



# Interacoustics<sup>®</sup> ASSR

*When time is precious and accuracy is essential*

## **New generation ASSR:**

- Results in half the time it would take with traditional ASSR systems
- Prediction of the audiogram at four frequencies binaurally
- Full stimulus control
- Powerful complete 2 channel system
- NOAH compatible



**leading diagnostic solutions**



# Interacoustics® ASSR

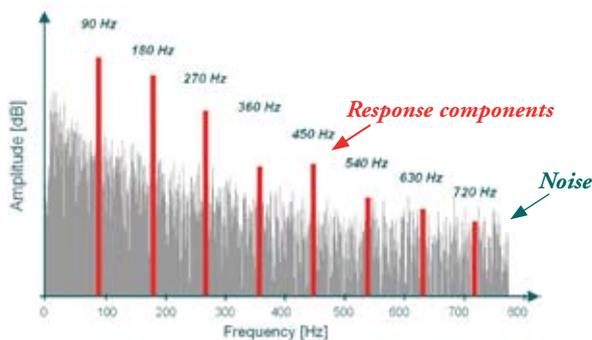
## New Generation ASSR

The new ASSR system from Interacoustics is not just another ASSR system, but a system that incorporates years of research aimed at taking ASSR a grand step further. Clinicians will appreciate this new technology which allows a much more efficient use of session time and at the same time provides highly accurate results with multiple data storage options.

## Reduce Test Time by up to 50%

The detection engine is the back bone of any ASSR system and is to a great extent responsible for the quality of the results. **The Full Spectrum Detection Engine** built into the Interacoustics ASSR system combines both phase coherence and response magnitude components, but more importantly uses additional information carried by the higher harmonics. The inclusion of 7 harmonics above the fundamental modulation frequency in the algorithm strengthens and improves the response detection. This feature alone will typically reduce the test time to less than 50%<sup>1</sup> compared to traditional technology.

<sup>1</sup> Mario Cebulla et al. "Objective Detection of Auditory Steady-State Responses: Comparison of One-Sample and q-Sample Tests". *Journal of American Academy of Audiology* 17:93-103 (2006).



The Full Spectrum Detection Engine evaluates the entire response spectrum, and not just the first harmonic of the response (here 90Hz) as traditional ASSR systems do. This causes very fast test times and accurate results.

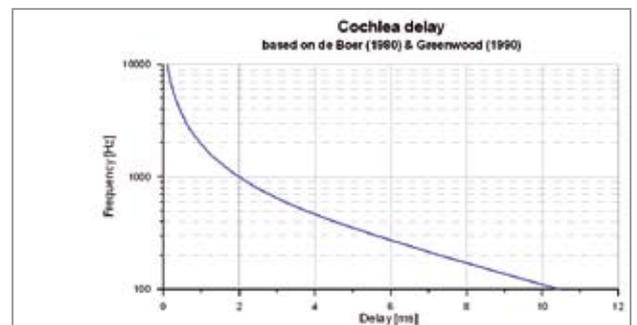
## Improved Stimulus Efficiency

In order to generate a measurable response for a given frequency, an ASSR stimulus excites a band of hair cells around that test frequency. It is desirable for all the hair cells in this band to fire simultaneously and thereby generate maximum response. However, a stimulating wave takes time to travel through the band (cochlear travel time) causing the hair cells to fire at slightly different times, broadening and weakening the combined response.

Traditional ASSR stimuli (AM, AM/FM, Exponential) do not compensate for this cochlear travel time, a journey that for low test frequencies can take several milliseconds. This is one factor in the weak response of some ASSR systems.

Interacoustics ASSR compensates for cochlear travel time by adjusting the phase of the stimulus components to achieve simultaneous maximum displacement of the basilar membrane around the test frequency. This gives a stronger, sharper evoked potential that is easier to detect, especially near threshold<sup>2</sup>.

<sup>2</sup> Ekkehard Stürzebecher, Claus Elberling et al. "New Efficient Stimuli for Evoking Frequency-Specific Auditory Steady-State Responses". *Journal of American Academy of Audiology* 17:448-461 (2006).



