Colloquium on Solid-State Physics

Department of Physics
WS 2022/23

Thursday, 12st January 2023, 17.15 h
Lecture Hall III, Department of Physics, Garching

Archimedean Screws, Skyrmion Jellyfish and Rotating Skyrmion Lattices

Nina del Ser

Institute for Theoretical Physics, University of Cologne,
Zülpicher Str.77a, 50937 Cologne, Germany

Abstract:

Archimedean screws, skyrmion jellyfish and rotating skyrmion lattices - all in one breath? That's right! If your interest has been piqued and you decide to come to my talk despite the wacky title, I will show you that in fact all three systems (and many others!) happily come to life in driven chiral magnets. Operating on the same governing physical principle of Goldstone mode activation, magnetic screws will turn, skyrmions will "swim" and skyrmion lattices will rotate when driven with weakly oscillating magnetic fields in the GHz regime. I will show too how at stronger driving, spatially periodic magnetic textures will turn into magnon lasers, triggered by Floquet spin-wave instabilities. Far from being purely theoretical oddities, these nano-sized (imagine an Archimedean screw 1/80,000 times the width of a single human hair!) machines also have very practical applications. For instance, the magnetic Archimedean screw becomes an efficient electron pump, capable of generating large voltages, giving us great hope of being detected in an experiment one day!

There will be coffee, tea, and cookies in front of the lecture hall at 17.00 h