



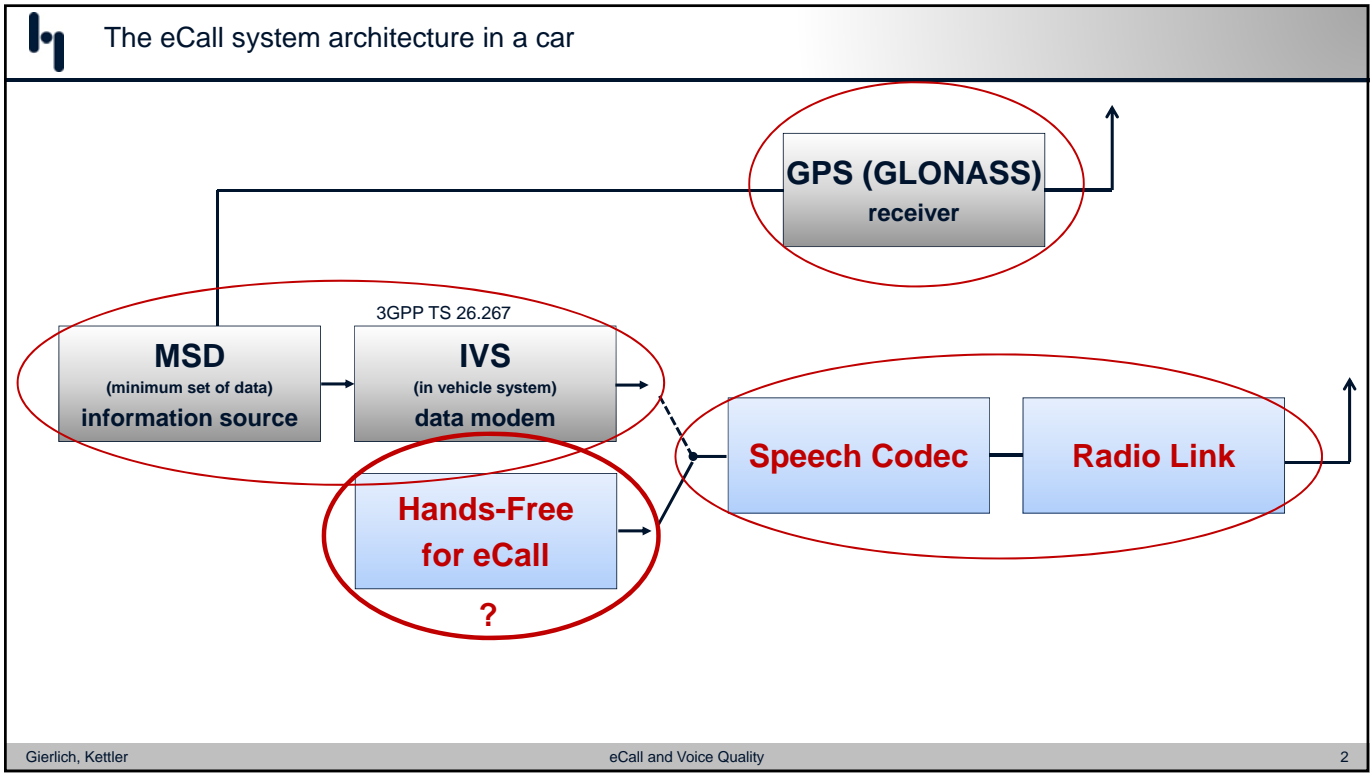
eCall and Voice Quality
—
The forgotten Dimension

