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Dr. Qun Shen
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Dear Qun,

The CHX BAT thanks you and the rest of the NSLS-II staff for your efforts in arranging the recent BAT meeting. We felt the meeting was highly productive and provided us good opportunity to evaluate the status of the CHX beamline project. Overall, we were pleased with the progress that the NSLS-II staff has made in advancing the NSLS-II project and in developing the conceptual design for the CHX beamline in particular. We are further encouraged by the addition of Andrei Fleuresu as group leader for the CHX beamline, and we look forward to the accelerated progress that the project will surely enjoy with his arrival.

Based on the progress report that Andrei provided and the presentations by NSLS-II staff at the meeting, we have a set of comments and recommendations for you and the staff to consider as the project moves forward:

- All design considerations for the CHX beamline should be made with the goal of optimizing its performance for x-ray photon correlation spectroscopy (XPCS) experiments. While a beamline optimized in this way could simultaneously be well suited for certain classes of microbeam (incoherent) SAXS and coherent diffraction imaging experiments, and the conceptual design currently being developed appears not to preclude such opportunities, no compromises in the design for these secondary applications should be made.
- The most important element of the beamline will be the detectors. At a minimum, the \$2,000,000 currently allocated for a state-of-the-art detector should be preserved for this purpose; any additional resources that can be directed toward detectors should also be considered a priority. Further, NSLS-II should take a proactive stance in advocating detector development efforts and should continue to strengthen its coordination with the BNL detector group and others who are working to advance this crucial technology.
- Many of the significant scientific opportunities of the CHX beamline will utilize the planned WAXS station. Therefore, this element should be prioritized as part of the beamline's "initial" scope. A combined SAXS and WAXS station, as opposed to separate in-line SAXS and WAXS stations, should be pursued only if such a station does not appreciably compromise the flexibility for either type of measurement and if the costs and complexity of the instrument are not increased. Since the optimization requirements for coherence in SAXS and WAXS scattering geometries are different, scientifically

compelling experiments that effectively investigate SAXS and WAXS XPCS simultaneously are likely very rare. Furthermore, caution should be used not to “over design” this and other beamline elements.

- The first white-beam aperture is a key element of the beamline. The aperture should be designed to select only the coherent part of the beam in a way that minimizes the required heat-load capabilities of the downstream optics. We recommend a (scannable) fixed-size aperture for this purpose.
- Beryllium compound refractive lenses (CRL) appear to be a promising option for vertical focusing. Diagnostic experiments that confirm their suitability, particularly with regard to maintaining beam coherence, should be performed as early as feasible in the design process.
- The BAT meeting included an extended discussion of the plans for standardized hutch dimensions at NSLS-II. While a hutch that enables a long sample-to-detector distance, as described in the LOI, remains an important priority, the standard height currently being planned for hutches should be adequate for the CHX beamline.
- The role of multilayers deserves further consideration. In the beamline layout described in the LOI, multilayers were proposed as a possible alternative to a mirror plus high-pass filter for harmonic selection. In the current conceptual design, which includes a mirror as a permanent beamline element, multilayers are included as a monochromator option to provide energy resolution intermediate between the Si monochromator and pink beam. While this option could prove useful for certain experiments, this role for the multilayer makes it less central to the beamline, hence efforts to secure multilayers with adequate reflectivity and wave-front preservation should be considered a lower priority.
- The feasibility of employing cryogenic cooling of the monochromator should be investigated carefully. Guidance on this issue should become available in the coming months as beamlines conducting XPCS that utilize this technology, such as at Petra-III, begin operations.
- Sustained engagement of the CHX group leader in the applications of the technique is important. Therefore, in addition to his primary responsibility in beamline design and construction, the group leader should be encouraged to develop collaborations with XPCS researchers and carry out experiments at other facilities.

Please let me know if you have any questions regarding these comments and recommendations or if the BAT can provide input about any other aspect of the project. We look forward to working with you and the rest of the NSLS-II to assure that the CHX beamline and the facility as a whole are a resounding success.

Best regards,

Robert Leheny
Spokesperson, CHX BAT