Project 3.5 Assisted surgical guiding in ophthalmology

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Background:

Optical Coherence Tomography is a non-invasive biomedical imaging technique employing broadband infrared light penetrating inside biological specimens (e.g. the eye and the retinal layers) and recording into an image light backscattered from different location within the specimen. While moderately scattering specimen's region do no distort light propagation and the ability to image at depth all that much; metals and plastics, as those found in eye surgical instruments, for example, create a shadow in the image beneath them, quite like they would in a standard image in visible light.

This is an issue as the ability to guide such instruments to the region of interest intraoperatively is severely hindered by such shadow, that covers exactly the location of where the surgical tool is being directed.

Aim:

In this project we propose micro and nano-optical methods and designs for an infrared light "cloaking" device, that would ideally allow to remove the shadow cast by the surgical tool (or any other shadow casting object) from the OCT image, allowing unparalleled access to the tissue and region of interest for image-guided procedures.

Requirements:

- Master's degree in physics, engineering or similar, with experience in both ray optics system design, and experiments dealing with both free space and fibre optics,
- any experience in metasurface design and nanooptics will be considered a plus.