Magnetic structure determination and putative anisotropic exchange coupling in the hybrid organic-inorganic perovskite $(CH_5NH_2NH_2NH_3)_2MnCl_4$

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The interest in low-dimensional magnetism (LDM) is manifold but can be summarized in two categories. First, it provides a rich test bed for fundamental research in many-body quantum phenomena to study the influences of restricted exchange pathways, frustration and enhanced quantum fluctuations. Second, LDM has been shown to have links with various phenomena such as high-temperature superconductivity, fractional excitations, spin liquids and multiferroicity, which are at the forefront of global solid-state research.

Metal-organic compounds (MOC) serve as an essentially infinite toolbox for building model systems for LDM research. Owing to their modular structure, the strength, type and direction of magnetic exchange can be tuned by the ligand molecules, which connect the magnetic ions. The perovskite Mn-PEA [fully $(C_6H_5CH_2CH_2NH_3)_2MnCl_4$] is considered to be one of the ideal layered 2D antiferromagnets, minimizing out-of-plane interactions by separating magnetically active Mn2+ ions by long organic chains.

We have successfully performed neutron diffraction (D10+, ILL) and inelastic neutron scattering experiments at the cold multiplexing spectrometer HODACA (JRR-3) and TAS (JRR-3, HANARO) on non-deuterated Mn-PEA single crystals to determine the magnetic structure and its spin wave excitations. The magnetic moments are antiferromagnetically aligned along the c-axis, with a slight canting into the ab-plane. The spin wave dispersion is completely *l*-independent which is characteristic of negligible exchange across the separation layer of organic ligands. Using spinW, we apply linear spin wave theory including the next-nearest neighbors exchange coupling and DMI between nearest neighbors to account for the observation of a second dispersion branch along *h*

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