Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

**An unified minimum effective model of magnetism in iron-based superconductors** JIANGPING HU, Department of Physics, Purdue University, West Lafayette, Indiana 47907, USA, BAO XU, WUMING LIU, NINGNING HAO, YUPENG WANG, Beijing National Laboratory for Condensed Matter Physics and Institute of Physics, Chinese Academy of Sciences, P. O. Box 603, Beijing 100190, China — Since 2008, many new families of iron-based high temperature (high-Tc) superconductors have been discovered. Unlike all parent compounds of cuprates that share a common antiferromagnetically (AF) ordered ground state, those of iron-based superconductors exhibit many different AF ordered ground states, including collinear-AF (CAF) state in ferropnictides, bicollinear-AF (BCAF) state in 11-ferrochalcogenide FeTe, and block-AF vacancy (BAFv) order state in 122-ferrochalcogenide K0.8Fe1.6Se2. While the universal presence of antiferromagnetism suggests that superconductivity is strongly interrelated with magnetism, the diversity of the AF ordered states obscures their interplay. Here we show that all magnetic phases can be unified within an effective magnetic model. This model captures three incommensurate magnetic phases as well, two of which have been observed experimentally. The model characterizes the nature of phase transitions between the different magnetic phases and explains a variety of magnetic properties, such as spin-wave spectra and electronic nematism. Most importantly, by unifying the understanding of magnetism, we cast new insight on the key ingredients of magnetic interactions which are critical to the occurrence of superconductivity.

Ningning Hao
Beijing National Laboratory for Condensed Matter Physics and
Institute of Physics, Chinese Academy of Sciences,
P.O. Box 603, Beijing 100190, China

Date submitted: 03 Nov 2011 Electronic form version 1.4