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Magnetic order without tetragonal symmetry-breaking in the iron pnictides XIAOYU WANG, RAFAEL FERNANDES, Univ of Minn - Minneapolis — In most iron pnictides, the magnetic state is orthorhombic, displaying domains of magnetic stripes with ordering vectors $Q_1 = (\pi, 0)$ or $Q_2 = (0, \pi)$. However, some recent experiments on Mn and Na doped Ba-122 found evidence for magnetic order at Q_1 and Q_2 without tetragonal symmetry breaking. Such a state corresponds to a spin configuration $S(r) = M_1 e^{iQ_1 \cdot r} + M_2 e^{iQ_2 \cdot r}$ with $|M_1| = |M_2|$, in contrast to the stripe case where either M_1 or M_2 vanish. Here we discuss possible microscopic mechanisms responsible for this unusual order and its manifestations in the electronic and spin-wave spectra, focusing on the Mn doped compound. We show that the coupling between the itinerant Fe electrons and the Neel fluctuations arising from local Mn moments can give rise to a tetragonal-symmetric magnetic state with $M_1 \parallel M_2$ – a non-uniform state that induces checkerboard charge order. In contrast, the state with $M_1 \perp M_2$ is non-collinear and gives rise to peculiar spin-wave modes. These characteristic features can be used to unambiguously identify the magnetic states, without relying on the absence of orthorhombic distortion. The existence of such states implies that tetragonal symmetry breaking is a consequence, not a cause, of magnetism.

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