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.

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.

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 rests calmly. A certain degree of sedation is also necessary due to the use of needle electrodes. Avoid the use of electrical hearing pads or other electrical equipment near the subject as it may create noisy test conditions. If placed on a metal structure, it must be grounded to the same earth ground as the hardware unit being used for testing.

Setting up SmartEP

The eeABR mode is an added module to the base SmartEP functionality. Complete the following steps in the order outlined, use the test setting that best fit your needs or use any type of stimulants should be avoided as they may affect the successful acquisition of recordings. Recording electrodes may be placed in the following configuration:

- **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.

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; however, needle electrodes may provide for better responses. 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 when using surface electrodes.
the recommended settings shown on the next section:

1. Select Somatosensory Low Current modality under [Stimulus > Modality].
2. To set the stimulus, click on [Stimulus > Select Stimulus] from the main menu and construct or load the stimulus signal as necessary.
3. 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.
4. Set rate, phase, side, limit, intensity and the number of sweeps.
5. 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.

It is possible to save the testing parameters for future use, click on the [Save Settings] button from the control panel. To load them at a later time, simply click on the [Load Settings] button and select the file from the list.

### 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 Window:** 12.8 msec
- **Sweeps:** 1024 or 2048
- **Electrode Montage:** Vertex Positive Array

### Marking Peaks

To accurately diagnose a condition, you may need to obtain latencies and amplitudes by marking peaks. Peaks I to VII may be marked, when recognizable, by following these steps for each of the peak markers to be placed:

1. Click on the peak label you wish to mark (I-VII) from the tool bar, it will turn red when chosen.
2. Click the location on the waveform where the label should be placed.
3. Once placed, drag the top marker of the labels to the top of the peak, if needed.
4. To obtain waveform amplitudes, 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.