

WORKSHOP # 1
September 16, 2025
NSLS-II Bldg 745, Room 183

NSLS-IIU brightness: scientific opportunities in Correlated Materials

Organizers: Electronic Properties Scientific Team
(contact: Claudio Mazzoli)

The field of Correlated Materials traditionally encompasses the investigation of many-body electronic effects within condensed matter systems. As such, the field gathers intrinsically yet-unresolved cases, but leading to a plethora of exotic states, excitations, and non-conventional macroscopic behaviors. Their description revolves around the competition of phases and interactions, and the emergence of new quantum phenomena. For these reasons, this field presents a natural testbed for challenging our understanding in fundamental condensed matter physics, including concepts such as superconductivity, topology, non-locality, frustration, etc., and it offers an inexhaustible source of multifunctional, smart, tunable materials with potential advanced applications for electronics and quantum devices.

This hybrid workshop aims at gathering the Correlated Materials scientific community, to discuss new opportunities offered by NSLS-IIU in view of tackling the above challenges. The goals are: i) to present the opportunities and challenges posed by the future upgrade of the NSLS-II source (in particular the higher brightness and the coherence in the tender x-ray regime), ii) to brainstorm on the relevant scientific problems which would benefit from the new performance and capabilities offered, and iii) to identify the new concepts and instrumentation required to tackle these forefront scientific cases.

Start Time (EDT)	Title	Speaker (Affiliation)
8:30a	Breakfast (coffee, tea, pastries)	
9:00	Introduction	Organizing Team
9:05	Current status and future prospects in soft and tender x-ray science at NanoTerasu	M. Takahashi (NanoTerasu, Japan)
9:35	Tender X-Ray RIXS at PETRA-III	H. Gretarsson (Desy Lab., Germany)
10:05	X-rays with Orbital Angular Momentum for Spectroscopy and Imaging experiments	M. Sacchi (Sorbonne Univ., France)
10:35	Break (coffee and snacks)	
10:45	Probing phonon and magnon dynamics with fast electrons	Y. Zhu (BNL)
11:15	Altermagnetism for Experimentalists	S. Cheong (Rutgers Univ.)
11:45	Frontiers in Quantum Materials: electron-phonon physics, topology, and dynamics	A. Millis (Columbia Univ.)

12:15	Lunch Break (provided)	
1:15	Multipolar loop current phases: chiral phenomena and spin-optical effects	M. Cuoco (SPIN-CNR Salerno, Italy) Remote
1:45	Capabilities for probing correlated electron materials at the Advanced Photon Source	J. Lang (APS)
2:15	Performance of NSLS-II and NSLS-IIU in brightness and coherence demanding experiments	O. Chubar (BNL)
2:45	Break (coffee and snacks) - group photo	
2:55	Strong-field quantum optics for correlated materials	I. Kaminer (Technion, Israel) Remote
3:25	Frontiers in X-ray and Electron Ptychographic Tomography for Quantum Materials	J. Miao (UCLA) Remote
3:55	Probing spin and many-body electron-electron and electron-phonon dynamics using tabletop high harmonic sources	M. Murnane (Univ. Colorado Boulder) Remote
4:25	Discussion	Organizing Team
5:00	Adjourn	
6:00	Dinner (provided)	NSLS-II Bldg 742