# Magnitude of Hearing Loss and Open Ear Fittings

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# Acknowledgments

This material is based upon work supported by the Department of Veterans Affairs, Veterans Health Administration, and Office of Research and Development, Rehabilitation Research and Development Service.

# Disclaimer

The contents of this presentation do not represent the views of the Department of Veterans Affairs or the United States Government.

# Background

- Hearing loss is the most common service connected disability for veterans
- Hearing aids are the primary treatment
- Hearing aids, however, are not accepted well by the general population or the VA population
  - 75-80% of adults who could benefit from hearing aids choose not to acquire them
  - Those that do acquire them, 16-30% go unused
  - 11% lack of use at one VA

Popelka et al., 1998; Kochkin, 2005; Noe et al., 2000; Larson et al., 2000; Dennis, 2006

# Background

Survey data and clinical experience suggest lack of hearing aid use for several reasons, including:

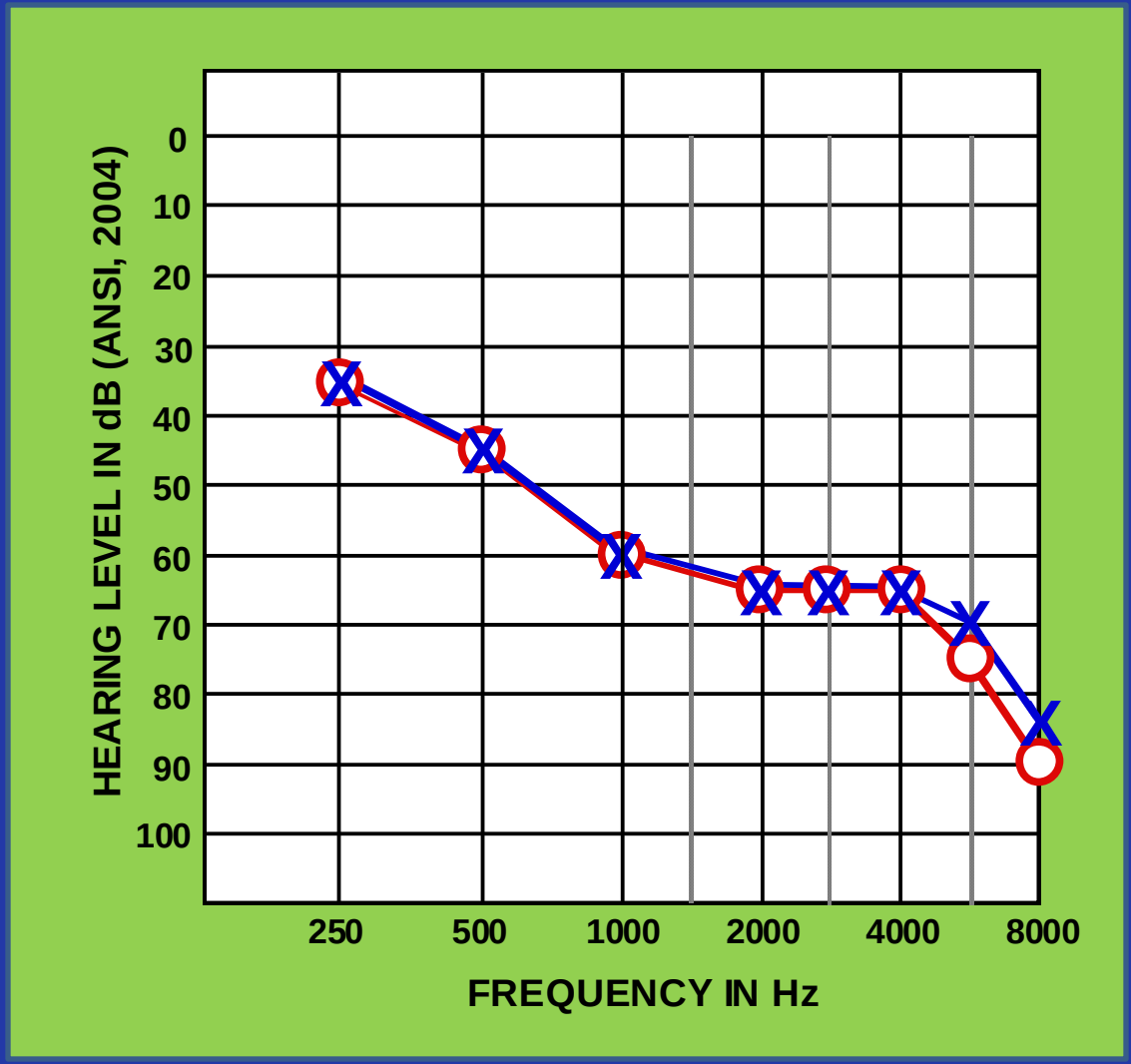
1. Poor fit and comfort
2. Poor cosmetics
3. Negative side effects of whistling feedback
4. “A plugged-up sensation” related to occlusion
5. Difficulty understanding speech in noise

Kochkin, 2007

# So…..

It has been suggested that open fit hearing aids could possibly increase the uptake and use of hearing aids since open fit hearing aids have been stated to improve the complaints of hearing aid user's regarding comfort, occlusion, and cosmetics

# What Would You Fit?



# Overarching Goal

To develop an evidenced-based model for clinicians to use to select an open fit hearing aid vs. a traditional custom fit hearing aid for patients with varying hearing losses

for pure tones

Merit Review funded through VA RR&D

# Evaluation of Open-Canal and Traditional Custom-Fit Hearing Aids

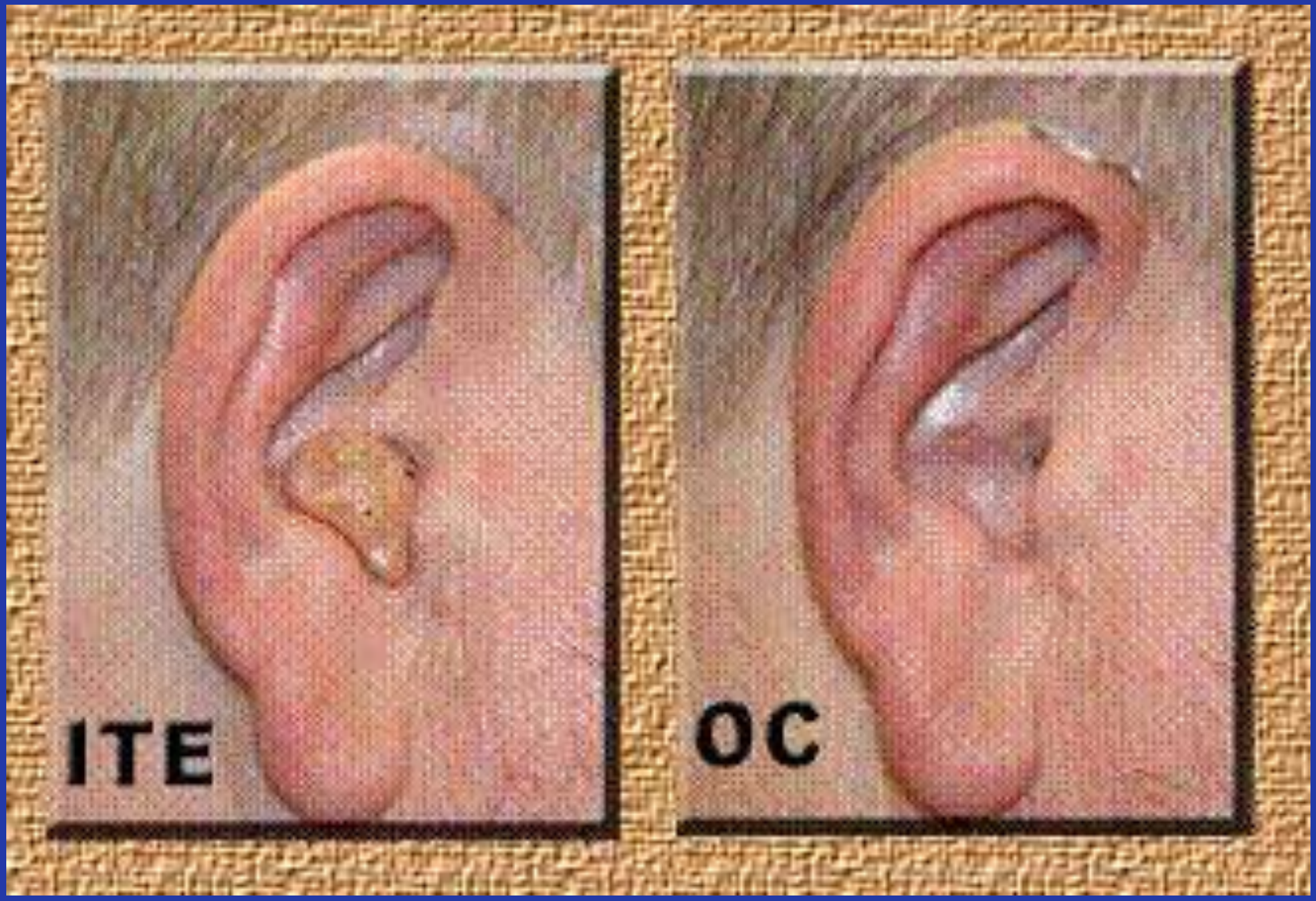
- Gene Bratt and Richard Wilson – Co-Principal-Investigators
- Theresa Chisolm, Rachel McArdle, Todd Ricketts, Sherri Smith – Co-Investigators
- Ginny Alexander, Elizabeth Talmage – Research Audiologists
- Mia Rosenfeld – Study Coordinator/ Research Audiologist

# Methods

- Large multi-site crossover study
  - Nashville, Mountain Home, and Bay Pines
  - Recruitment goal of 288 participants
- Participants fit with 3 types of hearing aids for 2 months each
  - Traditional custom (TC), receiver in the ear open fit (RIC), receiver in the aid open fit (RITA)
- Subjective and objective outcome data

