

New proposals on split-runs for UNECE WLTP road load

ROAD LOAD SPLIT RUNS

Introduction

- There are no test tracks for coast down, that allow for coasting down from 130 to 20 kph within one straight. Therefore split-runs are very common, the amount of splits depends on the vehicle's road load and the track length.
- Currently the GTR requires an overlap at the split including a tolerance. The purpose is to ensure stable conditions and prevent misuse.
- In the case of many splits, that overlap is very burdensome, therefore Japan asks for alternatives.
- One proposed is to use the transmission temperature as criterion instead of the overlap.

Draft text by Japan:

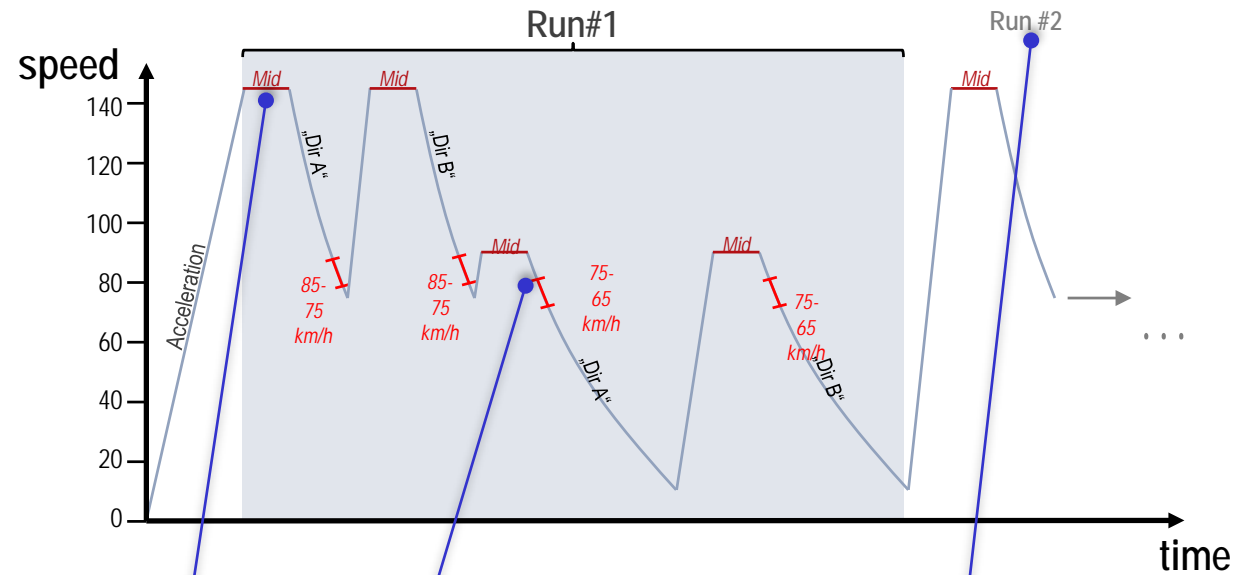
One of the recommended evidences is as follow:

- (i) representative parameter : transmission oil temperature
- (ii) criteria : temperature at the beginning of lower split run shall be within 0 to -3°C compared with the temperature at the end of higher split run.

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Overview

Diagram shows example for split run without overlap.
Relevant issues:

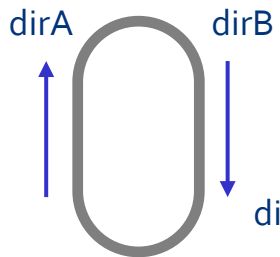


(1) Driving between splits.

(2) Criteria for starting the next split.

(3) Sequence:

- (a) all high speed splits (dir a and b), then all lower speed splits, etc.
- (b) always high to lower splits (dir. a and b), then next complete run starting from high speed.



dir...direction of coast down on the test track.

