SUMMARY OF RECOMMENDED ABR PARAMETERS[a]

	Click, NBchirp & 2kHz / 4kHz tone pip/	0.5kHz / 1kHz tone pip
Electrode location[b]	Positive : High forehead (as close to vertex as possible but avoiding fontanelle) Negative : Ipsilateral mastoid Common : Contralateral mastoid	
Stimulus type	Alternating polarity	
Stimulus timing	Click: 100µs. Tone pip: 2-1-2 cycles (linear rise–plateau–fall) or 5-cycle Blackman	
Stimulus rate[c]	45.1 - 49.1/s 17.1 - 19.1/s for wave I on BC[d]	35.1 - 39.1/s
Calibration values for 0dBnHL	Refer to NHSP calibration data	
Amplifier reject levels	±3 to ±10µV[e] peak-to-peak. Start at ≤±5µV peak-to-peak	
Amplifier filters	Low frequency: 30Hz High frequency: 1500Hz	
Window length[f]	20ms	25ms
Number of sweeps averaged per replication	Typically: 2000 click & NBchirp, or 3000 for TP Minimum: 1500 click & NBchirp, or 2000 for TP	
Display scales	Within range 25-100nV ≡ 1 ms See equipment specific settings.	
Display	Wave V up	

The frequencies used for frequency-specific testing should be 0.5, 1, 2 or 4kHz.

[a] Note that some equipment offer more advanced features or stimuli, not covered in this table. See the NHSP equipment-specific parameter document for details

[b] Alternative electrode montage: Negative – nape; Common – forehead at least 4cm from positive or negative electrodes (low forehead or to one side). Note that some manufacturers label positive and negative as active and reference respectively. Referring to common as Ground or Earth is technically incorrect; indeed it is dangerous to ground a patient. For two-channel BC see Appendix B.

[c] Most equipment can provide a rate within these ranges for the suggested window length (see equipment-specific parameters). The rate must not be related to 50Hz. If chirp stimuli are used the optimum rate depends on the chirp duration.

[d] If wave V asymmetry is being used in place of wave I presence, then stimulus rate is not reduced

[e] See Appendix D for note on using 10 µV rejection setting.

[f] These window lengths are nominal values and should be set to the closest value available on the equipment. Chirps should be used with a window length of 20ms regardless of stimulus frequency.

NHSP ABR Parameters on specific systems

Biologic (Windows software version 6.3 & 7.0)

The parameters are set in: Setup/Collection Protocols and in each protocol by selecting the relevant tab in the software headed 1/Recording, 2/Stimulus, 3/Amplifer.

Recording

Epoch time(window)
For Clicks & tone pips at 2kHz & 4kHz: 21.33ms
For Tone pips at 500Hz & 1kHz: 26.67ms
Points (No. of data points in average): 512 (only 256 possible with 26ms epoch)
Pre/post: 0
Blocking: See table below
Maximum number of averages (sweeps) 3000 for clicks, 4000 for tone pips.
Fsp details: tick enable but not stop criterion 0. See table below for range; set skipped points to

Stimulus

Transducer: headphones/insert earphones/bone oscillator
Insert delay: 0.80ms
Polarity: alternating
Stimulus rate: 45.1/s (for a 21.33ms window)
35.1/s (for a 26.67ms window)
NB check stimulus rates can be achieved and that high rate does not produce an artefact.

Intensity (initial level for 4kHz pips but refer to NHSP guidelines; aim is to start at discharge level +10dB):
Headphone: 40dBnHL
Insert earphone: 30dBnHL
Intensity step 5dB
Stimulus type:
Click
Duration 100µs.
Tone burst (tone pip)
Rise/fall time: 2 cycles
Plateau: 1cycle
N.B. Earlier software may require values in ms as follows:

	500Hz	*1000Hz*	*2000Hz*	*4000Hz*
Plateau	*2*	*1*	*0.5*	*0.25*
Rise time	*4*	*2*	*1*	*0.5*

Ramp: Blackman or linear (not critical)
Mask: none
(Noise calibration: 0dB of noise is actually 20 dB SPL)

Amplifier

Channel 2 enable: unchecked
Gain: 240,000 or 300,000
Artefact reject level: ±5µV to ±9.9µV (±3µV for CM tests)
WARNING reject level can change if the gain is changed - check reject levels are correct on display, especially after changing the gain setting.

