Dichotomic fluxoid quantization effects in a superconducting double network

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The magnetic-field dependence of the energy and vortex occupation is calculated for the recently realized superconducting double network consisting of two interlaced sub-networks of small and large loops [1].Numerical simulations, based on fluxoid quantization and energy minimization, show that while the vortex occupation of the large loops increases linearly with field, the occupation of the small loops grows in steps, resembling the behavior of an ensemble of decoupled loops. This decoupling is also reflected in the waveform of the energy versus applied field. A mean-field analysis which introduces decoupling between the small loops yields results in excellent agreement with the simulations. These findings demonstrate that the behavior of a single loop is reflected in the double network, constituting it as a favorable system for experimental study of quantization effects in superconducting nano-loops.

[1]I. Sochnikov et al., Nature Nano. **5**, 516 (2010); I. Sochnikov et al., PRB **82**, 094513 (2010)