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Optical spin excitations in quantum spin ladders GEDIMINAS SIMUTIS, SEVERIAN GVASALIYA, NSM laboratory, ETH Zurich, FAN XIAO, Department of Physics, Durham University, CHRISTOPHER LANDEE, Department of Physics, Clark University, ANDREY ZHELUDEV, NSM laboratory, ETH Zurich — We present a Raman spectroscopy study of magnetic excitations in quantum spin ladders. We start with a strong-rung ladder $Cu(Qnx)(Cl_{1-x}Br_x)_2$. It has recently attracted attention due to proposal that the ratio of leg to rung exchange can be varied continuously by substituting Br for Cl. We have measured the Raman spectra for the hole doping series and report on the scattering from two magnons [1]. We extract the onset and cutoff of the scattering for the whole series and compare it to the estimates from previous bulk measurements as well as numerical calculations. We find that the magnetic spectrum indeed varies continuously as the halogen ions are exchanged. The general behavior is found to be consistent with expectations, however small systematic deviations persist. The difference can potentially be explained by the existence of three-dimensional coupling, however more systematic computational studies are needed to ascertain the origin of the inconsistencies. Having established the analysis using the strong rung case, we then turn our attention to other ladder systems. Unusual magnetic signal is found in a strong leg spin ladder, which is discussed in terms of selection rules and an unexpected energy scale. [1] G. Simutis *et al.* arXiv:1510.06360

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