

Real-Ear to Coupler Difference (RECD) using the Affinity^{2.0}

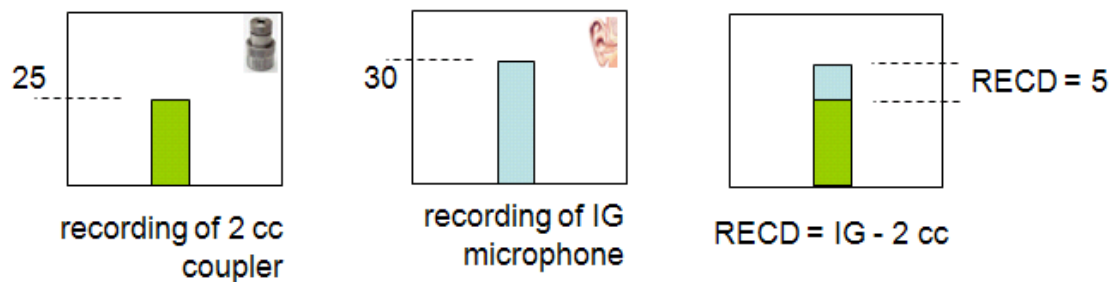
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1 What is RECD?

The RECD accounts for the difference in decibels (dB) across frequencies, between the SPL measured in the real-ear and in a 2cc coupler, produced by a transducer generating the same signal.

$$\text{Coupler SPL} - \text{Real-Ear SPL} = \text{RECD}$$



The RECD ensures that information about the patient's occluded ear canal characteristics is obtained and enables you to convert this information from dB HL to dB SPL. The RECD may also be utilized in the estimation of 2cc coupler targets which are not only useful in the verification process but also when selecting a suitable hearing aid by means of the manufacturer's data sheets (Pumford & Sinclair 2001).

RECD measurements are often used when fitting children due to the fact that they have smaller ears. The smaller ear canal the more SPL will be generated. Consequently if using the principles used for adults when fitting a child there will be a great risk of over amplifying. Further, the corporation to be expected from infants and young children is limited. When using the RECD only one measure of the ear canal is needed and subsequently the rest of the fitting can be performed in the 2 cc coupler.

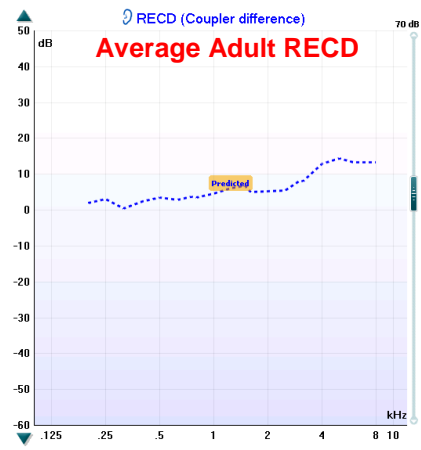
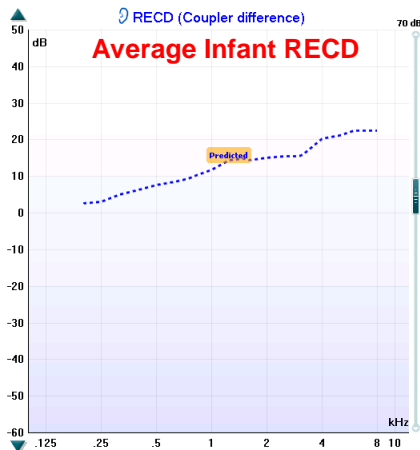
There are two ways to measure RECD:

- Use the client's own ear mold, or
- Use an SPL probe

Be aware that the method selected may have an effect on the result. The benefit of using the child's own ear mold is that the measurement will reflect the child's actual residual volume whereas the SPL probe only provides an estimate. However, you may find yourself in a situation where the mold is nonexistent, broken, or has an extremely bad fit. Furthermore, you may need to conduct measurements on children or infants not willing to co-operate. In these situations the SPL probe offers the benefit of easy probe placement and measurement.