# Hearing Aids

- TC = Starkey Destiny 1200 HC or ITC
- RITA = Starkey Destiny 1200 mini/full-size BTE with slim tube and open dome
- RIC = Starkey Zon receiver-in-the canal BTE with open dome
- Why Starkey?
  - Had models w/similar circuit for all 3 styles
  - Pilot testing indicated that these models were among the best across manufacturers in terms of additional gain before feedback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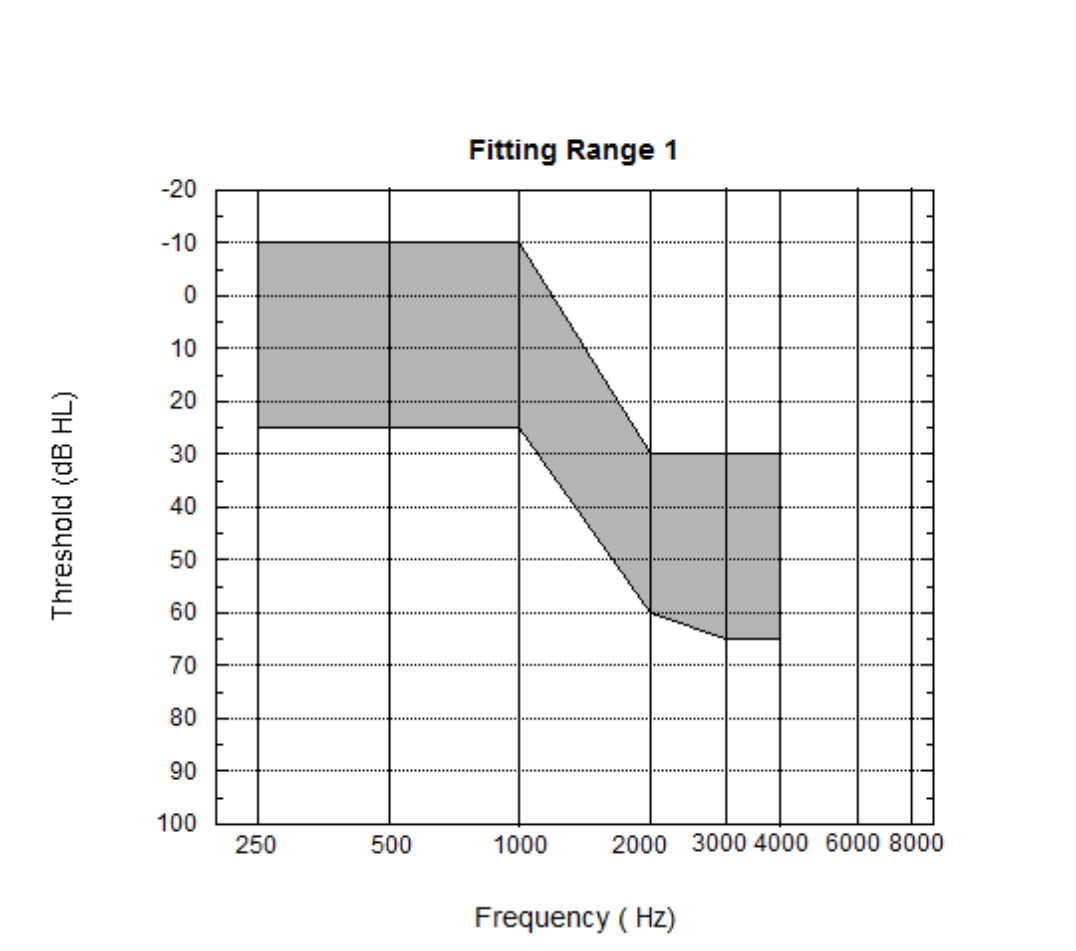
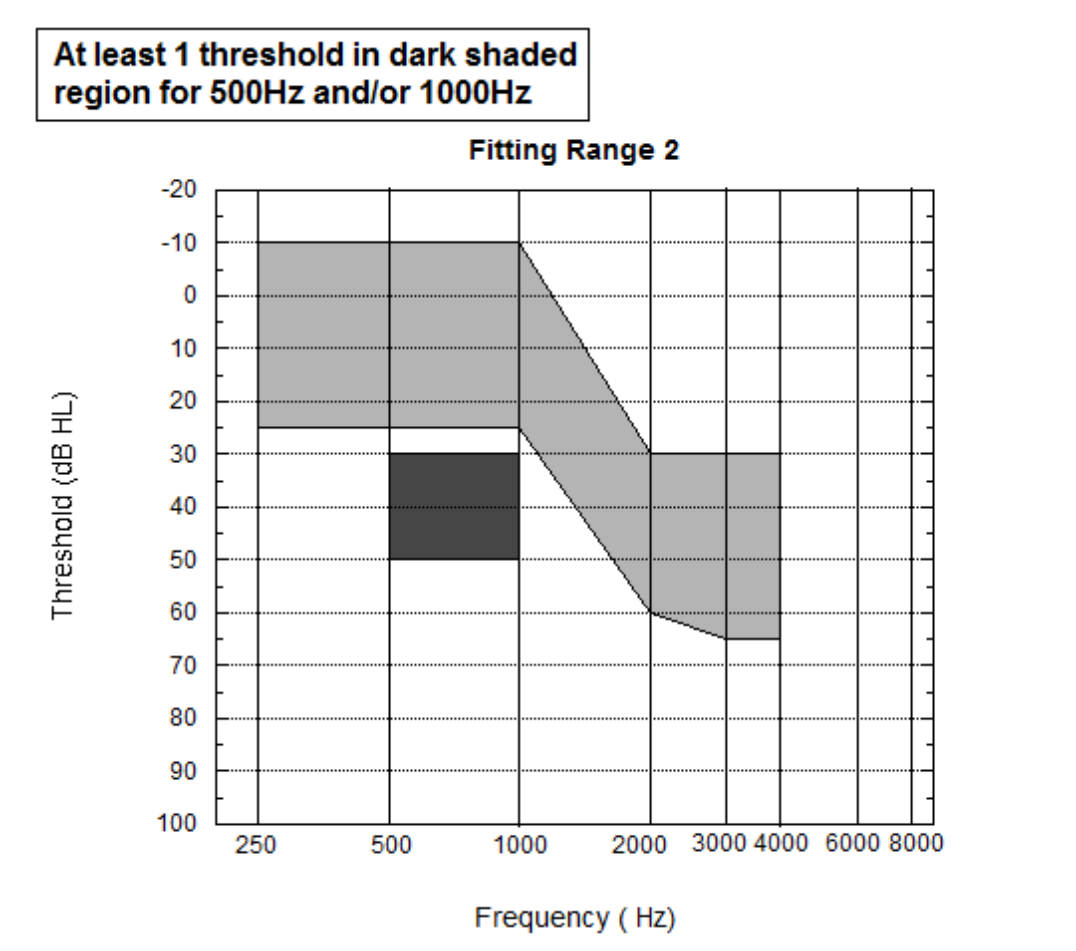
# Participant Groups

Each ear for all enrolled participants was labeled as one of four hearing loss groups based on the pure-tone thresholds for each individual ear

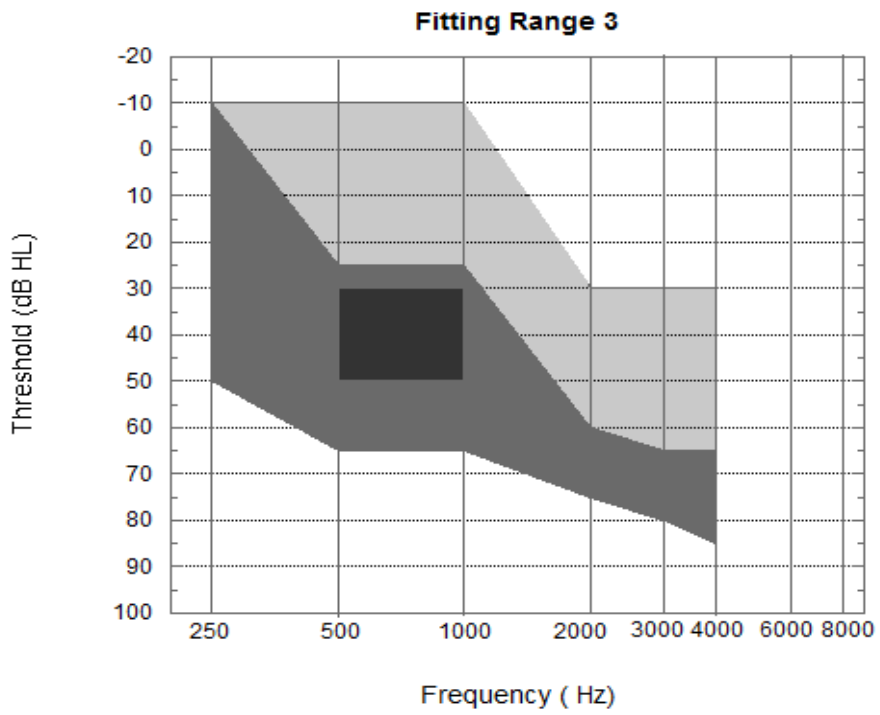
# Group 1 Fitting Range



# Group 2 Fitting Range

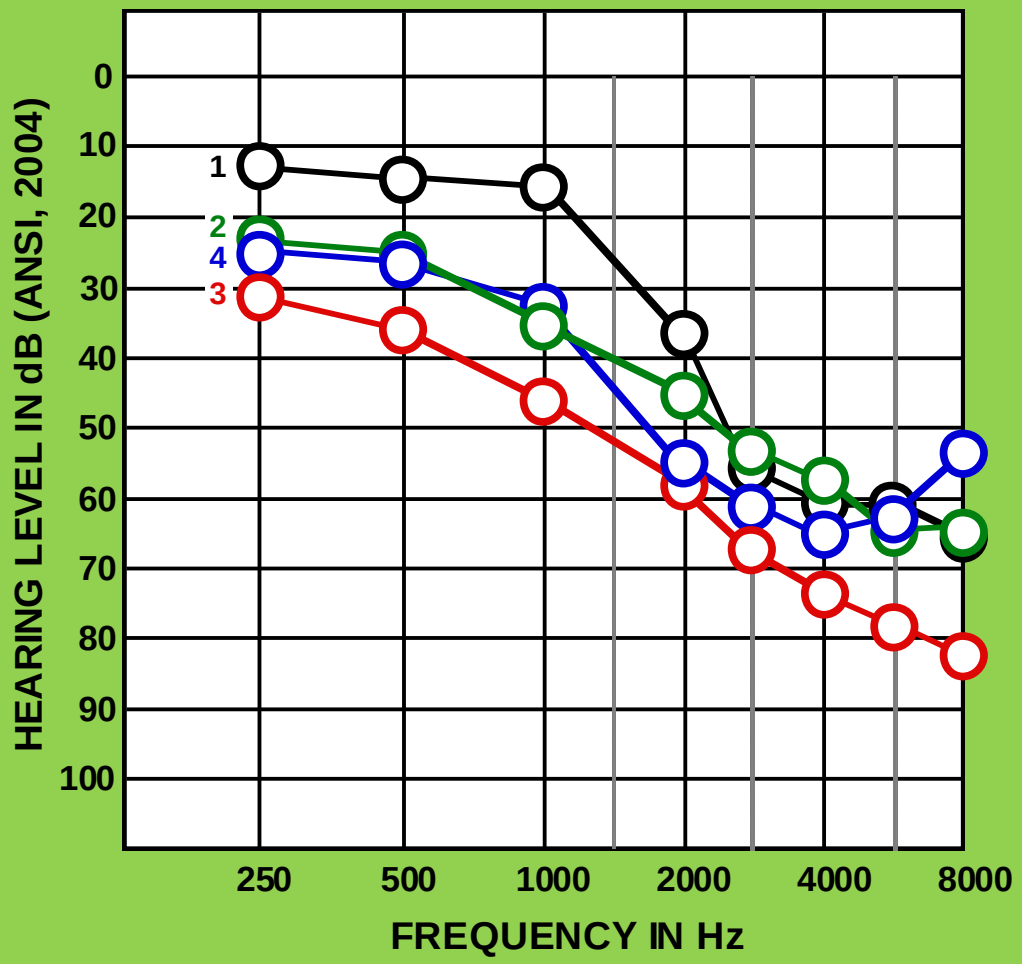


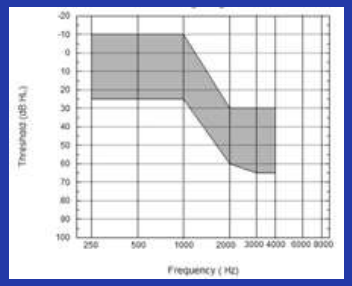
# Group 3 Fitting Range




**At least 1 threshold in the dark shaded box for 500Hz and/or 1000Hz and at least 3 thresholds in the lower region**

# Mean Thresholds for Hearing Loss Groups



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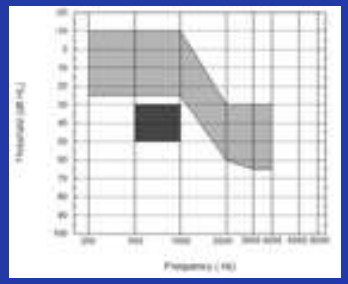

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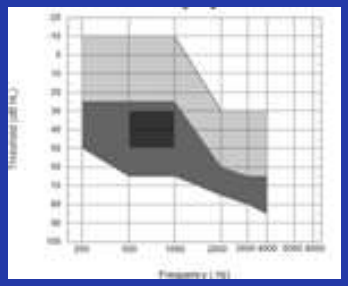

