



## SWIR microscopy

A new generation of surgical microscopes uses image sensors that create, process and display images in real time in the short-wave infrared light spectrum. The short-wave infrared light (ShortWave InfraRed), from which the technology takes its name, enables different structures such as blood, cartilage, soft tissue or bacterial biofilms to be illuminated and delineated from one another.

Specific software is being developed at the Faculty of Physics at Bielefeld University so that the new surgical microscopes can visualise the short-wave infrared signals. This should make it possible to filter out light outside the short-wave infrared and calculate a spatial view of the image.

The software is the most important link in the microscopy process and must be able, among other things, to produce colour contrasts in order to differentiate individual structures from one another. By transmitting the video image in real time, surgeons will be able to work precisely and without delay in the future and follow the results of their actions live.

Another advantage of the procedure is that, unlike conventional microscopes, SWIR microscopes can look through blood, differentiate and visually display bacterially colonised tissue, nerves, soft tissue and bone. In this way, surgeons can still see during an operation where there are still remaining bacterial colonisations in order to remove them completely and thus avoid bacterial regeneration.

Another research goal is to be able to look through soft tissue in the future and thus examine hidden areas in order to better assess the extent and depth of bacterial infestation locally.

The modern surgical microscopes thus not only offer visual advantages to the surgeon during the procedure, but also increase safety for patients. The improved imaging reduces the risk of accidentally injuring sensitive structures and thus causing consequential damage or longer recovery times.

### Innovative approach

- ◆ **Research project:**  
Betterview
- ◆ **Cooperation partners:**  
Universität Bielefeld  
Klinikum Bielefeld  
Helmholtz Pioneer Campus  
Leibniz Universität Hannover  
PCO AG  
Omicron-Laserage Laserprodukte GmbH  
Munich Surgical Imaging
- ◆ **Technological basis:**  
Short-wave infrared light  
+ sensors + software
- ◆ **Advantages:**  
Optical differentiation & imaging of different or hidden structures  
  
Increase patient safety by reducing the risk of injury
- ◆ **Contact:**  
Prof. Dr. Thomas Huser,  
Universität Bielefeld  
Faculty of Physics

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