



Memo

Date: October 4, 2018
To: Larry Carr, Mohamed Benmerrouche, Julian Adams, and Paul Zschack
From: Zhong Zhong (chair), Photon Science Radiation Safety Committee
Subject: Review of the radiation safety configuration of the FIS/MET beamline

Dear Larry, Mo, Julian, and Paul,

The Photon Science Radiation Safety Committee (RSC) reviewed the design of the new FIS/MET beamline (22IR) tunnel wall penetration and planned shielding modifications on December 5, 2017. Subjects reviewed include Bremsstrahlung radiation shielding analysis, design and configuration control of the shielding inside and outside of the ratchet wall.

Written documents

The following documents and drawings were reviewed:

Powerpoint Presentation "22BM-FIS/MET Radiation Shielding Analysis" by Mo Benmerrouche, dated December 11, 2017.

Presentation

Larry Carr introduced the design and scope of the FIS/MET beamline. Mo then gave the presentation entitled "22BM-FIS/MET Radiation Shielding Analysis". Following the guideline from the memo by Paul Zschack to the RSC on May 29, 2014, the following were discussed:

1. The purpose of the meeting with the RSC was to review a proposed modification to the storage ring wall shielding that allows the 22-IR beampipe to extend through the wall and out onto the experimental floor. This is for the (FIS and MET) infrared beamline program(s).
2. For the 22-IR beamline to operate, a hole will be opened in the tunnel side wall so that a pipe can be inserted. The beampipe and penetration needs to be shielded against Bremsstrahlung radiation, including neutrons, that could result from plausible fault conditions.
3. Mo demonstrated a plan for the shielding that achieves the requirements for all the relevant fault scenarios. The principal hazard is from neutrons, therefore most of the shielding in the design involves the use of borated polyethylene of known boron concentration and thickness to achieve the required level of shielding. This includes

layers installed on the outboard side of the dipole and around the M5 mirror tank support frame just outside the shield wall. Additional lead shielding is included inside the ratchet wall and around the beampipe.

4. FLUKA analysis, based on possible radiological source properties and fault scenarios in that section of the storage ring, were presented.
5. The RSC approved the shielding design, so that it could be installed.
6. The physical shielding was added to the NSLS-II storage ring shielding configuration controls.

Notes

1. FLUKA simulation for the case of electron beam being mis-steered into the quadrupole magnet (up-stream of the bending magnet) was requested by the RSC on the Dec. 5 meeting. This simulation was performed by Mo in the following week. A summary of simulation results was send to the RSC on Dec. 11. Ray Fliller reviewed the results and gave his concurrence.
2. The RSC chair met with the NSLS-II safety team and IRR planning team this summer to discuss the issue of possible infrared light hazard, and if a follow-up review by laser safety experts was warranted. The light hazard is out of scope of RSC, which primarily considers ionizing radiation. Thus the FIS/MET team is encouraged work with Chris Weilandics, our local expert in laser safety.
3. Since the FIS/MET uses infrared light, there is no ionizing radiation at the endstations/microscopes. Thus the current review of the front-end shielding and the shielding of the beampipe outside of the ratchet wall penetration also serves, in terms of radiation safety, as our endorsement of the operation of the FIS/MET beamlines.

Recommendations

There are no recommendations from the RSC at this time.

Conclusions

Based on our assessment of the FIS/MET shielding configuration inside and outside of the ratchet wall, and simulation results, the RSC finds that the FIS/MET shielding design meets the NSLS-II shielding policy. We believe the installed shielding and beam pipes will provide adequate personnel protection for normal operation and against failures of synchrotron orbit.

Radiation Safety Committee

<i>Name</i>	<i>Expertise</i>	<i>Directorate</i>
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