

I21 beamline - the ultra-high energy resolution RIXS facility at Diamond Light Source

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Resonant inelastic X-ray scattering (RIXS) is a powerful bulk-sensitive photon-in / photon-out spectroscopic and scattering probe for the electronic structure of condensed matter. It has following key advantages: (1) As working at the resonance of an absorption threshold, it has elementary sensitivity which is an excellent tool for studying complex correlated perovskite systems especially with mixed-valent states; (2) The direct RIXS obeys the dipole selection rule hence is directly sensitive to charge-, orbital-, spin-, and lattice-degrees of freedom. Advanced RIXS facilities with ultra-high resolution in energy and momentum spaces has become available enabling characterization of collective excitations such as orbitons, magnons and phonons. Apart from Angle-resolved photoemission spectroscopy and Inelastic neutron scattering, RIXS has been contributing to solving key questions in condensed matter physics, for instance, unconventional high-T_c superconductors.

I21-RIXS is a dedicated soft x-ray RIXS beamline at Diamond Light Source. It covers an energy range of 250 to 3000 eV with a designed ultra-high energy resolution of 40,000 at 1 keV. To achieve such demanding goal, we constructed a 81 meter long beamline with a 15 meter long RIXS spectrometer which can rotate continuously by 150 degrees. Through the preliminary x-ray commissioning, we have obtained the energy resolution of 35 meV at Cu L-edge (930 eV). In this talk, I will briefly introduce the performance of the I21 beamline and some initial results from commissioning users.



Overview of the I21 RIXS spectrometer