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Observation of Ultrahigh Spontaneous Emission Factors in GaAs(Ga,Al)As Microdisk Lasers W.H. WANG, X. LI, R. C. MYERS, S. GHOSH, D. D. AWSCHALOM, N. SAMARTH, Center for Spintronics and Quantum Computation, University of California-Santa Barbara and Materials Research Institute, Penn State University — We study optically-pumped stimulated emission in small diameter ($D \approx 2\mu m$) GaAs/(Ga,Al)As microdisk lasers that contain interface fluctuation quantum dots (IFQDs) in the active region. We observe single-mode laser operation over a wide range of pump power, and analyze the double logarithm input-output data with a standard rate equation. The analysis yields a spontaneous emission factor as high as $\beta \approx 0.82$, not seen in control experiments on microdisks with either larger diameters ($D \approx 4\mu m$, $\beta \approx 0.45$) or without IFQDs ($D \approx 2\mu m$, $\beta \approx 0.2$). This suggests that the ultrahigh values of β result from the small cavity volume and high optical confinement in small diameter microdisks, as well as the combination of relatively narrow gain width and carrier localization in microdisks with IFQDs. Supported by DARPA-QUIST and NSF.

Nitin Samarth
The Pennsylvania State University

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