

# 4th QRTV meeting

France proposals for AVAS  
requirements

# Objective of presentation

- Update of some proposals from GTRQRTV-02-07e for AVAS requirements on several issues :
  - Vehicles concerned
  - Operating conditions
  - Signal characteristics
  - Pitch shifting
  - Minimum sound level
  - Maximum sound level
- Comparison of some proposals and recommendation already presented during previous meeting :
  - R.E.3
  - US NPRM
  - Japan/JASIC proposals and suggestions GTRQRTV-06-06e/10e
  - France proposal GTRQRTV-02-07e
  - Recommendation in ECE/WP29/GRB/2012/6

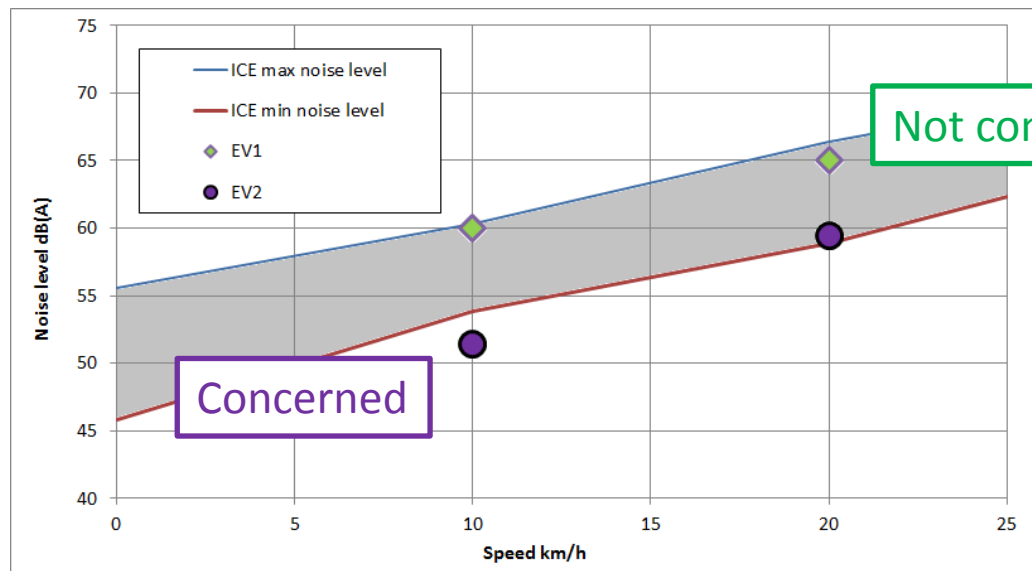
# Vehicles concerned

- R.E.3 : “This guideline addresses Acoustic Vehicle Alerting System (AVAS) for hybrid electric and pure electric road transport vehicles (HEV and EV)”

	<b>US NPRM</b>	<b>Japan / JASIC</b>	<b>France</b>
<b>Vehicles concerned</b>	EV and HV (operating in their electric mode)	-	EV and HV (operating in their electric mode) with noise level below xx dB

# Vehicles concerned

- Detectability of EV (with or without AVAS) shall be at least equivalent to ICE vehicle. So, all EV are not concerned : Some are already enough noisy.



from OICA database  
Gasoline ICE  
GTRQRTV-02-03e

- **France proposal for AVAS requirements** : Consider the minimum noise level required for AVAS to determine a threshold for concerned EV and HV (operating in their electric mode)

# Operating conditions

- R.E.3 : “The AVAS shall automatically generate a sound in the minimum range of vehicle speed from start up to approximately 20 km/h and during reversing”.

