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The Telecoil: The Lonely Transducer that Can Be a Big Producer

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The Telecoil: The Lonely Transducer That Can Be A Big Producer

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I know what you're thinking……

The title of this presentation is the highlight and it's all downhill from here!

But, I'm going to try to get you……

Outline

- **Introduction-Looping America**
- **Looping homes**
- **Examples of t-coils**
- **Orientation of t-coils for telephone and Hearing Assistive Technology (HAT)**
- **Some random, but somewhat connected thoughts**
- **Objective measures of t-coil performance using coupler (ANSI-2003)**
- **T-coil programming**
- **Research Projects**

Introduction

Recently, there has been a surge in interest, and the importance, of the telecoil due to the AAA & HLAA joint campaign to Loop America.

Get in the Hearing Loop

A Joint Project of the Hearing Loss Association of America and the American Academy of Audiology

Started @ AudiologyNow in 2010

Examples of Looping America

Main Chamber of House of Representatives
Home
Workplace
Entertainment
Places of Worship
Courtrooms
Ticket counters/information booths
Physician offices
Pharmacy counters
Elevators, trains, taxis, and buses
Transportation
Food/Dining
Education

Gerald Ford Airport
Grand Rapids, MI

Looping Taxi's in NYC

www.loopamerica.com

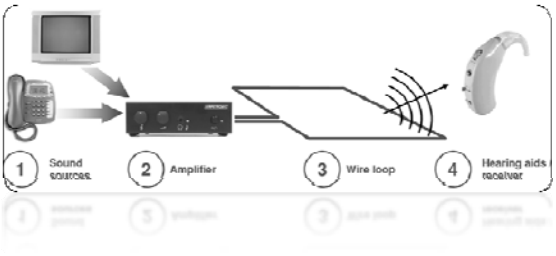
Find looping services available in your area

Do I hear…ripe for a market?

Looping Homes and Business

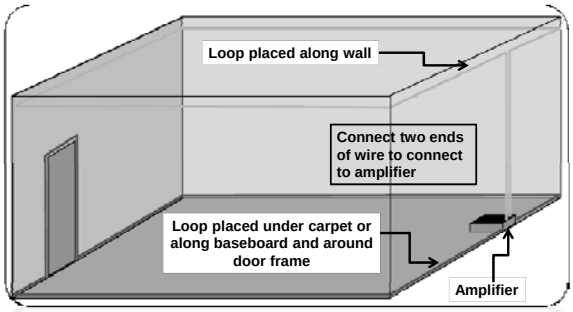
Several audiology clinics, including our own, provide this service

Induction Loop System

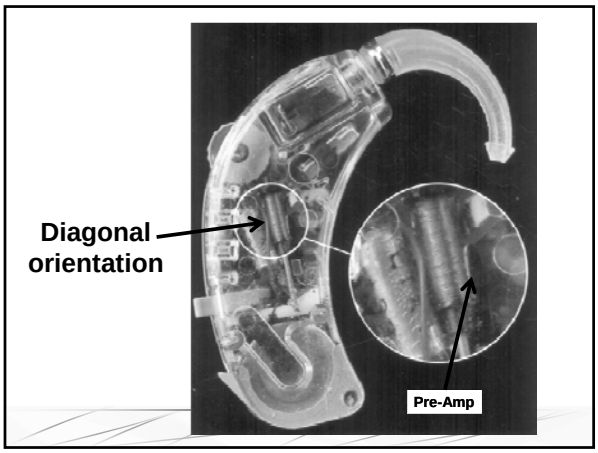


Four counseling rooms are looped in our Department

Home Loop System



Examples of T-Coil



Yanz and Pehringer (2003)

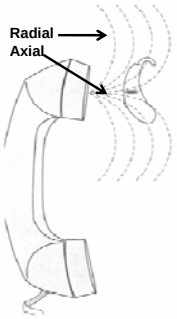
T-Coils should:

- **Be pre-amplified and programmable**
- **Included as it's own program**
- **Automatically switch from microphone to t-coil**
- **Provide bilateral signal**
- **Be multi-axis to accommodate different orientations of signals**
- **Develop a simple field strength meter for patients to assess strength of signal source**

Orientation of T-Coil

Axial (straight on) and radial (to the sides) magnetic fields from a telephone receiver to t-coil
(Preves, 1996)

Radial is ~6 dB less than axial.



Telephone: *horizontally mounted T-coil*

HATS: *vertically* mounted *T-coil*

Many manufacturers mount the t-coil diagonally as a compromise

ReSound, years ago, had two t-coils. One vertical and one horizontal.

Some random yet connected thoughts related to the t-coil

I think it's fair to say:

a. Only 20-30% of audiologists verify that the microphone FR matches a validated prescriptive target to assure optimal performance.
b. Most audiologists do not measure t-coil performance and leave the t-coil to the manufacturer default. Wide variance in SPLITS responses in default t-coils.
c. Audiologists should counsel patients on the use of the t-coil , but some don't even know what a t-coil is!
d. Patients often report that when switching to the t-coil the sound is softer and the t-coil offers limited benefit.

