

Abstract Submitted
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Direct measurement of the electron-phonon relaxation rate in thin metal films ILARI MAASILTA, LASSE TASKINEN, JENNI KARVONEN, Nanoscience Center, University of Jyväskylä, Finland, JANI KIVIOJA, Helsinki University of Technology, Finland — We have used normal metal-insulator-superconductor (NIS) tunnel junctions for ultrasensitive thermometry at sub-Kelvin temperatures. With the help of these thermometers, we have developed an ac-technique to measure the electron-phonon (e-p) scattering rate directly, without any other material or geometry dependent parameters, based on overheating the electron gas. The technique is based on Joule heating the electrons in the frequency range DC-10 MHz, and measuring the electron temperature in DC. Because of the nonlinearity of the electron-phonon coupling with respect to temperature, even the DC response will be affected, when the heating frequency reaches the natural cut-off determined by the e-p scattering rate. Results on thin Cu films show a T^4 behavior for the scattering rate, in agreement with indirect measurement of similar samples and numerical modeling of the non-linear response.^{1,2}

¹L. J. Taskinen, J. M. Kivioja, J. T. Karvonen, and I. J. Maasilta, *phys. stat. sol. (c)* **1**, 2856 (2004).

²J. T. Karvonen, L. J. Taskinen, I. J. Maasilta, *phys. stat. sol. (c)* **1**, 2799 (2004).

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