Protocol of Aided Cortical Auditory Evoked Potentials testing
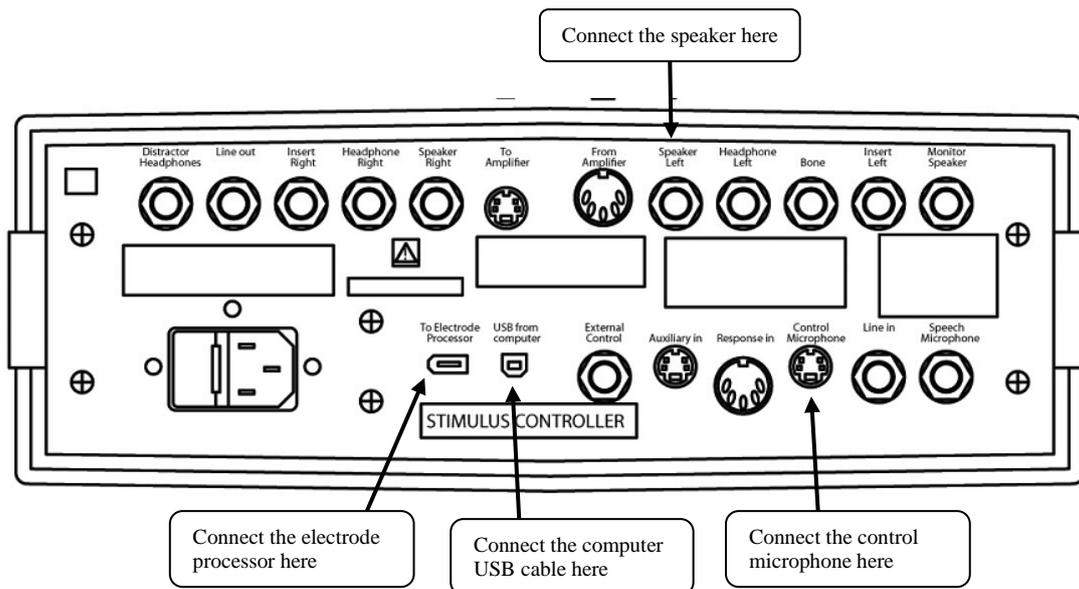
Contents

1. Equipment required

- HearLab
- Cotton buds
- Clean wipes
- Disposable electrodes
- Elastic bandage/headband
- Nu-prep abrasive gel
- Conductive EEG paste
- Quiet Toys, books and DVD to entertain the child during testing
- Tissue
- Comfortable chair covered with towel

2. Procedure

2.1 Start Up

- Switch on the power of HEARLab equipment

- Ensure connections on the Stimulus Controller are correct.

Connect the speaker here

Distractor Headphones | Line out | Insert Right | Headphone Right | Speaker Right | To Amplifier | From Amplifier | Speaker Left | Headphone Left | Bone | Insert Left | Monitor Speaker

To Electrode Processor | USB from computer | External Control | Auxiliary in | Response in | Control Microphone | Line in | Speech Microphone

STIMULUS CONTROLLER

Connect the electrode processor here

Connect the computer USB cable here

Connect the control microphone here

- Double click the ACA icon on desktop

2.2 Free-Field Calibration

(1) Ensure that the control microphone is located at the subject position.
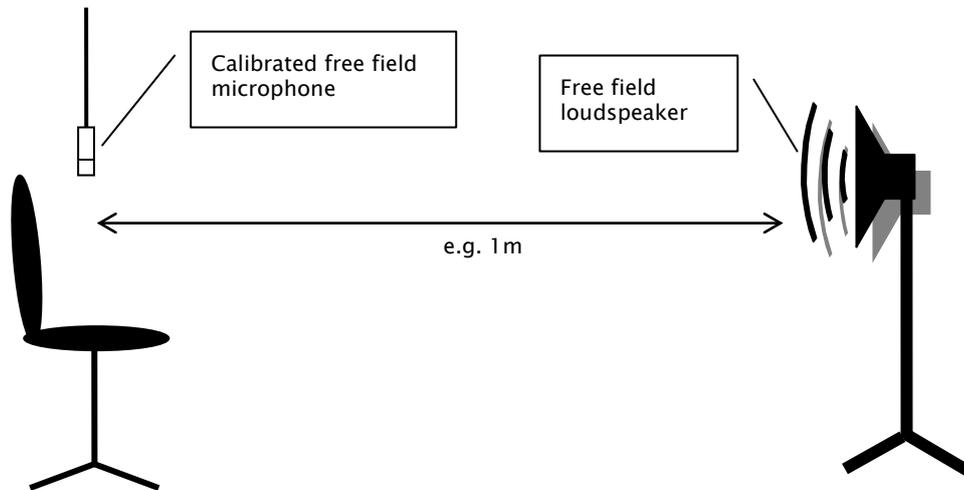
(2) To open the "Free Field Calibration Wizard", press keyboard shortcuts *Shift+Ctrl+Alt+K* and click the "Free Field" button.
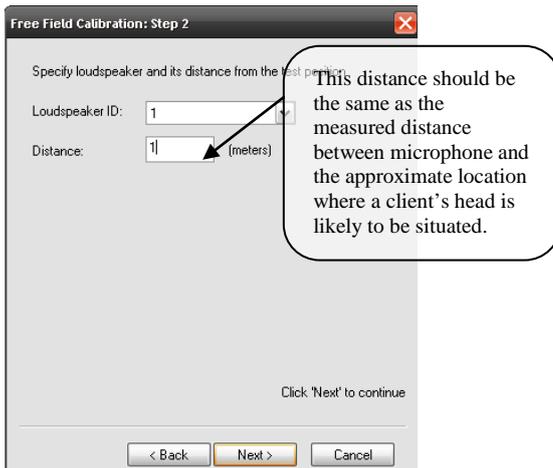

