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Photonic crystal circular defect (CirD) laser

By the analogy of Inter-chips optical interconnections, the target density for Intra-chip optical interconnections is estimated to be 10 Pbps/cm^2. This value may not be possible by Si-photonics anymore, because its target density is 10 Tbps/cm^2. The authors have proposed a solution by using 2 dimensional photonic crystal (PC). The laser-cavity is a circular defect (CirD) in the PC lattice. Only a whispering galley mode (WGM) with 9 wavelengths can stably exist there. The light in the cavity is outputted through the line-defect waveguide which is optically coupled with the cavity. The lasing wavelength in each cavity can be varied by changing the radius of CirD cavity. When cavities with different lasing wavelengths are placed near an output waveguide, the wavelength division multiplexing (WDM) transmission system can be realized without a conventional optical multiplexer. Each laser can operate at a speed of 50 Gbps due to small cavity volume. Therefore, the WDM transmission system with 20 channels results in transmission capacity of 1 Tbps. Since footprint of the proposed light source is 100 μm square, the density of 10 Pbps/cm^2 can be realized.

Biography

Masahiko Kondow received the B.E and M.E degrees in electrical engineering, from Osaka University in 1984 and 1986, respectively. Since 1986, he had been with Central Research Laboratory, Hitachi, Ltd. He received the Ph.D. degree in electrical engineering from Osaka University in 1991. In 1998, he was with University of California, San Diego, as a visiting scholar. Since 2005, he has been with Osaka University as a professor in Graduate School of Engineering.

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