Abstract Submitted
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Flux Quantization Without Cooper Pairs ALAN M. KADIN, Princeton Junction, NJ 08550 USA — It is universally accepted that the superconducting flux quantum h/2e requires the existence of a phase-coherent macroscopic wave function of Cooper pairs, each with charge 2e. On the contrary, we assert that flux quantization can be better understood in terms of single-electron quantum states, localized on the scale of the coherence length and organized into a real-space phase-antiphase structure [1]. This packing configuration is consistent with the Pauli exclusion principle for single-electron states, maintains long-range phase coherence, and is compatible with much of the BCS formalism. This also accounts for h/2e in the Josephson effect [2], without Cooper pairs. Experimental evidence for this alternative picture may be found in deviations from h/2e in loops and devices much smaller than the coherence length. A similar phase-antiphase structure may also account for superfluids, without the need for boson condensation.

[1] A.M. Kadin, "Superconductivity without Pairing?," http://arxiv.org/abs/0909.2901 (2009).
[2] A.M. Kadin, "Josephson Junctions Without Pairing?," http://arxiv.org/abs/1007.5340 (2010).

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