



Fermilab

Accelerator Physics Center

**LBNE ABSORBER SYSTEM, Version 4:
NORMAL OPERATION AND ACCIDENTS**
(extended version of 08/19/10)

Nikolai Mokhov

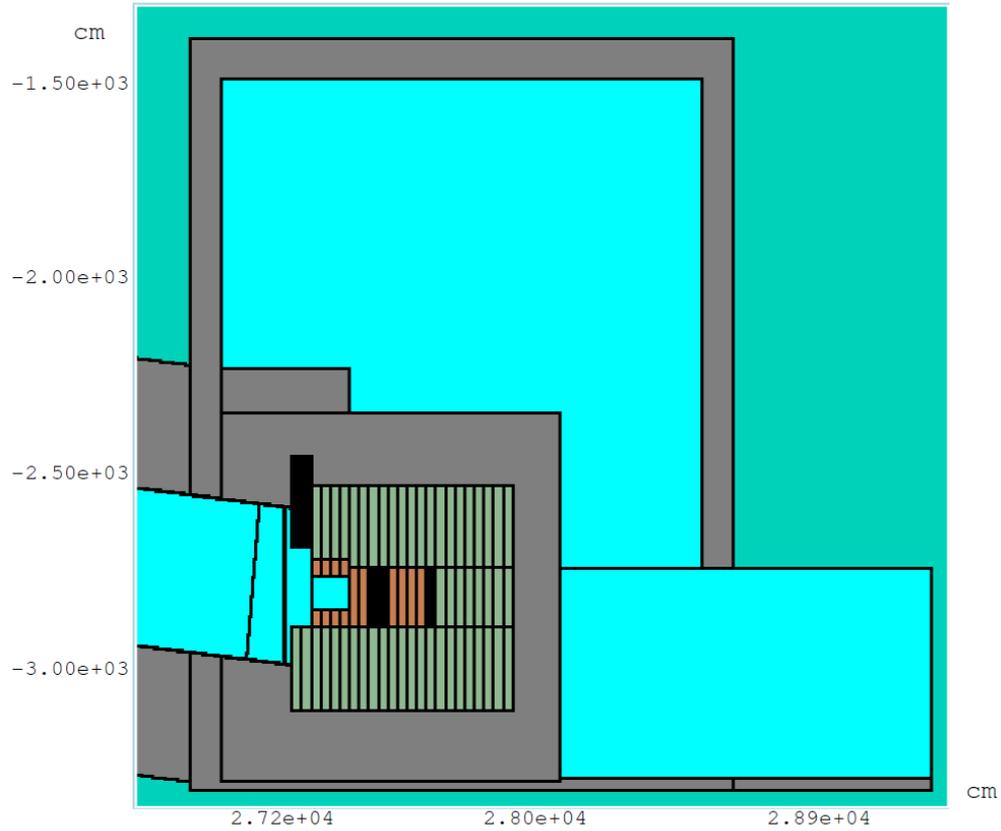
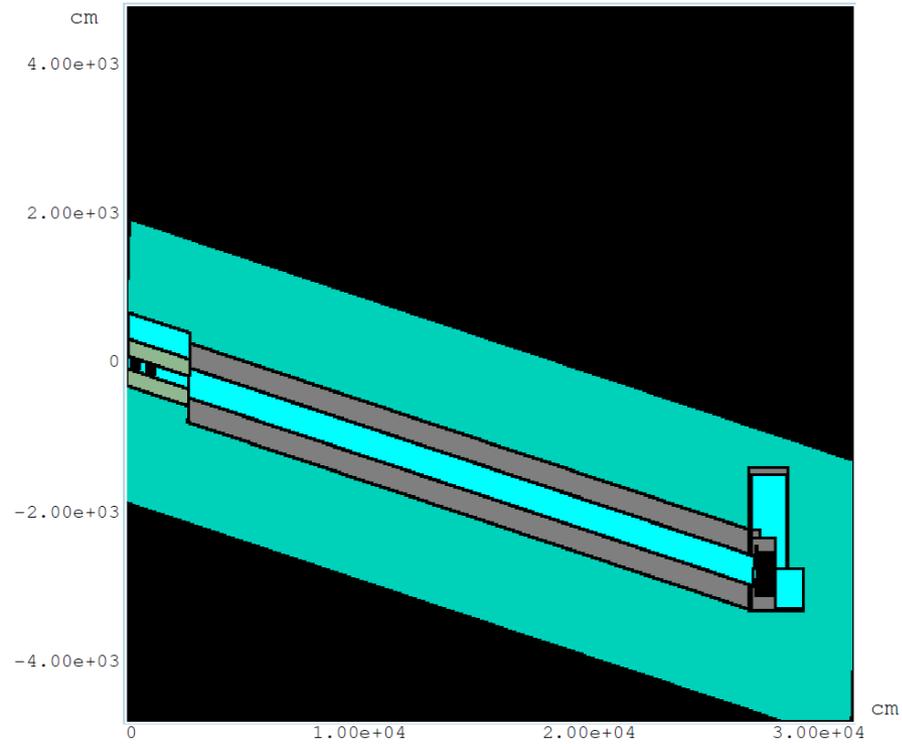
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LBNE Absorber Meeting

