

Part A. PERSONAL INFORMATION

CV date 01/04/2024

First name	María		
Family name	Vélez Fraga		
Open Researcher and Contributor ID (ORCID) (*)	0000-0003-0311-7434		

(*) Mandatory

A.1. Current position

Position	Full Professor		
Initial date	October 2019		
Institution	Universidad de Oviedo		
Department/Center	Physics	Science Faculty	
Country	Spain		
Key words	Magnetism, magnetic textures and domain walls, magnetic nanostructures, magnetic microscopy, superconductivity		

A.2. Previous positions

Period	Position/Institution/Country/Interruption cause
1998-2019	Associate Professor at Universidad de Oviedo
1997-1998	Assistant Professor at Universidad Complutense
1996	Post Doc at University of California San Diego
1993-1995	PhD student at Universidad Complutense

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD in Physics	Universidad Complutense de Madrid, Spain	1995
Physics Degree	Universidad Complutense de Madrid, Spain	1991

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

Maria Vélez graduated in Physics at Universidad Complutense de Madrid (1991) where she also got her PhD in Physics (1995) under the supervision of Prof. Vicent. After a postdoctoral stay at Prof. Schuller Laboratory at University of California San Diego, she arrived at Universidad de Oviedo in 1998 where she has developed most of her scientific career. Maria Velez is currently a full professor of Condensed Matter Physics at the Physics Department of Universidad de Oviedo. She has published more than 110 research papers, that have been cited over 2000 times (ISI WOK) with $h=22$. She has been IP of 4 national and 2 regional research grants, the last one as the leader of the Nanoscience group at Universidad de Oviedo. She has supervised 23 Physics Degree students (TFG), 1 Master degree (TFM) and 2 PhD Thesis, and is currently supervising one PhD student. She has recently started research collaborations with local companies such as Dropsens-Metrohm (2020) and PMG Powder (2022).

The research activity of Maria Vélez is centered along two main research lines in the fields of superconductivity and magnetism:

- 1) Hybrid superconducting/ magnetic systems: Her work has been devoted to the study of superconducting vortex pinning by ordered arrays of magnetic nanostructures and of proximity effects in superconducting/magnetic multilayers, with a thorough characterization of the effects of array geometry and vortex dynamics on synchronized vortex pinning and on the effects of Curie temperature and magnetic configuration of

the ferromagnetic layers on the superconducting properties of the system. This research line was performed in collaboration with Prof. I. K. Schuller at UCSD and Prof. Vicent at UCM and is the subject of the doctoral thesis of Dr. A. Alija (U. Oviedo, 2010). Some relevant publications in this line are Phys. Rev. Lett. 79 (1997) 1929; Phys. Rev. Lett. 83 (1999) 1022-1025; Phys. Rev. B 82 (2010) 174503; Nanotechnology 30(2019) 244003.

- 2) Domain walls and magnetic textures in nanostructures and multilayers: This line started with the study of domain wall propagation in nanostructured samples by Magnetic Force Microscopy and the observation of magnetic half vortices around isolated holes during the doctoral thesis of Dr. G. Rodríguez (U. Oviedo, 2010). Later, crossed ratchet effects on domain wall motion were demonstrated with the use of asymmetric shaped antidots, which gave rise to a patent on a memory device (2014). More recently, Maria Velez has been working in weak perpendicular anisotropy multilayers, in order to unravel the role of different textures on the magnetization reversal process such as merons (half skyrmions), vortices, antivortices and cycloidal domains. Very recently we have been able to image Bloch points in 3D and characterize their topological charge and surrounding emergent field configuration. This research line has been performed in collaboration with the group of Prof. Ferrer at Alba Synchrotron along three consecutive national research projects, in which Prof. Velez has been the IP of Oviedo Team, and has led to the development of X-ray magnetic vector tomography. Some relevant publications in this line are Phys. Rev. Lett. 100 (2008) 037203, Phys. Rev. Lett. 109 (2012) 117202, Nature Comm. 6 (2015) 8196, Nature Comm. 11 (2020) 6382.