	<b>US NPRM</b>	<b>Japan / JASIC</b>	<b>France</b>
<b>The AVAS shall automatically generate a sound</b>	Reverse Stationary From start up to 30 km/h	from start up to 20 km/h and during reversing	from start up to approximately 20 km/h. <i>The deactivation speed would be between 21 and [40] km/h.</i>

# Operating conditions

- AVAS stationary or start-up/just starting :  
**France proposal for AVAS requirements** : Do not consider sound emission in stationary condition **OR** consider it as an alternative (stationary or start-up/just starting)
- Deactivation speed sound  
**France proposal for AVAS requirements** : Consider a minimum deactivation speed sound (20 km/h) and a maximum deactivation speed (around 30 km/h).  
*It give a possibility for a manufacturers to adapt speed deactivation between these two threshold (specially regarding safety issue).*

# Signal characteristics

- R.E.3. : “The sound to be generated by the AVAS should be a continuous sound that provides information to the pedestrians and vulnerable road users of a vehicle in operation. However, the following and similar types of sounds are not acceptable:[...] »

	Recommendation in ECE/WP29/GRB/2012/6	US NPRM	Japan / JASIC	France
<b>Range of sound emission</b>	- 50-500Hz - 2 kHz to 5 kHz	- 160 Hz to 500 Hz - 2000Hz* to 5000Hz	- Below 800Hz - Above 1,25kHz	-
<b>Tone</b>	2 differ by at least 15 percent	1 tone between 160 and 400 Hz	-	At least 01 tone
<b>Sound signature</b>	-	By 1/3 oct band level (8 bands)	By 1/3 oct band level (2 bands)	-
<b>Description of sound avoided</b>	Yes, R.E.3	No	Yes, based on RE3	Yes, based on RE3

\* Central frequency band

# Signal characteristics

## France proposals for AVAS requirements :

- Consider at least one tone on “low frequency” range (below 800Hz) and one tone recommended on “high frequency” range (above 1,25kHz)
- Signal characteristic design (tone or broadband) might be induce alternative for metric to characterize it :
  - 1/3 octave level in one or two band or emergence for tone signature
  - 1/3 octave level in 8 bands for broadband noise signature
- Description of sound avoided shall be keep.



# Pitch shifting

- R.E.3. : “The sound to be generated by the AVAS should be easily indicative of vehicle behaviour, for example, through the automatic variation of sound level or characteristics in synchronization with vehicle speed.”

	US NPRM	Japan / JASIC	France
Pitch shifting	1% / 1km/h	[15%]/ 15 km/h	Yes

- Recommendation in ECE/WP29/GRB/2012/6 are : at least 8% / 10km/h  
→ **Pitch shifting shall be at least 8 or 10 % / 10 km/h for all proposals**

**France proposal for AVAS requirements** : Consider at least 8% which cover all proposal

*For other value, analysis of impact of value of pitch shifting on recognition by pedestrian of vehicle behavior and efficiency of existing AVAS shall be done.*