2 What does the RECD look like?

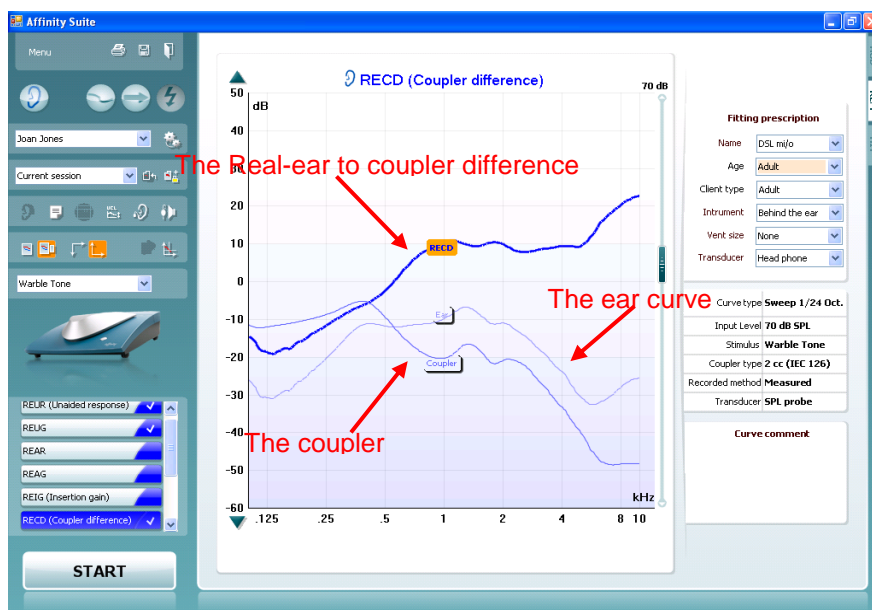
According to several studies the RECD is highly reproducible even in infants and young children when performed by a trained clinician (Bagatto et al. 2005). The measurement varies with age and typically increases somewhat with frequency. This is especially the case for children. Below average RECDs for infants and adults respectively are viewed. As can be seen the small ear canal volume of infant ears result in higher SPL values compared to the adult average.



3 How do I measure RECD on my Affinity^{2.0}?

The Affinity provides a guided RECD with instructional pictures ensuring that no mistakes are made during the procedure. Regardless of whether the measurement is made using the SPL-probe or the child's own ear mold the measured curves are shown as:

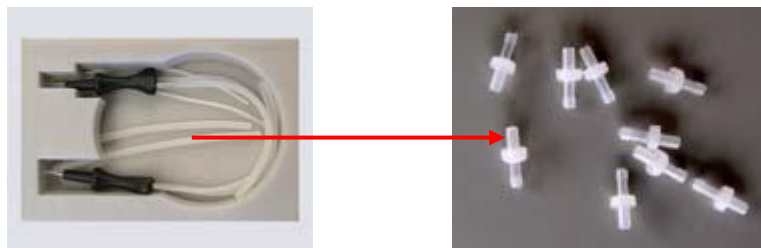
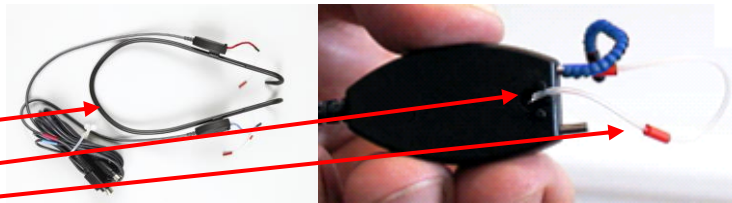
- Recorded Ear curve
- Recorded Coupler curve
- RECD curve



3.1 Test procedure using the client's own ear mould

Needed items:

- The Affinity^{2.0}
- The REM440 software
- An In-situ headset
- A reference microphone
- A probe tube microphone
- An ear mould
- A RECD tube found in the Probe tip set SPL60 to be connected with the ear mould tube by means of a Tube-nipple.

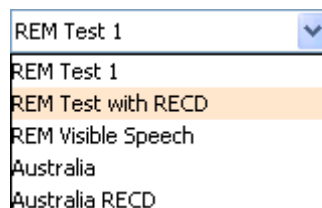


- A 2 cc coupler connected to an adaptor for the BTE. These click easily together.



