FURTHER IMPROVEMENTS TO FITTING FOR WIDEX MOMENT™

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Widex MOMENT™ with PureSound™ and TruAcoustics™ form a complete hearing solution, alongside Compass™ GPS for the Hearing Care Professional (HCP) and the Widex MOMENT app for the end user. This complete solution has been very well received, with great performance and benefit on many parameters for the MOMENT hearing aids (e.g. Balling, Townend, & Helmink, 2021) as well as for the fitting software (Balling & Townend, 2021) and the consumer app (Balling, Townend, Mølgaard, Jespersen, & Switalski, 2021). But Widex keeps working to further improve different parts of the solution to continuously deliver smarter and more accurate great-sounding Widex MOMENT fittings.

Continuous improvement is driven in part by fitting and app usage data, in part by survey data, and in part by direct feedback from HCPs and end users alike. Wherever the inspiration comes from, the goal is always to improve the sound in a way that is meaningful for Widex MOMENT users. When we help HCPs with the fitting process or make data-driven improvements to the way we calculate gain, it is always with the sound experience in mind.

In this WidexPress, we will look at new changes that the different types of feedback have motivated, focusing on updates to the Sensogram and on the new AutoREM functionality in Compass GPS 4.3.

1. FURTHER IMPROVEMENTS TO WIDEX MOMENT SOLUTION

As mentioned previously, Widex development is informed by multiple data sources, including survey data and direct feedback. Another, very objective source of information is the consented fitting data obtained via the Compass GPS software. Inspired by these data, which come from thousands of hearing aid fittings, we have recently updated the calculation of the vent corrections in the Sensogram portion of Compass GPS for Widex MOMENT fittings.

When we introduced the TruAcoustics vent compensation in Compass GPS 4.0, one goal was to better accommodate the increasing number of instant ear-tips being used in hearing aid fittings, by applying information from the Feedback Test to calculate the vent effect and resulting vent compensation for the individual user's ear. A benefit of the thousands of Widex MOMENT fittings that have accrued since this solution was launched is that we can review the calculations and refine them further. This was done recently for the TruAcoustics vent compensation calculations for instant ear-tips and the realization of these when the Sensogram is measured and corrected for vent effects.

The vent correction manifests itself in the Equivalent Adult Threshold (EAT) curve of the Sensogram. This curve is important because it combines information about the earware chosen with loop-gain information from the Feedback Test to calculate a vent-corrected threshold. The values of the EAT curve are then used as the basis for calculating the fitting, so it is important that these figures are as accurate as possible.

2. SENSOGRAM EAT

The Sensogram screen displays the Sensogram EAT (Equivalent Adult Threshold) by default to show the combined effect of the ear-tip selection, the Feedback test results, and the TruAcoustics

vent compensation on the measured Sensogram thresholds. This defines the optimal Widex MOMENT fitting. In other words, the ear-tip selection, Feedback test results, TruAcoustics and measured Sensogram thresholds are all combined to define the Sensogram EAT that is used for the calculation of gain.

The Sensogram EAT curve shows the vent-corrected Sensogram thresholds, either based on the measured vent effect (when a Feedback Test has been run) or the estimated vent effect (when a Feedback Test has not been run). The Sensogram EAT curve may be different in the two ears, if the vent effect is different between ears. This means that if the Feedback Test result shows two different vent effects for the right and left ears, then the Sensogram thresholds will be corrected differently on each side.

The four required Sensogram frequencies (500Hz, 1, 2 and 4kHz) are vital for accurate calculations of gain, based on in-situ thresholds, as well as for features that use threshold information such as the Speech Enhancer. If possible, it is recommended that all nine Sensogram frequencies are measured for maximum accuracy.

The Sensogram EAT curve will typically indicate better thresholds than the clinical audiogram at low-mid frequencies, because the clinical audiogram is measured with a closed earphone, while the Sensogram is measured with the hearing aid and ear-tip in the ear, including any venting and leakage in that ear-tip (Kuk, 2012). This means that direct sound reaches the eardrum for open and vented fittings,

making for better thresholds. It also means that, in some cases, the wearer gets the addition of ear canal resonances to the output of the hearing aid. As a result, thresholds from open-fitting hearing aids get a boost around 2-3kHz, leading to better thresholds for the hearing aids compared to headphones in this frequency area.

