

Low Energy Magnetic Excitations and Phonons in Chromium

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The magnetic and nuclear excitations in chromium were investigated using inelastic neutron scattering (INS). Pure chromium [1] is a typical itinerant electron antiferromagnet and spin density wave (SDW) state with incommensurate modulation vector (\mathbf{Q}) is stabilized by Fermi surface nesting below T_N (≈ 311 K). There is a spin flip transition at T_{sf} (≈ 122 K), and the spin direction (\mathbf{S}) changes from $\mathbf{S} \parallel \mathbf{Q}$ ($T < T_{sf}$, longitudinal SDW (LSDW)) to $\mathbf{S} \perp \mathbf{Q}$ ($T > T_{sf}$, transverse SDW (TSDW)) with increasing temperature. The INS measurements were performed on a chopper spectrometer at AMATERAS at J-PARC using a pure Cr single crystal after a field-cooling treatment.

Apart from steep pseudo-spin wave (p-SW) excitations dispersing from incommensurate magnetic Bragg positions, low energy excitations of Fincher-Burke mode (FB mode) exist in between p-SW excitations in TSDW state [2]. As is shown in Fig. 1, we found weak excitation also in LSDW state in addition to TSDW, though the intensity is weaker ($\sim 1/10$) than the FB mode in TSDW state. Kohn anomalies in phonon dispersions [3] are also measured. We will show and discuss these excitation results of chromium in this presentation.

References

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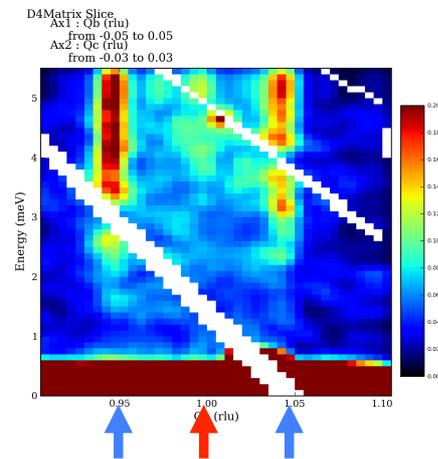


Fig. 1 Intensity map in the magnetic excitations near $\mathbf{Q}=(100)$ (red arrow) in the LSDW state of chromium. Blue arrows show incommensurate positions.