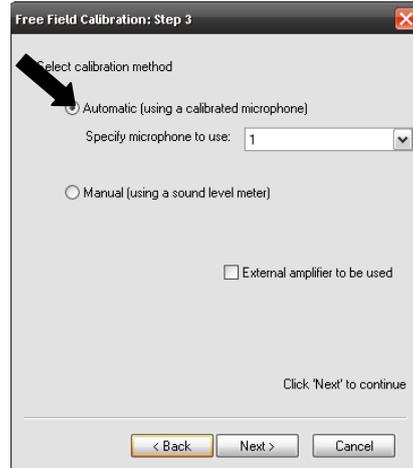(3) Follow the on-screen steps to complete free-field calibration

Step 1: loudspeaker position

Step 2: Distance of Loudspeaker

Step 3: Automatic calibration method

This distance should be the same as the measured distance between microphone and the approximate location where a client's head is likely to be situated.

Step 4&5: loudspeaker setup
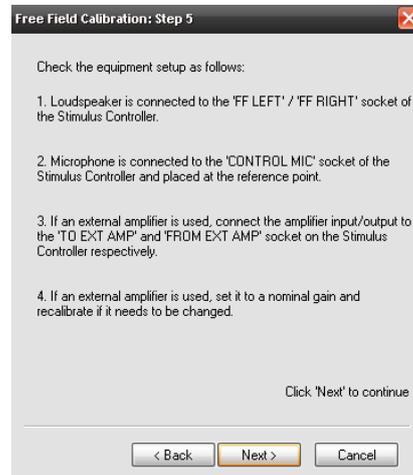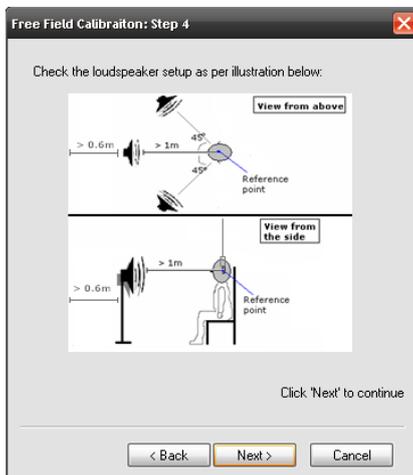
- For automatic free field calibration, a series of warble tones (from 125 Hz to 8 kHz in one-third octaves) will be presented through the loudspeaker. The signal will be recorded and measured by the microphone, and the HearLab system will make automatic level adjustments to achieve a flat frequency response.

- You may pause or abort the calibration process at any time by pressing *Pause* or *Abort* button.

Step 6: Calibration
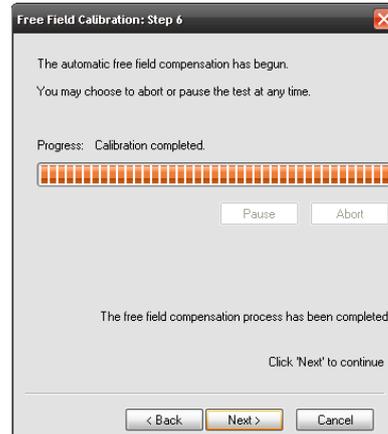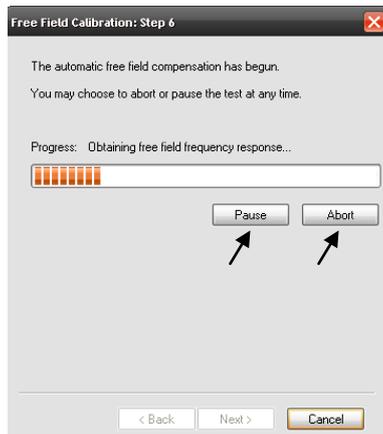
(4) View and Save Calibration Results

Free Field Calibration: Step 7

The free field compensation has been successfully completed.

