

May 2018

P R E S E N T A T I O N O F

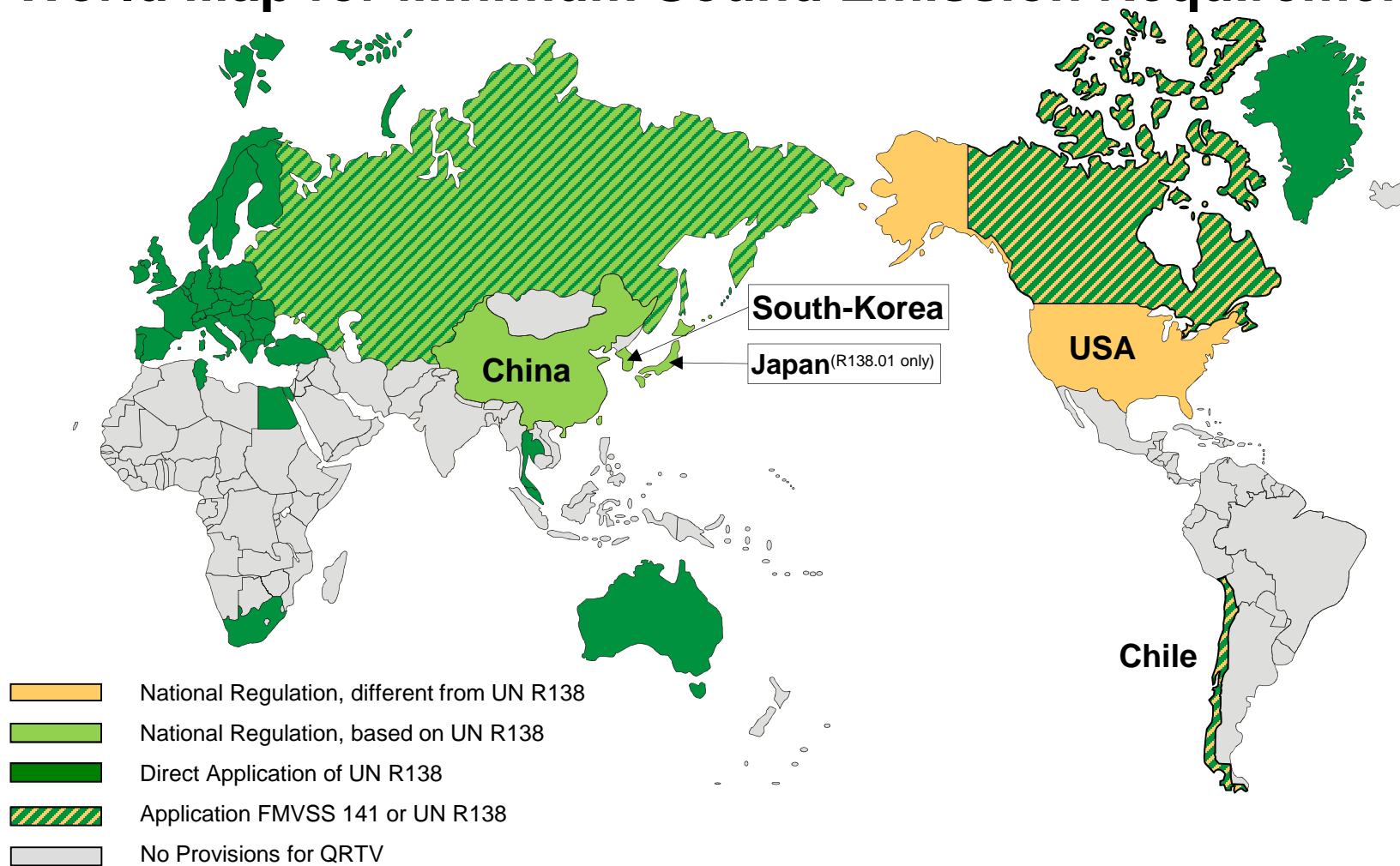


I N T E R N A T I O N A L O R G A N I Z A T I O N O F M O T O R V E H I C L E M A N U F A C T U R E R S

Regulations Worldwide on Minimum Sound Emission of Quiet Vehicles

**UN-ECE GRB GTR Working Group QRTV
May 2018 - Baltimore**

World Map for Minimum Sound Emission Requirements





Countries that Apply UN R138 under the 58 Agreement

ECE/TRANS/WP.29/343/Rev.25

UN Regulation No. 138 Uniform provisions concerning the approval of Quiet Road Transport Vehicles with regard to their reduced audibility

