ECE/TRANS/XXX

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GLOBAL REGISTRY

Created on 24 May 2013, pursuant to Article 6 of the
AGREEMENT CONCERNING THE ESTABLISHING OF GLOBAL TECHNICAL REGULATIONS FOR WHEELED VEHICLES, EQUIPMENT AND PARTS WHICH CAN BE FITTED AND/OR BE USED ON WHEELED VEHICLES
(ECE/TRANS/132 and Corr.1)
Done at Geneva on 25 June 1998

Addendum

Global technical regulation No. YYY

TECHNICAL REQUIREMENTS for *QUIET ROAD TRANSPORT VEHICLES with regard to the sound emissions.*

(Established in the Global Registry on DD.MM.YYYY)

UNITED NATIONS

The text below is a compilation of specification on sound devices for the purpose of informing pedestrians about the presence of a vehicle. The table shows the documents used for the development of this text. The colours indicate in origin.

Source	Colour
Minimum Sound Requirements for Hybrid and Electric Vehicles NHTSA 49 CFR Part 571 Docket No. NHTSA-2011-0148 RIN 2127-AK93	**Bold Black**
Guideline on Low-noise Measures for HEV, etc Japan Guideline Kokujigi No. 255 on 2010-01-29	Red
Japan Study Committee Report on Low Noise Measures for Hybrid Vehicles, etc	*Red Italic*
Proposal for guidelines on measures ensuring the audibility of hybrid and electric vehicles UN-ECE R.E.3 Annex 2 Guideline AVAS	Green
Draft Recommendations for a Global Technical Regulation Regarding Audible Vehicle Alerting Systems for Quiet Road Transport Vehicles GRB Informal Group Report ECE-TRANS-WP29-GRB-55-inf14e	*Green Italic*
Other Sources (EU 2011_0409 (COD) with amendments of Parliament A7-0435_2012 and Council st05832.en13[1] PUBLIC)	Blue
OICA comments to US NPRM NHTSA-2011-0148	Pink
OICA additional comments	***Pink Italic***

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A. JUSTIFICATION AND TECHNICAL RATIONALE

1. INTRODUCTION

This global technical regulation (gtr) is setting minimum sound requirements for hybrid and electric vehicles. This new standard would require hybrid and electric passenger cars, light trucks and vans (LTVs), medium and heavy duty, trucks, and buses, low speed vehicles (LSVs), and motorcycles to produce sounds meeting the requirements of this standard. This proposed standard applies to electric vehicles (EVs) and to those hybrid vehicles (HVs) that are capable of propulsion in any forward or reverse gear without the vehicle's internal combustion engine (ICE) operating. This standard would ensure that blind, visually-impaired, and other pedestrians are able to detect and recognize nearby hybrid and electric vehicles, as required by the PSEA, by requiring that hybrid and electric vehicles emit sound that pedestrians would be able to hear in a range of ambient environments and contain acoustic signal content that pedestrians will recognize as being emitted from a vehicle.

Following a decision to promote their widespread use toward the low-carbon society, registrations of hybrid vehicles (HEV) and electric vehicles (EV), etc have been rapidly growing in recent years with even further growth projected in years to come.
In the meantime, users and groups for the visually-impaired have expressed views that they find those vehicles dangerous due to the mechanism that does not make high noise, while similar points are made by some experts.
Therefore, in order to promote effective measures relating to the low noise as reported by the Study Committee on Low Noise Measures for Hybrid Vehicles, etc, requirements have been established as described below for those Devices for Approaching Vehicle Alert to be installed in HEV that can run only on electric motors with the internal combustion engines in shutdown condition, EV and fuel-cell vehicles.

It shall be assessed the need to review this Regulation, taking into account, inter alia, whether active safety systems can better serve the objective of improving the safety of vulnerable road users in urban areas, in addition to, or as compared to acoustic vehicle alerting systems and shall, where appropriate, and in accordance with the ordinary legislative procedure, submit a proposal which makes provision for a maximum sound level for AVAS installed in vehicles.

The environmental benefits achieved by hybrid electric and pure electric road transport vehicles (HEV and EV) include near zero air pollution, reduced fossil fuel demands and very quiet vehicle operation at low speeds. While quiet vehicle operation provides the potential for significant public health and welfare benefits to millions of citizens, it has resulted in an unintended consequence - the removal of an important source of audible signals that are used by many pedestrians (e.g. blind, low vision and elderly pedestrians) and road users (e.g. cyclists), to signal the approach, presence and departure of these vehicles.
This report presents the findings and recommendations of the QRTV / IWG with regard to the future development of a globally harmonized regulation that would specify the applicability and performance of an 'Audible Vehicle Alerting System' (AVAS). The AVAS would provide pedestrians and other road users with information regarding the operation of quiet vehicles at speeds below 20 to 30 kilometres per hour (12 to 20 miles per hour) that is essential to safe

movement decisions while also protecting the public from unnecessary increases in environmental noise and the vehicle operator from adverse noise impact.
Particular attention should be given to those countries that have programs directed at the reduction of community noise impact. While an in-depth assessment of the potential growth of the quiet vehicle fleet was beyond the scope of the QRTV terms of reference, there is substantial evidence to support a conclusion that any resulting UN/ECE regulation regarding AVAS must be harmonized as a Global Technical Regulation (GTR) to reduce pedestrian confusion(comment to be updated) and to minimize diverse regulatory burdens on powered road vehicle manufacturers.

3.1. *Discussions were held from the perspectives described below concerning (i) EV run ※-enabled HEV and EV (including fuel-cell vehicles), (ii) non-EV run HEV, (iii) vehicles with idle stop engines and (iv) ordinary vehicles with engines making low noise, for which measures may be needed.*

(i): It has been reported that difference in sound volume from vehicles reaches 20dB at maximum compared with ordinary vehicles with engines from starting to vehicle speed of about 20km/h; hence, measures are required. (See Diagram C.)

(ii): With engines always fired up during starting, it was confirmed at the Study Committee's experience session that these vehicles are equally noticeable compared with ordinary vehicles with engines; hence, measures are not needed.

(iii): As with the above (ii), with engines always fired up during starting, these vehicles are considered equally noticeable compared with ordinary vehicles with engines; hence, measures are not needed.

(iv): As a result of comparison between luxury models with quiet engines and ordinary models in the surveys conducted so far, the gap is not huge at about 2dB; hence, measures are not needed. (See Diagram C.)

Kommentar [DG1]: Japan comments moved from section 3.

2. PROCEDURAL BACKGROUND

During the one-hundred-and-fifty-sixth session of WP.29 on March 2012, the Executive Committee (AC.3) of the 1998 Global Agreement (1998 Agreement) adopted a two stage approach for developing the UN GTR, including in a first phase electric and hybrid vehicles and, in a second phase, quiet vehicle with internal combustion engines and possible inclusion of safety related matters.

Informal working groups – the GRB Informal Group on Quiet Road Transport Vehicles (QRTV) from March 2009 to September 2012 and the GRB GTR development group on QRTV from March 2012 to XXX – were established develop a proposal for this GTR.

The working group was instructed to

- Identify, review and assess the status of various researches being carried out by various

※ EV run refers to run on the electric motor only with the engine stopped.

governments, universities and non-governmental organizations on audible warning and signalling technologies for quiet vehicles.

- Invite, consult with and consider the input of safety experts from GRSP, GRRF, and GRSG.
- Determine potential audible sound characteristics and mechanisms that convey desired vehicle performance information to the human receiver.
- Develop harmonized test procedures for evaluating the conformity of potential audible sound characteristics and mechanisms.
- Determine the costs and benefits associated with a QRTV gtr including potential adverse impact on the public at large or existing vehicle noise emission standards and regulations. Note that the analysis is not intended to address specific countries or regions, but rather general considerations each Contracting Party (to WP.29) should consider when implementing the potential gtr.

US and Japan may wish to add some elements of their national studies.