When this occurs, audiologists counsel patient:

a. Place telephone receiver closer to the hearing aid and rotate until the "sweet-spot" (i.e., axial EM signal) of the t-coil is "found."
b. As a "explanation" for their difficulty, it is often counseled that differences exist between phones (inter) and within (intra) the same model.
c. Typically, most audiologists do not consider that some or all of the problem may be related to a less than ideal (whatever that is) FR (SPLITS) for the t-coil.

a. The "ideal" FR for the t-coil isn't know, but matching the programmed microphone FR would seem to be a reasonable starting point (seamless switching between transducers). Concern about interference.
b. T-coil measures are made using a <u>pure-tone</u> sweep with a TMFS (Telewand) or loop emitting a signal strength of 31.6 mA/M (60 dB SPL), but the users typically listen to <u>speech or music</u> when using the t-coil.
c. Putterman and Valente (2012): suggest ANSI should change the ANSI standard to include a speech signal to measure t-coil performance.
d. "Average" speech is @ one meter (60-65 dB SPL), but speech via a telephone is inches (~ 80-85 dB SPL).
e. Bandwidth of telephone is considerably narrower than the bandwidth of "live-speech."

Teder (2003)

National hearing aid programs in <u>England</u>, <u>Sweden</u>, and <u>Australia</u> specify that the output (dB SPL) of the t-coil (SPLITS) using a 31.6 mA/m field and the microphone using a 60 dB SPL input must be within +/- 5 dB of each other.

This is the same as saying that the RSETS must be 0 dB +/- 5 dB.

The clear implication is that 0 dB RSETS is <u>desirable.</u>

Nordic Standard
EN 60118-1 (1995)

- **Inductive signal of 31.6 mA/m shall give same output as an acoustical input of 57-67 dB SPL between 1000-4000 Hz and 55-67 dB SPL @ 500-1000 Hz.**

For the t-coil to provide maximum benefit for loop and telephone communication, equal attention must be paid to the SPLITS FR of the t-coil as is placed on the microphone FR

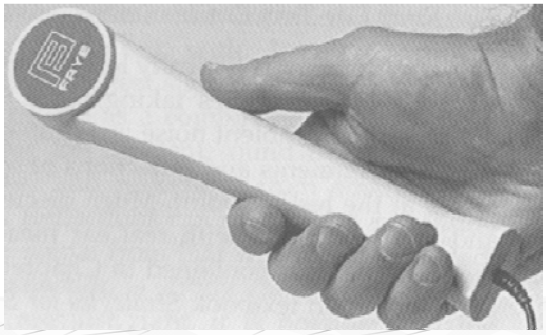
ANSI S3.22-2003

Measuring t-coil performance in a 2cc coupler

For T-Coil Measures

- **ANSI-2003: pure-tone sweep @ 36.1 mA/m using a Telephone Magnetic Field Simulator (TMFS) or loop within the test box (preferable).**

Telephone Magnetic Field Simulator (TMFS with 31.6 mA/M EM field strength)



ANSI S3.22-2003 Terminology

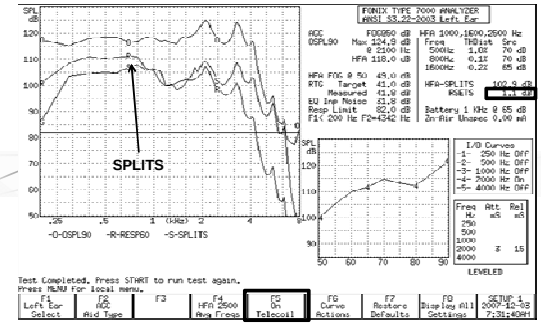
- SPLITS: SPL using an Inductive Telephone Simulator. This is the FR of the T-coil using the Telewand or loop within test box
  - HFA: @ 1000, 1600, and 2500 Hz
  - RSETS: Relative Simulated Equivalent Telephone Sensitivity or the difference in the HFA between t-coil and microphone at the average of 1000-1600-2500 Hz.
  - If RSETS is "0 dB," then HFA is equal between transducers @ 1000, 1600 and 2500 Hz.

Equipment

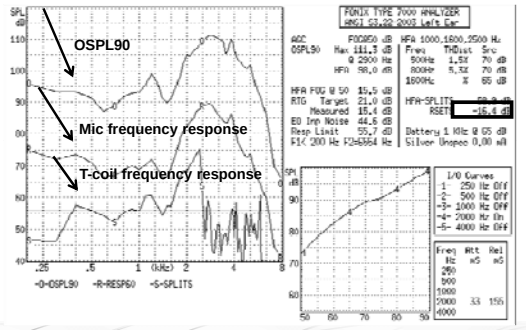
- A BTE hearing aid is placed in the test chamber for microphone measure.
- A Telephone Magnetic Field Simulator (TMFS) held near the case of a BTE hearing aid for telecoil measures. Can also use a loop built into the chamber

Courtesy of Frye Electronics, Inc.

