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Frustrated magnetism and bicollinear antiferromagnetic order in FeTe HSIN-HUA LAI, Rice University, SHOU-SHU GONG, National High Magnetic Field Laboratory, WEN-JUN HU, QIMIAO SI, Rice University — Iron chalcogenides display a rich variety of electronic orders in their phase diagram. A particularly enigmatic case is FeTe, a metal which possesses co-existing hole and electron Fermi surfaces as in the iron pnictides but has a distinct $(\pi/2,\pi/2)$ bicollinear antiferromagnetic order in the Fe square lattice. While local-moment physics has been recognized as essential for the electronic order in FeTe, it has been a long-standing challenge to understand how the bicollinear antiferromagnetic ground state emerges in a proper quantum spin model. We demonstrate here that a bilinear-biquadratic spin-1 model on a square lattice with nonzero ring-exchange interactions stabilizes the bicollinear antiferromagnetic order over an extended parameter space in its phase diagram. Our results show that frustrated magnetism in the quantum spin model provides a unified description of the electronic orders in the iron chalcogenides and iron pnictides.

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