



The IQARO (Spin-orbitronic QuAntum bits in Reconfigurable 2D-Oxides) project hosts a series of monthly seminars to communicate the work being done as part of the project. The seminars will feature presentations from IQARO partners from across all areas of the project, followed by a brief Q&A.

The next seminar will take place on Friday, 21st of February at 11:00 a.m.

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Nonreciprocal transport in ferromagnetic Rashba 2-dimensional electron gases

Abstract:

Interfacial systems displaying Rashba spin-orbit coupling (SOC) such as SrTiO₃-based 2-dimensional electron gases (2DEGs) may be used to realize spin-charge interconversion with great efficiency (through the direct and inverse Edelstein effects), and as such be used as sources and detectors of spin currents¹. Another consequence of their broken inversion symmetry is their nonreciprocal transport phenomena², such as unidirectional magnetoresistance that has been observed in SrTiO₃^{3,4} and KTaO₃⁵ 2DEGs and is often coined bilinear since it depends linearly on both the current and the external magnetic field. Endowing oxide 2DEGs with additional functionalities such as ferroic orders enriches their transport response from the coupling/competition between e.g. ferromagnetism and superconductivity or ferromagnetism and ferroelectricity. Here, we will focus on the interesting interplay that may arise between the Rashba-type SOC ferromagnetism in 2DEGs that qualify as Rashba ferromagnets⁶, that have been little investigated. In particular, we will discuss how magnetism can strongly enhance the spin-charge interconversion efficiency⁷ and yield spontaneous non-reciprocal transport, in the absence of external magnetic field. We will also describe the various ferromagnetic signatures of the 2DEG in magnetotransport and their distinct gate dependence.

1. Trier, F. et al. Nat Rev Mater 7, 258 (2022).
2. Tokura, Y. et al. Nat Commun 9, 3740 (2018).
3. Vaz, D. C. et al. Phys. Rev. Mater. 4, 071001 (2020).
4. Bréhin, J. et al. Phys. Rev. Applied 20, 044060 (2023).
5. Vicente-Arche, L. M. et al. Adv. Mater. 33, 2102102 (2021).
6. Ado, I. A. et al. Phys. Rev. Lett. 121, 086802 (2018).
7. Lazrak, G. et al. Phys. Rev. Res. 6, 023074 (2024).

Zoom link

<https://us02web.zoom.us/j/89977534015?pwd=EUNK6F241VWnQj2DyHbxOSO7wW29ZT.1>

Meeting ID: 899 7753 4015

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for more information about the project: www.iqaro.eu



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