NSLS-II SAC Close-out Report

September 20, 2017

Opening remarks

- The SAC congratulates the facility on the progress to date and especially over the last six months
- Accomplished as a result of the dedication and enthusiasm of the entire NSLS-II team

Accelerator (general)

- SAC congratulates the accelerator operations group for having reached the goals in terms reliability and availability.
- MTBF is developing well
- SAC recommends to increase the goals for availability (internally) to a level of 97%
- Work around staff reduction: share skills – avoid single points of failure; accelerator division is following the right strategy

Accelerator (1)

- Is the accelerator studies program appropriately sized and planned to deliver design performance?
  - The Accelerator program appears to be very robust with clear performance goal priorities.
  - As before, the SAC questions the goal to reach 500 mA as a priority, if it diverts resources from reaching other performance enhancements, such as increased stability in the beamlines or other beamline improvements.
  - The SAC encourages the NSLS-II staff to continue considering the option of operating at <500 mA in the near term if other performance enhancements are thereby enabled. The SAC endorses the basic performance priorities of reliability/stability/intensity/brightness.
  - The SAC compliments the work of the Stability Task Force and encourages continuation of this important work, such as local feedback including XBPMs
  - A schedule for future accelerator improvements, including the near-term harmonic cavity and 3rd RF cavity implementations, would be desirable (refer to goals set in Strategic Plan).

Accelerator (2)

- Are the appropriate steps being taken to mitigate the issues observed at high currents?
  - The ramp-up to full current is following a clearly laid out path.
  - Increasing the current in a new machine often results in a large number of smaller problems to solve. It appears that the accelerator group is taking a well-balanced approach between taking risks and going to slow. So far good technical solutions have been found for all problems.

Accelerator (3)

- Is the attention being paid to possible upgrades in performance at an appropriate level?
  - SAC was given an outline of activities concerning possible upgrades. The reflections go in the right direction and give the accelerator scientists a high level task which keeps them visible on an international level within the accelerator community. It is imperative that the facility develops plans for performance improvements that go significantly beyond todays performance.

Operations & beamline development (1)

- Is the in-house science program appropriately sized and valued? Are there opportunities for improvements?
  - Many examples of good science involving NSLS-II staff presented in various talks
  - Detailed account of BL personnel work-tasks and discretionary spending (10k$), seems to be in proportion. Valuation still somewhat unclear
  - Need to communicate and discuss this at e.g. a BL staff all-hands. BL staff at current seems confused about that. Perceived devaluation, e.g. refused travel for invited talks or external beamtime
  - Need to develop in-house science policy together with BL staff. BL staff need backing to be able to free time for R&D
  - Need to clarify use of BL discretionary time; grant BL staff more freedom to use it as seed for collaborations or own research.

Operations & beamline development (2): Controls

- Does the controls program have the right mix between the various elements of the program? Are there areas that are significantly under resourced? Are the priorities of the program clear, transparent and aligned with the priorities of the facility?
  - Controls mission statement is clear and the balance between the elements is mostly appropriate
  - Accelerator team sees a challenge in keeping interesting projects for the staff (no conference attendance, routine work): e.g. advanced control with AI, machine learning
  - Head count is reasonable for the size of the facility but beamline control needs severely underserved across the board
  - New management scheme needs monitoring for successful implementation: work order flow vs. practical communication on the floor
  - ….continued…

Operations & beamline development (2): Controls

- Open-mindedness in organizing and reporting structures could improve efficiency, productivity, and staff morale
- Lack of documentation in some areas (after IRR) might affect future maintenance/upgrade
- New hires with fresh minds could bring new ideas: importance of mentorship and recognition by beamline staff, management
- Data access and storage policy is strongly needed
- Communication across departments (USCEO, Photon Science, Controls) to achieve facility priorities: examples, data access, command-line control in most of BLs
- There seems to be a bigger issue with IT infrastructure
- Retention is becoming increasingly difficult
- Bluesky and DAMA well integrated with the US and international facilities, having impacts

CSX Crosstalk

- Develop a plan with cost/benefit analysis for the scenarios
  - Coherent flux increase on CXS1 with an optimized undulator period
  - Factor of two increase in capacity from re-canting
- Review and update your long-term plans for soft x-ray tools
  - Where do CSX1 and CSX2 fit and how can this be optimized?
  - What will be the long range impact of soft x-ray XPCS at NSLS-II?
  - How much imaging vs scattering will be done on CSX1? How do these tools fit into the NSLS-II quantum materials program?
  - How much APXPS, XAS, chemical RIXS, etc. will NSLS-II have and how much needs to be on an undulator? Consider APXPS 'special needs'.
- Consider a near-term solution (e.g., phasing magnet) as a step toward a longer term solution (e.g., moving CSX-2 to a separate sector)
- Organize an external review before making a final decision

Operations & beamline development (4)

