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Citation/Reference	Deprez H., Gransier R., Hofmann M., Moonen M., Wouters J., Verhaert N. (2016). Intra-operative assessment of direct acoustic cochlear implant functioning using ABRs and ASSRs. *International Symposium on objective measures in auditory implants*. OMAI. Szeged, Hungary, Jun. 2016, 1-1.
Archived version	Author manuscript: the content is identical to the content of the published paper, but without the final typesetting by the publisher
Published version	
Journal homepage	http://objectivemeasures.org/
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Abstract	
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Intra-operative assessment of Direct Acoustic Cochlear Implant functioning using ABRs and ASSRs

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Introduction: Direct Acoustic Cochlear Implants (DACIs) are used to treat severe to profound mixed hearing loss. An actuator in the middle ear is coupled via a stapes prosthesis to the inner ear, and directly vibrates the cochlear fluid. Confirming proper DACI coupling, crucial for its functioning, is challenging for ENT surgeons. Currently, the movement of the actuator is verified intra-operatively using Laser Doppler Vibrometry (LDV), requiring specific technical skills. Furthermore, LDV movement measures at the actuator rod do not confirm correct DACI coupling or adequate auditory processing. Electrophysiological responses have recently been recorded post-operatively in DACI subjects [1] and could potentially also be used to assess DACI coupling intra-operatively.

Objectives: To use auditory brain stem (ABRs) and steady-state responses (ASSRs) intra-operatively to confirm correct DACI coupling and evaluate auditory processing beyond the periphery.

Materials/Patients and Methods: ABRs and ASSRs were measured in two subjects under general anesthesia. Click stimuli were presented directly to the implant with stimulation frequencies in the 40Hz and 90Hz range at various stimulation levels. Electrophysiological thresholds were determined and compared with the behavioral thresholds obtained after DACI activation.

Results: For stimulation in both frequency ranges, clear ABR peaks V were observed and ABR thresholds could be estimated. Significant steady-state responses were

measured for 33Hz stimulation and for 90Hz stimulation, allowing electrophysiological threshold estimation.
Conclusion: The feasibility of measuring electrophysiological responses beyond the periphery intra-operatively to confirm DACI coupling has been demonstrated.

References:

[1] Verhaert, Nicolas, Michael Hofmann, and Jan Wouters. "Transient and Steady State Auditory Responses With Direct Acoustic Cochlear Stimulation." Ear and hearing 36.3 (2015): 320-329.

Acknowledgments:

Research was funded by the Research Foundation Flanders (G.0662.13), by the Agency for innovation by Science and Technology (IWT 141243; and IWT 150432) and by Cochlear Ltd.