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Title

High-resolution spectroscopy using interleaved 100GHz optical frequency comb scanned by phase modulator

Source

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Abstract

A high-resolution spectroscopy technique is proposed with an optical phase modulator combined with an interleaved optical frequency comb. The optical phase modulator and a frequency-locked laser light guarantee a spectral resolution less than 1MHz on an absolute frequency axis. A wide measurement frequency range was realized using a 25GHz optical frequency comb lying over a 4 THz frequency region. An extraction of single tooth intensity from the comb was realized by a heterodyne technique with a frequency-tunable laser used as a local oscillator. Also, the 25GHz optical frequency comb was interleaved to generate four 100-GHz combs for removing the crosstalk from the 25GHz neighboring sidebands in the teeth. This proposed spectroscopy technique was experimentally demonstrated with a resonator of less than 1MHz linewidth and a $^{13}\text{C}^{14}\text{N}$ gas cell. Thus, a measurement frequency range higher than 4 THz (1530nm-1560nm) was confirmed with an effective spectral resolution 100kHz order. In addition, the characteristics of the proposed system were compared with those of the previous system with a single-sideband (SSB) optical modulator. [All rights reserved Elsevier]. (16 References).