# Study of the magnetic structure of the helimagnet YBaCuFeO5 using neutron and x-ray scattering

## Y.-H. Liang1, K. C. Rule2, C.-H. Du1

### 1Department of Physics, Tamkang University, 2Australian Center for Neutron Scattering, ANSTO, Australia

### chd@gms.tku.edu.tw

The oxygen-deficient double perovskite YBaCuFeO5 was reported, from powder samples [1], to be the type-II multiferroic compound with a transition temperature close to 200 K. By studying a single crystal of YBaCuFeO5 (YBCFO), instead of observation of the long-range ferroelectric ordering, we observed YBCFO showing the dielectric relaxation behavior at TN2~ 175 K at where the commensurate spin ordering transfers to an incommensurate ordering with a propagation wavevector along c-axis. Using high-resolution neutron diffraction and resonant x-ray scattering, we further demonstrate that the incommensurate spin ordering consists of two components, from Fe and Cu respectively, forming a double helical spin ordering. By studying a single crystal of YBCFO using neutron/x-ray diffraction, magnetization and dielectric measurements, we provide the experimental evidence that YBCFO possesses a double-helical spin ordering with a magnetic moment lying on the *ab*-plane, which also explains the absence of the spontaneous polarization in YBCFO [2].

#### [1] M. Morin, *et. al*., Phys. Rev. B 91, 064408 (2015)

#### [2] Y.-C. Lai, *et. al*., J. Phys.: Condens. Matter 29, 145801 (2017)

*CHD is grateful to NSTC of Taiwan for funding Grant No. 113-2112-M-032-002. The authors are grateful to NSRRC for providing the travel grant to carry out neutron experiments at ANSTO and also thank NSRRC and ANSTO for the arrangements of the experimental beamtimes. The authors would like to thank the ACNS staff for their assistance during beam time proposals P3441, P3407, P4800, and P5215.*