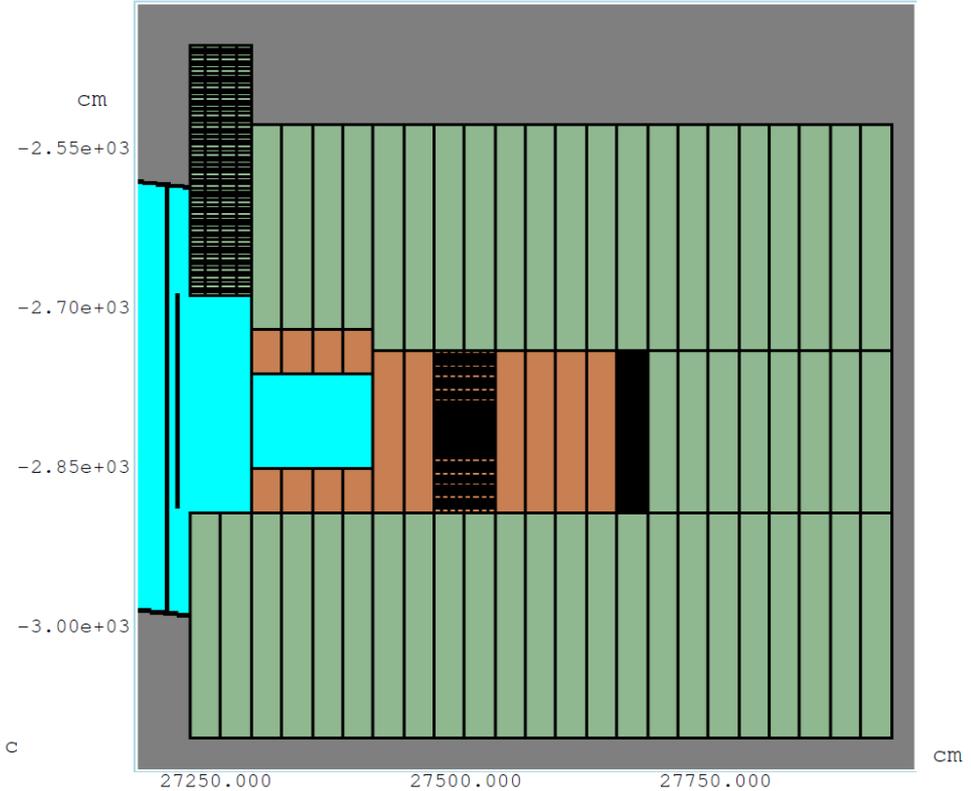
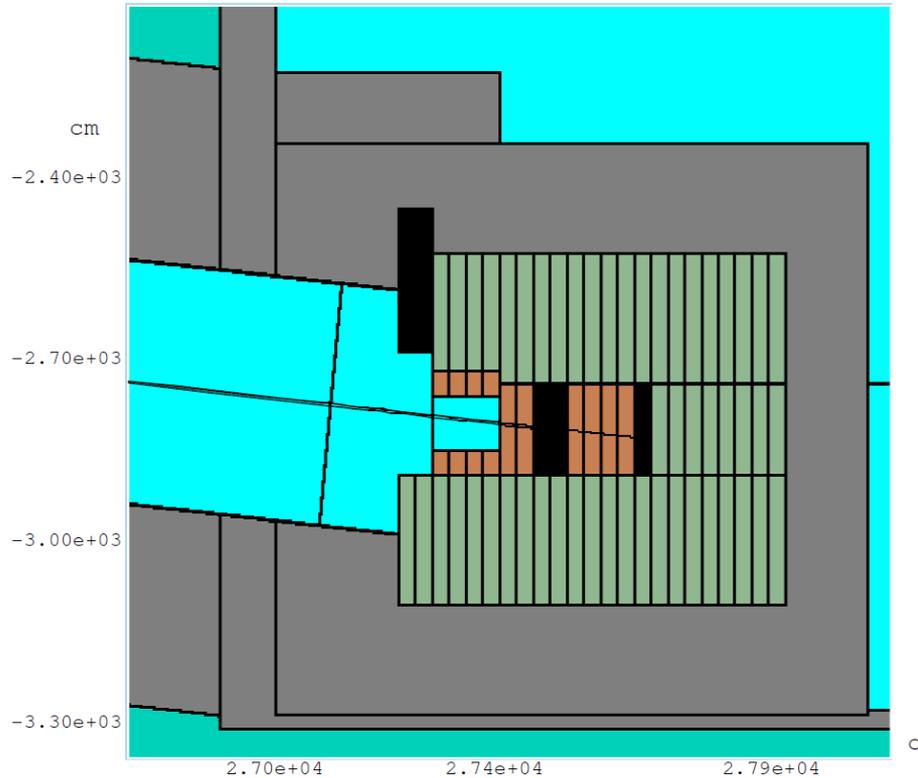
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July 19, 2010

MARS15 Model: Version 4



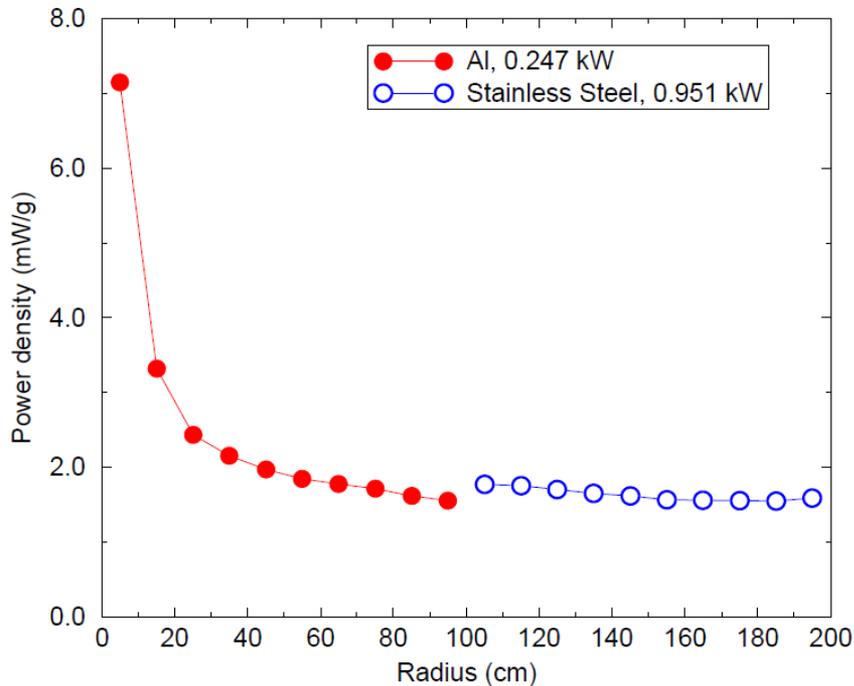
Absorber, Shielding, DK Cap, Hadron Monitor