Filters: Low 30Hz High 1500Hz. Notch filter: unchecked
Input 1:Cz Input 2: A1/A2
Electrode switching: use only if you understand how this works.

Display
Setup/Default Display parameters. Waveform Grouping: Select user positioning as default but manually select superimpose for interpretation. Scale: Normally split screen, format (two charts side by side – Ear Panel Same). Specific 0.2µV (0.3 for large responses). Do not manually alter chart size /position with the mouse – likely to alter aspect ratio.
Select "show response" for the default blocking appearance. The use of "show flat line" is appropriate only when the stimulus artifact is so large as to cause a chart to span several pages (usually BC >45dB).

Fsp range & blocking duration:

Stimulus	Blocking (ms)	Fsp range* (ms)
Click	1.5	6-14
4k Pip	1.5	6-14
2k Pip	2.5	8-16
1k Pip	5.0	11-19
500 Hz Pip	10.0	13-21

* Revised July 2011

There is an option to show the waveform (response) or show a flat line over the blocking period. The default option should be "show response" and the "show flat line option should be used only if the size of the stimulus artefact causes the chart to expand unreasonably. This tends to occur only when testing by BC at high stimulus levels. The default option is set in: Setup, Default Display Parameters, Stimulus Blocking Appearance. Toolbar buttons are provided to temporally change the option when required.

Adding Waveforms

Select the waveforms to be added: select the first waveform by clicking on it on the control panel listing. Hold the Ctrl key down and do the same for the second waveform to be added. Repeat process if more than two traces are to be added.
This highlights the traces to be added in the control panel.

Select: Analysis (from toolbar at top of screen)
Calculations (from drop menu)
Weighted Add
The weighted added trace appears on the waveform display

<u>Maximum stimulus levels:</u>
The following levels, in dBnHL, are typical for the Nav Pro when calibrated the levels advocated by NHSP. Users can use these as an approximate guide as a check for appropriate calibration. Individual systems are unlikely to have maximum stimulus levels that depart from these levels by more than 5dB. When making this check it is necessary to set the system to a stimulus step size of 1dB (not 5dB).

	Click	**4k**	**2k**	**1k**	**500**
TDH	99	107	107	114	109
Insert	100	109	109	112	109
BC	61	55	69	61	58

Fsp >7 for the NavPro in both replicated waveforms using the NHSP recommended settings support the conclusion that the response probably exceeds the 3:1 condition component of the NHSP CR criteria.
A CR decision still requires that the other interpretation criteria have been met. The principal use of Fmp and Fsp is in guiding the user when sufficient sweeps have been acquired.

Note that high Fsp values can sometimes be obtained in cases of low frequency drift (a sloping baseline) so the user must exercise judgement and require the all NHSP criteria for CR to be satisfied.

Residual noise: Set to most strict (lowest value) if you do not want to auto-stop. Note that the NHSP 25nV “gap” criterion is likely to correspond to an RMS noise value of 15nV or less.

Interacoustics ECLIPSE EP25 (software version 4.2 and above)

System Setup

Note: text in red gives advice specific to software versions of 4.4.xx and later

Auto Test Protocols:

Type of Measurement: ABR-30
Stimulus Properties:
Stimulus Type:
Traditional Click or
Tone Bursts (same as “Tone Pips”):
Blackmann: 5 sines
(Alternative: *Manual*: Rise/fall = 2 sines and Plateau = 1 sine)
CE-Chirps may also be used if desired. These require special test settings.
Stimuli per sec.:
20ms recording length: Click protocols: 49.1 /s;
Tone Burst protocols: 2kHz or 4kHz: 49.1 /s
24ms recording length: Tone Burst protocols: 500Hz or 1kHz: 39.1 /s
Polarity: Alternate
Stimulus Ear:
Binaural Stimulation: Off
Masking Difference: Off
Recording Properties:
Stop Criteria: 3000 sweeps for clicks / chirps, 4000 sweeps for tone pips
Recording:
Begin: 0ms
Display to: 20ms (24ms for 500Hz and 1kHz Tone Bursts).
Next Intensity Conditions: Off
Single Curve: Off
Wave Reproducibility: From the end of the blocking period to the end of the timebase.
Rejection Level (default amplifier gain setting): Manual: ±40µV (AC) or ±80µV (BC)
It is recommended that Bayesian Averaging is used, with ±10µV rejection.
Use the Advanced option to select ±3-10µV if Bayesian averaging is not used or if there is heartbeat activity in the incoming EEG leading to an upward or downward sloping ABR waveform.
Filter settings for input amp: High Pass: 33Hz Low Pass: 1500Hz
Preliminary display settings: High Pass: None Low Pass: 1500Hz

General Setup:
Tick the following:
- Multiple waveform markers on same intensity and side
- Show all contra curves
- Show all A+B curves
- Level measure method “Peak to trough”

Untick the following:
- Baseline
- Draw intensity handle at baseline
- Show EEG too low warning

Printer Setup:
Print view: do not tick the “Keep screen aspect ratio on print out” box.

For v4.4 to customise printout template select the Printer Wizard (consult Interacoustics for advice)

Report Setup:
Select a font size of 16

Printers:
For version 4.4 the default printer is the IA XPS Document Writer (EPxx). This file will be overwritten each time a new printout is created.
To change the default printer go to:
<Desktop><Control Panel><Hardware and Sound><Devices and Printers>
Right click the mouse over printer of choice (PDF / MS XPS / paper printer) and from menu select <Set as default>

"All Sweeps Rejected" Warning message
For 4.4.3.21 and later, there is an option in General Setup "Show rejection dialogue". Untick this box to avoid the warning appearing.

"All Sweeps Rejected" warning appears when the EEG activity exceeds the artefact reject level, even when the collection is paused. Note this may happen when the stimulus or the collection artefact reject levels are exceeded.
If the tester selects "OK" then all the sweeps collected will be lost and the collection needs to be started again.
If the tester selects "Cancel" the warning will keep appearing whilst the EEG is greater than the artefact reject level.
Advice is to ignore this warning box unless the stimulus artefact levels are being continuously exceeded. This would suggest that there is a problem with the electrodes or there is other electrical interference, for example when using the bone transducer at high stimulus levels.

Adding waveforms
The two waveforms must be at the same stimulus level.
The following adds two waveforms into a new waveform (weighted add):
With one of the two waveforms selected, position the cursor over the dB label of the other waveform and right-click, then select the "add this curve" option. A third (new) combined waveform is displayed. If more than two waveforms need to be added, select the new combined curve and repeat the process with the next waveform to be added.

Masking Noise:
• Noise is calibrated and presented in dBSPL

Fmp values and residual noise

a) Versions 4.2 and 4.3

Fmp: Fmp >2.5 for the Eclipse in both replicated waveforms using the NHSP recommended settings support the conclusion that the response probably exceeds the 3:1 condition component of the NHSP CR criteria. A CR decision still requires that the other interpretation criteria have been met. The principal use of Fmp and Fsp is in guiding the user when sufficient sweeps have been acquired.

