Magnon transport in bilayer $CrCl_3$

Stefan Stagraczyński,[1] Verena Brehm,[2] Anna Dyrdał,[1] Józef Barnaś,[1] and Alireza Qaiumzadeh[2]

[1] *Faculty of Physics, ISQI, Adam Mickiewicz University in Poznań, ul. Uniwersytetu Poznańskiego 2, 61-614 Poznań, Poland*

[2] *Center of Quantum Spintronics, Department of Physics, Norwegian University of Science and Technology, NO-7491 Trondheim, Norway*

Recently it has been shown that the monolayer and bilayer of two-dimensional van der Waals material $CrCl_3$ are ideal systems to test and explore different magnetic phases in low-dimensional magnetic materials [1].

A finite-size Berezinskii-Kosterlitz-Thouless phase transition has been observed in the monolayer of this material [2]. In addition, it has been shown that the magnetic ground state and spin-spin interactions in its bilayer can be tuned by strain and electric fields [3]. The system shows a transition from ferro- to anti-ferromagnetism under proper strain fields. It was also shown that both the sign and amplitude of the magnetic anisotropy and Dzyaloshinskii–Moriya interactions may also be tuned by applied strain fields [3].

In the present work, we study magnon dynamics and magnon transport in bilayer $CrCl_3$ under different strains using large-scale atomistic spin dynamics simulations. First, we compute the magnon dispersion in the presence and absence of tensile and compressive strain fields. Second, we investigate the nonthermal spin transport using a non-local geometry [4][5] and explore how different strain fields change the characteristics of the magnon transport in this system.

References:

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