An example of internal travelling time for different frequencies within the cochlea. Compensating for this smearing of a stimulus in the time domain provides much stronger evoked responses, benefiting both test time and accuracy of the obtained results.



## Powerful 2 Channel System

Clinical practice often requires the option of performing ABR and ASSR in the same patient session. Therefore, it is a considerable advantage if ASSR can be performed using a standard ABR electrode montage. Single channel ASSR systems are at a disadvantage because responses from both ears appear in the same channel, worsening the signal-to-noise ratio and increasing test time. Interacoustics ASSR overcomes this limitation by using a two channel system where each ear has its own dedicated detection engine.

## Full Stimulus Control

The Interacoustics ASSR system allows both ears to be tested at the same time and uses up to 4 simultaneous frequencies in each ear. In contrast to other systems, it is possible to control each of these 8 stimuli independently. As a test progresses you can control stimulation intensity for each frequency as well as controlling start and stop times for a particular stimulus. It is also common to use 40Hz or 90Hz stimulation rates – dependent on the age and patient state. The Interacoustics program allows the examiner to quickly change between the two as the patient state changes during the test. The availability of this full manual control allows a much more efficient use of the valuable session test time.

## Estimated Audiogram

The goal of an ASSR session is to obtain an Estimated Audiogram to provide the grounds for qualified decisions about rehabilitation. The process of converting the ASSR results into an Estimated Audiogram in the Interacoustics system is assisted by applying detailed ASSR to estimated HL correction tables. These correction tables can be modified by the clinic to reflect special clinical situations or be updated to keep pace with future clinical studies.

## NOAH Compatible

If you choose to run the Interacoustics ASSR system under NOAH the resulting Estimated Audiogram will be saved in the NOAH database making the results available for any Hearing Aid Fitting module running under NOAH. These Estimated Audiograms are also available for the Interacoustics Affinity hearing aid fitting system.

## Electronic Medical Records

In this day and age any clinic must carefully consider how to administer electronic medical records. The new Interacoustics Otoaccess™ database - included with the ASSR program - provides such a tool. Otoaccess™ also allows convenient integration of data from other Interacoustics products. For clinics using different databases, the ASSR system can output its data in pdf format for electronic storage.

## The Eclipse Platform

The attractive Eclipse hardware platform is the foundation for a variety of diagnostic modules. It offers state of the art diagnostic or screening solutions in portable ABR, VEMP, OAE, and now also ASSR.

Your office laptop or desktop PC becomes a powerful diagnostic tool with the simple connection of a USB cable to the Eclipse. The built-in medical safety transformer and full optical isolation of the Eclipse will meet all of your safety requirements.



*Tracking the Response Probability over time for the different intensities tested, adds important information during the session and allows optimization of the ongoing test strategy.*

# General Technical Specifications

## Standards:

EN 60601-1 (General safety) Class I, Type BF.  
EN 60601-1-1 (Safety of systems) Class I, Type BF.  
EN 60601-1-2 (EMC).  
EN 60601-2-26 (Electroencephalographs).  
EN60645-1/ANSI S3.6 (Audiometers).  
EN 60645-3 (Auditory test signals).

## Medical CE-mark:

Interacoustics A/S meets the requirements of Annex II of the Medical Device Directive 93/42/EEC. Approval of the quality system is made by TÜV – identification no. 0123.

## PC Requirements (PC not included):

Operating System: Windows XP®.  
Processor: Pentium III, 650MHz or better.  
RAM: 256MB.  
Hard disk: 5GB.  
Display Resolution: 1024 x 768 or better.  
USB: 1.1 or higher.

## System:

Eclipse Black box to connect to your own PC.

## Safety:

Medical Safety transformer built-in.  
Optical isolation to PreAmplifier.  
Optical Isolation to PC (optional).

## PreAmplifier:

2 channels. (EPA3: 1 channel).  
Gain: 80 dB. (EPA4V: 60/80dB).  
Frequency Response: Up to 8000Hz.  
Noise: 6.0nV $\sqrt{\text{Hz}}$  (0.33 $\mu\text{V}$  RMS (0-3kHz)).  
CMR ratio: >115 dB at any frequency between 0.1Hz and 100 Hz.  
Input impedance: >10M.  
Accepted electrode offset: >300mV.  
Power: From main unit.

