Spin wave and Sound in the High Field Phase of Solid ^{3}He

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The finite-temperature correction to the spin wave velocity and magnon relaxation rate are calculated in the high field phase (HFP) of solid ^{3}He by employing the Holstein-Primakoff 1/S expansion. In the calculation, multiple spin exchange model that includes up to planar and folded four-atom exchange was used.

The properties of sound are also calculated according to the methods similar to those developed by Khalatnikov *et al.*[1],[2] The anisotropy of the crystal is taken into consideration in deriving the kinetic equation as was done in the U2D2 phase. Sound velocity is obtained as a function of magnetic field and temperature. Sound attenuation resulting from magnon-magnon scattering is evaluated by collision-time approximation with a collision integral $I(n)$ that conserves energy and momentum[3]. The results are compared with the experimental results of Sasaki *et al.*[4]

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[3] Y. Disatnik, *Phys. Rev.* **5**, 162 (1967)
[4] Private Communications. Preliminary results are given in S. Sasaki *et al.*, J. Phys. Chem.. Solids, **66**, 1478 (2005).

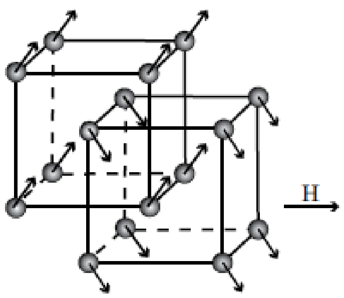

Fig. 1 Magnetic Structure of the high field phase of Solid ^{3}He and its sub-lattices.

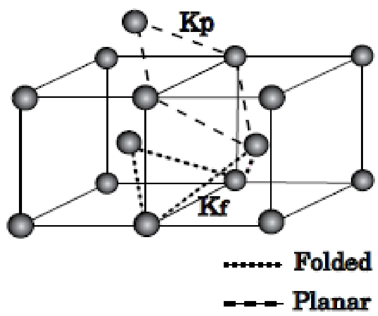

Fig.2 Planar and Folded four-atom exchange cycles.