Semiconductor Disk Lasers with Gain-Embedded Meta-Mirrors

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Gain-embedded meta-mirrors (GEMMs) are a proposed gain medium for optically-pumped semiconductor disk lasers (SDLs) that offer improved laser performance due to an increased thermal conductivity over traditional SDLs or recently demonstrated membrane-based SDLs. The GEMM SDL will build off of recent demonstrations of GaSb membrane SDLs at AFRL but include the meta-mirror fabrication proposed by UNM. Mating the meta-mirror and gain medium allows for the ability to generate structured light or add optical phase to the gain element which will be explored upon initial demonstration. In this project we seek to demonstrate the GEMM, systematically explore the meta-mirror epitaxial and optical design to extend-short wave infrared (eSWIR) wavelengths for high output power continuous-wave lasing, and explore novel meta-mirror designs.