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Narrow-linewidth operation of high power broad-area laser diodes using a passively stabilized variable external cavity design BRIAN L. SANDS, S. BURCIN BAYRAM, Miami University, OH — Many applications in atomic spectroscopy require the use of lasers with a narrow linewidth and high beam quality. External cavities have long been used with low power laser diodes to achieve this and to continuously tune the wavelength. Recently, broad-area laser diodes and laser diode arrays have been fabricated to produce many watts of cw output power. These are necessary in applications requiring high powers, such as spin-exchange polarization of ^{129}Xe, and as affordable alternatives to solid-state lasers in high-resolution spectroscopy. Coupling these lasers to external cavities becomes increasingly difficult, as the beam quality goes down with increasing power. We describe an external cavity based on the Littman-Metcalf design that can be easily aligned in a wide range of cavity lengths to adapt to different types of high power laser diodes and different applications. The cavity utilizes passive stabilization techniques to maintain a stable mode structure over long periods of time. We have narrowed the linewidth of a Coherent 2W single-stripe cw laser diode ($\sim$ 780nm) from about 550GHz to $<$ 200MHz with a coupling efficiency greater than 60%. We also describe the continuous tunable range of the cavity and its applications to high-resolution spectroscopy.

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