

The Shrewsbury and Telford Hospital NHS Trust



Adult RECDs

Practical Guide following

publication of BAA/BSA

Joint Guidance: January



What is an RECD?

RECD is the difference in dB across frequencies between the sound pressure level (SPL) in the "real-ear" and SPL measured in a 2cc coupler, produced by a transducer generating the same input signal in both. **Real Ear SPL – 2CC coupler SPL = RECD**

RECDs: Adult Service

- During periods of restricted face to face activity, coupler fittings with measured RECDs are the gold standard for verification of remote fittings with occluded earpieces (BSA/BAA, 2021).
- Functionally, RECD's are not intended to replace REMs, hence the long term practicality and feasibility of utilising RECD's routinely in clinical practice post COVID-19 remains uncertain.
- The BAA Service Quality Committee and BSA Adult Rehabilitation Interest Group have operationalised new guidance on how to perform RECD measures specifically for adult population.
- This practical guide has been developed to reflect the BSA/BAA Adult RECD Guidance.

Setting Up For RECD

You will need a RECD probe tube attached to the REM headset.

This must be a probe that has two outlets:

- 1. The REM tube attachment
- 2. RECD transducer tubing attachment with coupling attachment.



Display RECD in PMM

- Open Otosuite and click '*Navigator'*, then '*RECD*' in PMM.
- Next, click on 'Control Panel' to connect the Free Fit.
- If the RECD tab is not displayed you will need to add it.

To do this click on:

- Tools >Configuration Wizard > PMM Configure > Click
 'Next' until you get to the '*Test Type*' screen.
- Ensure that the 'Show RECD Test Type' is selected' then click finish.



Display RECD in PMM

 Click on Tools > Configuration Wizard > 'Next' until you get to the 'Protect User Tests' Screen, Click 'Allow editing during this session' > Finish



Reference Microphone Calibration

- Ensure Reference Microphone Calibration is completed at the start the session.
- Select Tools> AURICAL HIT Calibration > Reference Microphone.
- Follow the on-screen instructions.
- Position the reference microphone (1) pointing straight down from above and centred 1-2 millimetres above the coupler measurement microphone (2)
- Close the lid and complete calibration.



Please Note

Measured RECDs should **only** be performed for:

1) Earmoulds with <3mm vents including fully occluded

moulds.



2) Thin Tube Fittings including:

(double, single, power domes or micro-mould).











Please Note

RECDs should **NOT** be performed for:

1) Earmoulds with \geq 3mm vent including open claw, ring

and gap moulds.

2) Open Dome Thin-Tube Fittings





Effect of Venting

- Measured RECD performed on a large vented earmould/open dome fitting would take into account the sound escaping via the vent/open dome but not the sound entering, resulting in a very negative low frequency RECD and hence more low frequency gain prescribed (Dillon, 2012).
- Therefore the more 'open' the fitting, the more inaccurate coupler verification will be.
- It is recommended that RECDs or 2CC coupler fitting is not carried out for open dome thin tube/wire devices or when the vent is ≥ 3mm.
- Instead 'click and fit' or 'insitu' real ear measures would apply to this patient group.

Coupler Response Completed in Test Box without patient involvement



Please Note

- When considering remote hearing aid fitting, especially in the cases of a new Direct Referral, the assessment appointment will often be undertaken without access to well-fitting earmoulds.
- As a result, any hearing thresholds recorded will have been obtained from either headphones or preferably insert earphones, and the RECD measured using a foam-tip.
- This practical guide will therefore assume that an insert foam tip and HA-1 coupler is used for both the coupler and ear portion of the measured RECD in a remote fitting pathway.

Coupler Type (HA-1) ONLY

- HA-1 for BOTH earmould <3mm vent and closed dome thin tube fittings.
- RECD type should be set up **HA-1 Tip** if using foam tip to obtain RECD.
- 'Apply the RECD to both ears' enables RECD measured on one side to be applied to the contralateral ear. This can be considered if the outer and middle ear status is known to be the same. (Confirm with Tympanometry).
- If reported outer or middle ear abnormalities or surgery exists then separate RECDs should be performed for each individual ear i.e. presence of perforation, persistent MEE or grommet (if no contraindications exist).



HA-1 Coupler Response

Setting up for HA-1 Coupler (Using AURICAL Test Box)







HA-1 Coupler Response

Attach a **medium** insert foam tip to the RECD coupling tube and secure acoustic putty to the HA-1 adaptor.