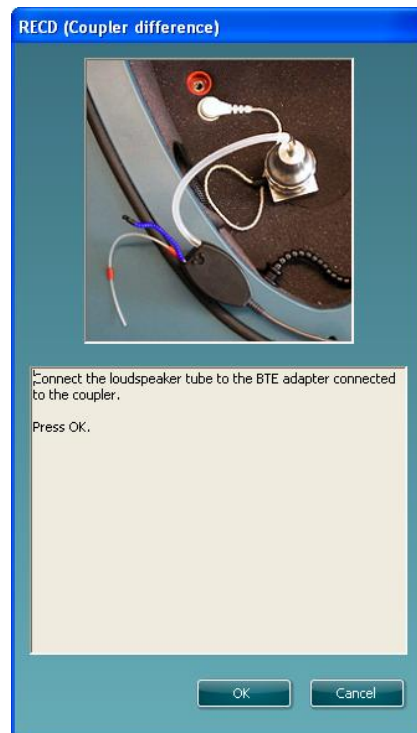
Test Procedure:

- 1) Start by opening the REM440 module via Noah3 or OtoAccess and select a standard or custom made RECD test in the **List of Predefined Protocols**.

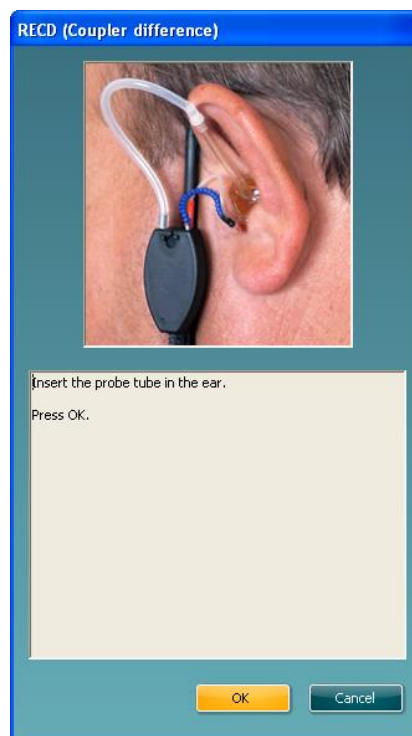


- 2) Upon otoscopic examination mount the probe tube and RECD tube on the in-situ headset. Ensure that the probe tube is calibrated.
- 3) Before performing the RECD ensure that the information about client, fitting prescription and hearing aid to the right are correct as these will affect the target.

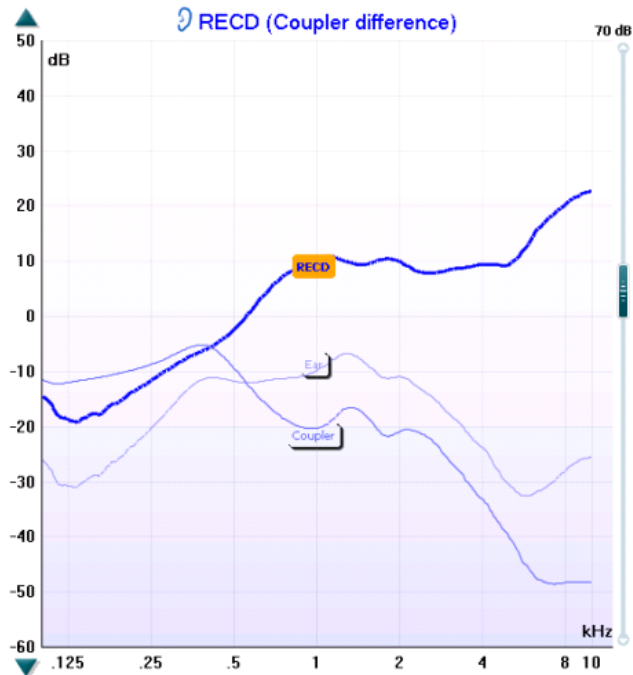
- 4) Click START and the dialog below will appear on the screen. Connect the tube to the BTE adapter as shown on the picture.



