

## Spin and Charge Excitations in the Antiferromagnetic Metallic Phase of Iron Arsenides: Inelastic Neutron Scattering and Resonant Inelastic X-Ray Scattering

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The ground state and band dispersions of the antiferromagnetic (AF) metallic phase in iron arsenides are calculated by mean-field theory for a five-band Hubbard model by assuming stripe-type AF order. We then investigate dynamical susceptibilities in the AF phase for both spin and charge channels by the random phase approximation. We find that spectral distribution in the bare susceptibility through particle-hole channel is crucial for obtaining anisotropic spin-wave excitation fully consistent with inelastic neutron scattering data.<sup>1</sup> Resonant inelastic x-ray scattering (RIXS) for Fe L-edge can reveal not only charge but also spin excitations. We calculate RIXS spectra by making use of a fast-collision approximation for intermediate states, and find that momentum-independent spin-orbital composite excitations in addition to spin and charge collective excitations with weak intensity.<sup>2</sup> These composite excitations as well as the collective excitations will be observed in RIXS experiments in the near future.

<sup>1</sup>E. Kaneshita and T. Tohyama, Phys. Rev. B **82**, 094441 (2010).

<sup>2</sup>E. Kaneshita, K. Tsutsui, and T. Tohyama, in preparation.