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Progress towards the laser cooling of the magnesium fluoride molecular beam YONG XIA, DAPENG DAI, XINGJIA LI, YANNING YIN, JIANPING YIN, State Key Laboratory of Precision Spectroscopy, Department of Physics, East China Normal University — Though the laser cooling techniques that have been tremendously successful in producing ultracold atoms are difficult to apply to molecules, in the past few years, a new approach, laser cooling and trapping of diatomic molecules has become possible. We select magnesium fluoride (MgF) as a prototype molecule for laser cooling experiment. In order to compensate the changes of the Doppler shift during the longitudinal slowing of the molecular beam, we theoretically investigate the possibility of stimulated light force deceleration and cooling of the diatomic magnesium fluoride molecular beam with near-cycling transitions in the bichromatic standing light wave of high intensity which estimated by the two-level optical Bloch equations. We also demonstrate a robust and versatile solution for locking the continuous-wave Ti:sapphire tunable laser for applications in laser cooling of molecules which need linewidth-narrowed and frequency-stabilized lasers.

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