3. EXISTING REGULATIONS, DIRECTIVES, AND INTERNATIONAL VOLUNTARY STANDARDS

3.1. Those pertaining to minimum sound requirements for motorized road vehicles

In the United States of America:

49 CFR Part 571, Docket No. NHTSA-2011-0148, RIN 2127-AK93, Federal Motor Vehicle Safety Standards, Minimum Sound Requirements for Hybrid and Electric Vehicles

In Europe:

Draft Regulation 2011/0409 (COD) with amendments of the European Parliament listed in A7-0435_2012 and changes by the European Council published in st05832.en13[1] PUBLIC and subsequent amendments. –further info to be provided by EC.

In Japan:

Guideline on Low-noise Measures for HEV, etc

ADD: Japanese proposal from 4th meeting – excluded sounds(Proposal for QRTV-GTR on performance requirements for AVAS)

3.2. [Types and Volume of Sound Generation

3.2.1. The sound generated shall be constant sound that reminds people of road vehicles that are running. The sounds listed below or similar sounds shall be deemed inappropriate

(i) Siren, chime, bells or melody

(ii) Horn sound

(iv) Sound generated by animals and/or insects such as birdsongs, etc

(v) Sound of natural phenomenon such as wave, wind, river current, etc

(vi) Any other sound that cannot be conceived as being generated by road vehicles based on a common sense]

In China:
To be updated

WP29 UNECE:
To be updated

4. TECHNICAL RATIONALE, ECONOMIC IMPACTS, AND ANTICIPATED BENEFITS

4.1. Technical rationale (complete this section after "targets" have been agreed)

The requirements of this proposal apply only to those HVs that are capable of propulsion in any forward or reverse gear without the vehicle's ICE operating because these were the vehicles that the agency believes fall under the definition of "hybrid vehicle" contained in the PSEA. A crossover speed of 30 km/h was chosen because this was the speed at which the sound levels of the hybrid and electric vehicles measured by the agency approximated the sound levels produced by similar ICE vehicles. This proposal contains minimum sound requirements for the activated but stationary operating condition because the definition of alert sound in the PSEA, as explained in Section III of this NPRM, requires the agency to issue minimum sound requirements to allow pedestrians to detect hybrid and electric vehicles. We have tentatively determined that this requirement can be best met by requiring vehicles to emit sound in this operating condition.

At lower speeds, hybrid and electric vehicles produce less sound than vehicles propelled by an ICE. At higher speeds, tire and wind noise are the main contributors to vehicles noise output so at higher speeds the sounds produced by hybrid and electric vehicles and ICE vehicles are similar. Because hybrid and electric vehicles do not produce as much sound as ICE vehicles when operating at lower speeds, pedestrians and other road users may not be aware of the presence of a nearby hybrid or electric vehicle. If a hybrid vehicle is involved in a low speed maneuver (defined as making a turn, slowing or stopping, backing up, entering or leaving a parking space, or starting in traffic), it is 1.38 times more likely than an ICE vehicle to be involved in a collision with a pedestrian and 1.33 times more likely to be involved in a collision with a pedalcyclist. We believe that this difference in accident rates is mostly attributable to the pedestrians' inability to detect these vehicles by hearing them during these maneuvers. (further comments expected by NHTSA)

Discussions were held from the perspectives described below concerning (i) EV run※-enabled HEV and EV (including fuel-cell vehicles), (ii) non-EV run HEV, (iii) vehicles with idle stop engines and (iv) ordinary vehicles with engines making low noise, for which measures may be needed.

・(i): It has been reported that difference in sound volume from vehicles reaches 20dB at maximum compared with ordinary vehicles with engines from starting to vehicle speed of about 20km/h; hence, measures are required. (See Diagram C.)

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with engines; hence, measures are not needed.

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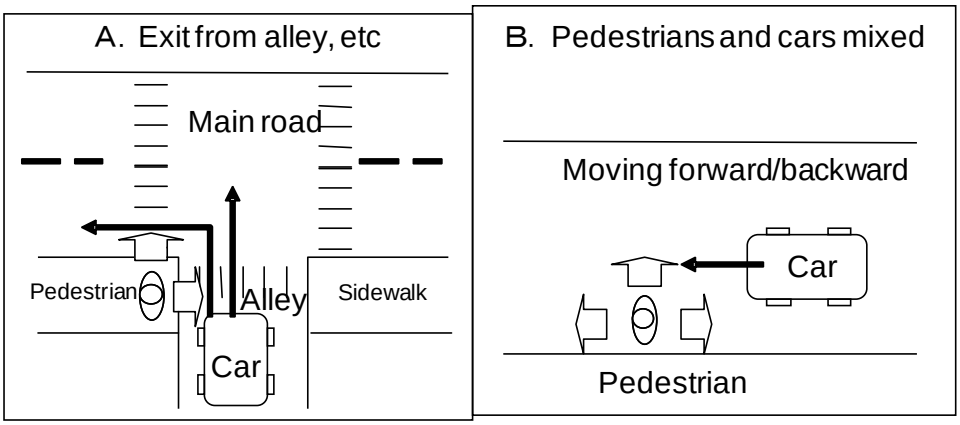
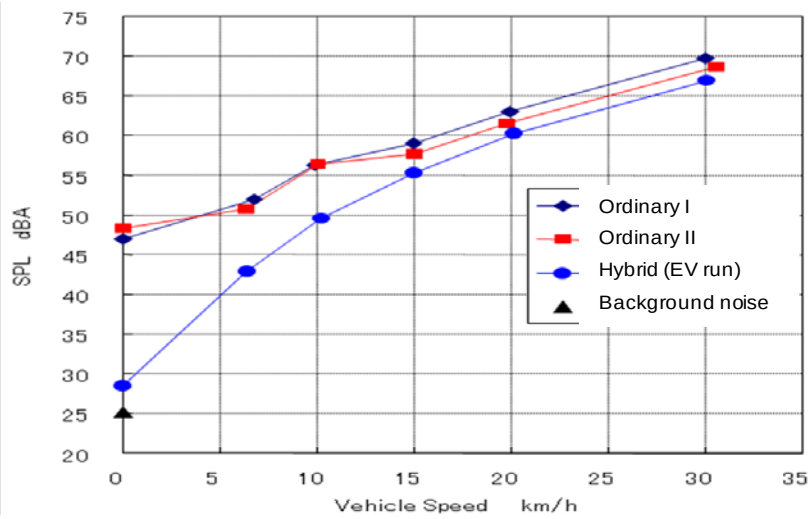
・(iv): As a result of comparison between luxury models with quiet engines and ordinary models in the surveys conducted so far, the gap is not huge at about 2dB; hence, measures are not needed. (See Diagram C.)

2. Scenes in which measures are required
Proposed measure:
Applicable in a range from starting to vehicle speed of 20km/h and when moving backward.
[Concept]
Based on the experience by the visually-impaired, etc, low noise measures are most needed when a vehicle is starting from a stopped state (Diagram A) and when it is running at low speed (Diagram B), in which case it will be required to notify approaching vehicles to pedestrians, etc, including the visually-impaired.



・The surveys conducted so far revealed that, since tire noise increases under the vehicle speed of 20km/h, even EV run-capable HEV is equally noticeable compared with ordinary vehicles with engines. (See Diagram C.)

Diagram C:
Comparison of sound volume (Microphone was placed at 2 meters to the left form the centerline of running vehicles and 1.2 meters from the ground. When stopped, it was place at a position immediately next to the front edge of vehicles.): EV run-capable HEV vs. ordinary vehicles with engines



Japan may wish to update this chart

Some are calling for measures even when a vehicle is stopped; however, since it is the same state as ordinary vehicles with engines parked or stopped with engines off, specific measures for hybrid vehicles, etc are not needed.

4.2. Economic impacts

To be added (test time, money, employees)

4.3. Anticipated benefits

To be added

5. ADMINISTRATIVE CONSIDERATIONS

To be added; Considerations about: Vehicle testing, component testing; other ways for pedestrian protection in terms of quiet vehicles; type approval –vs-self certification, etc.

Small volume manufacturers. *(May need to be adapted to UN-ECE specs)*
Vehicles manufactured during any of the three years of the September 1, 2015 through August 31, 2018 phase-in by a manufacturer that produces fewer than 5,000 vehicles for sale in the United States during that year are not subject to the requirements of S9.1, S9.2,S9.3 and S9.5.

