



What is the role of the AGC function on the Interacoustics Impedance instrument?

A) Probe tone AGC (maintaining the correct probe tone level)

The first and most widely understood use of AGC (Automatic Gain Control) on an impedance unit is for the purpose of maintaining an accurate probe tone signal in the ear canal (85dB SPL with 226Hz) during impedance measurements. This adjustment occurs automatically (transparent to the user) and compensates for variations of the ear canal volume. Since impedance instruments are calibrated using a 2cc coupler, the majority of ear canal volumes will be less – due to the insertion depth of the probe and especially with younger patients (*infants*). If it were not for the implementation of the AGC feature, the actual SPL in the ear canal would certainly be higher than the referenced calibration value.

For example, the following ear canal volumes require a '**reduction**' in the SPL level based on the 85dB SPL 2cc Volume Calibration reference.

Ear Canal Vol. Reduced SPL level

1 ml	6 dB
0.5 ml	12 dB
0.2 ml	20 dB
0.1 ml	26 dB

As can be seen by these 'reduced' values, we could also expect that ipsilateral reflex values can vary greatly when ear canal volumes are less than 2cc. Historically, most clinical impedance instruments have not had an AGC feature implemented for acoustic reflex testing and this would explain the observation of very young patients - *especially infants* - having acoustic reflexes as much as 10-15dB lower than their adult counterparts.

B) AGC active on IPSI stimulus (maintaining accurate SPL acoustic stimulus levels)

Interacoustics has an activate 'AGC on stimulus' feature located in the Advanced setup of the Titan. If this setup is selected the stimuli level, at all stimuli types, will be reduced with the above number of dB. Ex. for a 0.5 ml ear volume the stimuli level will be reduced with 12 dB, this will cause a more correct/accuracy output level in dB HL compared to doing nothing.

Located in the 'Advanced Setup' section



It is important to note that our method is approximated and not perfect. This is because the ear is not frequency linear. This simply means that when calculating the number of dB to reduce the stimulus level at all frequencies, it is based on the initial calculation from the AGC adaptation for the impedance measurement and the same dB level reduction is used across all frequencies. Therefore, the reduced level could be different if the stimulus frequency is 500 Hz compared 4000 Hz as it would be extremely complicated and time consuming to find the exact reduced value for all stimuli types in the each individual ear canal. Regardless, utilizing the AGC acoustic reflex function does make a significant correction that otherwise is neglected.

When to use or not use the AGC stimulus

Example 1: Infants with very small ear canals. It is not uncommon for infants and young children to have ear canal volumes less than 1 ml. If you do not use this feature, you could have excessive stimulus levels in excess of 110-120 dB SPL at higher presentation levels. Using the AGC feature will protect the ear against very high stimuli levels. If one does not wish to use the AGC feature, you should advise the user to limit the upper test level (i.e. 90 – 95dB) for infants in order to limit this possibility.

Example 2: The effects of dB variations in the ear canal will be similar if you use a contra-lateral insert phone. Therefore, if you choose to use the '**AGC on Stimulus**' function the dB level corrections will be the same as on the ipsilateral transducer.

Example 3: Since a TDH39 earphone is calibrated on a much larger coupler (6cc), a circumaural earphone like the TDH39 or comparable DD45 has much less effect on the dB presentation level from person to person. Therefore, it is advisable 'NOT' to use the AGC feature for contralateral reflexes.

In Summary

The Titan has the unique feature of enabling the clinician to use a more scientifically based method for analyzing acoustic reflexes – both ipsilaterally and contralaterally (when contra insert phones are used). Higher end users will appreciate this value added feature for compensation of ear canal volume SPL levels, as this has been a request for a variety of applications for decades. The difficulty will come when comparing data across different manufacturers and clinicians personal experience with 'known' and 'expected' reflexes with traditional instrumentation.