Prisma/Aurical 3w
NAL NL1

Modernising NHS Hearing Aid Services
Guidance on the use of REM to verify digital hearing aid fittings

Introduction

The MHAS project team is committed to working towards the recommendation that all patients undergo real ear measurement, as appropriate, at their fitting appointment, along the lines suggested by Gatehouse et al, (BAAS newsletter issue 36. Spring / Summer 2001).

> "...Where a fitting rationale contains an acoustical target, each hearing aid should be verified by REM using an input stimulus appropriate for the hearing aid under test. Tolerances to the prescription rationale of +/- 5dB at frequencies of 250, 500, 1k and 2k Hz, and of +/- 8dB at 3k and 4k Hz should be achieved in all cases. In addition the slope in each octave should be within +/- 5dB/octave of the target...."

For this project, we recommend the use of REM as a guideline, rather than a rule. There is agreement that audiologists should not aim to “reach target” if patient response/opinion indicates otherwise. There is also agreement that REM is useful in identifying gross differences from the acoustical target, which should be investigated at the fitting appointment as far as is possible. Reasons for gross differences include: faulty hearing aid, faulty programming, unusual shapes or sizes of ear canals and difficulties with earmoulds.

Hearing Aids and Targets

Prisma 2 aids. Siemens A&M recommend use of the NAL NL1 target for fitting of the aids, and then verification against NAL NL1 within Aurical. The Connexx software has 4 acclimatisation levels, and it is recommended that the aids are set initially to level 4 to achieve the NAL NL1 prescription. (Acclimatisation levels 1, 2 and 3 prescribe less gain.)

Siemens A&M do not recommend changing the programming of the aid unless there are gross differences from target, (as defined above). If differences of this magnitude are observed, then a reason for the difference should be investigated. If necessary, adjustments to the programming should then be made to achieve a closer fit to target, as long as the patient finds the sound acceptable and comfortable. These adjustments to the programming can be made easily while the insertion gain is active on screen, using the two NOAH modules (Connexx and REM) together.

Procedure

1. Tube Calibration

This must be done each time you use a new probe tube. That is, it must be done for each patient, and if you change the probe tube halfway through testing a patient, you must repeat the probe calibration.

Place the probe tube so that it is close to the reference microphone aperture, without blocking either of the microphones. Hold the headset 0.5m front of the speaker so the microphone and probe are facing the speaker.

Use a pure tone sweep at 65dB and click on “Tube calibration” to calibrate.

Your hand should not be between the loudspeaker and the microphone.

2. Check calibration

Holding the tube and microphone in the same position, record a response using 65dB FFT (modulated speech noise) stimulus.

Click “REUR” to record.

There should be a flat response across all frequencies at 0dB on the “real ear gain” screen. Check you have a flat line within 1dB of the 0dB line. If not, repeat the calibration. (Below 250Hz this may not be achievable - within 5 dB is acceptable).

3. Position patient

The patient should be seated so that the ear under test is

at 45º to the speaker,

0.5m from the speaker, and

level with the centre of the speaker (not higher or lower).

It is helpful to attach a piece of string to the speaker, to enable easy positioning of the patient, and also to have markers on the wall for the patient to look at.

The patient should be instructed to sit as still as possible during recording.

4. Otoscopy

Otoscopy must always precede REM.

Proceed with caution in any of the following circumstances: perforation, grommet, mastoid cavity, discharge or glue ear, wax filling more than one-third of the cross-sectional area of the canal.

It may be advisable in these circumstances to consider fitting to real ear aided gain, rather than insertion gain, see Dillon, Hearing Aids, p248 for an explanation.

5. Insert probe tube

Always use a new probe tube for each patient. We recommend using the thinner (1.1mm) probe tube (with a black-coloured marker) since this will be less uncomfortable for the patient if you touch the canal wall or TM.

Set black marker 27mm from the end of the probe tube, and insert probe tube down ear until the black marker is at the tragus. It is helpful to attach a short (15cm) ruler to the top of the aurical box so that measuring 27mm is very quick.

Accurate placement of the probe tube is important.

Use an otoscope to check that the probe-tube is lying along the bottom of the canal.

6. Measure Real Ear Unaided Response (REUR)

With the probe tube in place down the ear, use a 65dB FFT modulated speech noise stimulus.

Click on “REUR” to record.

Check that the response does not look very peaky, or that the gain at 6000Hz is not below -5dB (“real ear gain” screen).

If it is, reposition probe or move patient slightly.

7. Measure Real Ear Occluded Response (REOR) OPTIONAL

Insert the hearing aid into the ear, being careful not to dislodge the probe tube. With the hearing aid in place, the marker should still be at the tragus.

