

# C100 Lead Collar Update

9 April 2018

# 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.

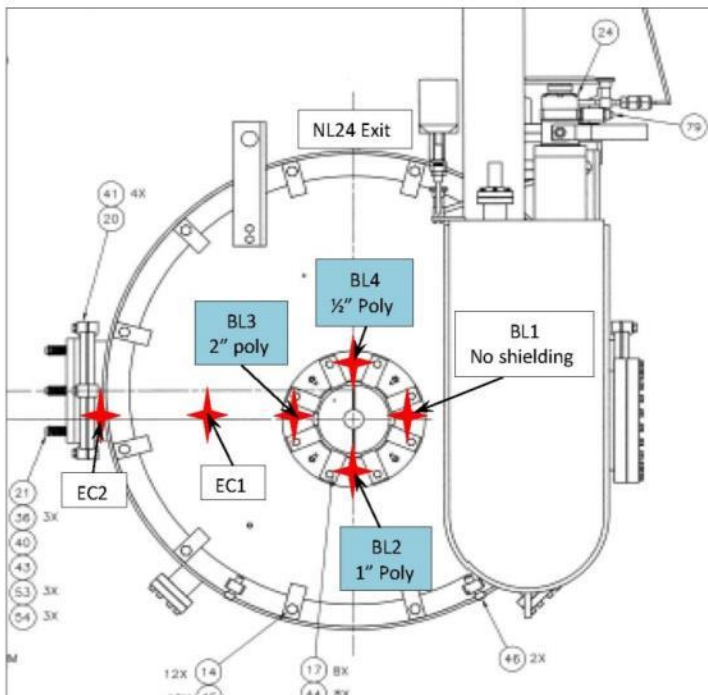


Fig 1 – Output end of NL24

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.