~~3.2.2.~~ **Final-stage manufacturers and alterers. Vehicles that are manufactured in two or more stages or that are altered (within the meaning of 49 CFR 567.7) after**

having previously been certified in accordance with Part 567 of this chapter are not subject to the requirements of S9.1 through S9.5. Instead, all vehicles produced by these manufacturers on or after September 1, 2018 must comply with this standard.

6. POSSIBLE FUTURE EXTENSIONS OF THE GTR

The need to review this Regulation shall be assessed, taking into account, inter alia, whether active safety systems can better serve the objective of improving the safety of vulnerable road users in urban areas, in addition to, or as compared to acoustic vehicle alerting systems.

Add NHTSA future plans – including ICE (NPRM comments)

Issues to be discussed and added to part A at a later stage:

~~*3.1.*~~*3.3.* *Frequency Modulation(Remark : need to be reconsidered either deleted or redefined to avoid excessive modulation)*

Used to simulate sound of "firing beat" of internal combustion engine. Modulation frequency is generally less than 0.6 kHz.

Commencing-Motion Sound

~~*3.3.*~~*3.4.* *When measured according to the test conditions of section 8.1 and the test procedure of 8.8.1.2., the commencing-motion sound shall be activated when the vehicle's drive selector is placed in drive or reverse and the parking and the service brakes are released. After the brakes are released, the peak of the commencing-motion sound shall reach within [500] ms an overall SPL of at least [53] dB(A)*

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B. TEXT OF REGULATION

1. PURPOSE

The purpose of this GTR is to reduce the risk of deaths and injuries that result from electric and hybrid electric vehicles low speed crashes with pedestrians (and others like but not limited to cyclists) by providing a sound level and sound characteristics necessary for these vehicles to be detected, located and recognized by pedestrians.

2. SCOPE

3. This standard applies to vehicles of categories [M, N, L] with either electric or hybrid electric drive for which the vehicle's propulsion system can propel the vehicle in the normal travel mode, in reverse or at least one forward drive gear, without the internal combustion engine operating.

~~3.4.~~3.5. *This guideline addresses Acoustic Vehicle Alerting System (AVAS) for hybrid electric and pure electric road transport vehicles (HEV and EV).*

Kommentar [DG2]: Moved to ADMINISTRATIVE CONSIDERATIONS (SECTION 5.)

4. DEFINITIONS (REVIEW LATER)

["Acoustic Vehicle Alerting System" (AVAS) means a system for hybrid electric and electric vehicles that provides vehicles with an audible signal of appropriate sound level and sound characteristics necessary for these vehicles to be detectable, recognizable and locatable by pedestrians (and others like but not limited to cyclists).]

["Acoustic Vehicle Alerting System" (AVAS) means a system for hybrid electric and electric road transport vehicles which provides- sound level and characteristics necessary for these vehicles to be detected, located and recognized by pedestrians for the purpose of reducing the risk of deaths and injuries that result from electric and hybrid electric vehicles low speed crashes with pedestrians (and others like but not limited to cyclists) by providing.]

4.1. Broadband content means a measureable acoustic signal (greater than 0 A-weighted dB) at all 1/12th octave bands within a one-third octave band.

4.2.

~~Broadband content means a measureable acoustic signal (greater than 0 A-weighted dB) at all 1/12th octave bands within a one-third octave band.~~

[“Broadband content” means a measureable acoustic signal (greater than 0 A-weighted dB) at all frequencies within a one-third octave band.]

4.3. [“Fundamental frequency” means, for purposes of this regulation, the lowest frequency of a valid measurement.]

4.4. Electric vehicle” means a motor vehicle with an electric motor as its sole means of propulsion.

4.5. Hybrid Electric Vehicle … see 4.11 ff

4.6. “Front plane of the vehicle” means a vertical plane tangent to the leading edge of the vehicle during forward operation.

4.7. “Rear plane of the vehicle” means a vertical plane tangent to the leading edge of the vehicle when the vehicle is in a condition in which it is capable of reverse self-mobility.

4.8. “Devices for Approaching Vehicle Alert” shall refer to those devices designed to be equipped in motor vehicles that meet certain requirements described in sections 2

and 3 below in order to let pedestrians, etc. beware of approaching vehicles, etc.

4.9. *"Electric Vehicle I (EV-I)" means a road transport vehicle whose drive-train consists of one or more electric motors that receive their energy from one or more externally charged batteries.*

4.10. *"Electric Vehicle II (EV-II)" means a road transport vehicle whose drive-train consists of one or more electric motors that receive their energy from one or more batteries that are charged by an on-board internal combustion engine that is not connected to the vehicle drive-train.*

4.11. *"Hybrid Electric Vehicle I (HEV-I)" means a road transport vehicle whose drive-train incorporates a combination of electric motors and an internal combustion engine that powers an electric generator to charge the batteries and also provides direct motive power to the drive-train on demand.*

4.12. *"Hybrid Electric Vehicle II (HEV-II)" means a road transport vehicle whose permanent internal combustion drive train can be supplemented by electric motors.*

4.13. ***"Hybrid Electric Vehicle III (HEV-III)" means a road transport vehicle whose power train consists of two propulsion systems (one of which is electrical); the non-electric can be completely turned off and disconnected, so that the vehicle propulsion is purely electrical.***

4.14. *"Internal Combustion Engine Vehicle (ICEV)" means a road transport vehicle whose operation relies entirely upon an internal combustion engine to power its drive-train.*

4.15. *"AVAS" means Audible Vehicle Alert System; A system fitted to a vehicle that emits audible sound(s) intended to give information to other road users.*

4.16. *"Attenuation" Reduction of the sound emitted by an AVAS.*

4.17. *"Attention catcher" means a special sound produced by an AVAS that indicates to pedestrians and road users the start of vehicle movement.*

4.18. *"Ready for Movement" means the sound produced by an AVAS that indicates all vehicle controls necessary to initiate immediate vehicle movement are ready for driver action.*

4.19. *"Pitch shifting" means the variation of the frequency content of the AVAS sound as a function of the vehicle speed.*

4.20. *"Directivity" means a measure of the directional characteristics of a sound source when mounted on a vehicle.*

4.21. *"Modulation" means the repetitive time dependant variation of the sound amplitude produced by an AVAS .*

4.22. "Authority" (see "certification authority" and "Contracting Party").

4.23. "Certification authority" means the authority that grants the compliance certification of an AVAS system according to this gtr. Per extension, it means also the technical service that has been accredited to evaluate the technical compliance of the AVAS system.

4.24. "Contracting Party" means the party signatory to the 1998 Agreement.

~~4.24.~~4.25.

4.26. "Cross-over speed" …..tbd

4.27. 'Pause switch' is a mechanism to halt temporarily the operation of the AVAS

4.28. 'Deactivation switch' is a mechanism to halt permanently the operation of the AVAS

4.29.

~~4.25.~~4.30. "Commencing Motion Sound" is a sound increase (sound peak) which indicates that a vehicle is starting to move.

5. GENERAL REQUIREMENTS

Each vehicle within the scope of section B item 2 shall meet the requirements specified under the test conditions and the test procedures in this Regulation.

5.1. PERFORMANCE REQUIREMENTS

~~**5.2. 6.3Directivity.**~~

~~**When measured according to the test conditions of X and test procedure ofX , the sound measured at the microphone on the line CC' must have at least the A-weighted sound pressure level in each of the one-third octave bands according to Table 1 (see Appendix X).**~~

5.2. ~~6.4~~ Backing.

For those vehicles already equipped with a reversing alarm [adressed~~-~~ by other legal requirement,] the requirements of this paragraph do not apply.

For vehicles capable of rearward self-propulsion, whenever the vehicle's gear selection control is in the reverse position [and the brake released] , the vehicle must emit a sound having at least the A-weighted sound pressure level in each of the one-third octave bands according to Table 1 of Annex 1) as measured according to the test conditions of 8.1 and the test procedure of 8.8.2.

