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Laser made from a superconducting lumped-element resonator and random defects YANIV ROSEN, Laboratory for Physical Sciences, College Park, MD, MOE KHALIL, Laboratory for Physical Sciences, College Park, MD and University of Maryland, College Park, MD, ALEX BURIN, Department of Chemistry, Tulane University, New Orleans, LA, KEVIN OSBORN, Laboratory for Physical Sciences, College Park, MD and Joint Quantum Institute, College Park, MD — Random two-level system defects in dielectrics absorb energy and limit the quality factors of superconducting qubits and resonators used in quantum computing applications. We have found a method to invert the population of these random defects and pass them through resonance with a lumped-element superconducting microwave resonator. Stimulated emission of the defects causes the internal quality factor of the resonator, measured by an injection locking tone, to cross through an infinitely large value before becoming negative. In the latter case the defects emit more than they absorb and the internal lasing threshold is reached. With further population inversion, amplification of the injection locking tone is observed.

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