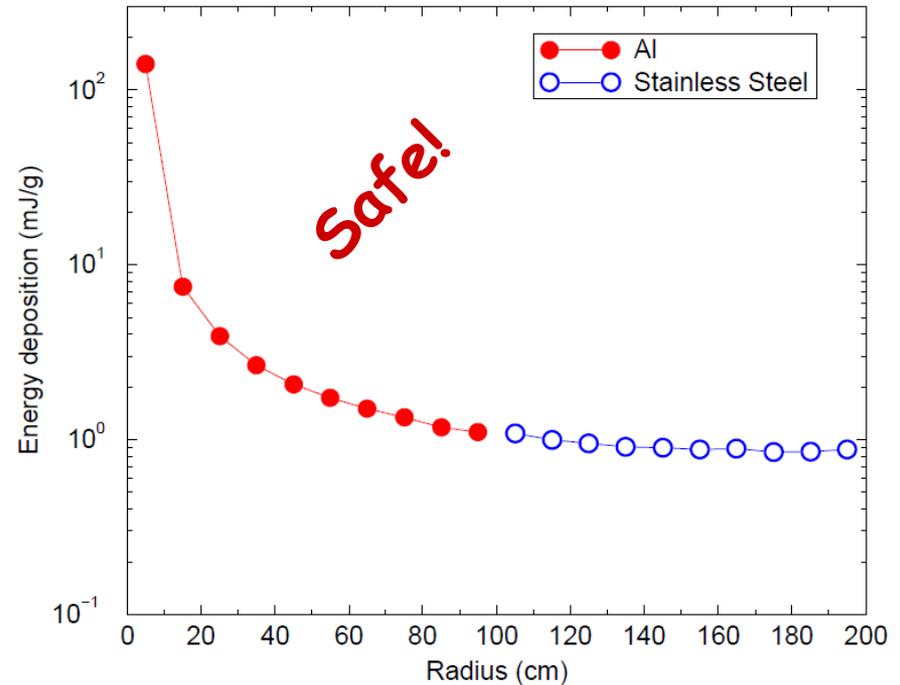
Normal operation and beam accident at 2.3 MW