# Minimum sound level

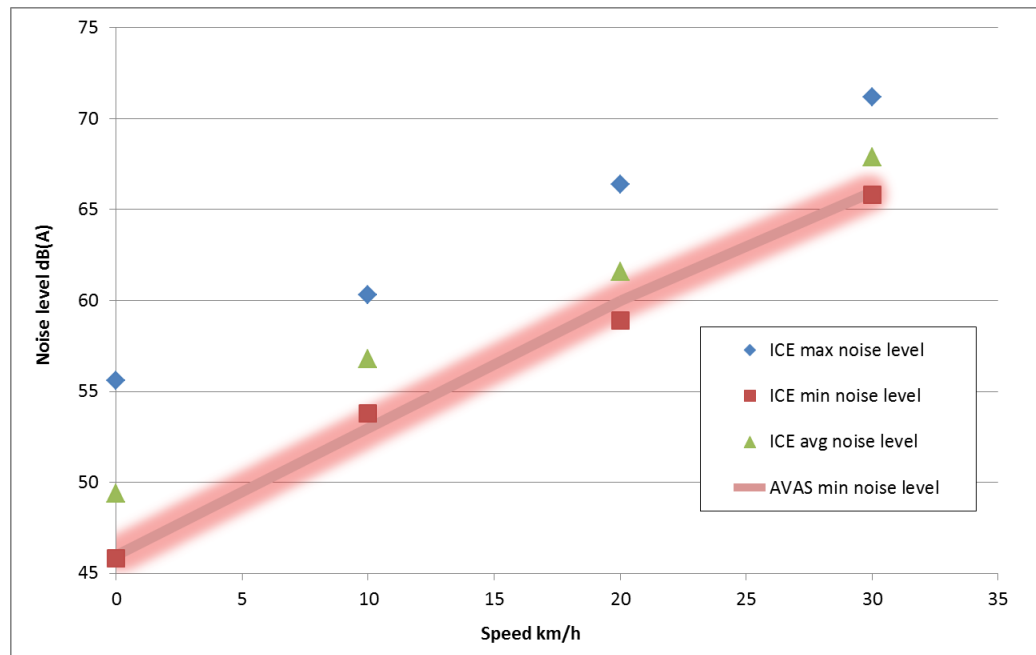
	<b>US NPRM</b>	<b>Japan / JASIC</b>	<b>France</b>
Operation to be tested	Reverse Stationnary 10 km/h 20 km/h 30 km/h	10 km/h 20 km/h	“ Just starting” condition (>0 km/h) 10 km/h 20 km/h
Minimum sound level in OA	No	YES	YES
Minimum sound level in 1/3 octave band(s)	8 bands : 315, 400, 500, 2000, 2500, 3150, 4000, 5000 Hz	At least one band less than 800Hz and one band over 1.25kHz	No

# Minimum sound level

- **France proposal for AVAS requirements :**

- Detectability of EV (with or without AVAS) shall be at least equivalent to ICE vehicle.
- So a minimum threshold level for AVAS could be deduced from “low noise” ICE.

Suggestion for minimum threshold for AVAS (and quiet vehicles) from *OICA database Gasoline ICE*



# Maximum noise level

- R.E.3. : “The sound level to be generated by the AVAS should not exceed the approximate sound level of a similar vehicle of the same category equipped with an internal combustion engine and operating under the same conditions. »

	<b>US NPRM</b>	<b>Japan / JASIC</b>	<b>France</b>
Maximum sound level requirement	No	Not exceeds ICE level (guideline)	Yes

- Recommendation in ECE/WP29/GRB/2012/6 are : “The acoustic performance requirements set forth in the UN GTR for AVAS give careful attention to their potential adverse environmental impact, particularly with respect to loudness and frequency content.”

# Maximum noise level

Why a maximum noise requirement ?

- For environmental issue : To prevent noise annoyance in quiet urban areas.
- For safety issue : To avoid excessive vehicle noise which might mask others.

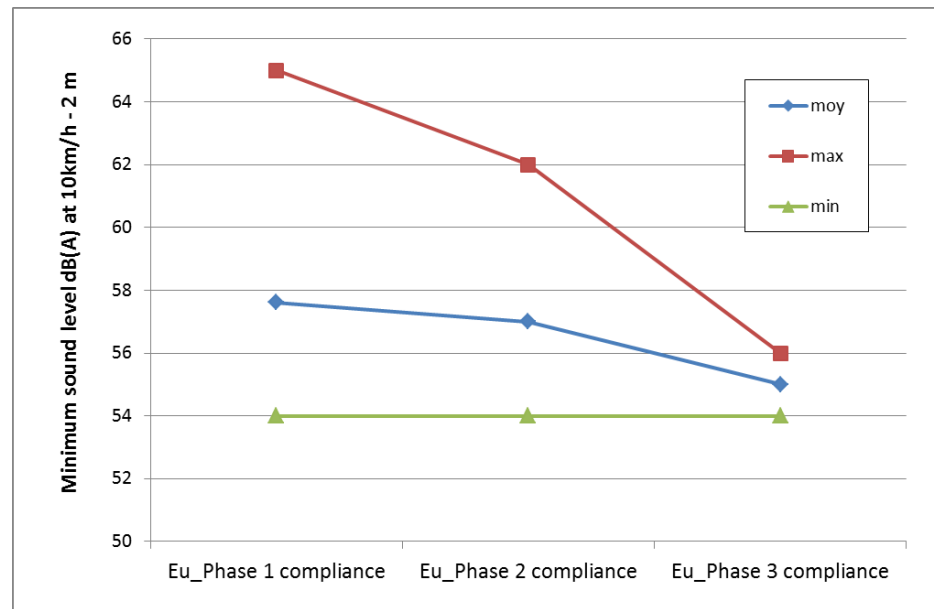
To define a maximum sound level threshold :