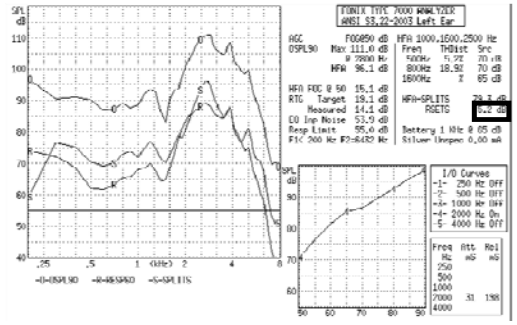
Telecoil Response



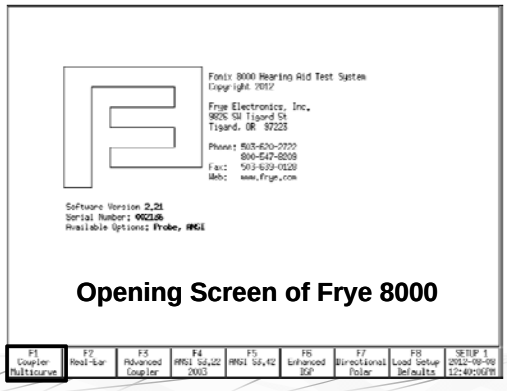
Relative Simulated Equivalent Telephone Sensitivity (RSETS): not programmed



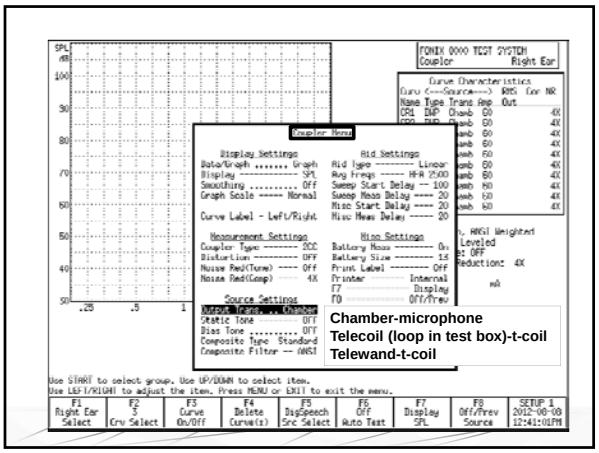
T-Coil Programmed

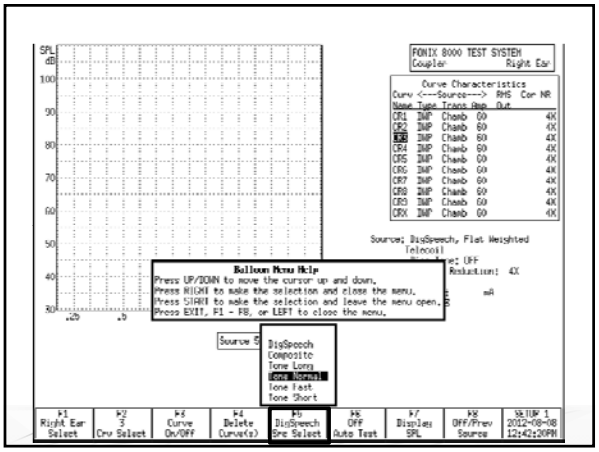


Using the Frye “Coupler Multi-Curve Option” to Allow Multiple Measures of Frequency Response

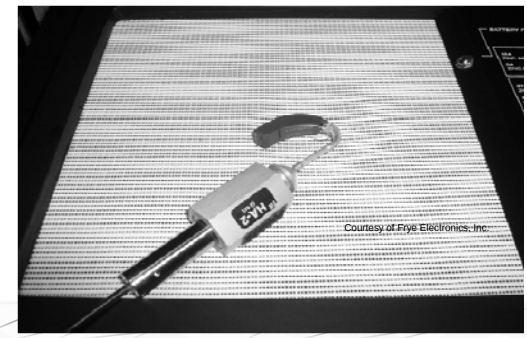


Opening Screen of Frye 8000



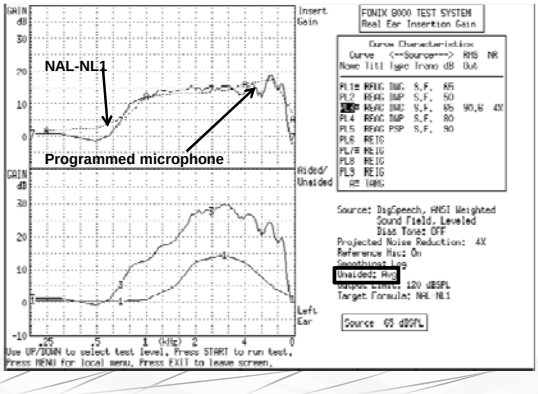


Coupler microphone response after the microphone programmed to NAL-NL1 using Real Ear Measures

