

Status Update on Lead Collars For C100s

8 May 2017

R. Legg

Reason behind work

- CEBAF ran from 5/23/16 at ~1600 until 6/22/16.
- Total RF time 619.5 hrs. NL24 gradient was 96 MV/m, NL25 was running at 80 MV/m.
- Poly shielding made no appreciable difference in doses around the beamline exit from the CM.
 - Indicates dose is predominately from high energy photons.

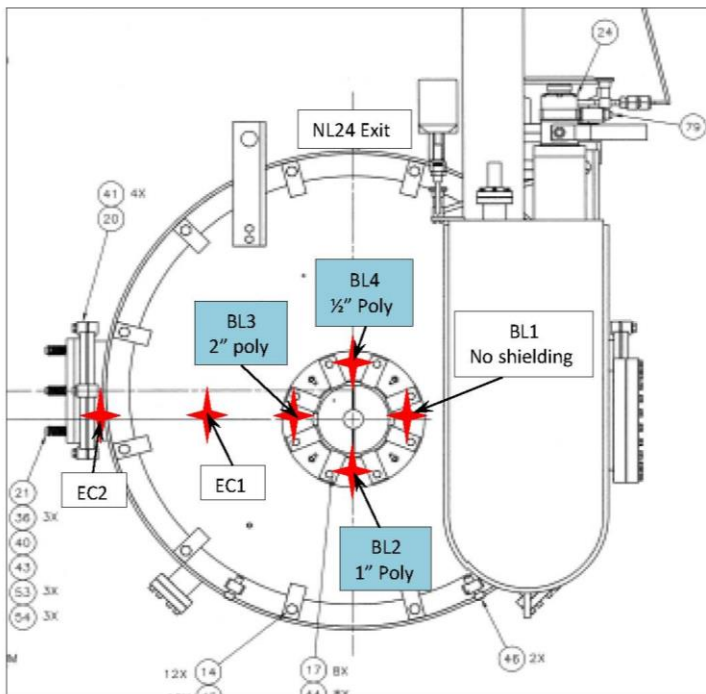


Fig 1 – Output end of NL24

Location	Dose (krad)	Dose rate (rad/h)
BL1	762.7	1231
BL2	876.2	1414
BL3	689.2	1113
BL4	809.1	1306
EC1	65.9	106
EC2	46.9	76

Table 1, Dose at NL24 exit

Radial Distribution of Radiation

- The dose seen at the end of NL24 is **concentrated** around the beam line.
- RadCon analysis (K Welch) determined at least a factor of 5x reduction can be expected if the photons can be shielded 10 cm (4") around the beamline
 - This was used as a shielding design requirement basis.

