



Memo

Date: October 10, 2016
To: Mark Breitfeller, Mohamed Benmerrouche, and Sushil Sharma
From: Zhong Zhong (chair), Photon Science Radiation Safety Committee
Subject: Review of the ray-tracing design of the NYX (19-ID) and SIX (2-ID) front-ends

Dear Mark, Mo and Sushil,

The Photon Science Radiation Safety Committee (RSC)'s ray-tracing subcommittee concluded review of the front-end ray-tracing of the NYX (19-ID) and SIX (2-ID) beamlines on October 7.

Subjects reviewed include the synchrotron max-fan and Bremsstrahlung drawings. Since the max. fan drawings are sufficient for assuring the safety of the front-end against synchrotron radiation, the interlocked synchrotron ray-tracings, included in the drawing packages, were not reviewed by the RSC.

Written documents

The following documents were submitted to the RSC on September 27, 2016 for review:

1. SIX front-end assembly drawing, SR-FE-EPU02-1001, Rev. B by J. Fabijanic.
2. SIX front-end Bremsstrahlung ray-tracing, SR-FE-EPU02-1001, Rev. B, sheets 4 and 5 for horizontal and vertical projections, respectively.
3. SIX front-end max. synchrotron ray-tracing, SR-FE-EPU02-1001, Rev. B, sheets 6 and 7 for horizontal and vertical projections, respectively.
4. NYX front-end assembly drawing, SR-FE-IVU19-1001, Rev. B by D. Puleo., dated 3/2015
5. NYX front-end Bremsstrahlung ray-tracing, SR-FE- IVU19-1001, Rev. B, sheets 4 and 5 for horizontal and vertical projections, respectively.
6. NYX front-end max. synchrotron ray-tracing, SR-FE- IVU19-1001, Rev. B, sheets 6 and 7 for horizontal and vertical projections, respectively.

Notes

NYX front-end ray-tracing, along with that of SST, was reviewed by the RSC on March 6, 2015. The report for that review is attached.

Conclusions

Our prior recommendations for NYX beamline were adequately addressed.

Based on our assessment of the ray-tracing drawings, the RSC finds the Bremsstrahlung and synchrotron shielding designs for both the front-ends of the SIX and NYX beamlines meeting the NSLS-II shielding policy.

Radiation Safety Committee

<i>Name</i>	<i>Expertise</i>	<i>Directorate</i>
Andrew Ackerman	Deputy ESH Manager	PS
Dana Beavis	Experimental Nuclear Particle Physics	NPP
Mohamed Benmerrouche	Nuclear and Radiation Physics	PS
Scott Buda	Personnel Protective Systems	PS
Ray Filler	Accelerator Physicist	PS
Wah-Keat Lee	Beam Line Physicist	PS
Boris Podobedov	Accelerator Physics	PS
Chuck Schaefer	Accelerator SME	ESH
Om Singh	Accelerator Controls	PS
Lutz Wiegart	Beam Line Physicist	PS
Zhong Zhong	Beam Line Physicist	PS
Emil Zitvogel	Accelerator Operations	PS
Ashley Shoemaker-Skokov	Administrative Support	PS

Ray-tracing sub-committee

Andrew Ackerman	Deputy ESH Manager	PS
Mary Carlucci-Dayton	Mechanical Engineer	PS
Wah-Keat Lee	Beam Line Physicist	PS
Chuck Schaefer	Accelerator SME	ESH
Christopher Stelmach	Designer	PS
Lutz Wiegart	Beam Line Physicist	PS
Zhong Zhong	Beam Line Physicist	PS

PPS sub-committee

Dana Beavis	Experimental Nuclear Particle Physics	NPP
Mohamed Benmerrouche	Nuclear and Radiation Physics	PS
Scott Buda	Personnel Protective Systems	PS
Robert Lee	ESH manager	PS
Zhong Zhong	Beam Line Physicist	PS



Memo

Date: March 6, 2015

To: Chris Amundsen, Daniel Fischer, Howard Robinson, Joseph Woicik, and Andy Broadbent

From: Zhong Zhong (chair), Photon Science Radiation Safety Committee

Subject: Review of the frontend ray-tracing for SST and NYX partner beamlines

Dear Chris, Dan, Howard, Joe and Andy,

At the request of Chris Amundsen, the Photon Science Radiation Safety Committee (RSC) reviewed the radiation safety aspects of the front-end design of SST (ID07) and NYX (ID19) on Tuesday February 3, 2015, 2:30 pm – 3:30 pm. The purposes of the review are: a) to validate the radiation and thermal protection aspects of the both designs, and since SST and NYX are the latest ID front-end design incorporating updates to prior designs at the NSLS, b) to validate the design criteria which most likely will be adopted for future frontends here.

