Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Stability of skyrmion lattices and symmetries of Dzyaloshinskii-Moriya magnets[1] UTKAN GÜNGÖRDÜ, RABINDRA NEPAL, Univ of Nebraska - Lincoln, OLEG A. TRETIAKOV, Tohoku Univ, KIRILL BELASHCHENKO, ALEXEY A. KOVALEV, Univ of Nebraska - Lincoln — Recently, there has been substantial interest in realizations of skyrmions, in particular in 2D systems due to increased stability resulting from reduced dimensionality. A stable skyrmion, representing the smallest realizable magnetic texture, could be an ideal element for ultra-dense magnetic memories. Here, we use the most general form of the 2D free energy with Dzyaloshinskii-Moriya interactions constructed from general symmetry considerations reflecting the underlying system. We predict that skyrmion phase is robust and it is present even when the system lacks the in-plane rotational symmetry. In fact, the lowered symmetry leads to increased stability of vortex-antivortex lattices with four-fold symmetry and in-plane spirals, in some instances even in the absence of an external magnetic field. Our results relate different hexagonal and square cell phases to the symmetries of materials used for realizations of skyrmions. This will give clear directions for experimental rea lizations of hexagonal and square cell phases, and will allow engineering of skyrmions with unusual properties. We also predict striking differences in gyro-dynamics induced by spin currents for isolated skyrmions and for crystals where spin currents can be induced by charge carriers or by thermal magnons.

[1]DOE Early Career Award DE-SC0014189, NSF Grants Nos. Phy-1415600, PHY11-25915, DMR-1420645, and DMR-1308751; Grants-in- Aid from MEXT and SpinNet (Nos. 25800184, 25247056, and 15H01009)

Utkan Güngördü
Univ of Nebraska - Lincoln

Date submitted: 06 Nov 2015 Electronic form version 1.4