

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?

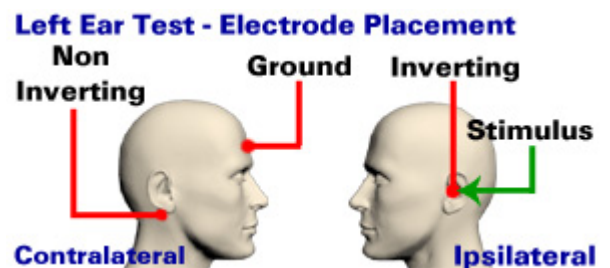
Electrocochleography may be used to diagnose some vestibular and auditory conditions like:

- 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.

Patient Preparation Procedure

- Examine both ears otoscopically to get a feel for the Tympanic Membrane (TM) and to remove impacted or large pieces of Cerumen.
- Do a tympanogram to test TM integrity.

- Place the contralateral mastoid and forehead electrodes in the following configuration:



- Let the patient lie down on his side and irrigate the patient's external auditory meatus with saline a body temperature using a syringe.
- Let the saline float any debris (1 minute minimum)
- Place a gauze pad over the ear and have the patient roll onto the opposite side to drain the ear.
- Check the rayon wick on the electrode to make sure it's soaked in saline and gel solution.
- Remove the clear tape from the well that houses the wick, remove the wick and lower it into the ear canal carefully.
- Anchor the shaft of the wick against using a foam ear plug, with its corresponding silicone tube, careful not to shift the wick.
- Connect the wick to the amplifier. Connect the test lead into the corresponding ear socket, and the green attachment between the ground socket and the ground electrode lead.
- Connect the far end of the silicon tube from the foam plug into the insert earphones transducer phones.

Setting up SmartEP

SmartEP from Intelligent Hearing Systems has built in functionality to acquire ECochG. Complete the following steps in the order

ECochG Using TM Wick Electrodes in SmartEP

outlined, use the test setting that best fit your testing requirements or use the recommended settings shown on the next page:

- Under **Stimulus > Modality** in the main menu, make sure *Auditory > ECochG* 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

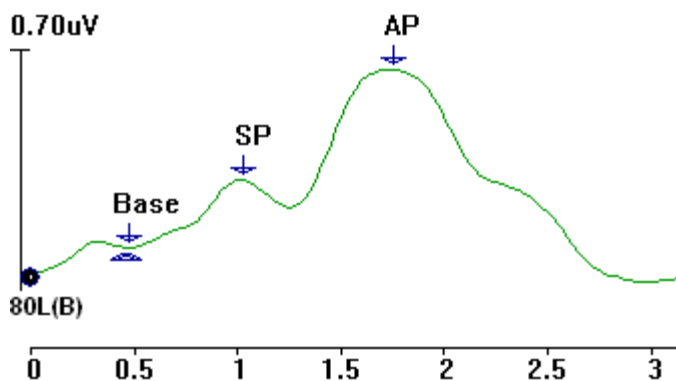
This table shows the settings that have been proven to work well for ECochG acquisition. Acquire three or four recordings with the exact same settings for more accurate diagnosis.

Stimulus:	0.1 milliseconds Click
Rate:	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).
Polarity:	Alternating
Transducers:	Insert Earphones
Intensity:	90 to 95 dB HL
Filters:	5 or 10 – 1500 Hz
Notch Filter:	OFF. ON, only if there is excessive electrical line noise present.
Amplification:	75x or 100x
Analysis Time Window:	5 milliseconds.
Sweeps:	250 to 500
Electrode Montage:	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.