

CROS and BICROS hearing aid verification

PRODUCT INSIGHTS

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The CROS (Contralateral Routing of Offside Signals) is a hearing aid (HA) system that combines components mounted at both ears, and allows the individuals with a unilateral hearing loss to hear the auditory stimulus received on the side of their hearing loss in the contralateral ear. The major categories of CROS hearing aid systems which may be placed on the outside of the head at ear level are CROS, and BiCROS (Bilateral CROS) systems. They use either a cable or a wireless connection to send the audio signal from the poorer ear to the better ear.

The CROS hearing aid fitting can be used for those patients with unilateral hearing loss, where the poorer ear could not benefit from a traditional hearing aid.

The BiCROS system can be used for those patients who have a hearing loss also in the better ear.

Hereafter we describe the procedure for verification of fitting of a CROS and BiCROS hearing aid which can easily be performed with the Inventis Trumpet REM system.

CROS HEARING AIDS

Patients experiencing unilateral hearing loss, where

the poorer ear could not benefit from a traditional HA, and the better ear has either normal hearing or at most a mild hearing loss at high frequency, might benefit from a CROS aid. When sounds reach the poorer ear, the head behaves like a filter, making speech understanding particularly difficult. CROS aids aim at obtaining a balanced configuration, where there is neither a better side nor a poorer side.

In its typical configuration, a CROS aid consists of a satellite microphone mounted on the poorer ear, and a receiver and amplifier, mounted on the better ear and coupled through an open earmold. Figure 1 shows a schematic representation of a CROS system.

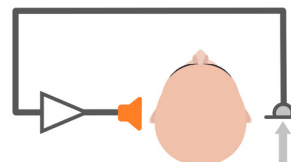


Figure 1

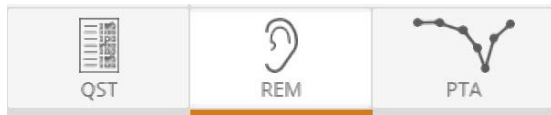
Sounds reaching the satellite microphone are amplified and sent to the better ear, while sounds reaching the better ear go directly in the ear canal through the open earmold, without any additional amplification.

PROCEDURE

Before proceeding with the verification of hearing aid fitting, the CROS aid can be pre-adjusted to approximate a coupler gain curve. The REAG (Real-Ear Aided Gain) of the better ear from free field input equals the REUG (Real-Ear Unaided Gain) of the same ear. This pre-adjustment can be performed using average values, and it does not need the presence of the patient.

Subsequent steps require the patient to be present, wearing the CROS aid, and with the probe microphone in the better ear only.

Step 1: Run Maestro software and click on REM section.



Step 2: Select ADVANCED mode.

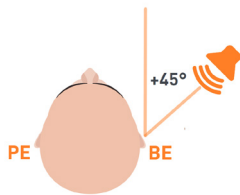
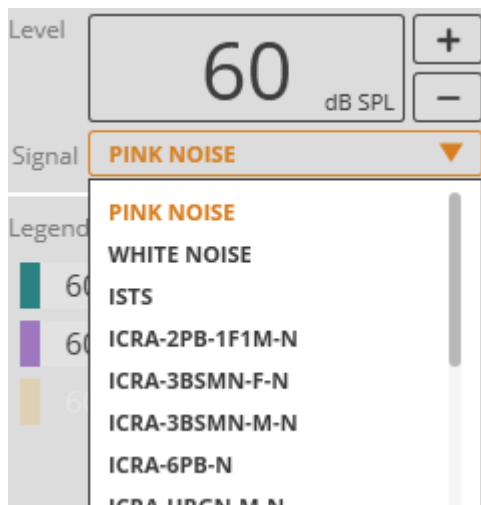


Figure 2

Step 3: Stimulus sent to the better ear.

Place the speaker at 45° from the front, on the side of the better ear (BE), as shown in Figure 2, and turn the



HA on. From the list of customizable stimuli, select for

example pink noise at 60 dB SPL.