Maria Velez has collaborated in different research evaluations such as H2020 Pathfinder OPEN and Marie Curie MSCA grants or Ramon y Cajal Technical Committee (2019) and within the I3 program of the Spanish AEI (Agencia Estatal de Investigación) in 2022. Prof. Vélez is part of the “Comisión de Asesoramiento para la Evaluación de Enseñanzas e Instituciones de ANECA” since 2021. She is the Physics degree coordinator at the Science Faculty of Universidad de Oviedo, where she is in charge of the organization of tutorial and mentoring programs for first year students. She is also active in the implementation of innovative teaching strategies based in the use of Smartphones for autonomous lab experiences (<https://www.unioviedo.es/smartfis/>). She has collaborated with the Royal Spanish Society of Physics in several local Physics Olympiads and in the organization of the 2008 National contest.

Research indicators

- Positive Research evaluations (Sexenios): 5, last evaluation in 31/12/2022
- Research articles: 121
- Total citations (Scopus): 2295
- Cites per year (last 5 years): 80
- h-index: 22

Part C. RELEVANT MERITS (*sorted by typology*)

C.1. Publications

1. V.V. Fernández, A.E. Herguedas-Alonso, J. Hermosa, L. Aballe, A. Sorrentino, R. Valcarcel, C. Quiros, J.I. Martín, E. Pereiro, S. Ferrer, A. Hierro-Rodríguez, M. Vélez, Memory effects on the current-induced propagation of spin textures in NdCo₅/Ni₈Fe₂ bilayers, Physical Review Applied 23, 014023 (2025)

2. J Hermosa-Muñoz, A Hierro-Rodríguez, A Sorrentino, JI Martín, LM Alvarez-Prado, E Pereiro, C Quirós, M Vélez, S Ferrer, Hyperbolic Bloch points in ferrimagnetic exchange spring. *Results in Physics* 61, 107771 (2024)
3. J Hermosa-Muñoz, A Hierro-Rodríguez, C Quirós, JI Martín, A Sorrentino, L. Aballe, E Pereiro, M Vélez, S Ferrer, Bloch points and topological dipoles observed by X-ray vector magnetic tomography in a ferromagnetic microstructure. *Commun Phys* 6, 49 (2023).
4. K Szulc, S Tacchi, A Hierro-Rodríguez, J Díaz, P Gruszecki, P Graczyk, C. Quirós, D. Markó, J. I. Martín, M. Vélez, D. S Schmool, G. Carlotti, M. Krawczyk, L. M. Álvarez-Prado, "Reconfigurable Magnonic Crystals Based on Imprinted Magnetization Textures in Hard and Soft Dipolar-Coupled Bilayers" *ACS nano* 16 (2022) 14168-14177
5. J Hermosa-Muñoz, A Hierro-Rodríguez, A Sorrentino, JI Martín, LM Alvarez-Prado, S Rehbein, E Pereiro, C Quirós, M Vélez, S Ferrer "3D magnetic configuration of ferrimagnetic multilayers with competing interactions visualized by soft X-ray vector tomography" *Communications Physics* 5 (2022) 1-11
6. A. Hierro-Rodríguez, C. Quiros, A. Sorrentino, L. M. Alvarez-Prado, J. I. Martin, J. M. Alameda, S. McVitie, E. Pereiro, M Velez, and S. Ferrer, "Revealing 3D magnetization of thin films with soft X-ray tomography: magnetic singularities and topological charges" *Nature Communications* 11 (2020) 6382
7. D. Markó, F. Valdés-Bango, C. Quirós, A. Hierro-Rodríguez, M. Vélez, J.I. Martín, J.M. Alameda, D. Schmool, and L.M. Álvarez-Prado, "Tunable ferromagnetic resonance in coupled trilayers with crossed in-plane and perpendicular magnetic anisotropies" *Applied Physics Letters* 115 (2019) 082401
8. Quirós, A. Hierro-Rodríguez, A. Sorrentino, R. Valcárcel, L. M. Alvarez-Prado, J. I. Martín, J. M. Alameda, E. Pereiro, M. Vélez, and S. Ferrer "Cycloidal Domains in the Magnetization Reversal Process of $\text{Ni}_{80}\text{Fe}_{20}/\text{Nd}_{16}\text{Co}_{84}/\text{Gd}_{12}\text{Co}_{88}$ Trilayers" *Physical Review Applied* 10 (2018) 014008
9. Hierro-Rodríguez, C. Quirós, A. Sorrentino, R. Valcárcel, I. Estébanez, L. M. Alvarez-Prado, J. I. Martín, J. M. Alameda, E. Pereiro, M. Vélez, and S. Ferrer, "Deterministic propagation of vortex-antivortex pairs in magnetic trilayers" *Appl. Phys. Lett.* 110 (2017) 262402
10. C. Blanco-Roldán, C. Quirós, A. Sorrentino, A. Hierro-Rodríguez, L. M. Álvarez Prado, R. Valcárcel, M. Duch, N. Torras, J. Esteve, J. I. Martín, M. Vélez, J. M. Alameda, E. Pereiro, and S. Ferrer, "Nanoscale Imaging of Buried Topological Defects with Quantitative X Ray Magnetic Microscopy" *Nature Communications* 6 (2015) 8196