Enter any additional note regarding the calibraiton below (e.g. ID of equipment used):

Click *View Results...* to view current calibration results in a dialog window which shows the frequency response obtained before and after the calibration.

View Results...

Click 'Finish' to save the results and exit, or 'Cancel' to exit without saving.

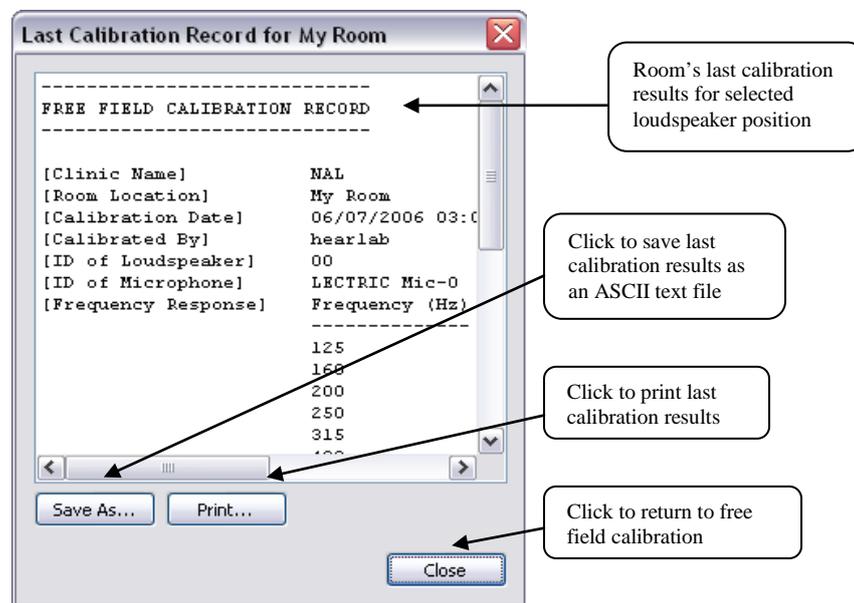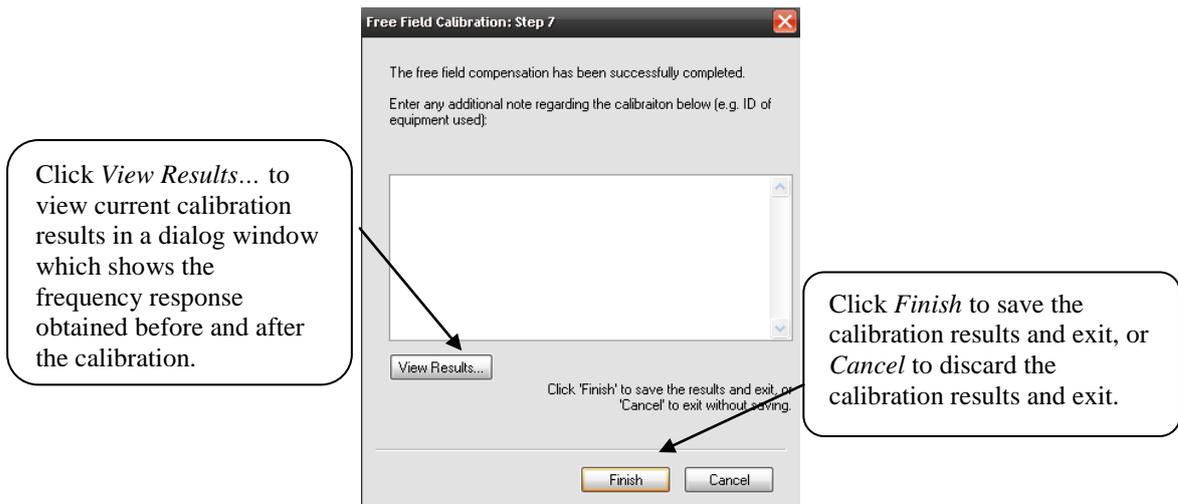Click *Finish* to save the calibration results and exit, or *Cancel* to discard the calibration results and exit.

