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Direct imaging of hot spot in $Bi_2Sr_2CaCu_2O_{8+\delta}$ mesa terahertz sources[1] TIMOTHY BENSEMAN, KEN GRAY, ALEXEI KOSHELEV, WAI-KWONG KWOK, ULRICH WELP, VITALII VLASKO-VLASOV, Materials Science Division, Argonne National Laboratory, KAZUO KADOWAKI, HIDETOSHI MINAMI, University of Tsukuba, Japan — Stacks of intrinsic Josephson junctions (IJJs) made from high-temperature superconductors such as $Bi_2Sr_2CaCu_2O_{8+\delta}$ (Bi-2212) are a promising source of coherent continuous-wave terahertz radiation. When electrical power is applied to these devices, it is thought that hot spots may form due to resistive self-heating, and that these spots may be highly beneficial for the generation of high levels of THz power from Bi-2212 stacks. In order to better understand these hot spots, we have performed a thermal imaging study of BSCCO stacks which generate approximately 50 microwatts of radiation power at 0.59 THz. Utilizing the temperature-dependent 612nm fluorescence line of Eu^{3+}, we are able to directly measure the temperature distribution at the top surface of these stacks with a resolution of +/- 1K. The images reveal a highly non-uniform temperature distribution in which the temperature in the middle of the stack can exceed the superconducting transition temperature by tens of Kelvin under biasing conditions typical for THz-emission.

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