

**ITU-T Workshop on  
"From Speech to Audio: bandwidth extension,  
binaural perception"**

**Lannion, France, 10-12 September 2008**

**End-Point Characteristics  
And  
User Perception**

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# Bandwidth Extension Considerations

- Endpoint Acoustics
  - ➔ Transducer Characteristics
  - ➔ Mechanical and Industrial design
- User experience
  - ➔ Handset/Headset
  - ➔ Handsfree

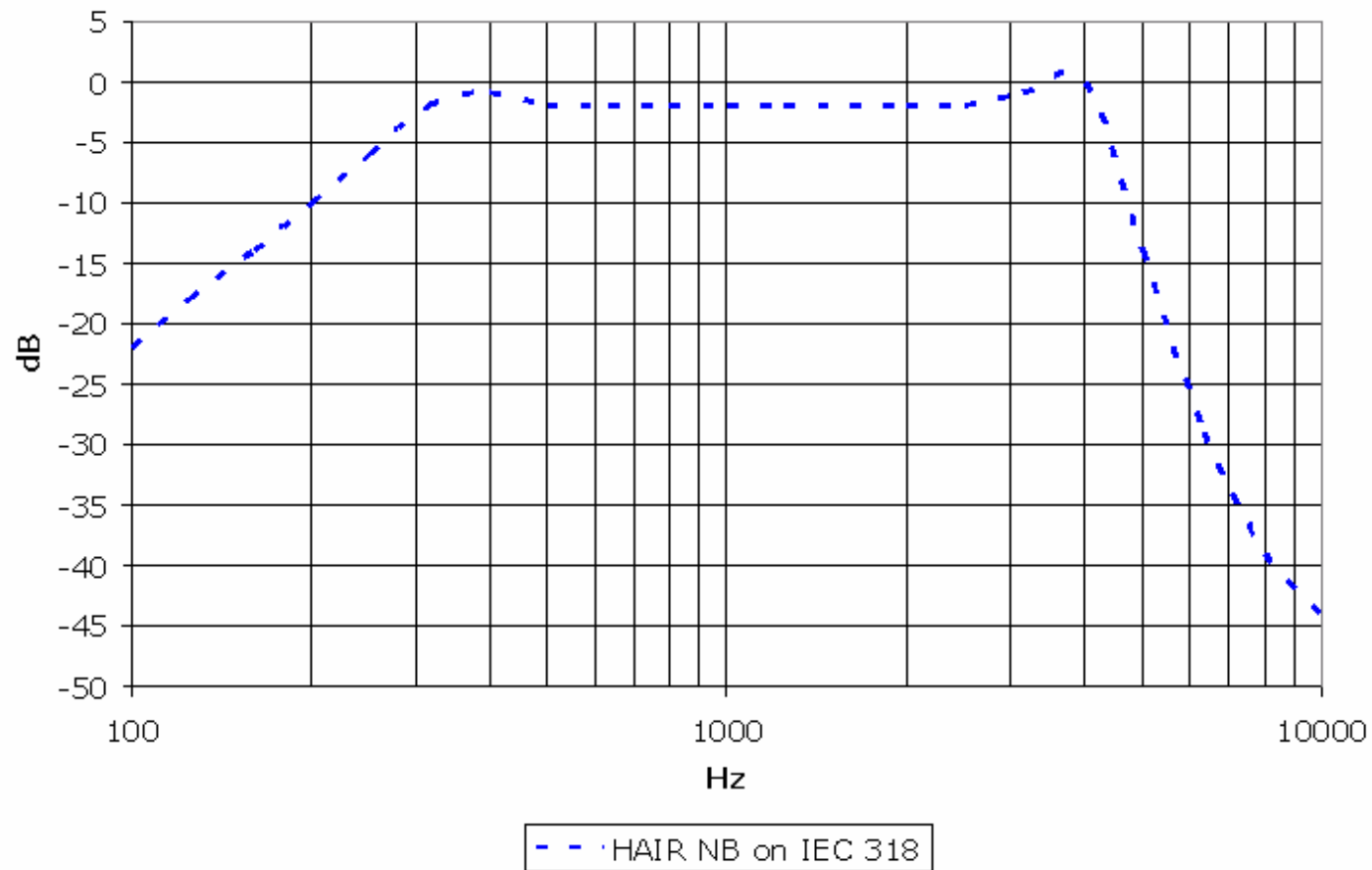
# Transducer Characteristics

## Standards and Technology

- Narrowband : TIA 810A (IEC 318)  
TIA 810B (HATS)
- Wideband : TIA 920 (HATS)
- High Acoustic Impedance vs. Low Acoustics Impedance Receivers