HEARING IS A FASCINATING SENSATION

ITU-T The Future Networked Car 2014

H. W. Gierlich, F. Kettler

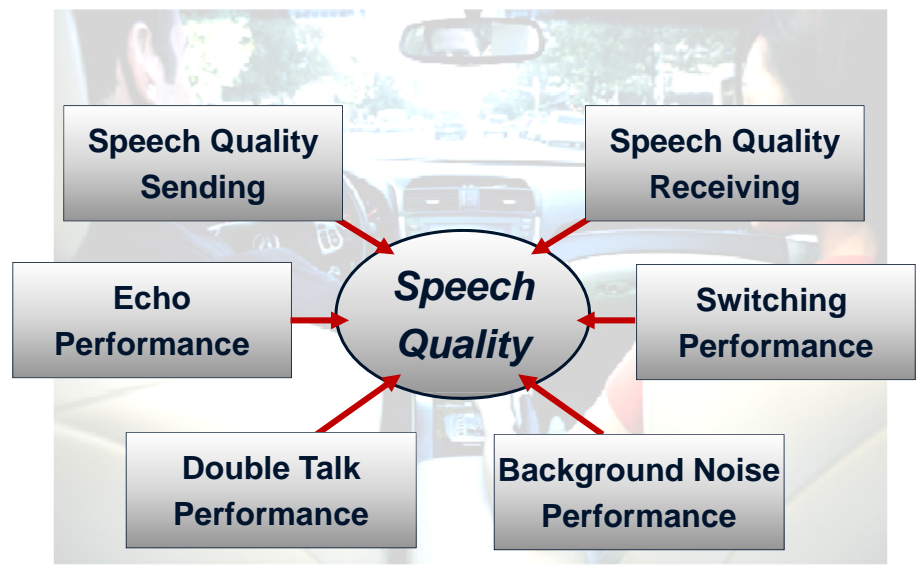
HEAD acoustics®



h Standards for Voice Quality in Car Hands-Free

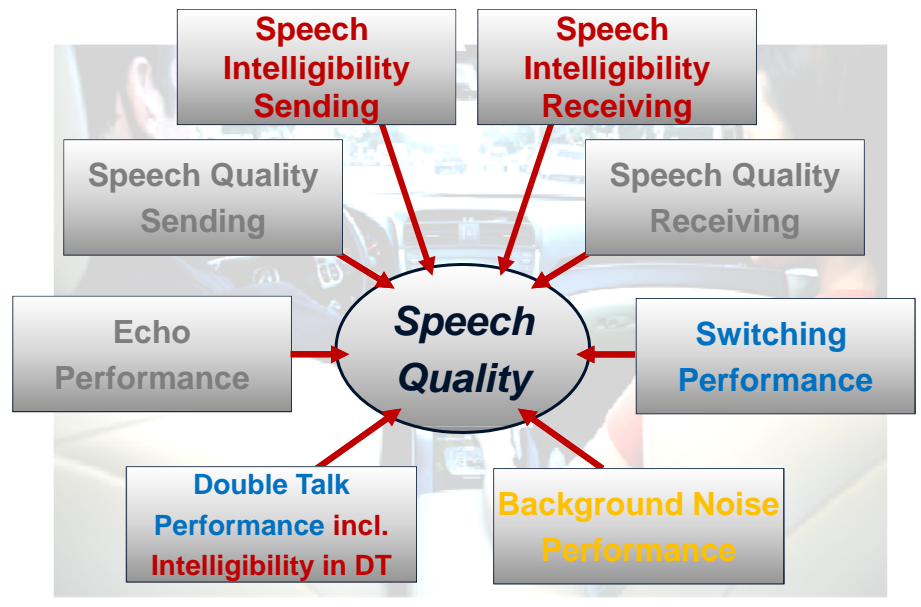
- VDA Specification for car hands-free systems**
since 2001 – targeted to narrow-band integrated car hands-free
- ITU-T P.1100: Narrowband hands-free communication in motor vehicles**
since 2008 – targeted to integrated, after-market car hands-free & headsets
- ITU-T P.1110: Wideband hands-free communication in motor vehicles**
since 2010 – targeted to integrated, after-market car hands-free & headsets
- ITU-T P.VSSR : Subsystem requirements for automotive speech services**
work ongoing since 2010 – targeted to integrated car hands-free