Decay Pipe Endcap: Operational & Accident

Decay pipe cap



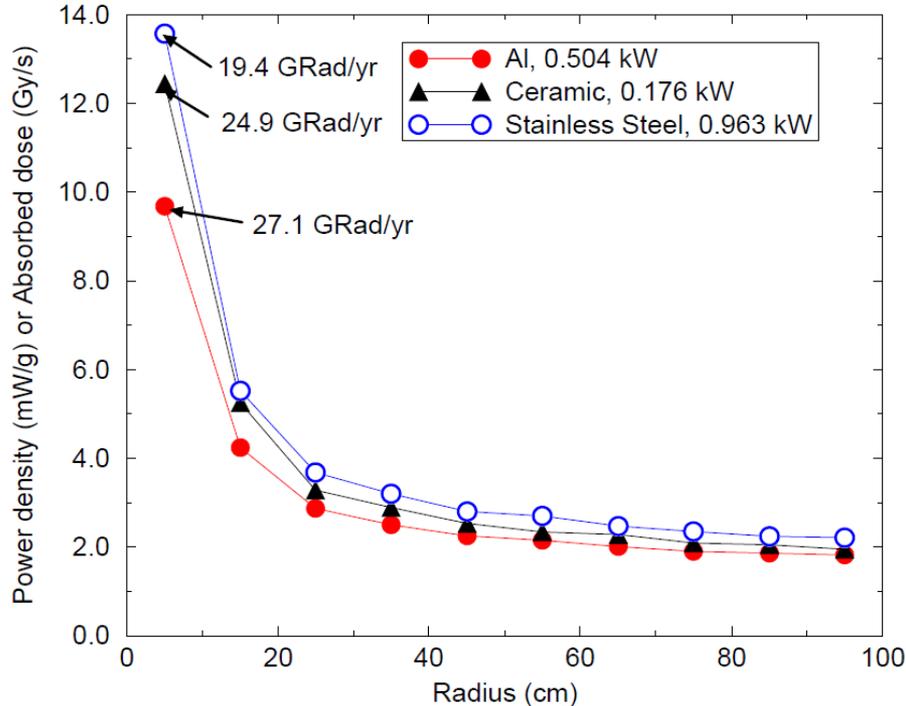
Decay pipe cap: Accident



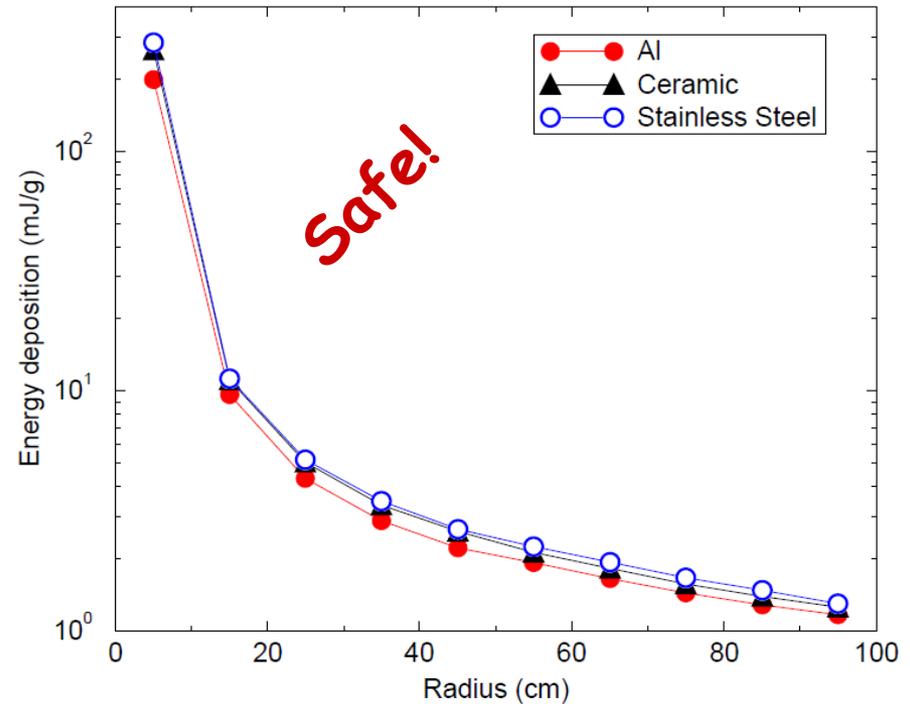
6-mm thick Al ($0 < r < 1\text{m}$) & SS ($1 < r < 2\text{m}$): Safe at 2.3 MW