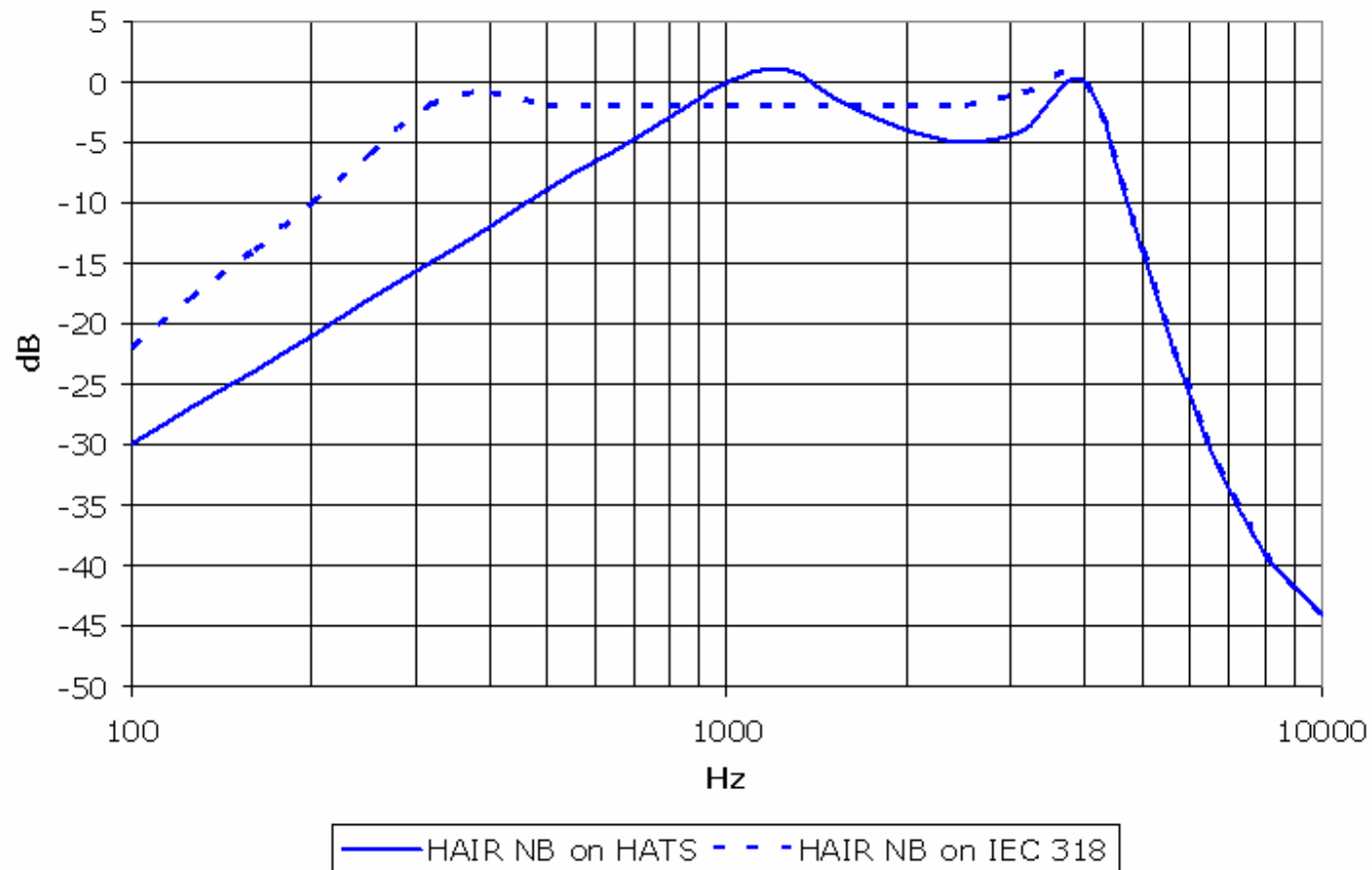
# Transducer Characteristics

## Generic Receiver Frequency Response



