

## Radiation

### Safety

Minutes of RSC Subcommittee of March 10, 2016

### Committee

#### **Subject: Closing CeCPoP Issues**

**Present:** D. Beavis, L. Hammons, M. Fedurin, E. Lessard, R. Karol, C. Schaefer, M. Benmerrouche, J. Reich, and C. Theisen

The meeting's primary purpose was to close out issues related to CeCPoP beam dump, shielding plan for the beam dump, and the analysis for the penetrations at 25 MeV. A Powerpoint presentation<sup>1</sup> was used to guide the discussion of open topics.

#### **Beam Dump**

The beam dump issues were discussed<sup>2</sup> during the RSC meeting of Dec. 9, 2015. The final report<sup>3</sup> on the beam dump design and radiological issues was submitted to the committee on March 2, 2016. The numbers in the report were unchanged from the December review. After the meeting it was decided that the release of gases from the water system would occur in building 1002A where most of the water system equipment is located. The issue of determining if this is an appropriate location will be sent to the safety section.

The hazard of the air activation will be mitigated by the shield design that surrounds the beam dump and air sampling. Plans for air sampling are underway so that samples can be obtained from outside the IR. The IR has a ventilation system which is either in 1002A or on the roof. The details of the ventilation system are unknown to the committee at this time. The committee requests that the release location for the air handling system be determined so that it can be sampled during operations.

**(CK-CeCPoP-April 15, 2016-D. Phillips&D. Beavis-1028) Determine the location of ventilation system release and if possible the rate of air exchange and make-up air.**  
**(CK-CeCPoP-June 1,2016-P. Bergh&D. Beavis- 1029) Survey the released air from the ventilation system.**

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<sup>1</sup> D. Beavis; CeCPoP Open Issues; March 10, 2016;

[http://www.c-ad.bnl.gov/esfd/RSC/Minutes/References/RSC\\_031016.pptx](http://www.c-ad.bnl.gov/esfd/RSC/Minutes/References/RSC_031016.pptx)

<sup>2</sup> RSC Minutes of Dec. 9, 2015; [http://www.c-ad.bnl.gov/esfd/RSC/Minutes/12\\_09\\_15Minutes.pdf](http://www.c-ad.bnl.gov/esfd/RSC/Minutes/12_09_15Minutes.pdf)

<sup>3</sup> D. Beavis, Radiological Issues Related to the CeCPoP Water Cooled Beam Dump", March 2, 2016; [http://www.c-ad.bnl.gov/esfd/RSC/Memos/3\\_02\\_16\\_CeCPoP\(2\).pdf](http://www.c-ad.bnl.gov/esfd/RSC/Memos/3_02_16_CeCPoP(2).pdf)

There was minimal concern about contamination caused by dust in the air around the beam dump, but it was decided that it would be prudent to have some smears conducted once operations exceed 10 MeV.

**(Ck-CeCPoP-June 1, 2016-P. Bergh&D. Beavis-1030) Conduct smears near dump for operations above 10 MeV.**

A report was issued<sup>4</sup> to the committee that described a phased approach to the beam dump shielding. The report uses the final shielding design but a simple approach to hazard mitigation. The plan is to use a combination of time, distance and shielding to keep an dose exposure ALARA. The dump shield may not be completed when high energy electrons are stopped by the water cooled beam dump. The committee was satisfied that the approach was satisfactory and that work planning should be used for activities near the beam dump. The committee would prefer that the complete beam dump be in place before substantial integrated beam is terminated by the beam dump.

There was a question on the ratio of the <sup>13</sup>N to <sup>15</sup>O which will be examined by a subgroup.  
**(Ck-CeCPoP-May 1, 2016-M. Benmerrouche & D. Beavis-1031)**

A series of slides demonstrated the analysis of the penetrations for 25 MeV beam losses. The final report on the analysis will be issued in a few weeks and if committee members have any questions or concerns they can be addressed to the Chair.

The RHIC access procedure has been changed for IR2. A sample of the form was presented that allows a designated group to determine if an RCT is required to conduct radiation surveys. This scheme provides flexibility in event of changing conditions due to CeCPoP initial operations. The committee also accepted the proposed change of the form to allow flexibility in a wait time for possible exposure issues related to the beam dump.

M. Benmerrouche gave a presentation on the preliminary results conducted using FLUKA for radiation issues related to the beam dump. The calculations are not final but appear to give agreement with the calculations already presented to the committee. The FLUKA code calculates the activation products in a single step rather than post processing as is required with MCNPX. The ionization in the water was approximated using a thin layer of water rather than discrete channels and is about 1%. This result is similar to the “guessimated” value used in the earlier analysis and the chair expects it to be conservative. Additional analysis will be conducted on the beam dump<sup>5</sup> using FLUKA to provide independent estimates of several of the radiation issues for CeCPoP. The results will be presented at a future meeting.