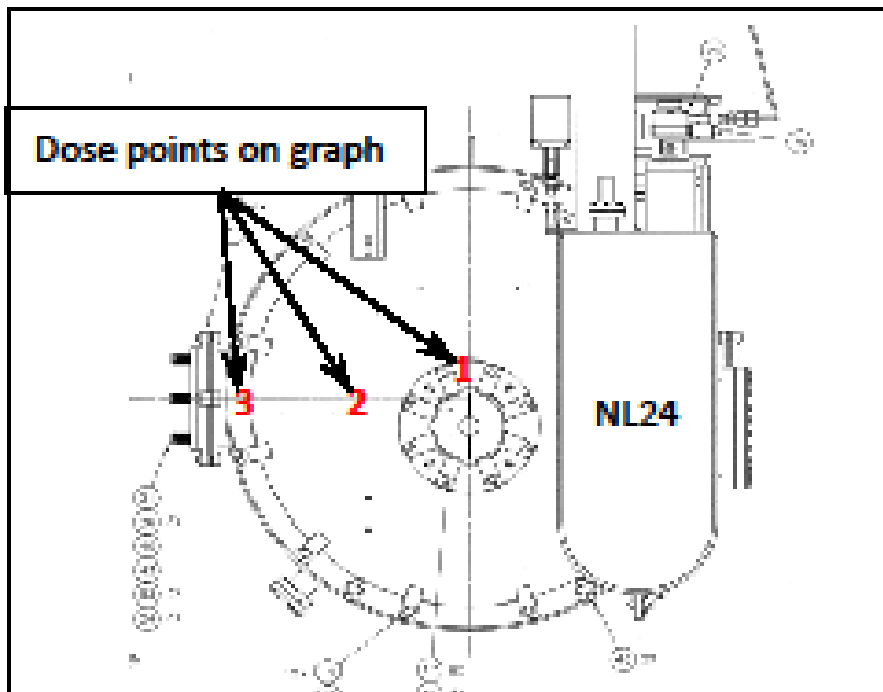


Figure 5, Monitoring points shown in Fig 6

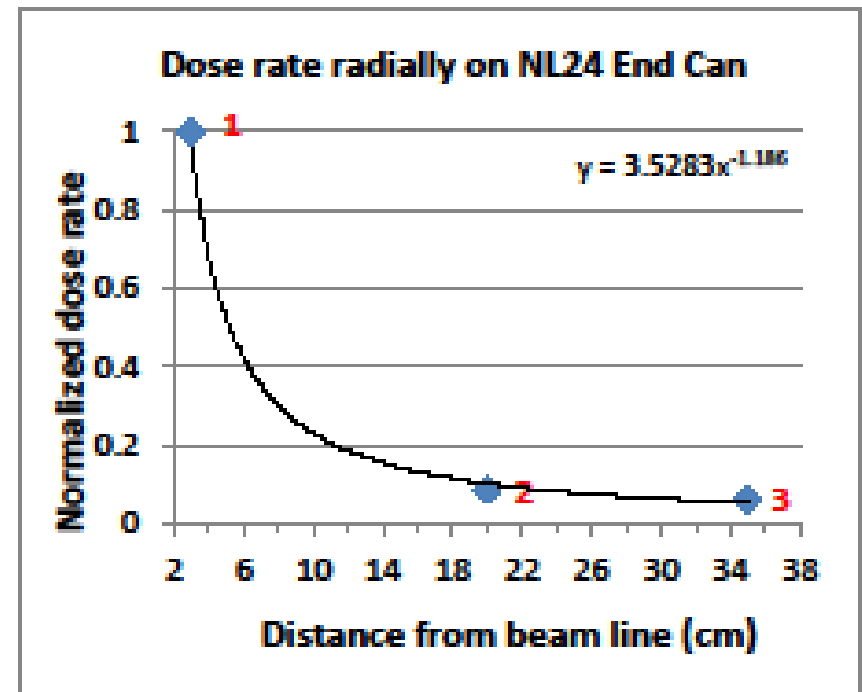
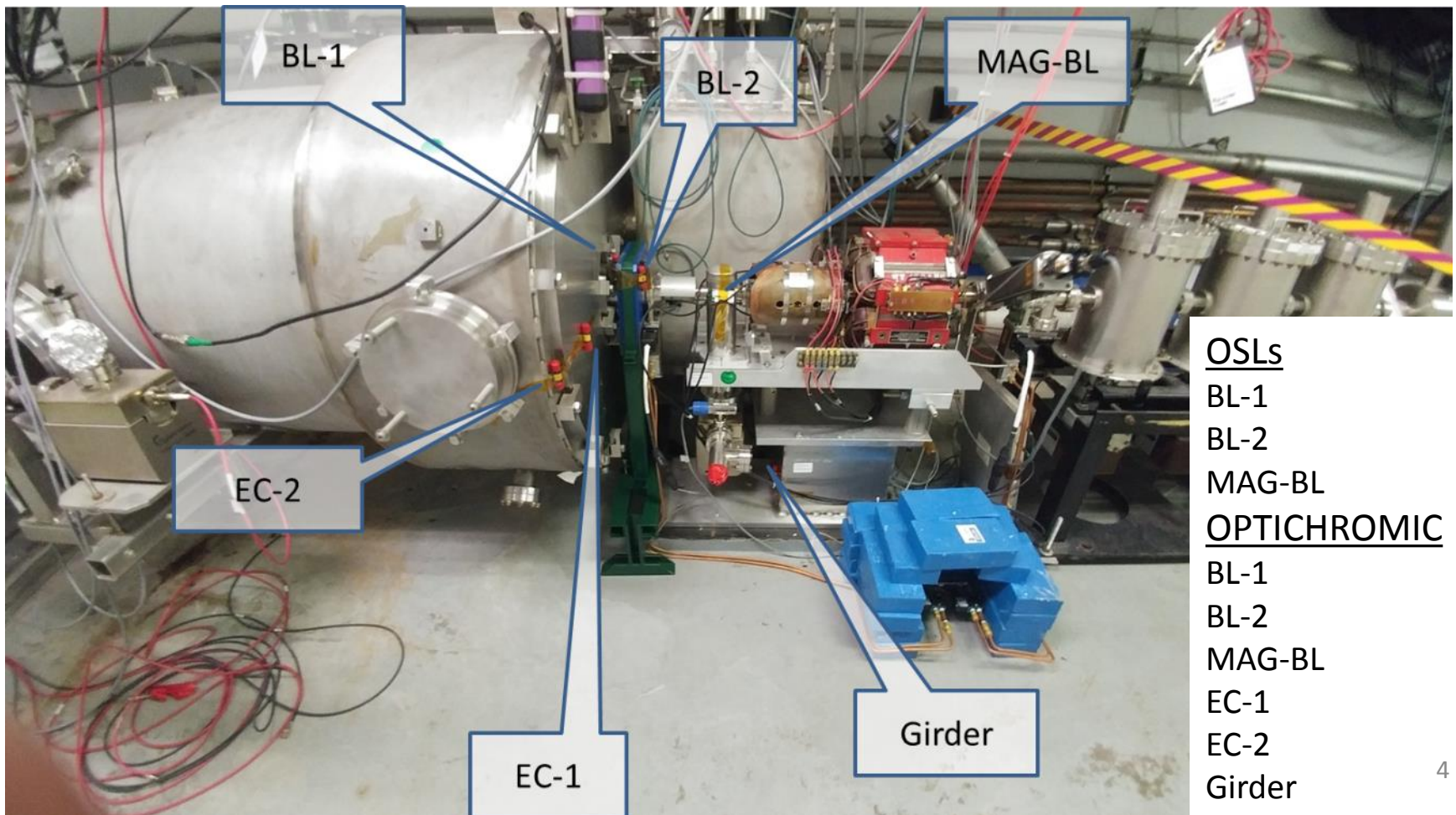


