SCIENTIFIC/TECHNICAL RECORD DURING THE LAST FIVE YEARS OF THE RESEARCH TEAM

1. LIST OF PEOPLE WHO MAKE UP THE RESEARCH TEAM.

The Group of Nanomagnetism and Magnetization Processes (GNMP) belongs to the *Instituto de Ciencia de Materiales de Madrid* (ICMM) at National Scientific Research Council in Spain (CSIC). The group is composed of 15 members:

Principal Investigators
Dr. Agustina Asenjo: Senior Scientist
Dr. Oksana Chubykalo-Fesenko: Senior Scientist
Dr. Rafael Perez del Real: Scientist.
Dr. David Navas Otero: Scientist.
Dr. Unai Atxitia Macizo: Ramon y Cajal Fellow.
Prof. Manuel Vazquez, emeritus research professor.

Postdoctoral Fellow
Dr. Eider Berganza: Juan de la Cierva incorporación.
Dr. Elias Saugar. Ascribed to project
Dr. Alejandro Jiménez. Ascribed to project

Graduate Students
Cantia Beloso. FPU grant (supervisor A. Asenjo).
Jorge Marques. FPU grant (supervisor A. Asenjo).
Joao Fradet. FPI grant (supervisor O. Chubykalo-Fesenko and A. Asenjo).
Theo Griepe. Ascribed to project (supervisor U. Atxitia)
Paul Gavriloaea. ITN-Marie Curie (supervisor O. Chubykalo-Fesenko).
Zengxin Wei. Ascribed to project (supervisor D. Navas and M. Vazquez).

2. SCIENTIFIC-TECHNICAL ACHIEVEMENTS AND CONTRIBUTIONS TO SOCIETY.

The **Group of Nanomagnetism and Magnetization Processes** (GNMP) is a highly productive research team of the *Instituto de Ciencia de Materiales de Madrid* (ICMM) from the *Consejo Superior de Investigaciones Científicas* (CSIC). Our group has obtained the **maximum calification (A-Excellent)** in the last internal evaluation of all the CSIC groups. The evaluators highlight the good Spanish and International funding as well as the funding obtained from technological companies. It is also remarked the scientific and technological activity together with a high-level scientific training of PhD students. The GNMP is composed of two intertwined research teams, experimental and computational.

Experimental magnetism team
Besides nanofabrication, GNMP research efforts are focused on magnetic domain observation, magnetization reversal process (i.e., controlled domain wall motion), magneto-transport properties and thermomagnetic effects, with particular emphasis on the study of this phenomena through magnetic imaging via Magnetic Force Microscopy and the development of novel measurement modes. The group members are, as well, frequent users of the CIRCE and MISTRAL beamline in ALBA synchrotron, where they perform X-ray magnetic circular dichroism photoemission electron microscopy (XMCD-PEEM) and Transmission X-ray

Microscopy. Regarding facilities, besides all the available experimental techniques provided by the ICMM as well as those facilities at the Cantoblanco Campus of Excellence, the GNMP group owns a number of specialised laboratories and measurement techniques of its own, additionally to other available techniques in the Institute and the Campus:

-Sample preparation: Anodization & electrodeposition laboratory; Magnetron sputtering and evaporation growth laboratory; ultrafast solidification laboratory.

-Magnetic characterization: Magnetometry & magnetotransport laboratory (Vibration Sample Magnetometry (VSM), Anisotropic Magnetic Resistance (AMR), Giant Magnetic Impedance (GMI), Anomalous Nernst Effect (ANE) & Ferromagnetic Resonance measurements); Scanning probe microscopy & surface magnetism laboratory (Variable Field Magnetic Force Microscopy (VF-MFM), Magneto-optic Kerr effect magnetometry).

-Technical magnetism laboratory: Fluxmetric induction technique, switching field fluctuations measurement. Time-resolved domain wall speed.

