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Development of a Tunable Ultra-Broadband Mid IR Pulsed Source for Nonlinear Spectroscopy[1] MARK CHENG, ANTHONY REYNOLDS, HEATHER WIDGREN, MUNIRA KHALIL, Department of Chemistry, University of Washington, Seattle, WA 98195
— We generate ultra- broadband mid-IR pulses tunable from 2.5 – 8 μm by focusing 800 nm/400 nm pulses into various gas media. The input 800 nm light is doubled to 400 nm in a type I BBO crystal. The two orthogonally polarized $\omega/2\omega$ pulses encounter a birefringent calcite crystal for time delay compensation and are subsequently focused in various gas media (air, argon, neon and nitrogen) contained within a 1.2 m gas cell using a 1 m focal length silver mirror. The tunability of the broadband mid-IR pulses arises from different gases, pressure of gases and the amount of incident 800 nm/400 nm light focused into the gas cell at a given pressure. We measure IR energies as high as 0.5 μJ/pulse for an input 800 nm energy of 3 mJ/pulse in 900 Torr of Argon. The mid IR pulses exhibit $\sim$2% long term stability. The ultrabroadband IR pulses have a spectral bandwidth of $\sim$2000 cm^{-1} corresponding to a sub-cycle pulse centered at 4.5 μm. We will present our preliminary efforts on using the ultrabroadband IR pulses in nonlinear experiments. The broad spectral content of this novel source affords the possibility of probing multiple vibrations in a coherent manner.

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Munira Khalil
Department of Chemistry, University of Washington, Seattle, WA 98195

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