Construction of a Broadband Diode Laser System for Rovibrational Cooling of Rb2 Molecules

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The research field of ultracold (T«1mK) molecules is continuously expanding in many directions, involving an increasing number of groups throughout the world. Molecules at ultracold temperatures move at very small speeds, making it easier to control their quantum states. Unfortunately, until recently, laser cooling could not be easily applied to molecules because they generally do not have suitable closed optical transitions, as in atomic systems. In this work, we pretended to build an optical system to spectrally shape multimode diode lasers to perform rovibrational cooling of Rb2 molecules. The optical system is composed of 7 broadband multimode diode lasers with an average power of 1.0 to 1.5 W and an estimated linewidth of about 15 cm^{-1}. Such lasers will couple states of the potential to the rovibrational levels of the potential. To combine rays of different wavelengths we use volumetric Bragg gratings (VBR) which in turn selectively filter each input beam. To discriminate the frequencies the beam is opened using a diffraction grating, then using cylindrical lenses it is possible to collimate the beam in a two-dimensional plane where we can use a digital micromirror device (DMD) to obtain a modulated output beam.

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