Once the RECD probe is placed inside the Test box, click Measure Right/Let as appropriate.

Measured Coupler values will appear in the white boxes for the selected ear.

Click OK to save the values.



Normative Coupler Response

inadequate seal with acoustic putty.



Normative Trace: Acceptable for both Moulds and Open Fits.

Abnormal Trace: Sound Leakage due to loose fitting foam tip in coupler. This will affect low frequency response. Ensure adequate tight seal and re-run the trace.

Very Abnormal Trace: Major sound leakage due to foam tip not inserting tight enough into the coupler and sealed

Ear Response Completed in the Patient's Ear

NB: Same contraindications apply to measuring ear response as they do

for 'insitu REMS' and use of insert tips





Probe Tube Calibration

 Remove the RECD probe and RECD coupling from the test box.

 Perform Probe Tube calibration for the RECD probe tube

Probe Tube Calibration	×
- Place the probe tubes on top of the reference	e microphones.
- The calibration stops automatically when suc	cessful.
Reference Level: 0 dB	Reference Level: 0 dB
Click Start to start Probe Tube Calit	pration.
Use the AURICAL HIT speaker	
Sho <u>w</u> for new client	<u>S</u> tart <u>C</u> lose <u>H</u> elp

Foam Tip Insertion (Ear Response)

- Connect the RECD coupling to a foam insert tip ensuring that a suitable size is used appropriate to the patients ear to prevent acoustical leakage.
- A loose-fitting foam tip in the patient's ear will result sound leaking out around the foam tip leading to negative RECD values in the low frequencies.



Probe Tube Placement

Follow BSA (2018) REM procedure

- Check for contraindications prior to probe tube insertion with Otoscopy.
- Place the REM tube in the patient's ears and perform Otoscopy to check probe tube placement.
- The REM tube should be inserted within 5mm of the TM and 5mm past the insert tip.



Gender	Insertion Depth
Adult Females	28mm
Adult Males	30mm

Foam Tip Placement







Do not use foam tip inserts where medically contraindicated including occluding wax, ear infections, discharge or other otological conditions. Compress the foam tip and insert it over the probe tube, into the ear. Watch the black marker to make sure it stays at the notch. Ensure adequate seal and allow foam tip to expand.

Foam Tip Placement

• Ensure that the foam tip is given

enough time to fully expand and consider using a larger insert tip if needed.

• To run the 'Ear Response' ensure that the correct ear marker is selected.



Normative RECD

- Gently insert the probe tube. A notch in the gain curve above 4000 Hz is likely to be observed which is moving towards higher frequencies.
- The probe tube is located correctly as soon as the notch is no longer pulling the gain curve down (-5 dB) in the high-frequencies.
- Once a normative trace has been obtained, if suitable, copy RECD for the contralateral ear.





Negative RECD







RECD Troubleshooting

- Loose-fitting insert foam tips: In this case, sound leaks out around the foam tip leading to negative RECD values in the low frequencies. Make sure the foam tip is given enough time to fully expand and consider using a larger insert if needed.
- Shallow probe tube insertions. Negative RECD values may occur in the higher frequencies above 3000 Hz when the probe tube has not been inserted far enough into the ear canal.
- Blocked probe tube: When RECD values are negative across the frequency range a blocked or crimped probe tube may be the cause. The tube could be blocked by wax or by incorrect placement of the tube against the ear canal.

Middle Ear Problems

- Presence of a patent PE tube or TM perforation: The larger ear canal/middle ear volume created by a patent PE tube or TM perforation creates a negative RECD value in the low frequencies. This not a concern as the effect of the perforation is unlikely to fluctuate.
- **Grommets:** Take care if grommets are fitted as canal characteristics (and RECDs) will vary depending on the patency of the grommet.
- Middle Ear Effusion (MEE): MEE will prevent sound entering the middle ear, resulting in a larger RECD. If MEE is persistent, you can use the measured RECD. If the effusion is transient, an average RECD may be more appropriate (or use the contralateral RECD if no effusion is present).

What Next: Thin Tubes

- Once you have obtained RECD measurement for closed dome fittings, you will need to determine the patient's individual thin tube size for each ear using the Corda MiniFit measuring tool appropriate to the hearing aid manufacturer as well as measuring the dome size.
- Best practice would be to check the fit of tubing and dome size in the patients ears to ensure comfort and enable accurate fitting.
 Determine whether sports lock will be required.
- Record measurement in patient's journal.



