HIGH PRECISION MID-IR SPECTROSCOPY OF $^{12}C^{16}O_2$ NEAR 4.3 μm

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We have observed the sub-Doppler saturation spectrum of the $^{12}C^{16}O_2$ near 4.3 μm using a mW-level DFG (Difference Frequency Generation) source. The DFG radiation is generated by a 1-W Ti:sapphire laser and a Nd:YAG laser amplified by 10-W fiber amplifier in a 50-mm long PPLN (Periodically Poled Lithium Niobate) crystal. We are able to generate 2 mW DFG power at 4.3 μm. The Nd:YAG laser is frequency-doubled, and frequency stabilized on one $^{127}I_2$ hyperfine transition. The Ti:sapphire laser is locked onto the center of CO_2 transition and its frequency is measured by an OFC (Optical Frequency Comb). In this talk, we will report our recent measurements on the high J 0001 $\rightarrow$ 0000 fundamental band transitions and the hot band 0111 $\rightarrow$ 0110 transitions. To increase the signal-to-noise ratio of the observed spectra, the CO_2 absorption cell in heated to a temperature $> 500^\circ C$.