Residual noise: The NHSP 25nV "gap" criterion is likely to correspond to an RMS noise value of 25nV or less.

b) Version 4.4

Fmp and residual noise values appear to have been significantly changed from previous software versions to which the 2013 NHSP ABR guidance applies. Direct comparisons between Eclipse 4.2 and 4.4 systems simultaneously recording ABRs has led to the following new advice (advice for the Biologic NavPro is unchanged): Fmp >7 for the Eclipse (v4.4.2.x or later) in both replicated waveforms using the NHSP recommended settings support the conclusion that the response probably exceeds the 3:1 condition component of the NHSP CR criteria.
Residual noise values may be used as a guide of when to stop averaging if the outcome of the test appears to be a candidate for RA status. The recommended target value for the Interacoustics Eclipse (v4.4.2.x or later) is 15nV. Thus for both Fmp/Fsp and residual noise, the criteria for the Interacoustics Eclipse and Biologic NavPro are now the same.

Maximum stimulus levels:
The following levels, in dBnHL, are typical for the Eclipse when calibrated the levels advocated by NHSP. Users can use these as an approximate guide as a check for appropriate calibration. Individual systems are unlikely to have maximum stimulus levels that depart from these levels by more than 5dB.
When making this check it is necessary to set the system to a stimulus step size of 1dB (not 5dB).

	Click	4k	2k	1k	500
TDH	100	100	100	100	100
Insert	100	100	100	100	100
BC	50	50	50	50	50

Test protocols and their settings (AC: 40dBeHL for babies <12/52; BC: max level for no masking). Applicable for 4.4.3.21 or later.

Test Protocol Name	Default Stim dBnHL	Time base (ms)	Rate (/s)	Blocking 0ms to (ms)	Wave Repro (ms)	Fmp range (ms)
1a NHSP ABR TDH Click	45	20	49.1	1.5	5-15	5-15
1b NHSP ABR TDH 4k Pip	50	20	49.1	1.5	5-15	5-15
1c NHSP ABR TDH 2k Pip	50	20	49.1	2.5	7-17	7-17
1d NHSP ABR TDH 1k Pip	55	24	39.1	5.0	10-20	10-20
1e NHSP ABR TDH 500 Pip	60	24	39.1	10.0	10-20	10-20
2 NHSP CM Insert Click	80	10	88.1	1.5		
2a NHSP ABR Insert Click	35	20	49.1	1.5	5-15	5-15
2b NHSP ABR Insert 4k Pip	40	20	49.1	1.5	5-15	5-15
2c NHSP ABR Insert 2k Pip	45	20	49.1	2.5	7-17	7-17
2d NHSP ABR Insert 1k Pip	50	24	39.1	5.0	10-20	10-20
2e NHSP ABR Insert 500 Pip	55	24	39.1	10.0	10-20	10-20
3a NHSP ABR BC Click	15	20	49.1	1.5	5-15	5-15
3b NHSP ABR BC 4k Pip	15	20	49.1	1.5	5-15	5-15
3c NHSP ABR BC 2k Pip	20	20	49.1	2.5	7-17	7-17
3d NHSP ABR BC 1k Pip	10	24	39.1	5.0	10-20	10-20
3e NHSP ABR BC 500 Pip	10	24	39.1	10.0	10-20	10-20
Chirp protocols:						
1f NHSP ABR TDH WB Chirp	40	20	39.1	*	5-15	5-15
1g NHSP ABR TDH 4k Chirp	45	20	49.1	*	5-15	5-15
1h NHSP ABR TDH 2k Chirp	45	20	45.1	*	5-15	5-15
1i NHSP ABR TDH 1k Chirp	50	20	39.1	*	5-15	5-15
1j NHSP ABR TDH 500 Chirp	55	20	37.1	*	5-15	5-15
2f NHSP ABR Insert WB Chirp	30	20	39.1	*	5-15	5-15
2g NHSP ABR Insert 4k Chirp	35	20	49.1	*	5-15	5-15
2h NHSP ABR Insert 2k Chirp	40	20	45.1	*	5-15	5-15
2i NHSP ABR Insert 1k Chirp	45	20	39.1	*	5-15	5-15
2j NHSP ABR Insert 500 Chirp	50	20	37.1	*	5-15	5-15
3f NHSP ABR BC WB Chirp	10	20	39.1	*	5-15	5-15
3g NHSP ABR BC 4k Chirp	10	20	49.1	*	5-15	5-15
3h NHSP ABR BC 2k Chirp	15	20	45.1	*	5-15	5-15
3i NHSP ABR BC 1k Chirp	5	20	39.1	*	5-15	5-15
3j NHSP ABR BC 500 Chirp	5	20	37.1	*	5-15	5-15