Or

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[proposal from Japan]
For vehicles capable of rearward self-propulsion, whenever the vehicle's gear selection control is in the reverse position [and the brake released - OICA] , the vehicle must emit a sound having at least an overall A-weighted sound pressure level of 47 dB(A) as measured according to the test conditions of 8.1 and the test procedure of 8.8.2.

Kommentar [Bnb3]: To be deleted once table 1/Annex 1 is completed

Note: IWG – "reverse gear"– Canada/NFB/US; "brake release" position – France~~/~~

5.3. 6.5 Constant 10 km/h pass by

When tested under the conditions of section 8.1~~S6~~ and the procedures of section 8.8.3.~~S7.4~~, the vehicle ~~must~~ shall emit a sound having at least the A-weighted sound pressure level in each of the one-third octave bands according to Table 1 of Annex 1~~3~~ at any speed greater than or equal to 10 km/h, but less than 20 km/h.

[proposal from Japan]
When tested under the conditions of section 8.1 and the procedures of section 8.8.3., the vehicle shall emit a sound having at least the A-weighted sound pressure level of 50 dB(A) and one or more 1/3 octave bands level(s) shall exceed or equal 43dB(A).

If after a vehicle to which this standard applies according to Section B paragraph 2~~Xor~~ is tested in accordance with paragraph~~s~~ 8~~S7.~~4, for ten consecutive times [*within a series of measurements- OICA]* without recording a valid measurement because the vehicle's ICE remains active for the entire duration of the test *[or restarts and interferes with the measurements-OICA]*, the vehicle is not required to meet the requirements in S5.1.3.
-Further explanation for this requirement is requested from NHTSA-

~~ADD: Japanese proposal from 4th meeting page 2 (Proposal for QRTV-GTR on performance requirements for AVAS)~~

5.4. 6.6 Constant 20km/h pass by

When tested under the conditions of paragraph ~~S6~~8.1 and the procedures of paragraph 8.8.4~~S7.5~~, the vehicle must emit a sound having at least the A-weighted sound pressure level in each of the one-third octave bands according to Table 1 of Annex1~~4~~ at any speed greater than or equal to 20 km/h but less than 30 km/h.

[proposal from Japan]
When tested under the conditions of section 8.1 and the procedures of section

8.8.4., the vehicle shall emit a sound having at least the A-weighted sound pressure level of 56 dB(A) and one or more 1/3 octave bands level(s) shall exceed or equal 48dB(A).

If after a vehicle to which this standard applies according to ~~paragraph~~ Section B paragraph 2~~Xor~~ is tested in accordance with paragraphs S7.4, for ten consecutive times [*within a series of measurements- OICA]* without recording a valid measurement because the vehicle's ICE remains active for the entire duration of the test *[or restarts and interferes with the measurements-OICA]*, the vehicle is not required to meet the requirements in S5.1.3.

-Further explanation for this requirement is requested from NHTSA-

~~5.5. 6.7 Constant 30km/h pass by~~

~~*When tested under the conditions of S6 and the procedures of S7.6, the vehicle must emit a sound having at least the A-weighted sound pressure level in each of the one-third octave bands according to Table 5 at 30 km/h [20 km/h – Japan].*~~

~~If after a vehicle to which this standard applies according to paragraph Xor is tested in accordance with paragraphs S7.4, for ten consecutive times [*within a series of measurements- OICA]* without recording a valid measurement because the vehicle's ICE remains active for the entire duration of the test *[or restarts and interferes with the measurements-OICA]*, the vehicle is not required to meet the requirements in S5.1.3.~~

6.8 ~~Pitch~~Frequency shift~~ing~~ to signify acceleration and deceleration.

~~[The fundamental frequency of the sound emitted by the vehicle must vary with speed by at least one percent per km/h between 0 and 30 km/h.]~~

At least one- frequency of the sound emitted by the vehicle must have -a frequency shift within each individual gear ratio according to vehicle speed by at least 1% [0.8%] per km/h during the operation range according to Table 2 of Annex 1

~~5.6.5.5.~~ **Sameness** *(OICA REMARK: This should be covered under COP)*

~~5.6.1.5.5.1.~~ ~~**Any two vehicles of the same make, model, and model year (as those terms are defined at 49 CFR 565.12) must emit the same sound as measured by the test required in S5.1.1 [within 3 A-weighted dB in each one-third octave band] from 160 Hz to 5000 Hz**~~

~~[it is highly unlikely that these requirements can be fulfilled because the tolerance provided are technically not feasible]~~

~~Sameness~~

~~Any two vehicles of the same type must emit the same sound within a set of sounds as measured by the test required [specify reference]within a [6] A-weighted dB overall level.~~

~~Vehicle manufacturers may offer itheir vehicle to the customer with one or more alternative sounds; each of these sounds shall fulfil the minimum requirements defined within this standard.~~

~~Vehicle manufacturers may define alternative sounds which can be selected by the driver during vehicle operation; each of these sounds shall fulfil the minimum requirements defined within this standard~~

Kommentar [Bnb4]: TF recommends to rethink introducing requirements for sameness as this regulates tolerances of production. (COP). COP requirements are not part of a GTR but shall be regulated regionally at a later stage, e.g. in an UN Regulation under the 58 agreement.

The proposed tolerances appear far too strict and need to be revisited under the aspect of technical feasibility.

Proposed definition for model-year is US specific. Such requirement does not exist in other countries/regions

~~5.7.~~5.6. Method of sound generation

~~5.7.1.~~5.6.1.
~~5.7.2.~~5.6.2.
Remark: Specifications of maximum sound to be added. Need for the differenciation into options.

~~5.8.5.7.~~ ~~Attenuation~~

~~The AVAS sound level may be attenuated by up to 10dB(A) during periods of vehicle operation.~~

~~*3.2.5.8.* *Frequency specifications*~~

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~~*Frequency range of audible signal: between 50 Hz and 5 kHz*~~

~~*3.3.5.9.* *Frequency content*~~

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~~*The frequency content should include at least two 1/3 octave bands within that range given above.*~~
~~*In the case where the AVAS produce only two frequencies, they should differ by at least 15%.*~~

~~*An alerting signal's mid frequencies (0,5 kHz to 2 kHz), higher frequencies (2 kHz to 5 kHz) support audibility and directional cues. Low frequencies (below 500Hz) support earlier detection but in an urban environment are at risk of being masked.*~~

[One or more one third octave band level(s) shall exceed or equal [43]dB(A) at the vehicle speed of 10km/h and [48]dB(A) at 20km/h at each frequency range of [less than 800Hz] and [over 1.25kHz] in 1/3 octave band.]

~~*5.9.5.10.* *Sound Level*~~

[O.A. level shall exceed or equal [50]dB(A) at the vehicle speed of 10km/h and [56]dB(A) at 20km/h for forward motion, and [47]dB(A) for reversing.]

~~5.10.~~5.11. *[Alerting System Deactivation Speed*
The system shall be operational up to the speed of 20/30 km/h.]

6. REQUIREMENTS FOR NATIONAL ADOPTION BY CONTRACTING PARTIES

Contracting Parties may choose to adopt requirements listed in this section on a national basis

6.1. ***Start up and stationary but activated.***

6.2. Performance requirements for recognition as a motor vehicle.

[The sound emission of a vehicle is characterised by frequency content as a linear function of the vehicle speed

The sound emitted by the vehicle to meet the requirements in S5.1.1 must contain at least one tone. A component is defined as a tone if the total sound level in a critical band centred about the tone is 6 dB greater than the noise level in the band.

The sound emitted by the vehicle to meet the requirements in S5.1.1 must have at least one tone no higher than 400 Hz.

The sound emitted by the vehicle to meet the requirements in S5.1.1 must have broadband content in each one-third octave band from 160 Hz to 5000 Hz.]

