High-power high-brightness diode lasers

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On the occasion of the laser trade fair "Laser 2005" in Munich, the Berlin-based research institution Ferdinand-Braun-Institut für Höchstfrequenztechnik (FBH) presents novel high-power high-brightness diode lasers. These distributed feedback (DFB) lasers feature a small spectral line width. They are characterized by high beam-quality, a stable wavelength and a high output power at the same time. Last but not least, comparable light sources are much higher priced than the DFB lasers which can be produced on a large-scale at significantly lower costs.

The technology of the DFB lasers was awarded the "WissensWerte" transfer prize in June 2004. Since then, FBH succeeded in further increasing efficiency of the DFB lasers to 0.5 Watt, an enhancement of 20 percent. The properties of this laser are crucial for applications in telecommunications, e.g. for erbium-doped fiber amplifiers (EFA).

The high efficiency also enables effective frequency doubling by non-linear crystals. This allows for compact lasers in the visible spectral range based on diode lasers for applications in material analytics and display technology. As a result of the extremely small line width of less than 5 MHz, possible applications are also in spectroscopy, metrology, sensor technology, and atomic physics.

The FBH was able to integrate periodic structures of about 200 nanometer length, so called bragg gratings, with high precision in high-power diode lasers. Thus, the institute managed to enhance output power and brightness. "We sucessfully developed and apply a design for the

exact positioning of gratings which is unique throughout the world", explains Götz Erbert, Head of Optoelectronics Department at FBH.

"This scientific and technological headstart not only opens up new markets, but also gives us a strong competitive advantage." The new technology is based on an exactly defined crystalline layer growth of different crystal material in the nanometer range. In these layers, a bragg grating is etched and overgrown in a second step. The FBH succeeded in developing layer structures with highest precision, which allows for high power with a great reliability. The unique technique was filed as a patent.

The Ferdinand-Braun-Institut