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Title:Rapid and high-sensitivity measurements of O<inf>2</inf> A-band absorption spectra with combination of a current-modulated distributed-feedback diode laser and balance detection

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Publisher:Japan Society of Applied Physics, 1-12-3 Kudan-Kita,k Chiyoda-ku, Tokyo, 102, Japan Abstract:We modulate the driving current of a distributed-feedback diode laser for the laser-light frequency to scan over the oxygen A-band (P11Q10, ν = 392:3220 THz) at the scan repetition rate from 0.1 to 10 kHz. The scan range is over 40 GHz below 1 kHz, while it is 35.5 GHz at 10 kHz. Using a balanced photo-receiver, we measure the absorption spectra for an optical path length of 0.22m in atmospheric air at 298 K. The minimum detectable absorbance is 3.6 × 10⁻⁵ at 10 kHz for a single scan measurement, which is about 2 times as large as the shot noise limit. We also demonstrate the absorption measurement for an optical path length of 0.03 m, the size of which is comparable to a small reaction chamber such as a combustion engine. © 2012 The Japan Society of Applied Physics.

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