-High-frequency magnetisation dynamics

Facilities at the ICMM-CSIC: The material science institute has some support laboratories where different characterization techniques are available for the researchers, as well as a clean room, workshop, informatics service, etc. https://www.icmm.csic.es/institute/techniques-equipment.php and https://www.icmm.csic.es/institute/support_labs/index.php. Additional facilities are available on the UAM-CSIC Campus, such as the micro and nanofabrication NanoFabLab from IMDEA Nanociencia.

Theory and computational magnetism team

The research of the computation and theory team (two principal investigators, a postdoc and three PhD students) is devoted to identify and address the challenges arising in the context of femtomagnetism – understanding magnetisation textures (domain walls, skyrmions etc.) in nanostructures and spin dynamics - from a theoretical and computational modeling point of view. This task includes the design and development of new computational techniques and algorithms aimed at finding novel phenomena related to magnetism for faster communication and storage of digital information. Methods include atomistic, micromagnetic and multiscale models to investigate ultrafast all-optical switching, antiferromagnetic spintronics, magnetic hyperthermia, two-dimensional magnets or relativistic kinematics of magnetic solitons. Applications include heat-assisted magnetic recording, all-optical magnetisation switching and biological applications, related to dissipated heat during **hyperthermia cancer treatment.** Our team is nowadays a reference in the field of computational magnetism for magnetisation dynamics with temperature and spintronics applications.

Scientific-technical achievements

The GNMP factual multidisciplinary approach has enabled it to participate in different national (Consolider, generación del conocimiento, etc) and international research (EU-ITN program) projects over the last five years. The group has also an Industrial Project with companies like ARKEMA QUIMICA and RIMSA METAL TECHNOLOGY and the group carries out Technology Transfer Projects with the spintronics group at Hitachi-Cambridge Lab.

The group team has led to the publication of reviews on the field of spintronics, nanomagnetism and magnetic imaging and has participated in more than 30 invited talks in national and international conferences. The group has organized two international conferences, Intermag 2008 and JEMS 2023. Prof. Manuel Vazquez has been selected as Distinguished Lecturer of the IEEE magnetic society for 2023.

The Scientific Results of Group of Nanomagnetism and Magnetization Processes during the last 5 years can be summarized in:

- 140 papers published in journals included in JCR in this period with more than 1500 citations, the H index=17.

- 97 papers are Open Access
- 1 book has been published by M. Vázquez as Editor and with the participation of different members of the group in four Chapters.
- We have published 4 patents (one of them was exploited by a company in 2018)
- We have presented around 80 contributions to international congress, 30 of them as invited talks.

Books

"Magnetic Nano and Microwires" M. Vazquez ed., Elsevier, Cambridge, 2020 Second edition, ISBN: 978-0-08-102832-2

Selected 20 out of 140 publications in the last five years:

