

X-ray Powder Diffraction

SAC Review of Beamlines

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General Comments

- The staff have done an excellent job with the optics, extracting two powerful, usable beams from the damping wiggler to feed the two parallel end stations/beamlines, XRD and PDF.
- The dedicated XPD staff should be commended for their excellent support of users, which is particularly notable considering the breadth of capabilities that are supported.
- XPD is a versatile beamline that serves a wide set of user groups, and has distinguished itself in in-situ/operando studies.
- The scientific productivity of XPD is exemplary for a beamline that has been operating only three years.

Beamline Capabilities

- An impactful effort has been made in provision and development of sample environments to support the theme of in-situ and operando experiments, in line with BNL priorities. Hutch D is an asset to develop large complex experiments.
- XPD has proven itself to be versatile, supporting a broad program set. However the program runs the risk of becoming too broad without the concomitant staffing effort necessary to support such a broad program set.
- Continue planning toward new beamlines offers the potential for spinning off nascent programs from XPD
- The high resolution powder diffraction capability using analyzer crystals has not been put into service, though with the opening of the PDF beamline this should be done.

Scientific Program

- The scientific productivity of XPD is excellent (>30 publications in 2018) and indicative of high impact for a beamline operating for only three years.
- Scientific productivity ramped up fast and should be commended.
- Program is broad, as XPD matures it will be critical that strategic scientific directions are identified and appropriately supported.
- There is a need to support an in house research program and use it to leverage the development of new capabilities.
- For the future striking the right balance between user and staff research could benefit the productivity and impact of the beamline in the longer term. This could drive coalescence of new user communities.

User Support and Laboratories

- The support of users at XPD has been exemplary, however there is a risk that staff will become overworked. Moving forward, the number of supported experiments/users will need to be balanced with available staff.
- There should be consideration to efficiently training new users.
- There should be a continued goal to provide seamless support between beamline controls, data acquisition and management, and sample environments.
- Consideration should be given for the support (maintenance, installation, service support) of standard sample environments. Could this be done by a central sample environment laboratory?

Partner Users

- XPD has three Partner User groups that are active at the beamline at different stages of maturity
 - Columbia/Billinge- Established PU (3 years tenure) , provided the foundational software necessary for data control and acquisition, significant contribution to the science productivity
 - Stony Brook/Weidner- Emerging effort in Large Volume High Pressure experiments, providing significant instrumentation, staff effort, and established expertise. Significant potential for future impact.
 - BNL/Ecker- Partnership with Nuclear Materials community providing enabling capabilities for radioactive materials research. Potential for impact within the nuclear community.
- Management should ensure PU's are aligned with overall strategy.

Future Plans

- XPD should continue to work toward a comprehensive development plan, that has defined strategic priorities.
- New capabilities will only be successful with appropriate investment and additional support. This should be considered when external collaboration is driving developments.
- Appropriate staff is necessary for the CT development.
- Modernizing detectors is necessary. Replacing the existing Perkin-Elmer flat panel detector should be considered a priority, especially in light of the microCT development.