WORKSHOP # 13 – Tuesday, May 5, 2026

Novel soft x-ray spectroscopic imaging at the upcoming ARI beamline

Organizers: Jiemin Li (NSLS-II, BNL)

Quantum computing holds great promise for revolutionizing scientific discovery, industry and society by processing massive computations that are not possible with classical computational technology. One key bottleneck is the material design for qubits which are at the core of quantum computing. Our physical understanding of how electrons behave within these novel quantum materials, and how those behaviors connect to qubit performance, remains very limited, mainly because of the lack of experimental tools that can directly correlate electronic properties with magnetic, atomic, and chemical structure at relevant length scales. The new ARPES (Angle-Resolved PhotoEmission Spectroscopy) and RIXS (Resonant Inelastic X-ray Scattering) Imaging (ARI) beamline at NSLS-II addresses this gap by combining state-of-the-art electron and photon spectroscopies with an imaging capability enabled by a ~100 nm soft x-ray beam. It features two endstations, Elektra (electron) and Phaos (photon), bridged with one sample transfer system, therefore allowing the experimental investigation on the same sample using full suite of techniques, including ARPES, RIXS, and other secondary techniques such as XAS, XPS, inverse XAS, photoelectron diffraction and fluorescence. As a uniquely integrated facility of its kind in the world, the ARI will enable systematic studies of how electronic structure and excitations correlate with local variations on ~100 nm length scales, opening new pathways for understanding and designing materials relevant to quantum information science. This workshop will bring together experienced and new users along with world leading experts to highlight recent research examples, identify high-impact scientific questions uniquely accessible at ARI, and explore emerging opportunities enabled by the beamline's advanced instrumentation. By fostering collaborations across diverse communities, the workshop will help address critical quantum-material challenges and reinforce the facility's leadership in soft X-ray spectroscopic imaging worldwide. More practically, it will strengthen users' understanding of the unique opportunities associated with the beamline and provide feedback on how the beamline can be used to accelerate their research and in-turn allow the beamline to prioritize the most important capabilities during the commissioning which is coming in mid-2026.

Start Time (ET)	Preliminary Topic/Title (Time in Min.)	Speaker (Affiliation)
9:00a	Welcome & Strategic Context (5)	Steven Hulbert (BNL/NSLS-II)
9:05a	ARI Beamline Overview and Current status (10+20+10)	Andrew Walter (BNL/NSLS-II) Jiemin Li (BNL/NSLS-II)
9:45a	TBD (20+5)	Thorsten Schmitt (PSI) *(remote)*
10:10a	TBD (20+5)	Weisheng Lee (SLAC)
10:35a	*Break (15)*	
10:50a	Exploring excitons in van der Waals materials (20+5)	Mark Dean (BNL)
11:15a	RIXS application in the battery field (20+5)	Wanli Yang (ALS)

11:40a	Discussion of multi-modal soft X-ray imaging covering semi-simultaneous electronic, chemical, structural and magnetic variations	Discussion (20)
12:00p	*Lunch Break (60)*	
1:00p	TBD (20+5)	Aaron Bostwick (ALS/LBL)
1:25p	Large exciton binding energy in a bulk van der Waals magnet from quasi-1D electronic localization (20+5)	Na Hyun Jo (University of Michigan)
1:50p	TBD (20+5)	Cissy Suen (Princeton University)
2:15p	*Break (15)*	
2:30p	TBD (20+5)	Sanfeng Wu (Princeton University)
2:55p	TBD (20+5)	Zubia Husan (PhD student from Julia's group@Harvard University)
3:20p	TBD (20+5)	Shuolong Yang (Chicago University) *(remote)*
3:45p	*Break (15)*	
4:00p	Discussion of capability priorities for maximizing the impact of early science Panel Discussion (60)	Jiemin Li (BNL/NSLS-II) Andrew Walter (BNL/NSLS-II) Xuefei Guo (BNL) Workshop participants
5:00p	Closing Remarks	Jiemin Li (BNL/NSLS-II)