ACTive Implant for Optoacoustic Natural sound enhancement

SEVENTH FRAMEWORK PROGRAMME

First oaCAP

To our knowledge, for the first time an oaCAP was generated by a light source fully inserted into the unmodified cochlea. Previously, the same could only be achieved with external light sources connected to a fibre optic light guide or with optogenetically modified cells

Optoacoustic compound action potentials (oaCAP) were triggered by sound waves in the cochlea. These sound waves, in turn, were 'artificially' generated by a light source at 1550 nm wavelength placed inside the cochlea. The optoacoustic effect describes this process, in which the absorption of the light in a small volume of the cochlea liquid leads to a sudden expansion of this volume and a pressure increase induced by a local increase of the temperature. The increased volume displaces adjacent fluid volumes. This displacement (along with the pressure change) propagates through the cochlea liquid in the form of a sound wave.

This feat was achieved by integrating custom made VCSEL devices on small flexible substrates. The laser light was collimated by a specially designed Silicon-based ultra-thin lens (165 μm thick) to achieve the energy density required for the generation of oaCAP signals.

These measurements, made at MHH, are believed to be unprecedented. The benefits over the current approach with fibre optic light guides are: reduced power consumption (i.e. no loss at the laser to fibre interface), potential increase of number of light sources (i.e. spatial distribution of stimulation sites in the cochlea) and dramatic miniaturisation of the device, thereby making a huge step from laboratory devices towards implantable devices for humans.

For additional information, please contact us at info@action-project.eu
Or visit our website www.action-project.eu

Project partners

MED-EL, CSEM SA, Medizinische Hochschule Hannover, Teknologian tutkimuskeskus VTT Oy, SUSS MicroOptics SA, VERTILAS GmbH, STMicroelectronics SRL

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