NYX BAT Report

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BAT Members

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Overview

The NYX Beamline Advisory Team held its inaugural meeting February 5, 2016 at the Springhill Suites in Bellport NY. We note that most of the design decisions have already been made, equipment has been ordered (and mostly delivered), contingency plans have been made or implemented, and the budget for scope additions, whether for equipment or manpower, is quite small. Nevertheless, there is some advice we can give that we believe will help make the facility be the best it can be for both the NYX users and the NSLS-II general users.

The general theme of this report is that the user community will be best served by NYX working with NSLS-II and other beamlines in as many areas as possible to leverage existing expertise and resources. To bring this project in on time and within budget in a manner that the user community will find compelling requires compromise: beamlines built without compromise are never productive.

We have made an effort to produce this report quickly so that it can have the greatest possible impact over the few remaining months of construction. We apologize if the report appears rushed, terse, or stylistically inconsistent.

Commissioning

An ambitious schedule has been presented for delivery of the beamline to first scientific commissioning in December 2016. The advisory team recognise the NYX and NSLS-II team are aware of the challenges and multiple risks to the achievement of this plan. Key to this is the installation in September 2016 of the X25 ID at the very least in it's current guise which can reach 5.6mm gap (6.5 - 17keV) and installation and full pre-commissioning of photon delivery and end-station systems to permit IRR and commissioning to begin promptly. Best efforts now should be pursued to investigate the minimal gap achievable for the X25 ID to broaden the available lowest energy range before installation since this work will be difficult once installed - the September 2016 install date should not be missed however. An outline plan for commissioning should be developed, aligned with recruiting key personnel to assist with this and developing the user program to follow. Key stakeholder scientific users should be solicited in preparation for this period of scientific commissioning to ensure availability of samples and users capable of evaluating, providing constructive advice and highlighting the key scientific and technical drivers of the beamline to the NYX staff and the broader community.

BPM integration with ring feedback

NYX has made some provisions for installation of X-ray BPMs downstream of the front end (two thermostable support structures, one immediately upstream of the monochromator). This presents an opportunity to specify BPMs that may be installed at these points for use with the NSLS-II position feedback system to ensure a stable beam for the NYX experiments. We would like to see a plan to develop this idea.

Staffing plans

To help with the tight schedule for commissioning the NYX beam line and future operations, it is important to begin the process of hiring and training future staff. Experience from other beam lines suggests allocating 3 or 4 full time employees. Also, as part of the overall plan for operating the beam line (post Dec 2016) sharing technical staff with AMX and FMX to handle users and dewar transfers after hours should be considered.

Data handling

Because of the anticipated large volume of data and the primacy of remote access it is important to begin considering the anticipated computer and storage needs, as well as a faster connection for optimal remote access and file transfer. The advisory team recognized that it is best to wait for actual equipment purchase (for best value) - but important to begin considering the IT infrastructure. Note that remote users of NYX as well as AMX/FMX will be pressing for 10 to 40 GB connections (or higher) so developing a comprehensive, lab wide, plan to support these connections is in order.

User program management detailed plan

A comprehensive plan for the NSLS-II user program and how it will be articulated at NYX (monitor, schedule, and handle remote data collection) needs to be drawn up.

Plan for the next detector

There are many positive features associated with the new pixel array detector, but there is some concern about continued support as the company that developed the detector no longer exists. As such, the beamline will rely primarily on scavenged parts, their continuing relationship with developers, and intellectual property shared with Columbia that allows NYX to manufacture replacement components for the detector. While all of the aforementioned issues suggest that the detector will be viable option for the short term, a 3-5 year plan should be developed in anticipation of detector replacement. Perhaps more important, a contingency plan should be developed to alleviate down time when individual components fail, or in the possible event of total failure. The BAT members discussed the idea of a detector pool, perhaps shared among beamlines that utilize direct detectors. This would certainly share the burden of cost, and it may help to promote collegiality among beamlines.

End Station Control System

The hardware and software for the NYX end station controls system differs significantly from the rest of NSLS II making direct use of existing and planned developments of some controls difficult.

Although the NYX control architecture contains an EPICs gateway (situated beneath the BLU-ICE distributed control system) NYX will not be able to exploit high level end station controls and data collection sequencing software under development at AMX/FMX. NYX plans to build their control system by extension of their existing software base from NSLS X4. We feel that the scale of low and high level software development required for timely and effective beam line commissioning and implementation of the user program is beyond the capacity of a single FTE. NYX should consider revising their planning to offset the modest commitment they have made towards software development through the exploitation of programming efforts at AMX/FMX and other NSLS-II beam lines.

Recommendations

Here is a summary of the recommendations made in the previous sections. Most of these recommendations can be summarized by "Let's make a detailed plan for what we are doing for the next 12 months". Our sense is that there is an awful lot to do and to be successful in the one year time frame will require collaboration and cooperation with other groups.

1. Develop a detailed commissioning plan that includes operations staff and stakeholders.
2. Provide for an x-ray BPM upstream of the mono that could be used by the storage ring for beam position feedback.
3. Prepare an operations staffing plan.
4. Prepare a data handling plan.
5. Detail how the user program will work for both NYX users and General Users.
6. Plan for a replacement of the current detector.
7. Investigate collaborations with other NSLS-II beamlines for the end station control system.

Charge Questions

1. *Is the scientific mission for NYX clear and appropriate to needs of the community that it is expected to serve?*

Yes. The user community is eagerly awaiting the availability of this exciting new resource.

2. *Do the NYX beamline designs and technical requirements address the scientific mission appropriately?*

In short, yes.

Are there adjustments or enhancements that you would advise as scope additions when feasible?

We understand that the current scope contingency budget is approximately $400K with about a year of construction left to go: it would be unwise to increase project scope at this time. We have made some suggestions that may lead to scope additions.

3. *Do you see any technical complications for the beamline as being constructed?*

The original design includes a novel Segmented Adaptive Gap Undulator that would likely lead to about a factor 2 increase in the achievable brightness of the beamline. While we applaud the NYX's willingness to take

on such a development we understand that it is too expensive in terms of both cost and schedule to be initially available. Should NYX chose to pursue this option at a future time we recommend early involvement of the BAT and a full review by qualified experts before resources are spent. In other facilities it is unusual for a single sector to take on an insertion device development project.

The BAT is happy that the X25 undulator has been adapted for use at NSLS-II by NYX as this allows operations to commence in a timely way.

Some concern was raised at the complexity of the proposed monochromator optics. We believe it is in the interest of the user community that work on implementing this design continue as, if successful, the increased beam intensity will benefit the user program. If, however, there are unforeseen problems, flat crystals should be used for the initial commissioning.

Can you suggest ways to address any such complications?

We are pleased that contingencies are in place for the noted complications.

4. *Do you have any advice for the commissioning and operation of the NYX beamline, particularly as ongoing efforts in the construction project might be adjusted for beneficial impact?*

Yes, as noted above, bringing in operations staff to help will the commissioning will likely be beneficial.

5. *Are there any safety concerns that have not been addressed adequately?*

No obvious safety deficiencies were found though BNL was closed during this review so we did not get a chance to tour the facilities. We do recommend that NYX be fully integrated into the BNL safety program and work to establish a strong culture of safety among the staff and users. This requires that the beamline management lead by example and set a “this is the sort of place where safety is taken seriously” tone.