Written documents

The following drawings were submitted to the RSC two weeks prior to the formal review:

1. SST Component Layout, SR-FE-IVU07-1001 rev. 1, drawn by C. Amundsen, dated 11/14.
2. SST synchrotron ray tracing horizontal and vertical, SR-FE-IVU07-1001 rev. 1, sheets 2 and 3.
3. SST Bremsstrahlung ray tracing horizontal and vertical, SR-FE-IVU07-1001 rev. 1, sheets 4 and 5.
4. SST PPS ray tracing, horizontal and vertical, SR-FE-IVU07-1001 rev. 1, sheets 6 and 7.
5. NYX Component Layout, horizontal and vertical, SR-FE-IVU19-1001 rev. 4, drawn by C. Amundsen, dated 11/14.
6. NYX Interlocked Synchrotron Ray Tracing, horizontal and vertical, SR-FE-IVU19-1001 rev. 4, sheets 2 and 3.
7. NYX Bremsstrahlung Ray Tracing, horizontal and vertical, SR-FE-IVU19-1001 rev. 4, sheets 4 and 5.
8. NYX Max Synchrotron Ray Tracing, horizontal and vertical, SR-FE-IVU07-1001 rev. 1, sheets 6 and 7.

Oral Presentations

Attendance: See RSC March 3, 2015 minutes.

Chris Amundsen summarized the design principles of the SST and NYX front-end design, and addressed issues raised by prior RSC and other reviewers the NSLS-II front-ends.

The following were discussed:

1. NYX is a partner beamline, to be built by NYSBC in partnership with the NSLS-II. SST is a partner beamline to be built by NIST in partnership with NSLS-II. The NYX front end is designed to accommodate 2 canted IDs, but only one undulator, to be retrofitted from the NSLS X25 undulator, is included in the current design. The SST front end includes two canted undulators. Like NYX, both SST undulators, U42 to be on loan from ESRF, and EPU60 purchased from Wisconsin, are to be retrofitted to suit NSLS-II.
2. SST and NYX frontend designs are similar to that of the FXI beamline reviewed by RSC before, with the following updates: a) the design accommodates future changes in ID center longitudinal position, b) the role of dipole shadow-shield was studied and determined to be of no benefit to the Bremsstrahlung drawings, c) additional transverse lead was added to the safety shutters, and d) the burn-through device was removed from the ratchet wall collimator to simplify future maintenance.

Tammy Stein provided administrative support for this review. Peets' coffee, of French Roast flavor instead of the normal Major Dickason's Blend, was served with no complaints.

Notes:

The following are noted here for completeness:

1. Alternative methods to accommodate future changes in ID center longitudinal position, without triggering the need to update the shielding drawings, was discussed. This includes either additional source size transverse tolerance, or representing the source at the worst-case (most downstream possible) longitudinal positions. If the design team takes this approach, this does not change the Bremsstrahlung drawings, but may impact the max-synchrotron fan slightly.
2. On sheet 2 of the SST design, synchrotron ray tracing horizontal, it is not obvious how the fixed mask intercepts the fan between the two ID beams. For clarity, a call-out box could be added to sheet 2 to depict the cross-sectional view of the fixed mask.

Recommendations

The RSC is providing the following recommendations:

1. We agree with the assessment that the dipole shadow shield does not impact the ray-tracing of the beamline front-end in a meaningful way. Including it in the drawings may cause confusion for contractors who are asked to design beamline shielding based on the front-end drawings. Thus, we recommend removing the dipole shadow shield from the Bremsstrahlung drawings.
2. The nomenclature in the SST drawing should be changed to be consistent with that of the NYX: SST PPS ray tracing, horizontal and vertical, SR-FE-IVU07-1001 rev. 1, sheets 6 and 7 should be entitled "Max Synchrotron Ray Tracing" instead of "PPS ray tracing".
3. We recommend that Chris present the front-end drawings of NYX and SST to Amy Xia and YongJun Li so that the TOSS (Top-Off Safety System) team can review them

for top-off compatibility. This review is not required for approval of the current drawing, but will be required for the IRRs, anticipated in late 2016, of the beamlines.

Conclusions

1. Based on our assessment of the ray-tracing drawings, the RSC find both the SST and NYX frontend shielding designs meet the NSLS-II shielding policy. Subject to fulfillment of recommendations above and experimental verification by radiation survey, we believe the designed shielding will provide adequate personnel protection for normal operation and for fault conditions in which electron beam orbit deviate outside that of the active interlock.
2. Based on our review of synchrotron max-fan ray-tracing drawings, the RSC believes that both frontends are adequately protected against thermal failure of shielding components.

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Scott Walker	Health Physics	ESH
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