## Anti Aliasing Filter:

Analogue 8kHz 24dB / octave  
(30kHz Sampling rate).

## Impedance Check:

30Hz rectangle.  
Impedance information for each individual electrode.  
No unplugging of electrode leads required.  
Readout directly on Amplifier.

## Included Parts (Complete System):

Eclipse  
EPA4 Preamp  
ETB4 Standard electrode cable with buttons  
ETU4 Universal electrode cable  
ETR4 Electrode cable with re-usable electrodes  
PEG15 Set of 25 single use pre-gelled electrodes  
EarTone ABR Insert ear phones w/foam tips  
20 pcs. of Infant eartip (2 x 10)  
SPG15 Tube of skin preparation gel  
Electrode gel  
Alcohol pads (100 pcs.)

Measuring Current: 25 $\mu\text{A}$ .  
Ranges: 0.5k $\Omega$ -25k $\Omega$ .

## Transducers:

Ear-Tone ABR insert phones included.  
Independent calibration for TDH39 (not included).

## Number of Channels:

2 channel response detection. (EPA3: 1 channel).  
8 channels for stimulus control.

## Test Protocols:

Test protocols included for children and for adults (sleeping and awake).  
Customized protocols can be created by user.

## Stimuli:

500Hz, 1kHz, 2kHz, 4kHz.  
Bandwidth: +/- 1/2 octave -3dB. Very steep roll offs.  
Compensation for cochlear delays.  
Simultaneous stimuli: 8 (4 frequencies in each Ear).

## Modulation Rates:

90Hz and 40Hz.  
Can be changed within the same session.

## Masking:

White noise.  
0 – 100dB HL.

## Stimulus Control:

Independent control of up to 8 simultaneous stimuli (max. 4 per ear).  
Independent stimulus level control for each of the 8 stimuli, with dynamic range assistance.  
Independent start / stop control for each of the 8 stimuli.

## Data Acquisition:

2 channels.  
Separate Detection Algorithm for each Channel.  
A/D resolution: 16bit.  
Manual Start and Stop: Global as well as for each stimulus.  
Time out limits:  
Max 15min. (Default: 6 min.).  
Manual change in +/- 1 min. steps.  
False Pass Probability Settings: 1% and 5%.

USB cable 2m  
Power cable  
Software CD as ordered  
OtoAccess™ Database Software  
Operation Manual  
CE Manual



## Gain:

Manual: 6dB steps from 74dB to 110dB (5 $\mu\text{V}$  to 3200 $\mu\text{V}$  input).

## Rejection system:

Manual increase and decrease of rejection limits during data acquisition.

## Raw EEG:

Online display for each channel simultaneously.  
Refresh rate: 10Hz typical.

## Printout:

Customized printouts.  
Hardcopy or as pdf file for EMR.

## Patient communication:

Talk back (built in loudspeaker).

## OtoAccess Database:

Included  
Database: SQL  
Data format: XML  
Full network capability  
Unlimited storage. Patient demographic data. Patient Journal.  
May also include data from Interacoustics' audiometers, impedance audiometers, and hearing aid analyzers.  
Easy back-up function.  
Interacoustics® ASSR may alternatively run without a database.

## NOAH:

NOAH compatible (NOAH 3.6 or higher).  
(Estimated Audiogram available for Hearing Aid Fitting NOAH modules).

## Networks:

May connect to a network.  
Subsequent session viewing from reader stations.  
With optional software, even tests in progress may be monitored and controlled from any reader station in the network.

**Dimensions Eclipse:** (L x W x H) 28 x 32 x 5,5 cm / 11 x 12.5 x 6 inches.

**Weight Eclipse:** 2,5 kg / 5,5 lbs excluding accessories

## Optional Parts:

TDH39 Headset  
EPA3 Preamp (one channel/3 electrodes)  
UCO15 Optical USB cable for Eclipse (can be delivered with 1 or 5 metres USB extension cable).

## Other modules available for the Eclipse black box:

- ABR (EP15/25/VEMP)
- ABR Infant Screening (ABRIS)
- TEOAE (TEOAE25)
- DPOAE (DPOAE20)

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