- Consider conflict between minimum and maximum noise level.
- Consider “maximum level” of M1 vehicles.

# Conflict between maximum and minimum noise

- Conflict with ECE51 noise reduction limits for LV

Using OICA dBase, statistics are build on ICE vehicle's compliant for each Eu phase



→ Noise level of ICE will be reduced in next 10 years in Europe.  
Sound level of EV with AVAS shall not become higher than ICE

# Conflict between maximum and minimum noise

- Conflict with ECE51 noise limits for HDV with powertrains with no rotational engine speed available - 2 target conditions for the vehicle speed  $v_{\text{target}}$  BB' :

$$- 25 \text{ km/h} \leq v_{\text{BB}'1} \leq 35 \text{ km/h}$$

$$- 35 \text{ km/h} \leq v_{\text{BB}'2} \leq 45 \text{ km/h}.$$

AVAS will impact ECE51 sound level for that condition

→ If applicability is confirmed for all EV and HV vehicles, sound level specification has to take into account maximum limit values for HDV.

# Conflict between “maximum” and “minimum” noise

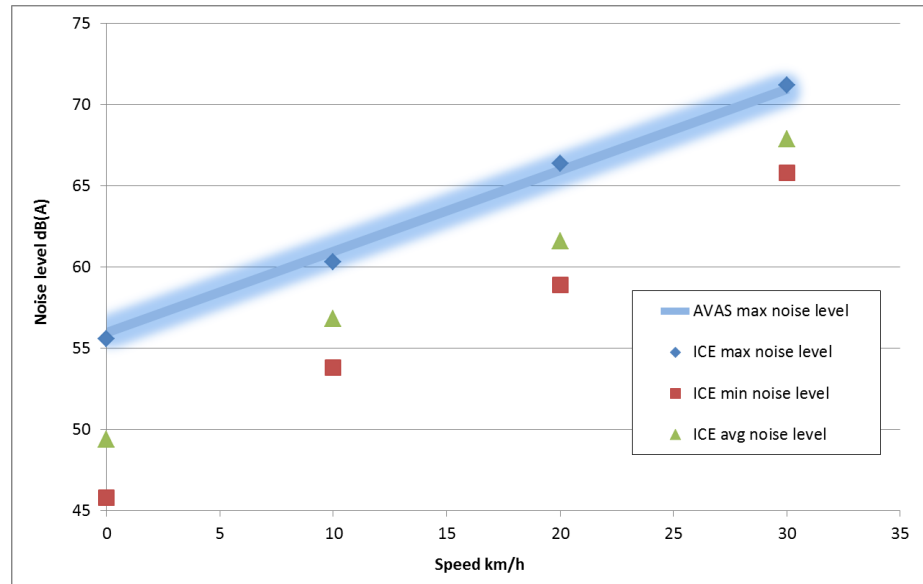
- Overlap with ECE51 ASEP :
  - No conflict as long as ASEP is applied to vehicles of categories  $M_1$  and  $N_1$  equipped with an internal combustion engine and AVAS is applied on EV and HV (ICE off).
  - If AVAS is applied to quiet ICE or If ASEP is applied to EV, a conflict is possible for excessive noisy AVAS → Non compliance for ASEP due to AVAS could be prevent by a maximum sound level for AVAS.