Date of entry into force of: Original version: 05.10.2016

ECE symbols	Contracting Parties	Date of application	Designated Type Approval Authority(ies)	Designated Technical Service(s)
E 1	Germany	05.10.2016	1/A	1/G; 1/L; 1/BM; 1/BQ
E 2	France	05.10.2016	...	...
E 3	Italy	05.10.2016	...	...
E 4	Netherlands	05.10.2016	...	...
E 5	Sweden	05.10.2016	5/A	...
E 6	Belgium	05.10.2016	...	...
E 7	Hungary	05.10.2016	...	...
E 8	Czech Republic	05.10.2016	...	...
E 9	Spain	05.10.2016	...	9/A
E 10	Serbia	05.10.2016	...	...
E 11	United Kingdom	05.10.2016	...	...
E 12	Austria	05.10.2016	...	...
E 13	Luxembourg	05.10.2016	13/A	13/B(a), (b), (e)
E 14	Switzerland	05.10.2016	...	...
E 16	Norway	05.10.2016	...	...
E 17	Finland	05.10.2016	...	...
E 18	Denmark	05.10.2016	...	...
E 19	Romania	05.10.2016	...	...
E 20	Poland	05.10.2016	...	...
E 21	Portugal	05.10.2016	...	...
E 22	Russian Federation	05.10.2016	...	...
E 23	Greece	05.10.2016	...	...
E 24	Ireland	05.10.2016	...	...
E 25	Croatia	05.10.2016	...	...
E 26	Slovenia	05.10.2016	...	...
E 27	Slovakia	05.10.2016	27/A	27/J
E 28	Belarus	05.10.2016	...	...
E 29	Estonia	05.10.2016	...	...
E 30	Republic of Moldova	20.11.2016	...	...
E 31	Bosnia and Herzegovina	05.10.2016	...	...
E 32	Latvia	05.10.2016	...	...
E 34	Bulgaria	05.10.2016	...	...
E 35	Kazakhstan	05.10.2016	...	...
E 36	Lithuania	05.10.2016	...	...
E 37	Turkey	05.10.2016	...	...
E 39	Azerbaijan	05.10.2016	...	...
E 40	The Former Yugoslav Republic of Macedonia	05.10.2016	...	...
E 42	European Union	05.10.2016	...	...
E 43	Japan	...	...	...
E 45	Australia	05.10.2016	...	...
E 46	Ukraine	05.10.2016	...	...
E 47	South Africa	05.10.2016	...	...
E 48	New Zealand	05.10.2016	...	...
E 49	Cyprus	05.10.2016	...	...
E 50	Malta	05.10.2016	...	...
E 51	Republic of Korea	05.10.2016	...	...
E 52	Malaysia	05.10.2016	...	...
E 53	Thailand	05.10.2016	...	...
E 54	Albania	05.10.2016	...	...
E 56	Montenegro	05.10.2016	...	...
E 57	San Marino	05.10.2016	...	...
E 58	Tunisia	05.10.2016	...	...
E 60	Georgia	05.10.2016	...	...
E 62	Egypt	05.10.2016	...	...