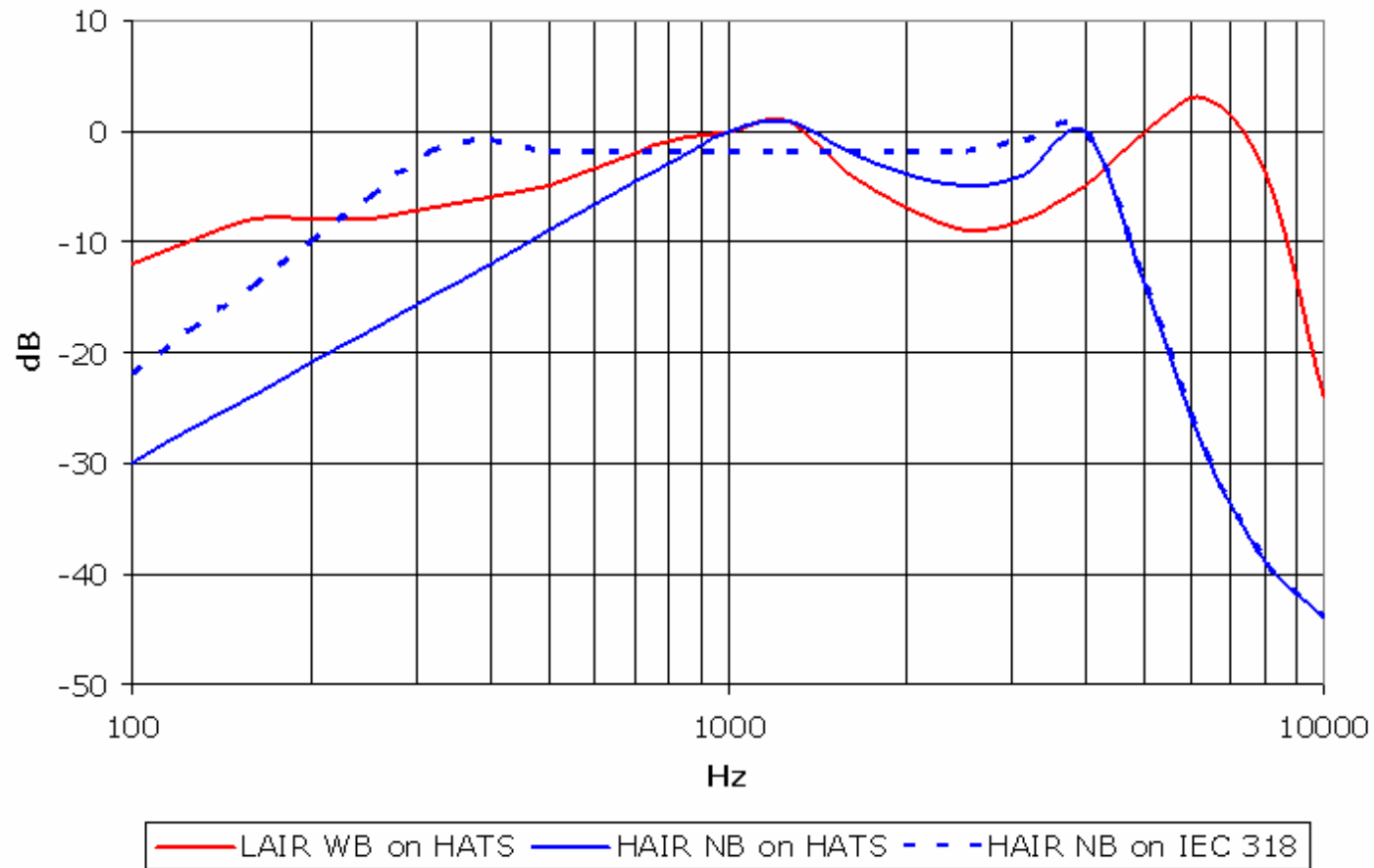
# Transducer Characteristics

## Generic Receiver Frequency Response