h Parameters Considered in Present Standards

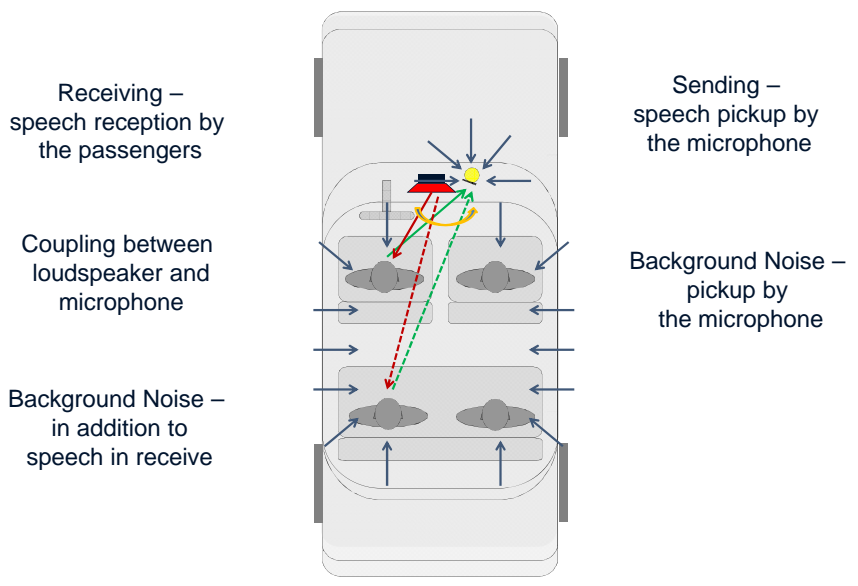




What is Different, what is Missing for Emergency Call Systems

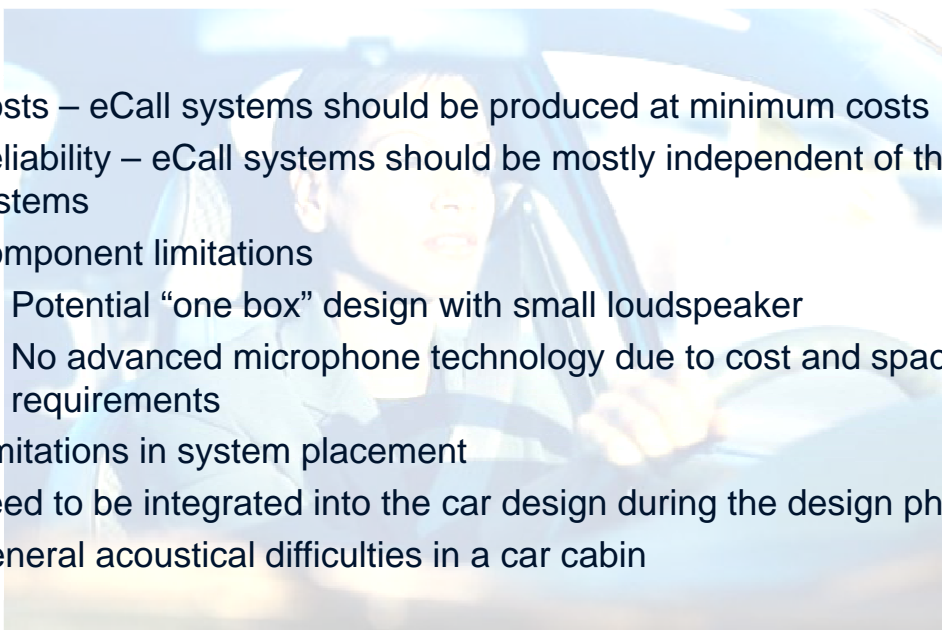


The Acoustical Situation in a Car





Potential System Constraints for eCall Systems



- Costs – eCall systems should be produced at minimum costs
- Reliability – eCall systems should be mostly independent of the car systems
- Component limitations
 - Potential “one box” design with small loudspeaker
 - No advanced microphone technology due to cost and space requirements
- Limitations in system placement
- Need to be integrated into the car design during the design phase
- General acoustical difficulties in a car cabin



