主　論　文　要　旨

2010 年　12 月 24 日

論文題名　Generation of efficient optical frequency comb by electro-optic modulation

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主論文要旨

In this thesis, generation of efficient optical frequency comb by an intracavity optical modulator is described. It is experimentally demonstrated in three kinds of modulation systems, which employ an Fabry-Perot resonator or a fiber ring resonator.

In an optical frequency comb generation system employing an Fabry-Perot modulator, the comb spectrum is obtained by using a periodic domain inversion modulator which is produced by a dual-step pulse method. As an experimental result, an optical frequency comb with the spectral bandwidth of about 150 GHz is generated by driving the modulator on the modulation frequency of 10.4 GHz and the modulation power of 1.0 W.

In an optical frequency comb generation system with a fiber ring resonator, to make an original comb spectrum flatten is proposed as a broadening technique of the spectral width. Using an FM laser operation which can operate in the spectral bandwidth of several terahertz, a flat spectrum can be generated from the FM laser operation by using an external intensity modulator. In experiments, a comb spectrum with a power deviation of 1.5 dB in the spectral bandwidth of about 0.5 THz is obtained by driving an intracavity phase modulator on the modulation frequency of 10 GHz and the modulation power of 1.0 W. In addition, using fiber loop modulation including an optical intensity modulator with an external injection laser, a flat spectrum can be generated by a spectral shaping which employs actively mode-locked oscillation. As an experimental result, a flat comb spectrum with a power deviation of 1 dB in the spectral bandwidth of about 1 THz is obtained by driving the intracavity modulator on the modulation frequency of 11 GHz and the modulation power of 0.6 W.

Such optical frequency comb generator is expected to be useful for optical communication and metrology because it can control the spectral band electrically.