DYNAMIC KINK STATES IN INTRINSIC JOSEPHSON JUNCTIONS GENERATED BY INTERNAL RESONANCE

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Intrinsic Josephson-junction stacks are realized in mesas fabricated out of high-temperature superconductors, such as $Bi_2Sr_2CaCu_2O_{8+x}$. Phase oscillations in different junctions can be synchronized via coupling to the internal cavity mode leading to powerful electromagnetic radiation in terahertz frequency range [1]. As homogeneous oscillations do not couple directly to the cavity modes, the mechanism of mode excitations is a nontrivial issue. New dynamic state providing a very efficient coupling has been demonstrated recently [2]. A key feature of this state is the alternating phase kinks and antikinks *statically* located near the center and coexisting with the oscillating phases. We studied evolution of this state with increasing magnetic field at fixed current and found several dynamic regimes. The initial kink state remains stable up to a certain critical field, similar to the lower critical field. Above this field the kink configuration starts to restructure and we observe formation of different *static* kink lattices existing inside dynamic states. These lattices represent new resonance-stabilized coherent states which differ considerably from the well-known static and moving Josephson vortex lattices. The voltage monotonically increases with the magnetic field and behavior changes when the voltage exceeds the resonance voltage. Above this voltage the kink states become disordered and the voltage-field dependence becomes noisy. Finally, above certain field, the coherence is lost completely and chaotic state emerges. We will also discuss (i) stability analysis of the coherent states and (ii) synchronization regimes in inhomogeneous mesas.

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References

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