What Next: <3mm Vented Earmoulds

- Once you have obtained a RECD measurement for earmoulds with <3mm vents, measure the distance between the the centre of the ear canal opening and end of the hearing aid elbow.
- Place the hearing aid behind the patient's ear
 this is critical as the hearing aid can sit differently behind
 different ears, affecting tubing length.
- It may not be exact but would be within 5mm and therefore the hearing aid should stay behind the ear.
- This will need to be determined using a ruler or standardised prototype measuring tool that is wipeable in line with infection control.
- Please document measurement for left and right ear accordingly in the patient's journal as this measurement will be used when verifying the hearing aids with earmoulds in the coupler.
- It is important that the ear mould tubing length is measured and accounted for each patient as this will affect the gain from the hearing aid when verifying in the test box.

Coupler Verification in Test Box



Fitting Details

- Ensure that when setting the fitting details page on Otosuite, the *'Coupler Type '* selected for *'Measured RECD'* reflects the coupler used at assessment (HA-1 tip).
- It is important to ensure that the fitting details page is set up correctly as the only impact of the RECD measurement for use of headphones will be in the correct selection of the 'RECD Type' and 'Hearing Instrument Type. If those settings accurately reflect your fitting they will be accurately reflected in the target and the application of RECD.
- Select the relevant acoustic parameters i.e. transducer, tubing, dome, measured RECD values if obtained at assessment etc) otherwise the accuracy of the fitting will be affected.

Closed Dome Thin Tube Fitting



With the HA-1 coupler, clinicians should be mindful about leakage when using putty to attach the device with the coupler. Use patient's thin tube size

Closed Dome Thin Tube Fitting

- Attach some acoustic putty on to the thin tube wire, this will shift its resonance frequency and prevent it from vibrating and creating feedback during testing (see image 3).
- Place the patient's thin tube size into the HA-1 coupler adaptor so that the thin tube's entry hole is flush with the underside of the adaptor.
- Make sure that the acoustic putty is creating a tight fitting seal around the thin tube.
- Position the hearing instrument horizontally on a piece of acoustic putty on the surface of the HA-1 adapter inside the test box.
- Align the microphones along the loudspeaker axis and the reference microphone as close as possible to the front microphone of the hearing instrument without touching (image 5).
- Close the lid and you are ready to start testing.

Earmould Fitting <3mm vents

- Once the patient's earmoulds have returned from the manufacturer, cut the tubing to the size measured and documented at assessment.
- It is critical that the tubing length is cut before verification, to ensure the gain is correct when worn by the patient.
- Once cut to appropriate length, attach earmould to hearing aid and place on HA-1 coupler using acoustic putty.
- Align the microphones along the loudspeaker axis. It is important to align the test box reference microphone and hearing device microphone appropriately to avoid measurement error. Position the reference microphone as close as possible to the front microphone of the hearing instrument without touching.
- Close the lid. You are ready to start testing.



Verification

- Measure the hearing aid output inside the test box at:
- 50dB SPL, 65dB SPL AND 80dB SPL using ISTS signal
- Ensure responses are made in SPL format.
- Ensure output does not exceed uncomfortable loudness levels by running the 0SPL90 warble tone sweep and adjusting the MPO where appropriate.
- Take care with the low frequency gain when verifying for thin tube/wire hearing aids. For low frequencies (1kHz and below) be cautious not to move too far from the click-fit starting point, even if the target is requesting much more low frequency gain. The clinician is advised to sense check the target against the hearing loss to spot a spurious element to the low frequency target.

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Key Documents



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BAA/BSA Joint Guidance

AURICAL HIT and the OTOsuite HIT Module Reference Manual

Part No. 7-50-11500-EN

AURICAL® HIT

otometrics

RECD and CBF made easy with the new AURICAL

By Mona Dworsack-Dodge, Au.D. and Peter Kossek

otometrics

British Society of Audiology Promoting excellence in hearing and balance

Practice Guidance

Guidance on the verification of hearing devices using probe microphone measurements Date of version: May 2018 Date for review: May 2021

Setting and verifying the frequency response of a hearing aid remotely for adults during periods of restricted service delivery.

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