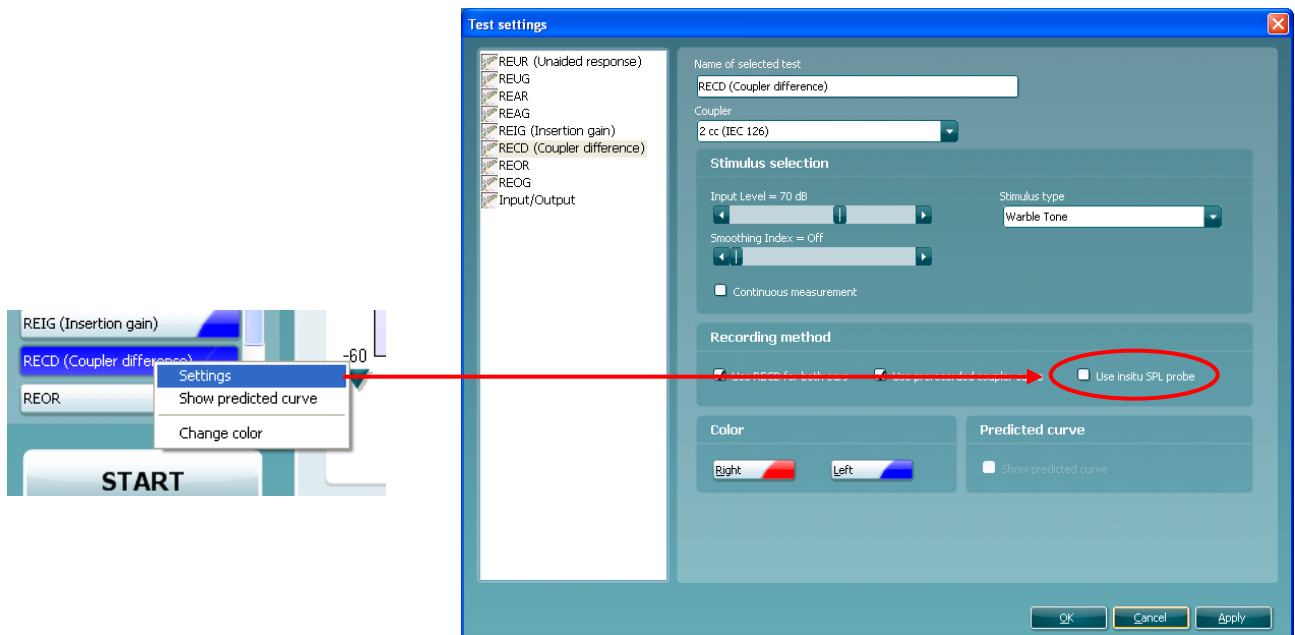
- 5) Click OK and the coupler curve will be performed followed by the dialog below:



- 6) Disconnect the sound tube from the BTE adapter and connect it to the ear mould using the RECD tube and Tube-nipple. Place the insitu headset on the client and insert the probe and ear mould as shown on the picture.
- 7) Press OK and the ear curve will be conducted and shown on the screen as below.



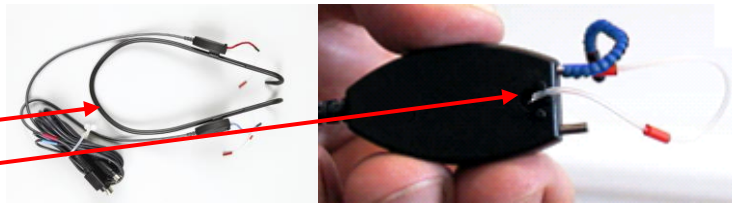
Note: Right click on the RECD test in the protocol list and select *Settings* to ensure that the test is setup to use the client's own ear mould. Ensure that *Use insitu SPL probe* is NOT ticked.



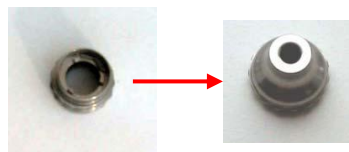
3.2 Test procedure when using the SPL probe

Needed items:

- The Affinity ^{2.0}
- The REM440 software
- An In-situ headset
- A reference microphone
- A Probe tip set SPL60 and ear tips.

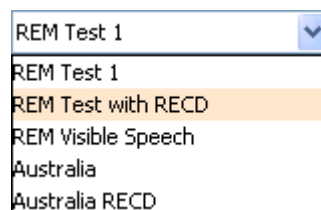


- A 2 cc coupler connected to an adapter for the SPL probe.