Countries that have Signed-Up of the 98 Agreement

I. List of Contracting Parties (36) to the 1998 Agreement

List of the Contracting Parties to the Agreement, indicating also the legal history of their adhesion or withdrawal. A daily updated list of the Contracting Parties to the Agreement is available at: http://www.unece.org/trans/conventn/agreem_cp.html#18

<i>Contracting Parties</i>	<i>Adhesion effective from</i>	<i>Adhesion process</i>	<i>Related depositary notification, date...</i>
Australia	07.06.08	Accessed on 08.04.2008	C.N.272.2008.TREATIES-1, 10.04.2008
Azerbaijan	14.06.02	Accessed on 15.04.2002	CN.350.2002.TREATIES-2, 15.04.2002
Belarus	03.03.15	Accessed on 02.01.2015	C.N.22.2015.TREATIES-XLB.32
Canada	25.08.00	Signed on 22.06.1999	CN.648.1999.TREATIES-2, 15.07.1999
P.R. China	09.12.00	Accepted on 10.10.2000	CN.1000.2000.TREATIES-10, 27.10.2000
Cyprus	11.06.05	Accessed on 12.04.2005	CN.274.2005.TREATIES-1, 12.04.2005
European Union	25.08.00	Signed on 18.10.1999 Approved on 15.02.2000	CN.1019.1999.TREATIES-6, 17.11.1998 CN.82.2000.TREATIES-3, 18.02.2000
Finland	07.08.01	Accessed on 08.06.2001	CN.587.2001.TREATIES-2, 11.06.2001
France	25.08.00	Signed on 22.09.1999 Approved on 4.01.2000	CN.1.2000.TREATIES-1, 05.01.2000
Germany	25.08.00	Signed on 11.05.2000	CN.360.2000.TREATIES-5, 05.06.2000
Hungary	21.08.01	Accessed on 22.06.2001	CN.655.2001.TREATIES-3, 09.07.2001
India	22.04.06	Accessed on 21.02.2006	CN.202.2006.TREATIES-2, 02.03.2006
Italy	30.01.01	Accessed on 01.12.2000	CN.1084.2000.TREATIES-12, 05.12.2000
Japan	25.08.00	Accepted on 03.08.1999	CN.692.1999.TREATIES-4, 03.08.1999
Kazakhstan	27.08.11	Accessed on 28.06.2011	C.N.415.2011.TREATIES-2, 29.06.2011
Republic of Korea	01.01.01	Accessed on 02.11.2000	CN.1014.2000.TREATIES-11, 17.11.2000
Lithuania	25.07.06	Accessed on 26.05.2006	CN.434.2006.TREATIES-3, 30.05.2006

<i>Contracting Parties</i>	<i>Adhesion effective from</i>	<i>Adhesion process</i>	<i>Related depositary notification, date...</i>
Luxembourg	15.11.05	Accessed on 16.09.2005	CN.968.2005.TREATIES-2, 16.09.2005
Malaysia	04.04.06	Accessed on 03.02.2006	CN.116.2006.TREATIES-1, 03.02.2006
Republic of Moldova	17.03.07	Accessed on 16.01.2007	CN.32.2007.TREATIES-1, 17.01.2007
Netherlands ¹	05.03.02	Accessed on 04.01.2002	CN.12.2002.TREATIES-1, 08.01.02
New Zealand ²	26.01.02	Accessed on 27.11.2001	CN.1448.2001.TREATIES-6, 02.01.2002 CN.1497.2001.TREATIES-7, 04.01.2002
Norway	29.11.04	Accessed on 30.09.2004	CN.1061.2004.TREATIES-1, 01.10.2004
Romania	24.06.02	Accessed on 25.04.2002	CN.390.2002.TREATIES-4, 25.04.2002
Russian Federation	25.08.00	Signed on 26.07.2000	CN.538.2000.TREATIES-7, 28.07.2000
San Marino	26.01.16	Accessed on 27.11.2015	C.N.642.2015.TREATIES-XLB.32
Slovakia	06.01.02	Accessed on 07.11.2001	CN.1159.2001.TREATIES-5, 08.11.2001
Slovenia	08.05.2014	Accessed on 08.07.2014	C.N.247.2014.TREATIES-XLB.32, 08.05.2014
South Africa	17.06.01	Signed on 14.06.2000 Ratified on 18.04.2001	CN.389.2000.TREATIES-6, 16.06.2000 CN.343.2001.TREATIES-1, 20.04.01
Spain	22.06.02	Signed on 24.08.2000 Ratified on 23.04.2002	CN.731.2000.TREATIES-9, 12.09.2000 CN.384.2002.TREATIES-3, 24.04.2002
Sweden	01.02.03	Accessed on 03.12.2002	CN.1249.2002.TREATIES-5, 06.12.2002
Tajikistan	26.02.12	Accessed on 28.12.2011	C.N.812.2011.TREATIES-3, 28.12.2011
Turkey	01.09.01	Accessed on 03.07.2001	CN.663.2001.TREATIES-4, 09.07.2001
Tunisia	01.01.08	Accessed on 02.11.2007	C.N.1048.2007.TREATIES-2, 05.11.2007
United Kingdom of Great Britain and Northern Ireland	25.08.00	Signed on 10.01.2000	CN.6.2000.TREATIES-2, 12.01.2000
United States of America	25.08.00	Signed on 25.06.1998 Accepted on 26.07.1999	CN.914.1998.TREATIES-1, 16.07.1999 CN.680.1999.TREATIES-3, 26.07.1999