Kommentar [Bnb5]: Content needs to be included in table in Annex

~~6.1.1.~~6.2.1. ***Stationary Sound***

When measured according to the test conditions of section 8.1 , the vehicle shall, within [500] ms of activation of its starting system [propulsion system], emit a sound according to the requirements specified in Table 1 of ~~Appendix~~ Annex 1. The vehicle shall also emit a sound meeting these requirements whenever moving less than 10 km/h. (recognize special cases such as vehicle on-charge)

-or-

When measured according to the test conditions of section 8.1 and *when in forward or reverse drive gear*, [from the start of a vehicle until reaching 20km/h – Japan] [when the brake is released – Alliance/Global]the vehicle must emit a sound having at least the A-weighted sound pressure level in each of the one-third octave bands according to Table x (see ~~Appendix~~ Annex~~x~~ 1). The vehicle must also emit a sound meeting these requirements whenever moving at less than 10 km/h. (*recognize special cases such as vehicle on-charge)*

Directivity.

When measured according to the test conditions of X and test procedure of X , the

sound measured at the microphone on the line CC' must have at least the A-weighted sound pressure level in each of the one-third octave bands according to Table 1 (see ~~Appendix~~ Annex 1~~X~~).

Constant 30km/h pass by

When tested under the conditions of paragraph 8.1and the procedures of paragraph 8.8.5, the vehicle shall emit a sound having at least the A-weighted sound pressure level in each of the one-third octave bands according to Table 1 of appendix 1 at 30 km/h
If after a vehicle to which this standard applies according to Section B paragraph 2 is tested in accordance with paragraphs paragraph 8, for ten consecutive times [within a series of measurements] without recording a valid measurement because the vehicle's ICE remains active for the entire duration of the test [or restarts and interferes with the measurements], the vehicle is not required to meet the requirements in S5.1.3.

-Further explanation for this requirement is requested from NHTSA-

~~6.2.~~6.3. Pause Switch (*to be drafted, reference control and displays legislation*)

This paragraph applies to vehicles equipped with AVAS only

Telltale
In the case a vehicle is equipped with a pause switch, an indicator shall be installed showing the driver the AVAS is suspended.

Automated AVAS reactivation
The AVAS shall always return to its original default mode after each shut down. However, the driver shall have the possibility to reactivate AVAS at any time.

Accessibility
The Pause Switch shall be accessible and operated by the driver in a normal seating position

Owner's manual information
…….

7. TEST PROCEDURES

7.1. Test Conditions
7.1.1. Weather conditions.
The ambient conditions required by this section ~~must~~ shall be met at all times during the tests described in section B, paragraph ~~8~~9.8.
7.1.2. Conditions ~~must~~ shall be measured with the accuracy required in paragraph 5.3 of ~~[~~ISO 16254~~, SAE J2889-1]~~ at the microphone height required in paragraph 7.1.1 of

Kommentar [Bnb6]: Do be decided during the next official meeting in Tokyo how to handle content of test procedures. Either the complete ISO standard in copied into the GTR or the standard is referenced at one occasion and only deviations are mentioned in the text.

[ISO 16254, SAE J2889-1 or alternatively according to ECE 51] *(OICA: ECE R51: +/- 2cm)*

7.1.3. The ambient temperature shall be between 5 °C (41°F) and 40 °C (104 °F).

7.1.3.7.1.4. The tests shall not be carried out if the wind speed including gusts at microphone height exceeds 5 m/s during the noise measurement interval

7.1.4. The maximum wind speed at the microphone height is no greater than 5 m/s (11 mph), including gusts.

7.1.5. Tests shall only be carried out only under conditions of no precipitation and the test surface is dry.

7.1.6. Background noise level. The overall sound pressure level (SPL) background noise level must shall be measured and reported as in paragraph 6.3.1 of SAEJ2889-1 [or ISO16254] The background noise in one-third octave bands shall be measured and reported as in paragraph 6.3.1.1 of SAE J2889-1 or ISO 16254.

7.1.7. Test surface. Test surface shall meet the requirements of ISO 10844:1994 or later versions2011 [ISO 10844:1994 or ISO 10844:2011]).

3.4.7.2. Instrumentation.

7.2.1. Acoustical measurement.

3.4.1.7.2.1.1. Instruments for acoustical measurement must meet the requirements of paragraph 5.1 of SAE J2889-1 [or ISO16254]

7.2.2. Vehicle speed measurement.

3.4.2.7.2.2.1. The road speed of the vehicle shall be measured with instrumentation having an accuracy of at least +- 0.5 km/h. Instruments used to measure vehicle speed during 9.8.3, 9.8.4, and 9.8.5 of this standard must be capable of continuous measurement within ± 1.0 km/h over the entire test distance between AA' and PP'

7.2.3. Meteorological instrumentation.

3.4.3.7.2.3.1. Instruments used to measure ambient conditions at the test site must meet the requirements of paragraph 5.3 of SAE J2889-1 [or ISO16254]

3.5.7.3. Test site.

3.5.1.7.3.1. The test site must shall be established per the requirements of paragraph 6.1.2 of SAE J2889-1 [or ISO16254] including Figure 1, "Test Site Dimensions" with the definitions of the abbreviations in Figure 1 as given in Table 1, section 4 of SAE J2889-1 [or ISO16254] Microphone positions must shall meet the requirements of paragraph 7.1.1 of SAE J2889-1 [or ISO16254]

3.5.2.7.3.2. Indoor test facilities meeting specifications in paragraph 6.1.3(vehicle) or 6.1.4(component), as applicable, of SAE J-2889-1 [or ISO16254] are an acceptable alternative to 98.3.1

3.6.7.4. Test set up for directivity measurement must be as per paragraph 7.1.1 of SAE J2889-1 or ISO 16254 with the addition of one microphone meeting the requirements of paragraph 5.1.1 of SAE J2889-1 or ISO 16254 placed on the line CC', 2m forward of the line PP' at a height of 1.2m *+/- 2cm* above ground level.

3.7.7.5. Vehicle condition

3.7.1.7.5.1. [Tires will be fitted and pressurized per the vehicle's tire placard. Tire tread will be

Kommentar [DBM7]: DBM edit to improve readability.

Kommentar [Bnb8]: specify acceptable range of humidity if possible or necessary

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Kommentar [DBM9]: This is somewhat redundant to paragraph 9.1.2

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free of all debris. Tires will be conditioned according to the following procedure: Drive the test vehicle around a circle 30 meters (100 feet) in diameter at a speed that produces a lateral acceleration of approximately 0.5 to 0.6 g for three clockwise laps, followed by three counterclockwise laps.]
Remark : fixed prescription how to warm up tires is unpractical and in some facilities even not possible]

~~3.7.2.~~7.5.2. Tires will be fitted and pressurized per the vehicle's tire placard. Tire tread will be free of all debris. Before the measurements are started, the tyres shall be brought to its normal operating conditions.

~~3.7.3.~~7.5.3. [The vehicle's doors are shut and locked and windows are shut.]

~~3.7.4.~~7.5.4. The vehicle's doors and windows are shut. In case of self-lockable vehicles the doors shall be locked before starting the measurement.

~~3.7.5.~~7.5.5. [All accessory equipment (air conditioner, wipers, heat, HVAC fan, audio/video systems, etc.) will be off. Propulsion battery cooling fans and pumps and other components of the vehicle's propulsion battery thermal management system are not considered accessory equipment.]

~~3.7.6.~~7.5.6. All accessory equipment (air conditioner, wipers, heat, HVAC fan, audio/video systems, etc.) that can be shut down, will be off. Propulsion battery cooling fans and pumps and other components of the vehicle's propulsion battery thermal management system are not considered accessory equipment.

~~7.1.8.~~7.5.7. **[Test weight of the vehicle will be the curb weight (as defined in 571.3) plus 125 kilograms. Equipment, driver and ballast should be evenly distributed between the left and right side of the vehicle. Do not exceed the GVWR or GAWRs of the vehicle.]**

~~7.1.9.~~7.5.8. Test weight of the vehicle will be the curb weight (as defined in 571.3) plus driver and test equipment with a 10% tolerance. *(OICA: Use ECE Definition)*

~~7.1.10.~~7.5.9. [Vehicle's electric propulsion batteries, if any, are fully charged.]
Remark : add definition from ISO 16254 paragraph 7.1.2.2
If so equipped, propulsion batteries shall have a state-of-charge sufficiently high to enable all key functionalities per the manufacturer's specifications. Propulsion batteries shall be within their component-temperature window to enable all key functionalities that could reduce vehicle noise emissions. Any other type of rechargeable energy storage system shall be ready to operate during the test.