# Maximum sound level

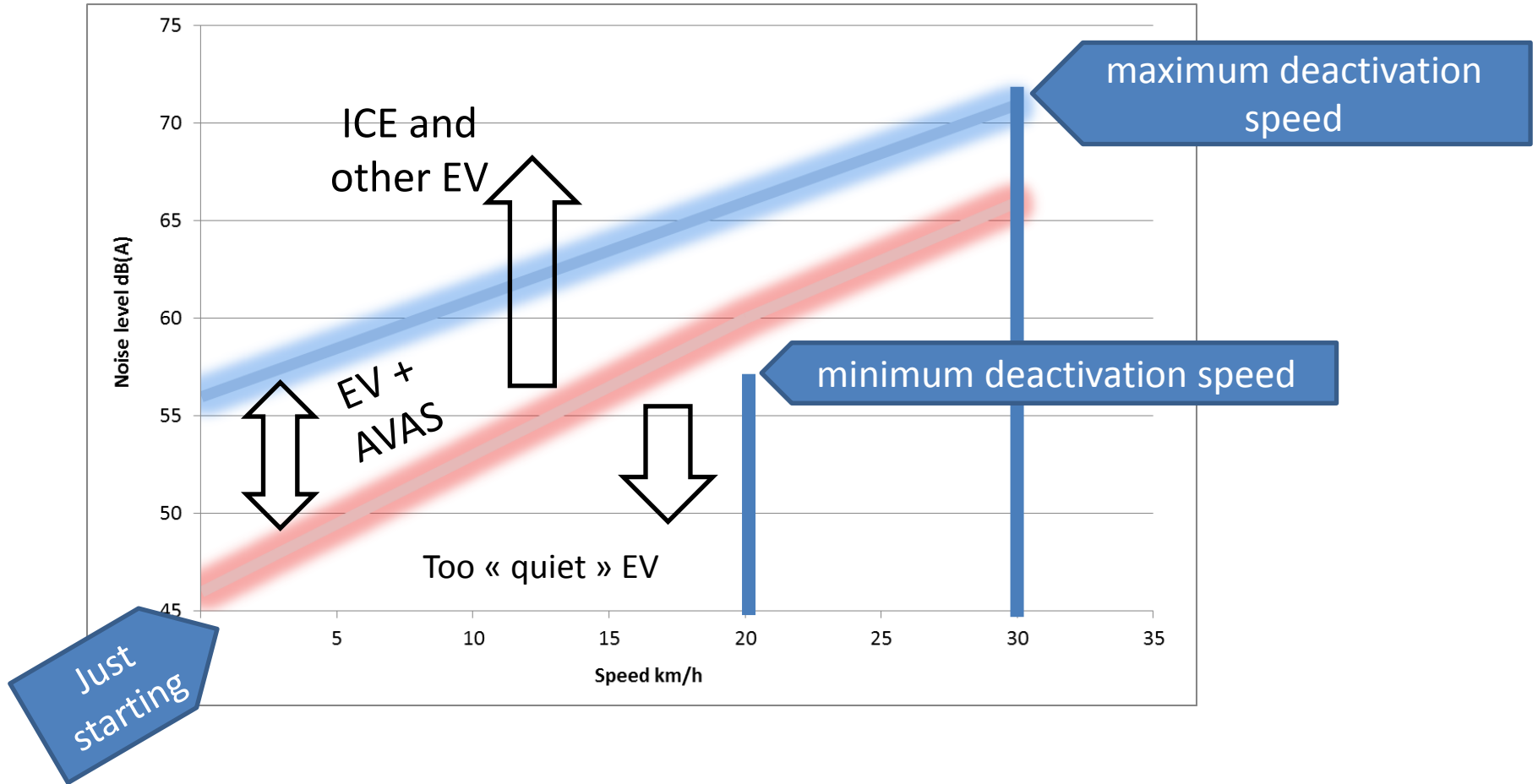
- **France proposal for AVAS requirements** : A maximum threshold level for EV with AVAS could be deduced from noisier M1 ICE.

