

The Children's FM Working Group

Information on the proposed Protocol

F.M. Radio Aids connected to Cochlear Implants.
The Nucleus® Cochlear Implant systems.
The SPrint™ and the ESprit™3G processors, verification
and monitoring of radio aid devices 'in the field' using a
specially adapted connection lead.

ESprit 3G



SPrint



Written by P.Harris – Ewing Foundation and member of the NDCS FM Working Group.

1st August 2006

This information document and developed protocol is the result of a joint collaboration between many F.M Working Group members and other professionals.
Information has been obtained from a range of sources external to the FM Working Group.

Introduction

The FM Working Group Formed in February 2004 to:

- Encourage the sharing of pertinent information and collaborative working between members and other professionals.
- Promote good practice and dissemination of information over a wide field.
- Monitor and encourage developments in F.M. and similar radio aid technology for the benefit of children and young people.
- Investigate and consider what actions might be taken to support teachers, audiologists and other professionals working with educational and support services.

The Group comprises of representatives of Radio Aid (RA) and Hearing Aid (HA) manufacturers and suppliers, member(s) of the Modernising of Children's Hearing Aid Services Team (MCHAS), national organisations, practitioners in education, Cochlear Implant companies and Cochlear implant teams. Other key individuals are invited to be present and to contribute at specific meetings.

The group is facilitated by the National Deaf Children's Society.
A list of FM Working group members and further information can be found from the NDCS website: <http://www.ndcs.org.uk/fmservices>.

The creation of the protocol

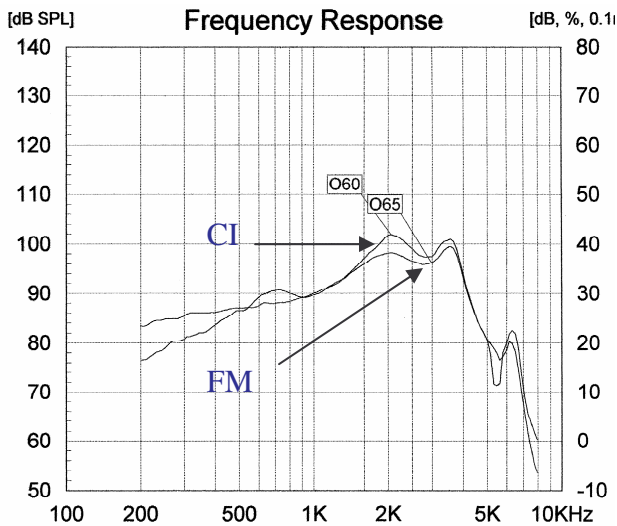
The principle theory is based on obtaining and using a specific 'electrical output' available from certain Cochlear Implant processors (CI).

This electrical output is designed to 'drive' designated low power earphones to monitor and ensure that the microphone and/or external audio source (such as a connected radio aid) are working and to confirm that they are being provided to the processor.

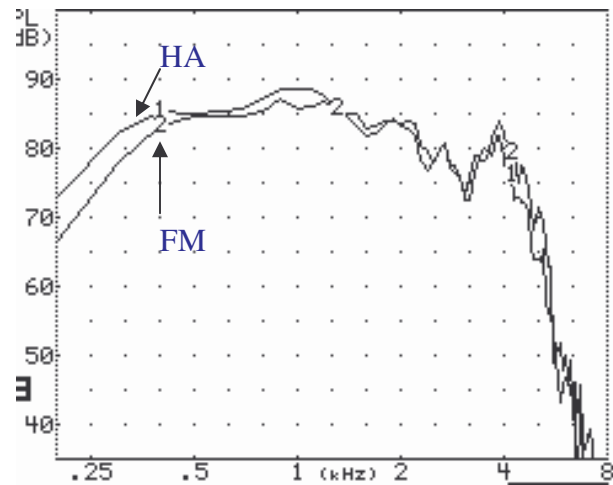
This output that is representative of the early audio input stages in the processor provides an opportunity to observe both the microphone and the F.M. signal using a hearing aid analyzer with modified CI monitor earphones.