Finish   Cancel

Last Calibration Record for My Room

```
------------------------------
FREE FIELD CALIBRATION RECORD
------------------------------

[Clinic Name]          NAL
[Room Location]        My Room
[Calibration Date]     06/07/2006 03:0
[Calibrated By]        hearlab
[ID of Loudspeaker]    00
[ID of Microphone]     LECTRIC Mic-0
[Frequency Response]   Frequency (Hz)
                       --------------
                       125
                       160
                       200
                       250
                       315
```

Room's last calibration results for selected loudspeaker position

Click to save last calibration results as an ASCII text file

Click to print last calibration results

Save As...   Print...

Click to return to free field calibration

Close

2.3 Open/Create a Client File

(1) Add a new client

- In the client screen, click the Add New Client icon on the toolbar

ACA 1.0

File   Main   Client   Tools   Help
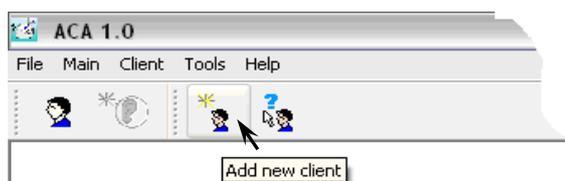
Add new client

- Fill in client details then click "OK" to save new client details to database. Ensure that you fill in the DOB so that the appropriate P1 range for normal hearing listeners will be displayed.

Add New Client

ClientID: 165354412

Surname: ABC   First Name: ABC   OK   Cancel

Date of Birth: 2006 – 7 – 7   Gender: Male

Notes:

(2) Search for an existing client

ACA 1.0
File Main Client Tools Help

Client search

- To work with an existing client, you may choose to either:
    - Search the client by their details, OR
    - Find the client by listing all the clients in the database

Client Search

ClientID: Search
Surname: First Name: Cancel
Gender:
Date of Birth: ○ On   dd / mm / yyyy
              ○ Before dd / mm / yyyy
              ○ After   dd / mm / yyyy
              ○ Between dd / mm / yyyy and dd / mm / yyyy

Note: When searching by surname or firstname, you can use % as the wildcard character

Cl...	Surname	First Name	Gender	Date of Birth	Notes
0000001234	VanWanrooy	Emma	Female	16/09/1974	
0000066601	Test	Demo	Male	11/11/1999	
0000088801	Test	Demo	Male	11/11/1999	
00016287700	Hill	Jordan	Male	16/03/2006	NAIDA_LOCHI
0001677869	1677869	ME	Female	25/12/2006	#129
0001690471	R	Z	Female	28/03/2007	
0001690443	L	N	Female	1/04/2007	
0001690550	129	AH	Female	14/05/2007	Outcomes
0001799358	Britten	Kirsten	Female	16/09/2008	NAIDA_LOCHI
0029071965	Test	Lyndal	Female	29/07/1965	Test run for visit
0165354412	ABC	ABC	Female	12/03/2006	LOCHI_NAIDA

List All Clients
Select Client

Double click on selected client or click 'Select' button to select client for assessment

- Name search is case sensitive.
- Wildcard character "%" can be use e.g. enter Smi% and it will search all clients' surname starting with

List all clients

Double click to select a client

- The selected client record, along with a list of the client's previous assessment records, will be displayed on the Client Screen.

(3) Edit client's details

- Once you have selected an existing client, you can click *Modify* to edit client's details or *Delete* to delete the client's record.

Client Details and Assesment Records

Client ID: 0001573830   Surname: Sleiman   Firstname: Aleesa   ✎ Modify   ✗ Delete

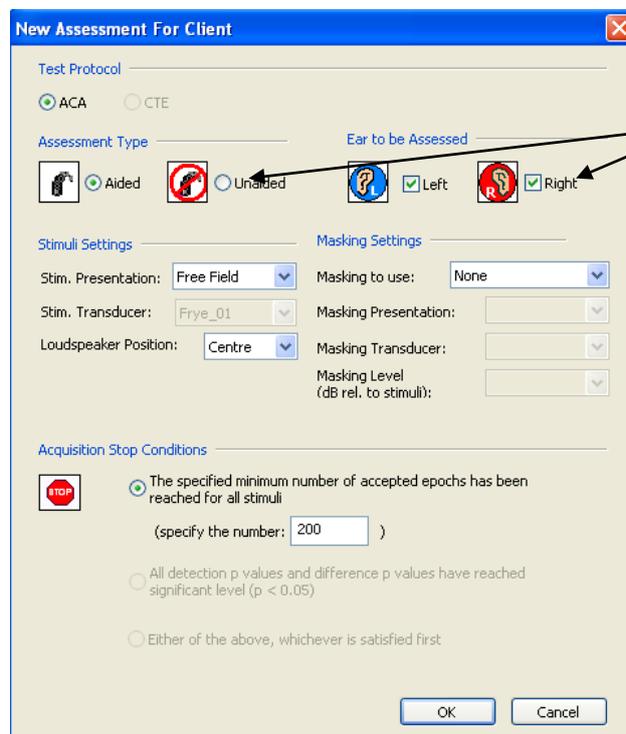Date of Birth: 23 Jul 2005   Gender: Female

