



Performance of a Reverse Horn Vent

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Background

- Some new hearing aid users reject amplification due to occlusion
- Limited space on CIC for venting
- Smallest vent opening dictates vent performance?



Purpose

To better understand the dimensional effects of a reverse horn vent on occlusion.

Objectives

Using a custom ear insert, we examined the effect of vent length and dimensions on:

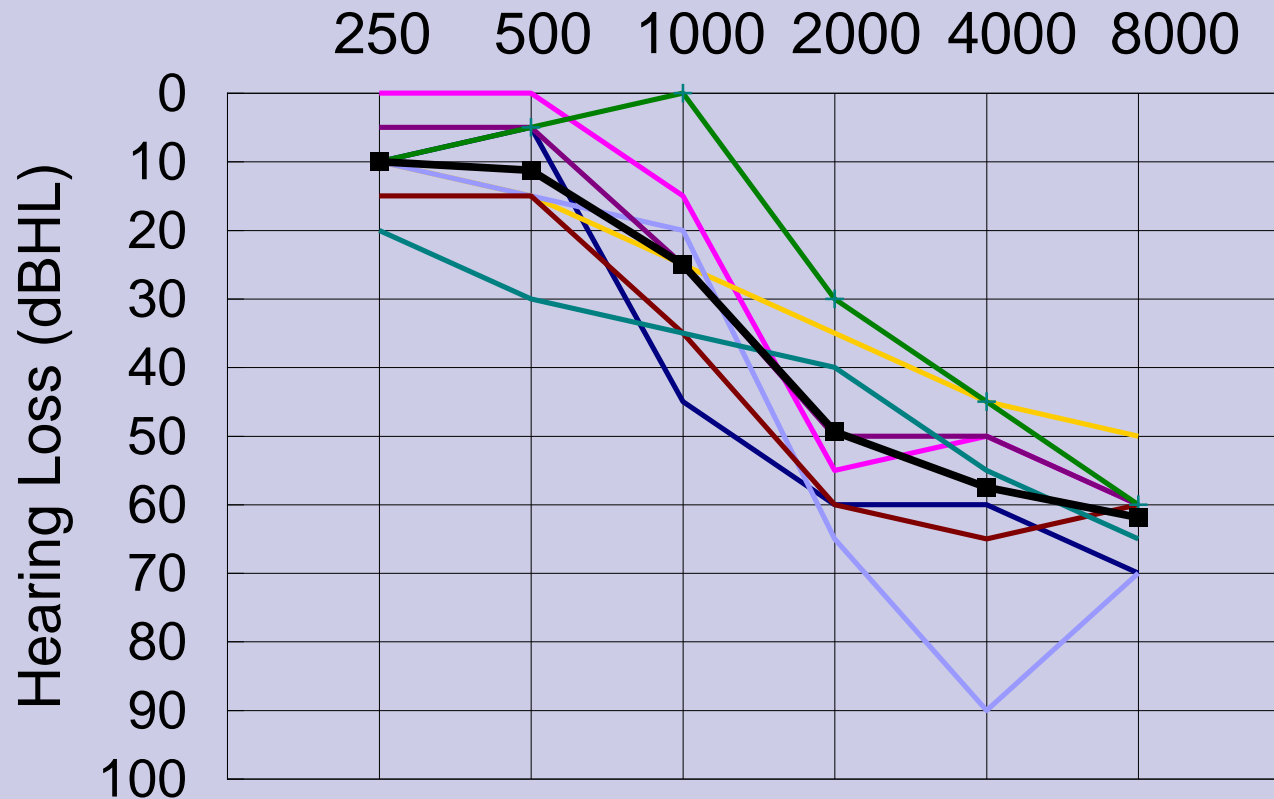
- Insertion Loss
- Objective occlusion effect
- Subjective occlusion effect

Subjects

- Eight adult hearing aid wearers
- Average age was 66 years (SD=9 years)
- Subjects were blind to the purpose of the study
- Mean audiogram is a sloping high frequency hearing loss

Audiogram for each test subject's right ear

Frequency (Hz)

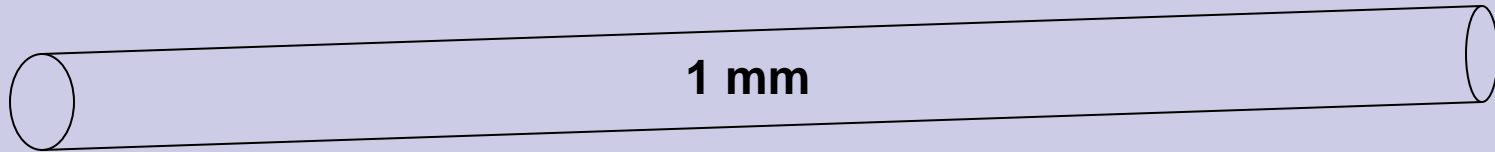


Insert Specifications

- Three insertion depths
 - Shell tip terminated at second bend (0mm)
 - Shell tip terminated 4mm beyond second bend (+4mm)
 - Shell tip terminated 4mm before second bend (-4mm)
- Seven vent conditions