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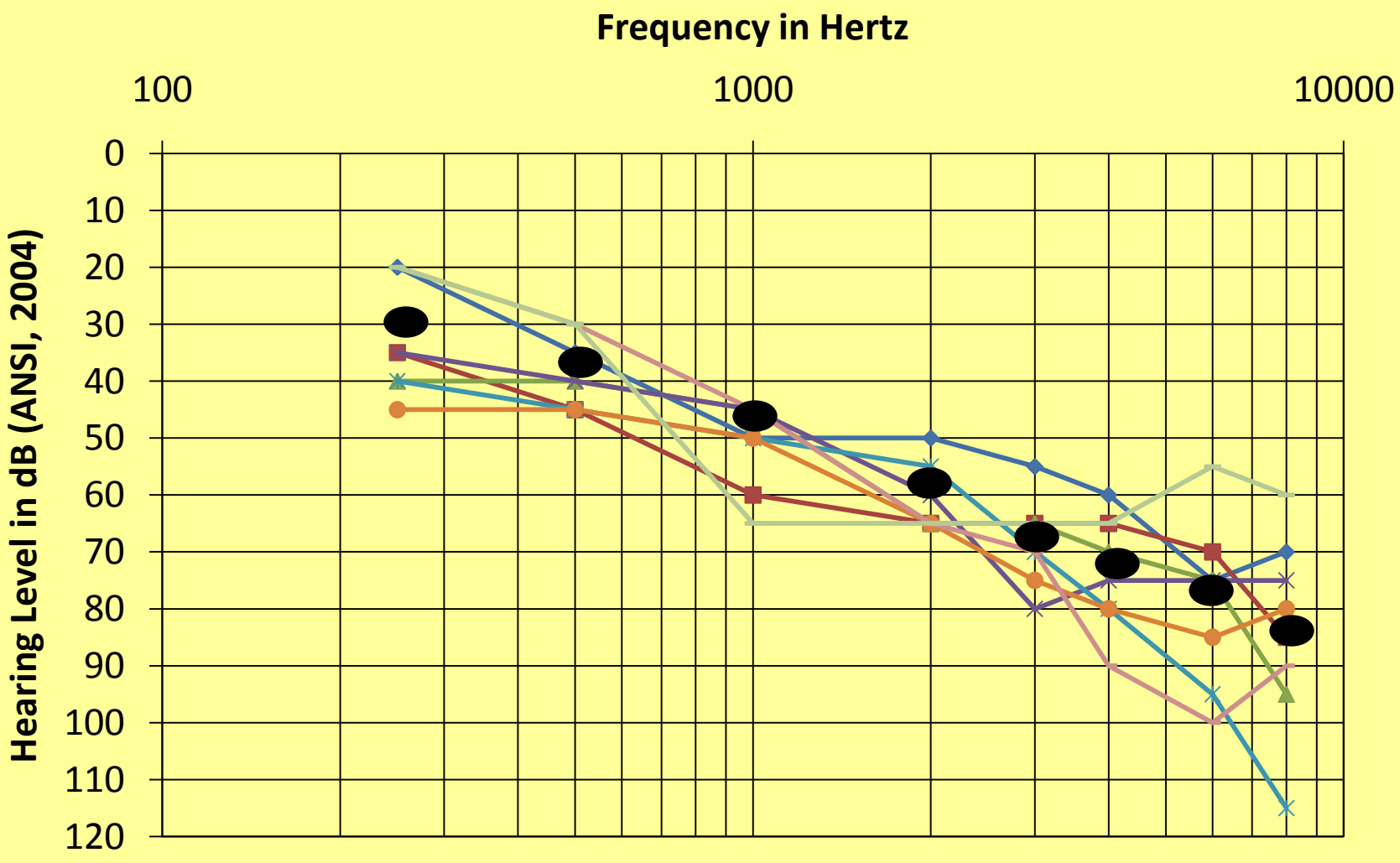
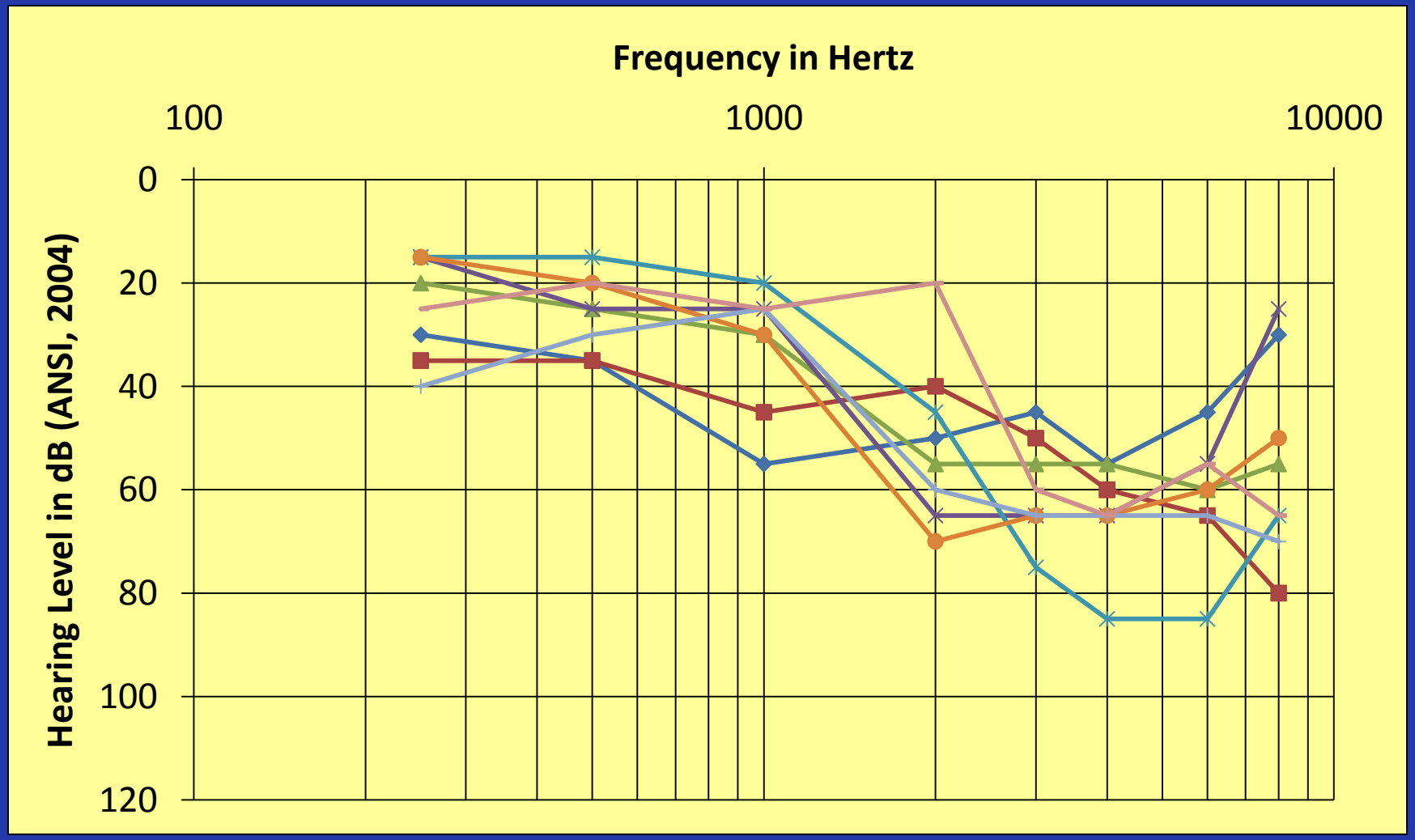
# Individual Audiogram Data for Group 3



# Individual Audiogram Data for Group 4



# Up to this Point in the Study…

- 32 participants have been fit with all 3 devices
  - 48-83 years old (mean = 70.13, SD = 8.81)
  - 22 new users, 10 with previous experience

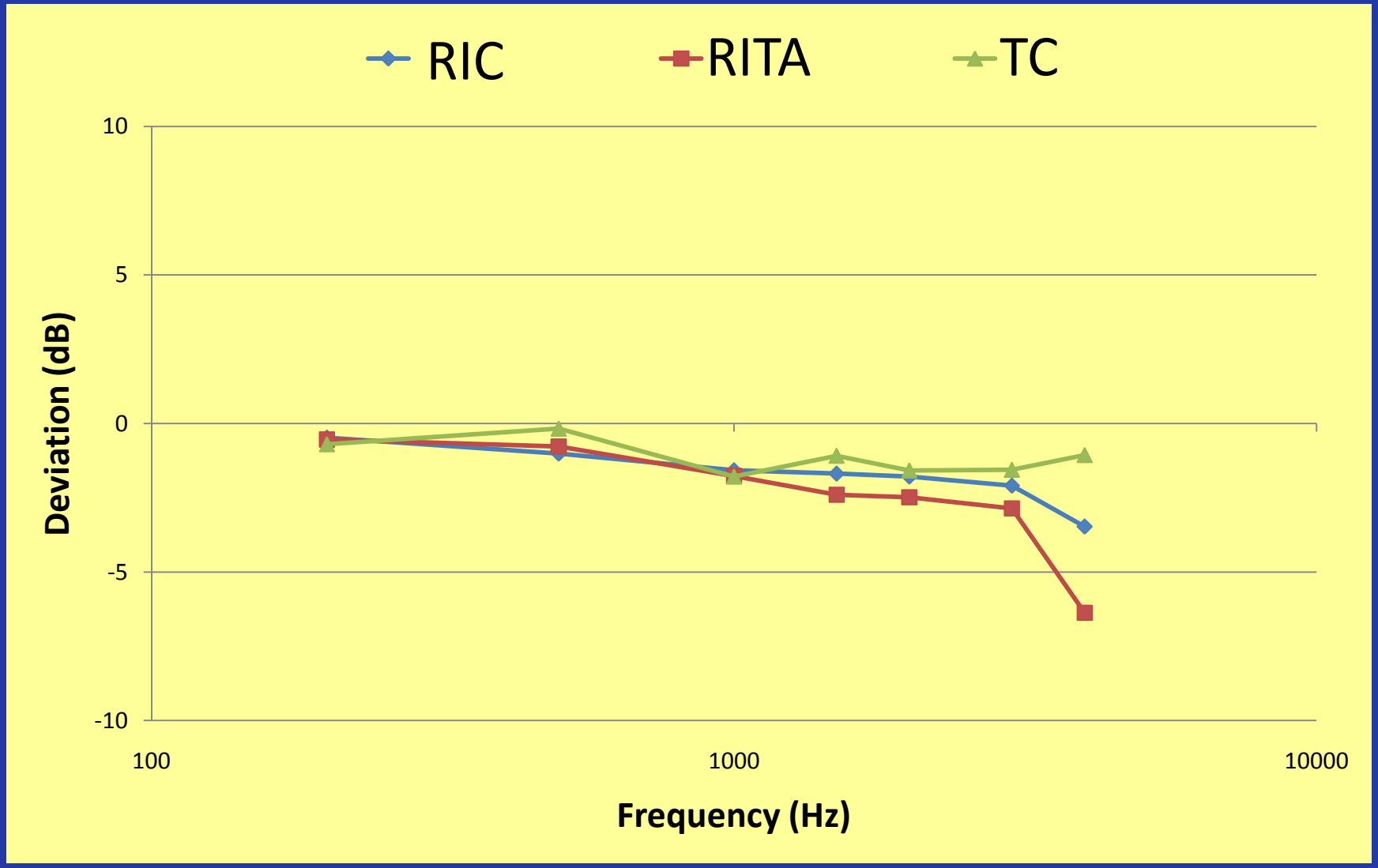
# Hearing Aid Procedures

- Frye Fonix 7000 real ear analyzer
- Goal: Match to NAL-NL1 REAR targets
  - From -4 to +2 dB for new users
  - ±3 dB for previous users

