Title: Properties of superconductors in the terahertz frequency region

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Abstract: Temperature dependence of transmission through thin superconducting NbN films in various magnetic fields applied in both Faraday and Voigt geometries has been measured and analysed for various linear polarisations of laser beam in terahertz range at frequencies both above and below the optical gap. Zero-field data are well explained using the extension of BCS-based model of Zimmermann *et al.* [Physica C 183, 99-104 (1991)]. In external magnetic field, vortex presence substantially influences optical properties of superconductors, both qualitatively and quantitatively. Transmissions through double-layer media - NbN films deposited on various substrates - have been analysed by taking into account interference effects, in case of birefringent sapphire substrate by utilizing Yeh formalism [J. Opt. Soc. Am. 69, 742-756 (1979)]. In Voigt geometry, observed transmissions for linear polarisation of the laser beam parallel with and perpendicular to the applied magnetic field exhibit different features. A developed phenomenological model captures all main experimental observations and accounts for different geometrical configurations.

Keywords: superconductivity, terahertz spectroscopy, high-frequency conductivity, vortices