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Terahertz Radiation above 1 THz from Intrinsic Josephson Junction Arrays

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In recent years, high temperature superconductor (HTC) $Bi_2Sr_2CaCu_2O_8$ (BSCCO) devices have become indispensable for generating electromagnetic coherent terahertz (THz) radiation and attracted a lot of research interest [1-6]. It has been reported, that an optimized GBG (gold-BSCCO-gold) sample structure with a BSCCO stack embedded between two gold layers, can give rise to strong and tunable coherent emission. However, the observation of THz emission from these GBG and other conventional mesa structures shows, that the frequencies are well below 1 THz, which limits the application of THz technology. In our experiments, we improved the sample structure by gluing a second, thermally anchored substrate onto the surface of a GBG sample, which leads to better cooling. Investigations of the stacks using the same measurement methods demonstrated that the sample with new structure allows for a remarkable increase in emission frequency compared to the previous designs. The maximum voltage of this better cooled and dimension-unchanged sample was increased and, accordingly, both the emission frequencies and the tunable frequency range were significantly increased to 1.05 THz and 0.71 THz, respectively [8].

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