Universiteit
Leiden
The Netherlands

Size effects in microstructured superconductors and quantum materials

Fermin, R.

Citation
Fermin, R. (2022, December 7). *Size effects in microstructured superconductors and quantum materials*. *Casimir PhD Series*. Retrieved from https://hdl.handle.net/1887/3492762

Version:	Publisher's Version
License:	Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden
Downloaded from:	https://hdl.handle.net/1887/3492762

Note: To cite this publication please use the final published version (if applicable).

Propositions

accompanying the thesis

SIZE EFFECTS IN MICROSTRUCTURED SUPERCONDUCTORS AND QUANTUM MATERIALS

1. The periodicity of the magnetic interference pattern of a planar Josephson junction between thin films has two universal geometry-independent limits, determined by the surface area of its electrodes. (*Chapter 3 of this thesis*)

2. Besides magnetic non-colinearity and spin-orbit coupling, a vortex magnetization pattern can serve as the generator of superconducting long-range triplet correlations. (*Chapter 4 of this thesis*)

3. The bistability of magnetic textures can be employed to construct energy efficient non-volatile superconducting memory elements. (*Chapter 5 of this thesis*)

4. The reduction of the resistivity in current driven experiments on Ca_2RuO_4 cannot be explained by heating effects only. (*Chapter 6 of this thesis*)

5. Indisputable evidence of hydrodynamic charge flow in the strange metal state of the cuprate superconductors from transport experiments requires single micrometer-sized devices at best, which is experimentally near impossible. (*Jan Zaanen, SciPost Phys 6, 061 (2019)*)

6. The gradual increase of infrared response across the metal-insulator phase boundary, as measured by scanning near field optical microscopy, highlights the non-uniform current density distribution in current-driven experiments on Ca_2RuO_4. (*Zhang et al., Phys. Rev. X 9, 011032 (2019)*)

7. There are many inconsistencies between the different experimental works that try to determine the pairing symmetry of Sr_2RuO_4, therefore one or more are incorrect or ill-interpreted. (*Grinenko et al., Nat. Commun. 12, 3920 (2021)*)

8. When performed correctly, the focused ion beam structuring technique does not induce damages that limit transport experiments. (*Philip J.W. Moll, Annu. Rev. Condens. Matter Phys. 9, 147-162 (2018)*)

9. All scientific equipment that cannot be interfaced with a computer is impractical in modern physics research, and therefore should be discarded.

10. The Leiden PhD thesis should be restructured: the propositions should be abolished, the summaries should be incorporated in the introductory chapter, and an abstract should become obligatory.

Remko Fermin
Leiden, 11th August 2022