

BEAMLINE INSTRUMENTATION GROUP STRATEGIC PLAN – 12/6/22

Introduction

The X-ray Science Division (XSD) at the Advanced Photon Source (APS) develops innovative instrumentation and techniques to enable and perform forefront research using X-rays. The Beamline Instrumentation (BI) Group which is part of the X-ray Science Technologies (XST) section within XSD contributes to this mission by providing beamline engineering design support to existing XSD beamlines as well as future beamlines that will be built or enhanced as part of the APS Upgrade (APS-U) Project and the follow-on MIE proposals. This document describes the BI Group's strategy to carry out this mission in collaboration with the other technical groups within the XST section.

Vision

The BI Group will work closely and collaboratively with other XST technical groups to carry out the design, development and construction of world-class instruments for current and future APS beamlines in support of XSD priorities.

Strategy

The BI Group will provide effective technical support to existing XSD beamlines with priority given to efforts that are in-line with the longer-term priorities of the XSD Strategic Plan. That Plan emphasizes beamline improvements and technical developments that take full advantage of the world leading coherence and brightness that the APS-U will provide as well those that utilize the distinguishing high-energy x-ray spectrum of the APS. The BI Group:

1. Provides the highest quality design, calculation, analysis simulation and measurement support in all areas of beamline engineering.
2. Collaborates closely with scientific and technical staff from other XST groups on beamline development projects, from concept through commissioning.
3. Cultivates a vibrant, energetic and competent in-house staff with expertise in novel research instrumentation, high-precision manipulation systems and quantitative diagnostics.
4. Assists beamline personnel with performance optimization of their experimental systems.
5. Stays apprised of world-leading instrumentation engineering developments.
6. Pursues application-driven R&D in partnerships with the scientific staff.

Implementation

1. Set BI Group priorities for beamline work in accordance with XSD strategic plan.
2. Support the APS-U Project as it develops and enhances beamlines.
3. Assign a Liaison Engineer as the primary BI Group contact for each Beamline Operations Group. That engineer works with the Group Leaders of their assigned groups to determine the relative

priorities of tasks within a given group. The engineer attempts to balance their efforts such that an equitable division of support is provided to each of the groups they support. (This model is largely on hold while the BI Group focuses on supporting APS-U beamline efforts.)

4. Establish external sources for design work to augment in-house capabilities.
5. Maintain close ties with specific designers in the AES-DD Group.
6. Maintain strong ties to AES-MED Group and other APS engineers to benefit from their experience and resources.
7. Establish clear requirements and specifications prior to and as part of the design process.
8. Serve as project managers for XSD BI Group projects.

Five-year Goals

The BI Group's goals over the next five years are directed at making beamline improvements and technical developments such that XSD beamlines will be poised to take advantage of the upgraded APS source.

1. Work closely with vendors to improve the overall stability of beamline components such as monochromators, mirrors and slit assemblies to preserve the high brightness.
2. In partnership with the Optics group, develop optics and windows to preserve the coherence of the upgraded APS source.
3. In partnership with the Beamline Controls group, develop vibrationally stable, rapid scanning, nano-positioning capable end stations to exploit the upgraded source.

Goals and Action Plan for FY2023

1. Transition from developing and executing designs for APS-U feature and enhanced beamlines and end station instrumentation to actual installation of components during the dark period that begins in FY23. (APS-U)
2. Continue support of the LYNX Instrument as it is moved to a new home at 31-ID following the dark period. (Ops, SPP)
3. Continue to address on-going obsolescence issues at the beamlines through the XSD multi-year plan to replace key components including cryo-cooler systems. (Ops)
4. Continue development of a synergistic strategy document with other XST section technical groups that incorporates all aspects of beamline optics, detectors, instrumentation, controls, and computing. (Ops)

BI Group SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none">• Group members have strong technical skills and are highly motivated.• Group members have established good working relationship with beamline staff.• Group has a good mix of education and experience level.	<ul style="list-style-type: none">• Staffing level and demands of APS-U will limit the number of OPS projects and tasks that the Group can take on.• Some technical skills are concentrated in key personnel.
Opportunities	Threats
<ul style="list-style-type: none">• APS-U feature and enhanced beamlines offer cutting edge design opportunities.• Mentoring within the Group to transfer specialized knowledge.• Greater collaboration with XST team.	<ul style="list-style-type: none">• Competition for scarce resources.• Stringent design requirements for APS-U beamlines.