Sequence of Vent Configurations

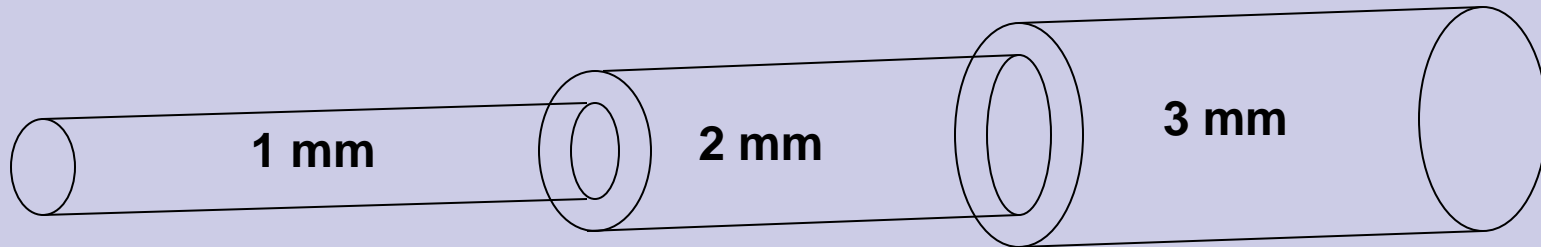
← 100% →



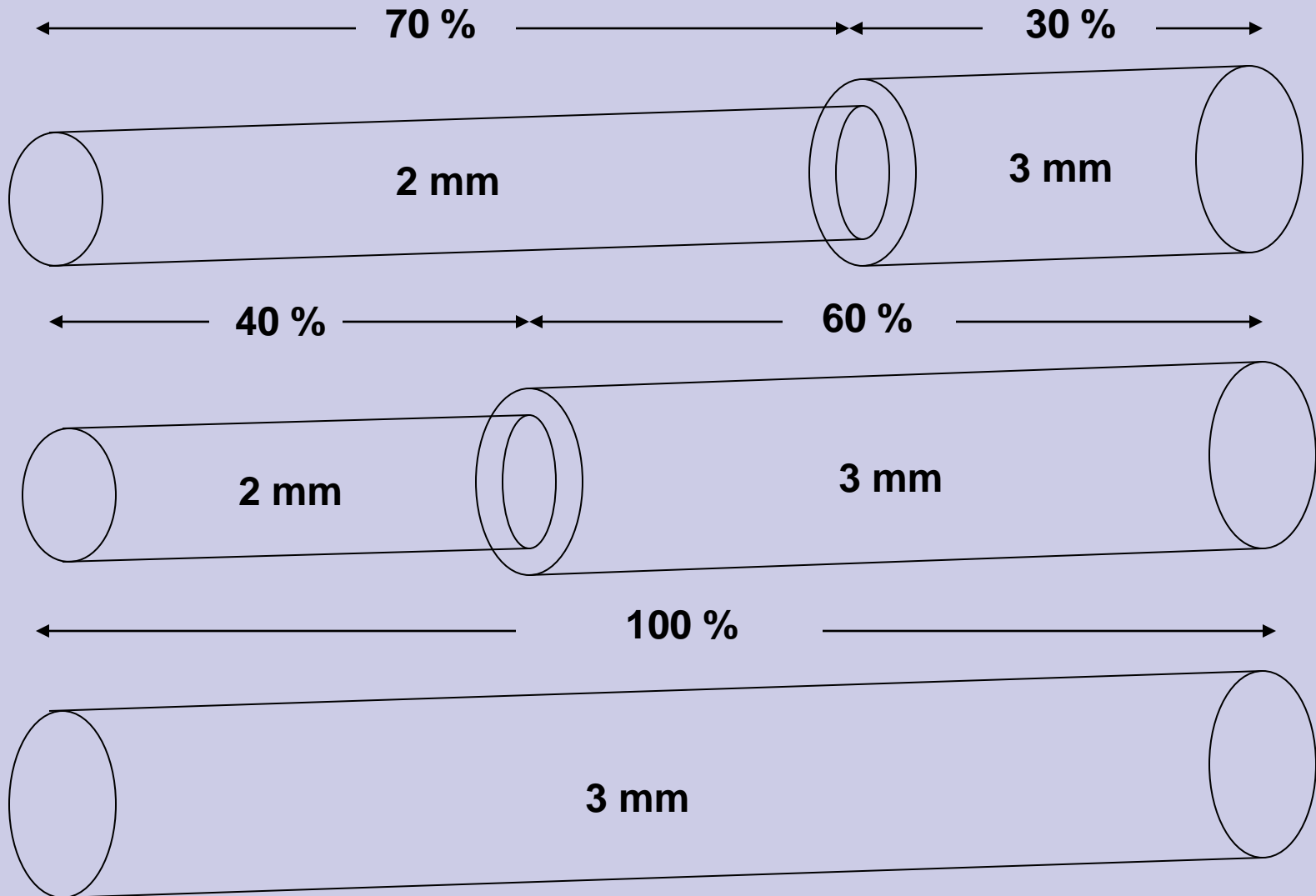
← 40% → * → 60% →



← 40% → >> 30% → >> 30% →



Sequence of Vent Configurations



Stimulus conditions

- White noise at 89 dB SPL measured one meter from the loudspeaker at 0° azimuth
- Sustained vocalization of /i/ for five seconds at a monitored level of 70 dB SPL measured 12 inches from the mouth

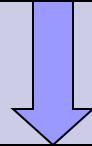


For each vent condition, three measurements were made:

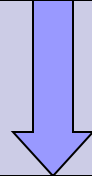
- Real-ear occluded response (REOR) to the white noise
- Real-ear occluded response (REORvoc) to subject's vocalization of /i/
- Subjective rating of own voice hollowness on a 1 (poorest) -10 (best) scale.



