

Press Release

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European Research Consortium coordinated by the Fraunhofer Institute for Applied Solid State Physics develops new Infrared Lasers

50 years laser – the success story goes on

Within the framework of the European project VERTIGO a research consortium jointly developed a new class of infrared emitting lasers. The innovative semiconductor disk laser concept employed opens up new wavelength ranges in the infrared spectral region. These compact lasers, being power-efficient and versatile, enable new applications in medicine, environmental sensing, and production technology.

A “new and potentially disruptive technology, based on world-leading laser material” – this was the enthusiastic comment of the reviewers when evaluating the European research project VERTIGO (Versatile two micron light source, www.2micron-laser.eu), which was coordinated by the Fraunhofer Institute for Applied Solid State Physics (IAF) in Freiburg, Germany.

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Within the framework of the EU-funded three years’ project a new class of lasers for the infrared spectral range between two and three microns was developed, so-called semiconductor disk lasers.

In total EURO 1.9 million have been spent by the European Union on this research project. This was well invested money as VERTIGO brought about new semiconductor lasers, which set, compared to international standards, new benchmarks

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regarding power-efficiency and beam quality in this so far mostly unexplored wavelength range.

These results demonstrate again the worldwide leading position of Europe in the growing field of optical technologies.

Networked research in Europe and for Europe

Besides the Fraunhofer IAF, institutes and companies in Great Britain (Institute of Photonics, Glasgow), France (Alcatel-Thales III-V Labs, Palaiseau), Poland (Institute of Electron Technology, Warsaw) and Germany (LISA Laser GmbH, Katlenburg-Lindau) participated in the project. These partners cover the whole technology chain from basic materials science to the development of customer specific laser modules.

Requirements of future laser systems

The use of laser radiation in industrial production (cutting and joining of materials), medicine (surgery and diagnostics), telecommunication (fiber optics), consumer electronics (DVD-player) is well established in the meantime. But there is an increasing demand for further improvements. Future laser systems need to be smaller, more economic, more energy-efficient and more powerful.

First of all, the goal is to make new wavelength regions (colors) accessible which allow new applications. Especially for the wavelength range above two microns no suitable laser sources were available up to now which are at the same time compact and cost-efficient. This gap has now been filled by the new semiconductor lasers developed within the VERTIGO project. They are true quick-change artists as they can be fabricated and tuned to any desired wavelength within the 2 – 3 μm range and the laser resonator can be easily configured to serve the needs of specific application.

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These new lasers will have a strong impact on the future market of infrared laser systems.

Industrial implementation just on its way

The German company LISA Laser, being one of the VERTIGO partners, will develop and commercialize new products using these new semiconductor disk lasers. Innovative optical sensors to detect dangerous air turbulence generated by aircrafts during take-off and landing or precise laser scalpels for surgeons will be available soon. And further applications will be tested by the VERTIGO partners and their customers, such as micro-processing of transparent plastic materials and optical satellite-to-ground communication.

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The Fraunhofer IAF

The Fraunhofer Institute for Applied Solid State Physics is a leading research and technology center in the field of micro- and nanostructured compound semiconductors and diamond. Its research work is focused on the development of micro- and optoelectronic circuits, modules, and systems. These find their applications in security and communication systems as well as in environmental and medical technology. The institute was founded in 1957. Today 240 highly motivated staff members and an annual budget of EURO 26 million are available for research on topics with high social relevance.

More info: www.iaf.fraunhofer.de

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Core of the VERTIGO laser technology: the semiconductor gain chip for the 2 – 3 μm wavelength range embedded in a custom designed heatsink.

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From basic material science up to application specific laser-modules: Prototypes of two different hermetically sealed 2 μm disk laser modules.

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