Countries Which Have or Will Have QRTV Requirements

Mandatory Application of Minimum Sound Standards / AVAS ¹⁾ for Electrified Vehicles (Green colored cells contain official information, others are drafts)						
Market / Regions / Provinces	Contractor to UN Agreement	Regulation / Law / Standard	Derived from	First Application Date New Types	First Application Date All Vehicles	Status of Development
USA	98	FMVSS 141	Own Standard	09/2019 phase-in 50%	No transitional provisions	Published
Canada	98	CMVSS 141	Alternatives FMVSS or UN-ECE	September 1, 201X	No transitional provisions	informal consultation in progress
Chile		WTO Notification: G/TBT/N/CHL/396	Alternatives FMVSS or EU	12 month after publication	No transitional provisions	WTO notification, not published by now
UN-Regulation	58	UN-ECE R 138.00	Own Standard	no dates	no dates	Published
	58	UN-ECE R 138.01	Own Standard	09/2019	09/2021	Published
EU	58 & 98	540/2014/EC	Alternatives EU or UN-ECE	07/2019 before: if fitted!!!	07/2021	In Force
Japan	58 & 98	Nat. Reg. TRIAS 43 (7) Art. 67.3 UN R138.01	UN R138.01	03/2018	10/2020	In Force
China (PR)	98	GB 7258-2017 ²⁾	Own Wording	01/2018	No transitional provisions	In Force
	-	GB/T 32694-2016 ²⁾			No transitional provisions	no application for type approval
	-	GB/T 28382-2012 ²⁾			No transitional provisions	no application for type approval
	-	GB/T XXXXX-XXXX	UN R138.00		No transitional provisions	Draft
China (ROC)	-	VSTD 2(020) ²⁾	UN R.E.3	01/2015	01/2017	In Force
	-	VSTD 80	UN R138.01	07/2019	07/2021	Published
Korea	(58) & 98	Draft KMVSS 53.3	UN R138.01	t.b.d.	t.b.d.	WTO Notification