Probe mic



Probe-mic remote pad



Computer

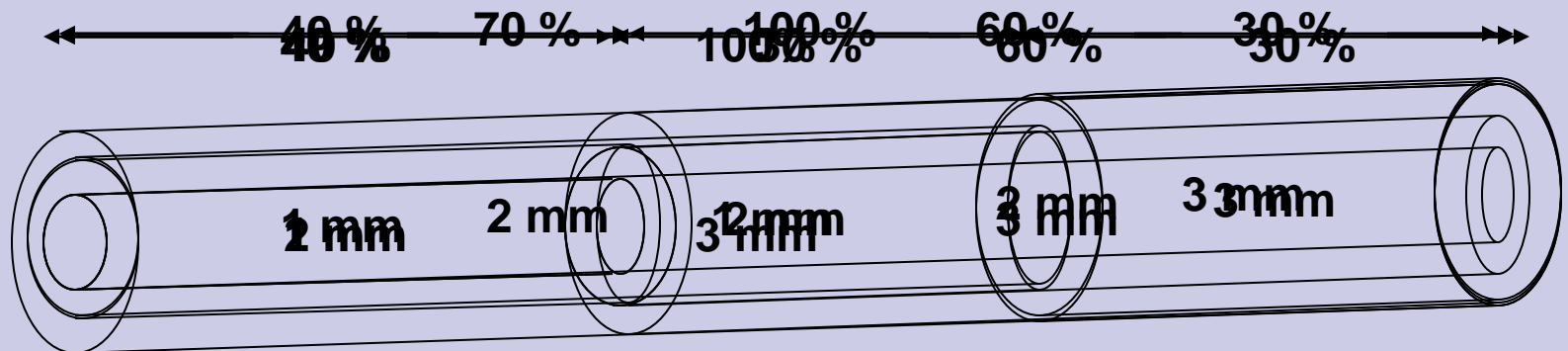
Procedures

- Impression of right ear
- Three inserts made with CAMISHA
- Three visits; one for each insert length
- Subjects sat in the center of a 10' x 10' x 6'6" sound-treated booth 1 meter from the loudspeaker placed directly in front
- Measurements were made without insert and with insert of various lengths and vent diameters