The Different Parameters Influencing the Quality of eCall Speech Services

Parameter in present standards

- Delay
- Frequency Response
- Loudness Ratings
- Distortions
- System noise
- Out of Band signals
- Terminal Coupling Loss
- Background noise performance
- Echo performance
- Double talk performance
- Switching performance
- Comfort noise insertion



Relevance to eCall speech services

- Probably less important
- Should be targeted to intelligibility
- Important basic parameter
- Probably less important
- Less important if below certain limits
- Less important if below certain limits
- Probably less stringent requirement sufficient
- Important information in the background noise should be preserved
- Probably less stringent requirements needed
- Important due to less disciplined conversation
- Important due to less disciplined conversation
- Less relevant

• **Speech Intelligibility**

• **Most important, new tests required**



Main Impact on Testing and Requirements for eCall Speech Services

- **Speech Intelligibility**
 - In sending probably no objective methodology available
 - In receiving the application of existing methods needs to be studied
- Frequency response characteristics – masks need to be adapted
- Adjust loudness requirements in receiving to eCall situation
- Additional loudness rating requirements in sending for different positions in the car
- Echo loss requirements need to be revisited
- New focus in background noise situations:
 - High intelligibility with background noise
 - Preserve “naturalness” & “recognizability” of the background noise
- Preserve double talk capability as much as possible with special focus on intelligibility during double talk

