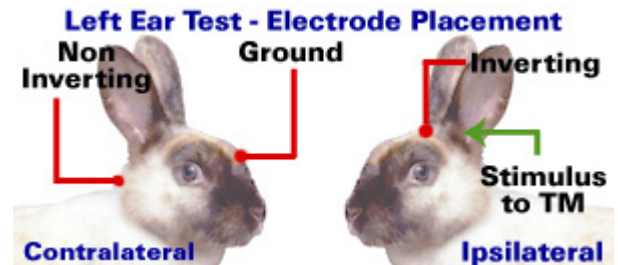


Why acquire eeABR?

The eeABR responses are acquired from the animal subject in order to assess and determine the VIIIth cranial auditory nerve function. In humans, similar techniques have been conducted to assess the viability of cochlear implantation, or the existence of any physical conditions that may prevent successful implantation. This module is not intended for human use. The eeABR stimulation is delivered using transtympanic needle electrodes; these are placed on the promontory, the prominence on the medial wall of the tympanic cavity formed by the first turn of the cochlea, piercing thru the tympanic membrane. This electrode delivers small electrical pulses. In addition, a ground stimulation electrode, not to be confused with the ground recording electrode, is placed subcutaneously in the pre-auricle area.

- Inverting (-) : Vertex (Cz)
- Non-Inverting (+) : Back of the Neck
- Ground: Mid-Forehead (or Leg)



When testing both ears, in a dual channel system, keep test electrode placement as indicated and switch only the stimulus to the opposite side. When using a midline recording configuration, it is recommended to set the designation of the channel being used to ON in the EEG and Amplifier window.

What is eeABR?

eeABR (electrically elicited Auditory Brainstem Responses) are potential differences generated when the auditory brainstem is stimulated with an electrical pulse. The electrical pulse is delivered to the promontory while bypassing the tympanic membrane and outer ear. These potential differences originate in the VIII cranial nerve and auditory brainstem system; they can be assessed by using controlled stimulation, allowing acquisition of these differences while averaging the acquired signal.

Electrode Usage

Sub dermal needle electrodes are needed for stimulus delivery. The IHS needle electrodes, comply with regulations of CSA, UL, CE and proposals from the US FDA. It is imperative to follow the sterilization instructions from the electrode manufacturer. Surface electrodes are sufficient for acquisition. Clean and prepare electrode pacing sites in order to reduce the impedance and acquire a clearer recording. Shaving the electrode site is often necessary to obtain reliable and secure electrode placement.

Animal Subject Preparation

The animal subject must be placed in a comfortable and quiet environment, preferably a sound booth or quiet laboratory where the subject lies down on a comfortable space. A certain degree of sedation is also necessary due to the use of needle electrodes. Stimulants should be avoided as they may affect the successful acquisition of recordings. Recording electrodes may be placed in the following configuration:

Setting up SmartEP

Acquiring ECoChG and ABR recordings is SmartEP's main 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 needs or use the recommended settings shown on the next section:

- Select **Somatosensory Low Current** option Under **Stimulus > Modality**.

eeABR – Transtympanic in Animals using SmartEP

- Set the stimulus, Click on **Stimulus > Select Stimulus** from the main menu and construct or load the stimulus signal as necessary.
- Click on the **EEG and Amplifier** button on the control panel and set the filters, notch filter, artifact rejection ratio and region and amplification for each channel.
- Set rate, phase, side, limit, intensity and the number of sweeps.
- Press the **Acquire** button to start. Repeat acquisition 2 to 4 times.

Make sure to carefully select your filter settings in the EEG and Amplifier dialog box. An unfiltered recording can always be filtered digitally to obtain a smoother waveform; however, hardware filtering cannot be undone.

Recommended Test Settings

This table shows the recommended settings for eeABR acquisition (ABR Mode):

Stimulus:	75 usec biphasic pulse (25 usec positive, 25 usec neutral and 25 usec negative)
Rate:	19.3/sec or 21.1/sec. Slower rates enhance earlier components.
Polarity:	Biphasic
Transducers:	Transtympanic Electrodes
Intensity:	Approximately 1000 uA. Threshold will vary depending on impedance.
Filters:	30 – 3000 Hz
Notch Filter:	OFF. ON if there is excessive electrical line noise present.
Amplification:	100x
Analysis Time	12.8 msec
Window:	
Sweeps:	1024 or 2048
Electrode Montage:	Vertex Positive Array

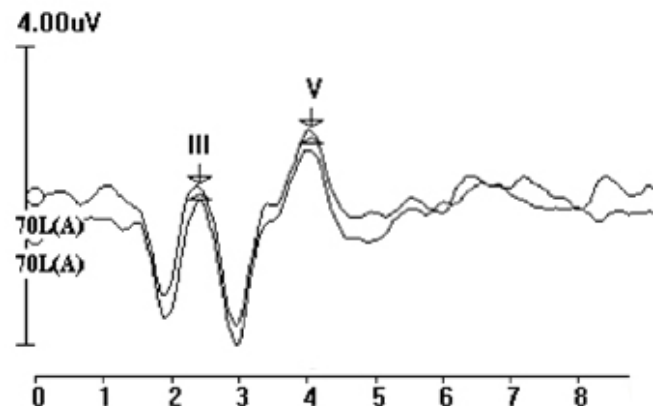
Marking Peaks

To accurately analyze data, you must first place the applicable labels on the recently acquired recording. Peaks I to VII may be marked when recognizable. Custom labels may also be

placed using the “Mark Other Peak” option from the right click menu. Follow these steps for standard labels:

- Right click at the point of the recording where the label is to be placed.
- Select the peak to be marked (I – VII).
- Once placed, drag the top marker of the labels to the top of the peak.
- Drag the bottom marker to the valley following the peak.

The graph shows suggested label placement for an eeABR recording taken from a rabbit subject. Note that recordings from different species will differ from each other and from the one shown. Acquired eeABR recordings may differ slightly from normal ABR recordings on the same species.



Analysis

Select Print Pages or Print Page from the SmartEP main Menu to print a report of the currently displayed signals. See the SmartEP manual for other report generation options. For additional information see:

Polak, Marek., et al., “Evaluation of hearing and auditory nerve function by combining ABR, DPOAE and eABR tests into a single recording session.” *Journal of Neuroscience Methods* 134 (2004) 141–149.