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Sin(2ϕ) component in the current-phase relation of SFS Josephson junctions near the 0-π transition[1] M.J.A. STOUTIMORE, Department of Physics, University of Illinois at Urbana-Champaign, A.YU. RUSANOV, V.A. OBOZNOV, V.V. BOLGINOV, A.N. ROSSOLENKO, V.V. RYAZANOV, Laboratory of Superconductivity, Institute of Solid State Physics, Russian Academy of Sciences, D.J. VAN HARLINGEN, Department of Physics, University of Illinois at Urbana-Champaign — We directly determined the Josephson current-phase relation (CPR) of superconductor-ferromagnet-superconductor (SFS) junctions by rf-SQUID interferometry, and corroborated it with measurements of the critical current as a function of temperature and magnetic field and rf-induced Shapiro steps in the current-voltage characteristics. Our Nb-$Cu_{47}Ni_{53}$-Nb trilayer junctions, with 2x2μm^2 area and 7nm CuNi thickness, show a transition with temperature from the usual Josephson 0-junction state to a π-junction state, defined by a phase difference of π in the ground state, at temperatures between 1.5K and 3.5K. Near the transition, we observe second harmonics in the CPR, deviations from the usual Fraunhofer diffraction pattern and half-integer Shapiro steps, all consistent with a sin(2ϕ) component in the CPR.

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