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Doppler-free saturation spectroscopy of acetylene inside a photonic band-gap fiber RAJESH THAPA, MOHAMMED FAHEEM, KRISTAN CORWIN, Dept. of Physics, Kansas State University — We are developing portable frequency references based on saturated absorption of acetylene ($^{12}\text{C}_2\text{H}_2$) in the near IR spectral region with sub-MHz accuracy inside hollow core photonic band-gap fibers. Acetylene is a commonly employed reference gas in the telecommunications band. The light from the tunable diode laser at ~ 1531 nm (P11) is amplified by an erbium-doped fiber amplifier (EDFA) and split into a strong pump beam and a weak probe beam which counter propagate inside the gas-filled fiber. The sub-Doppler profile appears as a narrow absorption feature, about 20-40 MHz wide, even at the low pump power of ~ 18 mW. We also observe narrower sub-Doppler features in the $20\ \mu\text{m}$ -core fiber than in the $10\ \mu\text{m}$ -core fiber, consistent with the limitation of transit-time broadening.

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