



CURRICULUM VITAE (CVA)

IMPORTANT – The Curriculum Vitae cannot exceed 4 pages. Instructions to fill this document are available in the website.

Part A. PERSONAL INFORMATION

CV date

14/01/22

First name	Hermann
Family name	Suderow
Open Research and Contributor ID (ORCID)(*)	Orcid 0000-0002-5902-1880 Scopus 7003666360 WoS L-6612-2013 Google Scholar

(*) Mandatory

A.1. Current position

Position	Catedrático de Universidad	
Initial date	08-2019	
Institution	Universidad Autónoma de Madrid	
Departament/Center	Física de la Materia Condensada	
Country	Spain	
Key words	Low and very low temperature cryogenics (^3He - ^4He dilution refrigeration at millikelvin temperatures). Scanning Tunneling Microscopy, STM. Cryogenics and superconductivity.	

A.2. Previous positions (research activity interruptions, art. 45.2.c)

Period	Position/Institution/Country/Interruption cause
1998-2019	Marie Curie / Postdoc / Ramón y Cajal / Habilitación / Titular(2006)
1994-1998	PhD student and postdoc in Grenoble

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
Licenciatura	Universität Karlsruhe	1994
Doctorado	Université Joseph Fourier Grenoble	1997

Part B. CV SUMMARY (max. 5000 characters, including spaces)

I made my PhD in Grenoble (1997, supervisors J. Flouquet and J.P. Brison), where I performed thermal conductivity measurements in the superconducting phases of UPT_3 down to 15 mK. I discovered an increase of the density of states with the magnetic field, which has been widely used to study other superconductors as cuprates. In 1998, I started working at the low temperature laboratory of the Universidad Autónoma de Madrid (UAM) with a Marie Curie contract, supervised by S. Vieira, and I obtained a Ramón y Cajal tenure track position on 2000. In 2006 I tenured (prof titular), after winning

a habilitation contest and since 2019 I am full prof (catedrático) at UAM. I have pioneered scanning tunneling microscopy (STM) in ^3He - ^4He dilution refrigerators and set-up one of the few laboratories worldwide where several dilution refrigerator STMs are operated simultaneously.

During my work as a researcher, I have built or supervised the construction of numerous instruments, including operational STM electronics (8 units), superconducting persistent switch vectorial magnets (3 units), data acquisition and control units, cryogenic systems or STMs for very low temperatures. I have lead collaborations and partnerships with the private sector, including SME as well as large companies and numerous other small size collaborations. Recently, I have taken a keen interest in the zero-e project of Airbus and related industries. The project requires the establishment of a new wide-spread industrial use of liquid hydrogen at 20 K, presenting an enormous opportunity to apply low temperature physics.

Millikelvin STM provides neat images (free of thermal noise) of electronic correlations, disorder and the real space atomic structure. We have studied numerous superconducting materials, often obtaining results just a few weeks after the discovery of superconductivity. For example, in MgB_2 , our results provided the thread to establish the theory of two-band superconductivity. We contributed to understand superconductivity with spin and charge density waves, thanks to results in the nickel borocarbides, in ferromagnetic superconductors and in transition metal dichalcogenides. Recent work addresses vortex physics in iron based superconductors.

129 publications, more than 60 invited contributions to international meetings, 2 patents, 5 contracts with companies. 4 sexenios de investigación until 2017. 2446 total citations, 1870 without self-citations (3300 in [scholar](#)). 203 citations per year in the last 5 years (271 in scholar). 2 Nat Phys, 2 Nat Com, 9 PRL, 3 Comm Phys, 1 Nanolett, 4 PRR, 31 PRB, 1 PRA, 4 NJP, 4RSI, 1 Sci Rep, 3 Superc Sci Tec. 1 perspective in Science. H-index 29 (32 in scholar). 9 PhD thesis and participation in more than 20 PhD thesis juries. Chair of a [COST Action](#), PI of 12 projects (of these 2 ACI and 7 plan estatal), co-PI in 2 Marie Curie projects, organizer of major international conferences or summer schools. Co-organizer of [cmd2020gefes](#), [Vortex 2015](#), [Quantum materials school](#), [Superconductivity meets molecular spins](#), [N. Cabrera Summer School](#), [Low dimensional superconducting hybrids for novel quantum functionalities](#) and [Young investigators workshop on heavy fermion superconductivity](#). Program Committee in LT28 and in LT29. Co-organizer of [symposium "Topology in condensed matter physics"](#) in Berlin 2018 DPG-EPS meeting. [ICM 2015](#) Programme committee.

Physics committee of the Spanish research agency, "gestor" from 2015 to 2018. Director of the Nicolás Cabrera Institute from 2011 to 2020. Organization of prizes, student support activities (grants and video contests), colloquia and improvements in the organization of the Nicolás Cabrera Summer School. Materials and infrastructure coordinator of IFIMAC, scientific counselor of segainvex, member of commissions and panels (ANEP, COST, IIF, GEFES-RSEF). C5 commission of IUPAP. Fellow APS 2017.

