



Contribution ID: 12

Type: **Talk (20 min + 5 min discussion)**

Magnetic excitations in long-range stripes of $\text{Pr}_2\text{NiO}_{4+\delta}$

Thursday, 8 December 2022 15:50 (25 minutes)

Magnetic excitations in stripe-phases of La -based hole-doped 214- nickelates, especially in the Sr -doped ones, have been vigorously explored using inelastic neutron scattering (INS) studies. In Sr -doped samples, the spin stripe correlation is relatively short-ranged due to unavoidable disorder introduced by the randomly distributed dopant. However, often the results have been compared with the linear spin wave (LSW) theory-based calculations, which assume long-range spin-stripe ordering.

In this talk, we will present the effect of long-range spin stripe ordering on the magnetic excitations of an O -doped 214- nickelate $\text{Pr}_2\text{NiO}_{4+\delta}$ ($\delta \sim 0.24$), where we find the spin stripe correlation is quite long-ranged ($\sim 50 \text{ \AA}$) compared to the Sr -doped $\text{Pr}_{2-x}\text{SrNiO}_4$ ($\sim 20 \text{ \AA}$). For our investigation, we have performed the INS measurements using the thermal triple-axis spectrometer PUMA at MLZ, IN8 at ILL, and time-of-flight spectrometer MAPS at ISIS. Our investigation presents an intriguing observation of multiple equivalent weak modes in the spin wave dispersion of O -doped $\text{Pr}_{2-x}\text{SrNiO}_4$ [1], which we have interpreted from the internal periodicity of the long-range ordered discommensurated spin stripes.

Reference: [1] A. Maity, R. Dutta, A. Marsicano, A Piovano, J. Ross Stewart and W. Paulus Phys. Rev. B 103, L100401 (2021).

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Session Classification: Quantum Phenomena

Track Classification: Quantum Phenomena