

Gas spectroscopy and optical path-length assessment in scattering media using a frequency-modulated continuous-wave diode laser

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Simultaneous assessment of the spectroscopic absorption signal of gas enclosed in a scattering medium and the corresponding optical path length of the probing light is demonstrated using a single setup. Sensitive gas absorption measurements are performed by a tunable diode laser using wavelength-modulation spectroscopy, while the pathlength is evaluated by the frequency-modulated cw technique commonly used in the field of telecommunication. Proof-of-principle measurements are demonstrated with water vapor as the absorbing gas and using polystyrene foam as an inhomogeneously scattering medium. The combination of these techniques opens up new possibilities for straightforward evaluation of gas presence and exchange in scattering media. © 2011 Optical Society of America

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