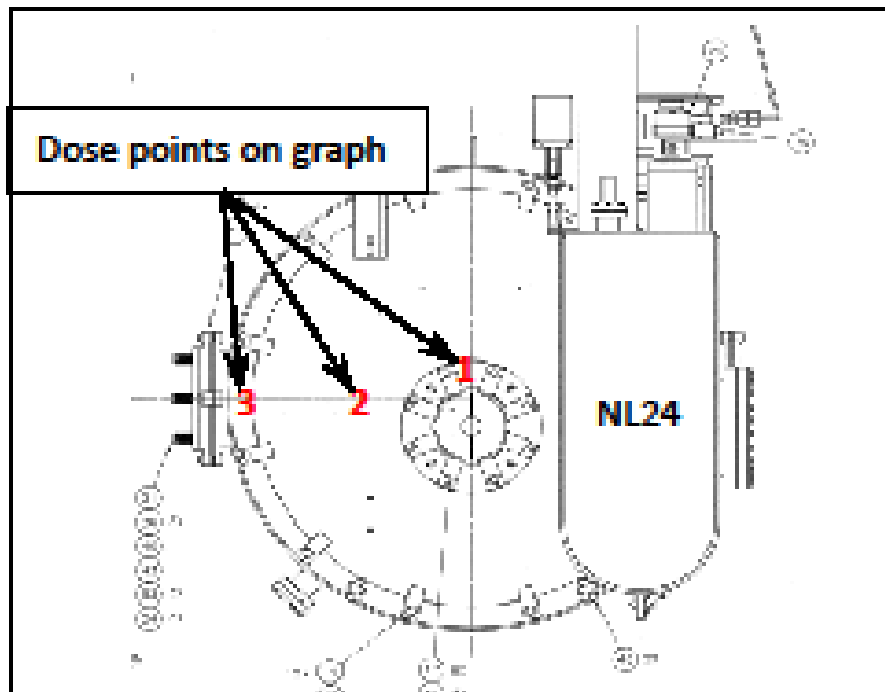


Figure 5, Monitoring points shown in Fig 6

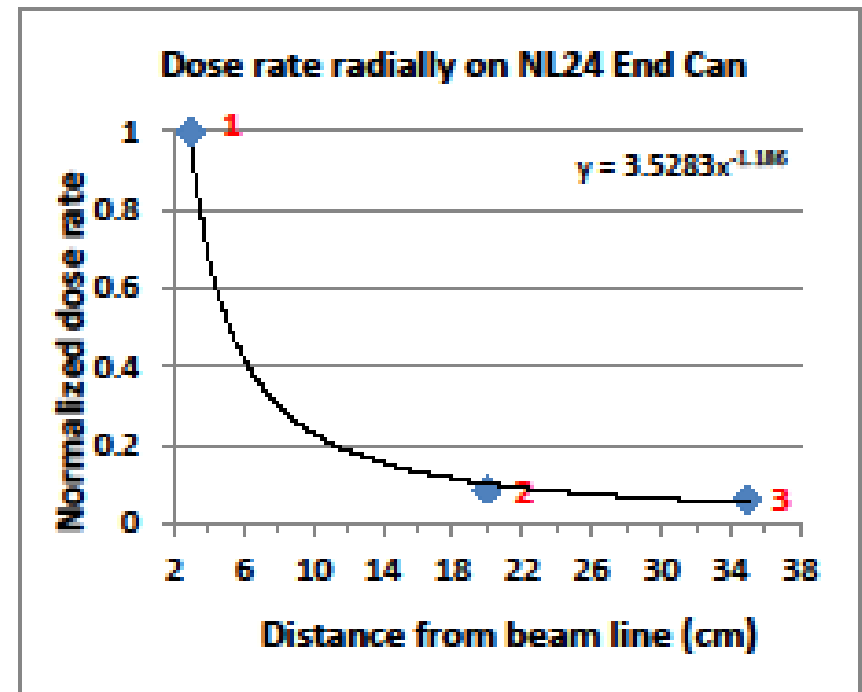


Figure 6, Radial dose rate in warm region

Tight spot for Shielding

- The area at the end of the cryomodules is very congested. Shield must be as thin as possible and machining is required.