Test Procedure:

- 1) Start by opening the REM440 module via Noah3 or OtoAccess and select a standard or custom made RECD test in the **List of Predefined Protocols**.

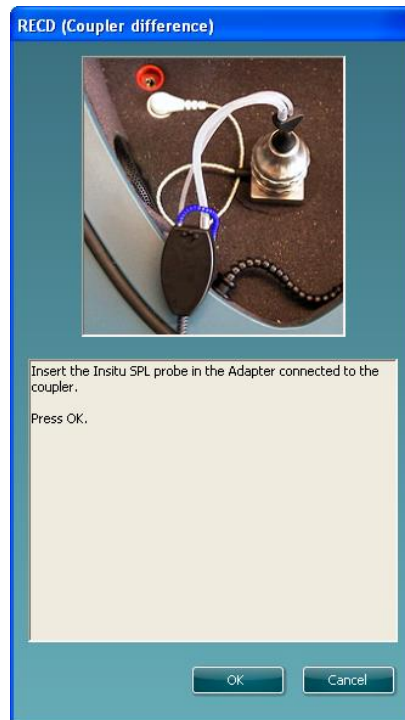


- 2) You may want to right click on the RECD test to ensure that *Use insitu SPL probe* is now ticked in the Test Settings (see page 6)

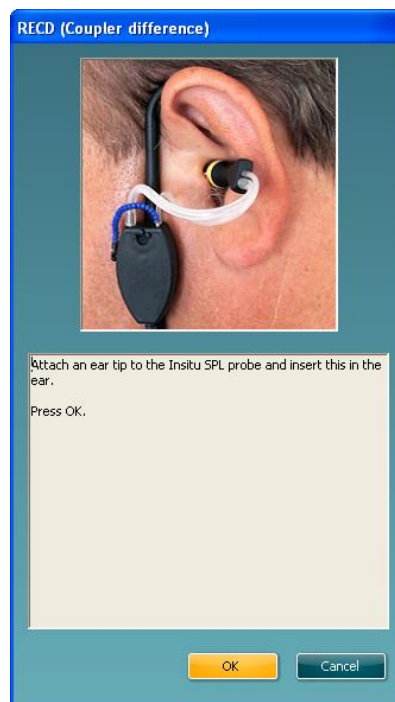
Use insitu SPL probe

- 3) Perform otoscopic examination and ensure that the probe tip is calibrated.

- 4) Click START and the dialog below will appear on the screen. Follow the instructions and connect the tube to the SPL probe adapter as shown on the picture.

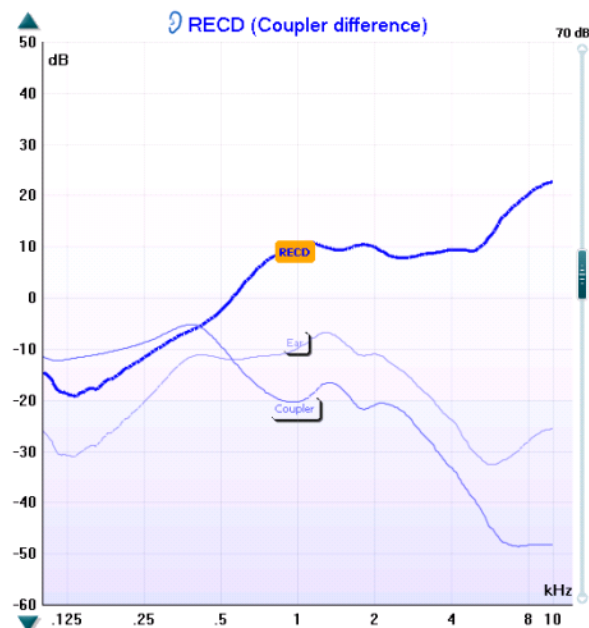


- 5) Click OK and the coupler curve will be performed followed by the dialog below:



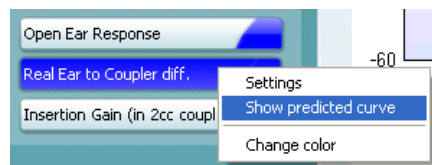
- 6) Disconnect the sound tube from the SPL probe adapter and place the probe in the client's ear.
Remember to attach the ear tip to the SPL probe prior to inserting the probe and connect it to the ear mould.

