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Creating Cold Molecules to Constrain the Evolution of the Fine Structure Constant HEATHER LEWANDOWSKI, ERIC HUDSON, JASON BOCHINSKI, BRIAN SAWYER, JUN YE, JILA / Univeristy of Colorado — Theories that try to unify gravity with the other fundamental forces predict variations in the fundamental constants over time, including the fine structure constant. Comparing measurements of OH transition frequencies at cosmological distances with laboratory based measurements can give a limit of the time variation of the fine structure constant. We create cold OH molecules by using the phenomenon of supersonic expansion to cool the molecules and the Stark effect to slow the resulting molecules for precision spectroscopic measurements. We have made the most precise measurements of microwave transitions in the ground state of OH to complement the astronomical observations.

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