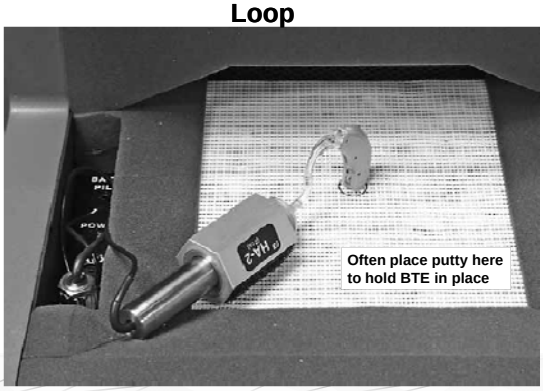


Case #1

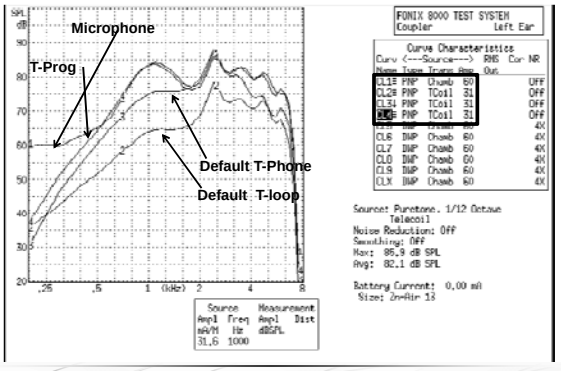
Microphone programmed to NAL-NL1



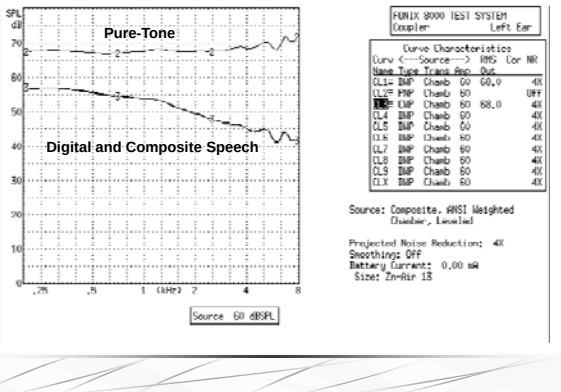
Evaluating the Telecoil Using the Built-In Loop



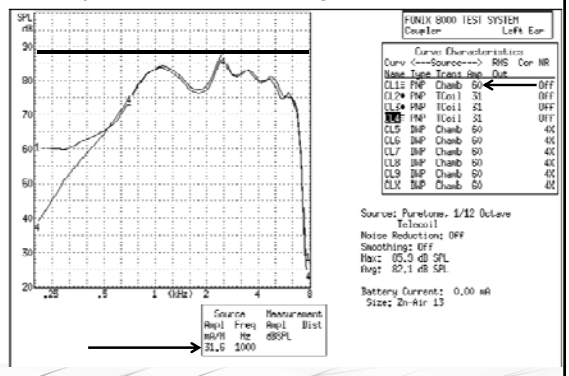
Pure-Tone Sweep (60 dB SPL; 31.6 mA/m)



