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

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We study the coherent terahertz emission from the intrinsic Josephson junctions in thermally-managed, high-symmetry, 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).

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