**OICA Comments to GRPE-86-45 (Proposed new UNR RDE)**

**Part 1**: general comments

**Part 2**: OICA proposal for amendments

**Part 1**

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|  | **Comment/ Question** |
| 1. Scope and applicationThis Regulation aims at providing a worldwide harmonized method to determine the levels of Real Driving Emissions (RDE) of gaseous compounds and particles from light-duty vehicles.This Regulation applies to the type approval of vehicles of categories M1 with a reference mass not exceeding 2,610 kg and vehicles of categories M2 and N1 with a reference mass not exceeding 2,610 kg and a technical permissible maximum laden mass not exceeding 3,500 kg with regard to their Real Driving Emissions.At the manufacturer's request, type approval granted under this Regulation may be extended from vehicles mentioned above to vehicles of categories M1 with a reference mass not exceeding 2,840 kg and vehicles of categories M2 and N1 with a reference mass not exceeding 2,840 kg and a technical permissible maximum laden mass not exceeding 3,500 kg and which meet the conditions laid down in this Regulation.Pure Electric Vehicles and Fuel Cell Vehicles are out of the scope of this Regulation. | Scope of UN-R RDE unclear: In the introduction to the UN-R RDE, M1, M2 and N1 vehicles are mentioned with a gross vehicle weight of up to 3.5 t. However, N2 vehicles are also mentioned later in the document. e.g. in Annex 8 ,,Assessment of overall trip validity using the moving averaging window method‘‘Scope differs from EU: The EU LD legislation includes M1, M2, N1 and **N2 vehicles** with a reference mass of up to 2610 or 2840 kg.* What does this mean in countries where the UN-R RDE is approved? Are fewer vehicles subject to the regulation here than in Europe?
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| 3. Definitions Declared values not included in the UN-R RDE | * Why are the declared values not included in the UN-R RDE? How is this supposed to work in markets such as Great Britain, where a CoC is required that contains these values?
* This also applies to the RDE CoC, in the template according to RDE Package 5 declared values are mentioned, in the template according to the UN-R RDE declared values are not mentioned.
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| 5.3.1. In the event of amendment to the present text, for example, if new limit values are prescribed, the Contracting Parties to the 1958 Agreement shall be informed which vehicle types already approved comply with the new provisions. | * How is this supposed to work in practice?

A tightening of limit values would first have to be shown in UN-R154, as the UN-R RDE refers to it. |
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| 6.1. Compliance requirementsFor vehicle types approved according to this Regulation, the final emissions at any possible RDE test performed in accordance with the requirements of this Regulation, shall be calculated for evaluation with a 3-phase and a 4-WLTC. | Why does an approval according to the UN-R RDE always have to be evaluated according to 3- and 4-phase WLTC? Although this enables the use of the UN-R RDE for Europe and Japan for approvals, it also leads to additional work.* Wouldn't a Level 1A/1B/2 concept as in the UN-R154 Series 02 and 03 be better?

