Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Zeeman-Sisyphus Deceleration of Molecular Beams NOAH FITCH, MIKE TARBUTT, Imperial College London — Ultracold molecules are useful for testing fundamental physics and studying strongly-interacting quantum systems. One production method is via direct laser cooling in a magneto-optical trap (MOT). In this endeavor, one major challenge is to produce molecules below the MOT capture velocity. Established molecular beam deceleration techniques are poorly suited because they decelerate only a small fraction of a typical molecular pulse. Direct laser cooling is a natural choice, but is also problematic due to transverse heating and the associated molecule loss. I will present a new technique that we are developing, which we call Zeeman-Sisyphus deceleration and which shows great promise for preparing molecular beams for MOT loading. This technique decelerates molecules using a linear array of permanent magnets, along with lasers that periodically optically pump molecules between weak and strong-field seeking quantum states. Being time-independent, this method is well-suited for temporally extended molecular beams. Simultaneous deceleration and transverse guiding makes this approach attractive as an alternative to direct laser cooling. I will present our development of the Zeeman-Sisyphus decelerator and its application to a molecular MOT of CaF and an ultracold fountain of YbF.

Noah Fitch
Imperial College London

Date submitted: 29 Jan 2016 Electronic form version 1.4