Leibniz
Ferdinand-Braun-Institut

Press release

Energy-sources of the future: novel diode lasers for ultra-high power laser applications

The FBH will present the latest results from their project CryoLaser at CLEO 2013. CryoLaser has been selected as a "hot topic" for the central press event at the renowned technical conference in San Jose, USA

Berlin, June 7, 2013

High energy laser applications of the future: these are the target of current diode laser research at the Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (FBH). World-wide, teams of scientists and technologists are working on a new generation of ultra-high energy lasers. These are tools for basic science, for novel medical applications and, not least, for laser-induced fusion. Large facilities that make use of this technology could in future ensure clean, highly efficient energy supplies for all mankind. Ultra-high power laser systems require diode lasers that are not just extremely capable, but also manufacturable at low costs in very high volumes. The FBH are currently optimizing both the necessary design and technology, as a part of the Leibniz project, CryoLaser. If the cost per photon is to fall, a higher optical power density must be generated, reducing the amount of material needed. The conversion efficiency and material quality must also be dramatically improved. CryoLaser uses a novel design concept, developing innovative structures that are optimized for operation below the freezing point (-73°C, 200K). The performance of diode lasers is substantially improved at these temperatures.

The FBH scientist, Paul Crump, will present the latest results from CryoLaser in his invited talk on 12 June at CLEO in San Jose, USA. This presentation has been selected as "hot topic" for the conference's main press event.. The results focus on laser bars in the wavelength range 930 to 970 nm. Such diode lasers are the fundamental building blocks for pump sources for Ytterbium-doped crystals in large laser facilities, where optical pulses are generated with peta-watt class peak energies and picosecond pulse widths. The individual laser bars in these pump sources emit 1.2 millisecond long optical pulses, previously with a typical output power between 300 and 500 Watts. First tests of FBH bars at -50°C (223K) lead to a world-wide best result of 1.7 kilowatt (kW) peak power per bar, that corresponds to a pulse energy of 2 J. To date, such pump energies could only be achieved by combining the optical beams from at least five single bars. Currently, the FBH team is working to increase the electro-optical conversion efficiency of these bars from the current 50% to values of more than 80% at the targeted operational power of 1.6 kW per bar.

The FBH is responsible for the full value chain within this development project, from design to construction of first prototypes, which will be delivered to project partners. As in previous technology developments, these pump sources will be evaluated together with the world-leading groups in their field. Here, these are LIFE in the USA, HiPER in Europe, both working on the use of ultra high power lasers for laser-initiated fusion.

Further Informationen on CryoLaser & CLEO

http://www.fbh-berlin.com/special-projects/cryolaser

Publication: P. Crump, C. Frevert, H. Wenzel, F. Bugge, S. Knigge, G. Erbert and G. Tränkle "Cryolaser: Innovative Cryogenic Diode Laser Bars Optimized for Emerging Ultra-high Power Laser Applications," Paper JW1J.2, Proc. CLEO, San Jose, USA (2013).

Technical conference and trade show CLEO (9.-14.06.2013) in San Jose, USA
http://www.cleoconference.org

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Contact

Petra Immerz, M.A.
Communication & Public Relations Manager

Ferdinand-Braun-Institut
Leibniz-Institut fuer Hoechstfrequenztechnik
Gustav-Kirchhoff-Str. 4
12489 Berlin, Germany

Phone +49.30.6392-2626
Fax +49.30.6392-2602

Email petra.immerz@fbh-berlin.de
Web www.fbh-berlin.de

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 260 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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