C.2. Congress

International Workshop "Advances in nanostructured superconductors: materials, properties and theory" Madrid 2014 **Invited Conference**

International Workshop on Vortex Matter in Superconductors VORTEX 2015, El Escorial, 10-15 May, 2015 **Invited Conference**

International Conference on Superconductivity and Magnetism ICSM2018, Beldibi, Turquía, 29/4/2018 -4/5/2018 **Invited Conference**

XII Latin American Workshop on Magnetism, Magnetic Materials & Applications LAW3M, Puerto Varas, Chile, 16/10/2023-20/10/2023 **Invited Conference**

IEEE International Conference on Nanotechnology 2024 “Nanoscale magnetic textures in 3D: X-ray vector tomography and applications”, Gijón 10/07/2024 **Plenary Conference**

C.3. Research projects

1. IDE/2024/000678: Grupo de Nanociencia de la Universidad de Oviedo (UONANO). IP: Prof. M. Vélez, Agencia Sekuens Asturias 2025-26, 188.000 € **Principal investigator**
2. PID2022-136784NB-C21: “Materiales con anisotropía magnética perpendicular para sistemas reconfigurables de espintrónica: dominios de banda, texturas magnéticas y ondas de spin” IP: Prof. M. Velez & Dr. L. M. Alvarez-Prado (Universidad de Oviedo); coordinated with Universidad del País Vasco. AEI 2023-2026, 125.000 € **Principal investigator**
3. AYUD/2021/51185: Grupo de Nanociencia de la Universidad de Oviedo (UONANO). IP: Prof. M. Vélez, Asturias FICYT 2021-2023, 222.000 € **Principal investigator**
4. PID2019-104604RB-C31: “Texturas Magnéticas 3D en Multicapas y Nanoestructuras para aplicaciones en aprovechamiento de energía y guías y vórtices” IP: Prof. M. Velez & Dr. C. Quirós (Universidad de Oviedo); coordinated with Sincrotrón Alba & Universidad del País Vasco. AEI 2020-2023, 70.000 € **Principal investigator**
5. FIS2016-76058: “Control De Superconductividad Y Magnetismo: Canje Quiral Y Anisotropía En Aleaciones, Nanoestructuras Y Multicapas Asimétricas Ferrimagnéticas” IP: Prof. J. M. Alameda, Prof. J. I. Martín & Dr. M. Velez (Universidad de Oviedo); coordinated with Univ. Complutense, Sincrotrón Alba & Universidad del País Vasco. MINECO 2016-2020, 63.000 € **Principal investigator**
6. FIS2013-45469-C4-4R: “Interacción y Manipulación de defectos topológicos: Nanoestructuras y multicapas Magnéticas” MINECO 2014-2016, IP: Prof. J. M. Alameda & Dr. M. Velez (Universidad de Oviedo); coordinated with Universidad Complutense, Sincrotrón Alba & Universidad del País Vasco. 2013-2016, 61.000 € **Principal investigator**

C.4. Contracts, technological or transfer merits,

A. Junquera, A. Alija, L. Álvarez-Prado, M. Vélez, J. M. Alameda, J. I. Martín, V. Marconi, A. B. Kolton, J. M. Rodríguez-Parrondo, J. V. Anguita, I. Souche, Ref. No. 2406182, “Soporte magnético para la grabación y lectura de información, método de almacenamiento y lectura de información y su uso”; País de prioridad: España; Fecha de concesión: 10/01/2014; Entidad titular: Universidad de Oviedo, CSIC, Universidad Complutense, CNRS