Review by OICA members, without guarantee

1) AVAS = Acousical Vehicle Alerting System
2) No specific requirements

Conclusions on the Formal Assessment

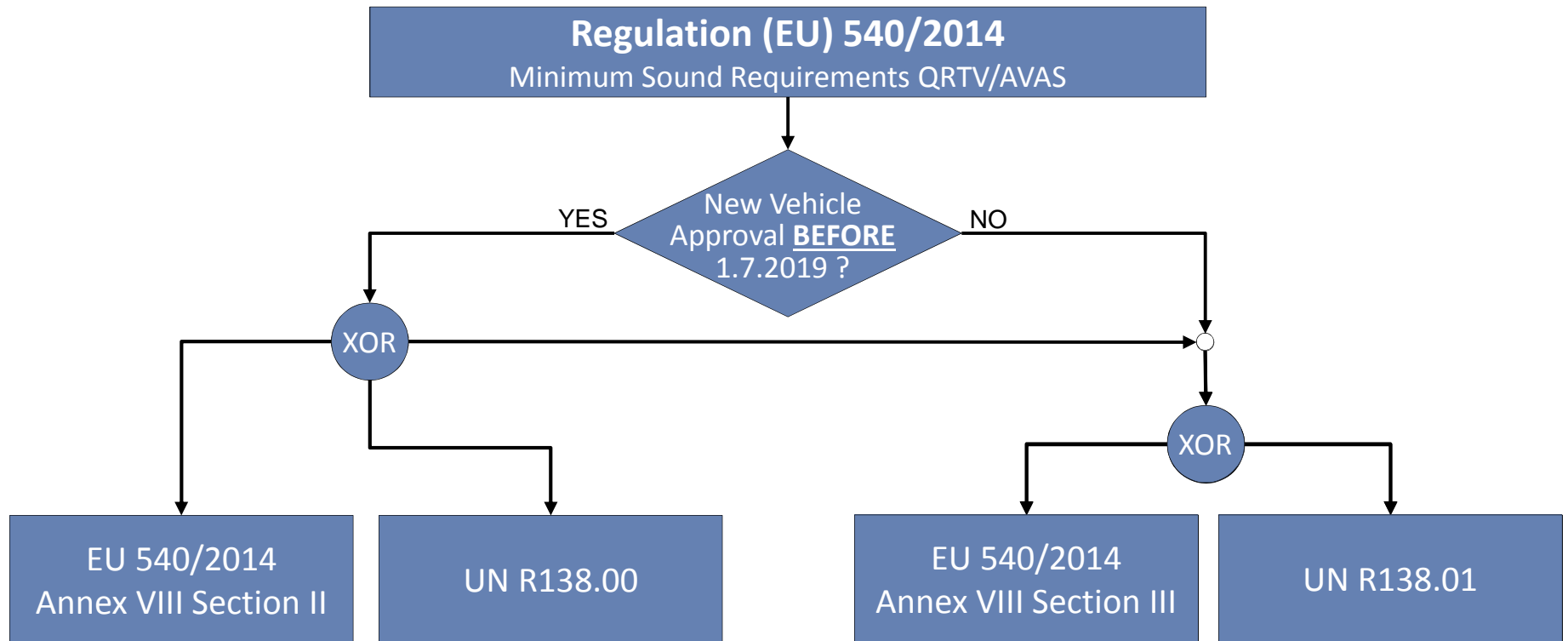
- Most countries that apply today the UN R138.00 / UN R138.01 are contractor to both Agreements of the UN (58- and 98-Agreement)
- Countries that apply the 98-Agreement only are:
 - Canada
 - China
 - India
 - New Zealand
 - Tajikistan
 - USA
- For the development of a GTR on QRTV, OICA suggests to review the provisions for QRTV of those countries relative to UN R138.01 to analyse what is common and where are the differences.



QRTV Application in Europe (EU28)

- QRTV is regulated by Regulation (EU) 540/2014
- This regulations entered into force in 4/2014 with provisions for electric and hybrid vehicles in case, the manufacturer fits an AVAS to the vehicles.
 - These specifications are based on the recommendations of UN R.E.3 the consolidated resolution on the construction of vehicles.
 - These specifications are mostly descriptive and do not contain specific requirements on sound levels or frequency content.
- In 6/2017 the EU commission amended this Regulation via a delegated act to align the provisions with UN R138.
 - Due to the restrictions of the delegated act the Commission was not able to fully harmonize Regulation (EU) 540/2014 with UN R138.
- As the EU is contractor to the 58 Agreement, UN R138 is applicable in Europe in parallel. Thus manufacturer have options for approval in Europe.

