Standing-wave Mode Formation of Irradiated Microwaves in Stacked Intrinsic Josephson Junctions

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We studied the suppression of the critical current of a rectangular stack ($15\times0.72\times0.060$ m^3) of $Bi_2Sr_2CaCu_2O_{8+x}$ intrinsic Josephson junctions (IJJs) with varied microwave power at frequencies in the W band. The stack was fabricated into a transmission-line geometry, with a-few-hundred-nm-thick Au layers deposited on top and bottom of the stack. In general the tunneling critical current of each IJJs was suppressed with increasing power. At frequencies higher than a certain critical value, however, the tunneling critical current of junctions located closer to the top and bottom Au layers remained almost unaltered by the microwaves while that of inner junctions closer to the center of the stack was significantly reduced. This observation suggests that the irradiated microwaves form a standing wave along the *c*-axis direction. These results may provide valuable information on the microwave transmission modes inside the sandwiched stack of IJJs, which is important for the high-frequency device applications using IJJs, such as fluxon-flow THz local oscillators or mixers for integrated submillimeter-wave receivers.

keywords : intrinsic Josephson junctions, microwave transmission mode, $Bi_2Sr_2CaCu_2O_{8+x}$ single crystals