Pure-Tone and Speech @ 60 dB SPL

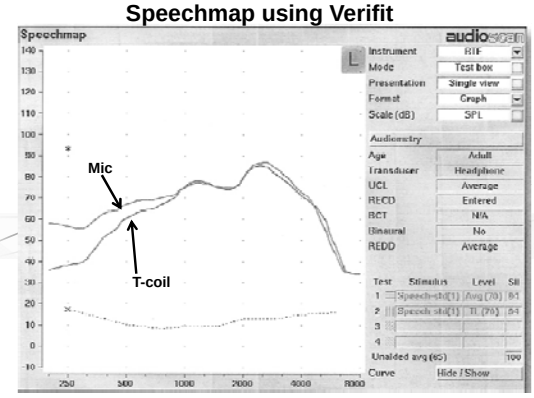


Microphone and T-Prog to Pure-Tone



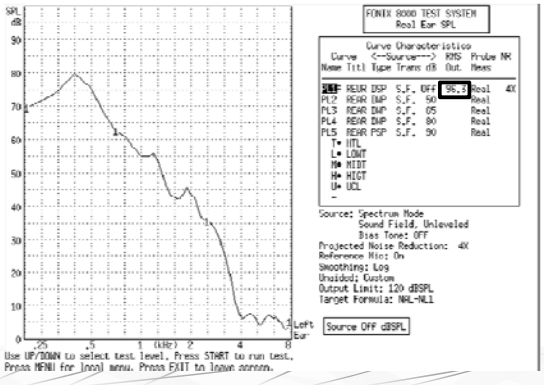
Microphone and T-Prog to Speech

T-Coil Measure to Microphone Response in Speechmap using Verifit

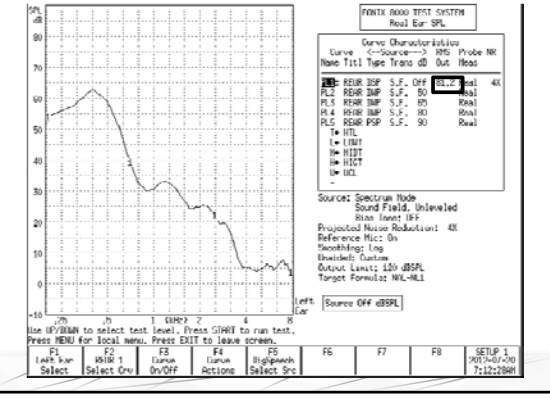


SPL of Various Positions of Telephone at the Ear

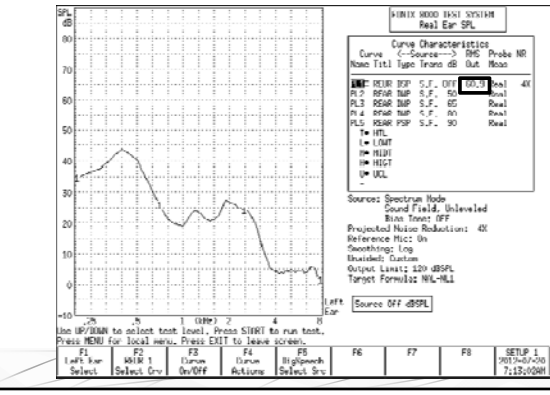
SPL @ TM with Telephone Receiver @ Entrance to the Ear Canal and the VC of Telephone @ MAX



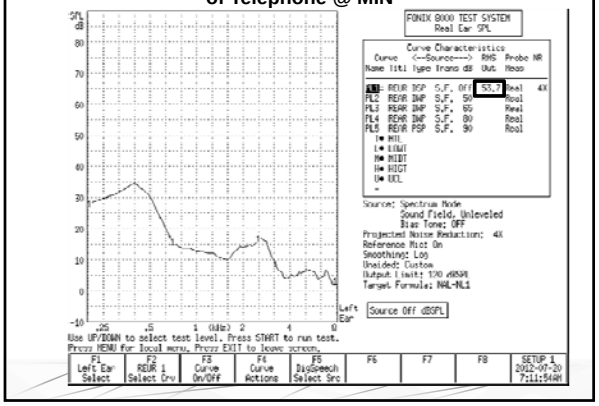
SPL @ TM with Telephone Receiver @ Entrance to the Ear Canal and the VC of Telephone @ MIN



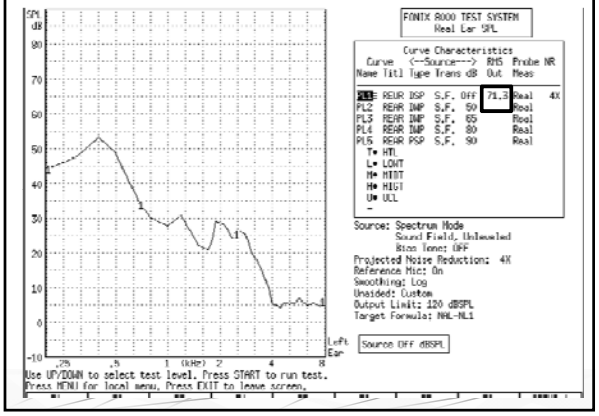
SPL @ TM with Telephone Receiver Over the Ear and the VC of Telephone @ MAX



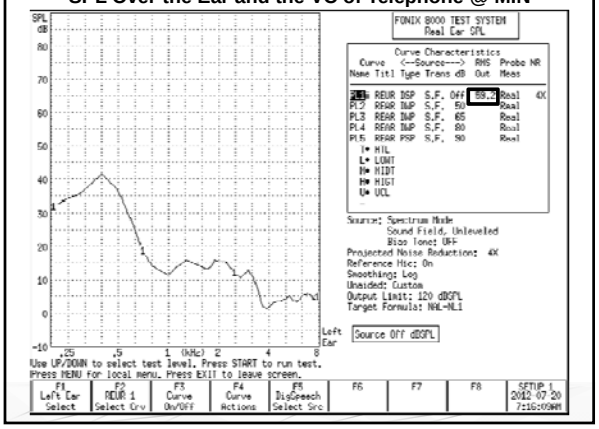
SPL @ TM with Telephone Receiver Over the Ear and the VC of Telephone @ MIN



