Abstract Submitted
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Strong-Field Pulsed THz Study of Superconductivity Breakdown in NbN[1] G.L. CARR, Y. SHEN, Y. HIDAKA, J.B. MURPHY, X. YANG, X.-J. WANG, Photon Sciences, Brookhaven National Laboratory — We report the ultra-fast breakdown of the superconducting state in a NbN thin film ($T_C \approx 14$K) when exposed to an intense single-cycle THz pulse. The THz pulse's transform-limited spectral content was kept below the NbN pair-breaking energy threshold near $2\Delta/hc = 35$ cm^{-1} (i.e., <1 THz). Thus, the initial electronic response was dominated by the inductive behavior of the pair condensate. At low THz E-field strength, the NbN film transmitted less for the superconducting state than for the normal state, as expected. As a function of increasing THz E-field strength, the film transmittance remained constant until a threshold range was reached, after which the transmittance changed over to its normal state value. Through this threshold range we also observed a significant non-linear response in the form of THz upconversion to frequencies approaching 3 times the optical gap, corresponding to time scales well below 1 picosecond.

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