

UNECE GRPE Real Driving Emissions IWG  
Open points and the way forward for the GTR

**RDE IWG**

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# The way forward for the GTR

- The GTR should contain the harmonised elements (driving dynamics evaluation but not the limit curves, method for cumulative altitude gain, but not limit, post evaluation of data, PEMS requirements, margin)
- Could leave out boundary conditions, exact trip composition but prescribe minimum distances and trip duration
- Mostly focused for WLTP and IDC in Phase 1
- Include other cycles/approaches for Phase 2

# Parameters for trip validity (1)

Parameter	EU Settings	PHASE 1	PHASE 2
Total trip duration	[90-120 min]	<p>Minimum size of the data set required to achieve statistical significance and coverage of the operating conditions (urban/rural/motorway or speed bins)</p> <ul style="list-style-type: none"> <li>➤ One trip</li> <li>➤ Minimum duration, minimum distance (to evaluate if these need to change if there is only U/R)</li> <li>➤ Maximum duration should be kept to limit the PEMS drift</li> </ul>	<ul style="list-style-type: none"> <li>➤ Combination of several trips possible</li> <li>➤ Margin of PEMS to adapt to real trip length</li> <li>➤ How to deal with cold and hot start if several trips</li> </ul>
Minimum distances Distance shares for the U/R/M conditions	[min 16 km] [ <del>34/33/33%</del> ±5%]	<p>Minimum coverage of the operating conditions (urban/rural/motorway or speed bins). Each operating condition is likely to cover various areas of the engine map, thermal conditions of the engine system and driving dynamics (e.g. more dynamics in the city)</p>	<ul style="list-style-type: none"> <li>➤ To be reassessed in combination with the trip definition and duration requirements (see above)</li> </ul>

# Parameters for trip validity (2)

Parameter	EU Settings	PHASE 1	PHASE 2
<p>Cold start duration</p> <p>Cold start operational requirements</p>	[max 5 min]	<p>Defines the maximum cold start duration</p> <p>Ensures that the vehicle is conditioned properly and driven "normally" during the cold start phase to avoid excessively low or high emissions</p>	
<p>Cumulative altitude gain</p> <p>Difference between start and end points</p>	<p><del>[max 1200 m]</del></p> <p>[&lt;=100 m]</p>	<p>Ensures that the whole trip is not uphill or downhill and that the energy consumption used for "climbing" remains within normal values</p> <p>Ensures "Energy consumption neutrality" and (almost) forces a round trip.</p>	??

# Parameters for trip validity (3)

Parameter	EU Settings	PHASE 1	PHASE 2
Urban average speed	[15-40 km/h]	<p><i>Operating conditions which could cause (for some technologies) emissions levels which are not comparable to the average RDE emissions:</i></p> <p>Very low urban average speeds may include non-representative shares of vehicle idling – High urban average speeds are not representative for EU urban driving.</p>	Composition of trip to be reassessed
Motorway speed above 145 km/h	[<=3% of motorway time]	Most EU member states have motorway speed limits between 100 and 130 km/h (except Germany). Emissions driving at high speeds is possible up to 145 km/h without invalidating the tests. Emissions control at higher speeds is also ensured through provisions on emissions control strategies.	
Motorway speed above 100 km/h	[>=5 min]	Minimum coverage of “real” motorway driving (See above)	
Urban stop time	[6-30 %]	Limit the idling time during the test (potential effects on distance specific emissions, possible effects on cold start, etc...)	
		➤ Simplify and describe as speed bins	

# Parameters for trip validity (4)

Parameter	EU Settings	PHASE 1	PHASE 2
Overall driving dynamics	<p>CO2 reference curve based on the 4 phases of the WLTC</p> <p>Urban tolerance +45/-25% Rural and motorway tolerances +40/-25%</p> <p>50% of U/R/M windows within the tolerances to validate the test</p>	<p>The vehicle CO2 emissions encompass the effects of the driver's behavior, the vehicle payload, the wind, the road grade</p> <p>The severity of the driving conditions is assessed using the vehicle RDE CO2 emissions in comparison with the ones from the reference cycle (WLTP)</p> <ul style="list-style-type: none"> <li>- First at an intermediate scale using the MAW method;</li> <li>- Second at the trip scale for the final emissions calculation.</li> </ul> <p>➤ Harmonised CO2 reference curve ➤ Classification of MAWs into the average speed bins</p>	<p>Criteria for trip validity (Indicators, tolerances around the reference could be re-discussed if appropriate solutions are proposed)</p> <p>Accommodate other cycles than WLTP, IDC</p>

# Parameters for trip validity (5)

Parameter	EU Settings	PHASE 1	PHASE 2
Excess of absence of driving dynamics	Below or above the limit curves	<p>Additional kinematic indicators were introduced to assess:</p> <ul style="list-style-type: none"> <li>- The presence of excessive driving dynamics (e.g. a few strong accelerations) using the statistics of instantaneous Speed*Acceleration (VxA) product.</li> <li>- The absence of driving of driving dynamics (e.g. constant speed driving using a cruise control in an excessive manner) using the Relative Positive Acceleration (RPA).</li> </ul> <p>NB: To assess such effects, the MAW CO2 was not found sensitive enough.</p> <p>➤ Harmonised approach for WLTP/IDC</p>	<p>➤ Harmonised approach based on PMR?</p>

# Final Emissions Calculations

Parameter	EU Settings	PHASE 1	PHASE 2
Altitude / Temperature moderate and extended ranges	Altitude: - Moderate: 0-700m - Extended: 700-1300m	Factor applied to pollutant emissions under extended conditions.  ➤ Not in phase 1 because regional	➤ Effect of temperature/altitude etc..

# List of items for PHASE 1

- **Terminology to be quickly agreed to proceed (e.g. urban = low speed driving) as defined by the speed boundaries and bins.**
  - **Regions with 3 speed bins: EU, South Korea, China,...?**
  - **Region with 2 speed bins: Japan, India,...?**
- **How to take into account the margin of uncertainty of PEMS equipment?**
  - **$NTE = \text{limit} * (1 + \text{margin})$**
  - **$\text{Emissions} / (1 + \text{margin})$  less than limit**
- **PM methodology if ready**
- **Methods to establish the validity criteria (for Low Powered Vehicles)**

# List of items for PHASE 2

- **New trip composition (including the idea of sub-trips)**
- **PM if not already included in Phase 1**
- **Criteria for driving dynamics**
- **Criteria for inappropriate driving**
- **Method for characterizing real driving against the lab cycles**
- **How to evaluate real driving (not against lab cycles)**
- **Development of new tools (new EMROAD)**
- **New validity criteria**
- **Margin adaptation to new method**
- **Additional Pollutants**