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Magnetism in parent Fe-chalcogenides: quantum fluctuations select a plaquette order[1] NATALIA PERKINS, SAMUEL DUCATMAN, ANDREY CHUBUKOV, Physics Department UW Madison — The analysis of magnetism in parent compounds of iron-based superconductors (FeSCs) is an integral part of the program to understand the origin of superconductivity in these materials. Here we analyze magnetic order in iron-chalcogenide $Fe_{1+y}Te$ – the parent compound of high-temperature superconductor $Fe_{1+y}Te_{1-x}Se_x$. Neutron scattering experiments show that magnetic order in this material contains components with momentum $Q_1 = (\pi/2, \pi/2)$ and $Q_2 = (\pi/2, -\pi/2)$ in Fe-only Brillouin zone. The actual spin order depends on the interplay between these two components. Previous works argued that spin order is a single-Q state (either Q_1 or Q_2). Such an order breaks rotational C_4 symmetry and order spins into a double diagonal stripe. We show that quantum fluctuations actually select another order – a double Q plaquette state with equal weight of Q_1 and Q_2 components, which preserves C_4 symmetry but breaks Z_4 translational symmetry. We argue that the plaquette state is consistent with recent neutron scattering experiments on $Fe_{1+y}Te$.

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