GSI Audera

This relates to software version 2.6.6 or later

Stimulus Type:	100µs click / Blackman pip / CE-Chirp (software version 2.7)
Stimulus Polarity:	Alternating
Stimulus Level:	45dB earphones or 35dB inserts (suggested starting level: 40dBeHL)
Masking offset:	See # below
nHL adjustment:	3.9dB (version 2.6.5) / 0dB (version 2.6.6)*
Repetition Rate:	49.08/s (for 20ms window) / 38.98/s (25ms window)
Total sweeps:	2000 (clicks, 2kHz & 4kHz pips) / 3000 (500Hz & 1kHz pips)
High Pass Filter:	30Hz @ -6dB 12dB/Octave
Low Pass Filter:	1.5kHz
Waveform start at:	0.0ms
Noise (artefact) Rej	Armed after 1ms (clicks), 1.3ms (4k), 2.5ms (2k), 5ms (1k), 10ms (500)
Waveform ends at:	20ms (clicks, 2kHz & 4kHz pips) / 25ms (500Hz & 1kHz pips)
Sweeps:	Set to at least 4000 (see below) and use a number of sweeps appropriate to the prevailing test conditions.
Noise (artefact) rej level:	±10µV or ±5µV
Sensitivity:	50µV

The Audera is one of the few systems not to include the artefact rejection setting in the printout. Since this parameter is crucial and would be scrutinised by any subsequent review please ensure the value is hand-written or added as a comment on all printouts.

Note that the Audera test protocols do not include the specification of vertical display scale; however the use of a scale of 0.2uV/division (0.5uV/div for large waveforms) is appropriate.

Under certain circumstances it is possible to record a peak having a latency of about 3ms in the absence of a genuine physiological response. This is thought to be an instrument-generated artefact related to the proximity of the amplifier cable to the front of the Audera base unit. To avoid recording this artefact ensure that the amplifier cable does not pass close to the front of the base unit.

The wave V (or wave III) – SN10 amplitude of a response can be displayed on the printout as follows:
Go into the review screen, click on options and "edit marker sets." Add an additional marker to the set to indicate the amplitude measurement and then go to the Measurements tab. On the measurements tab, you can add an additional measurement and indicate the formula or edit one of the existing ones. Then, when interpreting, mark the two points that have been entered into the marker measurements and the value will automatically be calculated.

The Audera noise output is calibrated such that for noise delivered via an earphone 0dB noise is actually 10dBSPL; for noise delivered via an insert 0dB noise is actually -5dBSPL

* Select 0dB nHL adjustment and in the setup opt for the stimulus not to be compensated for repetition rate as follows:

For software version 2.6.6 and later ensure the “Constant SPL audio stimulus” option is selected (from main screen select Options, AEP Options, Miscellaneous) then in each test protocol (Test Set Definition) set the nHL adjustment to 0.0dB. This ensures correct stimulus calibration regardless of the stimulus rate being used.

Creating a weighted add on the Audera:
The Audera refers to this as ***average*** (its add function is an unweighted addition). On the Hierarchical Tree, locate the two waveforms to be combined mathematically. Drag the first waveform on to the second waveform and release the mouse button. This invokes the maths window. Select average.
The result of the function is displayed as a third waveform. Select OK if satisfactory. The maths window closes and the result is placed in a new chart on the main window. Unfortunately if an attempt is made to combine another waveform with the result of the previously averaged waveform the following message is seen: “One of the waveforms is the result of an existing “combine series” operation – it cannot be combined again.” This means that averaging (weighted addition) of more than two waveforms is not allowed. For this reason it is advisable to set the test protocols to at least 4000 sweeps, for use in noisy test conditions.