It also means additional effort compared to RDE package 5, especially for technical service and if the vehicles are not registered in Japan in this vehicle configuration.Why does the three-phase WLTC always have to be evaluated, even though the 3-phase WLTC only has limit values for vehicles with diesel engines? |
| Annex 6 3.3. Permissible tolerances for PEMS validation | * Why are there different tolerances for PN between EU regulation (42 %) and the UN-R RDE (50 %) in the PEMS validation?
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| **Part 2** |
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| Text of GRPE-86-45 | Proposed text |
| 4.5.1. Assessment of trip validity (for analysis with 4-phase WLTP)4.5.1.1. Tolerances around the vehicle CO2 characteristic curve The upper tolerance of the vehicle CO2 characteristic curve is for low speed driving and for medium and high speed driving.  The lower tolerance of the vehicle CO2 characteristic curve is for ICE and NOVC-HEV vehicles and for OVC-HEV vehicles. 4.5.1.2. Assessment of test validity The test is valid when it comprises at least 50 per cent of the low, medium and high speed windows that are within the tolerances defined for the CO2 characteristic curve. For NOVC-HEVs and OVC-HEVs, if the minimum requirement of 50 per cent between and is not met, the upper positive tolerance  may be increased until the value of reaches 50 per cent. For OVC-HEVs when no MAWs are calculated as result of the ICE not turning on, the test is still valid. | 4.5.1. Assessment of trip validity ~~(for analysis with 4-phase WLTP)~~4.5.1.1. Tolerances around the vehicle CO2 characteristic curve The upper tolerance of the vehicle CO2 characteristic curve is for low speed driving and for medium and high speed driving.  The lower tolerance of the vehicle CO2 characteristic curve is for ICE and NOVC-HEV vehicles and for OVC-HEV vehicles. 4.5.1.2. Assessment of test validity The test is valid when it comprises at least 50 per cent of the low, medium and high speed windows that are within the tolerances defined for the CO2 characteristic curve. For NOVC-HEVs and OVC-HEVs, if the minimum requirement of 50 per cent between and is not met, the upper positive tolerance  may be increased until the value of reaches 50 per cent. For OVC-HEVs when no MAWs are calculated as result of the ICE not turning on, the test is still valid. |
| 4.5.2. Assessment of trip validity (for analysis with 3-phase WLTP)4.5.2.1. Tolerances around the vehicle CO2 characteristic curve The upper tolerance of the vehicle CO2 characteristic curve is for low speed driving and for high speed driving.  The lower tolerance of the vehicle CO2 characteristic curve is for ICE and NOVC-HEV vehicles and for OVC-HEV vehicles. 4.5.2.2. Assessment of test validity The test is valid when it comprises at least 50 per cent of the low, and high speed windows that are within the tolerances defined for the CO2 characteristic curve. For NOVC-HEVs and OVC-HEVs, if the minimum requirement of 50 per cent between and is not met, the upper positive tolerance  may be increased by steps of 1 per cent until the 50% target is reached. When using this mechanism, the value of shall never exceed 50 per cent. | ~~4.5.2. Assessment of trip validity (for analysis with 3-phase WLTP)~~~~4.5.2.1. Tolerances around the vehicle CO~~~~2~~ ~~characteristic curve~~ ~~The upper tolerance of the vehicle CO~~~~2~~ ~~characteristic curve is for low speed driving and for high speed driving.~~  ~~The lower tolerance of the vehicle CO~~~~2~~ ~~characteristic curve is for ICE and NOVC-HEV vehicles and for OVC-HEV vehicles.~~ ~~4.5.2.2. Assessment of test validity~~ ~~The test is valid when it comprises at least 50 per cent of the low, and high speed windows that are within the tolerances defined for the CO~~~~2~~ ~~characteristic curve.~~ ~~For NOVC-HEVs and OVC-HEVs, if the minimum requirement of 50 per cent between and is not met, the upper positive tolerance  may be increased by steps of 1 per cent until the 50% target is reached. When using this mechanism, the value of shall never exceed 50 per cent.~~ |
| Justification:The only differences between the 3-phase and 4-phase text are;a) “For NOVC-HEVs and OVC-HEVs, if the minimum requirement of 50 per cent between and is not met, the upper positive tolerance  may be increased by steps of 1 per cent until the 50% target is reached. When using this mechanism, the value of shall never exceed 50 per cent.” (highlighted text applies to 3-phase). This concept related to the use of Moving Average Windows which is no longer applied in this context in the UNR.b) “For OVC-HEVs when no MAWs are calculated as result of the ICE not turning on, the test is still valid.” (highlighted text applies to 4-phase). This concept will be introduced shortly in EU legislation and we believe it should apply to both 3-phase and 4-phase analysis. |
| 3.4.4. Global Positioning System (GNSS)The GNSS antenna shall be mounted as near as possible to the highest location on the vehicle, so as to ensure good reception of the satellite signal. The mounted GNSS antenna shall interfere as little as possible with the vehicle operation. | 3.4.4. Global ~~Positioning~~ **Navigation** **Satellite** System (GNSS)The GNSS antenna shall be mounted as near as possible to the highest location on the vehicle, so as to ensure good reception of the satellite signal. The mounted GNSS antenna shall interfere as little as possible with the vehicle operation. |
| Justification:Reflection of updated terminology |
| 3.1.4.1. Calculation of per speed bin (for analysis with 4-phase WLTP). . . . . . . . . . . . . .The relative positive acceleration per speed bin shall be calculated as follows:where:

