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Multifirmprojekt:
Next Generation Drive and Actuator Systems

LCM LINZ
CENTER OF
MECHATRONICS
GMBH

MED-EL



SYSTEM OPTIMIZATION: MORE THAN THE SUM OF THE INDIVIDUAL PARTS

FOR THE FIRST TIME EVER, A HEARING AID THAT HAD ALREADY BEEN OPTIMISED IN ITS INDIVIDUAL COMPONENTS WAS SIGNIFICANTLY REDUCED IN SIZE - THE BASIS FOR THE NEW MARKET SUCCESS OF MED-EL.

The MED-EL BONEBRIDGE is a proven bone conduction implant that helps patients with defects in the outer or middle ear to regain their hearing. Only the outer part with microphone, audio processor and button cell is visible; the actual hearing aid is implanted completely under the skin.

The implant itself is a mechatronic work of art: wireless energy and signal transmission through the skin, magnetic attachment of the outer part to the implant, integrated signal demodulation and a miniaturized, electromagnetic vibration system, the transducer. Already in the past, LCM was able to contribute valuable mechatronics know-how. All system parts mentioned have been optimized for themselves.

The new generation of the BONEBRIDGE, the BCI 602, should now be reduced in size especially for use with children - with the same performance. But how to optimize a system that has already been optimized?

In the ongoing cooperation within the COMET K2 Center for Symbiotic Mechatronics, the individual optimization tasks were combined for the first time and the system model environment, the LCM SyMSpace, was expanded for this purpose: The calculation of the transducer, the demodulator, the transmission characteristic curve transmitter coil - skin - receiver coil and the motion model of the magnetic and mechanical systems were linked together in a workflow and can be executed automatically. Thus, the optimization can also be applied to the overall system and the actual target

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value, the hearing quality in the frequency range of the human hearing spectrum can be optimized.

The whole is more than the sum of its parts

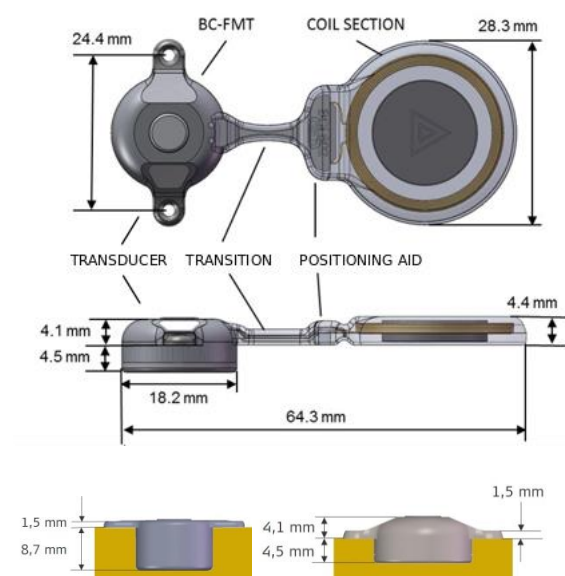
In previous solutions, all components were individually optimized and the optima found were combined into one system. With the new system optimization approach, the individual components merge into one system. It is not the performance of the individual components that is decisive, but the global optimum in the interaction of these components in the overall system.

Effects

The optimization of the individual components coupled with the help of the new SyMSpace workflow resulted in a significantly improved system design: The reduced geometry enables a significantly reduced drill depth, which is why the system can also be used for children.

At the same time, the integration density of the system was significantly increased (demodulator was integrated into transducer). The successful implementation of the system optimization has already been proven by numerous applications on patients.

Technological progress in the overall optimization of mechatronic systems has thus had a direct positive influence on the well-being and developmental opportunities of children with hearing loss.



Copyright MED-EL, New Implant Generation (above), Comparison of drilling depth in the bone for old (left) and new (right) implants

Project coordination (Story)

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