1. **C. Bran**, **J.A. Fdez Roldan**, J. Moreno, A. Fraile Rodriguez, **R. P. del Real**, **A. Asenjo**, **E. Saugar**, **J. Marqués-Marchán**, H. Mohammed, M. Foerster, L. Aballe, J. Kosel, **M. Vazquez** and **O. Chubykalo-Fesenko**, *Domain Wall Propagation and Pinning Induced by Current Pulses in Cylindrical Modulated Nanowires,* Nanoscale,15, 8387-8394, (2023)
2. A. Ruiz-Clavijo, O. Caballero-Calero, **D. Navas,** A. A. Ordoñez-Cencerrado, R. Sanz and M. Martín-González. *Unveiling the complex magnetization reversal process in 3D Nickel Nanowire Networks*, Advanced Electronic Materials, 2200342 (2022).
3. **Lopez-Polin, G**., Aramberri, H., **Marques-Marchan, J**., Weintrub, B., I., Bolotin, K. I., Cerdá, J.I., **Asenjo, A**. *High-Power-Density Energy-Harvesting Devices Based on the Anomalous Nernst Effect of Co/Pt Magnetic Multilayers*. ACS Applied Energy Materials 5(9), pp. 11835-11843 (2022)
4. **E. Berganza**, **J. A. Fernández Roldán**, M. Jaafar, **A. Asenjo**, K. Gusliyenko, **O. Chubykalo-Fesenko**. *3D quasi-skyrmions in thick cylindrical and dome-shape soft nanodots*. Scientific Reports 12 (2022)
5. **J. A. Fernandez-Roldán**, **C. Bran**, **A. Asenjo**, **M. Vázquez,** A. Sorrentino, S. Ferrer, **O. Chubykalo-Fesenko**, **R. Perez del Real**. *Spatial magnetic imaging of non-axially symmetric vortex domains in cylindrical nanowire by transmission X-ray microscopy*. Nanoscale 14 (2022) 13661
6. **J. A. Fernandez-Roldán,** and **O. Chubykalo-Fesenko**. *Dynamics of chiral domain walls under applied current in cylindrical magnetic nanowires*. APL Materials 19 (2022) 111101
7. R. Puttock, C. Barton, **E. Saugar**, P. Klapetek, A. Fernández-Scarioni, P. Freitas, H. W Schumacher, T. Ostler, **O. Chubykalo-Fesenko**, O. Kazakova. *Local thermoelectric response from a single Néel domain wall*. Science Advances 8 (2022) eadc9798
8. **C. Bran, E. Saugar, J. A. Fernandez-Roldan, R. P. Del Real, A. Asenjo**, L. Aballe, M. Foerster, A F. Rodriguez, E. M. Palmero, **M. Vazquez, O. Chubykalo-Fesenko**. *Stochastic vs. deterministic magnetic coding in designed cylindrical nanowires for 3D magnetic networks.* Nanoscale 13 (2021) 12587.
9. H. Gavilan, K. Simeonidis, E. Myrovali, E. Mazario, **O. Chubykalo-Fesenko**, R. Chantrell, L. Balcells, M. Angelakeris, M. P. Morales, D. Serantes. How size, shape and assembly of magnetic nanoparticles give rise to different hyperthermia scenarios. Nanoscale 13 (2021) 15631.
10. Vedmedenko, E.Y., Kawakami, R.K., Sheka, D.D., Gambardella, P., Kirilyuk, A., Hirohata, A., Binek, C. **Chubykalo-Fesenko**, O., Sanvito, S., Kirby, B.J. *The 2020 magnetism roadmap*. Journal of Physics D: Applied Physics, 2020, 53(45), 453001.
11. Dieny, B., Prejbeanu, I.L., Garello, K., Chubykalo-Fesenko, O., Bortolotti, P. Gambardella, P., Freitas,P, Lehndorff, R.,Raberg, W.,Ebels, U., Demokritov, S. O., Akerman, J., Deac, A., Pirro, P., Adelmann, C., Anane, A., Chumak, A. V., Hirohata, A., Mangin S., Valenzuela, S. O., Cengiz Onbaşlı, M., d'Aquino, M., Prenat, G., Finocchio, G.,Lopez-Diaz, L., Chantrell, R., **Chubykalo-Fesenko, O**., Bortolotti, P. *Opportunities and challenges for spintronics in the microelectronics industry*. Nature Electronics, 2020, 3(8), pp. 446–459.
12. **Bran, C., Fernandez-Roldan, J. A., Del Real, R. P**., **Asenjo, A**., Chen Y.S., Zhang, J., Zhang, X., Fraile-Rodríguez, A., Foerster, M., Aballe, L., **Chubykalo-Fesenko, O., Vazquez, M.** *Unveiling the origin of multidomain structures in compositionally modulated cylindrical magnetic nanowires*. ACS Nano, 2020, 14(10), pp. 12819–12827
13. **Berganza, E**., Jaafar, M., **Fernandez-Roldan, J. A., Chubykalo-Fesenko, O., Asenjo, A**. *Half-hedgehog spin textures in sub-100 nm soft magnetic nanodots*. Nanoscale, 2020, 12(36), pp. 18646–18653.

