

Miércoles 27 de SEPTIEMBRE 2023
12.00 h

Seminario de Física Teórica
(sobre el pasillo de Condensada)
Facultad de Ciencias

INMA

Impulso

Quantum Magnonics: Exploiting niches of magnets for quantum materials and computing



Akashdeep Kamra

Universidad Autónoma de Madrid
IFIMAC – Condensed Matter Physics Center

Several unique properties of light/photons have enabled generation and manipulation of optical fields in "nonclassical" states resulting in crucial contributions to quantum information and gravitational waves detection, among other research areas. Owing to the similar, bosonic nature of both photons and magnons - the spin excitations of ordered magnets, much can be learned about spin transport and dynamics in magnetic insulators from the relatively mature field of quantum optics.

In this talk, we will discuss how concepts, such as Heisenberg uncertainty principle, provide crucial novel insights into the quantum properties of magnons and show the latter's niche over photons in several regards. Focusing on the role of squeezing, we will see how anisotropic ferromagnets and Heisenberg antiferromagnets admit spontaneously squeezed excitations. The resulting quantum fluctuations enable magnons to couple strongly with other excitations and imbue them with an intrinsic entanglement. We will conclude with two examples on how these fresh insights open new avenues for exploiting magnetic insulators towards quantum computing technologies by interfacing these squeezed-magnons with spin qubits.