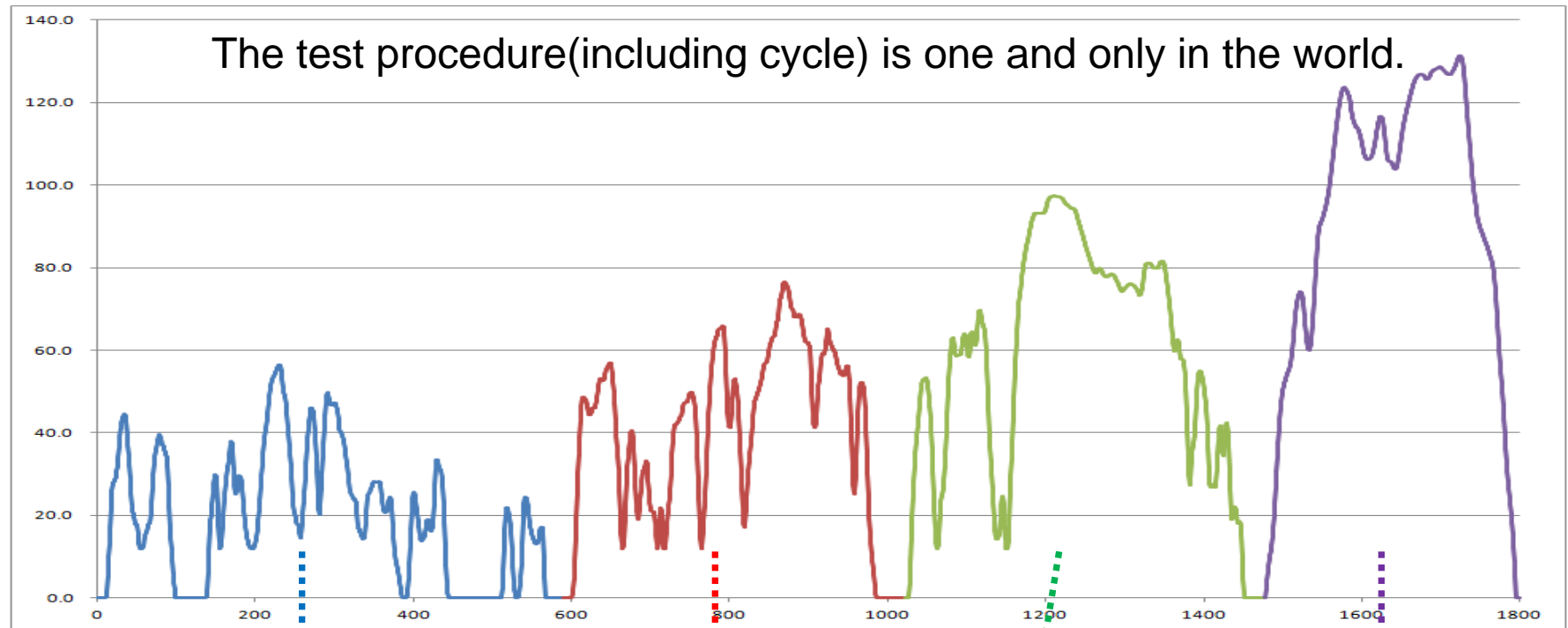
Introducing *Weighting Factors*

- The proportions of each phase are different among countries/regions.
- In order to adjust the proportions into the actual traffic conditions in each countries/regions, **the ratios of each phases (“*Weighting Factors*”) should be introduced.**



“Weighting Factors” was listed as one of the “Open Issues” at the 62nd GRPE meeting in June 2011. But, this issue has not been discussed well yet.

What is the Weighting Factors?



Test results measured according to the WLTP

Fuel
consumption: OO L/100km
NOx: OO g/km

Fuel
consumption: OO L/100km
NOx: OO g/km

Fuel
consumption: OO L/100km
NOx: OO g/km

Fuel
consumption: OO L/100km
NOx: OO g/km

$\times \alpha\%$

$\times \beta\%$

$\times \gamma\%$

$\times \delta\%$

Weighting Factors = Weighted by some coefficients in each phase

Fuel consumption: OO L/100km
NOx: OO g/km

Why Weighting Factors are needed?

Calculation of chi-square value in speed/acceleration distribution to compare WLTC-ver.5 with each country data.

The gap between WLTC and Japan (as well as India and Korea) is wider than that of EU and US.

