Talk 13: 12:00–

Quantum spin systems studied by high frequency high field ESR

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I will discuss about the experimental studies of quantum spin systems by our high frequency high field ESR system developed in Kobe. High frequency high field ESR turned out to be a powerful means to study quantum spin systems. For instance, it revealed the information about the spin correlation in the Haldane system by separating the ESR signals coming from different finite Haldane chains in $Y_2BaNi_{0.96}Mg_{0.04}O_5$ Ref. [1] or the spin gap in the S=1/2 diamond chain system $Cu_3(CO_3)_2rm(OH)_2$ (Azurite) by observing the direct transition between the ground and the excited states Ref. [2]. Our high frequency high field ESR system can perform the measurements in the multi extreme conditions, up to 55 T, down to 1.8 K and up to 1 GPa Ref. [3]. In this paper I will show the high frequency high field ESR results of S=1/2 antiferromagnet $Cu_6Si_6O_{18}\cdot 6H_2O$ (dioptase). The system has a peculiar spin network called dioptase lattice. The magnetic susceptibility has a broad maximum around 40 K and shows an antiferromagnetic order below T_N=15.5 K. The g-shift and the broadening of the line width are observed below 50 K reflecting the short range order in the system. Antiferromagnetic resonances (AFMR) have been observed at 4.2 K using the pulsed magnetic field up to 50 T. Although observed AFMR modes in the low field region can be well interpreted by the conventional AFMR theory, AFMR modes in the high field region start to depart from the conventional AFMR theory. Possible origin of the result will be discussed.

[1] M. Yoshida *et al.*, Phys. Rev. Lett. **95**, 117202 (2005).
[2] H. Ohta *et al.*, J. Phys. Soc. Jpn. **72**, 2464 (2003).
[3] H. Ohta *et al.*, J. Phys.: Conf. Series **51**, 611 (2006).