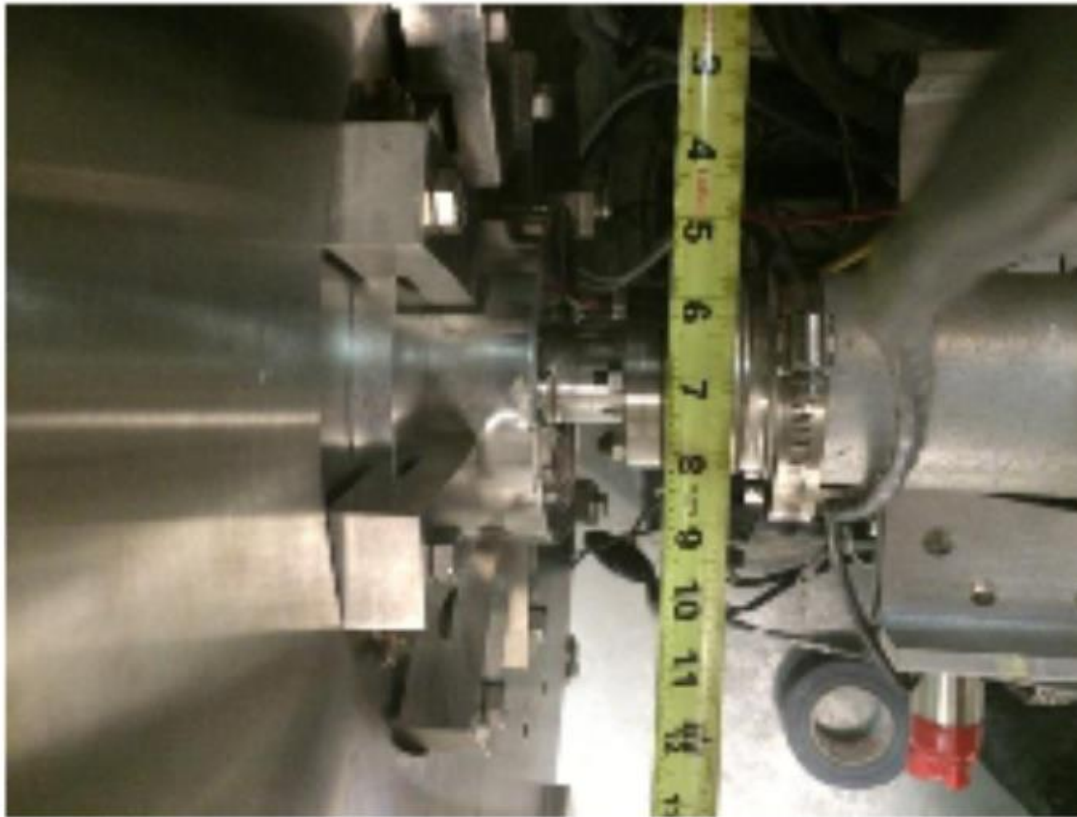
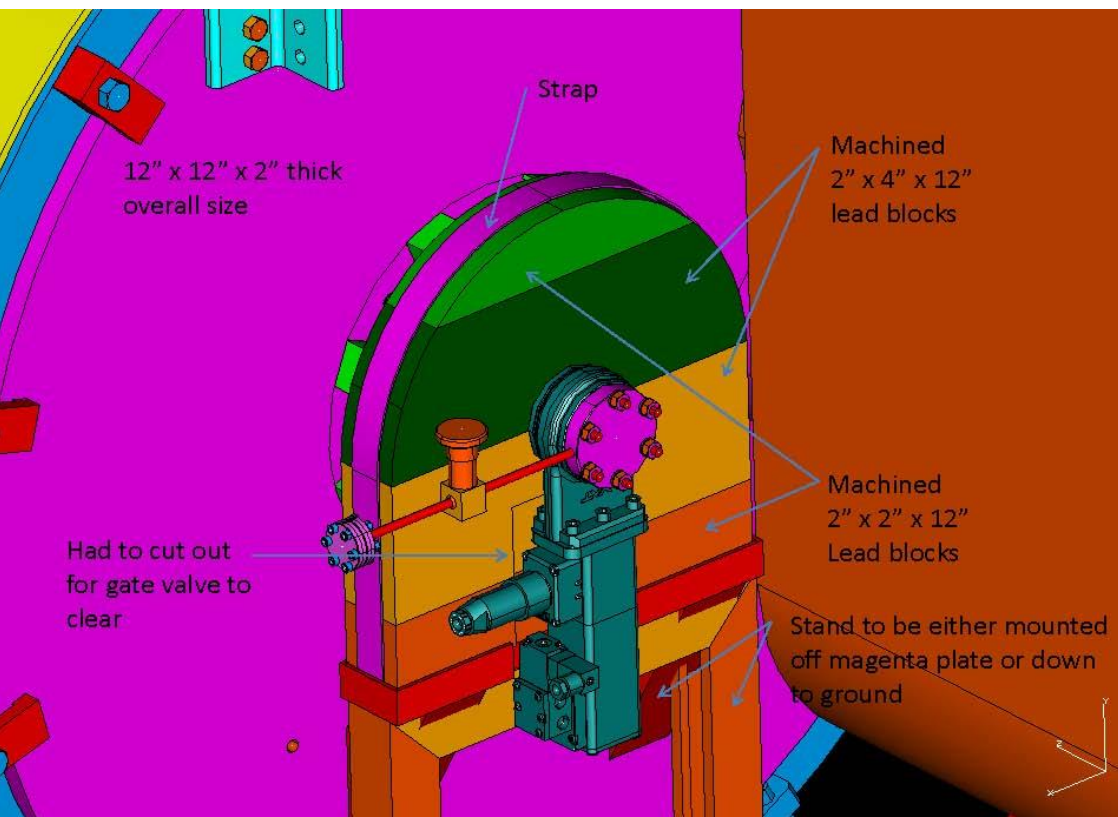


