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**Unusual Magnetic Spin Arrangements in Manganese Ferrite Nanoparticle Assemblies**[1] YUMI IJIRI, IAN HUNT-ISAAK, HILLARY PAN, Department of Physics and Astronomy, Oberlin College, KATHRYN KRYCKA, JULIE BORCHERS, NIST Center for Neutron Research, NIST, AHMED ABDELGAWAD, SAMUEL OBERDICK, SARA MAJETICH, Department of Physics, Carnegie Mellon University — Magnetic nanoparticles are of interest for many applications, yet the relevant magnetic structures are often difficult to predict *a priori* or even measure directly. In previous work, polarization analyzed small-angle neutron scattering (PASANS) measurements revealed an unusual core-shell magnetic structure for $Fe_3O_4$ nanoparticles governed primarily by the competition of exchange vs. Zeeman energy [1]. For $CoFe_2O_4$, the substantially larger anisotropy led to a uniform magnetic structure within each nanoparticle with sizeable canting in an applied magnetic field [2]. Here, we report new PASANS results investigating dense assemblies of 7.5 nm diameter manganese ferrite nanoparticles. For this system, we see a significant component of magnetic scattering perpendicular to the applied magnetic field, indicating important intra and now *inter-particle* effects. These results are interpreted considering the expected weaker exchange and anisotropy for $MnFe_2O_4$ relative to $Fe_3O_4$ and $CoFe_2O_4$, respectively and the internal structure of the individual nanoparticles. [1] K.L. Krycka, et al., *Phys. Rev. Lett.* **113**, 147203 (2014). [2] K. Hasz et al., *Phys. Rev. B* **90**, 180405 (R) (2014).

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