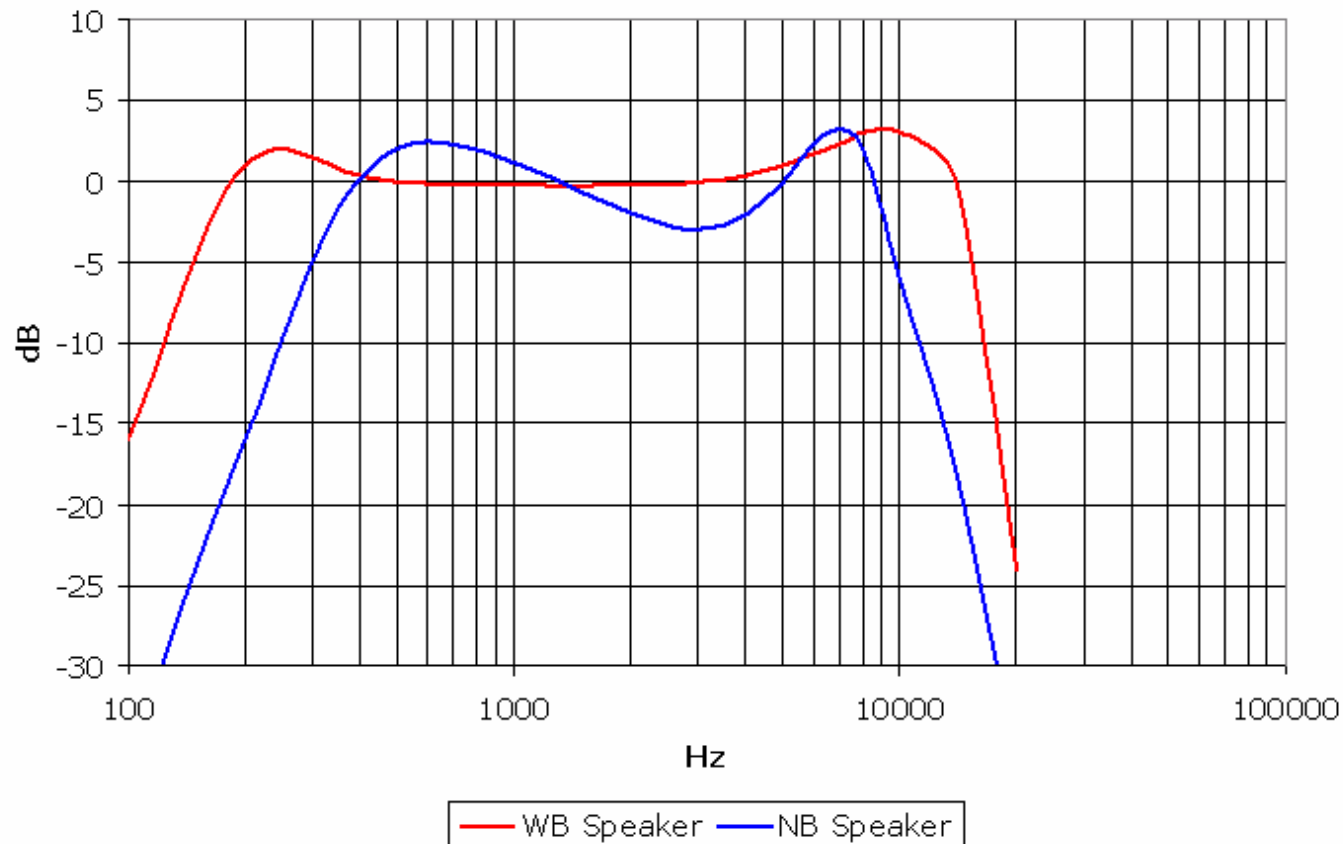
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## Generic Receiver Frequency Response