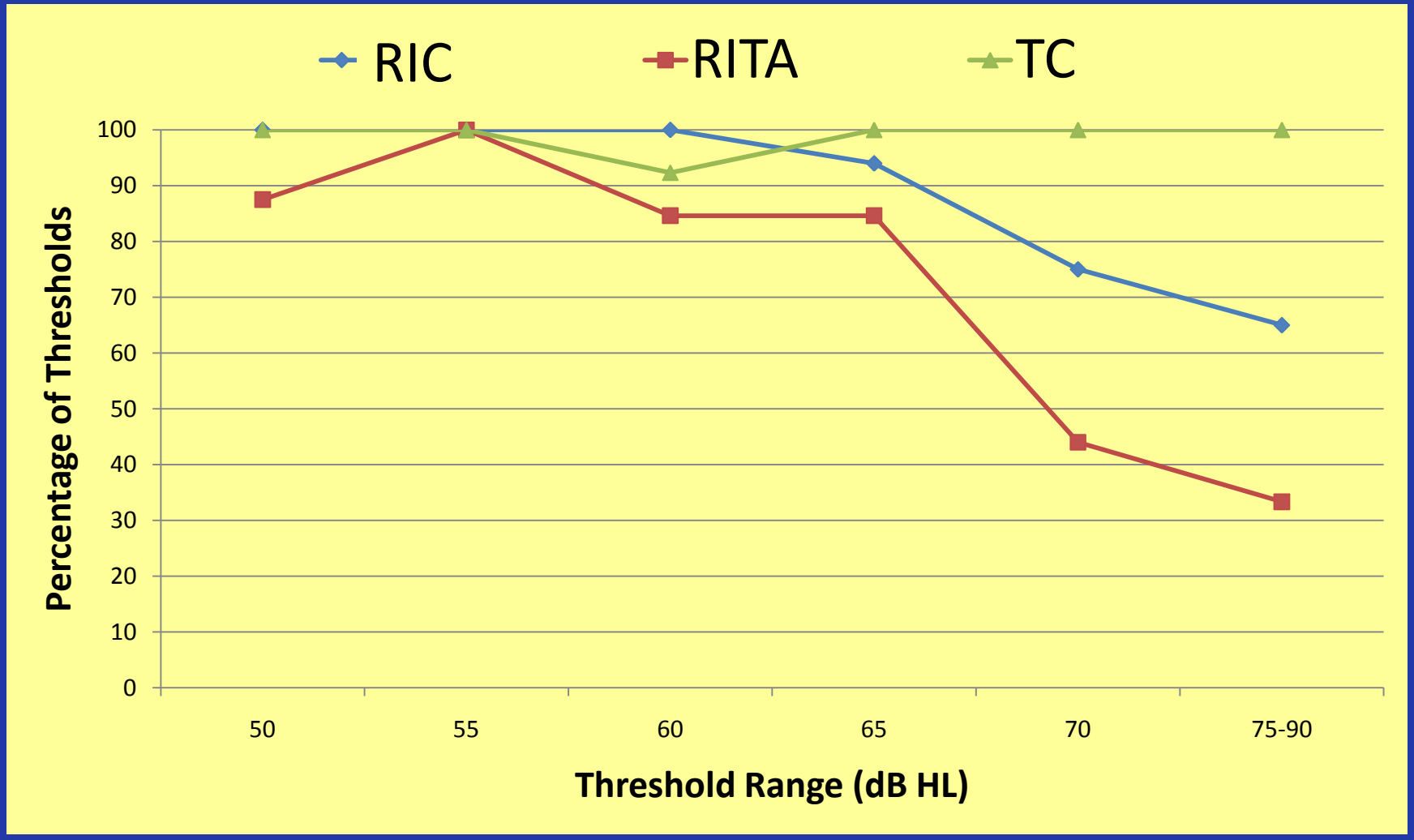
# Best Fit vs. User Fit

- Some patients prefer gain settings lower than NAL-NL1 target
- In these cases, we allowed gain reductions to the patient preferred levels, and documented "best fit" (closest to NAL-NL1 prior to feedback) and "user fit" (as worn)

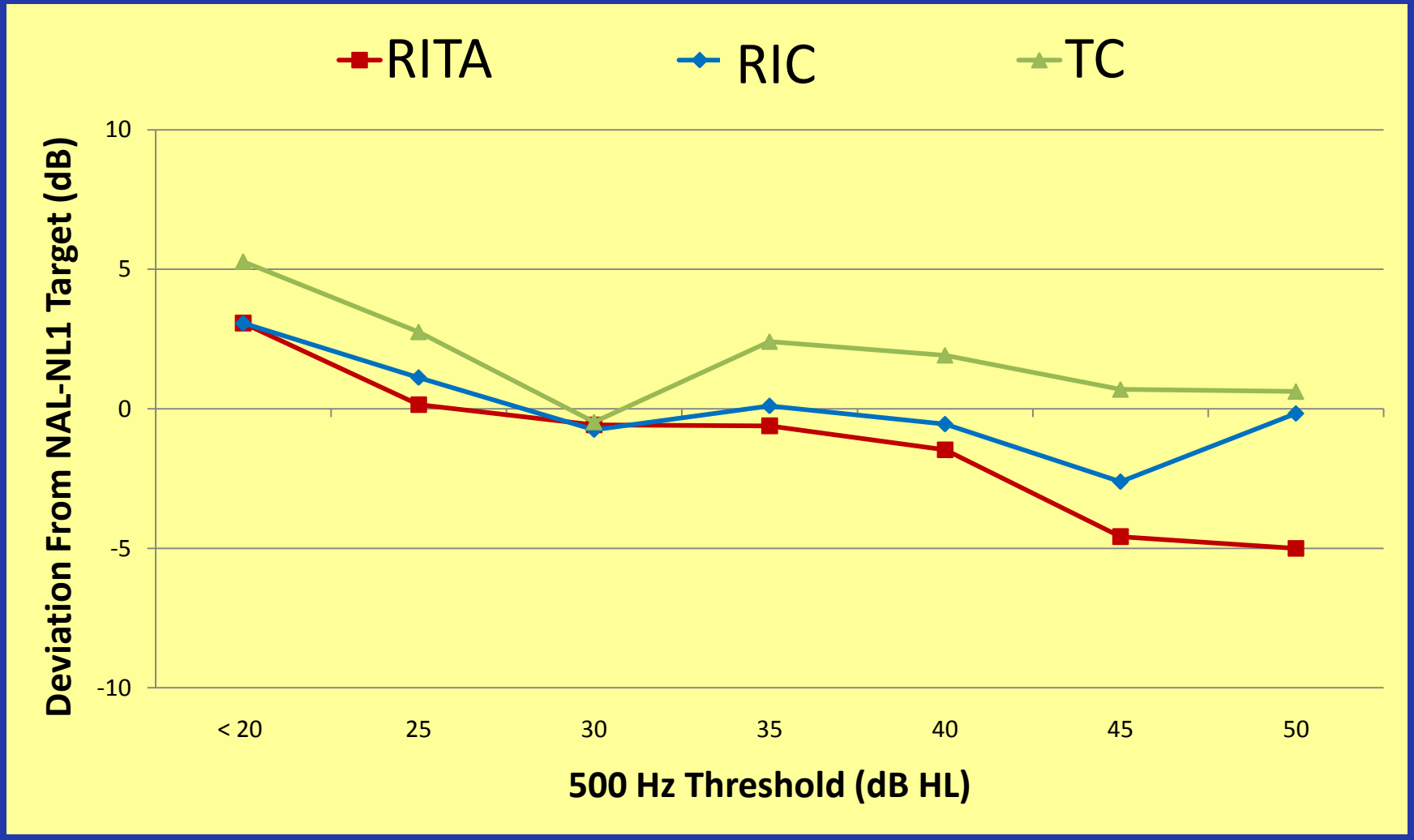
# Best Fit Deviation from Target (Average Across Both Ears)



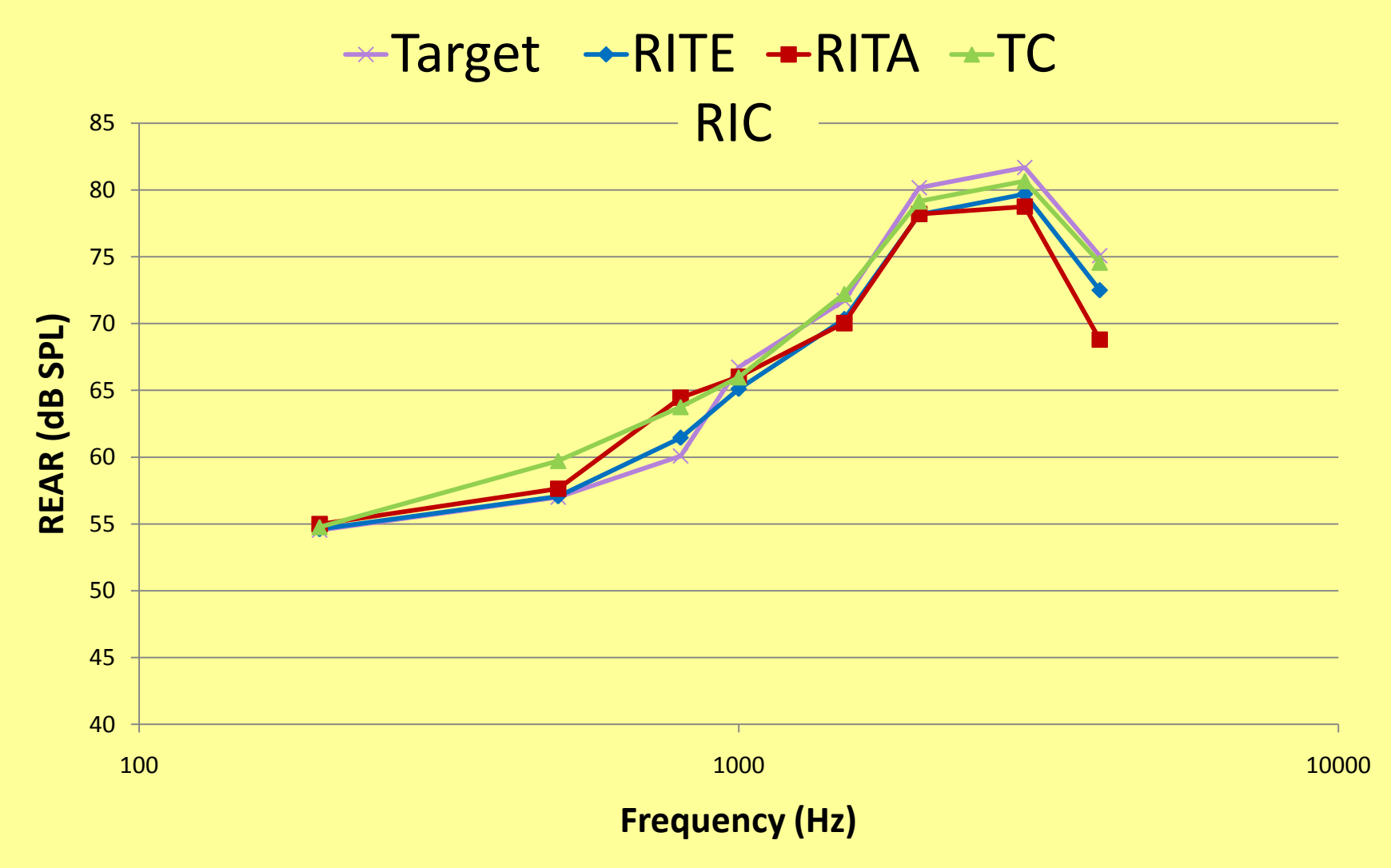
# Percentage of Thresholds Accurately Fitted to Within 5 dB of NAL-NL1 Targets (2000-4000 Hz)