Notes: NL02

2.4 Conducting the Assessment

(1) Specifying assessment settings

- Open the New Assessment screen by clicking the icon on the main toolbar

- Recommended settings:

Click the appropriate box

- Click *OK* and a "New Run" dialog window will appear.

Select presentation level

Select stimuli (maximum of 3, minimum of 1).
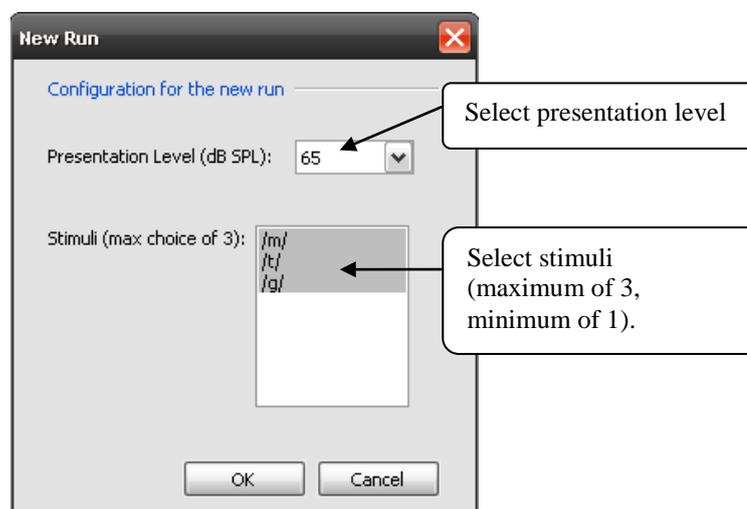
Select one stimulus only if the child's attention span and test time are very restricted. Prioritise stimuli according to frequency regions of interest, viz, /m/ for low frequencies, /g/ for mid frequencies, and /t/, /s/ for high frequencies.

(2) Placement of electrodes

- Prepare the electrode sites before attaching the disposable ECG electrodes (see Appendix 1 for details).

- Positions for the electrodes:

Electrode	Placement	Colour
Active	Vertex (Cz)*	Yellow
Reference	Mastoid (M1)	Blue
Ground	Forehead (Fz)	Black
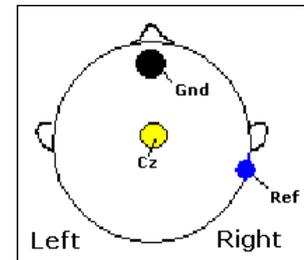
- Ensure the cords are plugged into the correct sockets with matching colours.

(3) Impedance Check

- A good electrode contact is crucial before acquiring any cortical response. The electrode impedance is checked, and if necessary redo the skin preparation to achieve a recommended impedance under 5 kΩ at the Ref and the Cz electrodes.
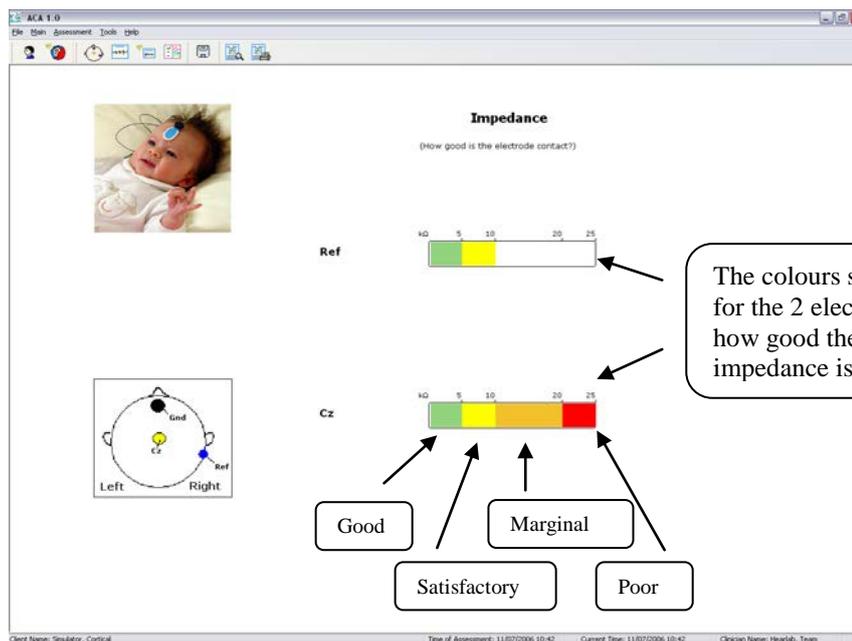
- Once the Impedance screen is displayed, impedance measurements will be performed continuously at 1 second interval until you exit the Impedance screen.