With the hearing aid switched OFF (using the software), click on “REOR” to record, using a 65dB FFT modulated speech noise stimulus.

You expect a reduction of the peak around 2-3 kHz, the natural resonance of the ear canal. Check that the gain has not reduced very much at the low frequencies. If so, reposition the hearing aid, and check the probe tube for wax/moisture.

8. Measure Real Ear Insertion Response (REIR)

Switch the aid on (using the software) without moving it. It should have all its usual features left on, the correct vent size having been selected.

Now select NAL NL1 as the target. (Check the settings are as in notes below, under “target” and also appendix 1)

Select an input of 65dB and click on “REIR1” to record using FFT modulated speech noise stimulus.

Compare the response you obtain with the NAL NL1 target.

9. Modify the programming in the aid.

If this is necessary, ensure that you are running both the REM module, and the Connexx module and make adjustments to the aid. Monitor those adjustments by leaving the REIR running.

This section gives the detail on how to achieve the above, although experience so far indicates that there is some variation across sites. Staff are advised to test this out in their own departments, write a step by step protocol, and seek advice from the IHR team if in any difficulty.

1. Open Connexx and program the hearing aid(s)
2. Leaving Connexx open, then also open Aurical REM using the NOAH module Selection.
3. Within Aurical REM, select view and enable on top mode.
4. Resize the windows, so that you can see both the Connexx screen, and the REIR and NAL NL1 target within Aurical REM.
5. Run through steps 1-8 above.
6. Compare the REIR with the NAL NL1 target.
7. Set up the REIR to run continuously on Aurical while you make changes to the Connexx software.
8. Take the on top mode OFF before saving and quitting the REM module.
9. Use the Programme Selection icon in the fitting software to ensure that any changes made during verification are transferred to the other programme.
10. Before closing Connexx, optimize the Feedback Algorithm for all programmes.
11. Finally save and close Connexx.

If the patient finds the sound of the hearing aid too loud, use clinical judgement to adjust the settings, eg. turn down the master gain, or the high frequency gain depending on patient report. Remember to report any changes made in AB/PN, or in the Save Session comments box in Connexx. Be aware that changing the acclimatisation level resets all the software and therefore any changes that may have been made to achieve target are not maintained.

Further details on this are available from Siemens A&M, who will cover this in their product training sessions at sites.

10. Check high level output. OPTIONAL

An 80 dB modulated speech noise can be used to ensure that the patient's ULL is not being exceeded and that the patient is happy at high intensity levels. This is especially important if the programming has been altered to meet the target at 65 dB. The patient should be warned that the signal is loud. Always use clinical judgement and caution as appropriate, particularly in patients with tinnitus or hyperacusis.

It is advisable for Audiologists to position themselves away from the speaker to avoid excessive noise exposure.

Notes

Setting up the REM equipment

Calibration

The REM equipment must have been subject to a full objective calibration within the last 12 months.

On top mode

This should be selected in the Aurical software *(view – tick enable on top mode)* This setting needs to be selected for each patient.

Target

Select NAL NL1. In the NAL NL1 set up box, ensure that you have selected multi-channel limiting and 4 channel compression. The reference position should be head surface, and orientation set at 45°. Select bilateral/unilateral as appropriate. Check the dob. Ensure the correct tubing and vent size is selected. In the NAL NL1 parameters box, check that the gain box reads 65 dB. Tick the box "Use Bone Conduction Values" if the patient has a significant conductive loss, (use >15dB air bone gap averaged over 500, 1k and 2k Hz as a guideline).

See more detail on NAL NL1 in Appendix 1.

Password

If asked for a password, type in B0505.

Stimulus

Use FFT broadband stimulus – modulated speech noise (the noise should be fluctuating in intensity). FFT is selected by clicking mode, FFT.

Check in *setup – test settings* that the FFT stimulus is "modulated speech noise".

