C-AD

Radiation

Safety

Committee

Issued: March 31, 2015

Minutes of BLIP RSC Target Review Subcommittee March 30, 2015

Subject: One week Irradiation of Sc in low energy slot

Present: D. Medvedev, L. Mausner, K. Yip, N. Contos, E. Lessard, R. Karol, D. Beavis, and C. Cullen

The committee discussed the target submission for a one week exposure of Sc. The committee had previously reviewed[1] and approved the exposure of SC for a much shorter duration. The target is indexed as:

Tgt_15_04: Low energy slot irradiation for one week of Sc metal.

The submitted target record was reviewed with the following comments:

- The discussion in section 5.a is just to optimize resources. They may move the target in the same pig provided no exterior dose limits are exceeded.
- The copper temperature in contact with the water271^{o} C ,which is above the boiling temperature of water. Targets have been run with higher contact temperatures (exceeding 300^{o} C) without cooling issues. The important parameter to prevent a lack of heat transfer due to boiling is the water velocity. The water flow is in the interlocks but a calculation has not been conducted to determine the minimum water velocity to prevent boiling. The water cooling system provides 25 gpm per box.
- Melting the target due to boing would interfere with the mission of the facility and require effort to remove the contaminated cooling water. Exterior releases are not expected to be an issue.
- C-AD does not have the appropriate software to calculate the critical velocity to prevent boiling. After the meeting, C. Cullen arranged for the Nuclear Science and Technology Department to conduct the calculations for future reference. **(CK-BLIP-Cullen&Beavis-May 1, 2015-938)**
- The proton entrance and exit energies at each layer were check by P. Pile.
- Al was used in place of Sc in Microshieled. (see Appendix 3)
- It was not understood why the volume for the source on page 13 was zero. This item should be understood but the change should not impact the Microshield results.
- The density of Pb in the Mircoshield calculations was slightly high but should not create a substantial difference in the dose calculations.
- It was noted that the Build-up factors appear to be excessively large for photon energies

[1] http://www.c-ad.bnl.gov/esfd/RSC/BLIP/Canning/9.1.15.a_BLIPtgt_CanRec(2).pdf

below 0.3 MeV. Future submissions should ensure the factor is correct. However, the photons at these energies are not contributing to the dose.

An updated canning record was received on March 31, 2014. The source of the large build-up factors was not determined.
The target is approved for irradiation.

The long term goal is to replace the copper beam stop at the back target box with Sc for long term irradiations. Since Ti-44 has a 60 year half-life it is desired to eventually hav exposure times as long as possible. There is no need for rapid transport to building 801 so that the samples can sit in the BLIP hot cell allowing the undesired short lived isotopes to decay away. It is expected that the next exposure request will be for 30 days. There is a desire to cut down on the paper work but maintain safe operations, appropriate reviews, and archived documentation.

The committee will accept submissions that are limited changes to a previous approved target. The submission needs to reference the original target index (canning record) and then provide the changes. For increased exposure durations methods can be used to calculate a new activity table and potential dose rates. If the submission is conducted for the longest anticipated exposure time then it will bracket any intermediate length irradiations. The RSC files will have a target index added such as Tgt_15_04a where a denotes an addendum to the target record. Additional addendums can be added as tTgt_15_04b, c, etc. Only the material documenting the changes will be added to the files.

It was reported that one of the Thorium irradiations with a copper capsule rather than Al had been completed. The dose rates were six to ten times lower with the copper capsule. The change to copper is a success in reducing the dose rates.