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Technical assessment of influencing factors 1/2

(1) Driving between the splits:

- A clear prescription is difficult (boundary conditions of the track), but the target is clear: Keeping the vehicle in same and stable condition as after the initial warm-up.

(2) Criteria for starting the next split:

- Influencing factors are the gearboxes (all transmission elements like gearbox, 4WD transmission, final drive) and tires.
- The influencing temperature is the one at the location where friction is produced, therefore the oil at gear-wheels and the bearings, or regarding the tire the temperature of the rubber (inside, not surface temperature). Consequently defining the correct position to measure is difficult, but not impossible regarding the gearboxes.

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Technical assessment of influencing factors 2/2

(3) Sequence:

- (a) all higher speed splits, then all lower speed splits, etc.

130→80 dirA run1 | 130→80 dirB run1 | 130→80 dirA run2 | 70→20 dirB run2 | 130→80 dirA run3 | ... | 70→20 dirA run1 | 70→20 dirB run1 | 70→20 dirA run2 | 70→20 dirB run2 | 70→20 dirA run3 | ...

- (b) always higher to lower splits, then next complete run starting from higher speeds, etc.

130→80 dirA run1 | 130→80 dirB run1 | 70→20 dirA run1 | 70→20 dirB run1 | 130→80 dirA run2 | 130→80 dirB run2 | 70→20 dirA run2 | 70→20 dirB run2 | 130→80 dirA run3 | ...

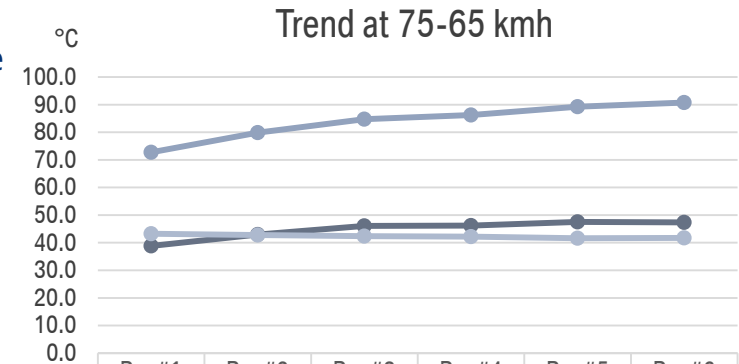
- Sequence (b) is closer at the initial sequence without splits, having complete runs prior to start a new run. Advantage: Statistical criterion can be checked and coast down can be stopped immediately after having fulfilled the criterion.
- But also sequence (a) can deliver correct results.
- Do we need a definition / decision, or should both options be possible?

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Test data – assessment of criteria

- Draft text:
 - (ii) criteria : temperature at the beginning of lower split run shall be within 0 to -3°C compared with the temperature at the end of higher split run.
- Temperature may change over the runs, mainly due to change of environmental conditions but also due to the fact, that after warm-up the vehicle is maybe not totally warmed-up.
- Although the intention is understood, a criterion requiring a lower temperature at the start of each split cannot work.

Example BMW rear wheel drive vehicle (coast down with no overlap).