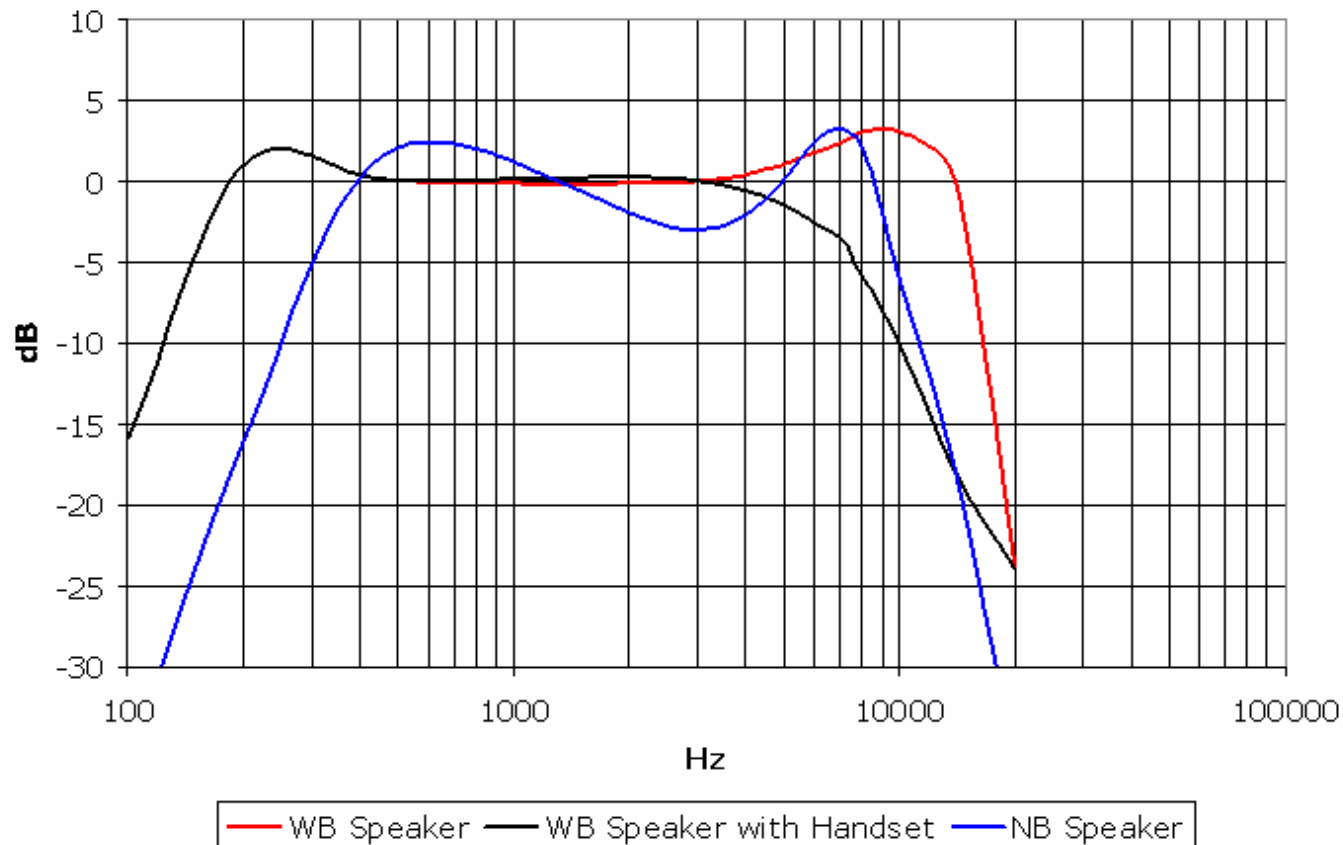
# Transducer Characteristics

## Generic Handsfree Speaker (<60mm, 100cc)