14. **Jaafar, M**., Pablo-Navarro, J., **Berganza, E**., Ares, P., Magén, C., Masseboeuf, A., Gatel, C., Snoeck, E., Gómez-Herrero, J., de Teresa, J.M., **Asenjo, A**. *Customized MFM probes based on magnetic nanorods*. Nanoscale, 2020, 12(18), pp. 10090–1009.
15. Peixoto L., Magalhães R., **Navas D**., Moraes S., Redondo C., Morales R., Araújo J.P., Sousa C. T., *Magnetic nanostructures for emerging biomedical applications*. Applied Physics Reviews (2020) 7, 10.1063/1.5121702
16. Carvalho, E.O., Fernandes, M. M., Padrao, J., Nicolau, A., **Marqués-Marchán, J., Asenjo, A**., M. Gama, F., Ribeiro, C., Lanceros-Mendez, S. *Tailoring Bacteria Response by Piezoelectric Stimulation*. ACS Applied Materials and Interfaces, 2019, 11(30), pp. 27297–27305.
17. O. Kazakova, R. Puttock, C. Barton, H. Corte-León, **M. Jaafar**, V. Neu, and **A. Asenjo**, *Frontiers of magnetic force microscopy,* J. Appl. Phys. 125, 060901 (2019);
18. **Fernandez- Roldan, J. A**., Serantes, D., **P. del Real, R**., **Vázquez, M**., **Chubykalo-Fesenko, O**. *Micromagnetic evaluation of the dissipated heat in cylindrical magnetic nanowires*. Applied Physics Letters 2018, 112, 212402.
19. **C. Bran, E. Berganza, J.A. Fernandez-Roldan**, **E.M. Palmero**, J. Meier, **E. Calle**, M. Jaafar, M. Foerster, L. Aballe, A. Fraile Rodriguez, **R.P. del Real**, **A. Asenjo, O. Chubykalo-Fesenko and M. Vazquez**. *Magnetization Ratchet in Cylindrical Nanowires.* ACS Nano 12 (2018) 5932−5939
20. **Fernández-Roldán J. Á., del Real R. P., Bran C., Vazquez M. and Chubykalo-Fesenko O**. *Magnetization pinning in modulated nanowires: from topological protection to the "corkscrew" mechanism*. Nanoscale, 2018, 10, 5923-5927.

3. National and International RESEARCH PROJECTS in the last five years.

1. **Title:** *"Thermomagnetic Materials with Perpendicular Magnetic Anisotropy"*.. **Generación de Conocimiento**: PID2022-138169OB-I00. **PIs:** Agustina Asenjo and David Navas. ICMM-CSIC. Oct. 2023 – Sept. 2027. **Funding: 275.000 €.**

2. **Title:** *"Curvature-driven effects in 2D and 3D magnetic nanostructures (CEMANA)".* **Generación de Conocimiento**: PID2022-137567NB-C21. **PIs:** Oksana Fesenko and Rafael P. del Real. ICMM-CSIC. Oct. 2023 – Sept. 2026. **Funding: 250.000 €.**

3. **Title:** *"Advanced functional nanomaterials for precise cancer diagnosis".* **Colaboracion Internacional 2023 M-ERA.NET 3 cofund 2022**: PCI2023-143411. **PIs:** David Navas and Oksana Fesenko. ICMM-CSIC. Oct. 2023 – Sept. 2026. **Funding: 74.000 €.**

4. **Title:** *"Reconfigurable bi-component magnonic crystals for low-energy-consuming devices".* **Consolidación Investigadora 2022**: CNS2022-135949. **PIs:** David Navas. ICMM-CSIC. Jul. 2023 – Jun. 2025. **Funding: 140.000 €.**

5. **Title:** "*Smart metal air scavengers: extending lifetime in autonomous powered systems*" **Proyectos en Líneas Estratégicas**. PLEC2022-009203 **PI**: Rafael Pérez del Real. Nov. 2022-Nov 2025. **Funding**: 109.200 €

