## APS Training #4: A Tutorial Workshop on XPCS for Probing Dynamics in Soft and Hard Matter

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X-ray photon correlation spectroscopy (XPCS) measures equilibrium and non-equilibrium dynamics in materials by correlating temporal fluctuations of a coherent speckle pattern. Over the past two decades, XPCS has led to many fundamental discoveries in soft matter (polymers, colloidal suspensions, membranes, proteins) and hard-condensed matter (ferroelectrics, metallic glasses, charge density waves). The APS Upgrade will have a tremendous impact on coherence techniques such as XPCS and will enable dynamics studies from sub-microseconds to hundreds of seconds. A new world-leading XPCS beamline is being constructed as part of APS-U with technical infrastructure to deliver the above science.

One of the major hurdles in XPCS reaching out to a broader scientific user community is the challenges associated with data analysis and interpretation. This training tutorial will cover the various important aspects of XPCS, such as its fundamentals, sample preparation, data analysis and interpretation. Special emphasis will be placed on methods to quantify temporally heterogeneous dynamics which opens up novel scientific capabilities after APS-U. The training will primarily target early career principal investigators, graduate students and postdocs.

The workshop topics include, but are not limited to:
(1) Introduction to coherent x-ray scattering
(2) Principles of spatial and temporal correlation techniques
(3) Experimental considerations and sample environments (Rheo-XPCS, Small Angle-XPCS, Wide Angle-XPCS, Grazing Incidence-XPCS)
(4) Data analysis and software infrastructure
(5) Application cases: polymers, nanoparticle assemblies, spin-glass, metallic glasses, ferroic thin films, battery materials
(6) How to apply for an XPCS beam time.