

Report on the main advances in the field on interface and monolayer superconductors, including the workshops and publications related to the WG1 of the Action.

This WG has taken part in the workshops:

Coherent superconducting hybrids and related materials, <https://nanocohybri.inc.uam.es/workshop-coherent-superconducting-hybrids-and-related-materials/>, 26-29 March 2018.

School on quantum materials and workshop on vortex behavior in unconventional superconductors, <https://nanocohybri.inc.uam.es/school-on-quantum-materials-and-workshop-on-vortex-behavior-in-unconventional-superconductors-7-12-october-2018/>, 7-12 October, 2018

Probing Coherent Superconducting Hybrids at the Nanoscale, <https://nanocohybri.inc.uam.es/probing-coherent-superconducting-hybrids-at-the-nanoscale-17-20-february-2019/>, 17-20 February 2019

International workshop on vortex matter 2019, <https://nanocohybri.inc.uam.es/international-workshop-on-vortex-matter-2019-antwerp-belgium-may-20-25/>, 20-25 May 2019.

The Action reports on the development of new ultrathin free-standing nanostructures, useful for radiation detection and with new vortex motion properties, on the fabrication of new nanostructures through controlled atom-migration, on studies of the properties of vortices and superconducting fluctuations in ultra-thin films and on new properties of junctions when combined with topological surface states.

Some of the instruments available within the Action that are related to this working group are described at <https://nanocohybri.inc.uam.es/vi-working-group-1/>.

We can highlight the following publications, often resulting from a collaborative arrangement sparked by the Action.

Microwave Radiation Detection with an Ultrathin Free-Standing Superconducting Niobium Nanohelix, <https://pubs.acs.org/doi/10.1021/acsnano.8b07280>.

Nano-SQUIDS with controllable weak links created via current-induced atom migration, <https://pubs.rsc.org/en/content/articlelanding/2018/NR/C8NR06433D#!divAbstract>.

Expansion of a superconducting vortex core into a diffusive metal. <https://www.nature.com/articles/s41467-018-04582-1>.

NanoSQUID Magnetometry on Individual As-grown and Annealed Co Nanowires at Variable Temperature. <https://pubs.acs.org/doi/10.1021/acs.nanolett.8b03329>.

4π -Periodic Supercurrent from Surface States in Cd₃As₂ Nanowire-Based Josephson Junctions. <https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.121.237701>.

Imaging quantum fluctuations near criticality. <https://www.nature.com/articles/s41567-018-0264-z>.

Zeeman-Effect-Induced $0-\pi$ Transitions in Ballistic Dirac Semimetal Josephson Junctions. <https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.123.026802>.

Some STSM or ITC grants made related to this WG:

Hybrid devices based on 1T-TaSe.

Stsm Beneficiary: Ms Maria D'antuono - Università degli Studi di Napoli (Italy) **Host:** Department of Complex Matter of the Jožef Stefan Institute (Slovenia)

Specific heat measurements on arrays of nanosuperconductors.

Stsm Beneficiary: Ms Judith Stein Bar Ilan University (Israel) **Host:** Institut Néel (France)

Superconducting properties of three-dimensional nano-objects.

Stsm Beneficiary: Dr Rosa Córdoba Instituto de Ciencia de Materiales de Aragón (ICMA) (Spain) **Host:** Radboud University Nijmegen; High Field Magnet Laboratory (The Netherlands)

Local flux-flow instability in superconducting films near T_c .

Stsm Beneficiary: Prof Valeriy Shklovskiy V. Karazin Kharkiv National University (Ukraine) **Host:** Goethe University (Germany)

Transport properties of topological superconductors hosting Majorana bound states.

Stsm Beneficiary: Prof Patrik Recher TU Braunschweig (Germany) **Host:** Departamento de Física Teórica de la Materia Condensada, Universidad Autónoma de Madrid (Spain)