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Global Technical Regulation No. 15 on Worldwide harmonized Light vehicles Test Procedures (WLTP)

Informal Document:
Proposal for a new Supplement to Global Technical Regulation No. 15 on Worldwide harmonized Light vehicles Test Procedures (WLTP)

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The text reproduced below was prepared by the expert from the International Organization of Motor Vehicle Manufacturers (OICA) to adapt the provisions of GTR 15 with respect to the criteria for avoiding illogical results when establishing an interpolation family. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

I. Proposal

Annex 4,

Paragraph 4.2.1.1.2., amend to read:

"4.2.1.1.2.   Using an interpolation method

At the request of the manufacturer, an interpolation method may be applied.

In this case, two test vehicles shall be selected from the family complying with the respective family requirement.

Test vehicle H shall be the vehicle producing the higher, and preferably highest, cycle energy demand of that selection, test vehicle L the one producing the lower, and preferably lowest, cycle energy demand of that selection.

All items of optional equipment and/or body shapes that are chosen not to be considered in the interpolation method shall be fitted to both test vehicles H and L such that these items of optional equipment produce the highest combination of the cycle energy demand due to their road load relevant characteristics (i.e. mass, aerodynamic drag and tyre rolling resistance).

Additionally the following restrictions apply to the road load relevant characteristics of road load families and interpolation families:

(a) the manufacturer shall take care of the linearity of the road load interpolation or the worst case shall apply. As a guidance, the following minimum deltas between vehicle H and L should be fulfilled for that road load relevant characteristic:

(i) mass at least 30kg;

(ii) rolling resistance at least 1.0 kg/t;

(iii) aerodynamic drag cd*A at least 0.05 m².

(b) To achieve a sufficient delta between vehicle H and L on a particular road load relevant characteristic, the manufacturer may artificially worsen vehicle H, e.g. by applying a higher test mass.

(c) For each road load characteristic (i.e. mass, aerodynamic drag and tyre rolling resistance) the value of vehicle H shall be higher than that of vehicle L, otherwise the worst case has to be applied for that road load relevant characteristic.

(d) The cycle energy of vehicle H shall be higher than that of vehicle L for all applicable phases."

Annex 6,

Paragraph 2.3.2., amend to read:

"2.3.2.   CO$_2$ interpolation range

2.3.2.1.   The interpolation method shall only be used if

> コメント **[LCE1]:** Strict requirement on min-delta currently not supported by Japan. Compromise proposal of using a guidance.

(a) the difference in CO_2 **over the applicable cycle resulting of step 9 of Table A7/1 of Annex 7** between test vehicles L and H is between a minimum of 5 **g/km** and a maximum **defined in paragraph 2.3.2.2. of this Annex.**

(b) for all applicable phase values the CO_2 values resulting of step 9 of Table A7/1 of Annex 7 of vehicle H are higher than those of vehicle L.

If these requirements are not met, tests can be declared void and repeated in agreement with the responsible authority.

2.3.2.2. **The maximum delta CO_2 allowed over the applicable cycle resulting of step 9 of Table A7/1 of Annex 7 between test vehicles L and H is** 20 per cent of the CO_2 emissions from vehicle H, **but at least 12 g/km and not exceeding 2730 g/km.**

For the application of a road load matrix family this restriction does not apply.

2.3.2.3. At the request of the manufacturer and with approval of the responsible authority, the interpolation line may be extrapolated to a maximum of 3 g/km above the CO_2 emission of vehicle H and/or below the CO_2 emission of vehicle L. ~~This extension is valid only within the absolute boundaries of the interpolation range specified above.~~

For the application of a road load matrix family extrapolation is not permitted.

2.3.2.4. **At the request of the manufacturer the allowed interpolation range can be increased by 10 g/km CO_2 if a vehicle M is tested in that family and the conditions are met, see paragraph 2.3.2.5. of this Annex.**

~~2.3.2.1. For the application of a road load matrix family the maximum difference in CO_2 between vehicles H_M and L_M does not apply and extrapolation is not permitted.~~

2.3.2.5. **Vehicle M**

Vehicle M is a vehicle within the interpolation family with a cycle energy demand of the arithmetic average of vehicles L and H with a tolerance of ±10 per cent of the delta in cycle energy between vehicle L and H.

The defined road load coefficients and the defined test mass shall be recorded.

The linearity of CO_2 mass emission for vehicle M shall be verified against the linear interpolated CO_2 mass emission between vehicle L and H over the applicable cycle.

The linearity criterion for vehicle M shall be considered fulfilled if the difference between the CO_2 mass emission of vehicle M derived from the measurement and the interpolated CO_2 mass emission is below 1 g/km. If this difference is greater, the linearity criterion shall be considered to be fulfilled if this difference is 3 g/km or 3 per cent of the interpolated CO_2 mass emission for vehicle M, whichever is smaller.

If the linearity criterion is fulfilled, individual vehicles are interpolated between vehicles L and H.

If the linearity criterion is not fulfilled, the interpolation family shall be split into two sub-families for vehicles with a cycle energy demand

コメント **[LCE2]:** Proposal from Japan to have also a minimum max-delta.
Proposal of 15g/km is reduced by 3 g/km as for the max-delta due to the proposal of simplifying the extrapolation rule.

コメント **[LCE3]:** Proposal on improvement on extrapolation.
Proposal from EU WLTP, 15.12.2017.
Currently not agreed by Japan.

コメント **[LCE4]:** Proposal on improvement on extrapolation.
Proposal from EU WLTP, 15.12.2017.
Currently not agreed by Japan.

コメント **[LCE5]:** Proposal of Mid-vehicle supported by Japan.

コメント **[LCE6]:** Text is copied from Annex 8 with slight modifications.
Some modifications may be helpful also for EVs?

between vehicles L and M, and vehicles with a cycle energy demand between vehicles M and H."

Annex 7,

Add paragraph 3.2.3.2.6.:

"**3.2.3.2.6.** **The individual CO_2 value determined in paragraph 3.2.3.2.4. of this Annex may be increased by the OEM. In this case:**

(a) **the CO_2 phase values shall be increased by the ratio of the increased CO_2-value divided by the calculated CO_2 value;**

(b) **the fuel consumption values shall be increased by the ratio of the increased CO_2 value divided by the calculated CO_2 value.**

This shall not compensate for technical elements that would effectively require a vehicle to be excluded from the interpolation family."

II. Justification

1. The interpolation method in the WLTP can only work physically correct, if the two points used for interpolation have sufficient difference between each other. This was already defined for some elements, but not for all elements in question. Due to the lack of such a definition, strange effects and wrong results have been observed.

As a consequence, minimum deltas and further explanations that clarify fields of misunderstandings have been proposed.

During IWG#20 in Seoul, a proposal to increase the stringency on the physical parameters for the interpolation method was considered positively. Also the EU WLTP working group recommends this improvements.

2. See slides 6 and 7 of presentation WLTP-20-15e_appendix-04_rev1_Improvement-of-Families_BMW_v2.pdf

3. The change to 27 g/km range and deletion of the reference of the 3 g/km to the entire range is based on the experience from current approvals, that this causes a lot of confusion and is creating loopholes. The important difference for the accuracy of the interpolation is the difference between H and L, which is even reduced by that proposal. The interpolation method is validated for its accuracy up to 40 g/km, so that is easily covered today and also in the new version.

4. Japan supports the concept of a mid-vehicle for a further increase of the interpolation range. The effective interpolation range is not increased, due to the fact, that a vehicle in the middle is tested (interpolation range is then approx. 20 g/km for two segments).