6. **Title:** *"Multi-scale models for ultrafast spintronics applications in 2D materials".* **CSIC Atracción de Talento***:* PIE-20226AT018. **PI:** Unai Atxitia. Sept. 2022- Aug. 2025. **Funding: 150.000 €.**

7. **Title:** *"Multiscale models for tuning complex magnetic orders in spin-orbitronic devices".* **Generación de Conocimiento**: PID2021-122980OB-C55. **PIs**: Unai Atxitia and Silvia Gallego. Sept. 2022 – Aug. 2025. **Funding: 169.700 €.**

8. **Title:** *"Advanced simulation tools for the design of nanostructured bonded magnets".* **Transición Ecológica y Digital**: TED2021-130957B-C53. **PIs**: Unai Atxitia and Silvia Gallego. Dic 2022 – Nov 2024. **Funding: 110.00 €.**

9. **Title:** "*Study of 3D magnetism in cylindrical geometry for emerging energy-saving technologies current-induced and high-frequency dynamics*". **MINECO:** PID2019-108075RB-C31. **PIs:** Oksana Fesenko and Agustina Asenjo. June 2019 – May 2022. **Funding: 223.850 €.**

10. **Title:** "*Dynamical properties of nanostructured ferromagnetic and magneto-plasmonic materials*". **Ministerio de Ciencia Innovacion y Universidades:** RYC-2017-22820. **PI:** David Navas. June 2019 – May 2024. **Funding: 40.000 €.**

3. National and International RESEARCH PROJECTS in the last five years.

11. **Title:** "*Dimensionality effects in the physical properties of Heusler and magnetostrictive intermetallic materials: From 1- to 3-D architectures*". **PTDC**: FIS-MAC/31302/2017**: PI:** David Navas. July 2018 – June 2021. **Funding: 221.432 €.**
12. **Title:** "*Isolated attosecond pulses on a tabletop: measuring and controlling extreme ultrafast dynamics in matter*". **PTDC**: FIS-OTI/32213/2017**: PI:** Helder Crespo and David Navas. July 2018 – June 2021. **Funding: 239.347 €.**
13. **Title:** "*New low-cost approach for solar-cells based on magnetoplasmonic nanostructures*". **FCT and MIT Portugal**: MIT-EXPL/IRA/0012/2017**: PI:** David Navas. Sept. 2018 – Aug. 2019. **Funding: 99.725 €.**
14. **Title:** *"Multiscale modeling of ultrafast spin dynamics".* Deutsche ForschungsGemeinschaft (DFG): TRR 227 - 328545488 Project A08. **PI:** Unai Atxitia. Freie Universitaet Berlin. Jan. 2018 – Dec. 2021. **Funding: 250.000 €.**
15. **Title:** *"Solutions from Nanomagnetism to the Society Challenges (NANOMAGCOST)".* **CAM:** P2018/NMT-4321. **PIs**: Rodolfo Miranda / Manuel Vazquez and Agustina Asenjo. Jan. 2019 – April 2023. **Funding: 1.064.800€ / 25.000€ ICMM.**
16. **Title:** *"Spanish Network on Spintronics".* **MINECO**: MAT2017-90771-REDT. **PIs:** F. Bartolomé/IP nodo campus UAM: Oksana Fesenko. Jan 2018 – Dec 2020. **Funding: 25.000 €.**

4. DOCTORAL AND POST-DOCTORAL TRAINING CAPACITY OF THE RESEARCH GROUP.

The members of the Research Group have a large experience in the training of scientific personnel:

- The scientific staff participate in different summer schools, Masters offered by prestigious Universities and in the postgraduate course of the ICMM-CSIC "*Fronteras en Ciencia de Materiales*" https://wp.icmm.csic.es/fronteras/cursos-fronteras-en-ciencia-de-materiales/.
- GNMP regularly participates in outreach activities (R. P del Real belongs to the Outreach Committee and U. Atxitia belongs to Seminars and Training Committee, both of the ICMM-CSIC) as Guided Visits to the ICMM, *Feria de la Ciencia*, *Festival de Nanotecnología*, *La Noche de los Investigadores. etc.* A. Asenjo participates regularly in different outreach activities as the coordination of the Contest "Nanocientíficas en 60 segundos"