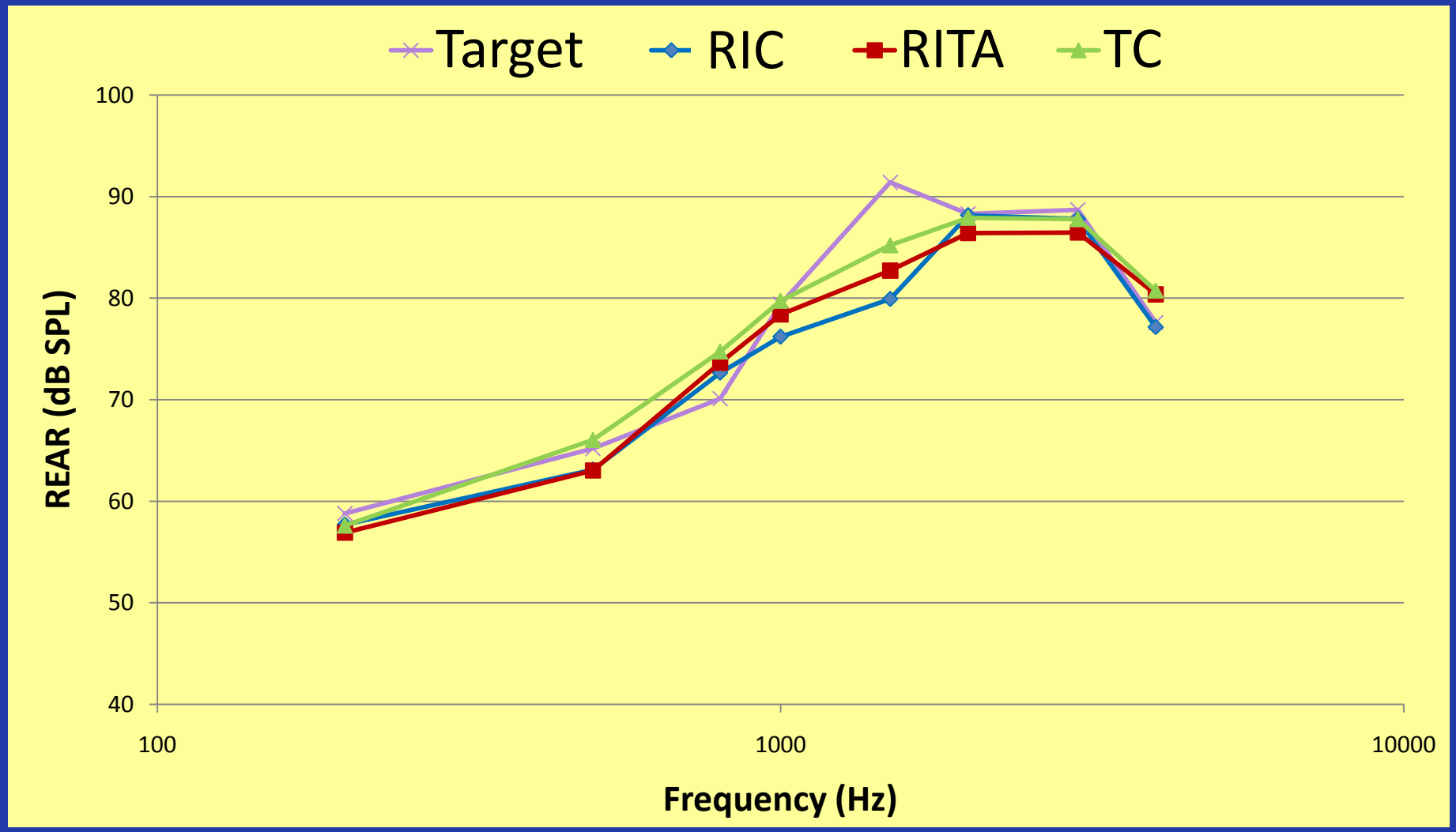
# Average Deviation from NAL-NL1 Targets as a Function of the Degree of Hearing Loss at 500 Hz



