Leibniz
Ferdinand-Braun-Institut

Press Release

More Light! – for Medicine

PET scan, CT and MRI are almost standard in today's diagnostics – highly developed and very sophisticated. Although more capable and less cost-intensive, laser-optical diagnosis methods are, up to now, far less prevalent. FAMOS is aiming to change this.

Berlin, March 26, 2013

Some diseases like cancer call for sophisticated imaging methods and also sample taking for precise diagnosis and therapy control. In the future, in case of examinations of surface tissue such as human skin, retina, and intestine, optical methods could be the technique of choice to clarify the matter – more cost-effective, non-invasive, and without requiring ionizing radiation and contrast agents. For examinations, only high-energy laser light is used.

In order to further advance Functional Anatomical Molecular Optical Screening, 17 partners joined forces within the EU project FAMOS. Among them, manufacturers of lasers and medical technology as well as scientists from the universities in Vienna (Austria) and St. Andrews (Scotland), the London University College, Weizmann Institute (Israel), Technical University of Denmark and the German Ferdinand-Braun-Institut (FBH). The project builds up on OCT – optical coherence tomography – a key technology precisely displaying structures which are located a few millimeters inside the tissue. The approach pursued for OCT requires white laser light that emerges when a special glass fiber is irradiated with a femto-second laser. As these lasers generate a lot of heat they need to be cooled with water. Thus, the equipment is rather massive, not portable, and, in addition, so complicated that it requires an expert for operation.

FAMOS is addressing these features: with it, the light sources shall become smaller and more compact. "Our task at FBH is to develop a semiconductor laser with very high beam quality. Colleagues from Denmark will then frequency-double the light, thus bisecting the wavelength", outlines Bernd Sumpf, head of the FAMOS project at FBH. This laser will be used by an industrial partner in Vienna to pump a femto-second titanium-sapphire laser, which will excite the white light OCT source. If everything works out as planned, ambient air will be sufficient for cooling – requiring only a little ventilator as in computers. Thus, the equipment will shrink to a fifth of its current size and accordingly be portable and cost-efficient. To achieve this, Bernd Sumpf and his team will develop a tapered laser as pump source that features an excellent beam quality and is highly focusable at the same time.

A titanium-sapphire laser can be stimulated at wavelengths around 500 nanometers (nm). Up to now, mostly water-cooled solid-state lasers with an emission wavelength of 532 nm have been used. "We decided to use a more efficient shorter wavelength of 515 nm", explains Sumpf. The aim is to generate 10 Watt optical output power at 1030 nm, the wavelength will then be halved to 515 nm using a specific crystal. As the overall efficiency shall be so high that no sophisticated cooling will be necessary, this tiny FBH laser will be the key part of the new technology.

The related press picture and further images are provided on our website: http://www.fbh-berlin.com/press/download-center. All images are copyrighted.

For further information

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Backgroundinformation – the FBH

The Ferdinand-Braun-Institut, Leibniz-Institut fuer Hoechstfrequenztechnik (FBH) researches electronic and optical components, modules and systems based on compound semiconductors. These devices are key enablers that address the needs of today's society in fields like communications, energy, health, and mobility. Specifically, FBH develops light sources from the visible to the ultra-violet spectral range: high-power diode lasers with excellent beam quality, UV light sources and hybrid laser systems. Applications range from medical technology, high-precision metrology, and sensors to optical communications in space. In the field of microwaves, FBH develops high-efficiency multi-functional power amplifiers, and millimeter wave frontends targeting energy-efficient mobile communications as well as car safety systems. In addition, compact atmospheric microwave plasma sources that operate with economic low-voltage drivers are fabricated for use in a variety of applications, such as the treatment of skin diseases.

The FBH has a strong international reputation and ensures rapid transfer of technology by working closely with partners in industry and research. The institute has a staff of 255 employees and a budget of 22 million Euros. It is part of the Forschungsverbund Berlin e.V., a member of the Leibniz Association and plays an active role in various networks.

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