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| RPAk | is the relative positive acceleration for urban, rural and motorway shares in [m/s2 or kWs/(kg\*km)] |
| Mk | is the sample number for urban, rural and motorway shares with positive acceleration |
| Nk | is the total sample number for urban, rural and motorway shares |

 | 3.1.4.1. Calculation of per speed bin (for analysis with 4-phase WLTP). . . . . . . . . . . . . .The relative positive acceleration per speed bin shall be calculated as follows:where:

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| RPAk | is the relative positive acceleration for urban, rural and motorway shares in [m/s2 or kWs/(kg\*km)] |
| Mk | is the sample number for urban, rural and motorway shares with positive acceleration |
| Nk | is the total sample number for urban, rural and motorway shares |
| **Δt** | **Is a time difference equal to 1 second** |

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| 3.1.4.2. Calculation of per speed bin (for analysis with 3-phase WLTP). . . . . . . . . . . . . . . . . The relative positive acceleration per speed bin shall be calculated as follows:where:

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| RPAk | is the relative positive acceleration for urban and expressway shares in [m/s2 or kWs/(kg\*km)] |
| Mk | is the sample number for urban and expressway shares with positive acceleration |
| Nk | is the total sample number for urban and expressway shares |

 | 3.1.4.2. Calculation of per speed bin (for analysis with 3-phase WLTP). . . . . . . . . . . . . . . . . The relative positive acceleration per speed bin shall be calculated as follows:where:

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| --- | --- |
| RPAk | is the relative positive acceleration for urban and expressway shares in [m/s2 or kWs/(kg\*km)] |
| Mk | is the sample number for urban and expressway shares with positive acceleration |
| Nk | is the total sample number for urban and expressway shares |

