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Φ_0 as a smallest unit of the intermediate state of a type-I superconductor: Revelation through nonlinear dynamics GOLIBJON BERDIYOROV, Departement Fysica, Universiteit Antwerpen, Groenenborgerlaan 171, B-2020 Antwerpen, Belgium, ALEXANDER HERNANDEZ-NIEVES, Centro Atomico Bariloche, 8400 San Carlos de Bariloche, Rio Negro, Argentina, FRANCOIS PEETERS, Departement Fysica, Universiteit Antwerpen, Groenenborgerlaan 171, B-2020 Antwerpen, Belgium, DANIEL DOMINGUEZ, Centro Atomico Bariloche, 8400 San Carlos de Bariloche, Rio Negro, Argentina, MILORAD MILOSEVIC, Departement Fysica, Universiteit Antwerpen, Groenenborgerlaan 171, B-2020 Antwerpen, Belgium — We study by time-dependent Ginzburg-Landau simulations the nonlinear dynamics of the intermediate state in a current-carrying type-I superconductor. The stray magnetic field of the current induces the intermediate state, where nucleation of flux domains is *discretized to a single fluxoid at a time*, while their final shape (tubular or laminar), size and nucleation rate depend on applied current and edge conditions. The current induces opposite flux domains on opposite sides of the sample, and subsequently drives them to annihilation – which is *also discretized*, as a sequence of vortex-antivortex pairs. Discretization of both nucleation and annihilation leave measurable traces in the voltage signal across the sample. These dynamic phenomena provide an unambiguous proof of a flux quantum being the smallest building block of the intermediate state in type-I superconductors.

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