Sequence of Vent Configurations

Lateral

Medial

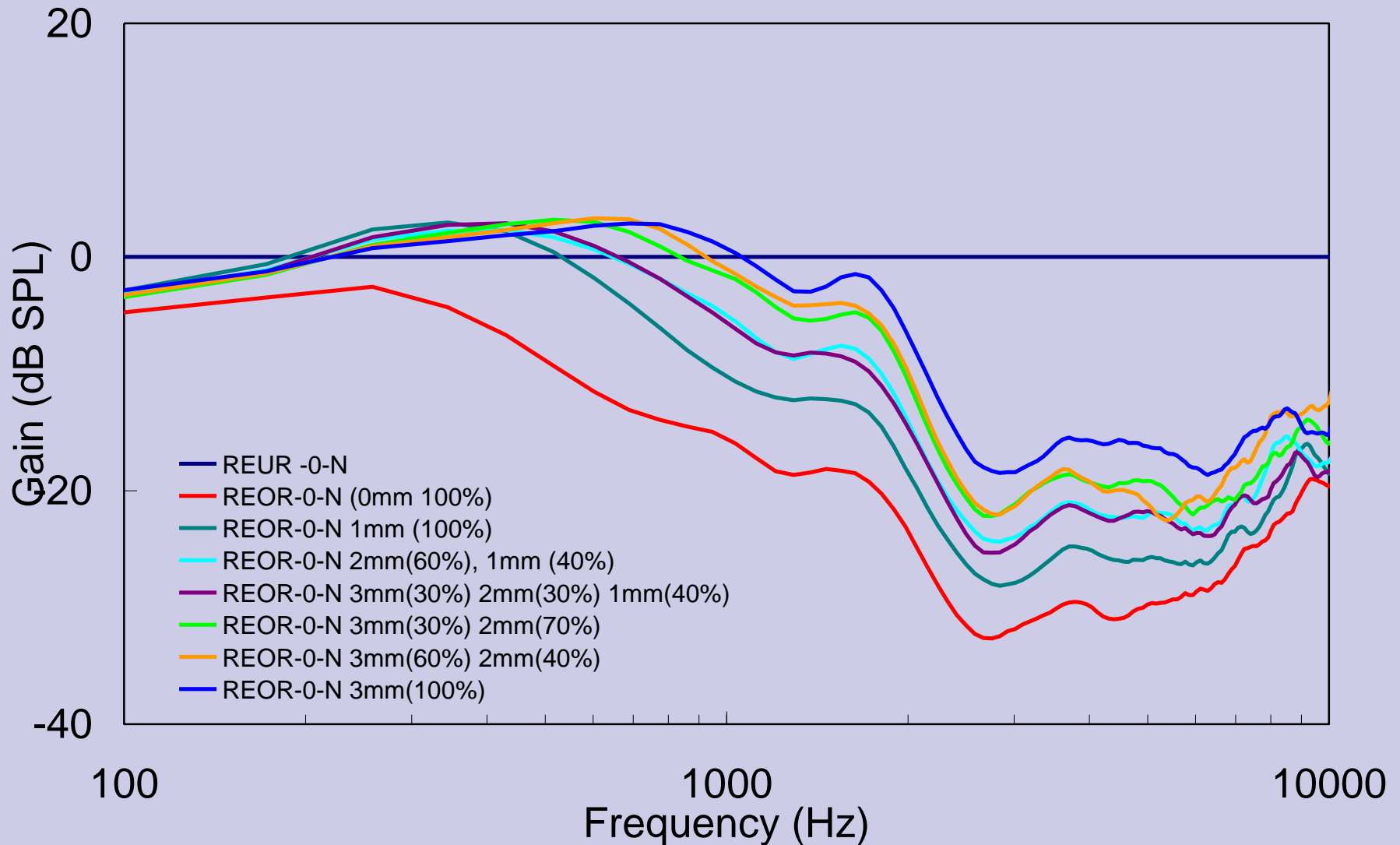




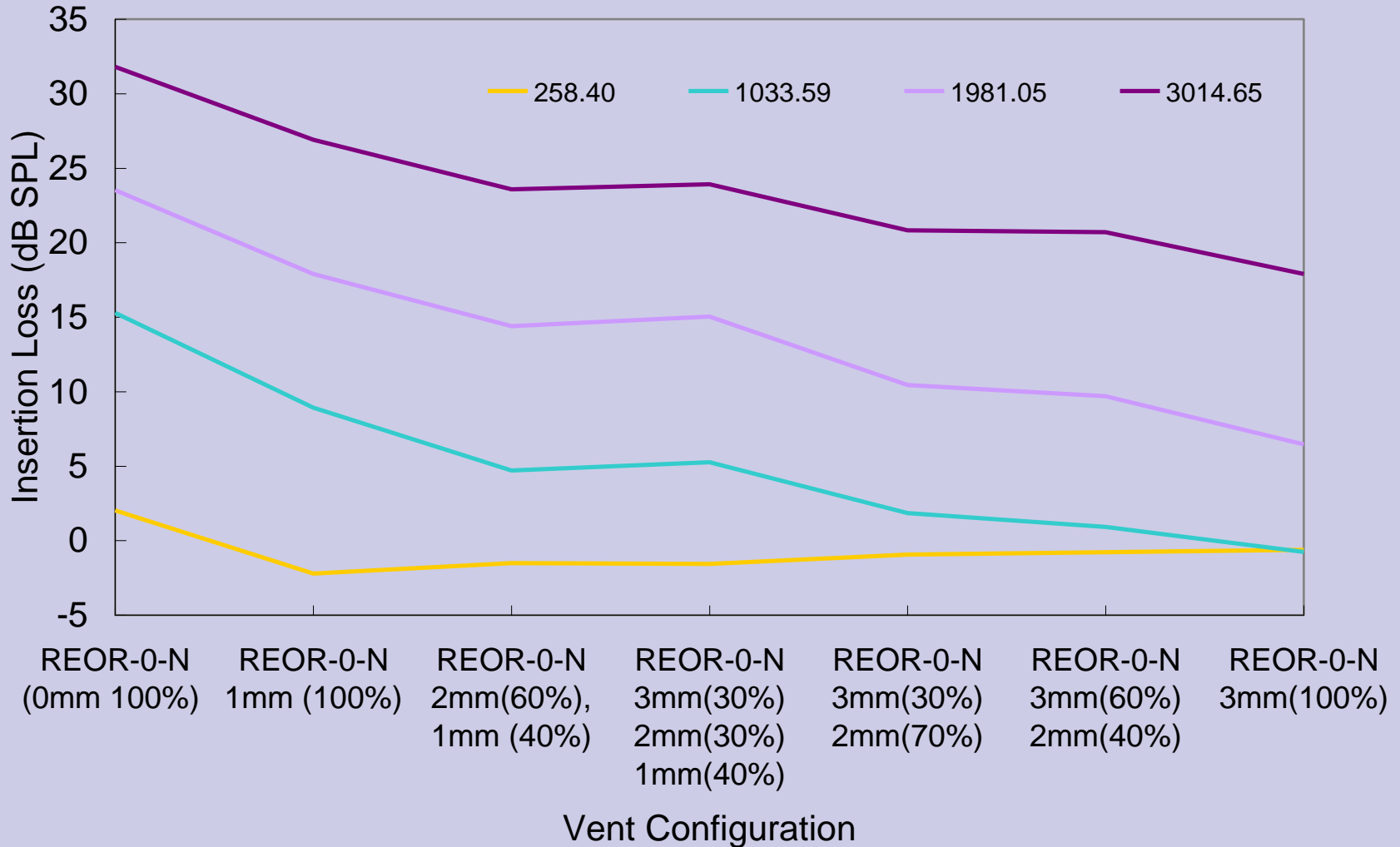
