

Workshop 2: Spectro-microscopy at the Nanoscale: Exploring Chemical, Electronic and Magnetic Properties of Novel Materials

Organizers: Ruud Tromp (IBM TJ Watson Research Center), Elio Vescovo (NSLS-II, BNL), and Jurek Sadowski (CFN, BNL)

A workshop titled “Spectro-microscopy at the Nanoscale: Exploring Chemical, Electronic and Magnetic Properties of Novel Materials” was held during the 2017 NSLS-II and CFN Joint Users’ Meeting at Brookhaven National Laboratory, Upton, NY on May 15th, 2017. This workshop brought together world leading experts in the field of electron spectro-microscopy to explore new challenges in technique development, as well as in the multi-dimensional, multi-set data acquisition and analysis, spanning from new experimental capabilities for spectro-microscopic characterization of emerging materials, new spin filters and detectors, to the theory of electron optics. The day-long workshop hosted 8 invited domestic and international speakers.

The meeting began with a presentation by L. Andrew Wray (New York University), who spoke of new experimental approaches that promise to resolve resonant inelastic X-ray scattering (RIXS) and angle-resolved photoemission spectroscopy (ARPES) measurements on the sub-micron spatial scale. Continuing the RIXS/ARPES theme, Konstantine Kaznatcheev (NSLS-II, BNL), provided the next presentation. He discussed the technical description, expected capability and scientific goals of ARI (ARPES & RIXS nano-Imaging) beamline, accepted for construction at the NSLS-II – facility dedicated to studying nanoscale origin of macroscopic (electrical, magnetic and optical) properties of the matter. Eli Rotenberg’s (LBNL) presentation followed, focusing on an overview of the new Microscopic and Electronic STRucture Observatory (MAESTRO) at the Advanced Light Source, which achieved first commissioning results. The final presentation of this session was given by Gerd Schoenense (University of Mainz), who discussed new way to perform “multidimensional ARPES” (termed momentum microscopy), utilizing time-of-flight (ToF) energy recording and yielding maximal parallelization.

The afternoon session began with a talk from Thomas Allison (Stont Brook University), who described a new method for generating femtosecond pulses of extreme ultraviolet (XUV) light at 87 MHz repetition rate and using these pulses for photoelectron spectroscopy experiments. A development of spatially-resolved angle-resolved reflection electron spectroscopy (ARRES) which can the unoccupied bands in 3D reciprocal space, was a subject of the presentation from Ruud Tromp (IBM). Hendrik Ohldag (SLAC) spoke of application of synchrotron based X-ray microscopy to detecting magnetization with nanometer and picosecond sensitivity. The final talk of the session was given by Armin Kleibert (Paul Scherrer Insitut), who discussed application of XPEEM with X-ray magnetic circular dichroism (XMCD) to investigations spanning from molecular magnetism at interfaces to artificial spin ice systems and laser-induced magnetization dynamics.