~~7.2.~~7.6. Ambient correction

~~7.2.1.~~7.6.1. Measure the background noise for at least 30 seconds before and after a series of vehicle tests.

~~7.2.2.~~7.6.2. A 10-second sample taken from these measurements will be used to calculate the reported background noise.

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Kommentar [DBM10]: ISO& SAE language

~~7.2.3.~~7.6.3. The 10-second sample selected will include background levels that are representative of the background levels that will occur during the vehicle measurement.

~~7.2.4.~~7.6.4. The minimum A-weighted SPL in the selected 10-second sample as the overall background noise level, Lbgn will be reported. The average A-weighted SPL in the same 10-second sample will also be noted.

~~7.2.5.~~7.6.5. The minimum A-weighted 1/3 octave band levels (OBLs) (per ANSI S1.11, Class 1) in the selected 10-second sample will be reported as the 1/3 octave band background noise level, OBLbgn, fc. The average A-weighted 1/3 octave band level in the same 10-second sample for each 1/3 octave band will also be noted.

~~7.2.6.~~7.6.6. Each 1/3 octave band of the measured jth test result within a test condition OBLtest,j,fc, will be corrected according to Table 6 to obtain the noise-corrected level OBLtestcorr, j, fc which is the OBLtest, j, fc minus the correction factor, Lcorr.

~~7.2.7.~~7.6.7. Ensure that maximum allowable peak-to-peak variation occurs in not more than one measurement for each operation during the portion of the measurement that will be reported, e.g. within the second prior to pass-by or during an entire active but stationary measurement.

~~7.2.8.~~7.6.8. Ensure that the background level is at least 10 dB below the measurement during any portion of the measurement that will be reported, e.g. within the second prior to pass-by or during an entire active but stationary measurement.

~~3.8.~~7.7. Background noise

~~3.8.1.~~7.7.1. A background noise representative for the period of the measurement shall be measured for 10 seconds before or after a series of vehicle tests.

~~3.8.2.~~7.7.2. The 10-second sample will be representative of the background levels that will occur during the vehicle measurement.

~~3.8.3.~~7.7.3. The overall background level is at least 10 dB below the measurement during any portion of the measurement that will be reported, e.g. within the second prior to pass-by or during an entire active but stationary measurement.

~~3.8.4.~~7.7.4. The test engineer shall ensure that the background noise does not interfere during the measurement. If a noise peak obviously out of character with the general sound pressure level is observed, the measurement shall be discarded..

~~3.8.5.~~7.7.5.

Measurement criteria for overall sound pressure level

The background, or ambient noise, shall be measured for duration of at least 20-seconds before and after a series of vehicle tests. A 20-second sample taken from this measurement shall be used to calculate the reported background noise, taking account to insure the 20-second sample selected is representative of the background noise in absence of any transient disturbance. The measurements shall be made with the same microphones and microphone locations used during the test.

When testing in an indoor facility, the noise emitted by the roller-bench, chassis dynamometer, or other test facility equipment, without the vehicle installed or present, inclusive of the noise caused by air handling, facility vehicle cooling, shall be reported as the background noise.

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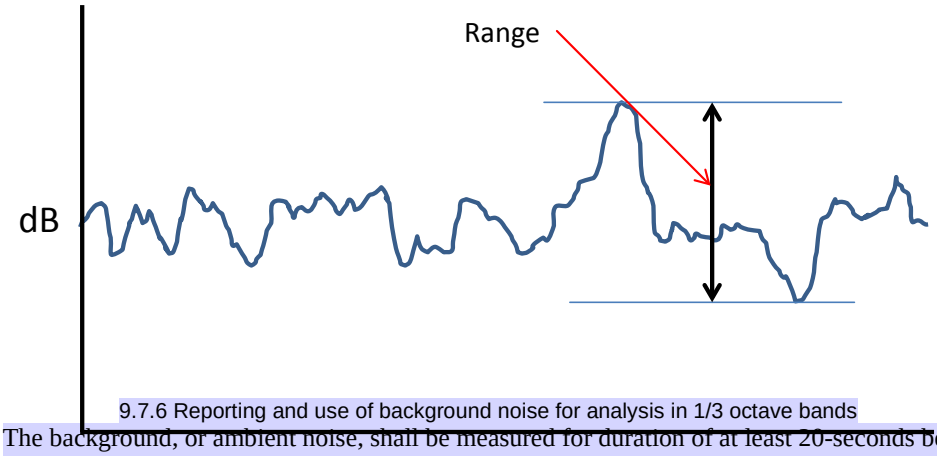
The maximum A-weighted sound pressure level in the selected 20-second sample shall be reported as the background noise, L_{bgn} , the range of the backgound noise, $L_{bgn,\ p\text{-}p}$, and the one-third-octave frequency per IEC 61260-1, Class 1, at this level of background noise, shall be reported. Figure 2 provides graphical information on the determination of the range of background noise.

When analysis in 1/3 octaves is required, the background noise shall meet the requirements of 6.3.1.1

NOTE 1 Standard sound level meters typically have peak hold functions designed to provide maximum sound pressure levels over a time period. Care should be taken to insure that the data measurement and analysis system is capable of reporting of minimum sound pressure level over a time period.

NOTE 2 The 1/3 octave levels reported as per this paragraph are for informative purposes only. They should not be relied on to determine if the background noise conditions are sufficient for accurate measurement of 1/3 octave levels.



9.7.6 Reporting and use of background noise for analysis in 1/3 octave bands

The background, or ambient noise, shall be measured for duration of at least 20-seconds before and after a series of vehicle tests. The measurements shall be made with the same microphones and microphone locations used during the test.

When testing in an indoor facility, the noise emitted by the roller-bench, chassis dynamometer, or other test facility equipment, without the vehicle installed or present, inclusive of the noise caused by air handling, facility vehicle cooling, shall be reported as the background noise.

The maximum hold A-weighted sound pressure level of the 20 second background noise sample in each 1/3 octave band of interest shall be reported as the 1/3 octave background noise, L_{bgn1_3} , per IEC 61260-1, Class 1.

NOTE The 1/3 octave levels reported as per this paragraph are use to determine if the test facility has sufficiently low background noise levels to accurately measure precision 1/3 octave results. Fluctuation and variation inherent to 1/3 octave measurement does not allow the use of correction procedures as specified in 9.7.7

9.7.7 Vehicle overall SPL measurement correction criteria

Depending on the level and peak to peak fluctuation of the background noise, the measured *j*th test result within a test condition, $L_{test,j}$, shall be corrected according to the table below to obtain the noise-corrected level $L_{testcorr,j}$. Except where noted, $L_{testcorr,j} = L_{test,j} - L_{corr}$.

Table 1 — Correction for background noise level when measuring full vehicle overall sound pressure level

Correction for Background Noise			
Background Noise Level L_{bgn}	Peak-to-Peak Background Noise Level $L_{bgn,\ p\text{-}p}$	Sound Pressure Level of *j*th test result minus Background Noise Level $\Delta L = L_{test,j} - L_{bgn}$	Correction L_{corr}
> 25 A-weighted sound pressure level	See Note 1 below	> 10 dB	0 dB
	< 2 dB	8 dB to 10 dB	0,5 dB
		6 dB to 8 dB	1,0 dB
		4,5 dB to 6 dB	1,5 dB
		3 dB to 4,5 dB	2,5 dB
		< 3 dB	Do not correct, report out: $L_{testcorr,j} \leq L_{bgn}$
< 25 A-weighted sound pressure level	See Note 1 below	< 10 dB	Do not correct, report out: $L_{testcorr,j} < L_{test,j}$
		> 10 dB	0 dB

NOTE 1 The trained technician should ensure that measurements are only performed when there is no excessive fluctuation that could potentially result in an inappropriate noise correction.

