

Report on the main advances in the field on vortex pinning, including the workshop and publications related to the WG3 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 studies of modifications of Josephson junction behavior by ferromagnetic exchange interaction, studies on the influence of exchange interaction on superconductivity, at macroscopic and atomic scales, coherent emission of radiation in nanofabricated films and in junctions involving magnetic systems or anomalous behavior produced by vortices in Josephson junctions and vortex motion in ultradense nanofabricated pinning arrays in cuprate superconductors.

Some of the instruments available within the Action related to this WG are described at <https://nanocohybri.inc.uam.es/vi-working-group-3/>.

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

Angular flux creep contributions in YBa₂Cu₃O_{7- δ} nanocomposites from electrical transport measurements. <https://www.nature.com/articles/s41598-018-24392-1>

Ultradense Tailored Vortex Pinning Arrays in Superconducting YBa₂Cu₃O_{7- δ} Thin Films Created by Focused He Ion Beam Irradiation for Fluxonics Applications. <https://pubs.acs.org/doi/10.1021/acsanm.9b01006>.

Controlled Generation of Quantized Vortex–Antivortex Pairs in a Superconducting Condensate. <https://pubs.acs.org/doi/10.1021/acs.nanolett.7b02180>.

Depairing Current at High Magnetic Fields in Vortex-Free High-Temperature Superconducting Nanowires. <https://pubs.acs.org/doi/10.1021/acs.nanolett.9b01693>.

Controlling supercurrents and their spatial distribution in ferromagnets. <https://www.nature.com/articles/s41467-017-02236-2>.

Disentangling vortex pinning landscape in chemical solution deposited superconducting YBa₂Cu₃O_{7-x} films and nanocomposites. <https://iopscience.iop.org/article/10.1088/1361-6668/aaa65e>.

Attractive interaction between superconducting vortices in tilted magnetic fields.

<https://www.nature.com/articles/s42005-019-0132-x>.

Some STSM or ITC grants made related to this WG:

Advanced design of superconducting nanocircuitry for nontrivial vortex transport.

Stsm Beneficiary: Pablo Orus - Universidad de Zaragoza/CSIC (Spain) **Host:** University of Antwerp (Belgium)

Characterization of reprogrammable vortex pinning templates by FMR spectroscopy.

Stsm Beneficiary: Oleksandr Dobrovolskiy - Goethe University (Germany) **Host:** IFIMUP-IN, Universidade do Porto (Portugal)

Microwave-stimulated superconductivity in the vortex state.

Stsm Beneficiary: Oleksandr Dobrovolskiy - Goethe University (Germany) **Host:** V. Karazin Kharkiv National University (Ukraine)

Local characterization of the vortex state in layered superconductors under tilted magnetic fields.

Stsm Beneficiary: Edwin Herrera Vasco - UAM (Spain) **Host:** Universidad Central (Colombia)

Scientific knowledge exchange regarding the construction and operation of a Scanning SQUID Microscope.

Stsm Beneficiary: Timo Ziegler - Universität Tübingen (Germany) **Host:** Swiss Nanoscience Institute (SNI) and Department of Physics, University of Basel (Switzerland)

Fabrication of regular topological defect structures with the Helium ion microscope.

Stsm Beneficiary: Bernd Aichner - Universität Wien (Austria) **Host:** Universität Tübingen (Germany)