Liquid helium dissemination experiments, see <https://www.youtube.com/watch?v=l9MYUdYgeXs>, <https://www.youtube.com/watch?v=sHkPFhyUrsE>. Co-organizer of open lab days for school visitors. Investigación y Ciencia, notiweb, 2Physics.com, US Society of Hispanic Professional Engineers. Dissemination in webpages, [lbtuam.es](#), [nicolascabrera.es](#), [nanocohybri.eu](#), <https://www.youtube.com/watch?v=zuiC41B7yHw>.

Part C. RELEVANT MERITS (sorted by typology)

C.1. Publications (see instructions)

Coherent coupling between vortex bound states and magnetic impurities in 2D layered superconductors. S. Park, V. Barrena, S. Mañas-Valero, J.J. Baldoví, A. Fente, E. Herrera, F. Mompeán, M. García-Hernández, A. Rubio, E. Coronado, I. Guillamón, A. Ley Yeyati, H. Suderow. [Nat Comm, 12 4688 \(2021\)](#). *Interaction between exchange coupling and vortex core states.*

One-dimensional moiré charge density wave in the hidden order state of URu₂Si₂ induced by fracture. E. Herrera, V. Barrena, I. Guillamon, J.A. Galvis, W. J. Herrera, J. Castilla, D. Aoki, J. Flouquet and H. Suderow. [Communications Physics, 4 98 \(2021\)](#). *Observation of moiré patterns caused by fracture in a strongly correlated electron system.*

Observation of a gel of quantum vortices in a superconductor at very low magnetic fields. J. Benito Llorens, L. Embon, A. Correa, J. González, E. Herrera, I. Guillamón, R. Luccas, J. Azpeitia, F. Mompeán, M. García-Hernández, C. Munuera, J. Aragón Sánchez, Y. Fasano, M. Milosevic, H. Suderow, Y. Anahory, [PRR 2 \(1\), 013329 \(2020\)](#). 8 citations (scholar 11). *Distinct behaviour of vortex lattices at very low magnetic fields, including multifractal arrangements and voids.*

Tilted vortex cores and superconducting gap anisotropy in 2H-NbSe₂. J.A. Galvis, E. Herrera, Ch. Berthod, I. Guillamón and H. Suderow. [Comm. Phys., 1, 30 \(2018\)](#). 12 citations ISI, 14 scholar. *Determination of the origin of striped vortex cores in tilted magnetic fields. Made using a three axis magnet built at UAM for scanning probe microscopy, further work using the same device is [PRB 96, 184502](#).*

Attractive interaction between superconducting vortices in tilted magnetic fields. A. Correa, F. Mompeán, I. Guillamón, E. Herrera, M. García-Hernández, T. Yamamoto, T. Kashigawi, K. Kadowaki, A.I. Buzdin, H. Suderow and C. Munuera, [Comm. Phys. 2, 31 \(2019\)](#). 2 citations ISI, 5 citations (scholar). *Interplay between Josephson and Abrikosov vortices.*

Methods to simply cooling of liquid Helium cryostats. R. Álvarez Montoya, S. Delgado, J. Castilla, J. Navarrete, N. Díaz, J.R. Marijuan, V. Barrena, I. Guillamón and H. Suderow, [Hardware X 5, e00058 \(2019\)](#). 5 citations (5 scholar). *Development of new and simplified cooling methods.*

Strong enhancement of superconductivity at high pressures within the charge-density-wave states of 2H-TaS₂ and 2H-TaSe₂. DC Freitas, Pierre Rodière, MR Osorio, Efrén Navarro-Moratalla, NM Nemes, VG Tissen, L Cario, E Coronado, M García-Hernández, S Vieira, M Núñez-Regueiro, H Suderow, [PRB 93, 184512 \(2016\)](#). 69 citations ISI, 76 scholar. *Enhancement of T_c in transition metal dichalcogenides.*

Enhancement of long range correlations in a 2D vortex lattice by incommensurate 1D disorder potential. I. Guillamon, R. Cordoba, J. Sesé, J.M. De Teresa, M.R. Ibarra, S. Vieira and H. Suderow, [Nat. Phys. 10, 851 \(2014\)](#). 57 citations ISI, 79 scholar. *Order-disorder transition in a 2D vortex lattice.*

Imaging superconducting vortex cores and lattices with a scanning tunneling microscope. Suderow, I. Guillamon, J.G. Rodrigo and S. Vieira [Superconductor Science and Technology, 27, 063001 \(2014\)](#). 57 in ISI, 81 in scholar. *Review article on imaging of vortex lattices.*