Results

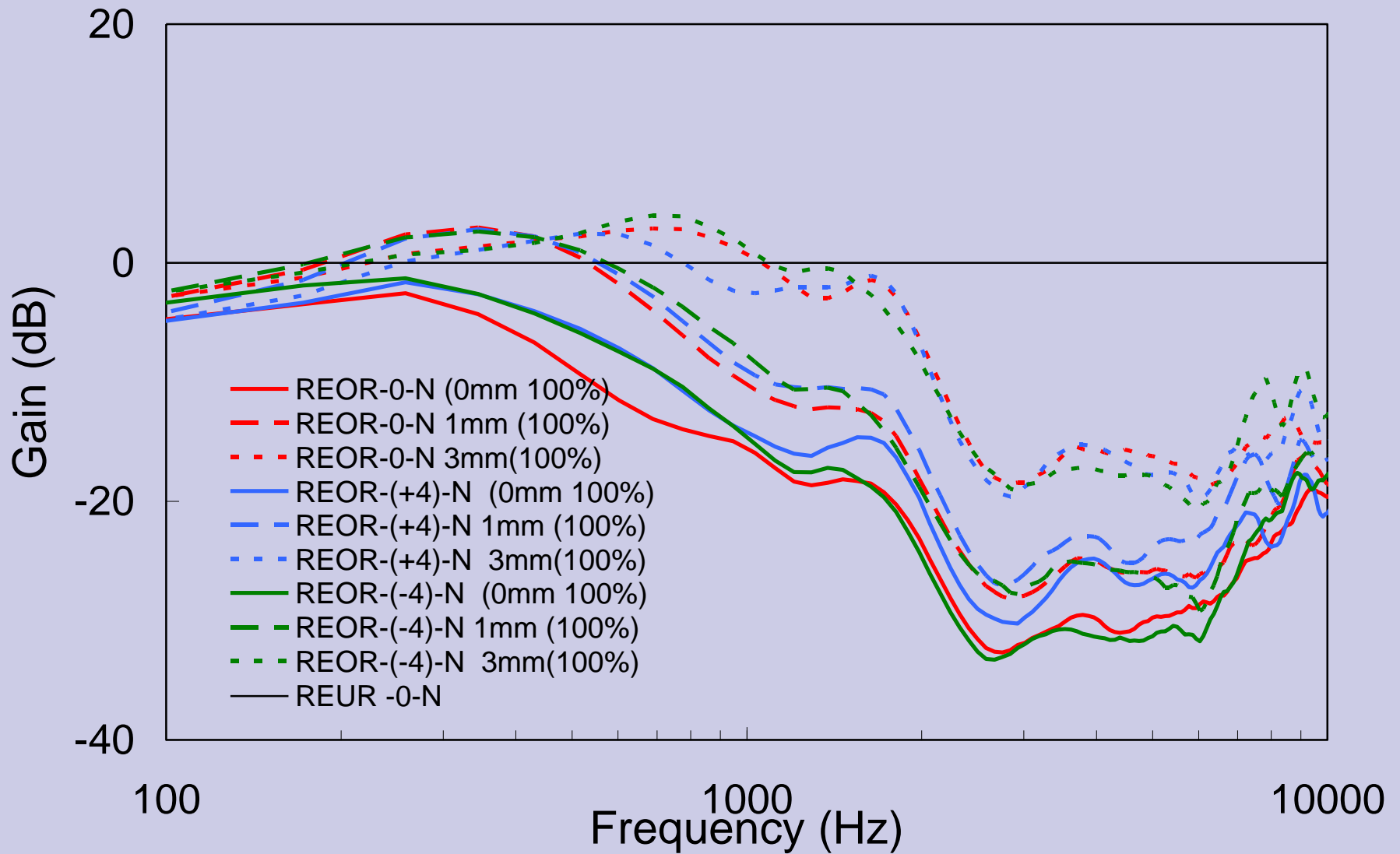
- Insertion Loss
- Occlusion Reduction
- Subjective Evaluation

