表題：MnSi におけるスキルミオンのダイナミクス

Low Energy Excitations of Magnetic Skyrmions in MnSi

M. Soda and H. Furukawa
RIKEN, Ochanomizu University,

Topological spin textures have been extensively investigated both experimentally and theoretically. Among them, a vortex-like spinswirling texture of so-called magnetic skyrmions has attracted much attention. A helimagnet MnSi possesses a magnetic skyrmion phase in a small magnetic field and temperature region.[1] Since the magnetic skyrmions in MnSi have a long periodicity (~18 nm), the structure has been examined by using small angle neutron scattering (SANS) and Lorentz Transmission Electron Microscope (LTEM) techniques. On the other hand, the dynamics of magnetic skyrmions has not been clear because inelastic neutron scattering measurements with an energy scale of 1~5 micro-eV in a small q region is not easy. Then magnetic excitations only in the helical phase has been reported.

Recently, a theoretical study on the magnetic skyrmions has been carried out by our theoretical group[2]. The string of skyrmions appears to be parallel to the magnetic field. Not only the difference between the magnetic dispersions for the helical and skyrmion structures but also the different q dependence of magnetic excitations along +qz and -qz have been predicted.

We have carried out the neutron spin-echo experiment with IN15 installed in ILL in MnSi to clarify the low energy excitation of skyrmion. Figure 1 shows the experimental setting in IN15. The profiles obtained by spin-echo experiment had the large phase shift which corresponds to the energy transfer. This behavior becomes opposite with changing the magnetic field direction. The obtained results mean that the skyrmion has the asymmetric dispersion.

reference
[1] S. Muhlbauer et al., Science 323 (2009) 915.
[2] W. Koshibae et al. private commun.

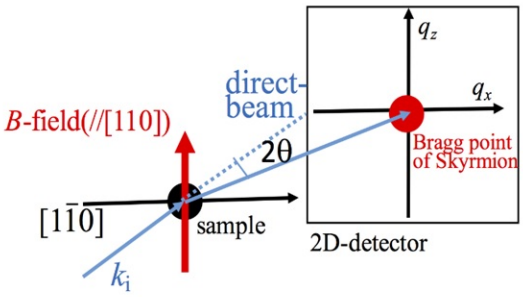

Fig. 1. Experimental setting in neutron spin-echo measurement

使用施設：JRR-3M，装置：C2-3-1:iNSE
分野：Magnetism