

## Why acquire Transient OAEs?

Transient OAEs may be used to diagnose certain auditory conditions. It can provide a health professional with very useful information about types of hearing loss in a patient and other conditions. TrOAEs can help with:

- Infant hearing screening.
- Monitoring of patients with a risk of hearing loss.
- Detection cochlear auditory dysfunction.
- Investigations of cochlear function and diagnosis before medical procedures
- Determination of sensorineural hearing loss causes.
- Investigations of middle ear effusion effects on hearing.

## What is TrOAE?

Transient Oto-Acoustic Emissions are responses generated by the test subject's cochlea when provided with a click or tone stimulation. These emissions are prevalent in subjects with normal hearing; subjects with a hearing threshold of 25 dB HL or better. They may also provide an indication of good mid-frequency hearing.

Due to the reduced intensity of the signals, the responses are recorded using a very sensitive microphone. Once the responses have been acquired, they can be presented in graphic or text form for further examination.

## Patient Preparation

The patient must be placed in a comfortable and quiet environment, preferably a sound booth where the patient lies down or sits comfortably. Even though the patient does not need to be in a relaxed state for this test, it is recommended, in order to minimize noise and decrease the possibility of false negatives. To obtain a better recording it is also recommended to inspect the patient's ear canal. Cerumen or debris may partially block

the stimulus signals, resulting in incorrect results. Cleaning of the ear canal shall only be performed by a person trained in such procedure in order to prevent any irreversible middle ear damage.

## Probe Usage

There are two types of probes available. Microphone-Stimulator probes, like the 10D, are self contained units that can deliver the stimulus and pick up the response. Microphone probes, like the 10B+, contain only microphones and stimulus delivery tubes, which allow any kind of stimulator to be attached, forgoing bulk in benefit of flexibility. Microphone only probes are especially useful when testing at frequencies higher than those allowed by probes with a built in stimulator. Probes should be used with an appropriate tip to provide a good seal and reduce external noise. Probes must be used with the right ear tip for the specific patient so as to provide a good seal in order to reduce noise and test times.

## Setting up SmartTrOAE

Acquiring Transient OAE's is SmartTrOAE's function. The system may be setup with a few clicks of the mouse. Complete the following steps in the order outlined, use the test setting that best fit your requirements, or use the recommended settings shown:

- Make sure that Automatic Gain is selected under the settings menu and that acquisition is set to non-linear mode when testing intensities above 65dB SPL.
- Click on **Stimulus > Select Stimulus** from the main menu and define the stimulus settings if using other than the standard 75usec click.
- Set the number of sweeps, intensity levels and rate of stimulation on the control panel at the bottom of the screen.

# Transient Oto-Acoustic Emissions with SmartTrOAE

- Set the artifact rejection as desired using the lever on the right hand side of the screen.
- Press the **Right** or **Left** button to acquire TrOAE's for that particular ear.

A good probe fit is recommended to reduce noise and obtain stronger more reliable recordings. Make sure to check the probe fit using the Probe Fit button before testing.

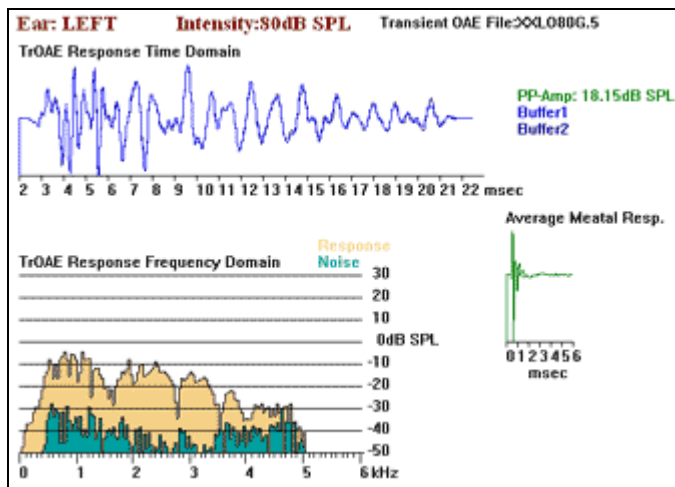
## Recommended Test Settings

This table shows the recommended settings for TrOAE acquisition:

<b>Stimulus:</b>	75usec click.
<b>Rate:</b>	19.30 Per second.
<b>Sweeps:</b>	1024, 512 for screening.
<b>Intensity:</b>	90 to 95 dB SPL.
<b>Acquisition Mode:</b>	Non-linear for intensities over 65dB SPL, Linear otherwise.
<b>Artifact Rejection</b>	6% or higher as needed.
<b>Passing Criteria</b>	3 out of 5 passing with 6dB SNR minimum and 90% Correlation.

## Analysis

As the test is being completed, the system will average the responses to each sweep and place them in a time domain and a frequency domain graph, facilitating response analysis. The average meatal response, which occurs in the first 6 milliseconds, is also shown.



A normal strong and consistent Transient OAE response will be shown with the buffers

overlapping each other, where the difference between one and the other is minimal. The differential signal can be seen by selecting **Display > Plot Difference** Curve from the main menu.

The presence of cochlear function is assumed for frequencies with amplitudes greater than 6 dB above the noise floor, which usually corresponds to a cross correlation score higher than 80%. Responses are expected from patients with a normal middle ear and pure tone sensitivity higher than 25 dB HL. Responses are not expected from patients with an abnormal middle ear or cochlear HL higher than 35 dB HL. Although Transient OAEs are a broadband response (1-5000Hz), some narrow frequency band information can be obtained using the Time-Frequency analysis utility found in the control panel.

## Screening with Transient OAEs

Transient OAEs are helpful to determine the overall health of the cochlea and can be used to screen newborns for hearing defects. SmartTrOAE is both a diagnostic and a screening Transient OAE system. To use the system as a screening system, it is only necessary to set the parameters to perform screening. Depending on your institution and regional regulations, set the number of sweeps and stimulus to the required values. Keep in mind that some newborns may still have some amniotic fluid inside their ear canals.

## Notes on Spontaneous OAE

All SmartTrOAE systems have the capability of acquiring spontaneous OAEs. Spontaneous OAEs are emissions produced by healthy ears in certain subjects. Only about 60% of the population has some form of spontaneous emissions, being more prevalent in females than in males. During a spontaneous OAE test, a sync pulse is sent to the subject's ear to provide a reference point for signal averaging, while the emissions are recorded outside the time frame influenced by the sync pulse. To start a spontaneous OAE test in SmartTrOAE, select **Settings > Acquisition > Spontaneous** from the main menu, and then click on the **Left** or **Right** button to start acquisition for the corresponding ear.