Hadron Monitor: Operational & Accident

LBNE Hadron monitor



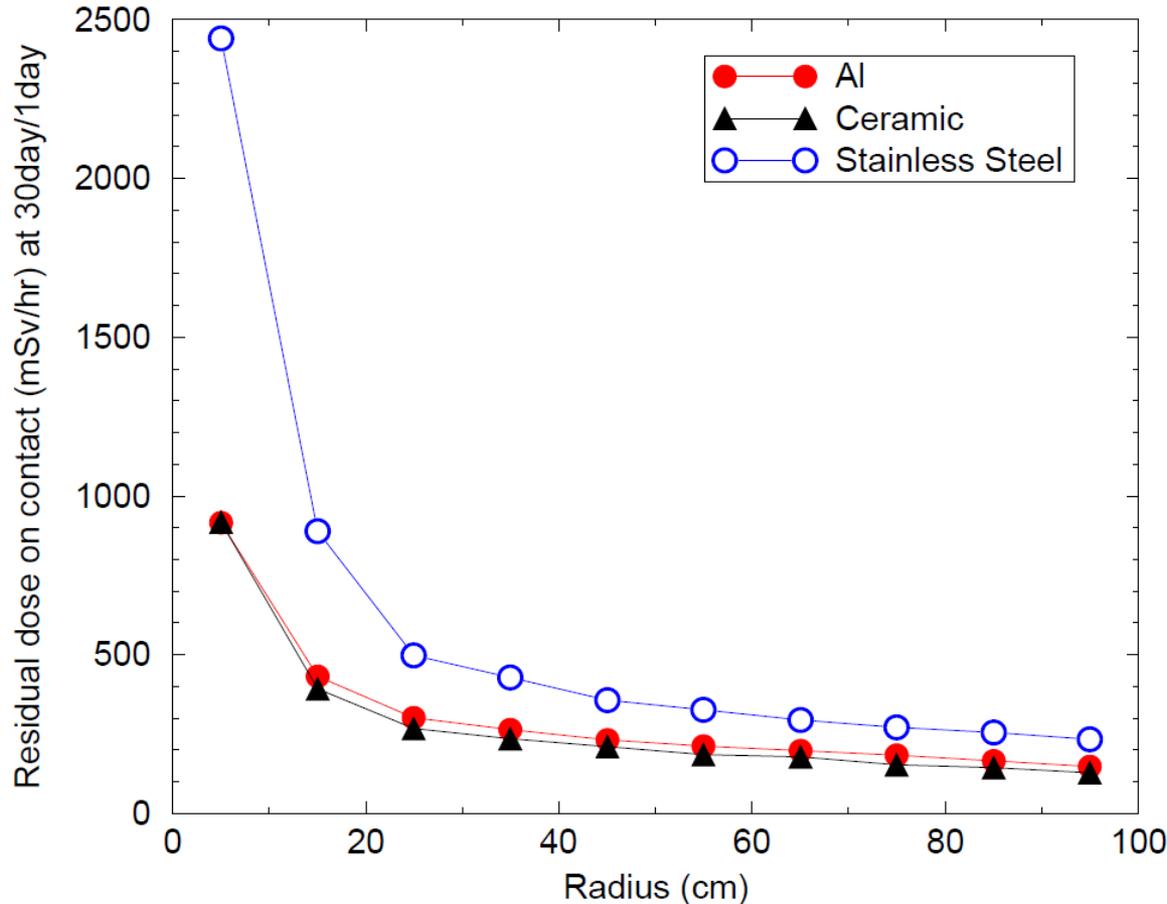
LBNE Hadron monitor: Accident



10-mm Al, 2-mm Ceramic, 5-mm SS ($0 < r < 1\text{m}$):
Safe at 2.3 MW

Hadron Monitor: Residual Dose on Contact

LBNE Hadron monitor

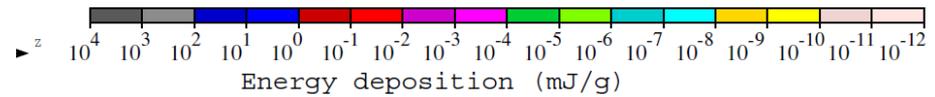
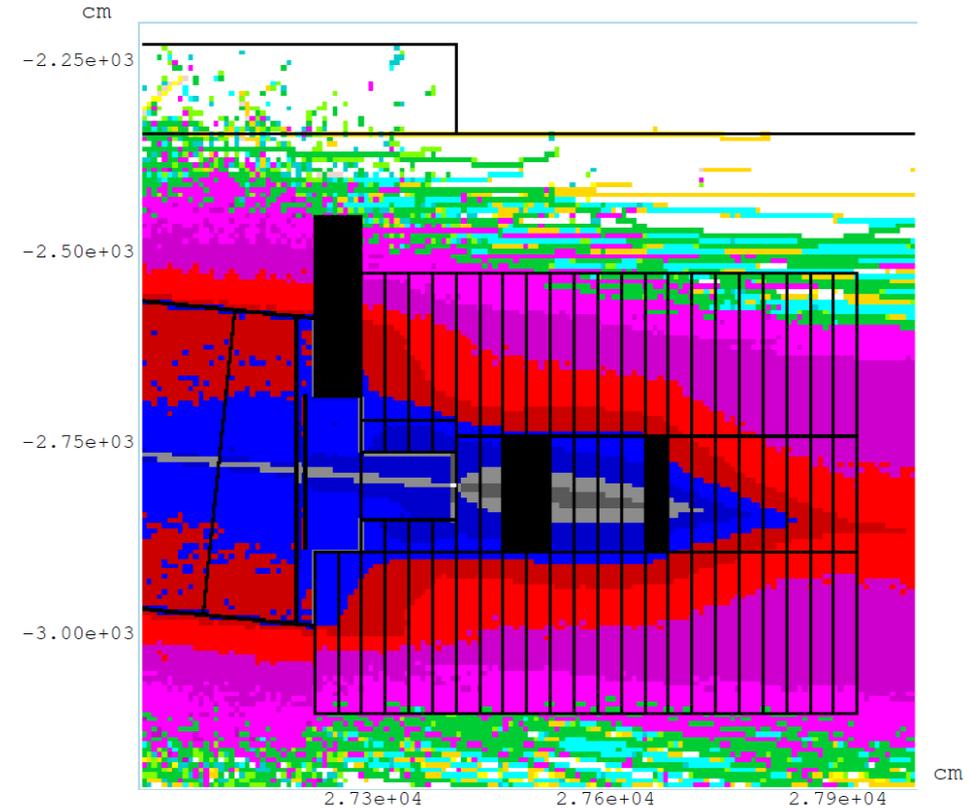
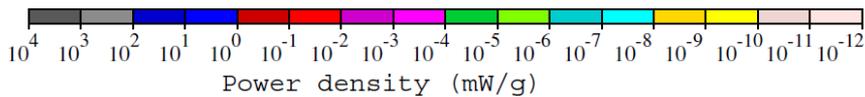
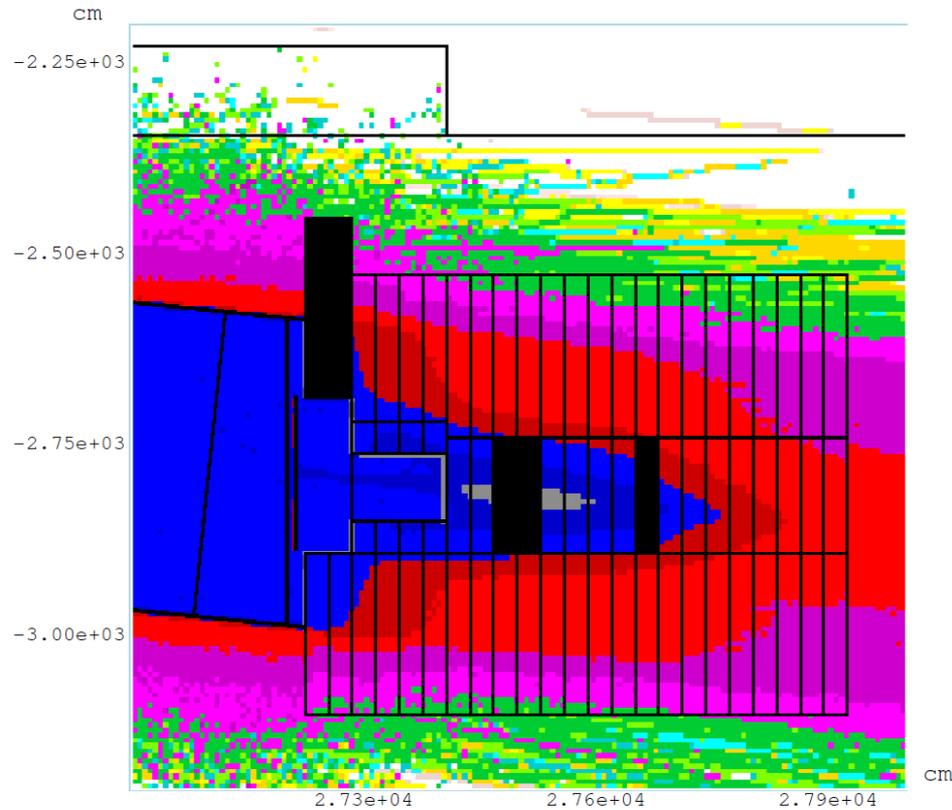