QRTV Application in Europe (EU28)



- New vehicle types have 4 options until 7/2019;
- New vehicles can be registered until 7/2021 with one of these four options.
- After these dates, two options remain, EU 540/2014 Anx. VIII Sec.III or UN R138.01

QRTV Application in Europe (EU28) - Requirements

Options	AVAS mandated	Speed Range	Stationary Sound	Reverse Sound	Pause Function	Frequency Band Specs	Overall Sound Level Specs
EU 540/2014 Annex VIII Section II	IF FITTED	> 0 km/h to 20 km/h	NO	No	MANDATED	NO	UNSPECIFIC
UN R138.00	NO	> 0 km/h to 20 km/h	NO	YES	OPTIONAL	YES	YES
EU 540/2014 Annex VIII Section III	YES	> 0 km/h to 20 km/h	NO	YES	OPTIONAL	YES	YES
UN R138.01	NO	> 0 km/h to 20 km/h	NO	YES	PROHIBITED	YES	YES

- Four options provide some ambiguities, especially regarding the questions:
 - shall vehicles be equipped with an AVAS after 7/2019 even if their “natural” sound emission is compliant with all sound pressure levels and frequency band specifications?
 - whether the driver shall, may or shall not be able to deactivate an AVAS?
- EU Workprogramme 2018-2019: Amendment of Delegated Regulation (EU) 2017/1576 of Regulation (EU) 540/2014 to align with UN R138.01.
Target date: 31 October 2018

QRTV Application in China

- China has several layer to regulate vehicle for China
 - GB standards are mostly binding and applicable during type approval.
 - GB/T Standards are often technical guidelines, sometimes binding for type approval, sometimes not. It depends, whether they are listed for applicable standards for type approval (example CCC listing)
- At the moment GB 7258-2017 specifies only:
 - *“Battery electric vehicles and plug-in hybrid electric vehicles shall give proper indicative sound to the people out of the vehicle at the moment of vehicle start-up and speed less than 20 km/h.”*
 - There are no further requirements at the moment.
 - Since 1/2018 manufacturer have to prove that they comply with this specification.
- China works on a GB/T for QRTV which is based on UN R138.00.
 - This technical standard is expected to be published within 2018.

QRTV Application in China - Requirements

Options	AVAS mandated	Speed Range	Stationary Sound	Reverse Sound	Pause Function	Frequency Band Specs	Overall Sound Level Specs
GB7258	NO	> 0 km/h to 20 km/h	NO	UNCLEAR	NOT SPECIFIED	NO	NO
GB/T XXXXX-XXXX	YES	> 0 km/h to 20 km/h	NO	YES	OPTIONAL	YES (+2 dB)	YES (+2 dB)

- GB 7258 mandates “proper sound”, it does not mandate an AVAS. However, it is unclear how to demonstrate “proper sound”, if not via an AVAS.
- The GB/T XXXXX-XXXX is based on UN R138.00, but with +2 dB higher minimum sound level specifications compared to UN R138.
- A maximum sound level is specified as in UN R138.
- A prohibition for a driver deactivation of the system is under consideration.
- OICA expects final review and publication of this technical standard by 2018.



QRTV Application in USA

- USA has published FMVSS 141 and recommended test procedure TP-141-00-Draft-7 in 2/2018
 - Application on electric and **hybrid vehicles**, while UN R138 applies to electric and **hybrid electric vehicles**.
 - Application only on light vehicles with a gross vehicle weight rating (GVWR) of 4,536 Kg or less.
 - Ongoing consideration on driver selectable sounds.
 - The standard will be applicable from 9/2019 on by phase-in for all produced vehicles with 50% compliance rate and from 9/2020 on with 100% compliance.

QRTV Application in USA - Requirements

Options	AVAS mandated	Speed Range	Ramp-Up Sound	Stationary Sound	Reverse Sound	Directivity	Selectable Sounds	Pause Function	Frequency Band Specs	Overall Sound Level Specs	Max Overall Level Specs
FMVSS 141	NO	0 km/h to 30 km/h	YES	YES	YES	YES	NO	PROHIBITED	YES	(NO)	NO

- This standard has several differences to all other standards:
 - Two different assessment methods
 - Speed range up to 30 km/h
 - Ramp-up Sound (Relative Volume Change)
 - Stationary Sound mandatory
 - Directivity Measurement
- There is a small overlap to UN R138, but most specifications are different.