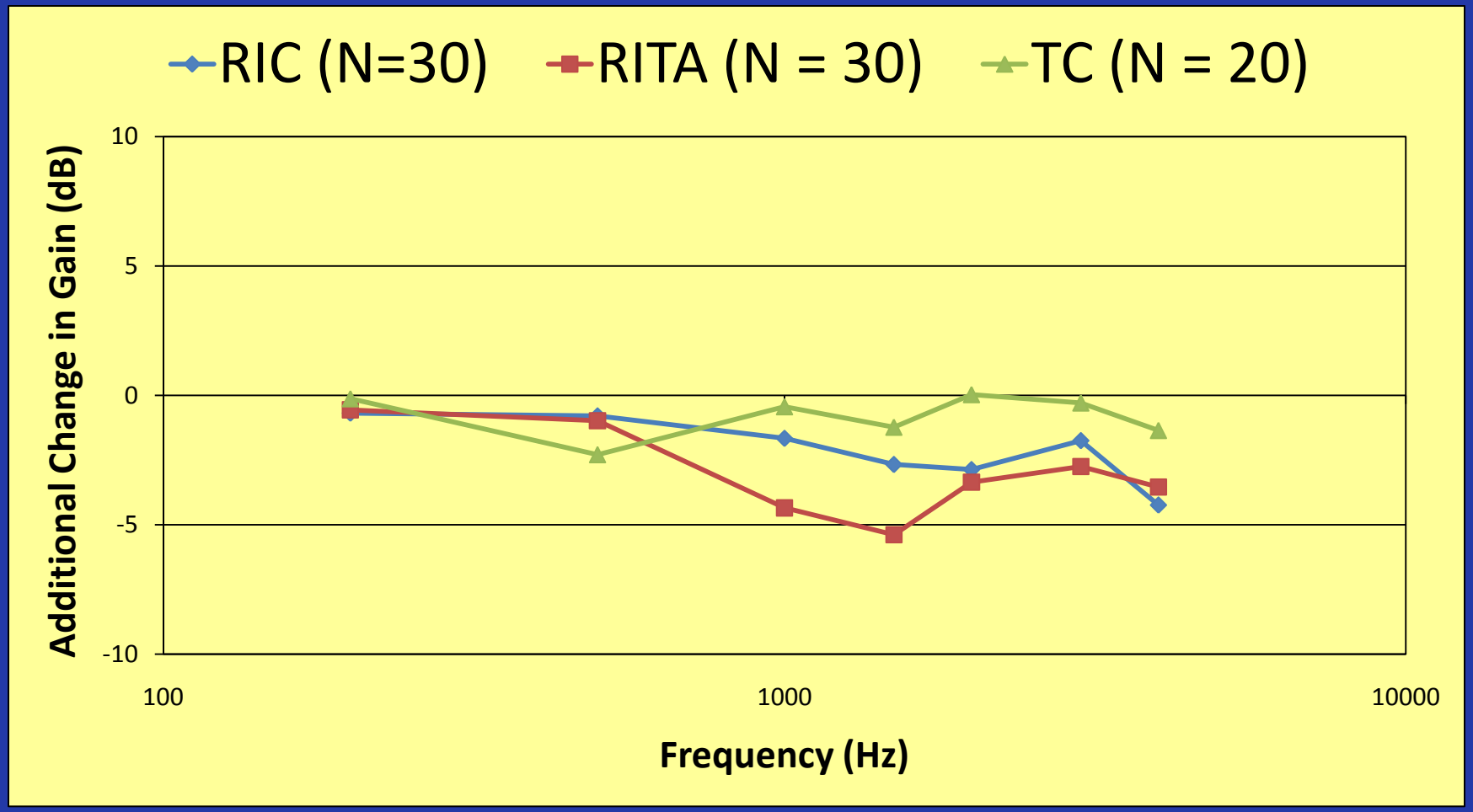
# Average REAR – Best Fit



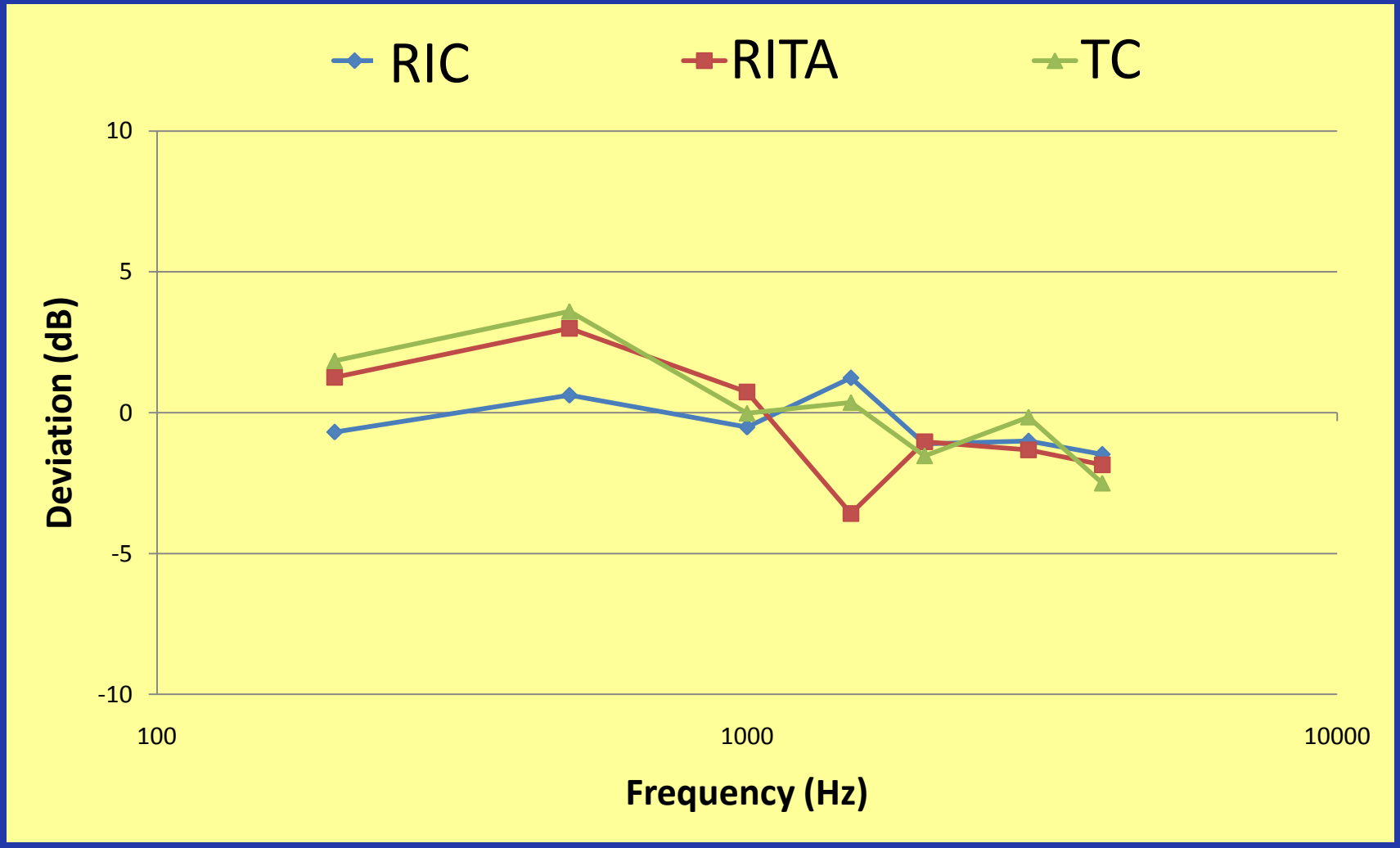
# Max REAR – Best Fit



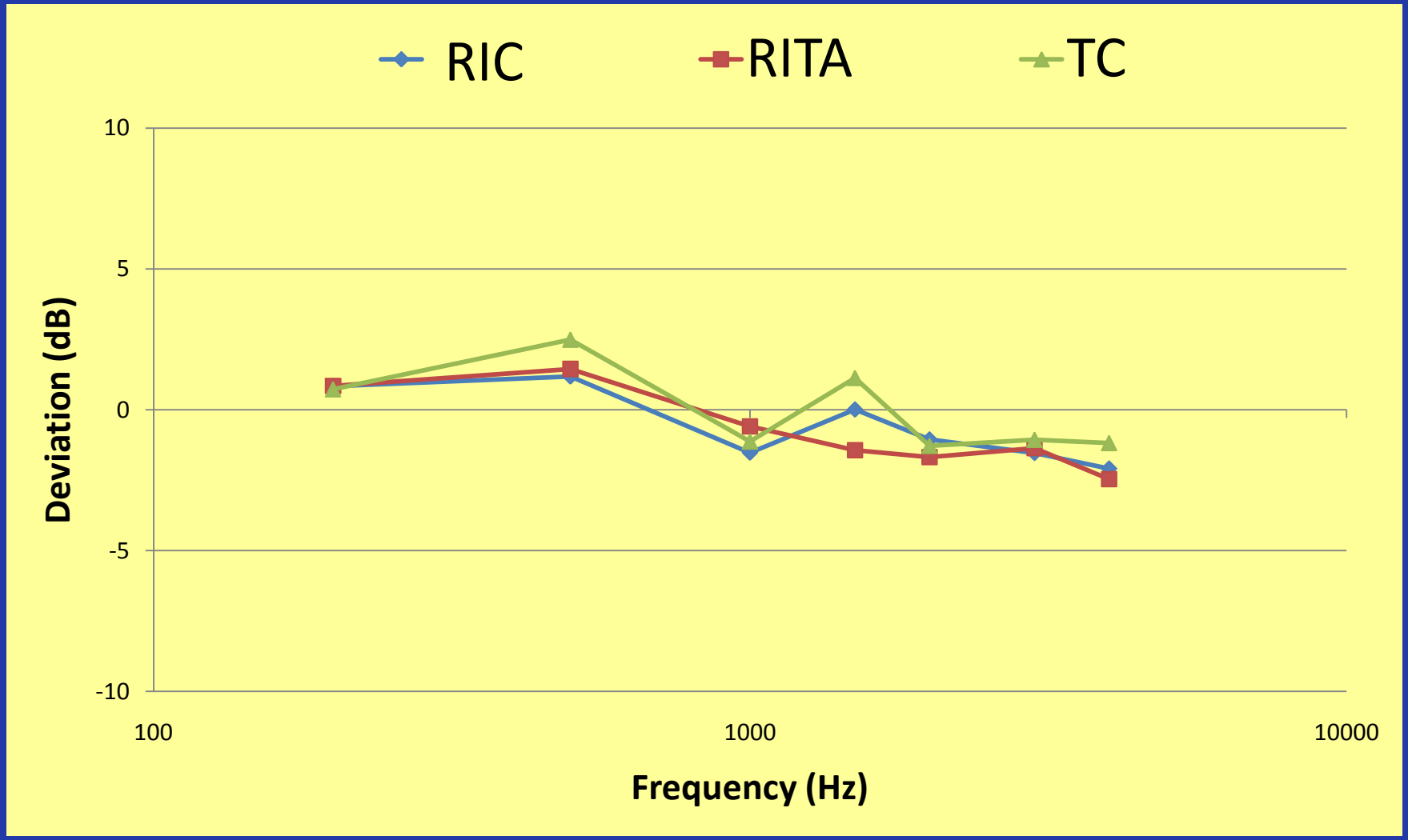
# Average Gain Changes for User Fit



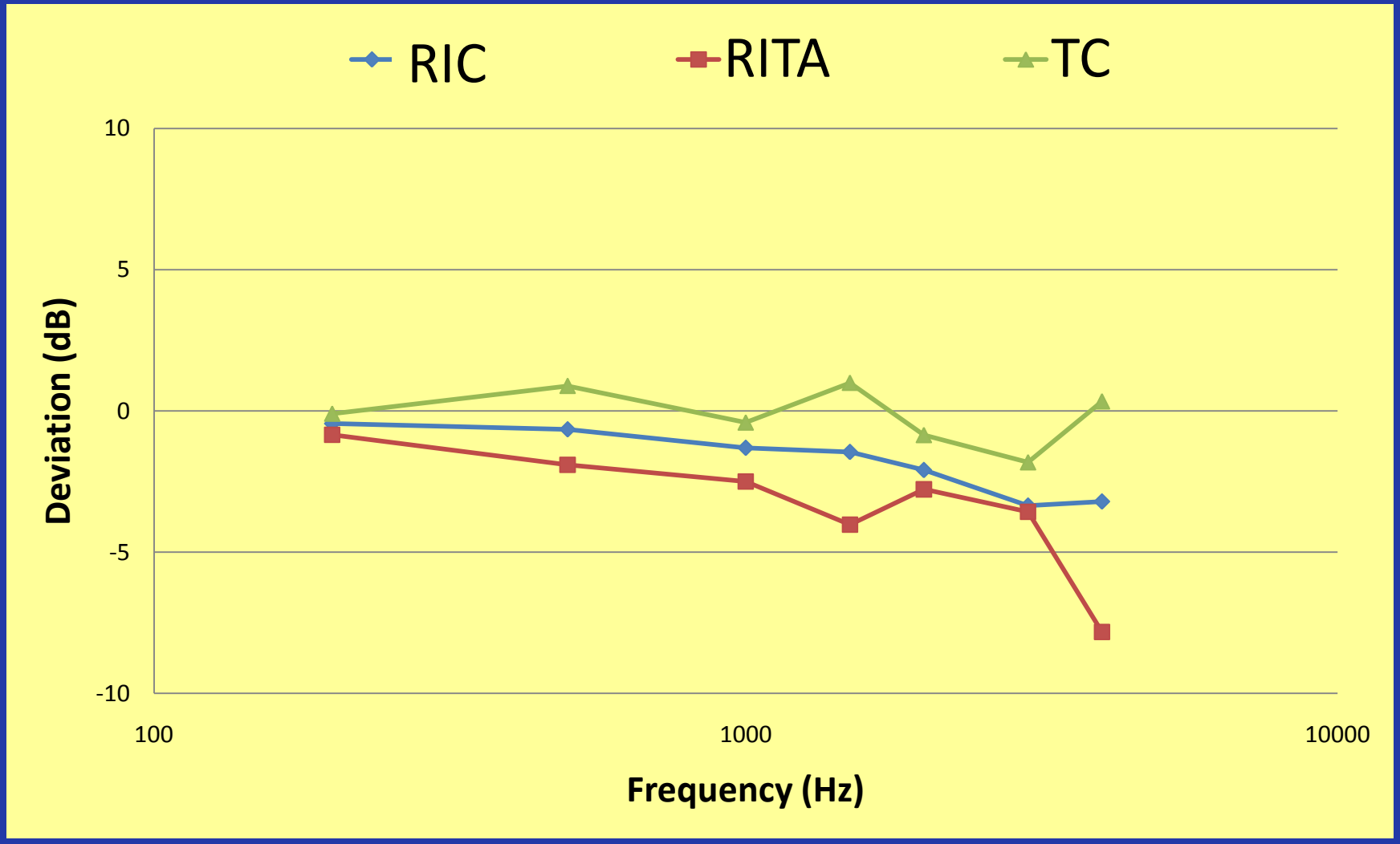
# Best Fit Deviation from Target Group 1 (6 ears)



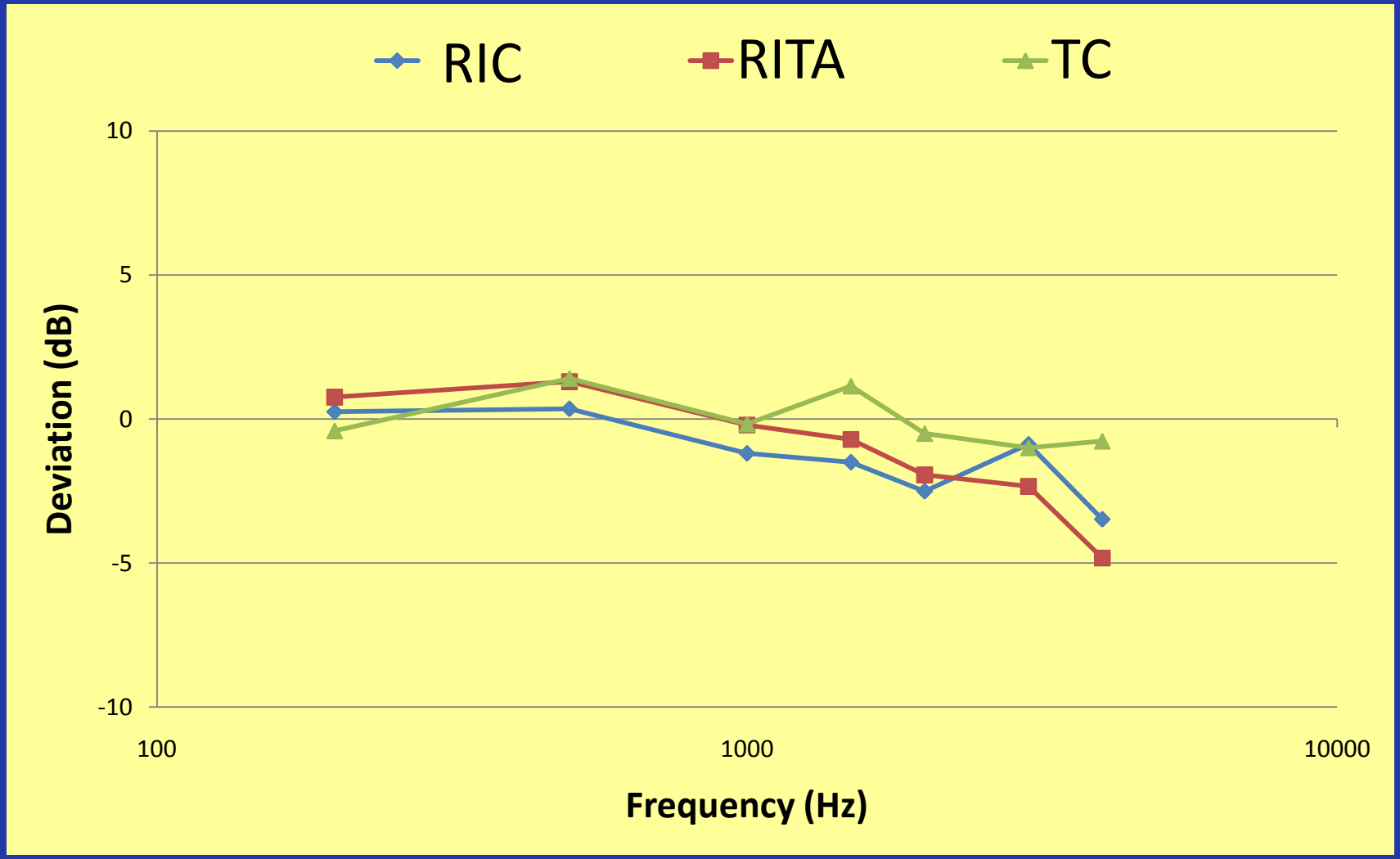
# Best Fit Deviation from Target Group 2 (24 ears)



# Best Fit Deviation from Target Group 3 (18 ears)



# Best Fit Deviation from Target Group 4 (16 ears)



# Summary of Objective Fitting Data

- Audibility is critical for any hearing aid treatment plan
- Data are preliminary, not enough yet to look at subjective outcomes in aggregate form

# Back to the Original Question:
# Who is an Open Fit Candidate?

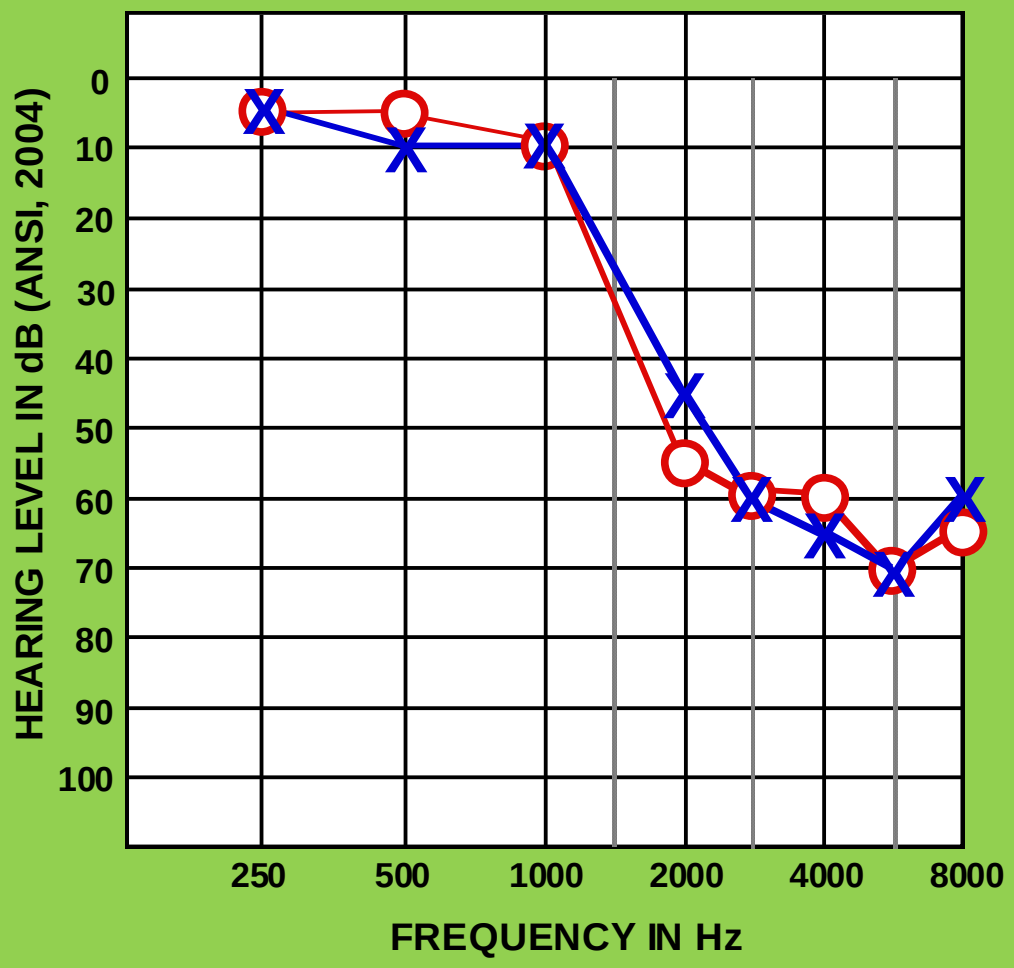
Case Studies:

Patient 1 = Traditional OE candidate

Patient 2 = Borderline OE candidate

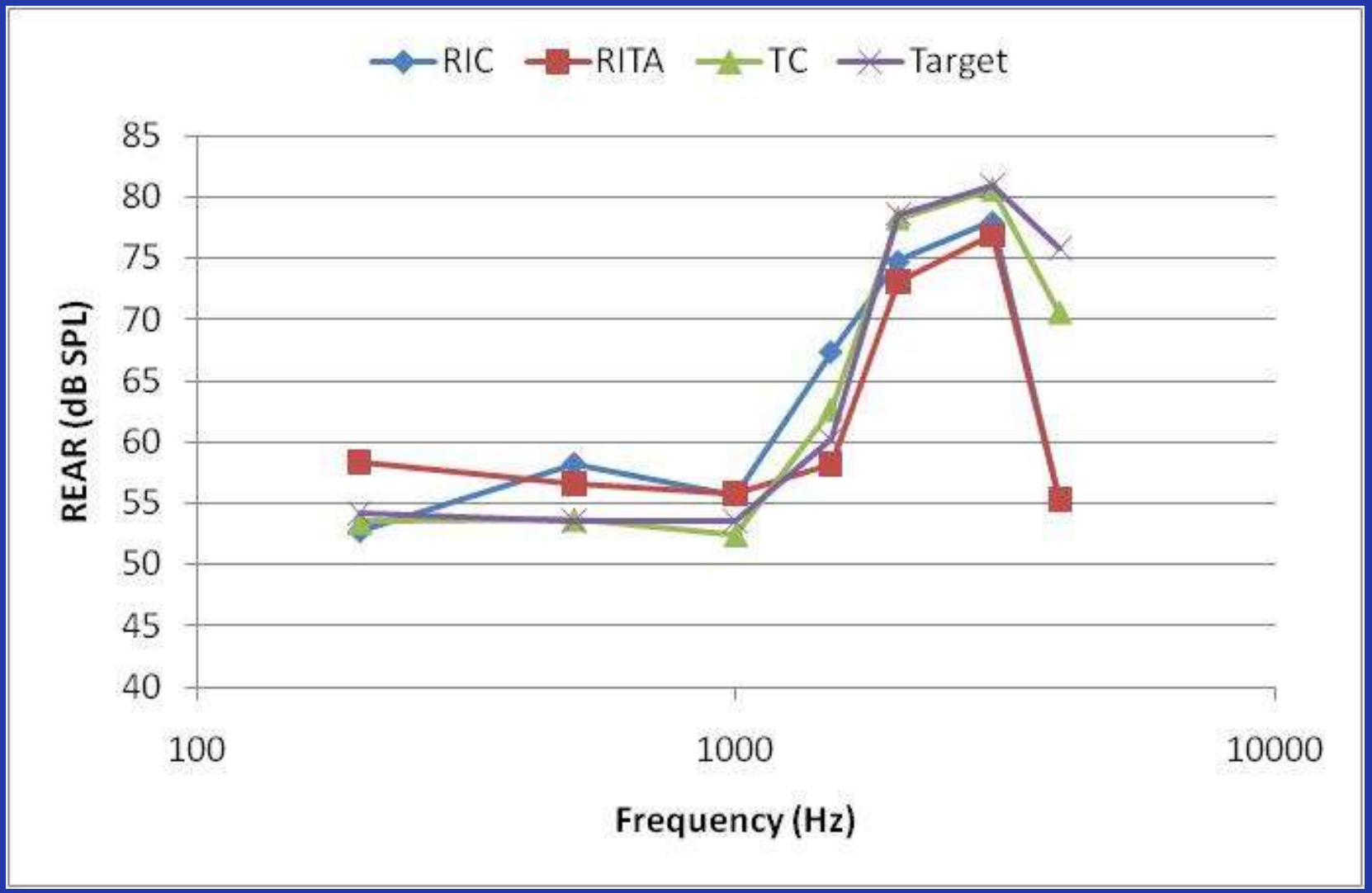
Patient 3 = Outside traditional OE candidacy

# Patient 1
# (Traditional OE Candidate)




- 48 y/o male
- New user
- NU-6 words in quiet unaided binaural score of 96%

# Patient 1 REAR (User Fit)



# Patient 1 Final Rankings

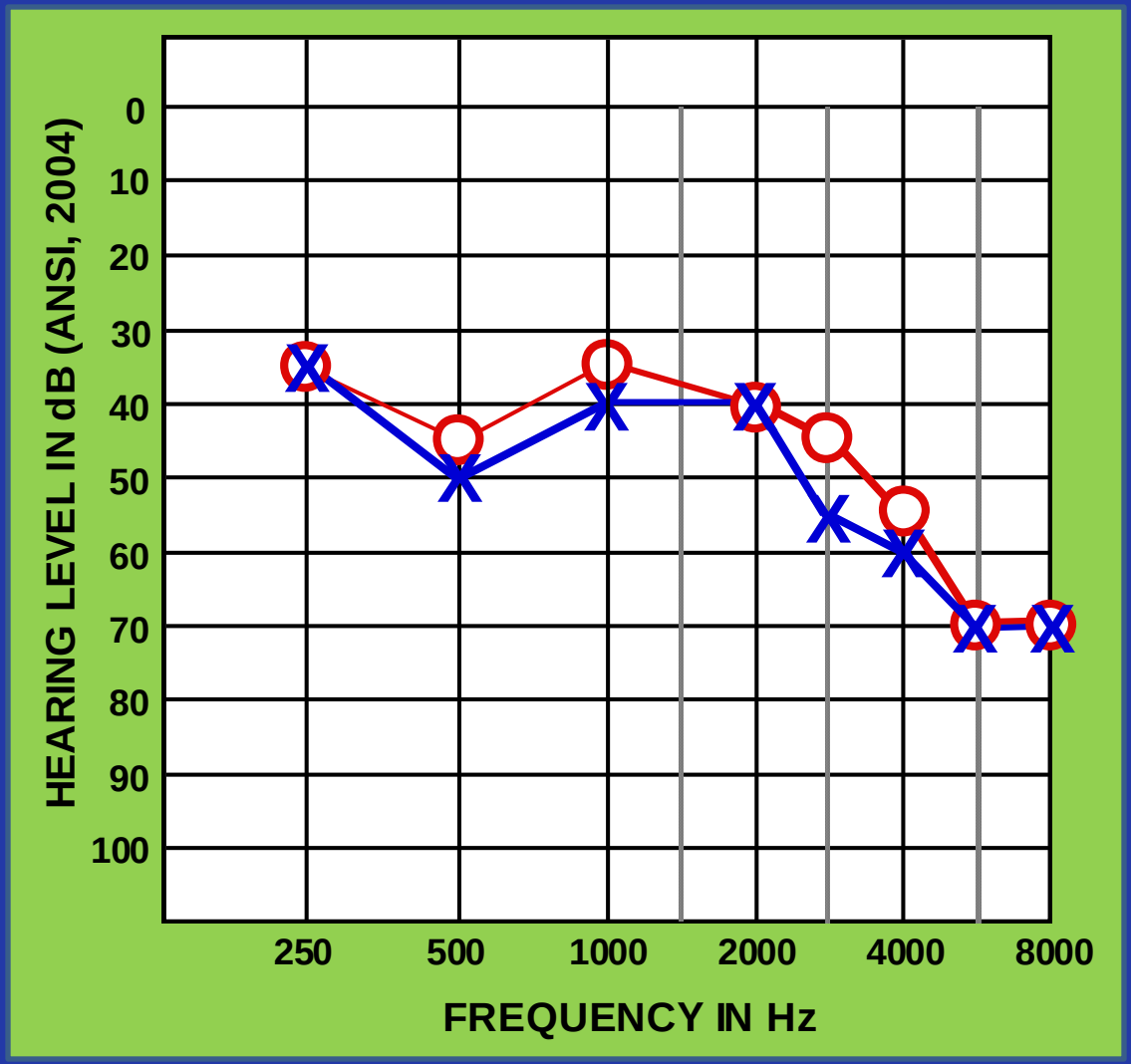
#1 RITA – 100% overall satisfaction

#2 RIC – 80% overall satisfaction

#3 TC – 75% overall satisfaction

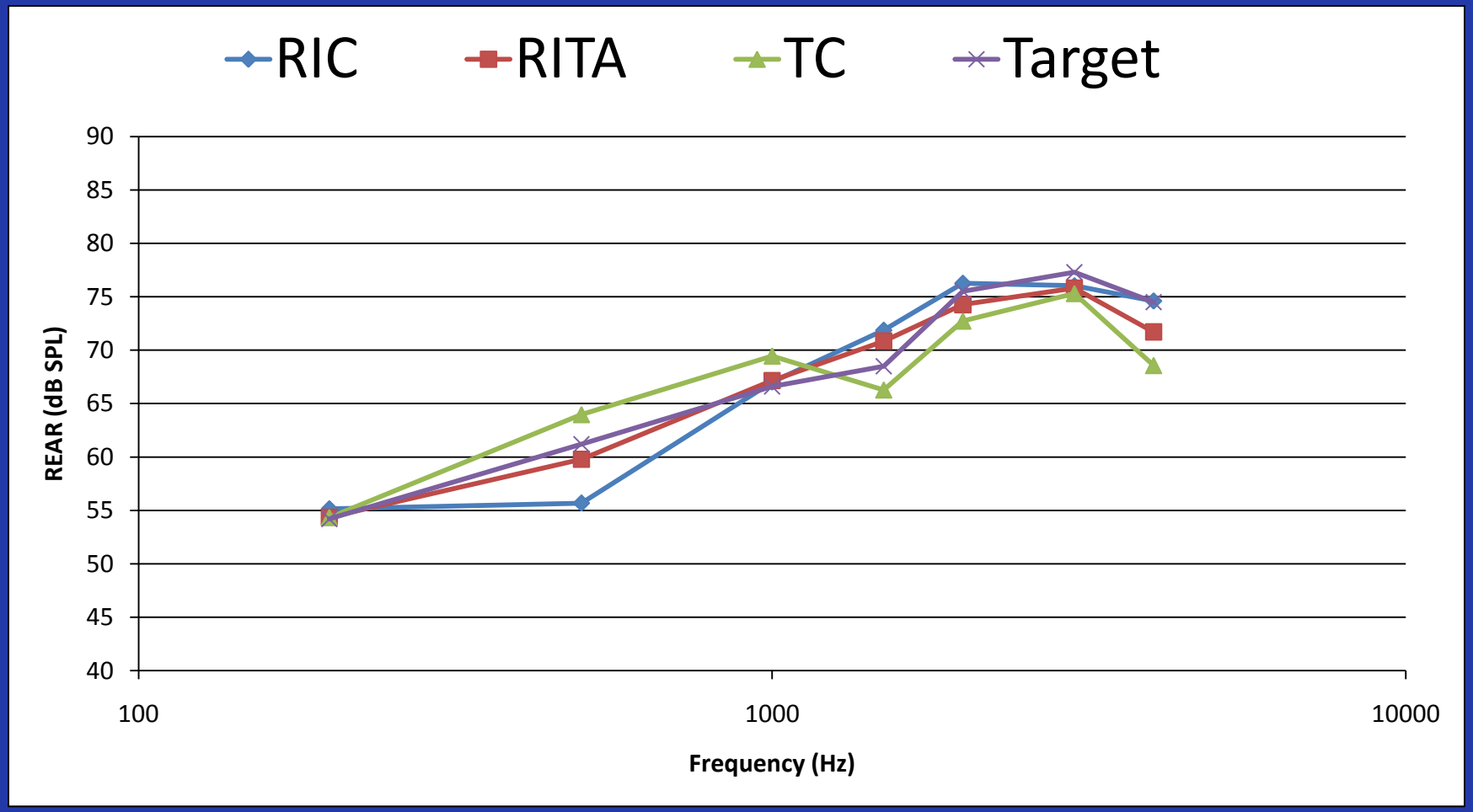
Main reason for selecting RITA over RIC was due to physical fit and main reason for selecting RITA/RIC over TC was due to sound quality.

