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Itinerant Double-Q Spin-Density Wave in Iron Arsenide Superconductors[1] RAYMOND OSBORN, Argonne Natl Lab, JARED ALLRED, University of Alabama, OMAR CHMAISSEM, STEPHAN ROSENKRANZ, Argonne Natl Lab, DENNIS BROWN, Northern Illinois University, KEITH TADDEI, MATTHEW KROGSTAD, DANIEL BUGARIS, DUCK-YOUNG CHUNG, HELMUT CLAUS, SAUL LAPIDUS, MERCOURI KANATZIDIS, Argonne Natl Lab, JIAN KANG, RAFAEL FERNANDES, University of Minnesota, ILYA EREMIN, Ruhr-Universität Bochum — The recent observation of a tetragonal magnetic (C_4) phase in hole-doped iron arsenide superconductors has provided evidence of a magnetic origin for the electronic nematicity in the C_2 phase of these compounds. Now, Mössbauer data shows that the new phase also establishes the itinerant character of the antiferromagnetism of these materials and the primary role played by magnetic over orbital degrees of freedom. Neutron diffraction had shown that the magnetic order in the C_4 phase was compatible with a double-Q structure arising from a collinear spin-density wave along both the X and Y directions simultaneously. The coherent superposition of the two modulations produces a non-uniform magnetic structure, in which the spin amplitudes vanish on half of the sites and double on the others, a uniquely itinerant effect that is incompatible with local moment magnetism. Mössbauer spectra in the C_4 phase confirm this double-Q structure, with 50% of the spectral weight in a zero-moment peak and 50% with double the magnetic splitting seen in the C_2 phase.

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Raymond Osborn
Argonne Natl Lab

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