Leave the REIR on single measurement

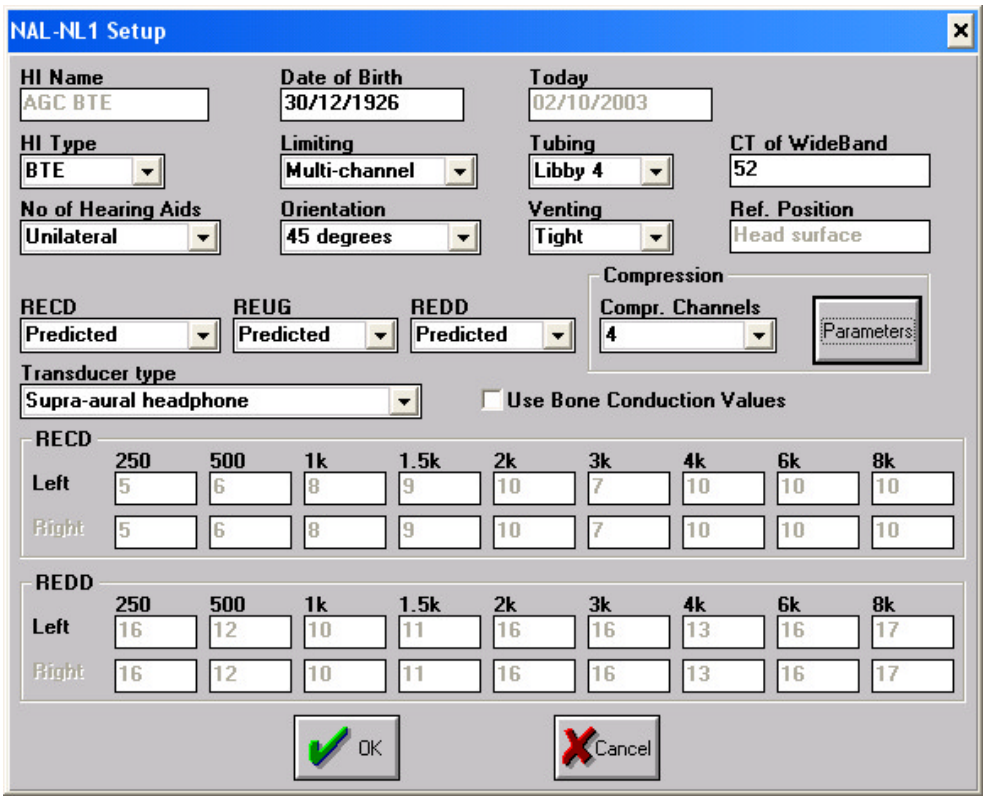
Check in *setup - repeated measurements* is unticked

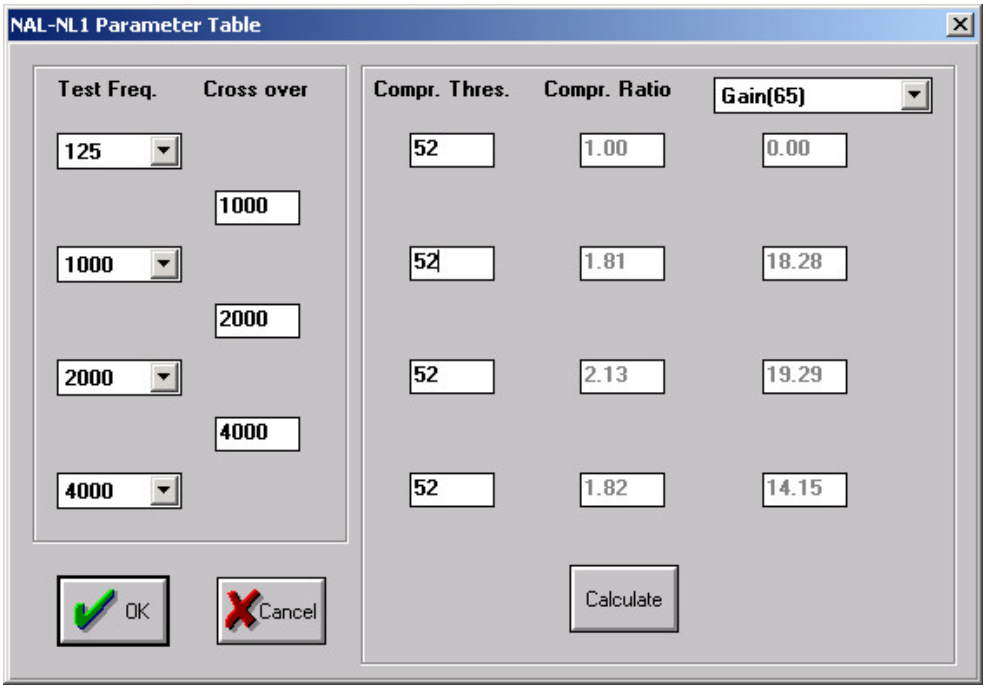
Positioning the speaker

Try to position the speaker so that it is not at the back of a table, and there are not large, flat reflecting surfaces near the patient.

Appendix 1.

This appendix shows the appropriate settings for NAL NL1 for Prisma 2.





Useful references

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