Current PhD students under supervision:

1. **Zengxin Wei**, "*Dynamical magnetic properties of hybrid materials*", Doctoral program "Física de la Materia Condensada, Nanociencia y Biofísica", to be defended in May 2024. Supervisors: Manuel Vazquez/David Navas
2. **Jorge Marqués Marchán** FPU-PhD."*Magnetic nanomaterials for biomedicine*", Doctoral program "Física de la Materia Condensada,UAM Nanociencia y Biofísica" to be defended in 2023. Supervisor: Agustina Asenjo
3. **Joao Filipe Pinto de Queiros Fradet**, FPI "*Exploring 3D nanomagnetism in cylindrical geometry for emerging energy-efficient technologies*". Doctoral program "Física de la Materia Condensada, Nanociencia y Biofísica" UAM. to be defended in 2025. Supervisors: Agustina Asenjo, Oksana Fesenko
4. **Cantia Belloso**, FPU-PhD "Nanoelementos magnéticos para tecnologías emergentes en aprovechamiento energético". Doctoral program "Física de la Materia Condensada, Nanociencia y Biofísica" UAM, to be defended in 2026. Supervisors: Agustina Asenjo/Guillermo López-Polín.

4. DOCTORAL AND POST-DOCTORAL TRAINING CAPACITY OF THE RESEARCH GROUP.

5. **Paul Gavriloaea**, PhD within EU-Training Network "Modelling of ultrafast magnetisaiton *dynamics*"
   Doctoral program "Física de la Materia Condensada,UAM Nanociencia y Biofísica", to be defended in 2025. Supervisor: Oksana Fesenko
6. **Theodor Fridolin Griepe**, PhD student "Ultrafast spin dynamics in 2D van der Waals magnets",
   Doctoral program "Física de la Materia Condensada,UAM Nanociencia y Biofísica" to be defended in 2026. Supervisor: Unai Atxitia

PhD thesis supervised in the last 5 years:

1. **Elias Saugar Gotor**, "*Modellization of magnetic textures in thermal gradients*", UAM May 2023, Supervisor: Oksana Fesenko. Currently contracted as postdoc in ICMM-CSIC
2. **Esther Calle**, "*Study and control of the Domain Wall dynamics in magnetic microwires*". UAM 2017- April 2021, Supervisor: Rafael Pérez del Real. She published 3 articles and a book chapter. Currently in Technological company InProtect, Madrid.
3. **Pablo Olleros Rodriguez**, "*Skyrmion Stabilization and Non-Equilibrium Nucleation Routes in Ultrathin Cobalt-Based Magnetic Trilayers*". IMDEA/ICMM/UAM 2021, cum laude, Supervisors Oksana Fesenko/P.Perna, He published 6 articles. Currently contracted as postdoc in IMDEA Nanoscience, Madrid.
4. **Ana Sofia Silva**, "*Ultrafast magnetization dynamics of ferromagnetic nanostructures in sub-10- fs regime*", USAL (2020); Supervisors: David Navas/Helder Crespo, she published 3 articles (2 Q1) and she has 2 articles in preparation. Currently Pos-doc at Institute of Physics for Advanced Materials, Nanotechnology and Photonics (IFIMUP) of the University of Porto (Portugal).
5. **Nikita Kulesh**, "*Continuous and nanopatterned TbCo based heterostructures with in-plane and perpendicular anisotropy*" UAM 2015- June 2020. Supervisors: M. Vazquez and V. Vaskovskii. Professor at Ural Federal University, Russia.
6. **José Ángel Fernández-Roldán**, "*Micromagnetism of cylindrical nanowires with compositional and geometric modulations*", UAM 2015- June 2019. Supervisors: Oksana Fesenko and Rafael Pérez del Real. He published 9 articles (7 in Q1). Postdoctoral Fellow at Helmholtz-Zentrum, Dresden (Humboldt Fellowship).
7. **Eider Berganza Eguiarte**, "*A Study of Complex Magnetic Configurations using Magnetic Force Microscopy*", UAM 2004-2018. She received the Cum Laude distinction. Supervisors: Agustina Asenjo/ Miriam Jaafar. She published 10 articles (9 in Q1). Posdoc at Karlsruhe Institute of Technology (Humboldt Fellowship). Awarded a *Juan de la Cierva Incorporación* contract, since June 2022 at ICMM/CSIC.