GN Otometrics Chartr EP200

Channels
One channel switched on, one off.
Amplifier gain: 200k,
Artifact rejection is controlled via the Test toolbar / Artifact level.
A reject level of ±5µV is achieved with Artifact Level set to 40% whereas a reject level of ±10µV is achieved with Artifact Level set to 80%.
A spreadsheet which offers these and other values is available from GN support staff.

Filters: High Pass: 30Hz Low Pass: 1.5kHz
Notch: off
Artifact on
Electrode switching on

Acquisition
Sweep time 20ms (25ms for 500Hz & 1kHz tone pips)
Delay: 0
Sweeps: 3000
Rate: 47.1/s (37.1/s for 500Hz & 1kHz tone pips)

Stimulus
Intensity: 45 (or appropriate level to start at 40dBeHL)
Transducer: as appropriate
Polarity: Alternating
Tone Frequency: as appropriate
Envelope: Blackman (preferred) or Linear
Ramp (cycles): 2
Plateau (cycles): 1

Noise calibration: The noise output is calibrated such that 0dB noise is 0 dB SPL (measured on a 6cc coupler for TDH phones and 2cc HA-2 coupler for inserts).

ABR Practical advice and interference reduction (all systems)

This is a collection of technical hints & tips for clinical ABR testing – almost certainly incomplete! Please contact Guy Lightfoot by emailing admin@eratraining.co.uk with suggested additions & corrections.
Thanks to Gary Norman for his suggestions upon which this section is based.

GOOD HOUSEKEEPING

Request a quiet room preferably away from roads, rooms containing power supplies / fuse boards.
Always log the room number/location on the ABR form unless the tests are always conducted in the same room. Make a note of any adverse conditions observed in the session.
*All fluorescent / energy saving lighting should be switched off. Use incandescent tungsten lighting.
*Do not use light dimming switches (a notorious source of interference).
*Turn off all mobile phones in the room (check with parent / carer).
*TVs in the vicinity should be turned off (not just on standby).
*Remove battery-powered wrist watches and place far away from the equipment & patient (especially important for the person holding the earphone or BC).
If a bed is used, move it away from any wall with mains sockets / trunking.
Position child with head towards centre of the room, not the wall, especially if there is a power trunking at the head of the bed.
Position equipment at end of bed (patient's head end), but as far from the patient as possible.
For babies in child seats or being held by mother position at least 1m from equipment and mains cables.
Do not position equipment near sockets or screened mains trunking.
*Unplug any power adaptors of non-essential equipment.
*Unplug any non-essential networked computers in the room remembering to remove the network cable from the data socket located on the wall or trunking.
For babies be prepared to suggest alternative positions, e.g. for the baby to be placed in a cot or pram, rather than being held by a parent.
* These items apply only if non-patient interference is present.

EQUIPMENT SET UP

Use a medical grade power isolation transformer; all interconnected equipment (even switched off) should be connected to this.
Equipment needs to be set up in a methodical fashion. In particular, ensure the transducers being used tally with the type (insert –v- phone –v- BC) assumed in the ABR software.
Stage A calibration check should be performed on site immediately prior to use.
Carryout a further listening check if no responses are seen or unusual waveforms are recorded.
Odd-looking responses can be recorded if the electrode leads are incorrectly connected (response may be inverted) and a flat-line is likely if we inadvertently record across the mastoids. Some equipment has automatic electrode switching options. If selected, check that the appropriate electrode set-up has been used.

If interference occurs try running any laptop on battery, disconnected from its power supply with the power supply unplugged (check battery charge is adequate to complete the test).
* Do not have a printer plugged in or switched on during testing.
* Do not have a tympanometer plugged in or switched on during testing.

Do not cross over any leads/cabling, especially electrode / transducer / power supply leads.
Run electrode cable from one direction to the patient and earphone cable from the other direction to the patient –DO NOT LET THEM CROSS.
* Use blankets/pillows to support cables across any point they may touch bed or pram frames. The bed / pram framing may act as an aerial.
An in-line RF filter between electrode box and electrodes sometimes eliminates RF interference.
Run electrode leads close together. If artefact is a problem plait longer electrode leads or use short electrode leads, gathered or twisted together.

