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All-fiber mode-locked fiber laser based on 45°-tilted fiber grating: From ultra-short duration to ultra-high repetition rate

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Mode-locked fiber lasers are vitally important tools in the contemporary science and industrial applications such as communication, sensing, imaging and micromachining and others. To make the best use of the all-fiber structure of the fiber laser, the selection of a proper mode locker or mode-locking mechanism is very critical. Polarizer is a critically important element of a fiber laser systems widely applied in NPR mode locking of fiber lasers. However, the standard bulk polarizers inherently break down the all-fiber structure of a fiber laser system while other type of fiber polarizers possess less robustness and high insertion loss. Polarizing fiber grating is a novel type of in-fiber polarizer device based on a 45°-tilted grating structure. In principle, it is very similar to a pile of plate polarizer which based on the Brewster angle therefore radiating out s-light and preserving p-light for propagation. With the benefits of low cost, all-fiber structure and low insertion loss, such device has found various applications as polarization dependent loss (PDL) equalizer, polarimeter and all-fiber polarization filter. Using Aston-made special design polarizing grating, we have implemented various mode-locked erbium fiber laser. A stretched-pulse fiber laser with 90 fs output pulse duration with 1.68 nJ pulse energy has been demonstrated. Additionally, using a 45°-tilted fiber grating as in-fiber polarizing element to increase the repetition rate of the fiber laser, high fundamental repetition rate erbium-doped fiber laser with all-fiber-integrated configuration has been achieved. Pulses with fundamental repetition rate of 245 MHz and pulse duration of 103 fs are obtained from the compact ring laser cavity.

Biography

Zuxing Zhang has completed his PhD from Shanghai Jiao Tong University and Postdoctoral studies from Beijing University of Posts and Telecommunications and Bilkent University. He is a Marie Curie Research Fellow at Aston Institute of Photonic Technologies, Aston University. He has published more than 30 papers in reputed journals.

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