Subsequently it is believed that it enables us to carry out comparative testing in a very similar way to that which we do at present with acoustic DSP hearing aids or hearing aid FM combinations.

Auricular Hearing Aid Analyzer



Fonix FP35 Hearing Aid Analyzer



Left: An example of a CI Nucleus ESPrIt 3G electrical microphone output curve and external radio aid level matched.

Curve 1 60dB, Curve 2 65dB DSP both with DSP test signal applied

Right: A typical Digital Speech Processor Hearing Aid (HA) curve with a radio aid level matched. Curve 1 65dB, Curve 2 65dB both with DSP test signal applied.

It should be noted that an adjustment of the microphone signal when the sensitivity control is active on CI processors will affect the 'mixing' of these signals and the resulting output signal to the next stage could invalidate the procedure if it exceeds a known pre-determined level.

During earlier group meetings it was thought this could also be used as a 'setting up' protocol for CI processors with the range of radio aids presently available. Early attempts at observing the levels of the electrical output included connecting one of the monitor earphones to a HA1 coupler used for connecting ITE hearing aids with a hearing aid analyzer.

These early attempts clearly indicated changing earphone output levels when adjustment of the FM radio system gain level was made.

Investigations into different earphone modification options to obtain the **clearest repeatable** response curves on hearing aid analyzers such as an Aurical or Fonix FP35 test box from the CI were then developed.

The proven ability to create comparative curves and subsequent investigations into different variations of the specially modified leads at previous meetings led to trials in educational establishments in the UK and included a visit to the South of England Cochlear Implant Centre (SOECIC) with a small team from the FM Working Group to investigate how a valid set up and verification procedure could be obtained.

This was attended by:

- Elizabeth Wood - South of England Paediatric CI Team**
- Paul Doughty - Telford Sensory Inclusion Service**
- Jeremy Hine - National Deaf Children's Society**
- Paul Harris - Ewing Foundation (South West and London)**
- Ken Higgins - Ewing Foundation (Midlands)**
- Tony Murphy - Phonak UK**
- Riaan Rottier - Cochlear UK**

Results raised a number of important issues which included the differences found between connecting radio aids of different types and more specifically the microphone options and gains.

An appropriate test stimulus and level were agreed upon and a test lead to enable the procedure to be carried out was developed.

It should be noted that during this time a very similar protocol created independently abroad had been reviewed and posted onto the main Phonak website further reinforcing the validity of the 'verification' using this method.

Connect to 2CC Coupler
In hearing aid Analyzer.



Connect special plug into
Sprint or
ESPrin 3G using adaptor
with headphone socket



Radio aid adaptors
Body worn FM



Wireless FM

The final protocol will be provided in clear sections including:
Section 1. Means of verification at the CI Centre to support initial set up of radio aids and using speech tests and feedback.
Section 2. For Specialist Teachers of the Deaf, Educational Audiologists and other professionals working in education to allow comparative testing and confirmation of the consistent level into the CI and the microphone from external radio aid products.

Future considerations

Development is ongoing and further trials of the section 2 protocol will be arranged this year in education with the assistance of the British Association of Teachers of the Deaf (BATOD)
The full protocol will be available to download in the last quarter of 2006 from the NDCS website.
The new Cochlear implant processor Nucleus Freedom will require a similar lead (currently unavailable).
Careful consideration of other CI manufacturers that do not have any access to measure the levels into the CI may need to be reviewed based on the findings of this protocol.
Investigations into other issues discovered with radio systems, Cochlear implants and hearing aids continues.
To be kept up to date on all discussions and outcomes during meetings please check the FM Working Group webpage for regular updates.
<http://www.ndcs.org.uk/fmservices>

The test lead is now available from Connevans Ltd.
Information can be found on their website (sample shown below):
<http://www.deafequipment.co.uk/store/viewProduct.do?id=924352>

DeafEquipment.co.uk 
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Cochlear test lead & button earphone

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Below are 3 types of Hearing aid analyzers and examples to how the lead is used. You will note the position of the ESPrit 3G processor inside the acoustic chamber is different for each analyzer due to the directionality of the internal microphone.

