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Device Applications for the Tunneling Atom Maser YANIV ROSEN, SAMARESH GUCHHAIT, Laboratory for physical sciences, College Park, MD, ALEX BURIN, Tulane university, New Orleans, LA, KEVIN OSBORN, Laboratory for physical sciences, College Park, MD — Random two-level system defects in dielectrics absorb energy and limit the coherence of superconducting qubits and resonators used in quantum computing applications. So far attempts to reduce this loss have been confined to device design and material optimization. We present the ability to control the loss of a dielectric by directly manipulating the population of its two level system defects (TLSs). The defect populations can be controlled and the resonator can pass continuously through regimes of ordinary defect loss, to negligible material dissipation, and finally to coherent amplification. The theory behind the device is discussed and matched to experimental results. Using similar methods, we propose devices that control loss, exhibit reduced noise, and amplify signals.

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