SPL Over the Ear and the VC of Telephone @ MAX



SPL Over the Ear and the VC of Telephone @ MIN

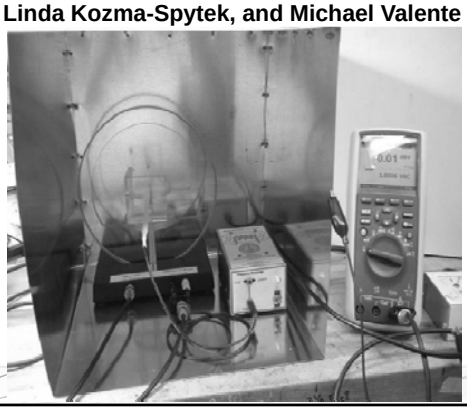


Tools for Assessing T-Coil Performance

Michael Valente and Arnold Heidbreder

To earphone output of audiometer from CD to deliver any signal (NU-6; HINT; sound quality judgments, etc)

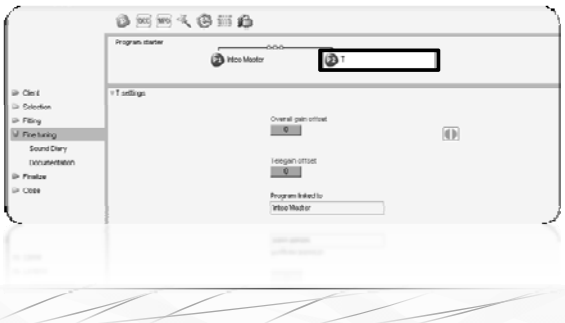
Stephen Julstrom, Arnold Heidbreder, Linda Kozma-Spytek, and Michael Valente



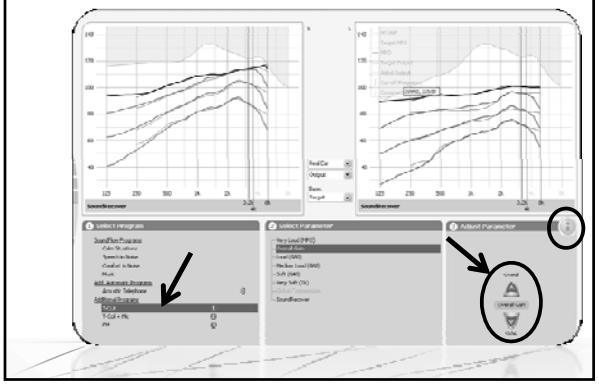
What if RSETS is not 0 dB? What are options to program t-coil to microphone to achieve 0 dB RSETS?