30-day irradiation
at 2.3 MW followed
by 1-day cooling

1 mSv/hr = 100 mrem/hr

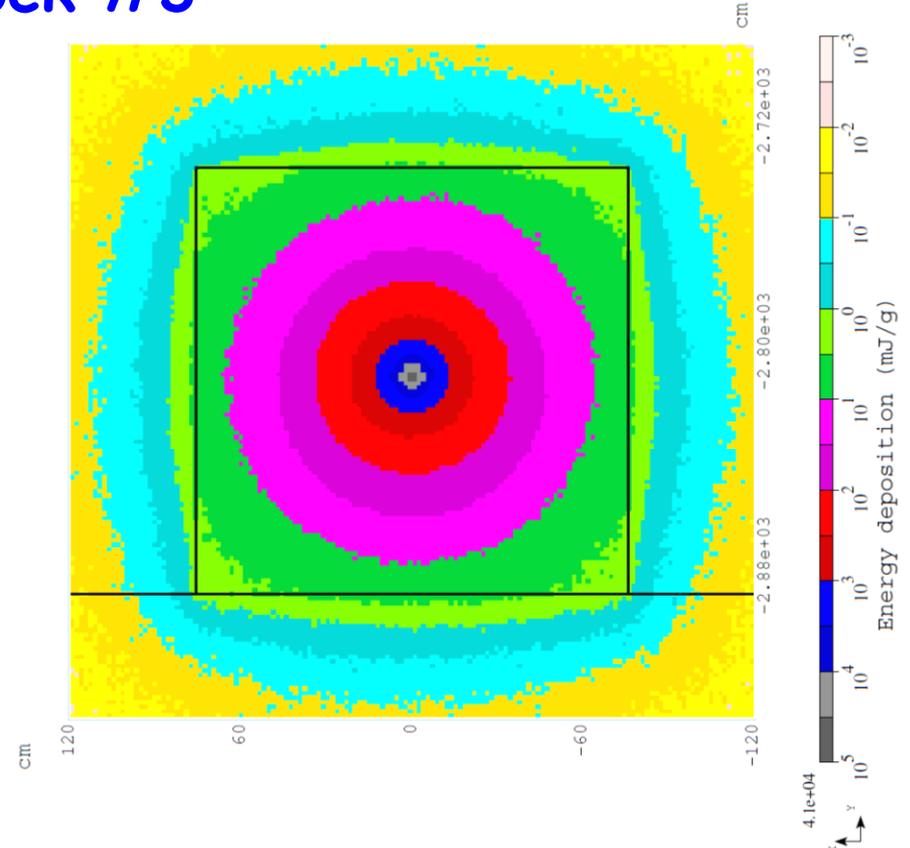
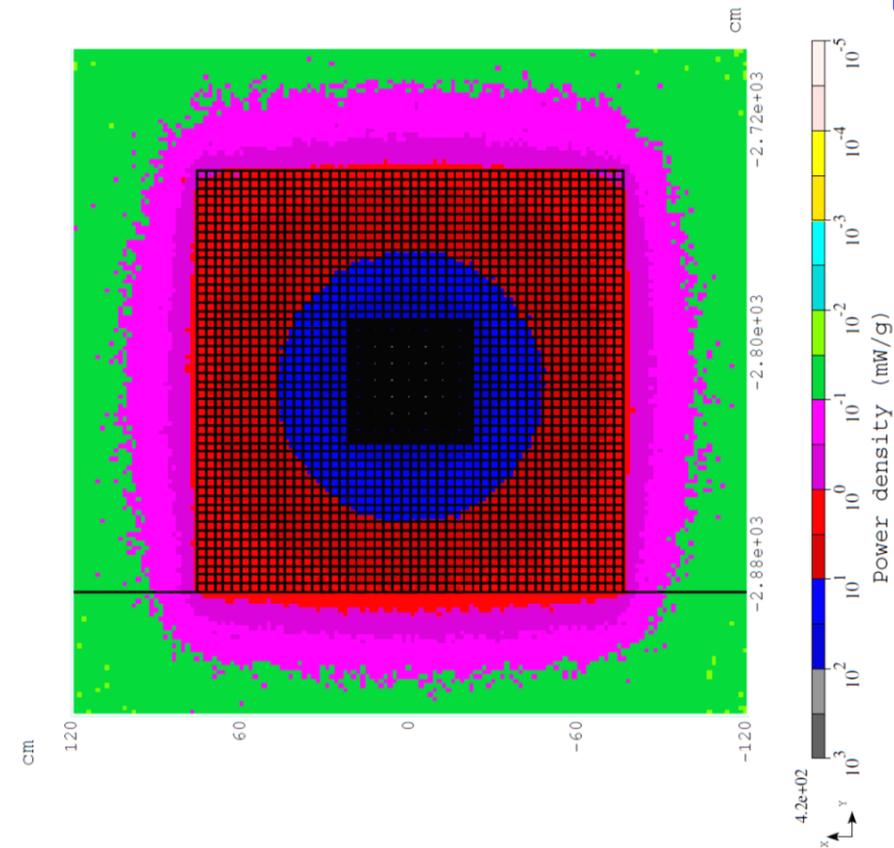
10-mm Al, 2-mm Ceramic, 5-mm SS ($0 < r < 1\text{m}$)

Power Density (operational) & Energy Deposition (acc)



