



Memo

Date: June 21, 2016

To: Jennifer Bohon, Howard Robinson, Michael Sullivan, Andrew Broadbent, and Paul Zschack

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

Subject: Review of the radiation safety configuration design of the 17-BM (XFP) beamline

Dear Jennifer, Howard, Mike, Andy, and Paul

The Photon Science Radiation Safety Committee (RSC) conducted review of the design of the XFP beamline, 17-BM, on Tuesday May 17, 2016. Subjects reviewed include synchrotron max-fan and Bremsstrahlung drawings, Secondary Bremsstrahlung and synchrotron radiation shielding analysis, and aspects of thermal management that relate to radiation safety.

Written documents

The following documents and drawings were reviewed:

1. XFP assembly drawing, PD-XPF-RAYT-000 rev. A, by L. Reffi, sheet 1, "XFP, Cell 17-BM, Component Layout".
2. XFP synchrotron max. synchrotron ray-tracing drawings, PD-XPF-RAYT-000 rev. A, by L. Reffi, sheets 2 and 3 for horizontal and vertical projections, respectively.
3. NSLS-II technical note M. Benmerrouche entitled "17BM XFP Beamline Radiation Shielding Analysis" dated June 2016. The document presents analysis results of Gas Bremsstrahlung (GB) as well as Synchrotron Radiation (SR) at 500 mA.

Oral Presentation

Attendance: Andrew Ackerman, Andrew Broadbent, Mo Benmerrouche, Jennifer Bohon, Edward Cheswick, Mary Carlucci-Dayton, Ray Filler, Robert Lee, Wah-Keat Lee, Boris Pedobedov, Howard Robinson, Om Singh, Chris Stelmach, Michael Sullivan, Lutz Wiegart, Emil Zitvogel, and Zhong Zhong

Jennifer Bohon gave the presentation entitled "RSC review of XFP". Following the guideline from the memo by Paul Zschack to the RSC on May 29, 2014, the following were discussed:

1. XFP is a simple beamline consisting solely of the FOE which serves as the experimental hutch. The FOE receives pink beam.
2. We reviewed the preliminary ray-tracing before on Feb. 29, 2016. The current ray-tracing incorporates suggestions by the RSC at that review. Recommendations from prior preliminary review were adequately addressed.

3. A beamstop downstream is needed according to top-off-safety (TOS) analysis. The beamstop is designed and built in house. The design of the beamstop, released ray-tracing drawings, and Mo's simulations are viewed.
4. Primary Bremsstrahlung radiation is contained in the front-end. Thus the front-end Bremsstrahlung drawing serves as the beamline Bremsstrahlung drawing. The front-end Bremsstrahlung drawings have been reviewed by the RSC ray-tracing subcommittee.
5. Shielding and control of secondary Bremsstrahlung radiation is verified by FLUKA analysis. Shielding of synchrotron x-ray is supported by simulation results specifying the shielding thicknesses for FOE.
6. The synchrotron beam has about 100 W maximum power. Thermal protection of the beamline shielding components is designed using ray-tracing method. The design is supported by synchrotron ray-tracing drawings assuming maximum possible synchrotron fan.
7. The PPS logic diagram for was reviewed separately by the RSC PPS subcommittee.
8. Configuration control of the radiation safety component was discussed.

Peet's coffee was served for the occasion.

Notes

The following comments are noted for completeness: The mirror in the front-end, at 21.65 milliradians, could potentially mis-steer the pink beam to strike the beampipe upstream of the cooled fixed mask 3. However, at such large mirror angle, the total beam power reflected is small at 2.67 W. We concur that this is not an issue.

Recommendations

There are no recommendations from the RSC at this time.

Conclusions

1. Based on our assessment of the ray-tracing drawings, thermal analysis, and simulation results, the RSC find that the XFP beamline shielding design meets the NSLS-II shielding policy. Subject to experimental verification by radiation survey, we believe the installed shielding will provide adequate personnel protection for normal operation and against failures of synchrotron orbit.
2. Based on our review of the and max. synchrotron ray-tracing drawings, the RSC believes that the XFP mask and mirror, all in front-end, are adequately designed to protect against thermal failure of shielding components.

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 Fliller	Accelerator Physicist	PS
Wah-Keat Lee	Beam Line Physicist	PS
Boris Podobedov	Accelerator Physics	PS
Chuck Schaefer	Accelerator SME	ESH
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Lutz Wiegart	Beam Line Physicist	PS
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Emil Zitvogel	Accelerator Operations	PS
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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
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Lutz Wiegart	Beam Line Physicist	PS
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PPS sub-committee

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