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Periodic and Quasiperiodic Dynamics of Optoelectronic Oscillators with Narrowband Time-Delayed Feedback YUNJIA BAO, LUCAS ILLING, Reed Coll — Optoelectronic oscillators with delayed feedback are nonlinear systems that can generate high-frequency electric signals of high spectral purity. The nonlinearity, however, limits the ability to produce stable periodic signals that also have large amplitude because transitions into a chaotic state may occur. This study examines the dynamics and bifurcations of the system as the feedback gain and feedback delay are varied. We experimentally explored feedback parameter regions of stable periodic oscillations as well as the region-boundaries where a torus bifurcation leads to quasiperiodic behavior. We develop a theory that provides the periodic solutions and the feedback parameters at which torus bifurcations occur. We find good agreements between experiments, results of numerical simulations, and theory.

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