Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

THz magneto-optic study of a clean and a bond-disordered $S = 1$ quantum magnet DTN DAN HUVONEN, URMAS NAGEL, TOOMAS ROOM, National Institute of Chemical Physics and Biophysics, Tallinn, Estonia, KIRILL POVAROV, ERIK WULF, ANDREY ZHELUDEV, Neutron Scattering and Magnetism, Laboratory for Solid State Physics, ETH Zurich, Zurich, Switzerland — We report THz absorption spectroscopy results from 3 to 40 cm^{-1} (0.09 to 1.2 THz) for a spin-1 quantum magnet $NiCl_2{\cdot}4SC(NH_2)_2$ (DTN) and its magnetic bond-disordered derivate $Ni(Cl_{0.87}Br_{0.13})_2{\cdot}4SC(NH_2)_2$ (DTNX) at temperatures down to 0.3 K in magnetic fields from 0 to 12 T. In DTN the single optically active mode at 9 cm^{-1} in zero field corresponds to the top of the magnon band excitation. In DTNX, an additional broad feature is observed at about 1.5 cm^{-1} above the 9 cm^{-1} mode in agreement with the recent inelastic neutron scattering data [PRB92, 024429, (2015)]. Both modes undergo Zeeman splitting in magnetic field with similar g-factors, but the weak mode loses intensity as the systems order antiferromagnetically in 2 T at 0.3 K. We are able to resolve several modes around 15 cm^{-1} in the ordered phase, which above ordering temperature merge into the broad mode reported earlier by ESR. As DTNX approaches the second critical field 11.5 T of the induced ferromagnetic transition at 0.3K, an additional mode, not present in DTN, emerges at 14 cm^{-1}. These new data assist in constructing a detailed microscopic Hamiltonian for DTN and will be discussed in the context of Bose glass physics reported for DTNX.

Dan Huvonen
National Institute of Chemical Physics and Biophysics, Tallinn, Estonia

Date submitted: 31 Oct 2016 Electronic form version 1.4