Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

**Novel Laser-Coolable Molecular Species** NATHANIEL VILAS, BENJAMIN AUGENBRAUN, ZACK LASNER, ALEX FRENETT, HIROMITSU SAWAOKA, CALDER MILLER, ZHIJING NIU, DANIEL ABDULAH, LOUIS BAUM, DEBAYAN MITRA, CHRISTIAN HALLAS, SHIVAM RAVAL, ANDREW WINNICKI, Harvard University, TIMOTHY STEIMLE, School of Molecular Sciences, Arizona State University, JOHN DOYLE, Harvard University — Laser cooling techniques have recently been extended to diatomic and polyatomic molecules. The molecules that have so far been laser cooled are highly symmetric, linear molecules. Previous cooling schemes have relied crucially on these high symmetry states. Here, we identify several new classes of laser-coolable molecules with complex molecular and electronic structure. Among these are non-linear symmetric top molecules like $CaOCH_3$ [1], asymmetric rotors including CaSH and $CaNH_2$ [2], and exotic molecules with multiple optical cycling centers, such as CaCCSr [3]. We discuss ongoing experimental and theoretical work, including dispersed fluorescence spectroscopy, demonstrations of optical photon cycling, and structural calculations. The addition of such species to the laser-cooled molecular toolbox will lend itself to diverse applications ranging from quantum computing and simulation to quantum chemistry to precision measurements and fundamental physics. [1] Yu et. al., New J. Phys. 21, 093049 (2019). [2] Augenbraun et. al., arXiv:2001.11020 (2020). [3] Ivanov et. al., J. Phys. Chem. Lett. (2020).

Nathaniel Vilas
Harvard University

Date submitted: 30 Jan 2020 Electronic form version 1.4