7) Press OK and the ear curve will be conducted and shown on the screen as below.

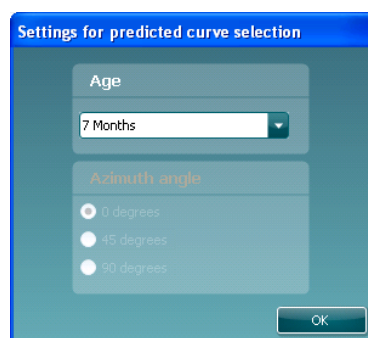


3.3 Using a predicted RECD curve

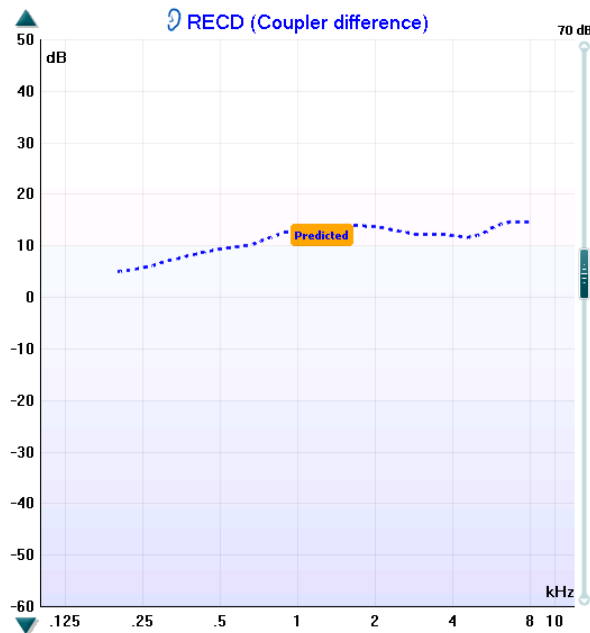
1) When right clicking on the RECD (as described above) you may choose to use a predicted curve.



2) A predicted curve may be helpful if having to do with challenging patient's such as babies. When clicking *Show predicted curve* the dialog below will appear:



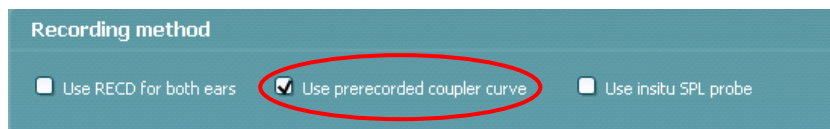
- 3) Select the **Age** of the client using the dropdown. Ages are listed with one month interval up to 12 months. Then the interval switches to three months up until three years of age. From three to 18 years of age the interval is one year after which the client will be categorized as adult. The **Azimuth angle** can also be selected. Choose from 0 degrees, 45 degrees, and 90 degrees as only the age is relevant to the RECD. The stimulus is presented through the in-situ headset.
- 4) When having ensured the all settings are correct click on the OK button in order to return to the main screen where the Predicted RECD will appear.



3.4 Re-using a coupler curve

If you prefer to use a pre-recorded coupler curve this can be setup in the *Settings* menu for RECD.

When ticking Use pre-recorded coupler curve the latest coupler curve with automatically appear on the graph which means that you only need to perform the ear measure.



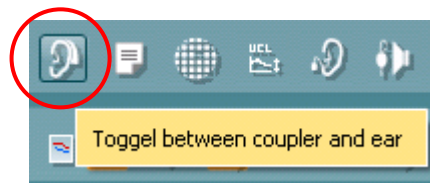
Note: This is only possible when using a Pure Tone stimulus.

4 How do I use the RECD in my Hearing Aid fitting?

When having measured the RECD you have the option to fit the hearing aids using the DSL method.

By clicking on the **Toggle between coupler and ear** button in the front screen after performing the RECD measurement you may choose to continue your fitting using either the...

