

The Influence of the Resonator on the Self Heating Effect and the Synchronization of Josephson Junctions

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Abstract - Arrays of synchronized Josephson junctions can be used as coherent frequency sources where the voltage across the junctions is connected to the frequency only via fundamental constants. Recent results on intrinsic Josephson junctions in high temperature superconductors show problems with synchronization and self-heating effects. Thus, we investigate numerically the temperature of the self-heated chain of two current-biased Josephson junctions loaded by a resonator and the conditions of synchronization in the system. For calculations we used parameters of intrinsic Josephson junctions in high temperature superconductors. We found that the increase of the ac current at the resonant frequency results in the phase locking of junctions (coherent radiation) as well as in an increase of the temperature of each of the junctions above the nominal bath temperature of the cryostat. Both the increase of the temperature and the phase locking appear in the same interval of the bias currents.

Keywords - Josephson junctions, synchronization, high-temperature superconductors.

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