Wednesday, August 30, 2006

Session Title:	***Novel Devices - IV***
Session Chairs:	***Mark Blamire, University of Cambridge & Alexander Brinkman, University of Twente***
Paper Number:	***3EW03***
Start Time:	***5:00pm***
Session Type:	***Contributed Oral***

Complementary SQUIDs based on superconductor-ferromagnet pi-junctions.

V.V. Ryazanov, V.A. Oboznov, V.V. Bolginov, A.K. Feofanov, Institute of Solid State Physics, Russian Academy of Sciences; *V.P. Koshelets, P.N. Dmitriev,* Institute of Radio Engineering and Electronics, Russian Academy of Sciences

Novel superconducting weak links, a specific type of Josephson junctions, called `pi-junctions` were realized in the last decade. Recently [1] we fabricated and investigated in detail SFS pi-junctions (Nb-Cu/Ni-Nb) with high critical current density up to 1000 A/cm^2 that are suitable for possible applications as elements of digital and quantum logics [2-4]. These junctions are based on a classical niobium thin film technology so they can be incorporated directly into existing architectures of superconducting electronics. Due to sign-reversal spatial oscillations different signs of the order parameter can occur at the two banks of the SFS junction when the F-layer thickness is of the order of half a period. Our recent result [5] is detection both the transition to the pi-state and reverse one to the conventional 0-state, i.e. nonmonotonic behavior of the SFS junction critical currents vs. F-layer thickness with two nodes. The theoretical analysis reveals a very important role of the magnetic scattering and allows to describe this dependence in a very large interval (over 10^6). In the presented talk we report also about a successful realization of the complementary RSFQ-cell, i.e. a dc-SQUID frustrated by the pi-junction. It is a key experiment related to SFS pi-junctions insertion in a typical cell of Josephson electronics like a stationary phase inverter. 1. V.V. Ryazanov, V.A. Oboznov, A.S. Prokofiev, V.V. Bolginov, and A.K. Feofanov, J. Low Temp. Phys. 136, 385 (2004). 2. E. Terzioglu, and M.R. Beasley, IEEE Trans. On Appl.Supercond. 8 48 (1998). 3. A.V. Ustinov, V.K. Kaplunenko, Appl. Phys. 94, 5405 (2003). 4. G. Blatter, V.B. Geshkenbein, and L.B. Ioffe, Phys. Rev. B 63, 174511 (2001). 5. V.A. Oboznov, V.V. Bolginov, A.K. Feofanov, V.V. Ryazanov and A.I. Buzdin. ArXiv:cond-mat/0508573.

This work was supported by the Russian Foundation for Basic Research, Programs of Russian Academy of Sciences and CRDF project N 2691.