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* Cz is the midway of two ears and midway of the bridge of nose and the nape of neck. For infants, the placement should be just behind the fontanel.

- Monitor the impedance of the Ref and Cz during assessment by clicking the Impedance Check icon on the Assessment toolbar.
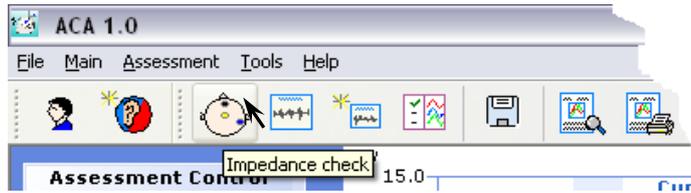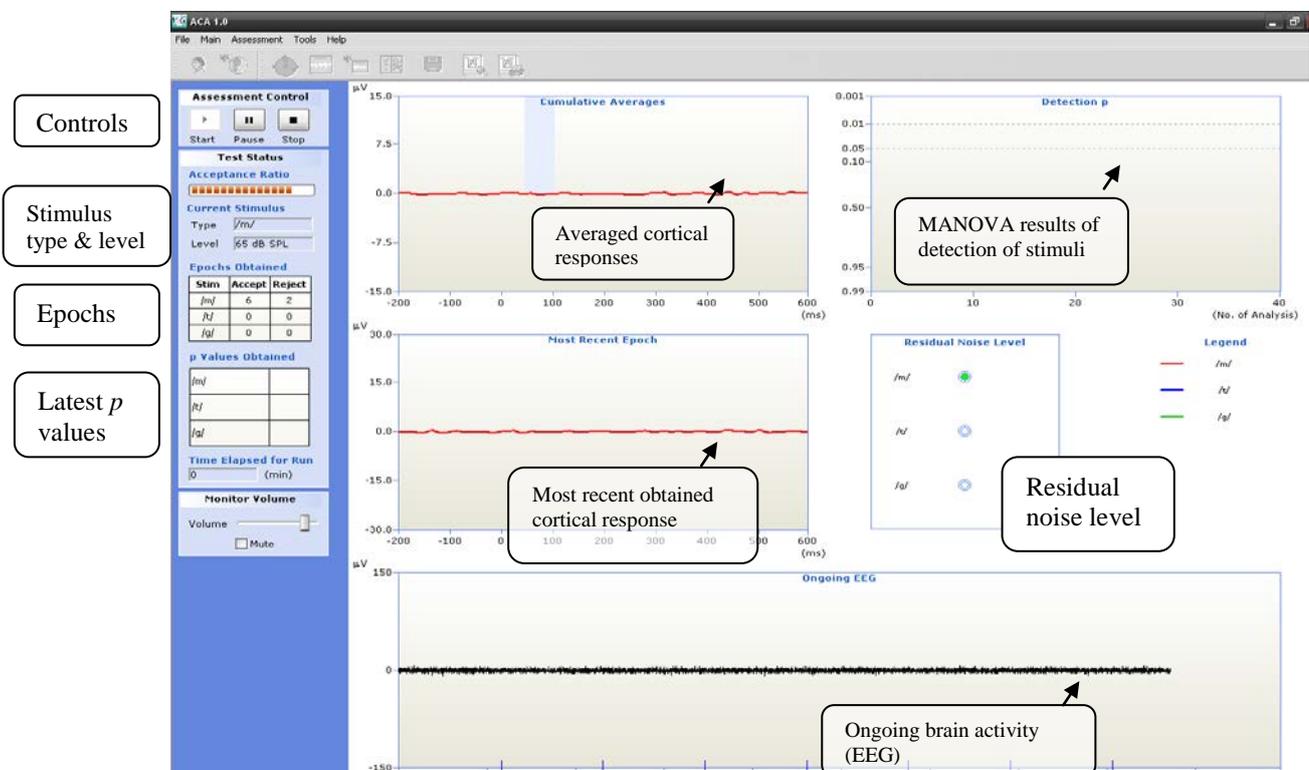