Therefore, the Sensogram EAT curve, which corrects for the vent effect and resonances, is a more precise representation of the hearing ability under the acoustic circumstance where the hearing aid sits in the ear. On average the difference between the Sensogram thresholds and standard audiogram thresholds should not be more than 10 dB different.

Vent effect and resonances have been included in the calculations for years, but until we had a large pool of Widex MOMENT fitting data from the real world, it was not possible to exhaustively review this area of the fitting flow and analyze the estimated vent effect. Because the Sensogram calibrates the receiver and the ear-tip to the volume of the individual ear canal, it is important to base this review on large amounts of data from many different individuals. From these data, it was possible to calculate the corrections needed to make the EAT curve even more accurate. The corrections made are largest for the most open fittings and smaller for more closed fittings, due to the more predictable vent effect for the latter.

The resulting corrections have led to more accurate EAT curves; an example of the changes from Compass GPS 4.2 to 4.3 is shown in Figure 1. The EAT curve
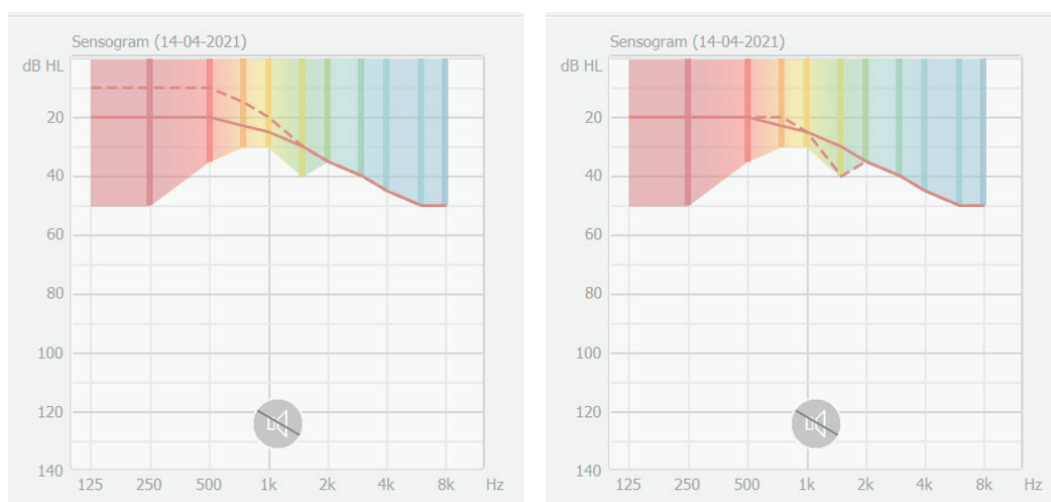

Figure 1: SENSOGRAM EAT Comparison with GPS 4.2 (left) and GPS 4.3 (right). The EAT curve (dashed line) is displayed on the SENSOGRAM (solid bars). The bars represent the thresholds measured and as described earlier the threshold difference compared to the audiometric thresholds (solid line) is clear. Once corrected, for venting, the SENSOGRAM EAT curve is expected to be closer to the original Audiometric thresholds, as seen here.

(dashed line) is displayed on the Sensogram (solid bars). The bars represent the thresholds measured and, as described above, the differences between the Sensogram threshold vs the Audiometric thresholds (solid line) is clear. Once corrected for venting, the Sensogram EAT curve is expected to be closer to the original Audiometric thresholds. The corrections in GPS 4.3 lead to a Sensogram EAT curve which delivers a vent-corrected threshold that is more accurate than was previously achieved with GPS 4.2.

