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# Irradiation device and method for optical cochlear implants and laser surgery systems

#### Reference Number TO 15-00490

## Challenge

Acoustic hearing implants usually generate sound with electro-magnetic or piezo actuators. Alternatively, optoacoustic generation of sound can be achieved by irradiating the cochlea with laser pulses. This method constitutes a promising alternative treatment option for sensorineural hearing loss and combined electro-acoustic stimulation. However, rectangular pulse stimulation suffers from low quality sound fidelity due to generate positive as well as negative pressure events for each rectangular pulse. The same applies to laser surgical treatments of the ear where undesired optoacoustic waves caused by sharply rising or falling laser pulses of the surgery system can cause severe noise damage.



#### Technology

The proprietary irradiation device and method generates laser pulses that exhibit a rising or a falling slope. This slopeshaped pattern of emitted laser power avoids or significantly reduces unwanted optoacoustic signals at the beginning or the end of the pulse, compared to rectangular excitation patterns. As a consequence, using this irradiation device and method, optical cochlear implants can generate significantly better sound quality for the patients. Moreover optoacoustic stimulation bears the potential for combined electro-acoustic stimulation in one electrode array due to its small size. Likewise, applying this method for laser surgery systems used in the ear will result in reduced noise damage for safe treatment.

# **Commercial Opportunity**

The patent protected technology is available for licensing. Further development and clinical validation can be realized in cooperation with an experienced university clinic in Germany.

# **Developmental Status**

The technology is in an early, conceptual development stage.

# **Patent Situation**

Patents have been granted in Europe (EP 3644912B1, national validation in DE, CH, FR and GB) and USA (US 11,224,758B2) with priority of 2017.

# **Further Reading**

Kallweit et al. (2016), Sci. Rep. 6:28141 (Optoacoustic effect is responsible for laser-induced cochlear responses).



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