

UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

**DOTTORATO DI RICERCA / PhD PROGRAM IN
INFORMATION TECHNOLOGY AND ELECTRICAL ENGINEERING**

Seminar announcement

Friday 30 January 2026, Time: 15:00

Seminar Room DIETI, Floor 1, Building 3A - Via Claudio, 21 - NAPOLI



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Nonreciprocal Inertial Spin-Wave Dynamics in Twisted Magnetic Nanostrips

Abstract: When magnetic materials are shaped into curved or twisted geometries, their internal spins—tiny magnetic moments of atoms— can exhibit ultrafast magnetic vibrations at terahertz frequencies (trillions of oscillations per second) known as inertial spin waves, which acquire a remarkable geometric character. This work develops an analytical theory showing how curvature and twist couple to the inertia of collective spin motion, giving rise to terahertz spin waves that behave differently depending on their direction of travel. The effect originates from a special geometric influence, known as a Berry phase, which emerges when the spins oscillate along a three-dimensional curved path. By analyzing two different types of twisted nanomagnets—

helices and Möbius strips— the study reveals how geometry alone can control inertial spin-wave properties without external magnetic fields or modulated material composition. The results establish a theoretical framework for the emerging field of curvilinear terahertz magnonics, highlighting the intimate link between geometry, topology and ultrafast magnetization dynamics. Beyond their fundamental significance, these insights lay the groundwork for new strategies to control magnetism at the nanoscale, potentially enabling faster and more energy-efficient technologies for data processing and communication.

(...more detail available [here](#))

Lecturer short bio: M.d'A. is Full Professor of Electrical Engineering at the Department of Electrical Engineering and Information Technologies (DIETI), University of Naples Federico II. His research interests include micromagnetics, magnetization dynamics, hysteresis modelling, and spintronics. He is the author of over 100 publications in international peer-reviewed journals and has delivered numerous invited talks at international conferences, universities, and research institutions. He has been Chief Editor of IEEE Magnetics Letters, one of the flagship journals of the IEEE Magnetics Society from 2020 to 2025, and since 2016 he has been a Leader of the Design and Modelling Theme of the European SpinTronic Factory (STF) network, involving nearly 90 academic and industrial partners across the EU. He maintains extensive international collaborations and has served as scientific coordinator and principal investigator in several national and European research projects.
(... more detailed bio available [here](#))

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