Abstract Submitted
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Laser cooling diatomic molecules to below the Doppler limit STEFAN TRUPPE, HANNAH WILLIAMS, MORITZ HAMBACH, LUKE CALDWELL, NOAH FITCH, BEN SAUER, ED HINDS, MIKE TARBUTT, Imperial College London — Ultracold molecules are useful for testing fundamental physics, studying strongly-interacting quantum systems, and exploring collisions and chemistry in the ultracold regime. We produce ultracold CaF by the following steps. First, we produce a beam of CaF molecules, with an average velocity of 140 m/s, by laser ablation of Ca into a flow of cryogenic helium gas mixed with SF_6. This beam is slowed via a chirped, counter-propagating laser beam to below the capture velocity of a magneto-optical trap (MOT). The molecules are then trapped and Doppler cooled in the MOT where they reach an equilibrium temperature of 12mK. We cool the molecules further to about 960μK by decreasing the intensity of the MOT beams. Finally, we load the molecules into a three-dimensional blue-detuned molasses where they cool to 50μK, well below the Doppler limit.

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