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Radiation

Safety Minutes of RSC BLIP Target Subcommittee Meeting

Sub- Committee Minutes of February 07, 2014

Subject: LHC Collimator Material Irradiations at BLIP

Present: D. Beavis, C. Cullen, N. Simos, P. Pile, E. Lessard, Y. Makdisi, C. Schaefer, and S. Smith

N. Simos provided a completed[1] Blip Target and Canning Record, OPM 9.1.15a to the RSC BLIP Target Subgroup for review. The materials that are being tested were irradiated for 4.5 weeks last year. To achieve the integrated dose they need another 3.5 weeks of irradiation. To provide the material performance information in a timely fashion to CERN designers it is important that the irradiation is conducted soon. The irradiation will be conducted by placing these samples in the first target can in front of the ^{82}Sr production targets. It is important to review both the safety aspects of the irradiation and the quality assurance issues for the ^{82}Sr production.

Transport on-site is conducted in a Pb cask (transport pig) which has six inches of Pb shielding and a quarter-inch thick steel liner on the inside and outside. The dose rates on contact outside the cask must be below 200 mrem/hr before transport can be allowed to building 801. The estimate is that the target can must be stored for one month in the existing storage box in the BLIP hot cell before it will reach sufficiently low levels that it can be transported in the transport cask. The dose outside the transport cask is estimated[2] to be 212 mrem/hr after the LHC array has cooled one week. The only issue was a **request that the checks on the rigging equipment be emphasized. (S. Pontiere, LE, will notify personnel to be careful to follow all rigging rules for the Pb pig). Can be post start.**

The materials in the LHC target can are designed so that the correct energy reaches the beginning of the ^{82}Sr production targets. The present setup has the Linac delivering an energy of 118 MeV to the ^{82}Sr production targets. For the LHC samples the Linac needs to deliver 200 MeV. The LHC materials, spacers, and degraders have been carefully

[1] N. Simos, "LHC Collimator Material Irradiation at 200 MeV", Jan. 21 2014.
[2] See reference 1, Figure titled "Effective Dose Outside the BLIP Transport Pig".

planned[3] to degrade the proton energy to be 118 MeV. **S. Smith will conduct spot checks on the SRIM calculations to ensure that the numbers provided are correct.** There will be flux losses caused by interactions in the first target can materials. S. Smith will check the impact of these losses on the ^{82}Sr production schedule. It may be necessary to delay introduction of the LHC samples till sufficient ^{82}Sr is produced to ensure the production schedule can be met. There have been several Linac failures that have impacted the ^{82}Sr production. **S. Smith will determine when it is possible to add the LHC samples in front of the ^{82}Sr production targets. Both must be pre-start.**

The amount of water path in the target array systems can change the emissions from the BLIP stack. The relevant stack emission issue for this exposure is the local dose rates. An atmospheric inversion can cause the BLIP stack emissions to remain close to the ground. A past irradiation[4] with 200 MeV protons and 60 mm of water gap produced 0.01-0.1 mrem dose rates in the vicinity of BLIP and had impact on the potential dose to users at NSRL. The present NSRL schedule will have beam exposures and users present starting in late March. **The total water path needs to be approved before the exposure begins. (closed D. Beavis and E. Lessard-see below)**

> After the meeting it was decided that the best approach to complete the LHC irradiations would be to leave the water paths unchanged. RCTs will conduct surveys to determine if any issues of increased dose rates around BLIP occur. Actions will be taken to ensure that personnel are not in any elevated dose rates for extended periods. The areas to be examined include NSRL, the road, and the building across the street from BLIP (formerly the REF building).

The exposure for pulling the target array can be kept modest if it is allowed to cool. The ^{82}Sr targets are usually allowed to cool about one week before being lifted into the BLIP hot box. If the LHC target can needs to be removed without sufficient cool down then there may be exposure issues. The dose rate outside the BLIP Hot box with one hour of cool down is estimated[5] to be 30 rem per hour but only 188 mrem/hr after one day of cooldown. Even if the dose can be kept low with minimal cool down the **RWP needs to be examined for the maximum allowed dose rate and modified if appropriate. (N. Contos and C. Schaefer-Post-start)**

Examine the use of shielding internal to the Hot Box to reduce potential exposure for extracting the LHC target array without sufficient cool down. (N. Contos& C. Cullen post Start)

> The LHC target array requires about I month of cool down. There is not sufficient room to cool down both a Sr production target and the LHC array in the shield box located in the BLIP hot box. When a Sr production target is pulled for cooling and the LHC targets have had sufficient irradiations the LHC array will be pulled and placed as the second target. A new Sr production target will be installed in from and the Linac operated an an energy of 118 MeV. The LHC targets in this

[3] See reference 1 Table A1.1.

[4] E. Lessard provide the linked PPT file which documents some elevated level in the past.

[5] See reference 1, figure titled "Effective Dose on Outside Wall of BLIP Hot Cell".

configuration will only be irradiated by low energy neutrons and their activity will decay during the Sr exposure.

All target can drawings for the LHC material irradiation are been signed and stored in the drawing vault.

Provide the references for the codes (including version) used in the analysis. Include in updated form 9.1.15a. (post start N. Simos & D. Beavis)

Provide the activity of the various isotopes in an EXCEL spread sheet. Kin Y. will spot check[6] some of the activity numbers. (N. Simos and K. Yip post start)

Some minor editorial changes were requested for the BLIP Target Canning Record (N. Simos & D. Beavis Post Start):

- **Fix figure A3.5**
- **Consider better labels on some of the figures**
- **Units and headers should be placed on Tables A3.1-3**

Because of the short time frame the normal ATS process is not appropriate. A short check-off list will is attached to ensure that these items are closed pre-start or Post start.

CC:
N. Contos
S. Pontieri
D. Passarello
J. Odin-McCabe

[6] After the meeting a partial check was provided by K. Yip and that item is closed. See Memo