2nd MEETING

WORKING GROUP ON QUIET ROAD TRANSPORT VEHICLES

3 & 4 MAY 2010

Washington DC, USA

May 3rd

1. Welcome and Opening remarks - K. Feith

2. Introduction of Participants and Adoption of Agenda

   List of participant – *please see document QRTV-02-02*

   Agenda Adopted – *please see document QRTV-02-01*

3. Election of a secretary

   Francois Guichard has been elected

4. Human and Animal Reaction to Sound: Spectra and Amplitude – Dr. Mary Florentine, Northeastern University, USA

   Dr. Florentine gave a presentation concerning the basics of psychoacoustics and explained the different factors affecting the human perception and interpretation of sounds. Two aspects of psychoacoustics which are highly relevant for the purpose of this working group are the human response to differences between sound pressure level and loudness – they are not the same. Also presented was the effect of masking sounds and induced loudness reduction (ILR), 2 acoustical demonstrations were presented to illustrate the concepts.

   Due to Copyright issues, no document is available

5. Human Detection and Localization of Sounds in Complex Environments – Dr. William Hartmann, Michigan State University, USA

   – *please see document QRTV-02-03*

   Dr. Hartmann presented various aspects of the psychoacoustics dealing with the detection and the localization of sounds, both of significant importance to the development of acoustic alerting signals for quiet vehicles.

   One particular aspect of the detection of one signal is the confidence of detection. One signal can be:
   1. detected,
   2. missed,
   3. reported as detected although there is no signal.

   Various psychoacoustic concepts (background noise effect, masking effect) were presented to explain the detection of one signal or sound in a complex

sound environment. The difference in the delectability of on-off type sounds verses continuous type sounds in high ambient sound environments was demonstrated.

Many details concerning the localization (azimuth, elevation, distance) were presented (sound level, time, spectral content and frequency bands used for localization)

Conclusion: cues are easier to be detected and localized if the spectral content includes both low and high frequencies and if it is impulsive.

Q and A:

Volvo NA asks the speaker to define what he calls low and high frequencies.
The cut off for azimuth localization is around 800 to 1000 Hz.
The cut off for front/back detection is by 8 Hz.

6. Evaluation of sound quality – Doug Moor (Chairman of the ISO WG42)

   – please see documents QRTV-02-15

   Doug Moor presented two sounds loops with similar spectral content and similar temporal content. The first sample was a sequence taken out of classical music tune. The second sample was a noise. Doug Moor let the audience listen to both samples and showed the wave form and the frequency analysis of both samples. He raised the question if psychoacoustic elements can help to assess the sound quality or information content between two similar sounds.

   Dr. Hartmann answered: there is no prediction of the sound quality but information content can be identified if certain sound attributes can be identified such as certain spectral content or time variability.

   Conclusion: there are no electronic tools to predict human response to sound spectrum – acceptance or rejection is in the “ear” of the listener.

   Steve Beretzky (NHTSA) asked whether one can discretely specify the noise of an ICE.

   Dr. Florentine answered that it is theoretically possible with a study.

   Dr. Hartmann advised to specify a sound with short time variable frequency spectrum rather than continuous or stable sound.

7. Use of Sound for Navigation by Blind Pedestrians – Professor Robert Wall-Emerson, Western Michigan University, USA

   – please see documents QRTV-02-04 to -06

   Dr. Emerson stated that studies show that blind persons rely on many different techniques to navigate in spaces and detect the presence of objects. Such techniques include facial detection (sensations on the skin), use of sound like “clicks” (made by mouth, cane or shoes) and intuitive sense of presence (similar to sensing someone is near you without seeing).

Some aspects of sound help blind and low vision persons to navigate: timbre, familiarity and intensity. Broadband sounds provide better detection than pure tones due to coherence effect.

Some ideas and realizations could inspire the working group: US-APS systems at traffic light with square signals audible by 12 feets.

Ken Feith asked John Paré to provide the group with any additional information about the kind of sounds that blind and low vision persons rely on to navigate.

8. NHTSA presentation. Overview of U.S. NHTSA Phase I Project

   – please see document QRTV-02-07

   This presentation was a summary of what has been presented by the USA in the last GRB with some additional explanation.

May 4th

9. Review of the first day

   Ken Feith summed up the "lessons" of the first day.

   The group has got information about theoretical aspects concerning:

   - The perception and the interpretation of sounds/information.
   - The links between physical values and psychoacoustical values e.g. sound pressure versus loudness
   - The masking effect.
   - How the blind and low vision persons make navigational decisions.

10. Overview of Japanese Project and Guidance Document

    – please see document QRTV-02-08 to -11

    Q and A:

    Tim Johnson (NHTSA): what is the next step? A regulation?

    Japan: not sure yet… the answer will come after the assessment phase…

    Christian Theis (Chairman, GRB): Can an OEM implement the noise of a Two-Wheeler on a HEV-Four-Wheeler?

    Answer: yes.

    Ken Feith: will Japan submit recommendations to GRB before passing requirements as a national law?

    Answer: maybe

John Paré (NFB): the idling situation is relevant for the safety of blind and low vision persons. It is used for their decision when to cross a street. Is Japan requiring a sound generation during idling?