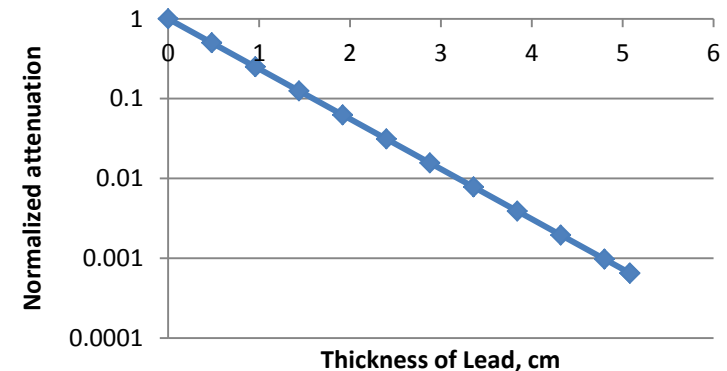
Figure 8, Clearance radially near CM

Shield for end of module

- 2" thick lead is about 10 half layers for photons. Expected attenuation is about 2^{10} or 1000x for photons passing through the shield.
- Estimate from RadCon is general reduction of 10x in girder region.



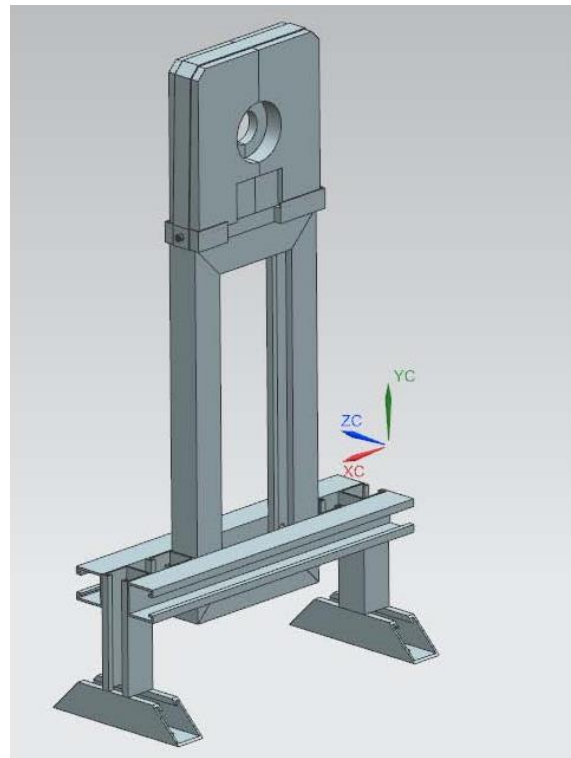
Attenuation of Photons in Lead



* Not as pretty as this since HVL in lead varies from 0.4 to 0.6 cm from 1 to 100 MeV.

Supporting the Weight

- Even with a thin shield, the weight of the lead makes a floor support very desirable.
 - Decided to avoid adding stress at end plate.
 - A floor support fits easily and was used in the final design.



Cost and Timeline

- Designer time was about 2 weeks
- Procurement took about 4 weeks
- Cost for procurements for single article was \$1185 or \$6800 for eight (one between all C100's)
- Bought one to check fit and operation
- Delivery is 5/12
- Installation is 5/15
- Test when 2K

[illegible]