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Terahertz Generation & Vortex Motion Control in Superconductors[1]

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A grand challenge is to controllably generate electromagnetic waves in layered superconducting compounds because of its Terahertz frequency range. We propose [1] four experimentally realizable devices for generating continuous and pulsed THz radiation in a controllable frequency range. We also describe [2-4] several novel devices for controlling the motion of vortices in superconductors, including a reversible rectifier made of a magnetic-superconducting hybrid structure [4]. Finally, we summarize a study [5] of the friction force felt by moving vortices.

1) S. Savel'ev, V. Yampol'skii, A. Rakhmanov, F. Nori, Tunable Terahertz radiation from Josephson vortices, preprint
2) S. Savel'ev and F. Nori, Experimentally realizable devices for controlling the motion of magnetic flux quanta, Nature Mat. 1, 179 (2002)
3) S. Savel'ev, F. Marchesoni, F. Nori, Manipulating small particles, PRL 92, 160602 (2004); B. Zhu, F. Marchesoni, F. Nori, Controlling the motion of magnetic flux quanta, PRL 92, 180602 (2004)
4) J.E. Villegas, et al., Reversible Rectifier that Controls the Motion of Magnetic Flux Quanta, Science 302, 1188 (2003)
5) A. Maeda, et al., Nano-scale friction: kinetic friction of magnetic flux quanta and charge density waves, preprint

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