- Are the plans outlined to further develop beamlines appropriate, given the current funding situation? Are there opportunities we have missed; to reduce costs, to obtain funding or to leverage other resources?
  - Right level of preparation work given current situation. Risk for frustration of staff working on these plans if progress slow
  - Current funding does not allow operation of any additional beamline, even if there was investment money
  - Opportunity to explore possibilities to get contributions to operations, e.g. new partners on existing BL's
  - Opportunity to continue efforts to make e.g. control systems resources more efficiently used, by identifying possible common solutions
  - Opportunity in "value engineering" for operations, concerning e.g. preventive maintenance, spares

User Program: General

- Is the user program making appropriate progress? Does the proposal review and allocation produce the appropriate balance between new users and experienced users?
  - User program is growing well. Difficult to discern the right balance between new and experienced users without having publications catch up. However, current balance seems reasonable.
  - Concern about small fraction of GU for MX beamlines; agree with increasing the RA fraction, reduction or removal of GU fraction
  - Surprised at small allocation for each BAG; will likely need to change if additional beamlines are added to BAG system
- Are the publication rates in line with what would be expected for this point in the life of the facility?
  - The publications are expected to lag, and 3 years is a standard lag phase, so this is not a concern yet.

User Program: USCEO

- SAC is in enthusiastic support of the creation of USCEO
- Several positive aspects:
  - User program reporting to director
  - One stop shop (boarding pass, move badging and TLDs to GUV center)
  - Housing and transportation addressed in Discovery Park
- User experience task force positive; has appropriate mix of priorities
  - User access modes (mail-in, remote, multi-BL and multi facility),
  - User experience (one stop shop, single user logon and improved access to data)
  - Education and outreach (hands on workshops at the beamlines)
- Questions about access:
  - What about streamlining access to user laboratories?
  - What happens about access after hours and on weekends?

User Program: Triennial Reviews

- Is the proposal for the triennial review of the beamlines reasonable? Does the SAC have other suggestions for how it might be run?
  - The proposal seems appropriate
  - It is important that reviews at this stage of the development are constructive
  - It will be very important going forward to cluster the reviews. Carefully consider whether this is by similar capabilities or by science areas
  - Planned frequency could be extended to 5 years
  - Be careful not to coincide reviews with other busy times for staff (e.g. grant renewal)

AMX

- Is it on track to develop world-leading programs? If not, what should be done?
  - Working towards becoming world-leading in automation, but this will need optimization time.
- Does it have the correct mix between commissioning new capabilities and running a user program?
  - Yes, but we would like to see a faster ramp-up to full operations than occurred between periods 2017-2 and 2017-3.
  - Critical features must be commissioned in order to bring user time to ~80%
- Is the user program looking healthy for this point in its development?
  - So far it looks good, look forward to seeing publications ramp up in the next 1-2 years.
- Is the future plan appropriate? Are there opportunities we are missing that we should go after? Conversely is the beamline pursuing directions that it should not?
  - Excellent to recognize the complementary features of AMX & FMX – collaborative development is critical as the BLs need identical high-level capabilities in sample handling and data analysis.

FMX

- Is it on track to develop world-leading programs? If not, what should be done?
  - World leading in flux density coupled to powerful control system for manipulating sample in beam. There's potential to develop new protocols for collecting multi-crystal datasets. Much work remains to develop suitable data analysis tools.
- Does it have the correct mix between commissioning new capabilities and running a user program?
  - So far all looks good; anticipate steeper ramp to full operations, but recommend careful balancing of efforts on finishing the development and integration of automation
- Is the user program looking healthy for this point in its development?
  - Tentatively yes – would like to have seen more users in 2017-3 than in 2017-2, but anticipate sharp up-tick in the 2018-1/2/3 runs.
- Is the future plan appropriate? Are there opportunities we are missing that we should go after? Conversely is the beamline pursuing directions that it should not?
  - Plans for serial crystallography, additional automation, more robust beam size and energy changes, and plate scanning are appropriate.
  - Developments highly complementary to those on AMX. The sample handling and data analysis problems are nearly identical, so the solutions should be co-developed.

CMS

- SAC complements NSLS-II staff on the rapid commissioning and initiation of user program on this beamline
- Very good partner user relationship with CFN. This should be very productive – and popular with BES
- Very good collaboration with CSI, ALS/CAMERA, etc.
- Near and long term plans will lead to a strong and very productive user program

XFP

- Is it on track to develop world-leading programs? If not, what should be done?
  - Yes, world leading although limited user community in a niche area Excellent new capabilities including the time resolved (10 ms) and BSL2
- Does it have the correct mix between commissioning new capabilities and running a user program?
  - Excellent introduction of XAS capability into the LifeSciecne mix of BLs.
- Is the user program looking healthy for this point in its development?
  - Rapidly ramping up for user operation on x-ray footprinting
  - Recommend more efforts in attracting new users from wider biology communities
- Is the future plan appropriate? Are there opportunities we are missing that we should go after? Conversely is the beamline pursuing directions that it should not?
  - Joining BAG system is a good way forward to be integrated with the life MX and SAXS beamlines