PCP6-5

Simulation of THz emission from various shaped intrinsic Josephson junction arrays

Yusuke Fujiki[1], Masaru Kato[1]

Department of Physics and Electronics, Osaka Prefecture University, Japan[1]

High-T_c cuprate superconductors have several special properties: higher superconducting transition temperature and unconventional Cooper pairing. Additionally, in these materials, superconducting layers and insulating layers are piled up alternately, thus the Josephson junctions between layers are formed spontaneously. These junctions are called the intrinsic Josephson junctions.

If a voltage is applied to the Josephson junctions, an ac current flows by the Josephson effect. Because of this ac current, this electromagnetic (EM) wave is emitted from junctions, and frequency of this wave reaches to the THz regime.

The frequency of the THz wave depends on the applied voltage, also the shape of the material. In some shapes, the EM wave have a circular polarization.

In this study, we simulate the EM field in the junction and the EM wave emitted to outside of the junction numerically using the finite element method and the boundary element method. In a junction array, we use the finite element method and solve Josephson relation considered coupling between the junctions [1], spatial variations of phase differences in magnetic wave,and the Maxwell equation.

And outside of the junctions, we obtain emitted EM wave by using the boundary element method. Then we investigate the dependence of the EM wave on the shape of the junction array.

[1] T. Koyama, H. Matsumoto, M. Machida, K. Kadowaki, Phys. Rev. B **79**, 104522 (2009)

Keywords: High-Tc cuprate superconductors, Intrinsic Josephson junctions, THz emission, Finite element methid