

Present

ESS: Yongjoong Lee, Tom Shea

FRIB: Aida Amroussia, Frederique Pellemoine

CERN: Marco Calviani, Antonio Perillo Marccone

BNL: Chris Cullen, Leonard Mausner, Nick Simos

KEK: Taku Ishida

PNNL: Dave Senior

FNAL: Patrick Hurh, Bob Zwaska, Kavin Ammigan

Notes

- Leonard clarified that beam power during our irradiation run will vary between 156-165 μA , due to RHIC sharing the Linac proton beam. Impact on peak temperature fluctuations needs to be determined. Also, beam downtime is expected during loading/unloading of isotope targets (about every other week), and during occasional maintenance.
- Cooling water temperature is 70 F (21 C).
- Path to design/fabrication
 - User to design/fabricate specimens and capsules as well as responsible for capsule welding
 - CERN has facilities onsite
 - ESS will partner with local facility
 - BNL to design/fabricate capsule holder, target basket, and provide drive box
 - FNAL can perhaps 3D print capsule holder and ship to users to ensure that their capsules fit correctly
 - FNAL will share weld prep drawing for TIG welding in Ar/He. Different from weld prep in BNL drawings for EB welding in vacuum.
 - FNAL also used a 'coining' process to bend over the edges of the window after welding. This removes the weld distortion in the windows.
 - BNL will repeat leak checking of all capsules upon receipt and before installation.
- Kavin to draft an interface document to list responsibilities of each institutions
- BNL recommends removing convective heat transfer boundary condition on radial edge of specimen layers.
- Need to investigate thermal gap conductance in vacuum!
 - 2000 $\text{W}/\text{m}^2\text{K}$ typically used by BNL for machined surfaces under 2 atm pressure.
 - Nick used 400 $\text{W}/\text{m}^2\text{K}$.
 - FNAL analysis used 200 $\text{W}/\text{m}^2\text{K}$.
- Should obtain quotes to determine number of Be specimens that we can afford.
- Need to extract surface heat flux on SS window to help determine possibility of boiling water. Heat fluxes less than 200-275 W/cm^2 is usually safe.

- Desired irradiation temperature for KEK Ti specimens is 85 – 150 C (for current 350 kW beam power and for future higher power).
 - FRIB is flexible in regard to irradiation temperature (100 – 300 C)
- FRIB will need to redesign their filler CTE specimen. BNL dilatometer can only accommodate maximum cross sectional dimensions of 4 x 4 mm.
- ESS Al thermal analysis
 - Assumed 10 μm gas gap in axial direction, and 50 μm gap in radial direction.
 - Cooling water HTC $\sim 5500 \text{ W/m}^2\text{K}$.
- BNL may have capability to perform TEM with irradiated specimens in the future.
- CERN update
 - Will be ready to present thermal analysis, capsule change frequency, and activity results in about 1 month. Simulations are ongoing.
 - Will coordinate with Makimura-san on SiC coated graphite specimen availability and geometry.
 - Plan to use just one type of Silicon in capsule (polycrystal)
 - BNL recommends changing capsules when isotope targets are also being replaced (about every 2 weeks).
- Activity/dose limits on BNL site (ballpark numbers)
 - For X-ray diffraction: $< 10\text{mR/hr @ 1ft}$
 - Operator dose outside of isotope extraction hot cell $< 40 \text{ mrem/hr @ 1ft}$
 - Hot cell has inner $\frac{1}{2}$ " steel wall, 6" lead, and $\frac{1}{2}$ " steel outer wall shielding
 - For calculations, source is assumed 2 ft from inner wall, and operator 1 ft from outside wall.
- Time for capsule shipment from institutions to BNL will be added to project schedule
 - Capsule shipment to BNL in early December so that BNL receives the capsules by Jan 1st, 2017 at the latest.
 - Chris Cullen will coordinate and review all drawings/designs with those at BNL
- Next meeting will be scheduled in about 4 weeks.