Examples of differences across some manufacturers to program the t-coil

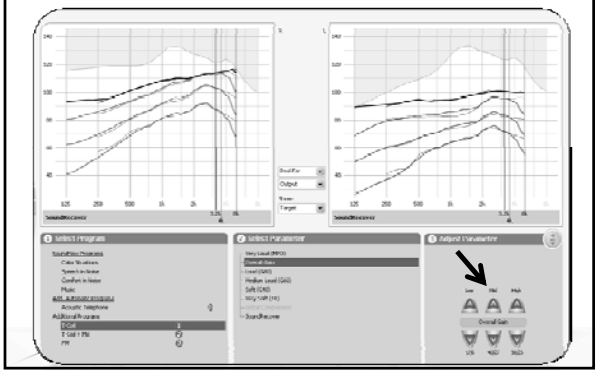
Widex: Program overall gain



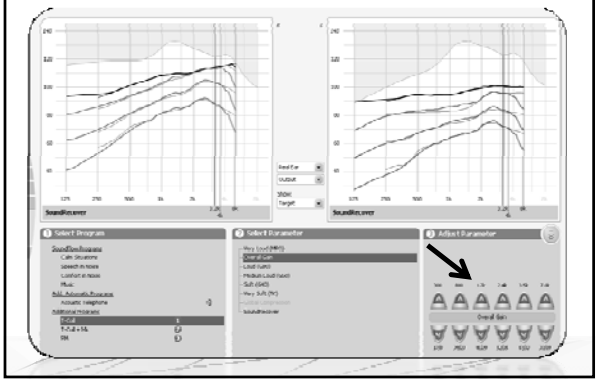
Phonak: Program overall gain



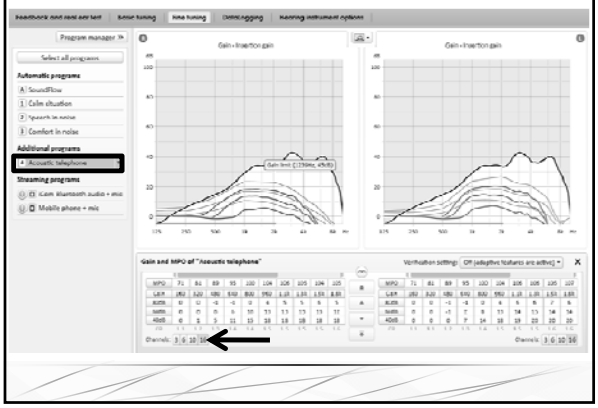
Phonak: Program in 3 bands



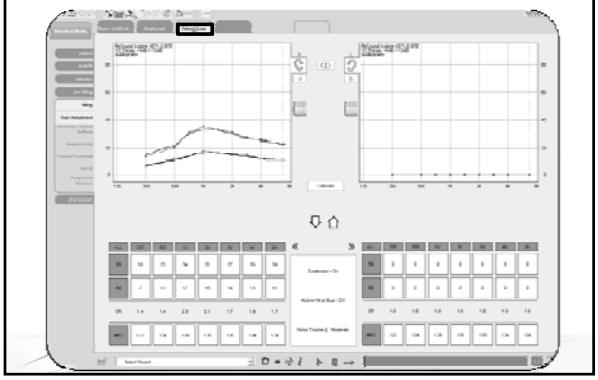
Phonak: Program in 6 bands



Phonak "Target" Software: 16 Bands



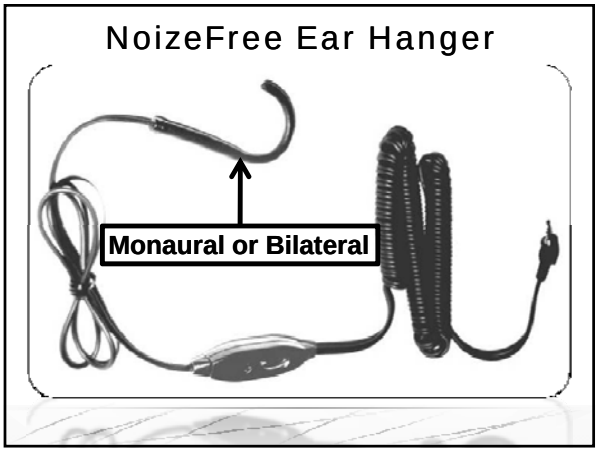
ReSound: Program 7 Bands

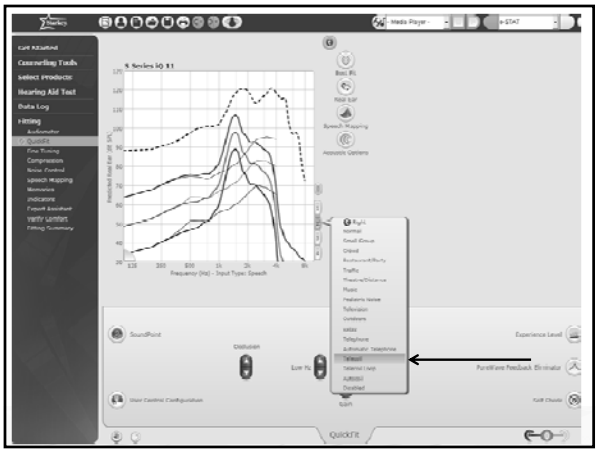


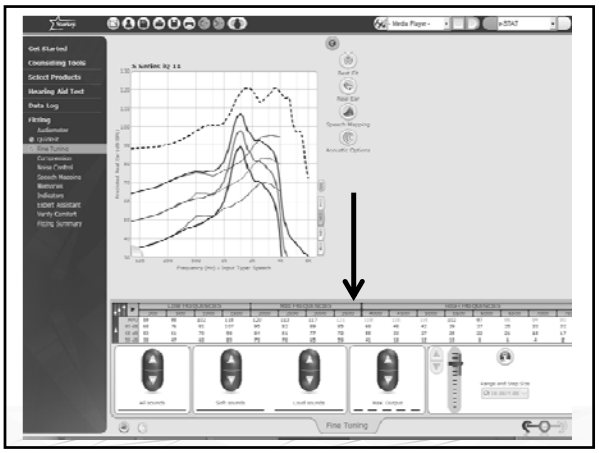
T-Coil Projects

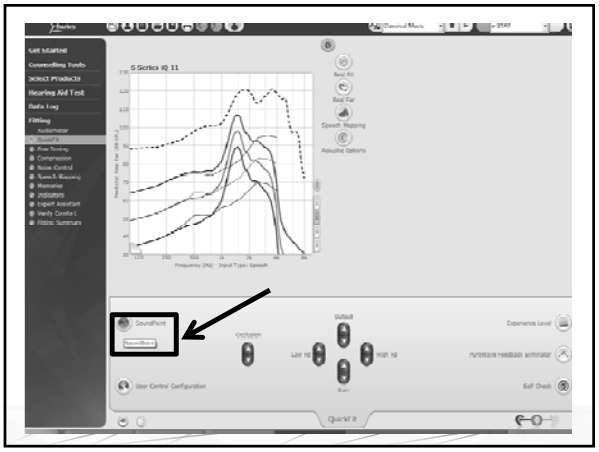
- **Does programming the t-coil to match the microphone response programmed to NAL-NL1 provide improved sentence recognition compared to default t-coil?**
- **Can improved performance in personal FM systems be achieved using a NoizFree ear hanger instead of a neck loop (next slides).**
- **Difference in t-coil response with a speech signal compared to a pure-tone sweep.**
- **Impact of low-frequency roll off on sentence recognition and patient perceived interference and annoyance.**
- **Does programming the t-coil via patient preference provide improved sentence recognition**