# Transducer Characteristics

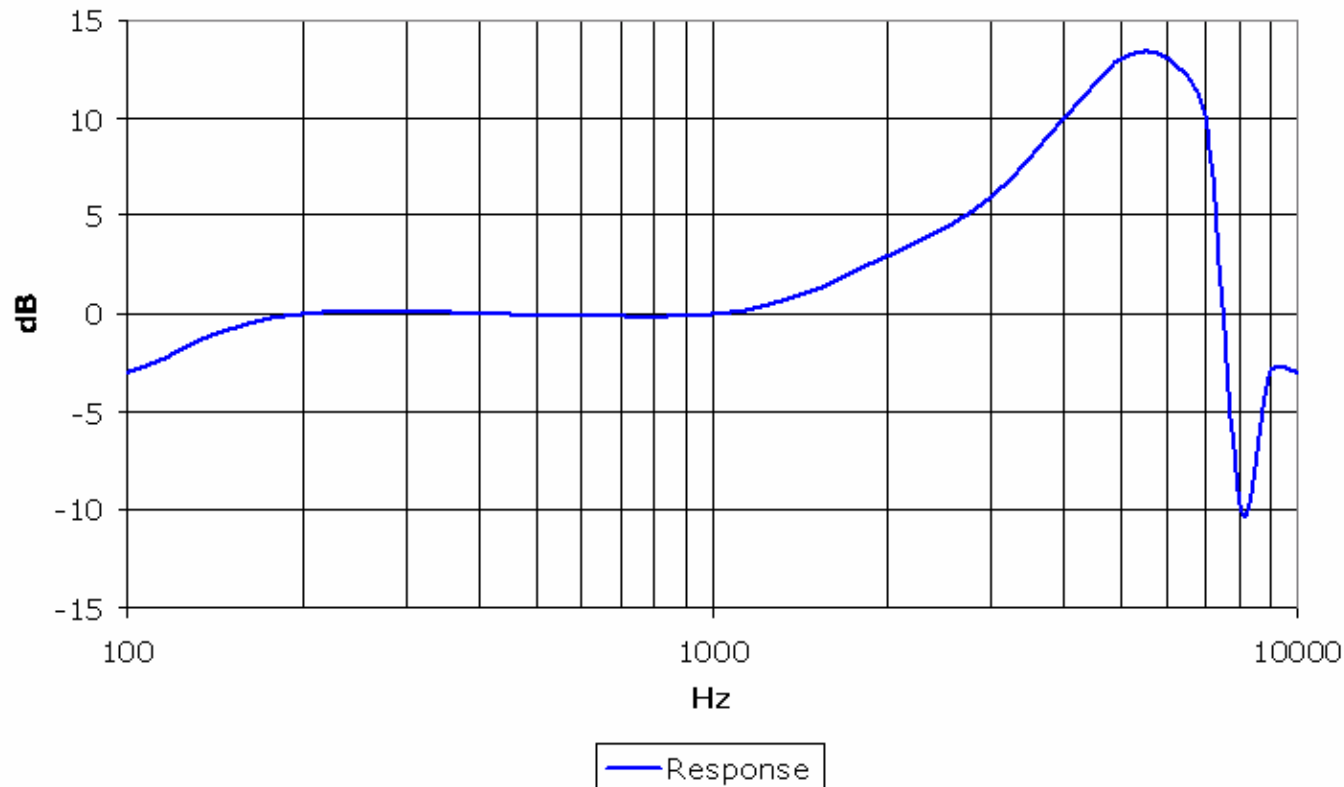
## Generic Handsfree Speaker (<60mm, 100cc)





