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CW difference frequency laser operating in the mid-infrared: application to NO_2

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Using difference frequency generation by temperature phase matching in a nonlinear optical periodically poled $LiNbO_3$ (PPLN) crystal, we generate up to 400 nW of infrared radiation in the 3-5 μm range by mixing the outputs of a diode pumped Nd-YAG laser at 1064 nm (800 mW) and of a tunable extended-cavity diode laser at 815-885 nm (10-50 mW). This laser source provides a very high resolution (1 MHz) and high signal-to-noise-ratio ($>$1000) radiation with about 0.5 to 4 cm^{-1} tuning range per mode.

In this paper, we report spectrometer characterization using N_2O as a molecular standard. The first application of this instrument is a new accurate ($<$2%) experimental determination of the NO_2 line intensities in the important $\nu_1 + \nu_3$ band around 3.4 μm (frequently used for retrievals of atmospheric NO_2 concentrations) showing about 5% difference compared to the most recent HITRAN database.