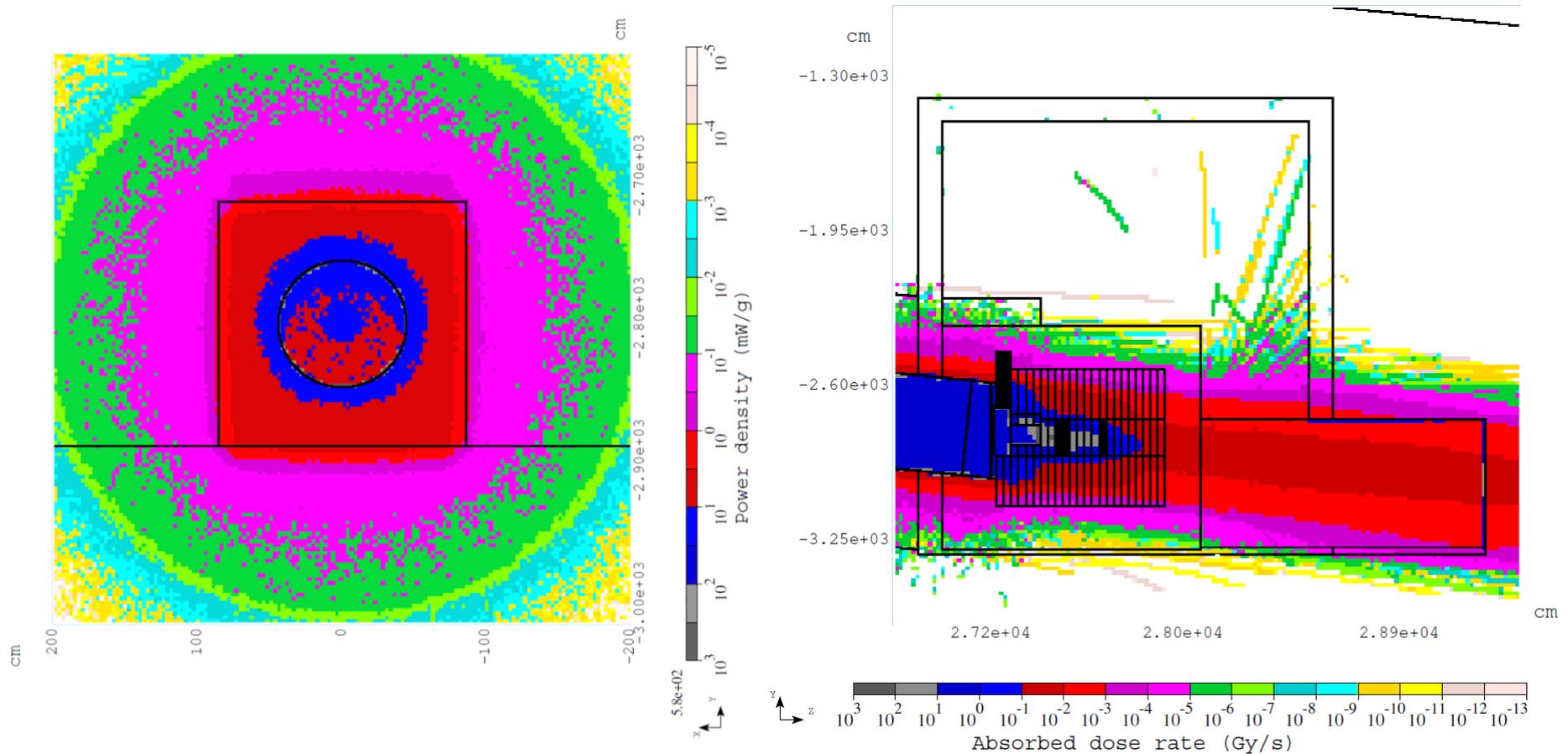
Power Density (oper) & Energy Deposition (acc)

