Press release

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**Uncooled 1310nm DFB laser breaks temperature barrier with ultrawideband highly linear operation — Provides key to low-cost direct analogue RF transmission over fibre for next-generation cellular systems and LANs**

Ottawa, Canada, and Cambridge, UK — Engineers from Bookham Technology plc (LSE: BHM, Nasdaq: BKHM) and Cambridge University Department of Engineering will present, at the Optical Fiber Communication Conference and Exposition in March 2003, the industry's first description of a directly modulated DFB laser that combines ultrawide bandwidth with very high linearity over the wide temperature range of 25°C – 85°C, but without cooling. Such devices are crucial to the realisation of the direct transport of analogue microwave/RF signals over fibre for inbuilding distributed antenna systems in cellular networks and for the burgeoning market in wireless LANs, such as the IEEE 802.11-series standards and HiperLAN.

"The big advantage of going to uncooled directly modulated lasers is they are cheaper, more compact and more efficient," says Kenton White, Advisor, Modulated Sources Technology, Bookham Technology, and paper joint author. "Typically, you can take up to a watt of power consumption off, and, in terms of packaging, I would say there is a factor of two in area reduction in removing the cooler — perhaps even more. And, of course, you don't need an expensive, and potentially complex, external modulator taking up more space and power. This would really help optics to move into the wireless area, for example, by solving the big problem of providing low-cost fibre-fed radio access points."

"Cost is key in RF-over-fibre applications in cellular and wireless-LAN distribution," says Prof. Ian White of the Photonics Group, Cambridge University Department of Engineering. "Hence Cambridge University is focusing on developing new techniques allowing full RF transmission over multimode fibre using uncooled lasers. This paper shows that laser diodes developed by Bookham for datacommunications applications also exhibit record linearities up to 20GHz frequencies. Broadband spurious-free dynamic ranges of over 100 $dB.Hz^{2/3}$ are demonstrated over this entire range, sufficient not only for wireless but, indeed, also for radar applications."

The design uses an InP-based compressively-strained multiple-quantum-well DFB laser, which incorporates a unique semi-insulating buried heterostructure for enhanced thermal performance. Bookham already uses this design of buried heterostructure in its reliable digital-communications lasers, where it has operated at over 100°C — among the highest operating temperatures ever achieved in such applications.

Bookham's gain-coupled DFB grating technology further enhances the performance of the design by placing the grating in the middle of the laser active region, rather than displaced from it as in most other DFB lasers. The central location gives a much stronger interaction between the laser light and the grating, resulting in a very fast laser with superior direct-modulation performance and lower spurious-frequency generation, and so improved linearity.

At 25 °C the laser has a spurious-free dynamic range (SFDR) of over 103dB-$Hz^{2/3}$ in the 1 – 20GHz range, while still maintaining an SFDR of over 90dB-$Hz^{2/3}$ in the 1 – 10 GHz range at 85 °C. Third-order intermodulation products are below –50dB (typically –60dB) over the entire 1 – 20GHz range at 25 °C. Excellent linearity performance like this is highly valuable for the 2 – 3GHz signals of 3GPP UMTS and IEEE 802.11b and the higher data-rate standards such as IEEE 802.11b, which use carrier frequencies beyond 5GHz. The performance easily exceeds the requirements of fibre-fed distributed antenna systems.

**Notes for editors**

(1) The Optical Fiber Communication Conference and Exposition (OFC) is one of the major events for the fibre-optics industry. OFC 2003 will be held in Atlanta, Georgia, USA, 23 – 28 March 2003. Details are available at www.ofcconference.com.

(2) The paper *Wide-frequency-range operation of a high-linearity uncooled DFB laser for next-generation radio-over-fiber* by J. D. Ingham, M. Webster, A. Wonfor, R. V. Penty and I. H. White, University of Cambridge, Department of Engineering, and J. K. White, Bookham Technology, will appear in the OFC 2003 Conference Proceedings.

(3) Multiple-quantum-well (MQW) lasers use a stack of ultra-thin cavities in which quantum effects modify the usual laser operation. Strained MQWs introduce mismatching between the crystal lattice of the quantum well and the substrate to further modify the laser characteristics. Very low threshold currents and thus very-high-speed modulation can be obtained.

(4) 3GPP is the 3rd Generation Partnership Project, a collaboration agreement between a number of telecommunications standards bodies that covers the development of technical specifications for GSM and the 3rd-generation-mobile system UMTS.

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Bookham Technology (LSE: BHM; NASDAQ: BKHM) designs, manufactures and markets optical components and subsystems using high volume production methods. With three cost disruptive technologies: Gallium Arsenide (GaAs) for modulation; Indium Phosphide (InP) for tunability and the silicon-based ASOC integration platform, the company delivers end-to-end solutions to communication network system providers, that offer higher performance, lower cost and provide greater subsystems capability to meet their customers' needs. The company's components and subsystems are used in access, metropolitan and long-haul networks. In November 2002, Bookham acquired the optical components businesses from Nortel Networks. This followed the acquisition of Marconi's optical components business in February 2002. The company, whose securities are traded on NASDAQ and the London Stock Exchange, is headquartered in the UK, with manufacturing facilities in the UK, Canada, and Switzerland with offices in US, France, Italy and Japan, and employs approximately 2000 people worldwide.

More information on Bookham Technology is available at www.bookham.com


**Bookham Technology's directly modulated 1310nm DFB laser combines ultrawide bandwidth with very high linearity over the wide temperature range of 25°C – 85°C, and represents a breakthrough for the realisation of the direct transport of analogue microwave/RF signals over fibre for inbuilding distributed antenna systems in cellular networks and for the burgeoning market in wireless LANs.**