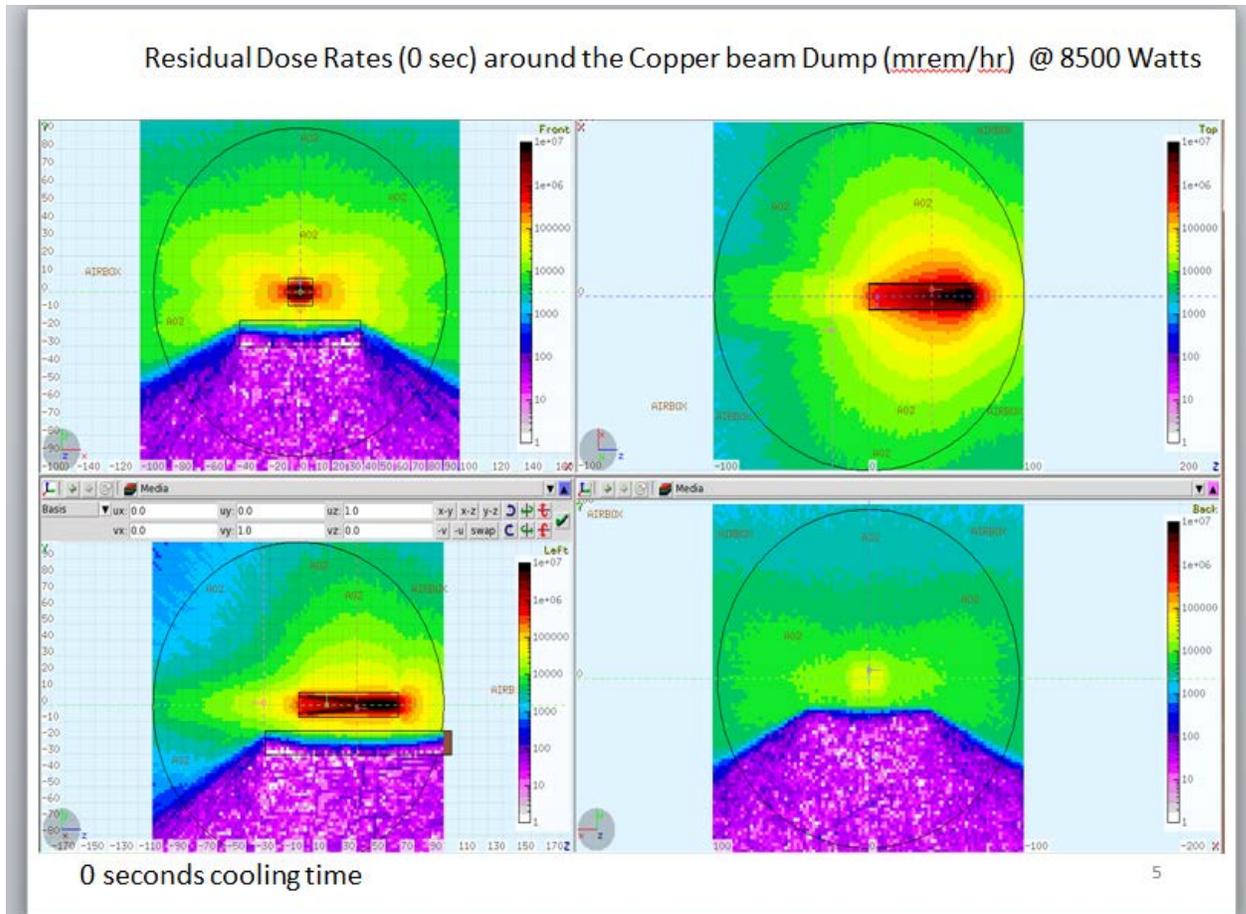
An example of the preliminary results is shown below. The figure displays the dose rates from residual activity immediately after shutdown after operating at high power. The plots are for different slices through the beam dump. The shielding around the beam dump is not

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<sup>4</sup> D. Beavis, “CeCPoP High Power Beam Dump Shielding”, March 2, 2016; [http://www.cad.bnl.gov/esfd/RSC/Memos/3\\_02\\_16\\_CeCPoP.pdf](http://www.cad.bnl.gov/esfd/RSC/Memos/3_02_16_CeCPoP.pdf)

<sup>5</sup> There may also be analysis on the cryopipe penetration.

in place except for the six-inch thick steel plate that provides downward shielding and support for the beam dump and other shielding. The highest dose rates to the side are 70 rads/hr where the simple estimate with no self shielding was 600 rads/hr. The effectiveness of the steel plate for shielding the area under the beam dump is evident.



CC:

- Present
- RSC
- RSC Minutes File
- D. Phillips
- C. Folz
- I. Pinayev
- V. Litvinenko