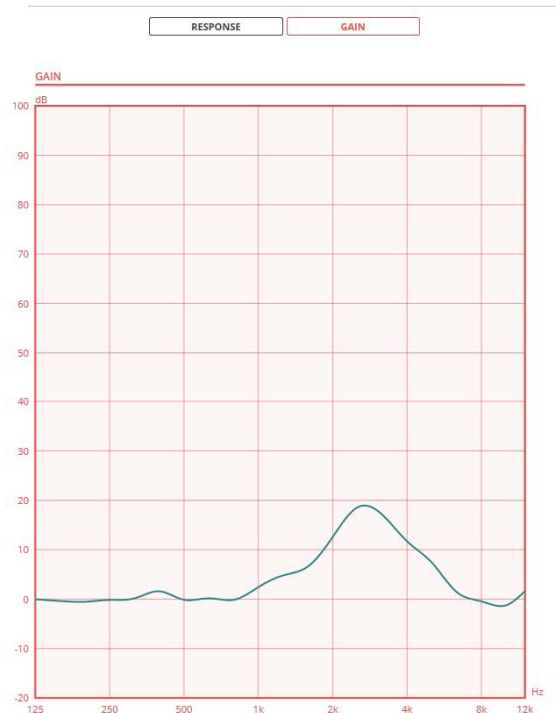
Step 4: Choose LTA as Acquisition mode and start the



measurement by pressing PLAY button.



Step 5: Verify that the signal measured in the better ear resembles the average REUG of an ear with no mold or hearing aid.



Then press RECORD button to record the first curve.



Step 6: Stimulus sent to the poorer ear.

Now perform the second measurement: from the stimuli list, select the same stimulus used in the previous step (e.g. pink noise at 60 dB SPL). Press PLAY and allow the Trumpet to adjust the stimulus level. As soon as the pink noise is reproduced, ask the patient to rotate so that

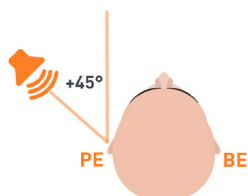
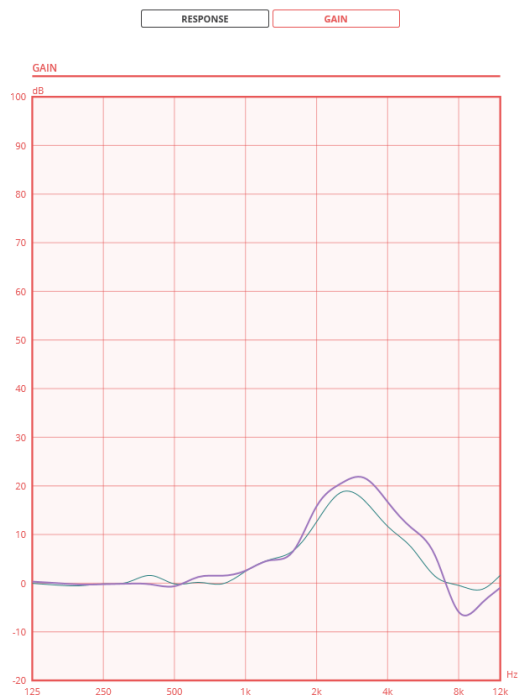


Figure 3

the sound source is placed at 45° from the front, on the side of the poorer ear (PE), as shown in Figure 3.

Verify that the REUG measured on the better ear matches the one acquired with the previous settings. Otherwise, adjust the hearing aid gain so that the two measures match as closely as possible.



Step 7: Stimulus sent at 0° azimuth.

Lastly, perform the third measurement: ask the patient to rotate so that the speaker is placed in front of him/

her, as shown in Figure 4. From the stimuli list select the same stimulus used in the previous step (e.g. pink noise at 60 dB SPL). Press PLAY and verify that the measured REAG is smooth: if dips are present, they might suggest that the amplified path is out of phase with the direct



Figure 4

sound path.

BICROS HEARING AIDS

BiCROS aids are used when the better ear has a hearing loss. In these cases, amplification is always needed, regardless of the side from where sounds are coming. The system includes two microphones, and two different pre-amplifiers both connected to the same amplifier and

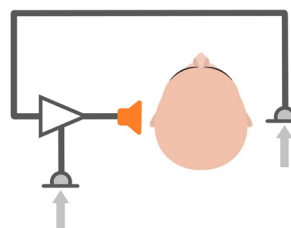


Figure 5

receiver (see Figure 5). This allows the auditory stimulus to be presented in the better hearing ear.

PROCEDURE

The procedure for verification of fitting is a combination of fitting a hearing aid unilaterally, and fitting a CROS hearing aid. Since there are two microphones, sounds coming from directions other than the frontal one might cause peaks and troughs in the REAG. Therefore, measures should be performed with the loudspeaker placed in front of the patient. Subsequent steps require the patient wearing the BiCROS aid, and the probe microphone in the better ear. Proceed in obtaining a Real Ear Measurement for a traditional HA fitting for the better hearing ear. Then use the procedure described above for fitting a CROS HA system.



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