Abstract Submitted
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Magneto-orbital helices: a novel coupling mechanism between magnetism and ferroelectricity in multiferroic $CaMn_7O_{12}$[1] PAOLO G. RADAELLI, NATASHA PERKS, ROGER D. JOHNSON, Clarendon Laboratory, Department of Physics, University of Oxford, Oxford, OX1 3PU, UK, CHRISTINE MARTIN, Laboratoire CRISMAT, ENSICAEN, UMR F-6508 CNRS, 6 Boulevard du Marechal Juin, F-14050 Caen, France, LAURENT CHAPON, Institut Laue-Langevin, BP 156X, 38042 Grenoble, France — The trigonal quadruple perovskite $CaMn_7O_{12}$ displays one of the largest magnetically induced ferroelectric polarisations measured to date (2870 μC m^{-2}). Ferroelectricity appears below 90 K, together with an incommensurate helical magnetic modulation, and cannot be explained within the framework developed for cycloidal magnets [2]. We report an unprecedented magneto-orbital texture in multiferroic $CaMn_7O_{12}$, which is directly connected to ferroelectricity[3]. X-ray and neutron diffraction characterisation of the structural and magnetic modulations in these "magneto-orbital helices", and analysis of magnetic exchange shows that orbital order is crucial in stabilising a chiral magnetic structure. Additionally, the presence of a global structural rotation enables the magnetic helicity to couple with the lattice, giving rise to electric polarisation. These novel principles open up the possibility of discovering new multiferroics with even larger polarization and higher transition temperatures. [1] G. Zhang, *et al.*, Phys. Rev. B 84 (2011) 174413. R.D. Johnson *et al.*, Phys. Rev. Lett. 108, 067201 (2012). [2] M. Mostovoy, Phys. Rev. Lett. 96, 067601 (2006). [3] N. Perks *et al.*, Nat. Comm., *in press*.

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