Figure 6, Radial dose rate in warm region

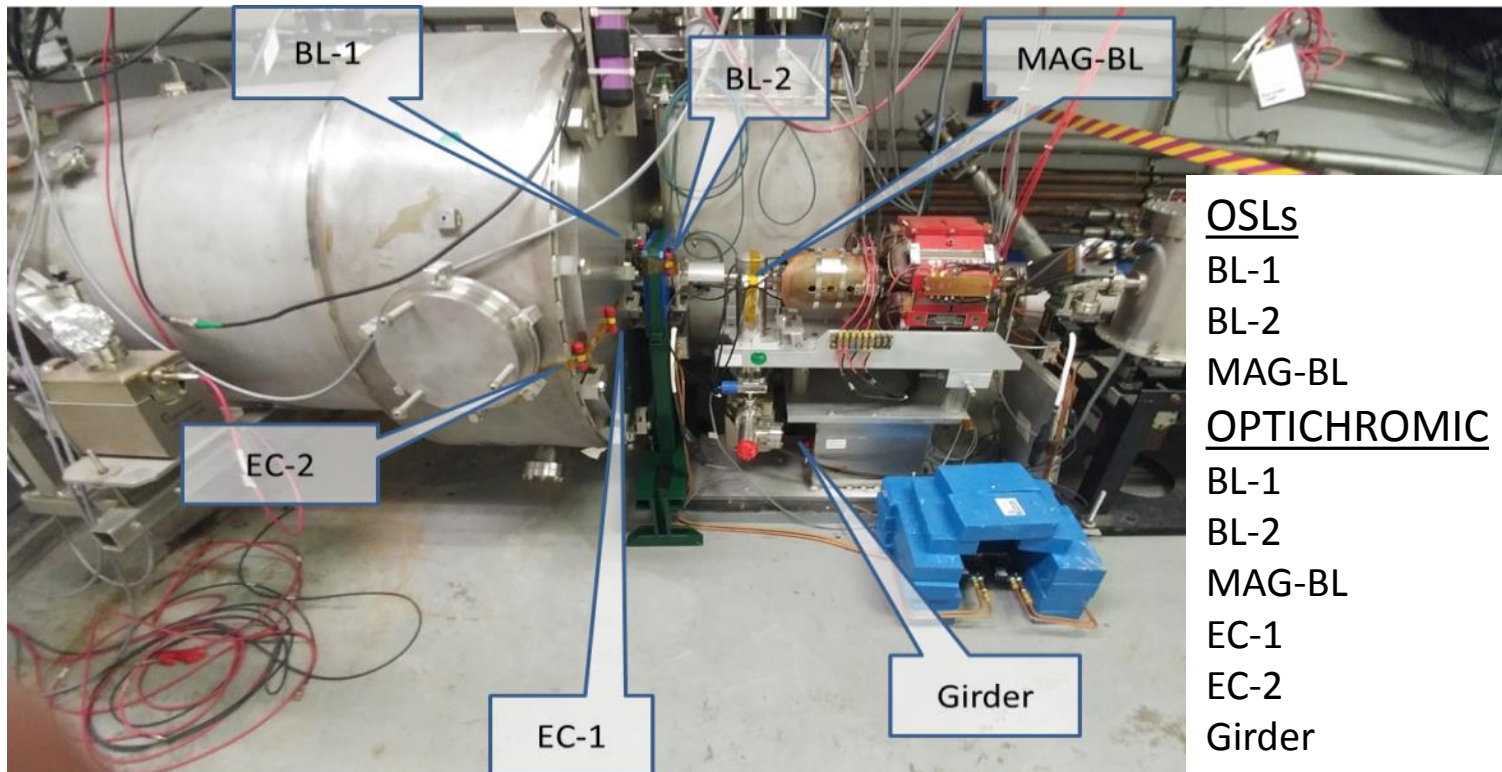
# Pb collars Installed on 1L25 and 1L26 Nov 1, 2017