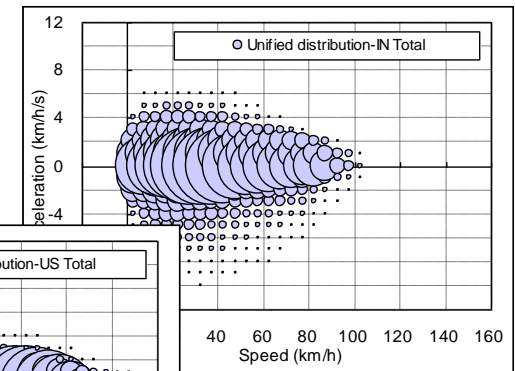
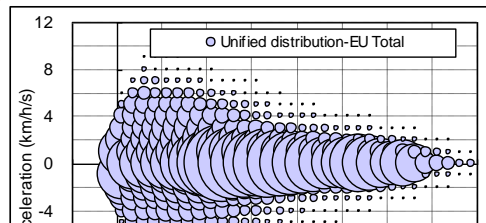
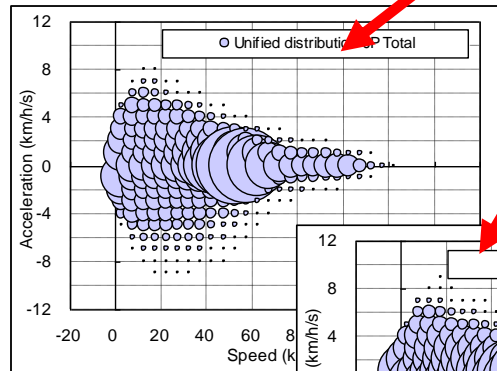


How can we describe the local characteristics with WLTC?

Japan $\chi^2=37.41$

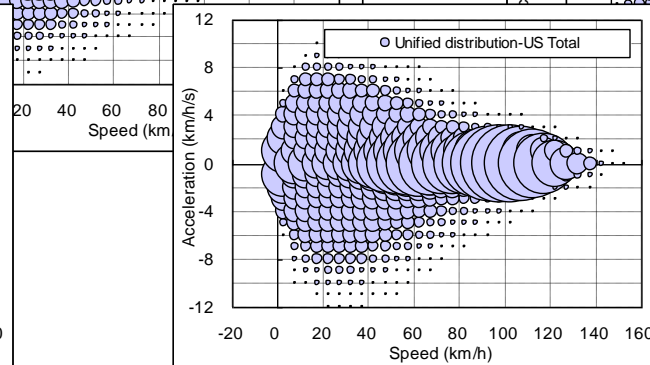
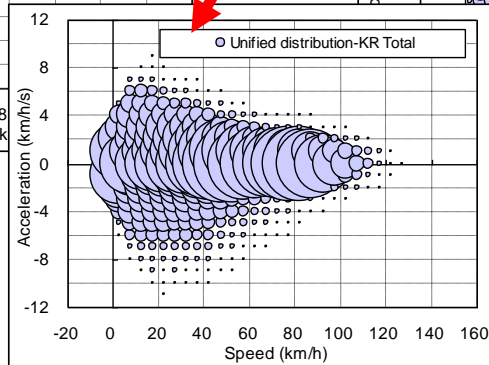
EU $\chi^2=0.510$