# Transducer Characteristics

## Generic Telephone Microphone Response

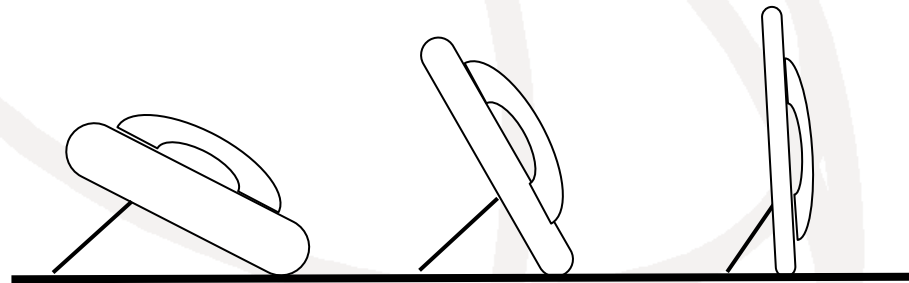


# Mechanical and Industrial Design

- Handsfree Mic Location
- Handset Location
- Speaker Cavity

# Enterprise Telephone Evolution

## ■ Acoustic Design Challenges

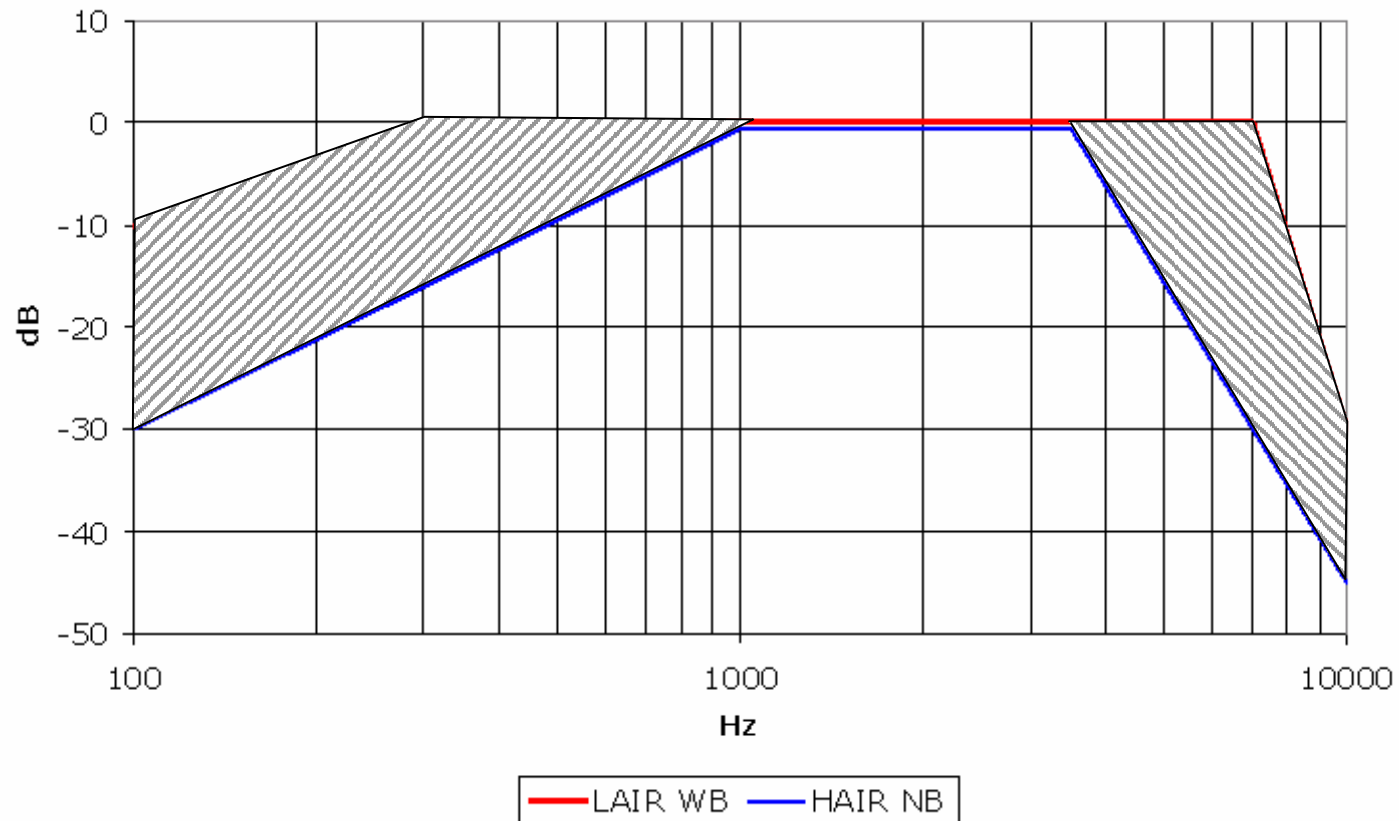


# User Experience

- Band extension effects
- Handset/Headset vs. Handsfree

# User Experience

## Narrowband vs. Wideband



# User Experience

- Handset/Headset
  - Closeness
  - Ambient pick up
  - Preference
- Handsfree
  - Ambient merge effect

# Conclusion

End-point Specifications should account for:

- User perception
- Industrial and Mechanical Design Limitations
- Audio Band extension