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Strongly disordered s-wave superconductors probed by microwave electrodynamics E.F.C. DRIESSEN[1], P.C.J.J. COUMOU, R.R. TROMP, P.J. DE VISSER[2], T.M. KLAPWIJK, Kavli Institute of Nanoscience, Delft University of Technology — In contrast to Anderson's theorem, recently evidence has emerged that superconductivity is susceptible to strong disorder and that there is a disorder-induced superconductor-to-insulator transition (SIT). We probe the effects of strong disorder ($8.6 > k_F l > 2.4$, approaching the SIT) in thin films of niobium titanium nitride and titanium nitride by measuring the microwave electrodynamics in coplanar waveguide resonators. The electromagnetic response gradually evolves with disorder, deviating from conventional Mattis-Bardeen theory, for both materials. The result is understood as due to changes in the quasiparticle density of states, as a consequence of the short elastic scattering length. Our observations are consistent with a model that uses an effective pair breaker, which is inversely proportional to the value of $k_F l$.

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