Magnetic fluctuation at the Wannier point in isosceles triangular lattice Ising magnet $CoNb_2O_6$

S. Mitsuda[A], H. Tamatsukuri[B], S. Asai[C]

[A]*Tokyo Univ. of Science,* [B]*J-PARC center, JAEA,* [C]*ISSP-NSL*

An isosceles triangular lattice Ising antiferromagnet is characterized by the ratio of exchange interactions defined as $\gamma = J_1$ (along the base direction) $/J_2$ (along the equilateral direction), and its magnetic property dramatically changes, depending on whether γ is larger than 1.0 or not. As one of the model materials, we have been studying an Ising magnet $CoNb_2O_6$, where the quasi-1D ferromagnetic zigzag chains along the *c* axis form a frustrated antiferromagnetic isosceles-triangular lattice (ITL) with $\gamma \simeq 1.33$ in the *a*-*b* plane. If the exchange ratio γ can be controlled in $CoNb_2O_6$ via anisotropic deformation of ITL by uniaxial pressure, a variety of interesting magnetic features intrinsic to γ would be observed. Actually, along this context, in previous neutron experiments, we have found that the magnetic ground state AF-II magnetic ordering with q=1/2 is switched to AF-I magnetic ordering with q=0 at the Wannier point (γ=1) with critical pressure $p_c \simeq 700$ MPa, by applying uniaxial pressure p up to 1GPa along the *c* axis.

In the present quasi-elastic scattering study using C1-1 HER (E_f=1.55meV), we investigated the energy-resolved spectrum of the spatial magnetic correlation in which magnetic scattering profile with q~1/3 along (3, K, 0) scan shows broadening toward the Wannier point (γ = 1). Fig. 1 depicts energy scan profiles at the Bragg point (1, q~1/3, 0) for p_c=0, 500, 700 MPa at T=2.5K. The Bragg scattering function exhibits a finite energy width beyond the elastic energy resolution, increasing toward the Wannier point (γ=1).

As was stated in the previous report (No. 22508), because of the inevitable distribution of the applied stress at lower temperatures below ~2.2 K, the region with $\gamma \leq 1$ is pulled into the AF-I long-range ordered state, and the region with $\gamma \geq 1$ into the AF-II long-range ordered state, so that the Wannier state disappears. Nevertheless, as shown in Fig.2, the energy spectrum at the (100) Bragg point at T=1.5K shows fluctuating quasi-elastic scattering coexists with an energy resolution-limited AF-I magnetic Bragg peak.

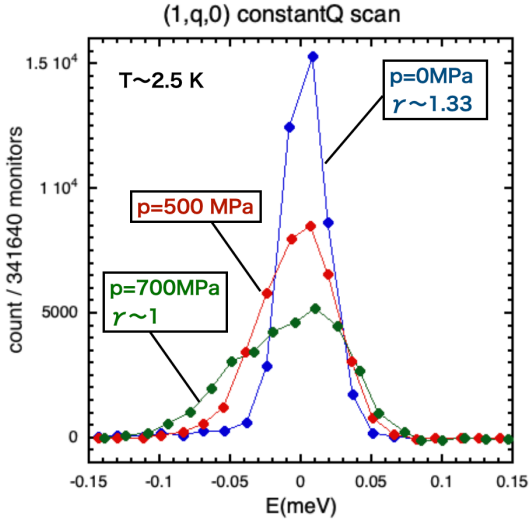

Fig. 1. Uniaxial pressure p dependence of energy scan profile at (1, q~1/3, 0).

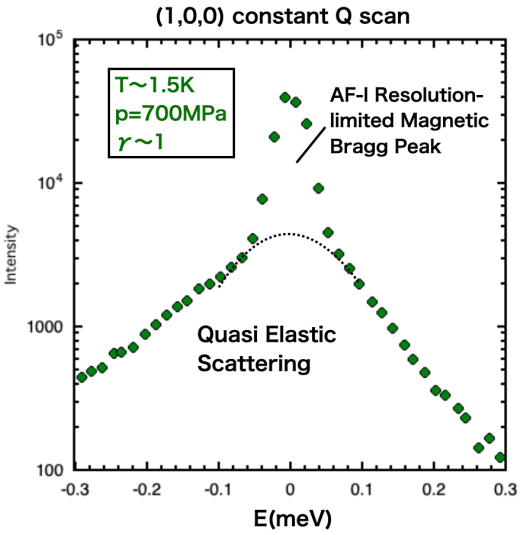

Fig.2 Energy scan profile at (1 0 0) AF-I Bragg point.