NOTE 2 These criteria are established to insure accurate vehicle measurements while recognizing the practical issue that A-weighted sound pressure levels lower than 25 dB are not necessary to measure accurately for the purposes of this International Standard. The use of indoor test facilities may be necessary to achieve the specifications in this International Standard.

9.7.8 When analyzing 1/3 octaves according to this international standard, the maximum hold background noise level in each 1/3 octave of interest, analysed according to 9.7.6, shall be at least 6 dB below the measurement of the vehicle or device under test in each 1/3 octave band of interest. The overall sound pressure level shall be at least 10 dB below the measurement of the vehicle under test.

NOTE 1 The requirements for margin between background noise and test results are given to maintain an uncertainty of 1 dB or less.

9.7.9 Component measurement background noise

When measuring a component as provided in this International Standard, the background noise shall be at least 10 dB lower than the result of the device under test.
The background, or ambient noise, shall be measured for a duration of at least 20 seconds before and after a series of vehicle tests. A 20-second sample taken from this measurement shall be used to calculate the reported background noise, taking account to insure the 20-second sample

selected is representative of the background noise in absence of any transient disturbance. The measurements shall be made with the same microphones and microphone locations used during the test.
The maximum A-weighted sound pressure level in the selected 20-second sample shall be reported as the background noise, L_{bgn} and the one-third-octave frequency per IEC 61260-1, Class 1, at this level of background noise, shall be reported. For measurements where narrowband results are reported, the narrowband background noise shall be reported at the same frequency resolution as the measurement results

~~3.9.~~7.8. VEHICLE TESTING

~~3.9.1.~~7.8.1. Vehicle stationary but activated

~~3.9.1.1.~~7.8.1.1. ~~Option 1:~~ Stationary Sound

~~3.9.1.1.1.~~7.8.1.1.1. Position the vehicle stationary with the front plane at the line PP', the centerline on the line CC' and the starting system deactivated.

~~3.9.1.1.2.~~7.8.1.1.2. For vehicles equipped with a Park position, place the vehicle's gear selection control in "Park". For vehicles not equipped with a Park position, place the vehicle's gear selection control in "Neutral" and engage the parking brake. Activate the starting system to energize the vehicle's starting system.
The vehicle's gear selection control shall be placed in "D" and the brake released.

~~3.9.1.1.3.~~7.8.1.1.3. The vehicle minimum sound pressure level shall be measured per paragraphs 7.1.5.3, 7.1.6.1, and 7.1.6.2 of ~~SAE J2889-1 or~~ ISO 16254) and corrected for the ambient sound level according to the procedure in paragraph 9.7.7 and the correction criteria given in Table 2.
The vehicle minimum sound pressure level shall be measured per S7.3.2.1 and S7.4.1 of SAE J2889-1 (incorporated by reference, see § 571.5).

~~3.9.1.1.4.~~7.8.1.1.4. Four valid measurements must be within 2 A-weighted dB Measurements that contain sounds emitted by any component of a vehicle's battery thermal management system are not considered valid. When testing a hybrid vehicle with an internal combustion engine that runs intermittently, measurements that contain sounds emitted by the ICE are not considered valid.
Four consecutive measurements are considered valid if their overall levels are within a 2 A-weighted dB range. When testing a hybrid vehicle with an internal combustion engine that runs intermittently, measurements that contain sounds emitted by the ICE are not considered valid.

~~3.9.1.2.~~7.8.1.2. Option 2: Commencing Motion Sound

8.8.1.2.1. The vehicle shall be placed with the front plane on the PP' line for driving forward and with the rear plane on the PP' line for backing

8.8.1.2.2. The propulsion system is active, the transmission in drive gear, the parking brake is released and the service brake is activated to hold the vehicle stationary.

8.8.1.2.3. After beginning of the measurement, the service brake shall be released (brake lights off) within 5 seconds [t_{rel}] and at least 10 seconds of data shall be measured.

8.8.1.2.4.. The signals brake lights and overall sound pressure level shall be measured.

Kommentar [DBM11]: Current ISO and SAE text which would replace all other text discussing background noise and background noise correction.

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Kommentar [Bnb12]: Before finalising this part, policy decisions must be taken.

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Kommentar [DBM13]: Correction is not applicable in 1/3 octave bands.

Kommentar [DBM14]: Not Practical

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Kommentar [DBM15]: This is covered in SAE and ISO paragraph 7.1.6.1

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8.8.1.2.5. The maximum overall A – weighted sound pressure level (L_{CMS}) is measured continuously with fast response mode.

8.8.1.2.6. Symbols and definitions of symbols

t_{rel}: Time where the service brake is released [s]

L_{CMS}: Sound pressure level of commencing motion sound [dB(A)]

8.8.1.2.7. To reduce artefacts four valid measurements are necessary. Reported will be the second lowest level of four measurements for each side. The lower value sound pressure level is reported as L_{CMS} in dB(A), rounded to the next integer. The measurements in a range of 2 dB(A) are valid

8.8.1.2.8. Equipment specification

Specification is the same as in all other tests

~~*3.9.1.2.1. The vehicle shall be placed with the front plane on the PP' line for driving forward and with the rear plane on the PP' line for backing*~~

~~*3.9.1.2.2. The propulsion system is active, the transmission in drive gear, the parking brake is released and the service brake is activated to hold the vehicle stationary.*~~

~~*3.9.1.2.3. The measurement starts 5 seconds before the service brake is released (brake lights off).*~~

~~*3.9.1.2.4. The signals (time, brake force, SPL) shall be measured for duration of at least 15 seconds.*~~

~~*3.9.1.2.5. The maximum overall A – weighted sound pressure level is measured continuously with fast response mode.*~~

~~3.9.2.~~7.8.2.**Backing. Test**

~~3.9.2.1.~~7.8.2.1.**The vehicle per 9.8.1, except that the rear plane of the vehicle is placed on line PP'. Backing.**

~~3.9.2.2.~~7.8.2.2. The vehicle per S7.1, except that the rear plane of the vehicle is placed on line PP' and the gear selection control in "R".

~~3.9.3.~~7.8.3.**Pass-By test at 10km/h**

~~3.9.3.1.~~7.8.3.1.**Measure the sound emitted by the vehicle at a constant 10 km/h (+/- 1 km/h) throughout the measurement zone specified in paragraph 7.1.5.5.1 of SAE J1889-1 or ISO 16254 between lines AA' and PP'. The test result shall be the lowest value (average of the two microphones) of the four valid pass-bys. The test result shall be reported to the first significant digit after the decimal place.**

~~3.9.3.2.~~7.8.3.2. Measure the sound emitted by the vehicle at a constant 10 km/h (+/- 1 km/h) throughout the measurement zone specified in S6.4 between lines AA' and PP'.
The test result shall be averaged per side. The final result to be reported is from the vehicle side with the lower level.

~~3.9.3.3.~~7.8.3.3.**Four valid measurements must be within 2 A-weighted dB. Measurements that contain sounds emitted by any component of a vehicle's battery thermal management**

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Kommentar [DBM16]: Not Practical
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system are not considered valid. When testing a hybrid vehicle with an ICE that runs intermittently, measurements that contain sounds emitted by the ICE are not considered valid. The test result shall be corrected for the ambient sound level according to the procedure in 9.7.7 and the correction criteria given in Table 2 and reported to the first significant digit after the decimal place.

~~3.9.3.4.~~7.8.3.4.Four consecutive measurements are considered valid if their overall levels are within a 2 A-weighted dB range. When testing a hybrid vehicle with an internal combustion engine that runs intermittently, measurements that contain sounds emitted by the ICE are not considered valid. The test result shall be reported to the first significant digit after the decimal place.

~~3.9.4.~~7.8.4. **Pass by test at 20 km/h.**
Repeat the test of 9.8.3 at 20 km/h.

~~3.9.5.~~7.8.5. **Pass by test at 30 km/h.**
Repeat the test of 9.8.3 at 30 km/h.

~~4.~~8. DOCUMENTATION REQUIREMENTS

~~(OICA: Specs to be added)~~

-Template sheet for test report necessary? To be clarified prior to next meeting in Tokyo

-vehicle drawings?

-decribtion of AVAS?

