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Nanoelectronic RF Josephson Devices

Source

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Abstract

Superconducting RF nanoelectronic devices exhibit a considerable potential for application in future electronics. Josephson effect based devices allow generation, detection, mixing, and parametric amplification of high-frequency signals up into the terahertz region and exhibit high sensitivity, low energy consumption, and small size. Traveling-wave devices can be realized with distributed Josephson junctions. Nonlinear lumped-element circuits can be realized that are small enough so that the circuit dynamics are governed by quantum mechanics. This allows to generate two-photon coherent states and entangled states and will open the door for quantum information processing. Nanotechnological fabrication techniques and the availability of novel materials give a strong impact on the development of novel Josephson-effect-based devices and systems. An overview over the physical principles and the possible applications of nanoelectronic RF Josephson devices is presented.