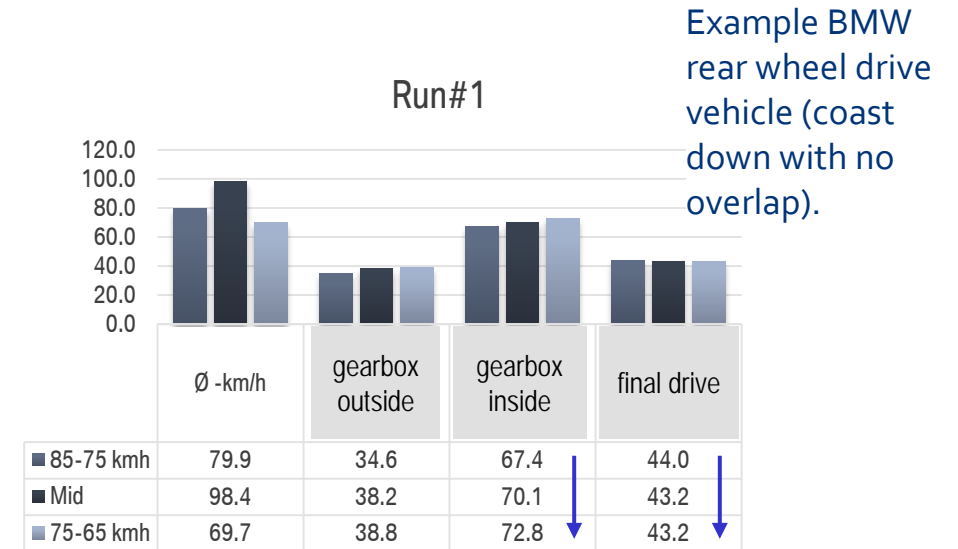
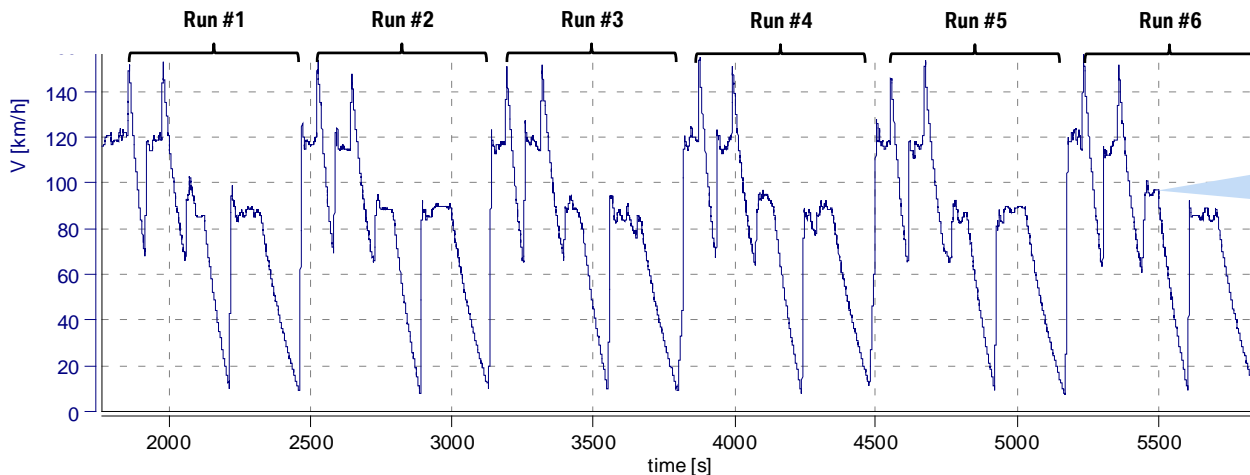


	Run#1	Run#2	Run#3	Run#4	Run#5	Run#6
∅ gearbox outside	38.8	43.0	46.1	46.2	47.6	47.4
∅ gearbox inside	72.8	79.9	84.8	86.3	89.3	90.8
∅ final drive	43.2	42.8	42.4	42.2	41.6	41.8

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Test data – assessment of gearbox temperature

- Draft text:
 - (i) representative parameter: transmission oil temperature
- Example shows, that for gearbox temperature increased, for final drive decreased
 → no general rule possible! Tolerance does not work.
- Influence on coast down result not measureable if temperature changes in that magnitude take place.



velocity during split was slightly above reference speed.

temperature goes up.

temperature goes down at the same time.

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Conclusion

- To add an alternative requirement instead of the overlap-criteria may work.
- But it seems difficult to define general rules. Therefore it needs to be an agreed procedure between authority and OEM, and maybe not a general procedure defined in the regulation.
- It has to be recognized, that only gearbox temperature can be measured, tires cannot, as inside temperature is important.
- Important: The proposed criterion may not work in all conditions and shall be further evaluated.



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Thank you for
your attention

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