LONGITUDINAL PLASMA WAVE NUCLEATION IN COUPLED SYSTEM OF JOSEPHSON JUNCTIONS

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The investigation of the charge dynamics allows us to predict new physical properties of the coupled system of Josephson junctions [1]. The system is described by capacitively coupled Josephson junctions model with the diffusion current [2,3]. In [1,4] a correlation between the charge dynamics on the S-layers and features of IV-characteristics (CVC) was established and we showed that the breakpoint on the outermost branch of CVC is related to the parametric resonance in this system. Experimental manifestation of the breakpoint and the breakpoint region [5] in CVC of $Bi_2Sr_2CaCu_2O_y$ stimulates new investigations in this field.

In this paper we study the nucleation of LPW in the coupled system of JJ and find the different stages in the process of development of the LPW. We explain the shape of the charge signal in time and present the data concerning the charge distribution along the stack and the results of fast Fourier transformation analysis at different values of bias current. The answer to the fundamental question concerning the correspondence between the breakpoint's position in CVC and the parametric resonance region in time dependence of the charge on the S-layers is found: the position of the breakpoint on the outermost branch of CVC is related to the region with sharp increase of the amplitude of charge oscillation in the superconducting layers. We demonstrate that the onset of the increase of the oscillation amplitude can be shifted by noise in the bias current and microwave radiation. These effects open a way to regulate the process of LPW nucleation in the stack of JJ.

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References

[1] Yu. M. Shukrinov, F. Mahfouzi, M. Suzuki, Phys.Rev.B, **78**, 134521 (2008)
[2] M. Machida, T. Koyama, A. Tanaka and M. Tachiki, Physica **C330**, 85 (2000)
[3] Yu. M. Shukrinov, F. Mahfouzi, P. Seidel. Physica **C449**, 62 (2006).
[4] Yu. M. Shukrinov, M. Hamdipour, M. R. Kolahchi. Phys. Rev. B, **80**, 014512 (2009)
[5] A. Irie, Yu. M. Shukrinov, G. Oya, Appl.Phys.Lett. **93**, 152510, (2008).