

## Mesoscopic cross-film cryotrons: Vortex trapping and dc-Josephson-like oscillations of the critical current

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In the 1950s Dudley Buck invented the cryotron, a revolutionary electronic device based on superconductors. Since the performance of cryotron device becomes greater as the size of the device is reduced, manufacturing thin-film cryotron integrated circuits was a primary focus for decades. Here, we will present experimental and theoretical investigation of the "quantum limit" of a cryotron device, i.e. when the dimensions become small enough to make evident the discrete character of Nature. Unlike the standard macroscopic cryotron devices, where the transport properties depend monotonically with the control wire current, here we report a highly non-monotonous dependence similar to the Fraunhofer pattern for conventional Josephson junctions<sup>1</sup>. This fascinating feature reopens new possibilities for the design of superconducting interferometer devices based on Superconductors/Electromagnet hybrid structures.

<sup>1</sup>A. Yu. Aladyshki *et al.* Phys. Rev. B **83**, 144509 (2011).