Observation of the Nernst signal generated by fluctuating Cooper pairs

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Long-range order is destroyed in a superconductor warmed above its critical temperature (T_c). However, amplitude fluctuations of the superconducting order parameter survive and lead to a number of well established phenomena such as paraconductivity: an excess of charge conductivity due to the presence of short-lived Cooper pairs in the normal state. According to an untested theory, these pairs generate a transverse thermoelectric (Nernst) signal, which can dominate the Nernst response of the system in a wide temperature range above T_c. In two dimensions, the magnitude of the expected signal depends only on universal constants and the superconducting coherence length, so the theory can be unambiguously tested. In amorphous superconducting films, due to the long coherence length and the short electronic mean-free-path, the lifetime of Cooper pairs exceeds the elastic lifetime of quasi-particles in a wide temperature window. This context is particularly appropriate for testing this theory**.** We report on the observation of a Nernst signal in such a superconductor ($Nb_{0.15}Si_{0.85}$) traced deep into the normal state. Its amplitude is in excellent agreement with the theoretical prediction.

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