Blue: almost no differences // yellow: significant differences

Setting up of microphones	<p>FMVSS: See next slide. Left, right, and front in stationary test.</p> <p>R138: See next slide. Left and right in stationary test.</p>
Background noise measurement	<p>FMVSS: Measure for 30 s before and after measurements; record min noise level.</p> <p>R138: Measure for 10 s and record max. noise level.</p>
OA measurement (moving)	<p>FMVSS: Max. between AA-PP. (Arithmetic?) average of 4 measurements.</p> <p>R138: Max. between AA-PP. Arithmetic average of 4 measurements.</p>
OA measurement (stationary)	<p>FMVSS: Max. during 10 s and (arithmetic?) average of 4 measurements</p> <p>R138: Max. during 5 s and arithmetic average of 4 measurements.</p>
1/3 octave band	<p>FMVSS: Max. at OA level 1/3 octave band</p> <p>R138: 1/3 octave bands at max. of OA level</p>
Correction of background noise	<p>FMVSS: Correction for both OA level and 1/3oct. level.</p> <p>R138: Correction only for OA level. No correction for 1/3 octave level.</p>
FFT analysis	<p>FMVSS: No need.</p> <p>R138: For frequency shift analysis.</p>
Indoor test	<p>FMVSS: Indoor testing not prohibited – Outdoor remains the reference</p> <p>R138: Outdoor or indoor test is selectable. Test simulation is allowed.</p>

	Moving test	Stationary for reversing	Stationary for forwarding
FMVSS141	<p>ISO test track</p> <p>Microphone (h = 1.2 m)</p> <p>V = 10 km/h</p> <p>2 m</p> <p>2 m</p> <p>V = 10 km/h</p> <p>PP'</p> <p>AA'</p>	<p>Microphone</p> <p>2 m</p> <p>2 m</p> <p>Microphone</p>	<p>2 m</p> <p>Microphone</p> <p>2 m</p> <p>2 m</p> <p>Microphone</p>
R138	<p>Noise level [dB(A)]</p> <p>70</p> <p>60</p> <p>50</p> <p>40</p> <p>30</p> <p>20</p> <p>AA' PP'</p> <p>Prius (EV mode), 10km/h</p> <p>Distance [m]</p> <p>-80 -60 -40 -20 0 20 40</p>	<p>Microphone</p> <p>2 m</p> <p>2 m</p> <p>Microphone</p>	<p>2 m</p> <p>Microphone</p> <p>2 m</p> <p>Microphone</p>



Definition in FMVSS141	Differences UN R138
Background noise measurement	
Measure background noise for 30 seconds before and after a series of measurements at each microphone and record minimum of OA A-weighted sound level.	Record max. of OA in R138
Record minimum sound level on each 1/3 octave band for 60seconds at each microphone.	Record 1/3 oct. at max. of OA in R138
Measurement of vehicle sound	
Measure 4 runs at each microphone and record maximum of OA A-weighted sound level.	
Record maximum sound level on each 1/3 octave band for 4 runs at each microphone.	Record 1/3 oct. at max. of OA in R138
Background noise correction	
Correct background noise on each four-run at each microphone. Average of OA levels of left and right separately and record lower sound level of both sides.	
Take the side at lower sound level and correct background noise for each 1/3 octave band on each four-run and average sound levels at each 1/3 octave band.	No correction for 1/3 oct. in R138

Correction Table

OA SPL Corrections	
ΔL [dB]	Correc.
$10 < \Delta L$	0 dB
$8 < \Delta L \leq 10$	0.5 dB
$6 < \Delta L \leq 8$	1.0 dB
$4.5 < \Delta L \leq 6$	1.5 dB
$3 < \Delta L \leq 4.5$	2.5 dB
$\Delta L \leq 3$	invalid