Answer: no

Christian Theis (GRB): If idling phase (e.g. at the traffic light) is relevant, then Stop/Start systems are a concern with respect to the Japanese guideline and the work of the GRB working group. The scope must be extended to such systems.

Hans-Martin Gerhard (OICA): Some Stop/Start systems cut off the engine when the vehicle is stopped. When the driver wants to start, the engine is first electronically started (this produces audible noise). Therefore the pedestrians receive, in this situation, audible information seconds before the vehicle is moved.

K. Feith: The Terms of Reference for the QRTV work group extend to vehicles beyond HEV and EV (buses, trams, trucks, motorcycles and bicycles). Therefore the working group must explore the need for warning devices for other than EV and HEV vehicles and new technologies that might be implemented on current quiet ICE vehicles.

John Paré (NFB): the goal is not to increase the overall environmental noise, but to find a compromise between environment and safety. “I don’t believe the warning device should be something that the driver can turn on and off.”

Y Shirahashi (JASIC): Japan doesn’t wish unnecessary additional noise. The purpose of the guideline is also to experience and assess the acceptance of various sounds.

Y Shirahashi provided information to the group that the AVAS systems will be demonstrated in Japan on May 10th . Japan will submit recommendations to GRB before passing a national regulation.

11. Overview of German Projects - Presentation about the activities concerning the Quiet Road Transport Vehicles in Germany

    A short overview of the 3 different projects started in Germany was presented by OICA (Gerhard).

    – please see document QRTV-02-13

12. Overview of United Kingdom Project – written brief from Robert Falk, UK work group member, was read by Wolfgang Schneider EU-KOM

    – please see document QRTV-02-12

    The email submitted by UK presented the recently started activities concerning the quiet vehicle issue. Available crash data will be analyzed. The safety

problem will be described out of the crash data available in the UK. TRL will start a test program with 7 different vehicles.

13. Presentation about the activities done by ISO (D. Moore)

The presentation was based on the presentation given at the last GRB

14. Presentation of U.S. Phase II Work Program – NHTSA

- Requirements for synthetic sounds to be employed as ountermeasures in EVs, HEVs, and PHEVs while operating in EV mode below 20 mph. (the sound will be synthetic) (if people donot recognize this sound as a vehicle then there is still potential problem)
- NHTSA will conduct human testing
- Objective specification test (or develop alternative sound)
- Five Tasks:

  1. Acoustic Measurement

     - Compile representative samples – low speed, low speed passby (6, 10, 15, and 20 mph), start up, idle/stationary, and acceleration from stop (10 mph)
     - Determine typical sound level of ICE vehicles
     - Develop quantitative description of the characteristics of background noise

  2. Analyze vehicle acoustic measurements and develop detectability requirements for synthetic vehicle sounds

  3. Obtain counter measure sound sources to test requirements for acoustic characteristics (sounds produced by real vehicles, recorded sounds, synthesized sounds, and VOLPE sounds)

  4. Human Subject Testing (to refine and validate draft requirements)

     - 72 test subjects will be used (blind and sighted)
     - various vehicles equipped with counter measures
     - data includes time and distance from point at which the vehicle is detected
     - use of collected information to identify the parameters of the set of counter measure sounds that are detectable and recognizable under representative urban, ambient noise conditions.

  5. Determine feasibility of an objective specification test or develop an alternative evaluation procedure

NHTSA -- Final Report is expected by January 2011

NHTSA topics for discussion:

- Discuss the assumption that synthetic vehicle sound should be similar to the sound emitted by current ICE vehicles
- What are possible approaches to the development of an objective description of the minimum sound level for synthetic vehicle sounds
- What objective testing procedure could be developed to determine compliance of synthetic motor vehicle sounds to the requirement that it sounds like a motor vehicle

Statements from the group:

- New ICEs are quieter, particularly at low speed (below 20 mph)
- Test bench needs to be assessed

Q and A:

The question was raised if the alerting system shall sound like an ICE. Answer: yes

The experts commented that synthetic sounds can be difficult to interpret by impaired vision persons.

Ken Feith raised the question of the background noise, making it difficult for a law maker to define the proper sound level of an alerting device to guaranty the safety of pedestrians.

Additional comments made by the group included:

- how the annoyance could be avoided, using e.g. GPS in “hot” or “cold” zones, with or without pedestrians
- the spectral content of the generated sound,
- John Paré (NFB) stated that reaction time is more important for a pedestrian than the kind of sound produced.

A last question has been raised whether a test procedure shall be developed or not. If yes, how shall it be developed, should it be only on a test track or on a test bench.

Christian Theis (GRB) stated, if a test is required the test procedure should be added in the regulation ECE R51 and therefore should be performed on a test track with the testing equipment defined in this regulation.

Dr. Hartmann and Dr. Florentine advised the group to use human test subjects to check the validity of the test procedure and check the following factors:

delectability, localization, attention as well as the sound discrimination in background noise.

15. Next Meeting:

JASIC offices, Tokyo, Japan, in the calendar week of 28 July or preferably week of 12 July 2010. Japanese delegation to determine best time and advice within one week.