India $\chi^2=NA(> 23.0)$



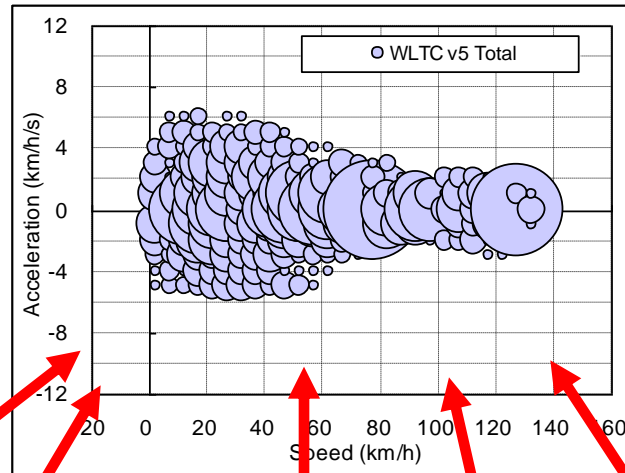
Korea

$\chi^2=36.78$



US

$\chi^2=0.903$

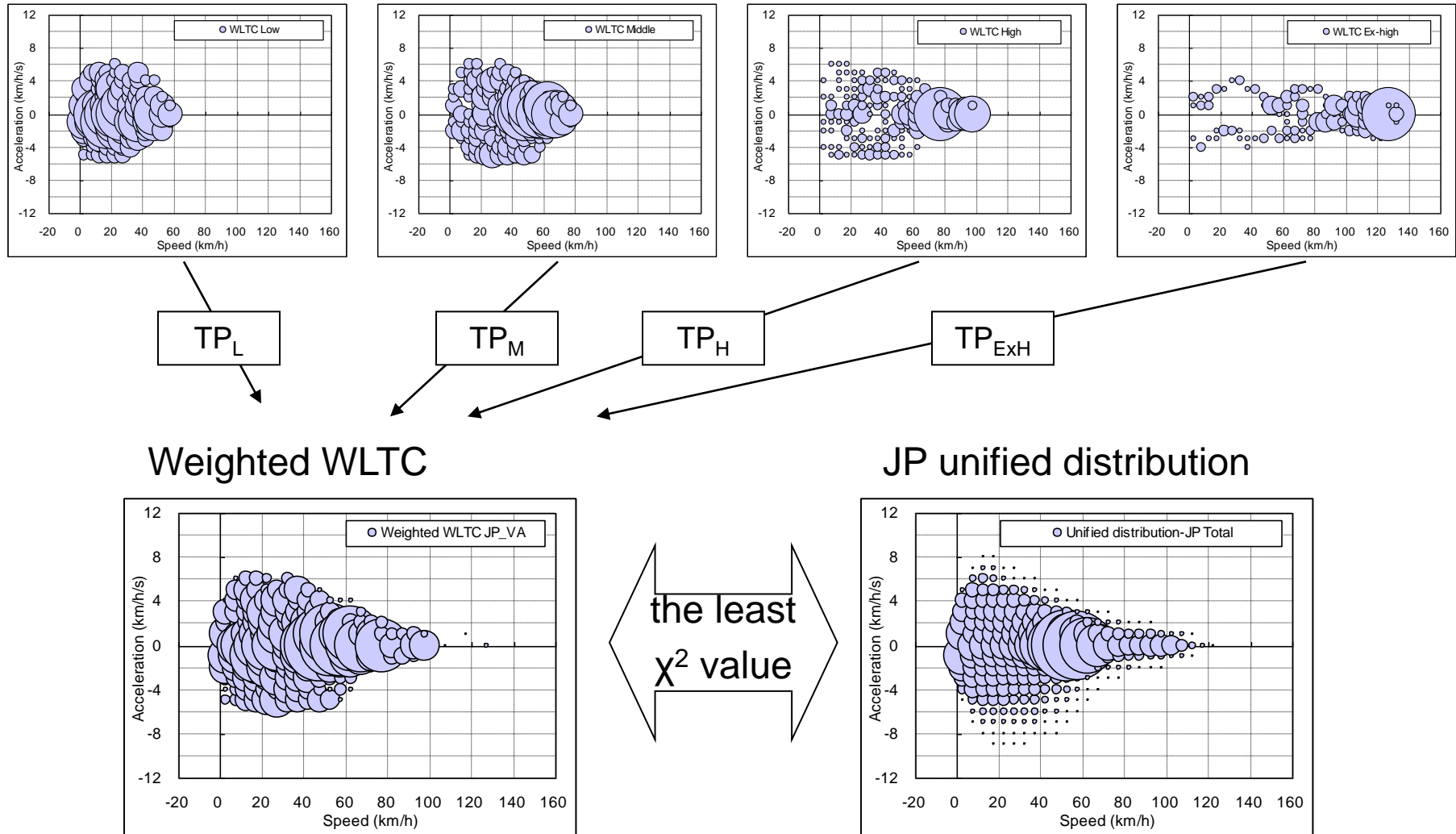


$$\chi^2 = \sum \frac{(WLTC_{i,j} - Unified_r_{i,j})^2}{Unified_r_{i,j}}$$

r: Region

Calculation method of the Weighting Factors

STEP 1: Convergence calculation of time proportions which give the least chi-square value in speed/acceleration distribution.



Calculation method of the Weighting

Factors

STEP 2: Conversion of time proportion to distance proportion (= Weighting Factors)

【Calculation for Japanese WF】

$$\chi^2: 37.4 \Rightarrow 0.58$$

		L	M	H	ExH	Total
1	Time Proportion	0.392	0.511	0.096	0.001	1
2	Mean Speed of WLTC	18.9	39.5	56.6	92.0	-
3	Distance Coverage(=1 × 2)	7.41	20.21	5.44	0.09	33.15
	Distance proportion (= Weighting Factors)[%]	22.4	61.0	16.4	0.3	(100)
Ref.	Distance proportion of WLTC [%]	13.3	20.5	30.8	35.5	(100)

(Ref.) Calculation for WF in other region

Weighting Factors[%]	L	M	H	ExH	
EU	13.4	28.9	30.3	27.4	$\chi^2: 0.51 \Rightarrow 0.45$
India	34.9	47.4	17.7	0.0	$\chi^2: >23.0 \Rightarrow 0.84$
Korea	22.4	37.7	39.6	0.3	$\chi^2: 36.8 \Rightarrow 0.49$
US	4.2	31.5	41.0	23.3	$\chi^2: 0.90 \Rightarrow 0.70$

(Ref) Calculation of fuel consumption and emission

Fuel consumption (L/100km)

(L/100km)

		L	M	H	ExH	Total
1. WLTC		6.090	4.983	4.760	5.970	5.417
2. WF[%]		22.4	61.0	16.4	0.3	(100)
1 × 2		1.36	3.04	0.78	0.02	5.200

Carbon monoxide (g/km)

(g/km)

		L	M	H	ExH	Total
1. WLTC		0.098	0.028	0.084	0.628	0.268
2. WF[%]		22.4	61.0	16.4	0.3	(100)
1 × 2		0.022	0.017	0.014	0.002	0.055