- End of 1L26 instrumented with dosimetry similar to PRAD run in previous slide.



# Intent of Pb was Reduce radiation on girder

- Removed OSL (low dose) dosimeters on Nov 6<sup>th</sup>; readings back 11/20/2017 all were maxed out at 1000 rads.
  - Estimated integrated beamline dose cross ‘calibrated’ using BLMs to PRAD and ion chamber tests, ~4.5 – 7.5 Krad over 53 hours of rf on; about 100 Rad/hr at reduced gradients.
  - DecaRads HV turned off Nov 13<sup>th</sup> to slow failure rate; D06 head replaced after 1L26 run





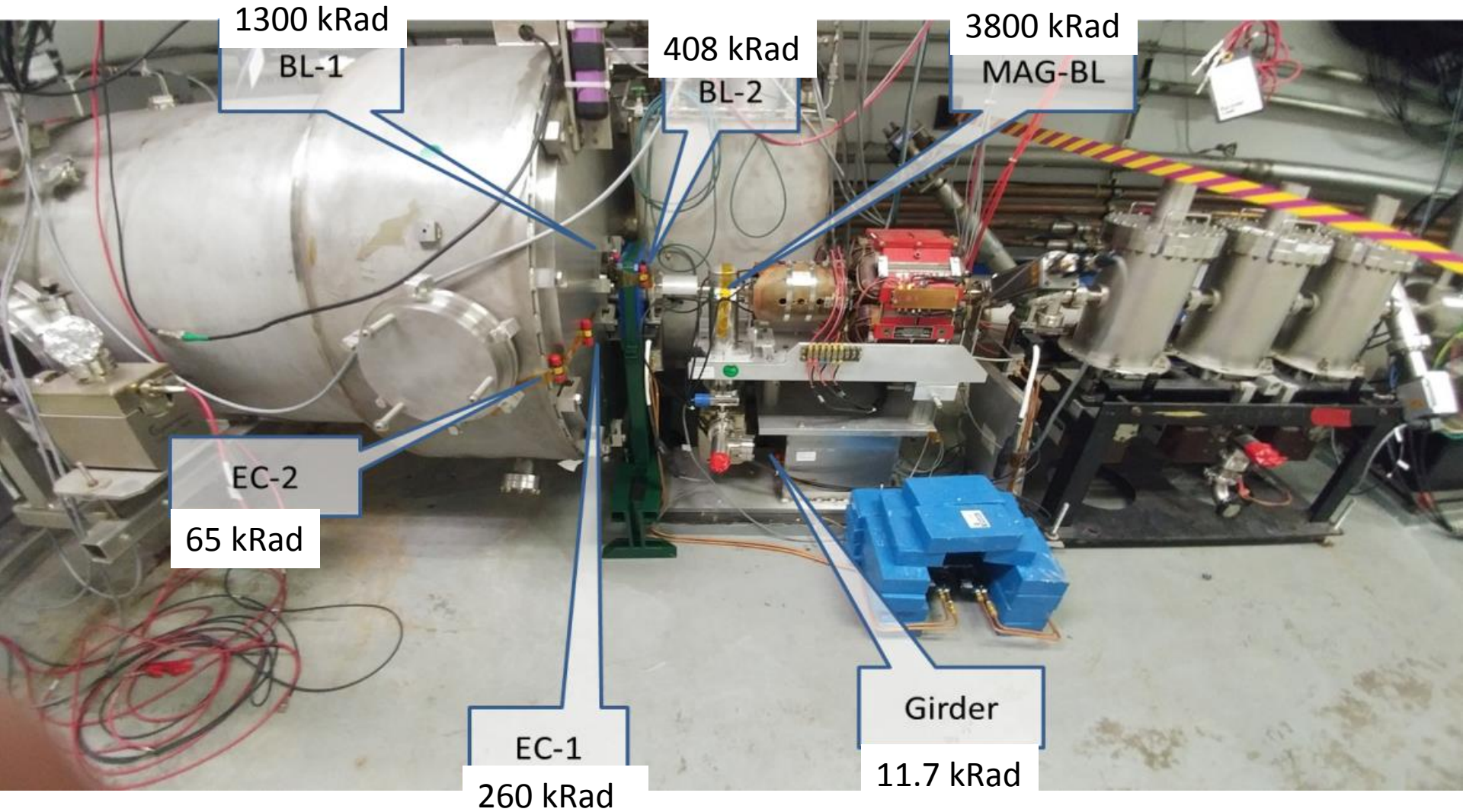
# High range dosimeters' left in place Nov 1 – 27, 2017