DURING TESTING/ASSESSMENT

A larger ABR response is obtained with the positive electrode as high as the fontanelle allows and the negative electrode just behind the ear and level with or slightly lower than the meatus (allowing BC placement above).
It is a common mistake to place the active electrode too low and the mastoid electrode too high.
Change electrode leads to new set or different type if any interference persists.
Ensure the equipment is switched from impedance mode to collection mode, when applicable.

Keep electrodes plus their leads away from bone conductor and its leads. Use practical positioning that will not diminish response (particularly important for recording CM).
When testing by BC the vibrator should be above the level of the mastoid electrode. If there is no response, when expected, it is worth checking the vibrator placement.
Increase artefact rejection from default value to 7.0 or 10.0uV as required but recognise that many more sweeps will be needed to average out the noise that this allows in to the recording. Doubling the noise requires a four-fold number of sweeps to preserve the noise content of the average.
Record changes made on the waveforms and reasons why.

Exercise care to avoid occlusion of the ear canal associated with pressure (especially transverse) when using supra-aural phones. Likewise debris can occlude a canal when an insert is placed. Bone vibrator pressure and placement should be consistent if variation in stimulus level during testing is to be avoided.

IDENTIFYING & ELIMINATING ELECTRICAL INTERFERENCE

Know your enemy! Try to deduce the source of the interference from its appearance in the incoming “EEG” display (or acquire a 1-sweep average) with filters wide open (e.g. 1Hz to 3kHz) and amplifier gain / artefact rejection adjusted so as to accept large signals.
Measure / estimate the period of any waveform and calculate its frequency (f=1/t)
Myogenic activity from the patient will fluctuate.
Endeavour to link the frequency of interference to its likely origin. Mains will have a period of 20ms.
If interference is clearly 50Hz (mains) and all efforts have failed (including obtaining approximately equal & low electrode impedances) to reduce it to a workable level then the use of a mains notch filter may allow testing to continue. However be aware that notch filters can distort the ABR waveform and possibly degrade threshold precision so their use should be exception rather than the rule. Their use should be noted in the clinical report.

Check the room for patches of electrical interference using an analogue, battery-powered radio on “AM” e.g. medium wave. Try to avoid testing at these places. This technique sometimes allows the source of the interference to be identified. A ‘dummy’ patient box is also useful to track down sources of interference.

TESTS IN THEATRE

Operating theatres are usually acoustically noisy. Insert earphones help attenuate ambient noise and are safer in post-myringotomy cases where blood could make an electrical connection between the patient and the transducer but the transducer should be held (with a drip stand) at a higher level than the tip to avoid blood entering the transducer under gravity.
Theatres are also notoriously electrically noisy – the use of diathermy in adjacent theatres can be problematic but they tend to be used intermittently.
Autoclaves and microwave ovens also radiate interference, as do hospital pager systems, mobile phones (actually turn them off), lifts, escalators, air conditioning systems etc.
Pulse oximeters are sometimes to source of electrical interference. Try turning it off to see if this eliminates the interference (if so, then negotiate with the anaesthetist to do without if possible).
If an oximeter is used, position as far away from patient and equipment as possible (at patient’s feet end). Run Oximeter on battery if this eliminates interference and is available.
If plugged into mains power, use sockets away from those used for ABR equipment.
Log Oximeter serial number and type if problems occur and try to avoid in the future.
Try to negotiate carrying out the testing at theatre quiet times.

HEALTH & SAFETY

Request assistance to transport heavy equipment.
Secure leads and wires before transit to prevent trailing or falling from trolley.
Refer to NHSP advice on sterilisation of equipment, electrode leads, transducers etc.
Always use single-use electrodes and take necessary precautions to avoid cross-infection via electrode prep paste or electrode gel container.