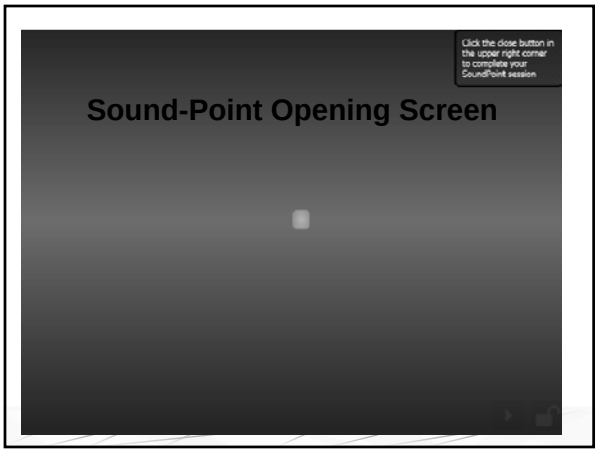
NoizeFree Ear Hanger

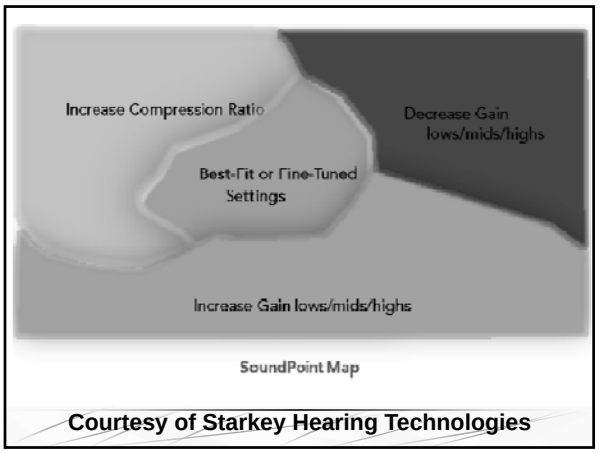




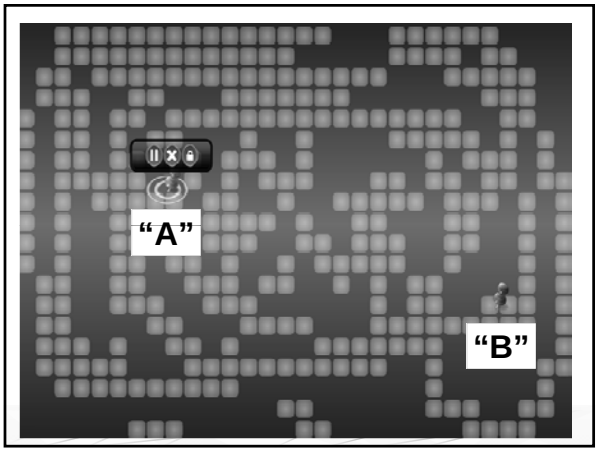


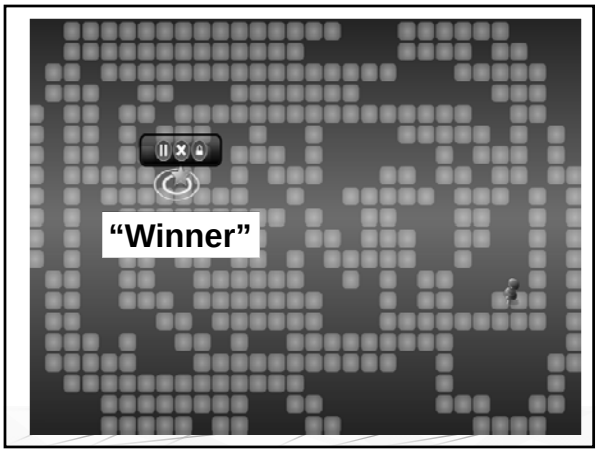


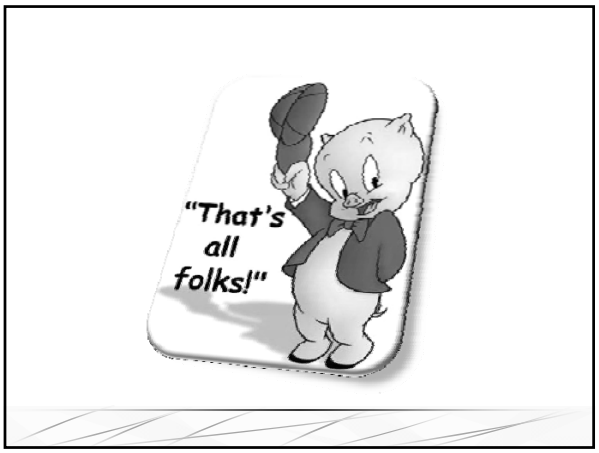

Click the close button in the upper right corner to complete your SoundPoint session
Sound-Point Opening Screen



Courtesy of Starkey Hearing Technologies






"That's
all
folks!"