Undergraduate supervision (last 5 years)

- The group has supervised **14 Master thesis** and **Final Year Research** projects.
- We also received **two Erasmus summer students** June-September 2022 from University of Iasi, Romania.

Postdoc supervision

- **Dr. Felipe Tejo Lazo** from the University of Santiago de Chile has been awarded a two years **post-doctoral fellowship** from Chile under the supervision of Oksana Fesenko. (2020-2021).
- **Dr. Guillermo López-Polin** (Juan de la Cierva contract) was working in the group in 2019-2021 with a *Juan de la Cierva* Fellowship. Host: Agustina Asenjo.
- **Dr. Eider Berganza Eguiarte** (*Juan de la Cierva* contract) is working in the group since July 2022 (-June 2025). Host: Agustina Asenjo.

4. DOCTORAL AND POST-DOCTORAL TRAINING CAPACITY OF THE RESEARCH GROUP.

- **Dr. Elias Saugar Gotor,** is working in the group since June 2023. Host: Oksana Fesenko……

Attraction of Talent

1. **Dr. G. López-Polin,** *Juan de la Cierva* Fellow from 2019 to 2021.
2. **Dr David Navas,** *Ramón y Cajal* Fellow in 2019.
3. **Dr. Unai Atxitia,** *Ramon y Cajal* Fellow in 2022.
4. **Dr. Eider Berganza,** *Juan de la Cierva* Fellow in 2022.

5. INTERNATIONAL ACTIVITIES.

International projects

1. "*Cold Opto-Magnetism for Random Access Devices (COMRAD).*" **H2020-MSCA-ITN-2019.** Coordinator: A. Kirilyuk (Netherlands), Oksana Fesenko – (CSIC, Training coordinator) (2020-2024).
2. COST Action "*Ultrafast opto-magneto-electronics for non-dissipative information technology.*" (**CA17123**) (2018-2023) A. Kirilyuk (Netherlands) Oksana Fesenko – Management committee member and coordinator of short-time scientific mission.
3. "*Ultrafast Spin Dynamics*" **TRR227**. Funding: DFG (Germany) Participants: Freie Universität Berlin & Martin-Luther-Universität Halle-Wittenberg University, PI: M. Weinelt (Freie University of Berlin) Oksana Fesenko – "**Mercator Fellow**"
4. "*Novel magnetic nanostructures for medical applications*" supported by Marie Sklodowska-Curie Research and Innovation Staff Exchange (**H2020-MSCA-RISE-2016**). Total Budget: 846.000€, PI Dr. R. Morales (UPV-EHU, Spain) (Coordinator) Dr. David Navas (ICMM-CSIC), April 2017 – May 2023.

The GNMP has participated in the following international collaborative projects supported by the CSIC, such as *i-link* and *i-Coop* programs:

1. "*Nanorobots and Magnetic sensors based on Nanowires*" (**i-LINKA0052**), Jan 2019- Dec 2020, participants. ICMM-CSIC, NPL (UK), King Abdullah University of Science and Technology (Saud Arabia), ETH (Switzerland), University of Vienna (Austria), Suessco Sensors (Austria) PI: Manuel Vázquez
2. "*Towards a personalized medicine: a proof of concept*" CSIC (**i-LINKA0783**) with Northeastern University (EEUU) y Monash University (Australia), Jan2019- Dec 2020 PI: Rafael Pérez del Real
3. "*Optimización de las técnicas electroquímicas para el crecimiento de nanohilos magnéticos y su caracterizacion mediante efecto Kerr magneto-óptico*" CSIC (**I-COOP-B20307**) Jan 2018 - Dec 2019. Paula Bercoff (University of Cordoba, Argentina) / Manuel Vázquez Villalabeitia
4. "*Design of truly ferromagnetic sub-20 nm particles*" (**i-LINKA20421**), with University of Sydney, Australia PI-S. Gallego, participants Oksana Fesenko 2022-2023

We also participate in the **Spintronic Factory European Association**, responsible from CSIC-Oksana Fesenko.

