CEC-ICMC 2017 - Abstracts, Timetable and Presentations



Contribution ID: 537

Type: Invited Oral Presentation

[Invited] Terahertz emission from the intrinsic Josephson junctions of high-symmetry thermally-managed BSCCO microstrip antennas

Wednesday 12 July 2017 11:45 (30 minutes)

We study the coherent terahertz emission from the intrinsic Josephson junctions in thermally-managed, highsymmetry, thin microstrip antennas constructed from single crystals of the highly two-dimensional, layered high-temperature superconductor BSCCO. The thin antennas studied are disk[1,2], square[3], and equilateral triangular[4,5] in shape. Upon application of a dc voltage across the junctions, the primary radiation source is the uniform ac Josephson current, but when the appropriate point in the current-voltage characteristics is found, the excitation of an electromagnetic cavity mode can lead to a considerable enhancement of the output power. When properly thermally managed by convering the top and bottom of a thin BSCCO crystallite with Au and sandwiching that between sapphire plates[6], only the one-dimensional representation wave functions of the appropriate point groups are excited, and the world record 2.4 THz emission from a superconductor was recently observed[2] from such a device. The coherent emission is widely tunable and has a narrow linewidth. The angular distributions of the output power are calculated and compared with experiment.

- [1] M. Tsujimoto et al., Phys. Rev. Lett. 105, 037005 (2010).
- [2] T. Kashiwagi et al., Appl. Phys. Lett. 107, 082601 (2015).
- [3] R. A. Klemm et al., IEEE JSTQE (2017, in press).
- [4] D. P. Cerkoney et al., J. Phys.: Condens. Matter 29, 015601 (2017).
- [5] K. Delfanazari et al., Opt. Express 21, 2171 (2013).
- [6] T. Kashiwagi et al., Phys. Rev. Applied 4, 054018 (2015).

Author: Prof. KLEMM, Richard (University of Central Florida)

Co-authors: Mr DAVIS, Andrew (University of Central Florida); Ms WANG, Qing (University of Central Florida); Dr YAMAMOTO, Takashi (University of Ulm); Mr CERKONEY, Daniel (Rutgers University); Ms REID, Candy (Lockheed Martin); Mr KOOPMAN, Maximiliaan (University of Central Florida); Prof. MINAMI, Hidetoshi (University of Tsukuba); Prof. KASHIWAGI, Takanagi (University of Tsukuba); Mr RAIN, Joseph (University of Central Florida); Mr SEDLACK, Michael (University of Central Florida); Mr MORALES, Manuel (Harvard Medical School); Ms WATANABE, Chiharu (University of Tsukuba); Prof. TSUJIMOTO, Manabu (University of Tsukuba); Dr DELFANAZARI, Kaveh (University of Cambridge); Prof. KADOWAKI, Kazuo (University of Tsukuba)

Presenter: Prof. KLEMM, Richard (University of Central Florida)

Session Classification: M3OrD - Focused Session: Cryogenic Microelectronics & Materials I