- a) ...“Coupler Approach”, or
- b) ...in the Real Ear



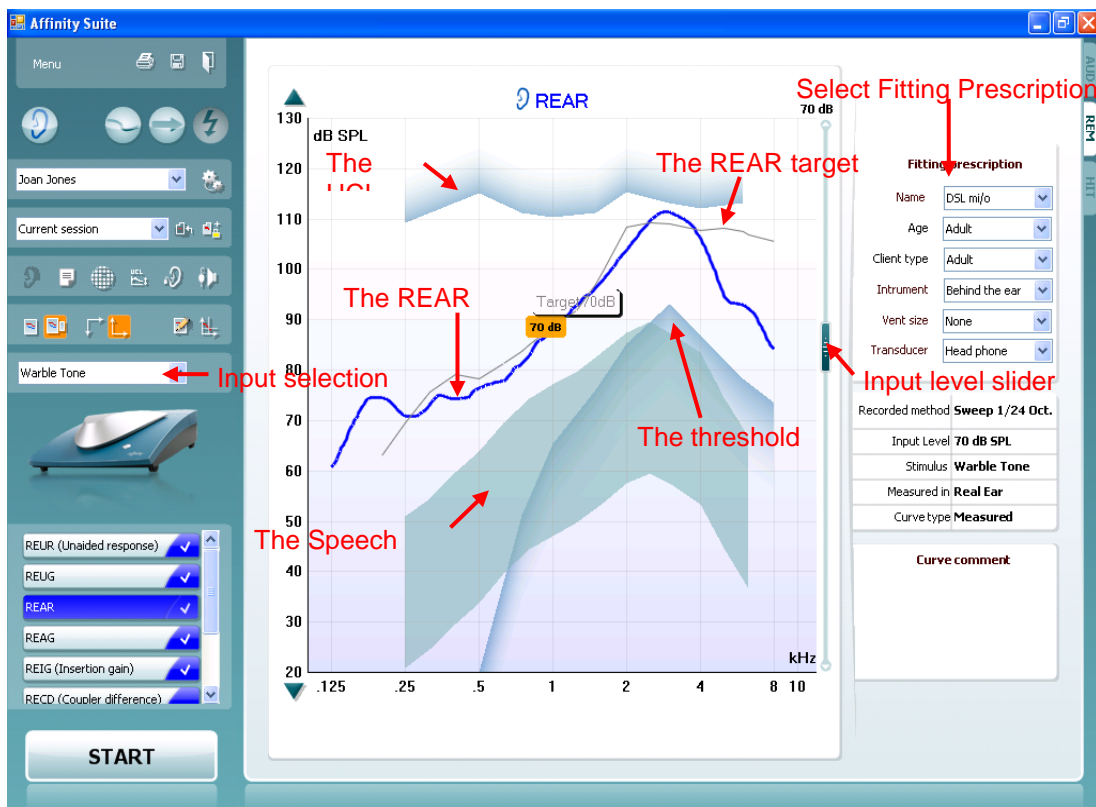
4.1 Verifying using DSL m[i/o] targets using the “Coupler Approach”

- 1) When continuing with an REAR measurement in the 2cc coupler after having performed the RECD select *Coupler mode*.



- 2) If DSL *m[i/o]* was chosen under *Fitting prescription* in the front screen the target will appear on the graph. Note that the Speech Banana also is represented on the graph.



- 3) Press START to conduct your measurement.



Note: Use the slider to the right to change the input level and the dropdown to the left to change the stimulus type as shown below. If you change input levels the target can be adjusted accordingly. This is done by right clicking on the input label of the original target and selecting *Reset target*.



4.2 Verifying using DSL m[i/o] targets in the Real-ear

- 1) If you prefer verification in the Real-ear select *Ear mode*  
- 2) If DSL m[i/o] was selected under *Fitting prescription* in the front screen the target will appear on the graph.
- 3) Press START to conduct your measurement.

Note: Use the slider to the right to change the input level and the dropdown to the left to change the stimulus type as shown below. If you change input levels the target can be adjusted accordingly (see illustration above). This is done by right clicking on the original target and selecting “reset”.

Advanced Note: Be aware that VSP (Visible Speech) is available in Coupler mode. Upon fitting the hearing aids you may therefore want to enter VSP for counselling purposes. This may help their understanding of both hearing impairment and hearing aids significantly.