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Isoelectronically tuned magnetic and Ising quantum phase transitions in iron-based superconductors JIANDA WU, QIMIAO SI, Rice University — The bad-metal behavior of the iron arsenides motivated a proximity-to-Mott picture, which led to the theoretical proposal for a quantum critical point (QCP) under iso-electronic phosphorous for arsenic doping in the parent iron arsenides [1]. Here, P doping increases the in-plane electronic kinetic energy and thus the coherent electronic spectral weight, thereby weakening the magnetic order and the associated Ising-nematic spin order. Extensive experimental measurements in the P-doped CeFeAsO and $BaFe_2As_2$ [2,3] have provided strong evidence for such a QCP. Here, we explore these phases and their transitions by carrying out a large-N study of an effective low-energy Ginzburg-Landau model for these systems. We determine the parameter range over which second order magnetic and Ising quantum phase transitions arise. [1] J. Dai, Q. Si, J-X Zhu, and E. Abrahams, PNAS, 106, 4118 (2009) [2] C. de la Cruz, et al., Phys Rev Lett, 104, 017204 (2010) [3] S. Kasahara, et al., Phys Rev B, 81, 184519 (2010); K. Hashimoto et al, Science 336, 1554 (2012).

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