Research (What is it about?)	**Tunable trapping in the states of mesoscopic superconductors**
UNN authors	*Mel'nikov A.S.*
We find (The result)	The effect of magnetic switch between Meissner and vortex states of mesoscopic superconductor has been first demonstrated.
Abstract	The ***Meissner*** effect is the expulsion of a magnetic field from a superconductor. A superconductor with no magnetic field within it is said to be in the Meissner state. The Meissner state breaks down when the applied magnetic field is too large. Superconductors can be divided into two classes according to how this breakdown occurs. In Type I superconductors, superconductivity is abruptly destroyed, in Type II superconductors it leads to a ***vortex*** state in which magnetic flux penetrates the material, but there remains no resistance as long as there is a superconducting path between the vortexes. In sufficiently small (nano) samples of superconductors the quantum effects reveal as the wave functions of colliding electrons remain coherent. In that ***mesoscopis*** superconductors new possibilities of controlling the quantum state appear. We realize one of them namely tunable trapping and switch in the vortexless (Meissner) state and the states with controllable number of vortexes. The switch occurs under external magnetic field variation and follows the switch of volt-ampere characteristic so a possibility of one-electron transistor arises.

Representative articles 2016-2017, quartiles	1. *Taupin M., Khaymovich I. M., Meschke M., Mel'nikov A.S., Pekola J.P.* Tunable quasiparticle trapping in Meissner and vortex states of mesoscopic superconductors. Nature Commun. **7**:10977 (2016).	Q1
	Q-index (Qi) of the result	**4**

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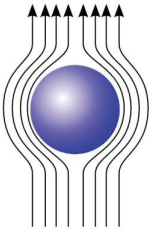
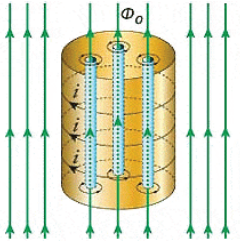
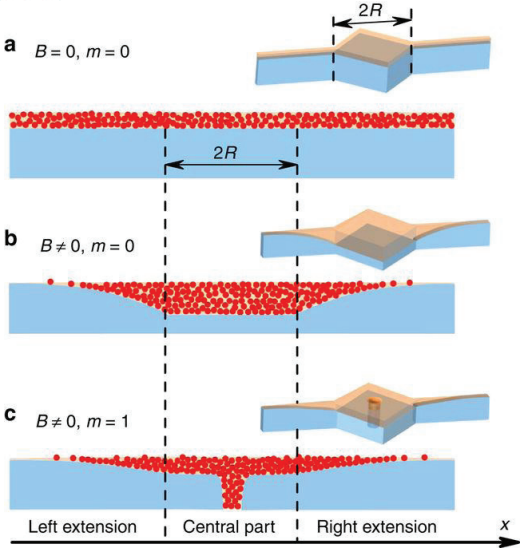


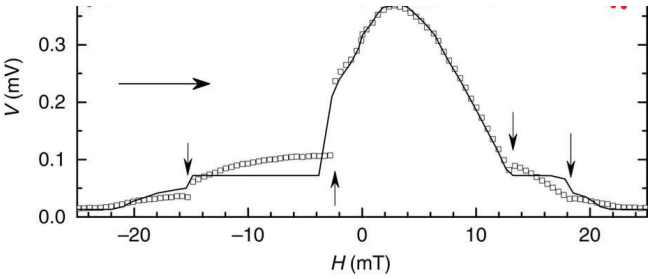


Type I and Type II superconductors interaction with external magnetic field: the Meissner state and vortex threads.

Quasiparticles (red circles) in mesoscopic structure: ***a*** – without magnetic field (***B***=*0*), ***b*** – Messner state in magnetic field (vortex number ***m***=0), ***c*** – vortex state (***m***=1).



Evolution of the voltage with the magnetic field.



The vertical arrows correspond to the applied field values at which the vorticity ***m*** increases step by step by one from 2 to 2 as the field is swept from -25 to 25 mT. The horizontal arrow shows the direction of the field sweep.