

Josephson structures with phase shift

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Physical phenomena in Josephson structures with a phase shift are considered [1]. In particular, we discuss the resonant control of magnetization in a shunted ϕ_0 junction. We demonstrate the possibility of effective influence on the resonant properties of the Josephson junction by changing the shunt parameters, the magnitude of magnetization, and controlling its dynamics [2].

The interplay of the electric and magnetic components of the external electromagnetic radiation on the constant voltage step in ϕ_0 JJ is demonstrated in Fig. 1. Three different steps are manifested in Fig. 1(a): the first one is the Shapiro step (blue curve). The electric component of radiation locks the Josephson oscillations which in turn locks the precession of the magnetic moment of the ferromagnetic barrier due to the spin-orbit coupling. The second Buzdin step takes place if the magnetic component is taken into account only. Here the corresponding m_y^{max} demonstrates a bubble-like structure along the step (see inset ii). This step appears as a result of the interaction between the magnetic component of the radiation with the magnetic moment which in turn locks the Josephson oscillations. The combined effect of both components results in the appearance of a unique step which is known as chimera step (black curve). Similar to Buzdin step, the corresponding m_y^{max} demonstrates a bubble-like structure along the step (see inset iii). The interesting cases occur by changing the spin-orbit coupling and the magnitude of the magnetic component (see Fig.1(b)) [3, 4].

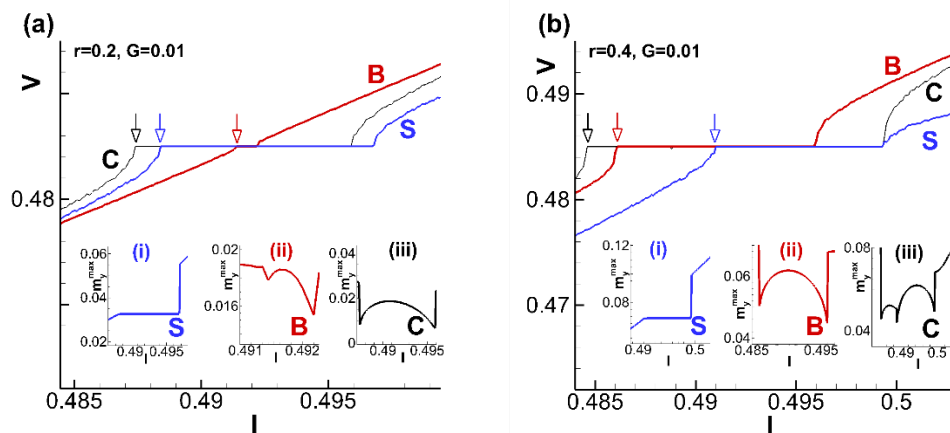


Fig. 1. (a) Shapiro (blue curve with amplitude of external radiation $A = 0,05$), Buzdin step (red curve with amplitude of magnetic component $h_R = 1$), and chimera step (black curve with $A = 0,05$, $h_R = 1$) at $r = 0,2$. (b) The same as in (a), but with $r = 0,4$ and $h_R = 1,7$

It is expected to discuss the physical phenomena in the Josephson junction-nanomagnet system, as well as in the system of coupled ϕ_0 Josephson junctions and chaotic features of Josephson structures with phase shift [5, 6].

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