[from GTR Nr. 2:
The following information shall be recorded with respect to each test:
(a) Test number,
(b) System or device tested (brief description),
(c) Date and time of day for each part of the test schedule,
(d) Instrument operator,
(e) Driver or operator,
(f) Test vehicle: make, vehicle identification number, model year, transmission type, odometer reading at initiation of preconditioning, engine displacement, engine family, emission control system, recommended engine speed at idle, nominal fuel tank capacity, inertial loading, actual curb mass recorded at 0 kilometre, and drive wheel tyre pressure.
(g) Dynamometer serial number: as an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, with the advance approval of the Administration, provided the test cell records show the pertinent instrument information.
(h) All pertinent instrument information such as tuning-gain-serial number-detector number-range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administration, provided test cell calibration records show the pertinent instrument information.
(i) Recorder charts: Identify zero, span, exhaust gas, and dilution air sample traces.
(j) Test cell barometric pressure, ambient temperature and humidity.
Note 7 A central laboratory barometer may be used; provided, that individual test cell barometric pressures are shown to be within ± 0.1 per cent of the barometric pressure at the central barometer location.
(k) Pressure of the mixture of exhaust and dilution air entering the CVS metering device, the pressure

Kommentar [DBM17]: Correction is not applicable in 1/3 octave bands

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increase across the device, and the temperature at the inlet.
The temperature should be recorded continuously or digitally to determine temperature variations.
(l) The number of revolutions of the positive displacement pump accumulated during each test phase while exhaust samples are being collected. The number of standard cubic meters metered by a critical flow venturi (CFV) during each test phase would be the equivalent record for a CFV-CVS.
(m) The humidity of the dilution air.
Note 8 If conditioning columns are not used this measurement can be deleted. If the conditioning columns are used and the dilution air is taken from the test cell, the ambient humidity can be used for this measurement.
(n) The driving distance for each part of the test, calculated from the measured roll or shaft revolutions.
(o) The actual roller speed pattern of the test.
(p) The gear use schedule of the test.
(q) The emissions results of the Type I test for each part of the test (see Annex 11).
(r) The second by second emission values of the Type I tests, if necessary.
(s) The emissions results of the Type II test (see Annex 12).]

9. ANNEXES

~~*(OICA: to be completed)*~~

Annex 1

Table 1~~Spectra Definitions Table 1 to 5~~

When measured according to the test conditions of sections 6 and 7 and the test procedures of section 8, the vehicle shall emit a sound having at least the A-weighted sound pressure level in not less than [two] of the one-third octave bands according to the table below.

1/3rd Octave band mid frequencies [Hz]	Stationary but activated	BACKING	Constant speed 10 km/h	Constant speed 20 km/h	Constant speed 30 km/h
160					
200					
250					
315					
400					
500					
630					
800					
1.000					
1.250					
1.600					
2.000					
2.500					
3.150					
4.000					
5.000					
Overall SPL					

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Table 2~~6~~ for Ambient Correction

Table 6. Corrections for Background Noise

1/3 Octave Band Noise Level OBLbgn,fc	* Peak-to-Peak 1/3 Octave Band Background Noise Level OBLbgn, fc, p-p	1/3 Octave Band Level of jth test result, ith frequency, minus 1/3 Octave Band Noise Level DL = OBLtest,j, fc - OBL bgn, fc	Correction Lcorr
≥ 25 dB(A)	**	> 10 dB	0 dB
	< 8 dB	> 8-10 dB	0.5 dB
		> 6-8 dB	1.0 dB
	< 6 dB	> 4.5-6 dB	1.5 dB
		> 3-4.5 dB	2.5 dB
		≤ 3 dB	Do not correct, but report OBLtestcorr, j < OBLtestj
< 25 dB(A)		≤10 dB	Do not correct, but report OBLtestcorr, j < OBLtestj
	**	> 10 dB	0 dB

Annex 2

Minimum Common Requirements

Table 1: Vehicle Categories Concerned

EV and HEV (operating in their electric mode)	**Mandated**	**forbidden**	**Optional**	**Remarks**
Light Vehicles	France, Japan, Spain		UK, Germany	Additional sub-categories to be defined
Heavy Vehicles	France, Spain		UK, Germany	Additional sub-categories to be defined
2-3 Wheelers (L1, L2, L3, L4, L5)		Germany	UK, France	
L6, L7		Germany	UK, France	
Vehicles with noise level above xx dB(A) – EV & HEV (are not required to be equipped with an AVAS)	Needed	Not Needed UK, Germany, France, Spain		Additional sub-categories to be defined

Table 2: Operating conditions

	Mandated	**forbidden**	**Optopnal**	**Remarks**
Stationary	[China]	France, Switzerland, Norway	Japan, Germany, UK	operating after vehicle ON or after gear engaged
Commencing	Spain	Switzerland	Japan, France, UK, Norway, Germany	
Reverse	Japan, Spain		Germany	UK has legislation on reversing devices
From start up to 20 km/h	France, Japan, Spain		Germany	
From 20 to 30 km/h			France, Japan, Spain	
> 30 km/h		Germany, France, Spain	Japan	

Table 3: Pause / Attenuation Options

	Mandated	**forbidden**	**Optional**	**Remarks**
Pause switch On/Off	UK, Germany	[Spain]	France, Japan	
Re-operation (after deactivation of the vehicle) in previous driver choice	[UK], Germany	France		
Re-operation (after deactivation of the vehicle) in ON	France, Japan			

Attenuation	NEEDED Germany, Spain	NOT NEEDED UK, Japan		
Software On/Off Switch (for regional legislative purposes)	UK, Germany, Spain		[France], Japan	

Table 4: Signal characteristics and minimum noise

	Mandated	**forbidden**	**Optional**	**Remarks**
Description of sound avoided	UK, France, Japan, Spain, Germany			R.E.3
Minimum sound level on 1⁄3 oct band level (8 bands)				NPRM : 315, 400, 500, 2000, 2500, 3150, 4000, 5000 Hz
Minimum sound level has to be met on one band less than 800Hz and on one band over 1.25kHz (1⁄3 oct band level)	France, Japan, Spain			Japan One band less than 800Hz and one band over 1.25kHz. The manufacture may add more bands without minimum requirements
Minimum sound level in overall	France, Japan, Spain			
Minimum sound level per band	France, Japan, Spain			

Table 5: Pitch shifting Options

	Mandated	forbidden	Optional	Remarks
Pitch Shifting	In favour UK, Germany, France, Japan, Spain	Not in favour		
At least 1% / 1km/h	Japan			NPRM
At least 8% / 10km/h	France		[Japan]	Japan is also considering this option
X tones between xx and yy Hz	Needed France	Not Needed Japan		NPRM : 1 tone between 160 and 400 Hz

Table 6: Maximum sound level

	Required	Not Required	Remarks
Maximum Sound Level for Evs and HEVs with the AVAS activated	UK, Germany, France, Spain		Japan has not carried-out a discussion yet
Max SPL of EV or HEV with AVAS activated not higher than the SPL of non-QRTV of the same category operated at conditions specified in SAE 2889-1 or ISO 16254	France		Japan has not carried-out a discussion yet Spain requires more information to become available
No vehicle shall be more noisy (with AVAS activated) than M1a vehicles	Germany, [France]		Japan has not carried-out a discussion yet Spain requires more information to become

			available

Table 7: Test Procedure for verification of acoustic performance of QRTV

	Allowed	**Not Allowed**	**Remarks**
Indoor Vehicle Testing			
Outdoor Vehicle Testing			

Table 8: Test Procedure of Vehicles equipped with AVAS system

Test Procedure	**YES**	**NO**	**Remarks**
Component Testing Indoors			AVAS system standalone test on a testing bench
Simulated Vehicle Testing Indoors			AVAS system testing with the vehicle as the test bench and the AVAS system receiving speed increase signals
Vehicle Testing Indoors			

Vehicles Testing Outdoors (when test facility meets some minimum requirements, i.e. each 1/3 octave bands has to be at least 6db below the targeted measurement)			

Annex 3

Referenced Standards

Formatiert: Deutsch (Deutschland)