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Probing the Dynamics of Andreev States in Coherent Normal/Superconducting ring: Evidence for a noisy supercurrent BASTIEN DASSONNEVILLE, Laboratoire de Physique des Solides, F-91405 Orsay, FRA, FRANCESCA CHIODI, Institut d'Electronique Fondamentale, F-91405 Orsay, FRA, SOPHIE GUERON, MEYDI FERRIER, HELENE BOUCHIAT, Laboratoire de Physique des Solides, F-91405 Orsay, FRA — Most properties of a non superconducting (N) metal connected to two superconductors (an SNS junction) can be seen as resulting from the phase dependent Andreev states (AS) in N. Density of states in N is then drastically changed with the emergence of a small energy gap, the minigap. Whereas AS equilibrium properties are well understood, AS dynamics is a more complex issue [1]. We perform experiments on a phase (ϕ) biased NS ring coupled to a superconducting resonator. The modification of the resonances (f from 200 MHz up to 14 GHz) yields the complex phase dependent susceptibility $\partial_\phi I_{ring} = \chi(f,\phi) = \chi' + i\chi''$. As expected, we find a non-dissipative χ' related to the supercurrent flowing through the ring. A more striking finding [2] is the existence of a dissipative χ'' revealing a noisy supercurrent, predicted [3] but never observed before. Moreover, as f increases we show that the main dissipation mechanism changes from population relaxation to microwave-induced transitions across the minigap.

[1] F. Chiodi et al, Sci. Rep, 1 (2011)
[2] B. Dassonneville et al, in preparation
[3] A. Martin-Rodero et al, PRB, 53 (1996)

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