



RaDIATE

May Technical Meeting
BLIP Irradiation Planning

May 04 2016

Radiation Damage In Accelerator Target Environments



Agenda

- RaDIATE news
- Update on BLIP Irradiation plans
- Interface document
- Specimen capsule update
 - Ir/TZM/Si (CERN)
 - Al (ESS)
 - Ti (FRIB)
 - Be/C (FNAL)
- Next steps and schedule
- Other questions/issues



Meeting documents

posted on RaDIATE website

- Current slides
- Updated proton energy budget (04.29.16)
 - Draft energy budget for test matrix
 - Individual capsule info
- Interface document (draft version)
- Capsule design update presentations
 - TZM, Ir & Si: CERN
 - Al: ESS
 - Ti: FRIB
 - Be & C: FNAL



RaDIATE News

- 3rd Annual RaDIATE Collaboration Meeting
- Hosted by PNNL in Richland, Washington.
- September 7-9, 2016
- [Meeting website](#)



BNL BLIP Irradiation Update

- BLIP beam parameters
 - Rastered beam operational
 - BLIP current: 156 - 165 μA for our run next year
 - Impact on specimen peak temperature needs to be evaluated?
- Higher beam time cost expected
 - Due to RF tube maintenance caused by increased beam intensities
 - May restrict irradiation time to around 10-12 weeks at 181 MeV
- Other BLIP operation updates from our BNL colleagues?



BNL BLIP Irradiation Update

- Updated proton energy budget
 - Specimen layers and capsules content finalized!
 - Si capsule revision – energy loss in SiC coated graphite layer updated
 - Assumed 1 mm layer as graphite only
 - Now have ~2.42 MeV to spare
 - Need to confirm capsule SS window thickness
 - Proton energy budget worksheet shows 0.009”
 - BNL drawings show 0.012”



BNL BLIP Specimen Capsule

- Need to confirm SS window thickness
- Specimen capsule drawings
 - BNL drawings for electron beam welding in vacuum
 - Drawing no. [D25-M-3462](#)
 - FNAL drawings for TIG welding in Ar/He
 - Slightly modified design and process
 - Coining process to bend over edges of window after welding to remove any weld distortion
 - Drawings no. [481069](#), [481067](#), [481288](#), [481287](#)
- Heat flux on capsule window surface $< 200 \text{ W/cm}^2$ to prevent water boiling
- PNNL W tensile specimen drawing updated
 - [W tensile geometry_042216.pdf](#)



Interface Document

- Draft posted on RaDIATE website
- Outlines responsibilities/roles
 - between users and BNL
 - Between different users collaborating on same capsule.
- Comments/Suggestions?



Specimen Capsule Update

- TZM, Ir, Si
 - CERN

- Aluminum alloys
 - ESS

- Ti alloys
 - FRIB/KEK/FNAL

- Beryllium & Graphite
 - FNAL



Next Steps

- Finalize each capsule design
 - Drawings of specimens and filler pieces
 - Capsule drawings
 - Forward 3D models & drawings to BNL for review
 - Initiate procurement process

- Full FLUKA analysis of target box
 - Estimate activity of specimens and target box
 - Operator dose outside isotope extraction hot cell
 - Evaluate impact of proton flux degradation on isotope yield during irradiation run

- Preparation of safety document for BNL review



Schedule

Tasks	2016									2017			
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Finalize BLIP test matrix	█												
Capsule design and thermal analysis	█	█	█										
BNL review of capsule design			█	█									
Specimen procurement & fabrication				█	█	█	█						
Specimen capsule procurement & fabrication				█	█	█	█						
Specimen pre-irradiation characterization							█	█					
Capsule assembly, welding, leak checking								█	█				
Shipment of capsules to BNL									█				
Full FLUKA analysis of target box		█	█	█	█	█							
Safety document preparation				█	█	█	█	█	█				
Vacuum degrader design/fabrication						█	█	█	█				
Capsule holders and basket design/fabrication						█	█	█	█				
Target box assembly									█	█			
Target box Irradiation											█	█	█