# Patient 2
# (Borderline OE Candidate)




- 76 y/o male
- New user
- NU-6 words in quiet unaided binaural score of 88%

# Patient 2 REAR (Best Fit)



# Patient 2 Final Rankings

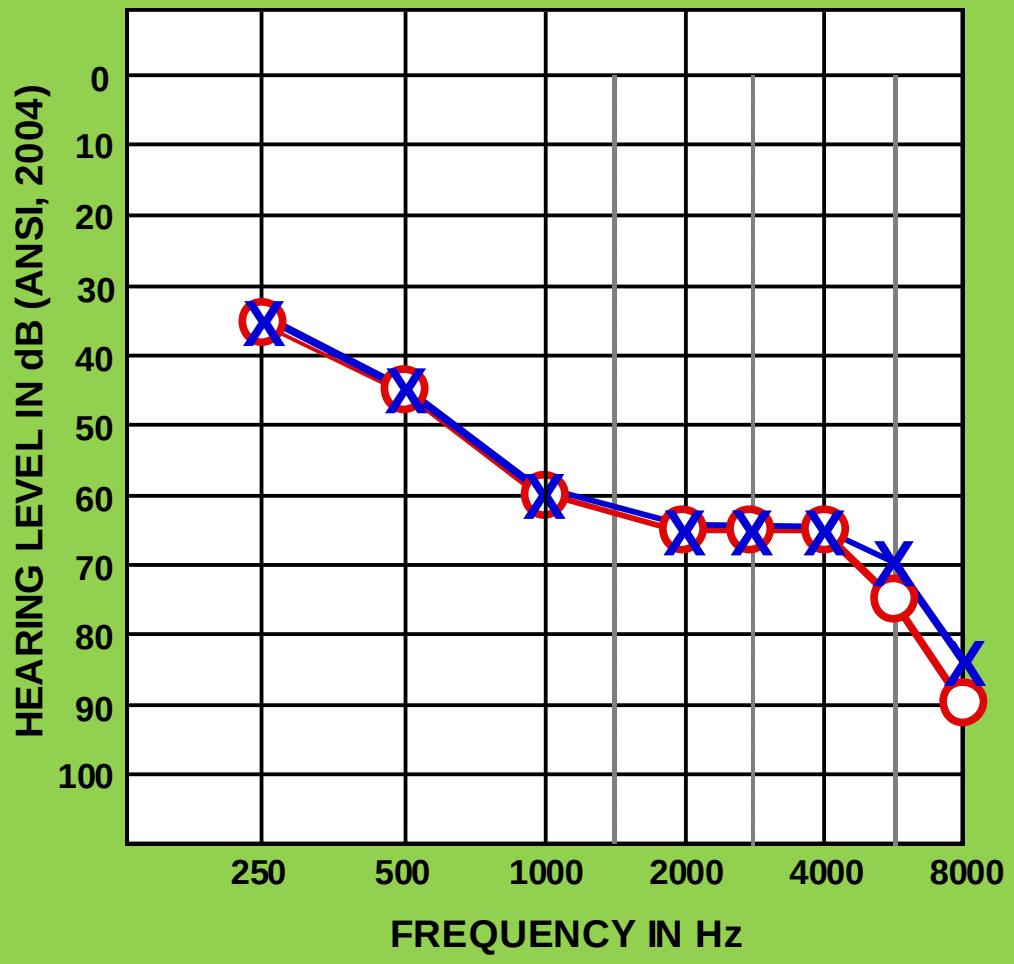
#1 RIC – 90% overall satisfaction rating

#2 RITA – 60% overall satisfaction rating

#3 TC – 70% overall satisfaction rating

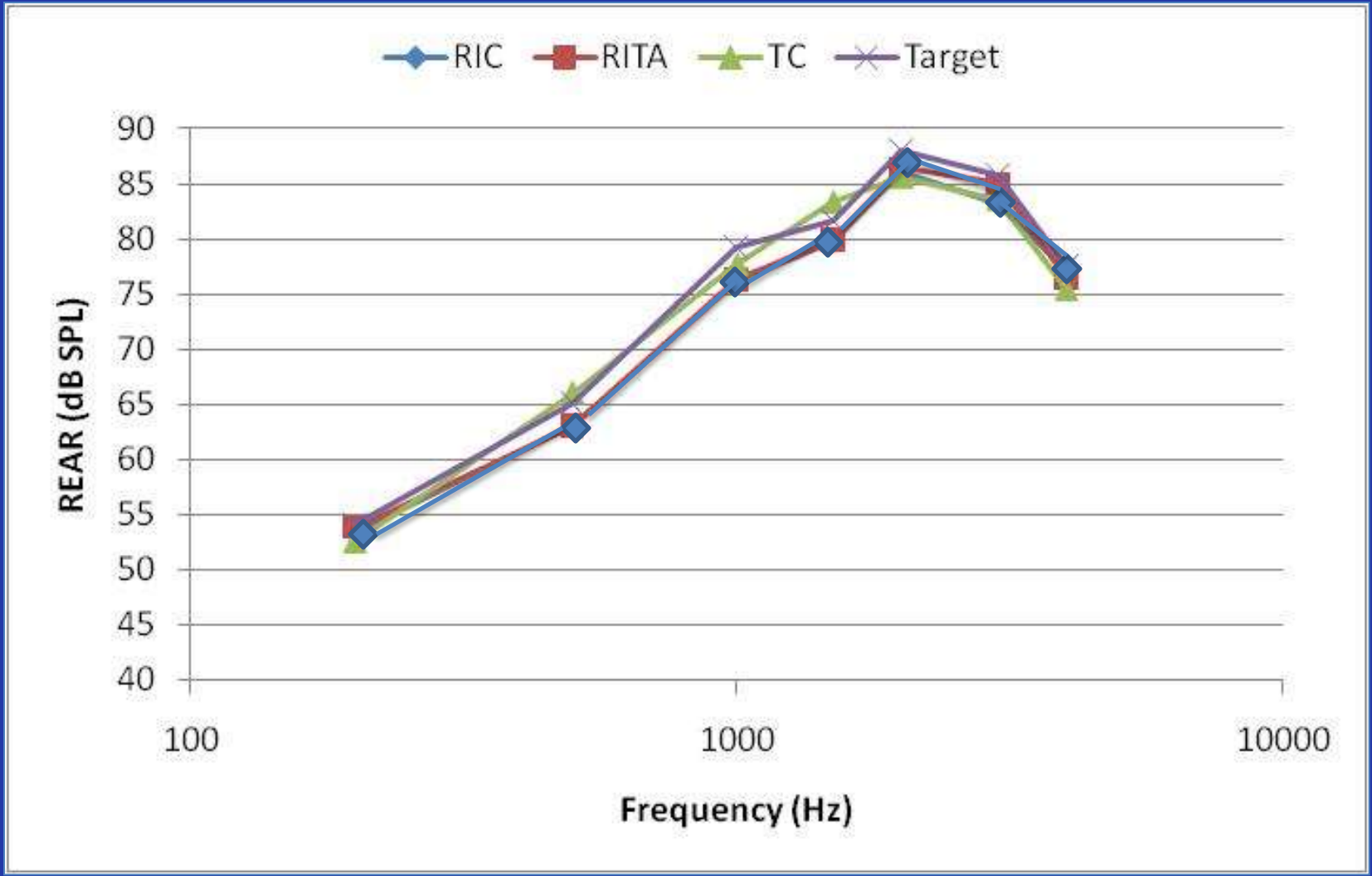
Main reasons for selecting RIC over RITA was due to cosmetics, better sound quality, and better physical fit and main reason for selecting RITA over TC was due to sound quality.

# Patient 3
# (Outside Traditional OE Candidacy)




- 81 y/o male
- Previous user with 19 years of experience
- NU-6 words in quiet unaided binaural score of 48%

# Patient 3 REAR (Best Fit)



# Patient 3 Final Rankings

#1 RITA (full size)– 80% overall satisfaction rating

#2 TC – 70% overall satisfaction rating

#3 RIC – 60% overall satisfaction rating

Main reason for choosing RITA was due to less battery drain in comparison to the TC and due to easier maintenance in comparison to the RIC.

# Gold Standard Outcome

#1 RIC – 19

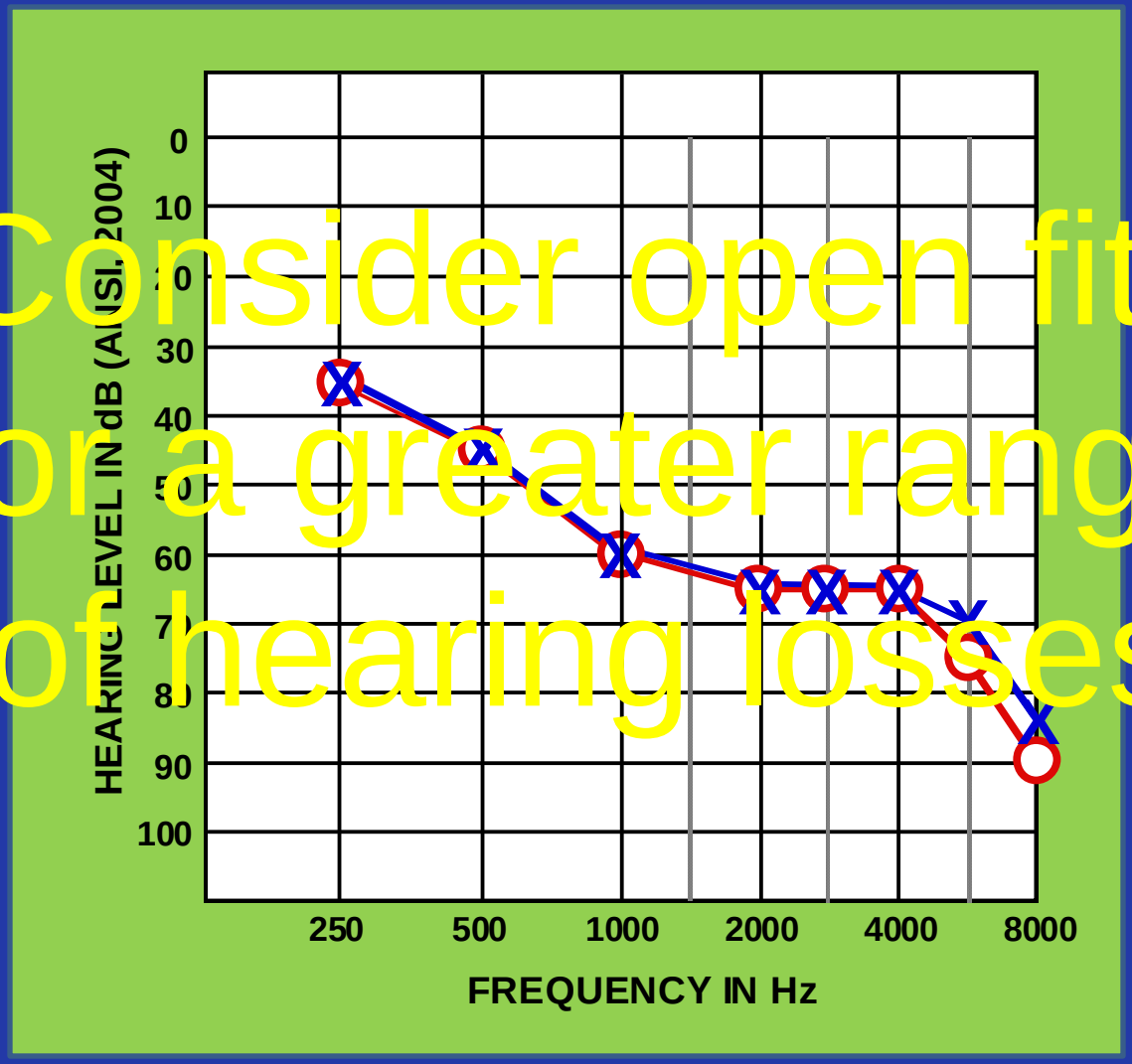
#2 RITA – 10

#3 TC – 3

# Summary

- Both open-fit styles:
  - Can fit a wide range of hearing loss
  - Can match to target through 3000 Hz
  - Are more likely to undershoot 4000 Hz but <u>can</u> meet target even with substantial hearing loss for some individuals

# What would you fit?




Consider open fits for a greater range of hearing losses