- After the impedance check, click the "Acquisition" icon on the main toolbar to go to the Acquisition screen.
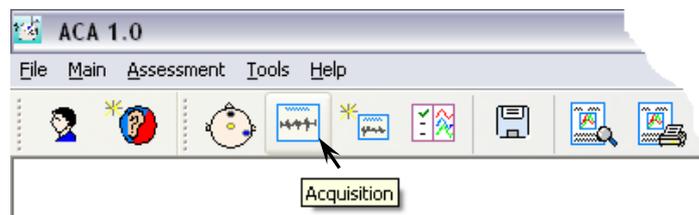
(4) CAEP Acquisition

- Once in the Acquisition screen, acquisition of cortical responses can be started, paused, resumed, or terminated at any time during a run.

- To start a test, click the Start button [▶]. A dialog box will appear and you need to type the file name and save the file.
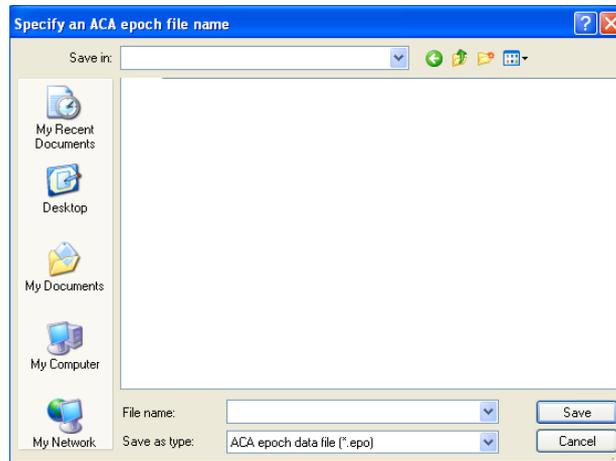
- During acquisition, statistical analysis for determining the detection and differentiation of the responses will be performed online.

Note that many factors may affect test results:

- Background noise may mask the stimulus and create "noise" in the electrical traces.

- Mobile phone signals may create electrical noise. Switch Mobile Phones Off.

- Other electrical interference e.g. fluorescent lighting

- Some medications such as those used to prevent seizures may affect the EEG.

- High muscle tone or sudden muscle movements such as experienced by some children with cerebral palsy may make the EEG noisy and hence mask the response

- Awake status of the child - responses diminish when the child is drowsy or asleep.

- Impedance of electrode

You can monitor the number of accepted/rejected Epochs and the residual noise levels by moving the cursor over the *Residual Noise Level* box.
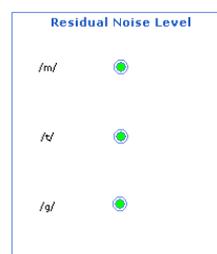
- If the number of rejected Epochs is high, pause or stop the test.

- If the impedance is high, remove and replace electrodes or redo preparation.

- If the child is drowsy, revive the child before proceeding with further testing.

- Click the Pause button [❚❚] to pause acquisition for the current run e.g if you need to access the Impedance Screen. You may also access the Result Screen or save the results at this point.

- Click the Stop button [■] to manually terminate acquisition for the current run. You may then view or save the results.

- Acquisition is automatically terminated once 200 accepted epochs for all selected stimuli have been reached.

- A clear response should be: (a) p value is lower than 0.05; (b) Residual noise is green.

- After a test is terminated, you may choose to start another test by clicking *New Run* icon on toolbar or start another assessment by clicking *New Assessment.*

- By clicking *New Run*, the results will be displayed on the same screen when you view/print the results.
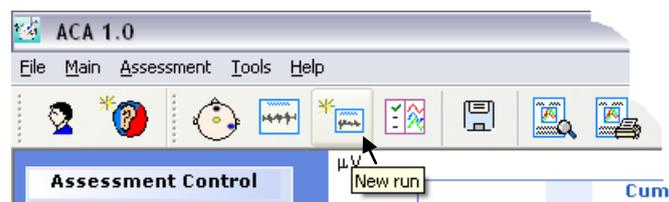
(5) Remove electrodes
- Once all testing is completed, remove and dispose of the electrodes
- Use clean wipes to help remove the conductive paste.

