

## What is Electrocochleography?

Electrocochleography, ECoChG, is a method to acquire auditory evoked potential responses from cochlear and auditory nerves by providing sound stimulation to the patient's ear. The averaged activity of the potentials on the auditory nerve is known as the action potential (AP, or ABR wave I). The response of the cochlea to the stimulation is known as the summing potential (SP).

The amplitudes, latencies and relationship of AP and SP can be used to diagnose certain pathological conditions. Due to the intensity of these evoked potentials, surface electrodes are not suitable for this application; Tiptrodes, Tympanic Membrane or Transtympanic electrodes must be used for acquisition.

## Why acquire ECoChG?

Electrocochleography may be used to diagnose some vestibular and auditory conditions:

- Meniere's disease is a potentially disabling condition that may cause episodes of hearing loss, fluctuating tinnitus, vertigo and aural fullness.
- Perilymphatic fistula is an abnormal communication between the fluid filled inner ear and the air filled middle ear resulting in hearing loss and/or vestibular symptoms.
- The procedure will help identify wave I of the ABR in patients with profound hearing loss. This wave may not be detected on standard ABR testing in patients with such condition.

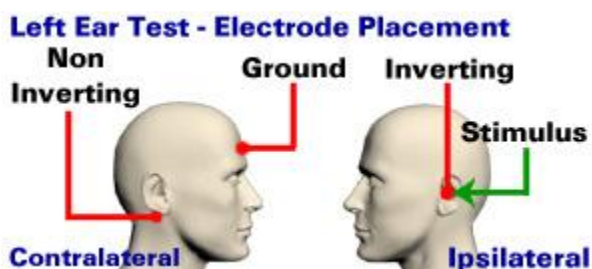
Other conditions may also be detectable using ECoChG diagnostic testing.

## Patient Preparation

The patient must be placed in a comfortable and quiet environment, preferably a sound booth where the patient lies down on a

comfortable bed. The electrodes should be placed using the following configuration:

- Inverting (-) & Stimulus: Test Ear Canal
- Non-Inverting (+) : Contralateral Mastoid
- Ground: Forehead



When recording from both ears, a contralateral tiptrode in the ear canal may be used as the non-inverting electrode.

## Electrode Usage

Surface electrodes cannot be used to acquire ECoChG recordings. The ECoChG signal is low in amplitude and electrodes must be placed closer to the cochlea in order to record such signals. You may use Tiptrodes covered with conductive paste placed in the ear canal, Tympanic Membrane Wick electrodes or Transtympanic electrodes. Consult the SmartEP manual and the Technical Reference manual for detailed instructions on electrode placement. Use extreme caution when inserting anything into the ear canal, this procedure must only be performed by a qualified medical professional.

## Setting up SmartEP

SmartEP from Intelligent Hearing Systems has built-in functionality to acquire ECoChG. The system may be setup with a few clicks of the mouse. Complete the following steps in the order outlined, use the test settings that fit your testing requirements or use the recommended settings shown on the next page:

## Acquiring ECoch-G with SmartEP

- Under **Stimulus > Modality** in the main menu, make sure *Auditory > ECoch-G* is selected.
- Set the stimulus, Click on **Stim** from the control panel and set the stimulus type, duration, frequency, window, masking and transducer, 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 desired amplification.
- On the control panel, set rate, polarity, intensity and the number of sweeps.
- Press the **Acquire** button to start recording ECoch-G responses

SmartEP allows automation of the acquisition process; consult your user's manual to learn how to create your own testing protocol or how to save your settings for future use.

### Recommended Test Settings

This table shows the settings that have been proven to work well for ECochG acquisition. Acquire three or four recordings with the exact same settings for more accurate diagnosis.

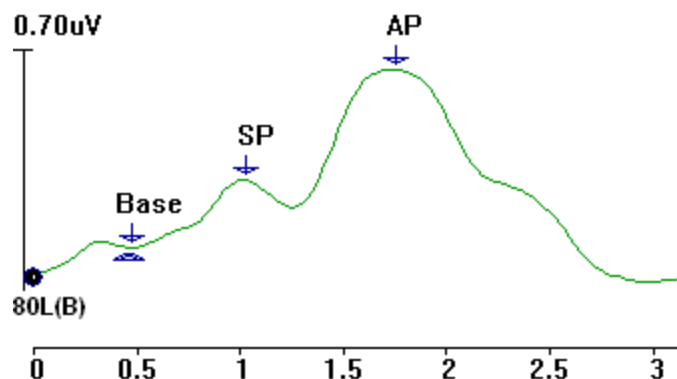
<b>Stimulus:</b>	0.1 milliseconds Click
<b>Rate:</b>	7.1/ sec or 99.9/sec. Use slow rates to enhance the AP component and fast rates to differentiate the SP (still robust) from the AP (now deteriorated).
<b>Polarity:</b>	Alternating
<b>Transducers:</b>	Insert Earphones
<b>Intensity:</b>	90 to 95 dB HL
<b>Filters:</b>	5 or 10 – 1500 Hz
<b>Notch Filter:</b>	OFF. ON, only if there is excessive electrical line noise present.
<b>Amplification:</b>	75x or 100x
<b>Analysis Time Window:</b>	5 milliseconds.
<b>Sweeps:</b>	250 to 500
<b>Electrode Montage:</b>	Horizontal Array (see figure in previous page)

### Marking Peaks

To accurately diagnose a condition, you must first place the applicable labels on the recently

acquired recording. The labels that need to be placed are: the action potential (AP, the summing potential (SP) and the base. To place the labels in their respective places, follow these steps for each of the labels:

- Right click at the point of the recording where the label is to be placed.
- Select “Mark Peak” or “mark other peak” option.
- Click on the appropriate ECochG label (Base, SP or AP).
- Once placed, drag the top marker of the labels to their appropriate place.
- Drag all the bottom markers of the labels to the place where the Base is.



The graph shows suggested label placing for an acquired signal.

### Analysis

Typically, a recording with differing amplitudes and latency ratios to those displayed on the previous graph may be considered abnormal, and reflect the presence of a pathological condition. All results must be evaluated by a medical professional trained in ECochG techniques. The amplitude ratios considered to be pathological depend on the type of electrodes used. Consult your SmartEP manual for additional sources.