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Coherence and Dynamics of a High-β Metallo-dielectric Nanolasers[1] SI HUI ATHENA PAN, University of California San Diego — Metal-clad nanolasers with high spontaneous emission factors (β) represent a class of ultra-compact light emitters with applications in fiber-optic communications, optical computing, imaging and sensing. In-depth studies on both the coherence and dynamical properties of these emitters are necessary before practical applications can be realized. However, the coherence characterization of a high-β nanolaser using the conventional measurement of output versus input intensity (L-L curve) is inherently difficult. We conducted the second order intensity correlation measurement, or $g^2(\tau)$ — a more definitive method to confirm coherence — on a high-β metallo-dielectric nanolaser. Our result indicates that full coherence is achieved at three times the threshold conventionally defined by the kink in the L-L curve. Additionally, we observed that the $g^2(\tau)$ peak width shrinks below and broadens above threshold. Rate-equation analyses reveal that the above-threshold broadening is due to dynamical hysteresis. We propose that this dynamical phenomenon can be exploited to determine the lasing regimes of a unity-β nanolaser, whose threshold is inherently ambiguous and difficult to observe.

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