1/3 Octave Band Corrections	
ΔL [dB]	Correc.
$6 < \Delta L$	0 dB
$4.5 < \Delta L \leq 6$	1.5 dB
$3 < \Delta L \leq 4.5$	2.5 dB
$\Delta L \leq 3$	Invalid for the band

ΔL =Difference between vehicle measurement and ambient noise level



QRTV Application in Japan

- Japan introduced a national regulation TRIAS 43 (7) Art. 67.3 in 2016 as Japan did not sign-up to UN R138.00 because of the optional pause function for the driver.
- The regulation is mandatory since 3/2018 for new vehicle types and has a transitional period for new vehicle registration until 10/2020
- Since UN R138.01 is published, Japan accepts UN R138.01 as alternative to its national provisions.
- The national standards is practically identical to UN R138.01.



QRTV Application in Other Markets / Regions / Provinces

- Canada announced a draft national standard, which allows a choice between FMVSS141 or UN R138.
Application on a September 1st, minimum 1 year after publication.
- Chile announced via WTO notification, that the will introduce minimum sound emission standards with a choice between FMVSS141 or UN R138.
Application date shall be 12 month after publication.
- Korea published a draft KMVSS 53.3 on minimum sound emission, which is based on UN R138.00.
Application date is under consideration, proposal for 2 years after official release.
- China (ROC) introduced already in 2015 for new vehicle types minimum sound emission standards based on the UN R.E.3.
Application be the same as in UN R138.01, from 7/2019 on.



QRTV Application in Key Countries - Overview

UNITED NATIONS											
Options	AVAS mandated	Speed Range	Ramp-Up Sound	Stationary Sound	Reverse Sound	Directivity	Selectable Sounds	Pause Function	Frequency Band Specs	Overall SPL Specs	Max Overall SPL Specs
UN R138.00	NO	> 0 km/h to 20 km/h	NO	OPTIONAL	YES	NO	YES	OPTIONAL	YES	YES	YES
UN R138.01	NO	> 0 km/h to 20 km/h	NO	OPTIONAL	YES	NO	YES	PROHIBITED	YES	YES	YES
EUROPEAN UNION											
Options	AVAS mandated	Speed Range	Ramp-Up Sound	Stationary Sound	Reverse Sound	Directivity	Selectable Sounds	Pause Function	Frequency Band Specs	Overall SPL Specs	Max Overall SPL Specs
EU 540/2014 Annex VIII Section II	IF FITTED	> 0 km/h to 20 km/h	NO	UNSPECIFIC	YES	NO	UNSPECIFIC	MANDATED	NO	UNSPECIFIC	UNSPECIFIC
EU 540/2014 Annex VIII Section III	YES	> 0 km/h to 20 km/h	NO	OPTIONAL	YES	NO	UNSPECIFIC	OPTIONAL	YES	YES	YES
PEOPLES REPUBLIC OF CHINA											
Options	AVAS mandated	Speed Range	Ramp-Up Sound	Stationary Sound	Reverse Sound	Directivity	Selectable Sounds	Pause Function	Frequency Band Specs	Overall SPL Specs	Max Overall SPL Specs
GB7258	NO	> 0 km/h to 20 km/h	NO	OPTIONAL	UNCLEAR	NO	UNSPECIFIC	NOT SPECIFIED	NO	NO	NO
GB/T XXXXX-XXXX	YES	> 0 km/h to 20 km/h	NO	OPTIONAL	YES	NO	UNSPECIFIC	OPTIONAL	YES (+2 dB)	YES (+2 dB)	YES
UNITED STATES OF AMERICA											
Options	AVAS mandated	Speed Range	Ramp-Up Sound	Stationary Sound	Reverse Sound	Directivity	Selectable Sounds	Pause Function	Frequency Band Specs	Overall SPL Specs	Max Overall SPL Specs
FMVSS 141	NO	0 km/h to 30 km/h	YES	YES	YES	YES	NO	PROHIBITED	YES	(NO)	NO



THANK YOU VERY MUCH !