























## 5. Method

- Tubal insert earphones **must** be used. These have a remote transducer coupled by an acoustic tube (e.g. ER-3A) that introduces a time delay (about 0.9ms) between the electrical signal at the transducer and the acoustic stimulus at the ear canal, enabling separation in time of the electromagnetic stimulus artefact from the cochlear microphonic. If conventional supra-aural earphones were to be used the CM and stimulus artefact would occur almost simultaneously and would therefore be difficult to distinguish. Tubal insert earphones have a further important advantage: the acoustic stimulus can be easily blocked during a control run by clamping the tube between the transducer and the ear tip. This forms an important element of the test procedure since in this condition the electrical artefact remains whilst the stimulus is effectively withdrawn, thus allowing a possible CM response to be validated or rejected as artefact.
- The recommended method is to use separate runs of condensation and rarefaction polarity clicks at 85 dBnHL<sup>2</sup>. Waveforms should be replicated (at least two runs). In order to avoid uncertainties relating to stimulus level in a baby's ear canal, it is recommended that both the ckABR and the CM test are conducted at the same stimulus level with the same (insert) transducer. This is not an issue for older children and adults, whose occluded ear canal volumes are larger and less variable, with correspondingly less uncertainty in effective stimulus level. If the ckABR at 85dBnHL is present but grossly abnormal then the highest level at which ckABR is absent should be determined and the CM then performed at that level, the aim being to perform the CM test with a stimulus for which the ABR is absent. This tactic can be used with a stimulus down to around 70dBnHL but at lower levels the likelihood of recording a CM diminishes, particularly in the presence of a conductive element.
- Many ABR systems have a facility whereby the responses evoked by rarefaction and condensation stimuli using an alternating polarity stimulus can be displayed simultaneously. This alternative approach is acceptable but note the next point, below, regarding the number of sweeps.
- Sweeps per waveform: typically 2000 (minimum 1500). If alternating polarity with simultaneous collection of responses to condensation and rarefaction stimuli is used then typically 4000 sweeps should be averaged, so that typically 2000 are averaged for each stimulus polarity. If the artefact rejection level is relaxed to above  $\pm 3\mu\text{V}$  then a greater number of sweeps may need to be collected.
- If a CM is considered to be present it is important to verify that it is not a stimulus artefact. Perform replicated additional control runs (of either polarity; it is not necessary to obtain both) at the same stimulus level but with the tubing clamped. An alternative to clamping the tubing is to temporarily disconnect the tubing from the transducer. If the potential is clearly eliminated, it is a true biological potential. If the measured potential remains, it is due to a stimulus artefact: separate the transducer

---

<sup>2</sup> In babies up to 84 days (12 weeks or 3 months) corrected age the stimulus level (clicks, the maximum for 4 kHz is the same) must be limited to 85 dBnHL. This can be exceeded in older babies (90 dBnHL from 85 to 168 days, 95 dBnHL over 168 days), children and adults but caution is advised in the 3-12 month range because there is little data on how the insert calibration error changes with age.