Suggestion for  
maximum threshold  
for EV with AVAS from  
*OICA database*  
*Gasoline ICE*

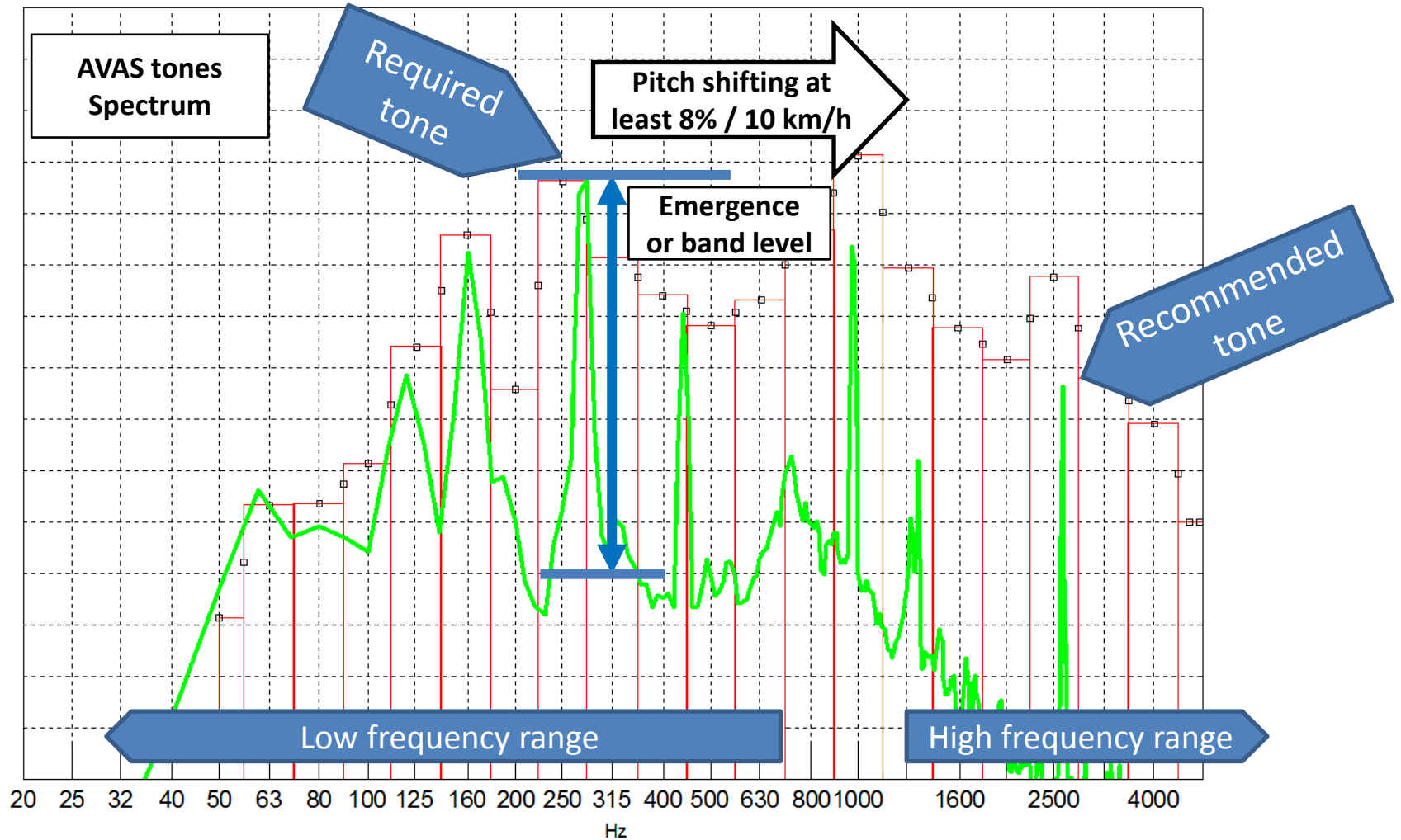


*Datas from*  
*OICA*  
*Gasoline ICE*

# Summary of France proposals



# Summary of France proposals



Thank you for your attention