Insertion Loss: REOR - REUR

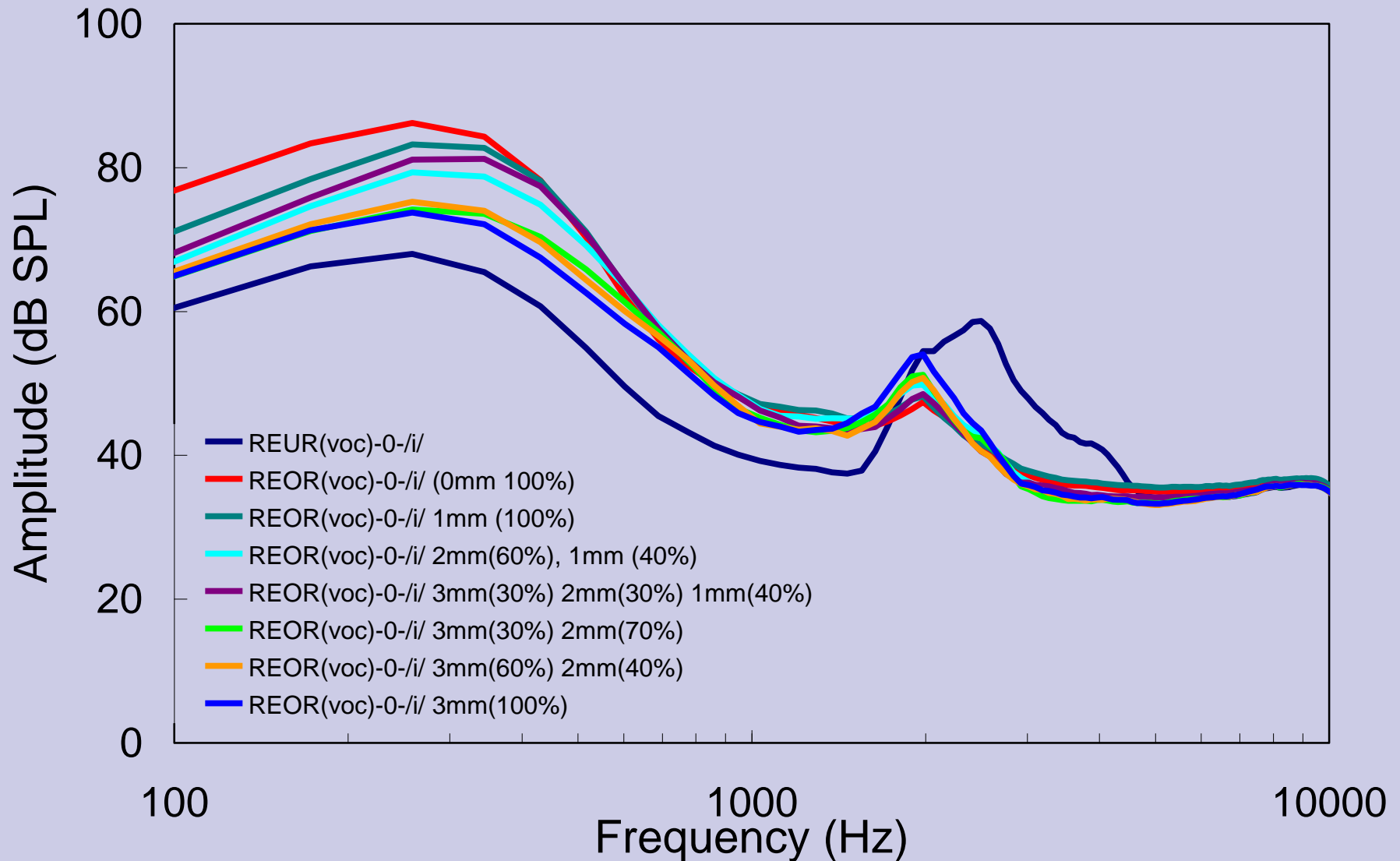


Insertion Loss for Four Frequencies

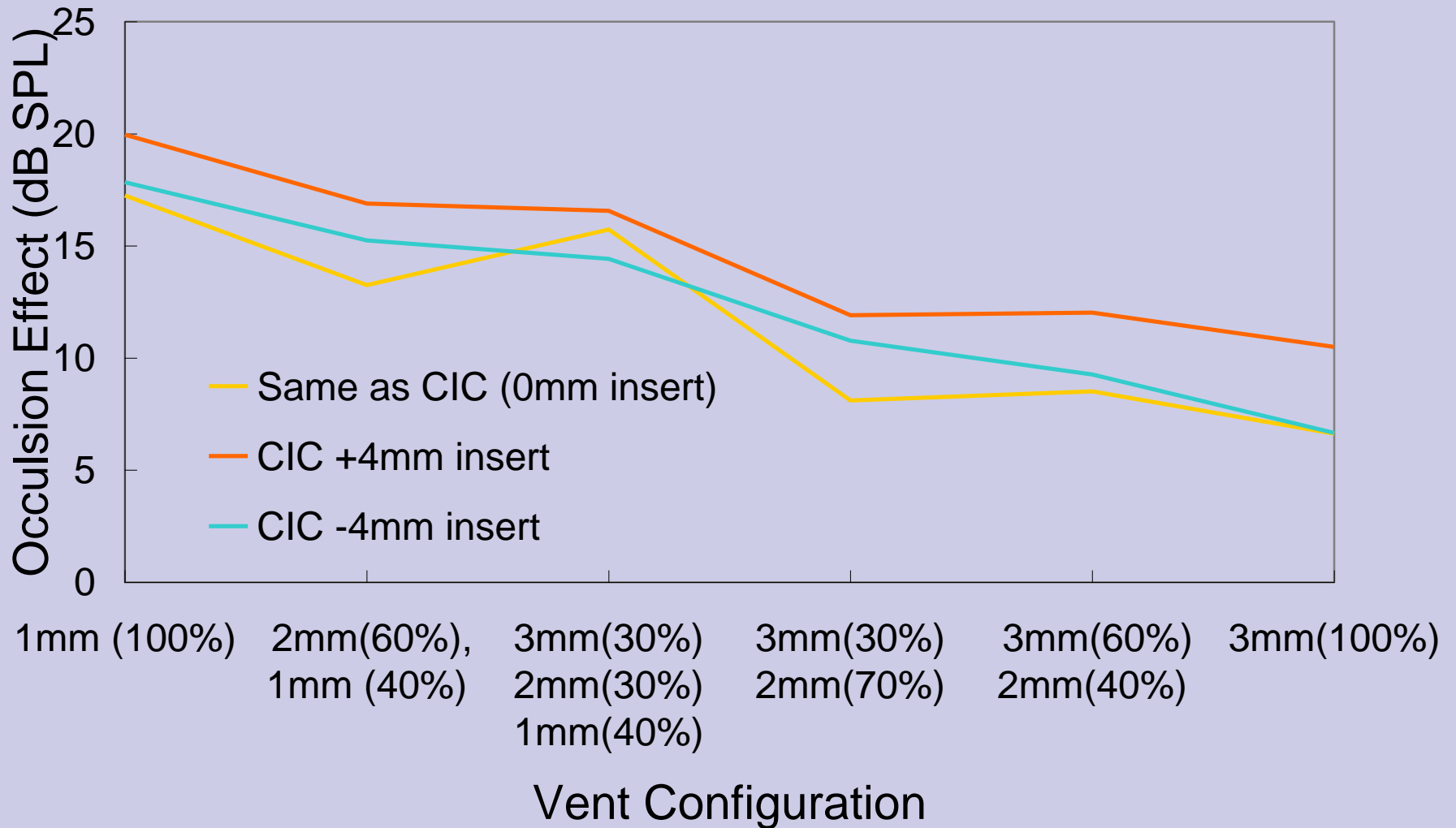


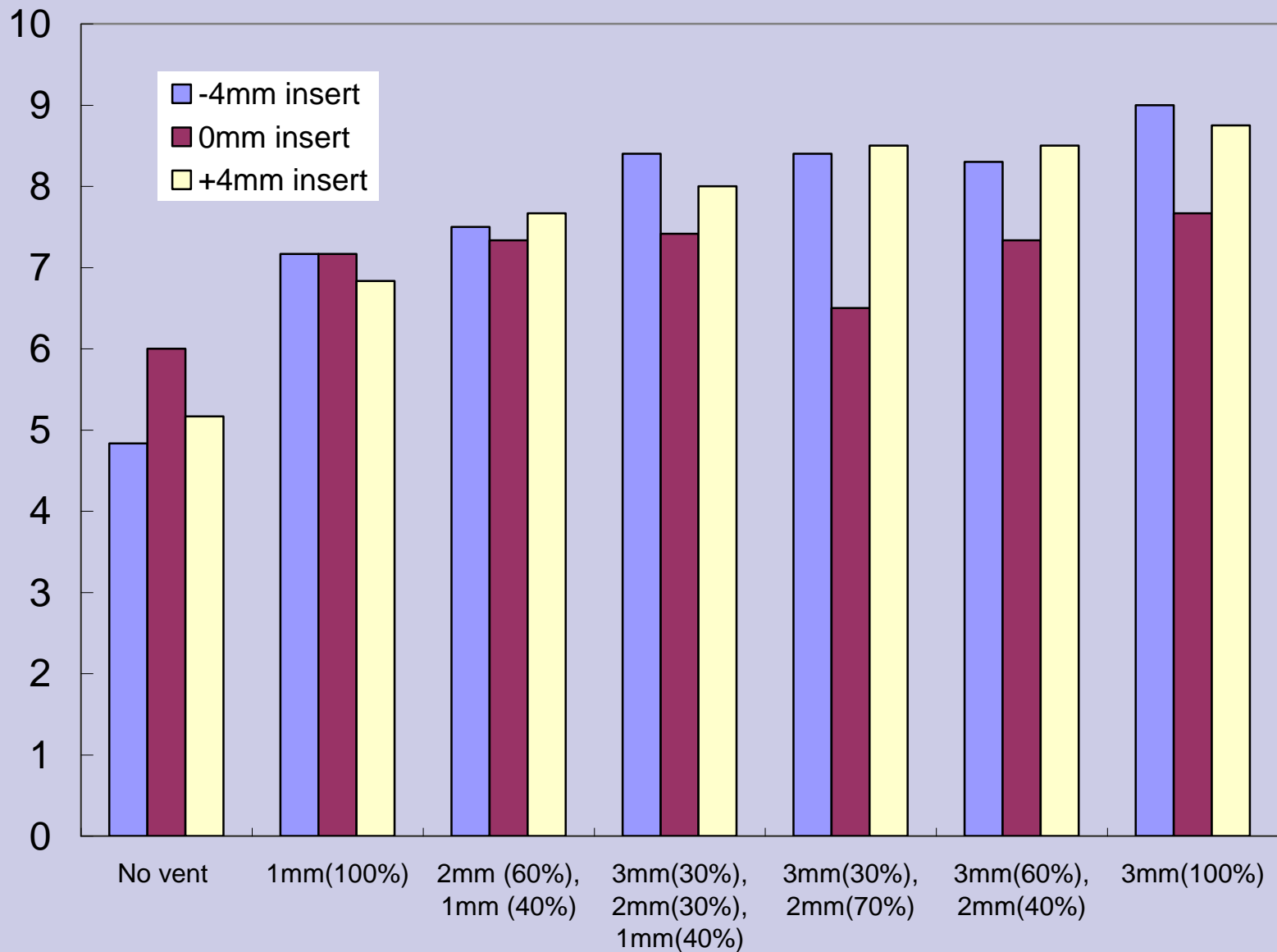