Magnetic field-induced dissipation-free state in superconducting nanostructures. R. Córdoba, T.I. Baturina, J. Sesé, Yu. Mironov, J.M. De Teresa, M.R. Ibarra, D.A. Nasimov, A.K. Gutakovskii, A.V. Latishev, I. Guillamón, H. Suderow, S. Vieira, M.R. Baklanov, J.J. Palacios and V.M. Vinokur [Nat. Comm., 4, 1437 \(2013\)](#). 73 citations ISI, 109 scholar. *Highlighted in basic Energy Sciences DOE report 2013.*

Compact very low temperature scanning tunneling microscope with mechanically driven horizontal linear positioning stage. H. Suderow, I. Guillamón and S. Vieira, [Rev. Sci. Inst., 82, 033711 \(2011\)](#), 54 citations scholar. *Sliding sample holder to manipulate sample and tip in-situ at cryogenic temperatures.*

C.2. Congress

Invited talks in meetings (selection)

- Microscience online Microscopy Congress. July 2021. *AC Josephson scanning tunneling microscopy.*
- WE Heraeus – Les Houches school on Fermi surface and novel phases in strongly correlated electrons systems. October 2019. *Real space imaging of electronic correlations.*
- International Conference on Materials and Mechanisms of Superconductivity and of High Temperature Superconductors. Beijing. August 2018. *Scanning probe microscopy of vortices in tilted magnetic fields.*

- March meeting. Nueva Orleans. March 2017. *Visualizing the vortex lattice in two-effective-band, stoichiometric high T_c CaKFe₄As₄ superconductor.*
- 3rd Toyota Riken International Workshop on vortex matter. Nagoya. May 2016. *Vortex core size from very low temperature scanning tunneling microscopy in one and two gap superconductors.*
- Moscow, Russia. Landau Institute. International workshop on localization, interactions and superconductivity. June 2015. *Scanning tunneling spectroscopy of two-dimensional superconductors at very low temperatures.*
- Semi plenary International Conference on Low Temperature Physics (LT27, Buenos Aires 2014), *Scanning tunneling microscopy and spectroscopy in superconductors at very low temperatures.*
- Invited seminars in institutes “Van der Waals-Zeeman Colloquium”, Antwerp (2011), Max-Planck Stuttgart (2011), Ames Laboratory (2012, 2017), Uni Karlsruhe, Uni Bath (online, 2020, 2021).

C.3. Research projects

- January 2021-December 2023. *New superconductors for quantum technologies: visualizing and manipulating triplet correlations.* PID2020-114071RB-I00. 314 600 € (costes directos). Co-PIs: I. Guillamón, H. Suderow.
- 2022-2023. *Microscopías de barrido a bajas temperaturas en campos magnéticos vectoriales.* 103 500 €. PDC2021-121086-I00. Co-PI: I. Guillamón and H. Suderow.
- Until end of 2022. *Planta de licuefacción de Helio para la ciencia y tecnología cerca del cero absoluto.* 1 183 000 €. EQC2021-007277-P. PI: H. Suderow. University infrastructure.
- January 2018-December 2020. *Integrating devices in the nanoscale microscopy to visualize quantum materials under control.* 272 000 € (costes directos). Co-PIs: I. Guillamón, H. Suderow.
- Comunidad de Madrid. *Soluciones del Nanomagnetismo a los Retos Sociales.* Ref: S2018/NMT-4321, NANOMAGCOST. 1M€. <http://nanomagcost-cm.es/>. PI: R. Miranda. PI of the low temperature group: H. Suderow.
- COST program (2017-2022). *Nanoscale coherent hybrid devices for superconducting quantum technologies.* <http://nanocohybri.eu/>. Approximately 130 000 €/year. Chair: H. Suderow. Over 100 participants from 27 countries.
- Internal project of the María de Maeztu program “Instituto de Física de la Materia Condensada” (<https://www.ifimac.uam.es/>, MDM-2014-0377 and CEX2018-000805-M). *Visualizing, understanding and controlling Andreev bound states down to atomic scale.* 160 000 € (costes directos). PI H. Suderow and A.L. Yeyati.
- Plan Estatal I+D+i (2015-2017). *Superconductividad bidimensional, nuevos fenómenos para nuevas aplicaciones.* FIS2014-54498-R. 130 000 € (costes directos). PI H. Suderow.

C.4. Contracts, technological or transfer merits

- “Ensayos de permeabilidad de materiales para la fabricación de depósitos criogénicos”, with FIDAMC, “Cryogenic test methods for of composite materials”, with AIRBUS, “He4SCool Heat Switch for Cooling Applications”, with LIDAX space engineering. In total >100k€ in ongoing (2021-22) industrial collaboration projects, PI H. Suderow.
- Past collaborations in cryogenic projects with EasyLab, Oxford and EADS-CASA.
- Dispositivo posicionador para microscopios operable en entornos criogénicos, número de publicación ES2396331B1. H. Suderow, I. Guillamón, A. Buendía, M. Pazos and S. Vieira. Procedure and thermometer to measure low temperatures. ES2380989B1. H. Suderow, S. Vieira and A. Maldonado.