OPTICAL FREQUENCY COMB REFERNCED SUB-DOPPLER RESOLUTION DIFFERENCE-FREQUENCY-GENERATION INFRARED SPECTROMETER

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We have determined absolute frequencies of 56 transition of the ν_3 band of $^{12}CH_4$ and $^{13}CH_4$ with at a typical uncertainty level of 2 kHz. While the frequency of the difference-frequency-generation (DFG) source is stabilized to the Lamb dip of the methane transition, the frequencies of the pump and signal source are measured with a 1.5-μm optical frequency comb (OFC). The determined value is consistent with the International Committee for Weight and Measures recommendation within the uncertainty. We have also developed OFC-referenced frequency sweep, which allow us to accumulate spectral data for long time without any frequency drift and to determine the frequency of the transition which are too weak to use the frequency reference for the frequency stabilization.