The GNMP group has a considerable international visibility and a tradition to collaborate and /or supervise visitors from research groups and universities from all over the world. Apart from the foreign people that have joined the group in the last years, the following researchers have visited us for stays longer than two weeks:

5. INTERNATIONAL ACTIVITIES.

1. **Prof. Laura H. Lewis**, Northeastern University, Boston, USA. May-Jul 2017, 2018, 2019. Funded by Fulbright- Spain.
2. **Nikita V. Kulesh**, Urals Federal University, Ekaterinburg, Russia. PhD Student. Jun-Sep 2017, Apr-May 2018, May-Jun 2019.
3. **Fernando Meneses**, National University of Cordoba, Argentina. PhD student. Oct - Dec 2018.
4. **Juan Pablo Mesa Taborda**, Northeastern University, Boston, USA. Master student. Jun - July 2018.
5. **Alex Jiménez**, Northeastern University, Boston, USA. Master student. Jun - Jul 2018
6. **Alejandro Riveros**, Universidad Central de Chile, Chile. PhD student. Jun- Jul 2018
7. **Felipe Tejo**, Universidad Central de Chile, Chile. PhD student. Dec 2017-Oct 2018
8. **Ass. Prof. Mattia Butta**, Czech Technical University, Prague, Czech Republic. Jan- Dec 2019. Bilateral program Czech Technical University / CSIC.
9. **Dr. Margarida Fernandes**, Universidade do Minho, Braga Portugal. Oct- Dec 2018.
10. **Mohamed Bipp**, University of Algerie, PhD student. November 2019-March 2020.
11. **Mihai-Octavian Buta**, University of Iasi, Romania, June-Sep 2022, Erasmus summer student.
12. **George Constantin**, Jîtariu, University of Iasi, Romania, June-Sep 2022, Erasmus summer student.
13. **Eleonora Raimondo**, University of Messina, Italy, September 2021
14. **David Solomoni**, Spintec, France, PhD student inside ITN “COMRAD”, October 2022

The members of the GNMP have intensively participated in international activities and societies. Particularly, **M. Vázquez** has been the **President of the IEEE Magnetics Society** in 2017-2018; **O. Chubykalo-Fesenko** has been member of the **Administrative Committee and Chapters Chair of the IEEE MagSoc,** 2017-2020; as well as member of European association (EMA), **A. Asenjo** is member of the General Council of the EMA since 2020. **M. Vazquez is currently (2023) a Distinguished lecturer of the IEEE Magnetics Society**.

Regarding organisation of international conferences, **Oksana Fesenko** currently acts as a **Chair of the Advisory** committee of the **ICMFS conference**, **Rafael P. del Real** has been the **Chair of the European Magnetic Sensor and Actuators** conference, Madrid, 2022.

In addition, members of the group have participated systematically in international activities giving over **40 Invited Talks** at National and International Conferences, Summer Schools and Seminars in well acknowledged international research centres within the period 2017-2022.

These achievements have allowed the group to gain international reputation and settle number of collaborations with recognized international groups from all over the world (S. Parkin, O. Gutfleisch, R. Cowburn, O. Kazakova, K. Nielsch, E. Snoeck, K. Y. Guslienko, M. Farle, M. Groenefeld, R. Ibarra, J.M. de Teresa, J. Kosel, A. Labarta, X. Battle, J. Gómez–Herrero, L. Aballe, O. Fruchart, R. Chantrell, M. Weinelt, U. Nowak or P. Grutter).