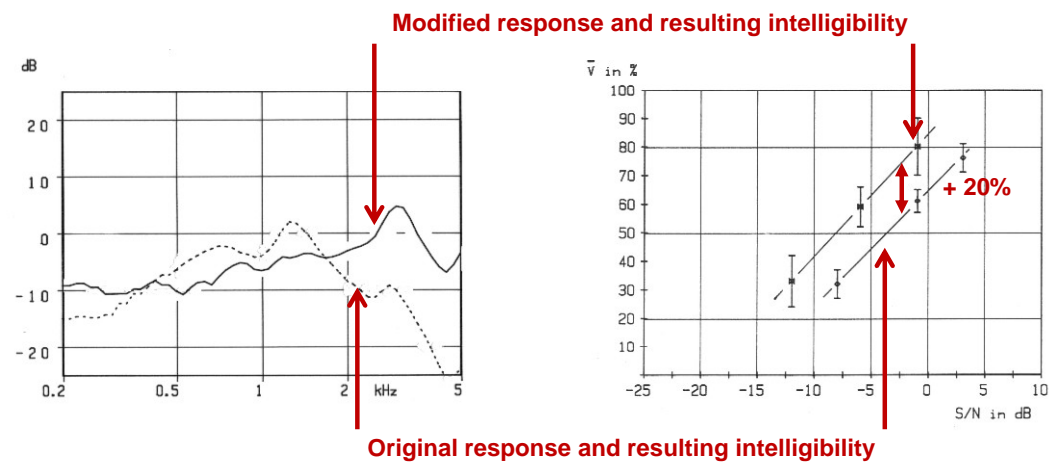


Considerations for Speech Intelligibility Testing in eCall Systems

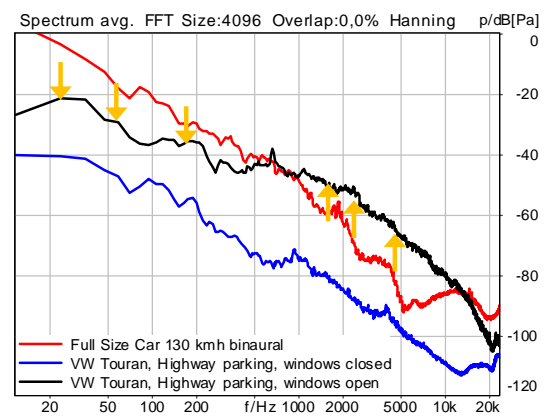
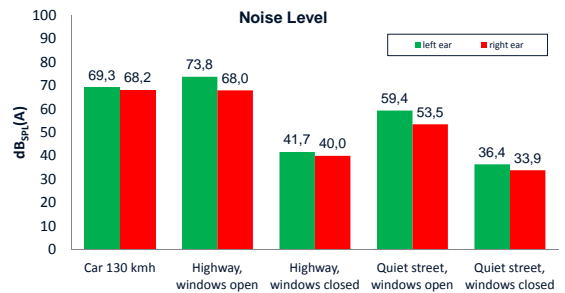
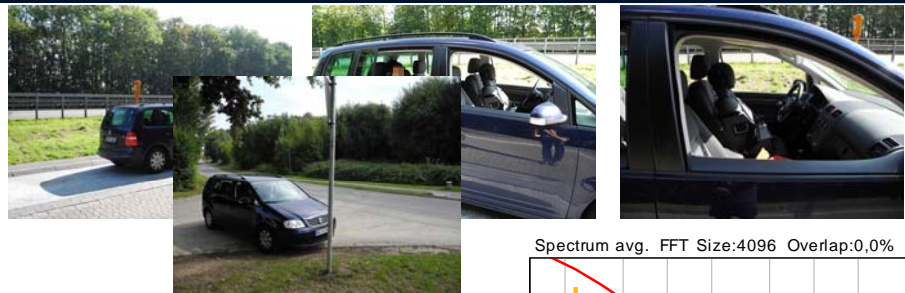
- **Speech Intelligibility in receiving**
 - More “classical” situation – similar to speech intelligibility in rooms
 - Potential application of existing methods such as
 - **SII (speech intelligibility index),**
 - **STIPA (speech transmission index for public address systems)**
 - **RASTI (rapid speech transmission index)**
- **Speech Intelligibility in sending**
 - No well performing objective test method available
 - Performance evaluation potentially possible using “second order” parameters such as
 - **Optimized frequency response characteristics,**
 - **Evaluation of switching and double talk performance with focus on speech intelligibility**
 - **Consideration of eCall relevant noise types**

Potential Improvements: Speech Intelligibility - Example

Improvement of Speech Intelligibility by Adapting Frequency Response Characteristics



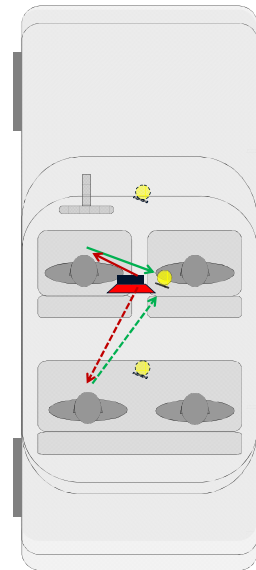
Background Noises in eCall Scenarios





Considerations for eCall System Design

- Use/adapt low power designs from modern mobile phones
- Choose appropriate locations for the eCall system components (esp. loudspeaker & microphone)
- Consider the integration of existing microphones/loudspeakers in the car for use in conjunction with the „one box“ eCall system
- ...



Required Actions in Standardization

- Most efficient solution: develop a **standard specifically targeted to emergency call systems**
- Base work on existing ITU-T standards P.1100 and P.1110
- Modify existing requirements and adapt testing procedures where needed
- Remove less relevant parameters
- Amend new standard by new parameters and testing procedures where needed – especially for speech intelligibility
- **Potential home for the work:**
ITU-T SG12 – Q.4 dealing with „Hands-free communication and user interfaces in vehicles“
- **ETSI TC STQ**
- **....use this standard as baseline standard for emergency call systems**



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