Real ear occluded response to vocalization

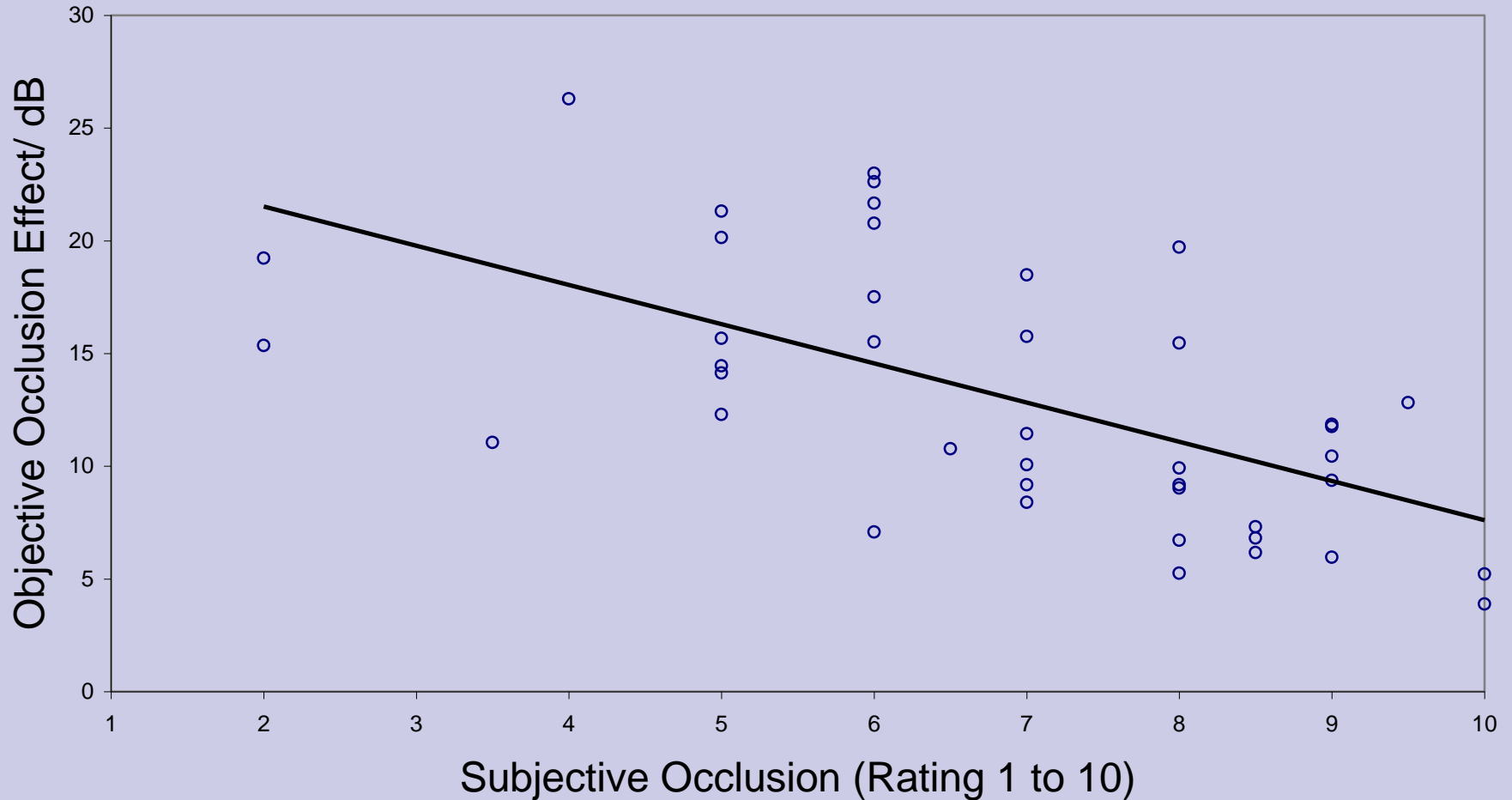


Occlusion Effect at 300 Hz: REORvoc - REURvoc





Occlusion Effect for CIC at 345Hz: Objective vs Subjective



Conclusions

- As vent configuration changed, insertion loss and subjective and objective occlusion effect changed
- The smallest opening did not dictate the effect
- When space is limited, a reverse horn vent may be helpful