Because the Sensogram EAT is the hearing threshold when wearing the hearing aid and is used by Compass GPS to calculate all gain targets, it is important that the EAT thresholds are entered into any external hardware to generate targets for in-situ measurements (REM). If REM is performed using the Natus Aurical system this manual step is not necessary, as the Sensogram EAT curves can be automatically transferred when using the new AutoREM feature, which we will explore next. It is also important to note that the same Sensogram results with different EAT curves (between GPS 4.2 and 4.3) will have different targets and corresponding gains calculated. However, existing Widex MOMENT fitting sessions will not be affected, as the new EAT curve will not be calculated until existing Sensogram data are deleted and thresholds re-tested.

3. AUTOREM

Another fitting improvement in Compass GPS, which is based on direct market feedback, is the new AutoREM feature in Compass GPS 4.3. With the AutoREM solution, it is now possible to do GPS-integrated Real-Ear Measurement (REM) with automatic match-to-target for normal speech levels (see Figure 2). The purpose of the feature is to facilitate the use of REM verification of hearing aid fittings.

This is enabled by:

- Introducing an AutoREM menu point in the Fitting step of GPS.

- Allowing access to the REM hardware indirectly via the REM software module and directly via the fitting software (visible in Compass GPS, see Figure 2).

- Speeding up the process of fine-tuning via an automatic match-to-target if the HCP is using the Otometrix Aurical FreeFit equipment.

The AutoREM feature works with external hardware Aurical FreeFit (Natus Medical Inc.) and external software OTOsuite (Natus Medical Inc.). It can be used with all rationales in GPS (Widex Fitting Rationale, NAL-NL2, DSL v5.0 Paediatric or Adult) and works for both monaural and binaural fittings and for all hearing aid models in the Widex MOMENT™ and MAGNIFY™ families. It is a convenient, time-saving method to simplify the match-to-target procedure within the Compass GPS software.

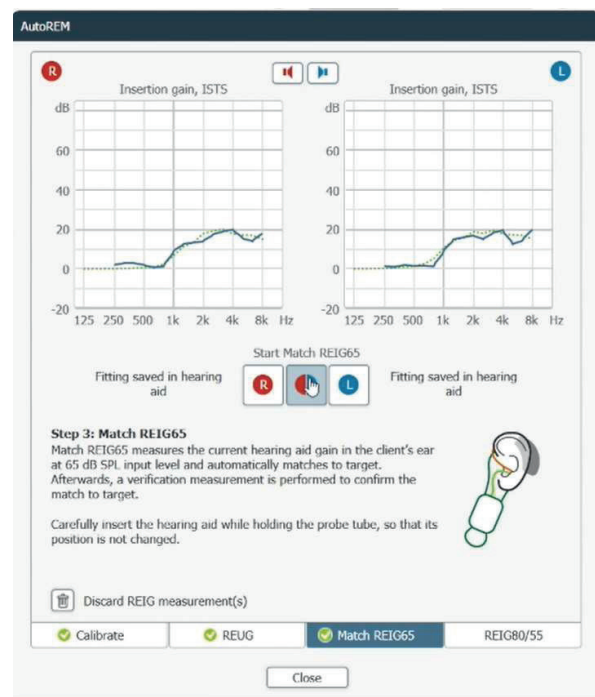Compass GPS contains an easy 4-step workflow following an expected procedure for REM:

Figure 2 Screenshot of the AutoREM flow in Compass GPS showing the REIG65 target matching.

- Probe tube calibration

- Real-Ear Unaided Gain (REUG) measurement

- Verification of and automatic match to target for a 65 dB SPL input signal - International Speech Test Signal (ISTS)

- Verifications of 55 and 80 dB SPL input signals (ISTS)

Internal studies have demonstrated that AutoREM works well for all targets available, helps provide a close match to target (as defined by the British Society of Audiology, 2018) in the majority of cases, and is comparable to results achieved with a manual REM (Seiden & Caporali, 2021).

WIDEX

4. SUMMARY

With the revised vent corrections in TruAcoustics to deliver improved Sensogram EAT curves and the introduction of AutoREM, Widex continues to deliver improvements to hearing aid fitting. These improvements aim to assist HCPs in delivering the optimum sound at fitting and in turn increase the accuracy of the fit for the individual end user. As always, the goal for Widex is optimal individualised sound quality for each unique hearing aid user and software that fully supports the HCPs in achieving this.

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