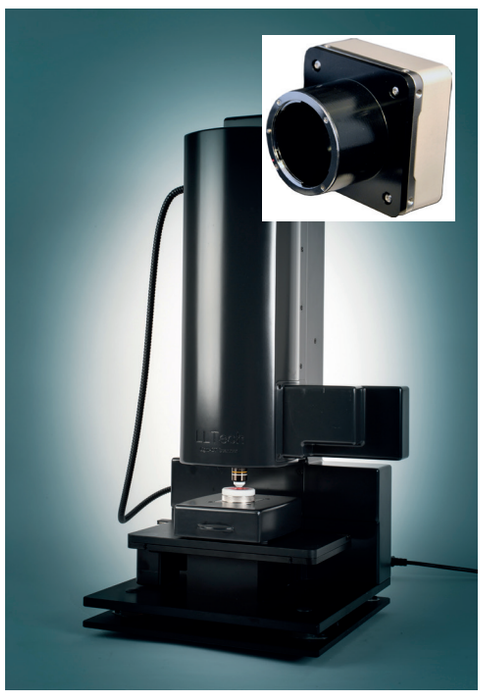
New optics for real-time cancer diagnosis

EU-financed research has resulted in the development of non-invasive optical imaging systems for rapid ex-vivo and in-vivo tissue analysis with a high potential for breast, head and neck cancer treatment.

Cancer diagnosis depends on a long-term and complex tissue examination process. At present, real-time tissue diagnosis is not possible during surgery. As a result, additional operations (in up to 40% of the cases) are needed. In the process of cancer treatment, especially with tumour biopsy and tumour removal, the present pre-operative and operative imaging does not provide a reliable diagnosis. What is more, the complete pathological diagnosis, usually based on (histological) section preparation, is only available after a number of days. For this reason, a substantial number of patients must undergo a second biopsy or operation.



The FFOCT microscope and the integrated high-speed, high-sensitivity camera (insert).

The European CAReIOCA project has combined the latest developments in CMOS camera technology and optical biopsy imaging for Full-Field Optical Coherence Tomography (FFOCT). This cooperation has resulted in the development of two innovative optical imaging methods:

- A high-speed FFOCT microscope for the non-destructive quality control of ex-vivo biopsies within several minutes.
- A FFOCT endoscope for in-vivo operations and guidance of biopsies on cell level.

The cooperation between LLTech, specialised in the development and production of FFOCT imaging equipment, CMOSIS and Adimec, experts in the field of sensor and camera development, respectively, has led to an important technological breakthrough. For FFOCT imaging, a specific camera has been developed which achieves a ten times higher sensitivity than conventional cameras, with a 1 kHz frame rate. By integrating this camera into the FFOCT equipment, the recording speed has been increased fivefold. Furthermore, development of new FFOCT optics, compatible with a medical optical probe, has led to a first FFOCT endoscope.

Both the new FFOCT microscope and the FFOCT endoscope have been evaluated at the Leiden University Medical Center (LUMC), the Netherlands, and at the Gustave Roussy Institute (Villejuif, France). The focus was on the detection of breast cancer and head and neck cancer, which led to very good results in comparison with the standard tissue analysis and 'frozen section' techniques. The LUMC has also produced very promising FFOCT images of ovary tissue, displaying sufficiently usable information without resulting in tissue damage, as happens with the present techniques. This research demonstrates the potential added value of FFOCT imaging in the clinical realm of ovary tissue transplantation. FFOCT endoscopy performed on head and neck biopsies by the Gustave Roussy Institute has revealed the potential of in-situ imaging of small structural characteristics in tissue.

Within the compass of CAReIOCA, three technological aspects have been successfully evaluated: the high-speed camera, the CMOS sensor and the FFOCT microscope. All three of these are almost ready for introduction in the market (scheduled for 2016 and 2017). Although the camera and the sensors are specified for FFOCT imaging, they can also be used in other interferometric systems in the medical and industrial sectors.

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NTS-Group opens second factory in Singapore

NTS-Group, the supplier of opto-mechatronic modules and systems with headquarters in Eindhoven, the Netherlands, recently opened a second factory in Singapore, NTS Mechatronics Singapore. This company will be responsible for engineering and assembling modules and systems in the Singapore region and will work closely with NTS Components Singapore, an existing company that specialises in the production of high-precision frames and sheet metalwork.
Marc Hendrikse, CEO of NTS-Group: "We already had significant knowledge and experience of co-design and assembly, but were being forced to relocate mechanical assembly activities because of growth in the current sheet metalwork factory. The need to launch the new company was also confirmed by demand from clients wanting the possibility to outsource in a cleanroom environment at module level." The new factory features a metrological department with a brand new Mitutoyo measuring machine. The 350 m^2 cleanroom is class 10,000 and contains a special booth for class 100, which is state-of-the-art for module assembly.

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