## Dosimetry Read

Serial #	Rod	600nm	656nm	
GIRDER(70-40m)	1	.838	.101	11.7KR
GIRDER(70-40m)	2	.837	.100	11.7KR
GIRDER(70-83)	1	.285	.087	
GIRDER(70-83)	2	.274	.064	
BL-1(70-40m)	1	2.55	1.89	
BL-1(70-40m)	2	2.59	1.75	
BL-1(70-83m)	1	2.55	0.741	1304 KR
BL-1(70-83m)	2	2.54	0.740	1300 KR
BL-2(70-40m)	1	2.58	0.542	
BL-2(70-40m)	2	2.58	0.546	
BL-2(70-83m)	1	2.52	0.266	452 KR
BL-2(70-83m)	2	2.57	0.219	368 KR
EC-1(70-40m)	1	1.6	0.18	
EC-1(70-40m)	2	2.6	0.38	
EC-1(70-83m)	1	1.975	0.16	263 KR
EC-1(70-83m)	2	1.76	0.158	260 KR
EC-2(70-40m)	1	2.57	0.210	
EC-2(70-40m)	2	2.52	0.176	
EC-2(70-83m)	1	0.611	.093	68 KR
EC-2(70-83m)	2	0.572	.097	63 KR
MAG-BL(70-40m)	1	2.057	2.34	
MAG-BL(70-40m)	2	2.127	2.13	

[illegible]

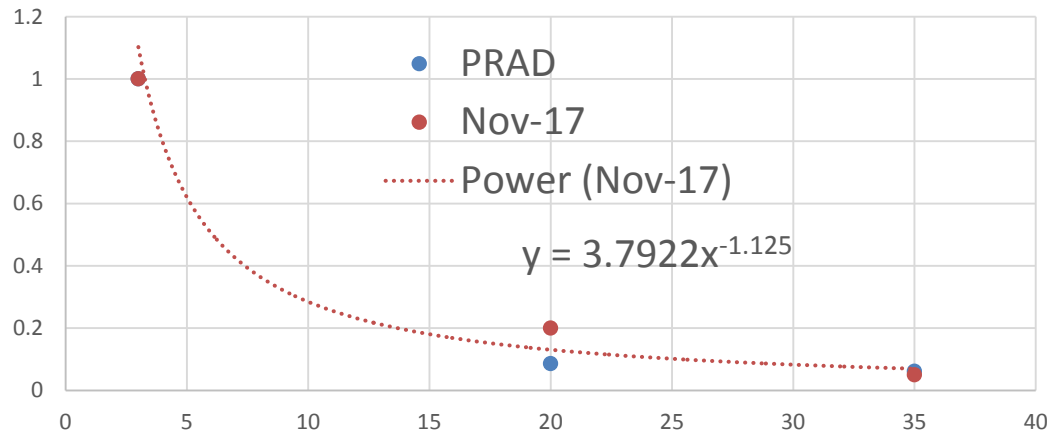
– No beam, 492 hours of rf on, 135 hours rf and quads on



–Just over 7.7 kRad/hr on beamline at girder MAG-BL

# Good and bad news

- Good – Data fits closely with PRAD dataset. Lead collars did attenuate radiation by 3x from one side to the other.



- Bad – Core of radiation cone which passes through the shielding in the beam pipe gave a dose at the girder 3x higher than measured on the face of the cryomodule.

No point in adding more lead; beam in pipe is major source.  
Move wires away from beam pipe.

Quads which might prevent FE from accelerating module to module should be run during rf recovery



# Qualitative results