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| Justification:Although Δt is always equal to 1, without it in the formula the units do not correlate (RPA is in m/s2).Additionally the text which is replaced here with “. . . . . . . . . . . . . .” should be identical for 3.1.4.1. and 3.1.4.2. but is not. It may be worth making the two texts consistent. |
| 7.3. Calculation method using air mass flow and air-to-fuel ratioThe instantaneous exhaust mass flow rate can be calculated from the air mass flow rate and the air-to-fuel ratio as follows:where:where: | 7.3. Calculation method using air mass flow and air-to-fuel ratioThe instantaneous exhaust mass flow rate can be calculated from the air mass flow rate and the air-to-fuel ratio as follows:where:where: |
| 7.4. Calculation method using fuel mass flow and air-to-fuel ratio The instantaneous exhaust mass flow rate can be calculated from the fuel flow and the air-to-fuel ratio (calculated with A/Fst and *λ*i according to paragraph 7.3.) as follows: The calculated instantaneous exhaust mass flow rate shall meet the linearity requirements specified for the exhaust gas mass flow rate in paragraph 3. of Annex 5 and the validation requirements specified in paragraph 4.3. of Annex 6. | 7.4. Calculation method using fuel mass flow and air-to-fuel ratio The instantaneous exhaust mass flow rate can be calculated from the fuel flow and the air-to-fuel ratio (calculated with A/Fst and *λ*i according to paragraph 7.3.) as follows: The calculated instantaneous exhaust mass flow rate shall meet the linearity requirements specified for the exhaust gas mass flow rate in paragraph 3. of Annex 5 and the validation requirements specified in paragraph 4.3. of Annex 6. |
| Justification:Correction of typographical errors. In two positions in paragraph 7.3. and two in 7.4. the symbol “λ” had been mistakenly replaced with the letter “l”. |
| 10.7. Where applicable, separate data-sets shall be created for 3-phase and 4-phase evaluation. The data collected during the entire trip shall be the basis of the 4-phase RDE emission results, while the data with the exclusion of any data point with speed above 100 km/h shall be the basis of the 3-phase RDE trip validity and emission results calculations according to paragraphs 8 and 9 and Annexes 8, 9 and 11. For data analysis continuity Annex 10 will begin with the entire data set for both analyses.10.7.1. In the case that that a single RDE trip is not capable of complying with all validity requirements described in paragraphs 9.1.1., 9.2. and 9.3., paragraphs 4.5.1. and 4.5.2. of Annex 8 and paragraph 4. of Annex 9 simultaneously, then a second RDE trip shall be done. The second trip shall be designed to meet either the 3 phase or 4 phase WLTC trip requirements not yet satisfied, as well as all other relevant trip validity requirements, but it is not necessary to satisfy again the 4 phase or 3 phase WLTC trip requirements previously met by the first trip.10.7.2. In case the emission calculated for the 3-phase RDE trip exceed the emission limits for the total trip due to the exclusion of all data points with speed above 100 km/h even though the trip is compliant, then a second trip with the speed limited to less than or equal to 100 km/h shall be made and evaluated for compliance with the 3-phase requirements. | 10.7. Where applicable, separate data-sets shall be created for 3-phase and 4-phase evaluation. The data collected during the entire trip shall be the basis of the 4-phase RDE emission results, while the data with the exclusion of any data point with speed above 100 km/h shall be the basis of the 3-phase RDE trip validity and emission results calculations according to paragraphs 8 and 9 and Annexes 8, 9 and 11. For data analysis continuity Annex 10 will begin with the entire data set for both analyses.10.7.1. In the case that that a single RDE trip is not capable of complying with all validity requirements described in paragraphs 9.1.1., 9.2. and 9.3., paragraphs 4.5.1. and 4.5.2. of Annex 8 and paragraph 4. of Annex 9 simultaneously **or for simplification of trip planning**, then a second RDE trip shall be done. The second trip shall be designed to meet either the 3 phase or 4 phase WLTC trip requirements not yet satisfied, as well as all other relevant trip validity requirements, but it is not necessary to satisfy again the 4 phase or 3 phase WLTC trip requirements previously met by the first trip.10.7.2. In case the emission calculated for the 3-phase RDE trip exceed the emission limits for the total trip due to the exclusion of all data points with speed above 100 km/h even though the trip is compliant, then a second trip with the speed limited to less than or equal to 100 km/h shall be made and evaluated for compliance with the 3-phase requirements. |
| 9.3. RDE test to be performedThe RDE performance shall be demonstrated by testing vehicles on the road, operated over their normal driving patterns, conditions and payloads. RDE tests shall be conducted on paved roads (e.g. off-road operation is not permitted). An RDE trip shall be driven in order to prove compliance with the emission requirements against both 3-Phase WLTC and 4-Phase WLTC.  | 9.3. RDE test to be performedThe RDE performance shall be demonstrated by testing vehicles on the road, operated over their normal driving patterns, conditions and payloads. RDE tests shall be conducted on paved roads (e.g. off-road operation is not permitted). ~~An~~ **Either a single RDE trip or two dedicated RDE trips** shall be driven in order to prove compliance with the emission requirements against both 3-Phase WLTC and 4-Phase WLTC.  |
| Justification:It can be complex planning an RDE trip to be compliant with both 3-phase and 4-phase analyses. This complexity can be eliminated by planning two independent trips and this should be clearly permissible. |
| 9.2. Required distance shares of trip speed binsThe following is the distribution of the speed bins in an RDE trip that are required for respecting the needs of evaluation for both the 4 phase WLTC and 3 phase WLTC:

| *Requirements for evaluation with 4 Phase WLTC* | *Requirements for evaluation with 3 Phase WLTC* |
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| The trip shall consist of approximately 34 per cent urban, 33 per cent rural and 33 per cent motorway speed bins. ‘Approximately’ shall mean the interval of ±10 per cent points around the stated percentages. The urban speed bin shall however never be less than 29 per cent of the total trip distance. | The trip shall consist of approximately 55 per cent urban and 45 per cent expressway speed bins. ‘Approximately’ shall mean the interval of ±10 per cent points around the stated percentages. The urban speed bin however can be lower than 45 per cent but never be less than 40 per cent of the total trip distance. |

 | 9.2. Required distance shares of trip speed binsThe following is the distribution of the speed bins in an RDE trip that are required for respecting the needs of evaluation for both the 4 phase WLTC and 3 phase WLTC:

| *Requirements for evaluation with 4 Phase WLTC* | *Requirements for evaluation with 3 Phase WLTC* |
| --- | --- |
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| The trip shall consist of approximately 34 per cent urban, 33 per cent rural and 33 per cent motorway speed bins. ‘Approximately’ shall mean the interval of ±10 per cent points around the stated percentages. The urban speed bin shall however never be less than 29 per cent of the total trip distance. | The trip shall consist of approximately 55 per cent urban and 45 per cent expressway speed bins. ‘Approximately’ shall mean the interval of ±10 per cent points around the stated percentages. The urban speed bin however can be lower than 45 per cent but never be less than 40 per cent of the total trip distance and in this case the expressway speed bin can be up to 60 per cent. |

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| Justification:If the urban speed bin would be 40 per cent the expressway speen bin would be out of conformity so this should be clarified. |
|  | Replace footnote 6 with 7 and vice versa |
| Justification:The footnotes 6 and 7 appear to have been transposed and are thus incorrect |
|  | The diagrams need to be amended to show the “knee” of the line at 45 rather than 50/55 |
| Justification:The text describes a “knee” at 45 |
| 9.1. Types of speed bins**Urban speed bin** (for both 3 and 4 phase analysis) is characterised by vehicle speeds lower than or equal to 60 km/h. **Rural speed bin** (for 4 phase analysis) is characterised by vehicle speeds higher than 60 km/h and lower than or equal to 90 km/h. For those vehicles that are equipped with a device permanently limiting vehicle speed to 90 km/h, rural speed bin is characterised by vehicle speed higher than 60 km/h and lower than or equal to 80 km/h.**Motorway speed bin** (for 4 phase analysis) is characterised by speeds above 90 km/h. For those vehicles that are equipped with a device permanently limiting vehicle speed to 100 km/h, motorway speed bin is characterised by speed higher than 90 km/h.For those vehicles that are equipped with a device permanently limiting vehicle speed to 90 km/h, motorway speed bin is characterised by speed higher than 80 km/h.**Expressway speed bin** (for 3 phase analysis) is characterised by speeds above 60 km/h and up to 100 km/h. | 9.1. Types of speed bins**Urban speed bin** (for both 3 and 4 phase analysis) is characterised by vehicle speeds lower than or equal to 60 km/h. **Rural speed bin** (for 4 phase analysis) is characterised by vehicle speeds higher than 60 km/h and lower than or equal to 90 km/h. For those vehicles that are equipped with a device permanently limiting vehicle speed to 90 km/h, rural speed bin is characterised by vehicle speed higher than 60 km/h and lower than or equal to 80 km/h.**Motorway speed bin** (for 4 phase analysis) is characterised by speeds above 90 km/h. For those vehicles that are equipped with a device permanently limiting vehicle speed to 100 km/h, motorway speed bin is characterised by speed higher than 90 km/h.For those vehicles that are equipped with a device permanently limiting vehicle speed to 90 km/h, motorway speed bin is characterised by speed higher than 80 km/h.**Expressway speed bin** (for 3 phase analysis) is characterised by speeds above 60 km/h and up to 100 km/h. **A complete trip for 4-phase analysis consists of urban, rural and motorway bins whereby a complete trip for 3-phase analysis consists of urban and expressway bins.** |
| Justification:There is no definition of a complete trip in the regulation despite the terminology being used many times. This may remove scope for misinterpretation |