3. Accessing the results

- Results of the current assessment can be viewed on the results screen by clicking the "View Results" button.
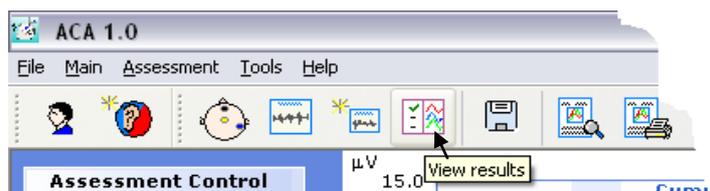
- Results of the previous assessment can be accessed under the Client Screen. All the saved assessments of the selected client are displayed in the list. Double click the assessment you wish to view.

- Result Screen:

4. Printing assessment reports

You may choose to look at the print preview of the assessment report before printing it out, or you may print it directly.

- Report preview:

Click Print

5. Database backup

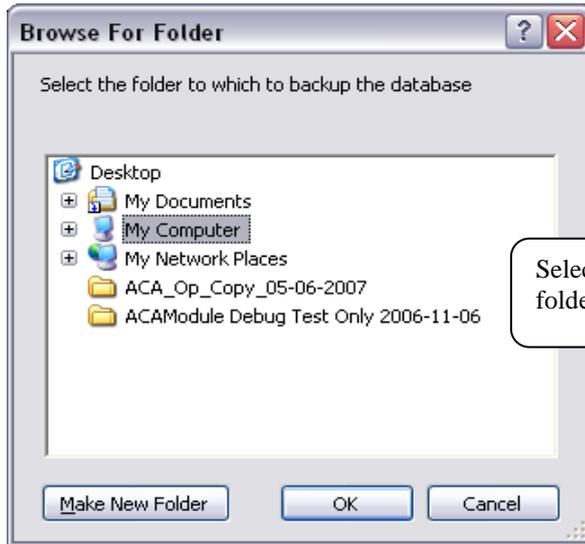It is important to regularly backup the database to prevent the loss of clinical records in the case of mishap.

- To initiate database backup, go to **Tools →Database Administration → Backup Database**

A *Browse For Folder* dialog will be displayed:

Browse For Folder

Select the folder to which to backup the database

- Desktop
  - ⊞ My Documents
  - ⊞ My Computer
  - ⊞ My Network Places
  - ACA_Op_Copy_05-06-2007
  - ACAModule Debug Test Only 2006-11-06

Make New Folder | OK | Cancel

> Select the folder or make a new folder for storing the backup data.

Appendix 1: Electrode Application

Preparation of electrode sites

- Attaching the electrodes is potentially the most challenging part of the test procedure. Approach the preparation confidently but not too forcefully. Smile, and talk to the child reassuringly.

- Try not to physically "stand over" the child while doing skin preparation. Working from behind the child may be a good option.

- Start the preparation in a position where the child is comfortable and not overly restrained. For example, try starting while an older infant is playing on the floor, or while a toddler is watching the DVD.

- Electrode sites are generally prepared by abrading with a cotton bud and a medical gel intended for the purpose e.g. "Nuprep". Rub firmly and vigorously enough to cause a slight redness on the skin surface, but not so hard that the child becomes obviously distressed by the sensation.

- Wipe away any excess gel before applying the electrodes.

- Wherever possible have a trained distractor (in addition to the parent), to interact with the child during electrode placement, as well as during testing. Toys that involve some fine motor manipulation (e.g. block stacking, button pressing) can help keep hands away from the electrode sites, and at this stage toys that make a noise are suitable.
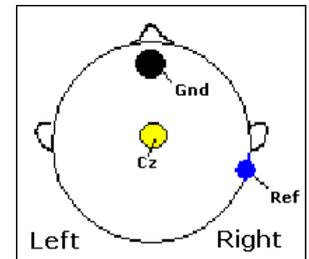
Optimising and maintaining electrode contact

- Use a pea sized amount of electrode paste (e.g. the conductive EEG paste) under the Vertex (Cz) electrode, even if disposable electrode, that already contains conductive gel, is used. Avoid applying to the adhesive surrounds.

- A headband is very helpful in keeping the electrodes in place, particularly at the vertex, but some children are less accepting of wearing a headband than others. Giving older children a choice of colours or designs can be important to the child, and sometimes also to the parent. Use fabrics that are easy to wash and dry after use.

- Once the electrodes are attached, try to drape the leads behind the child, avoiding contact with the child's face or neck. Try to keep the leads from becoming tangled in bibs or collars.

- Loosely taping the leads to the back of the child's clothing (using micropore tape or hair clip) may be helpful. Make sure the leads are not taped too tightly that they are pulled off by any head movement.