The RIXS Scientific Program at the APS and the New RIXS Beamline 27-ID

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Inelastic x-ray scattering (IXS) techniques have become very powerful spectroscopic tools at synchrotron radiation facilities all over the world. The resonant variety, RIXS, is uniquely suited to study electron dynamics in complex materials by probing the energy-, momentum- and polarization dependence of elementary excitations in these systems. The RIXS program at the APS was established in the early 2000s and many important results were achieved. Among them were comprehensive studies of 3d transition metal oxides, such as the cuprates and manganites. In 2008 a bi-magnon excitation was observed experimentally for the first time[1)], which constituted an important step in establishing RIXS as an inelastic scattering probe for not only electronic but also magnetic excitations. At the same time, however, it was recognized that the impact of RIXS would be dramatically enhanced if its energy resolution was substantially improved. Great strides towards this goal have been made with the implementation of an x-ray optical set-up that achieved an unprecedented energy resolution of 30 meV at the Ir L3 edge and enabled the observation of single magnon excitations[2)]. This major advance spurred many studies of novel magnetic phenomena in iridium transition metal oxides and a rapid burst in high-impact publications

A new RIXS beamline is being constructed in sector 27 at the APS, which will consolidate RIXS efforts on one dedicated, optimized, state-of-the-art insertion device beamline. It will offer greatly improved energy-resolution and x-ray intensities, combined with advanced beam focusing and a comprehensive suite of sample environments for meaningful in-situ experimentation at a wide variety of absorption edges. In this presentation, the scientific RIXS program at the APS and the plans for the new beamline will be reviewed.

[1)] J.P. Hill, et al., Phys. Rev. Lett. **100**, 097001 (2008)
[2)] Jungho Kim, et al., Phys. Rev. Lett. **108**, 177003 (2012)