Block #3



Results sent to Igor for ANSYS analysis

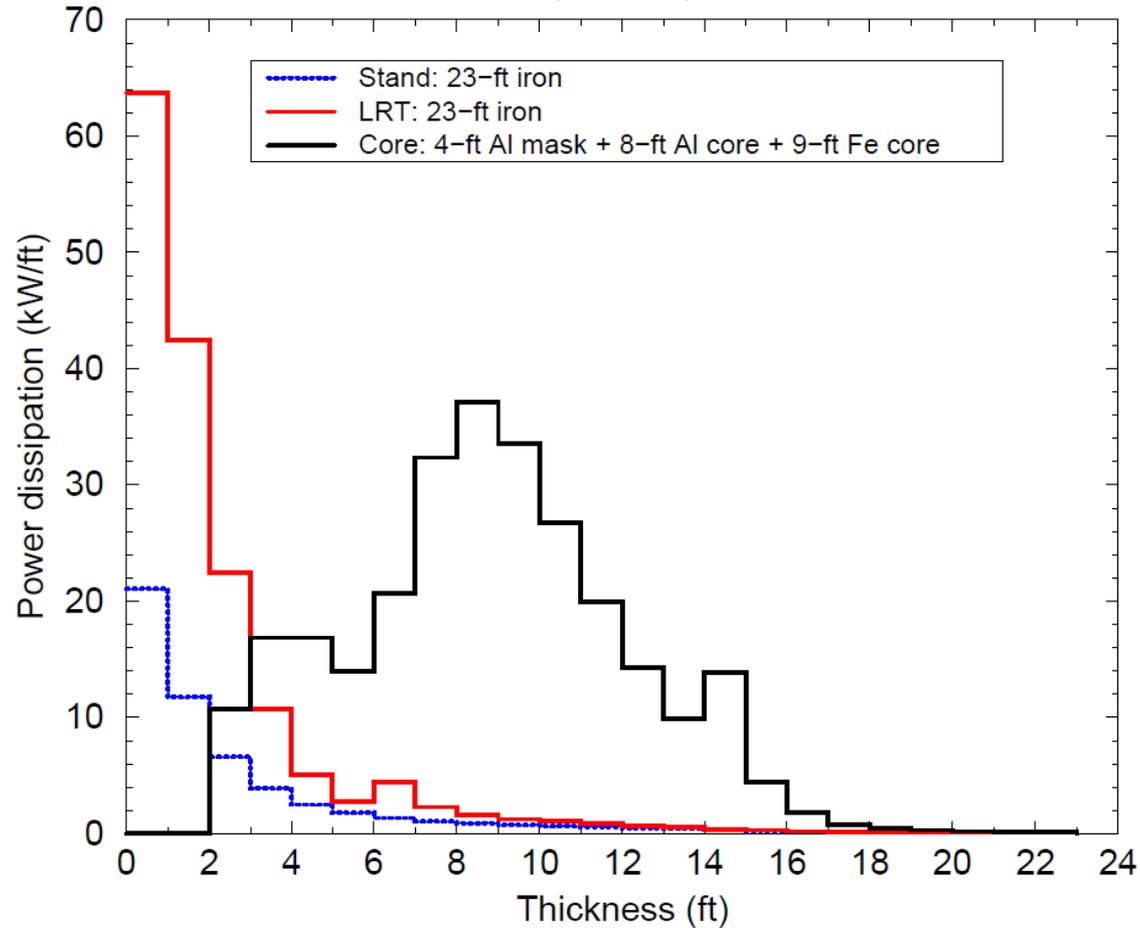
Power Density at Mask & Absorbed Dose



Heat Load

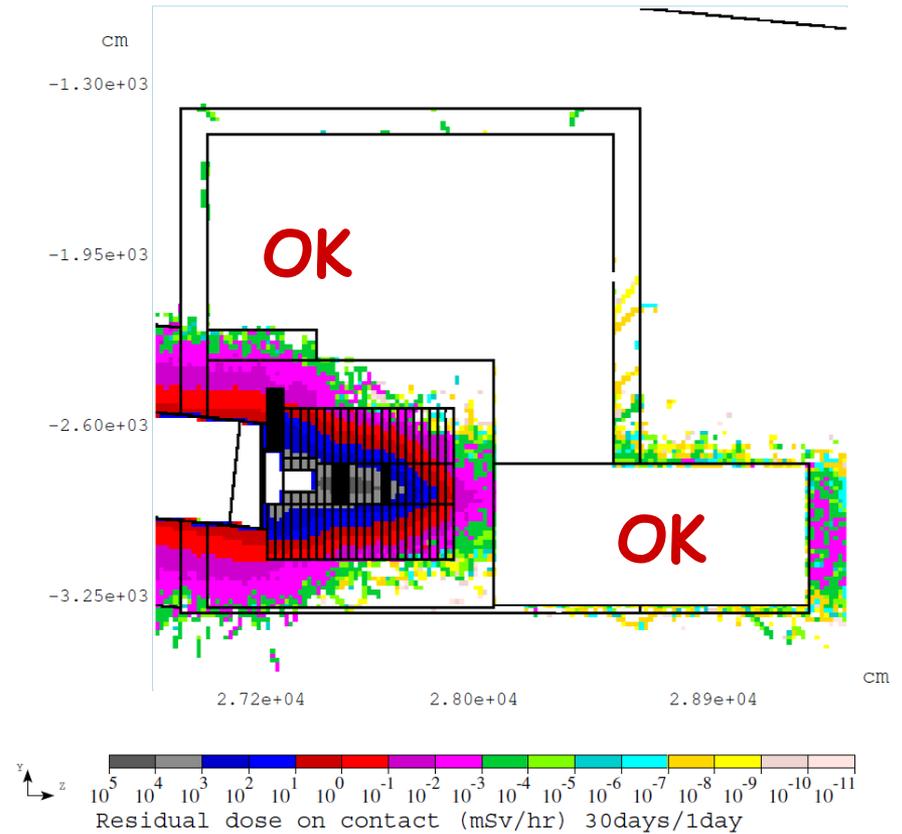
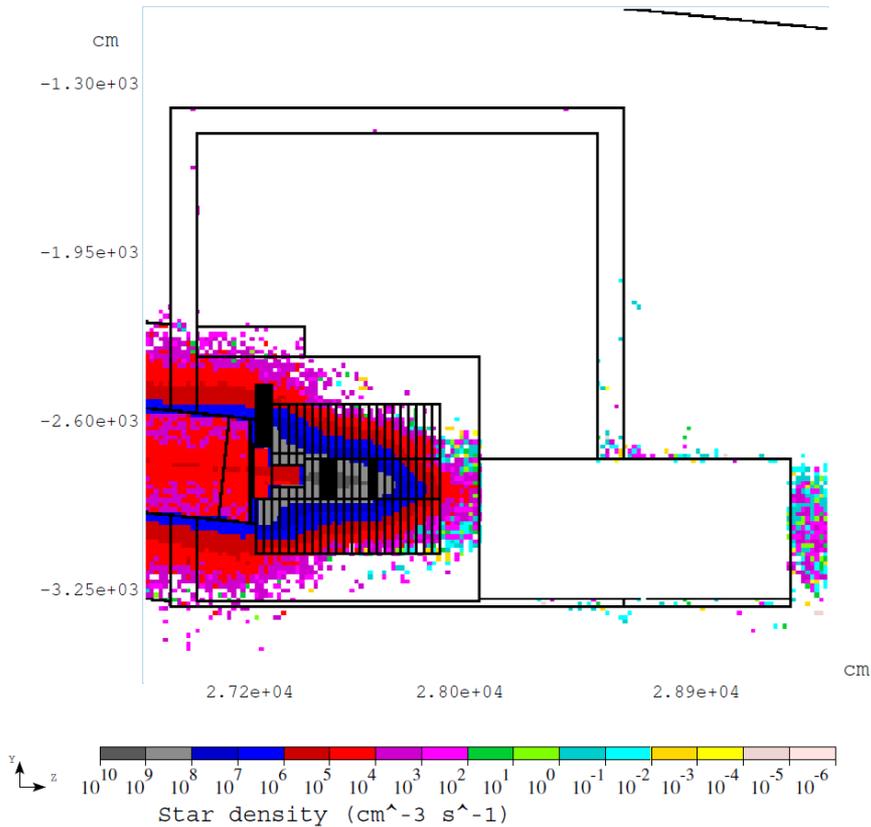
LBNE 2.3 MW: Heat load in absorber core and iron shield

Version 4, MARS15, 07/20/10



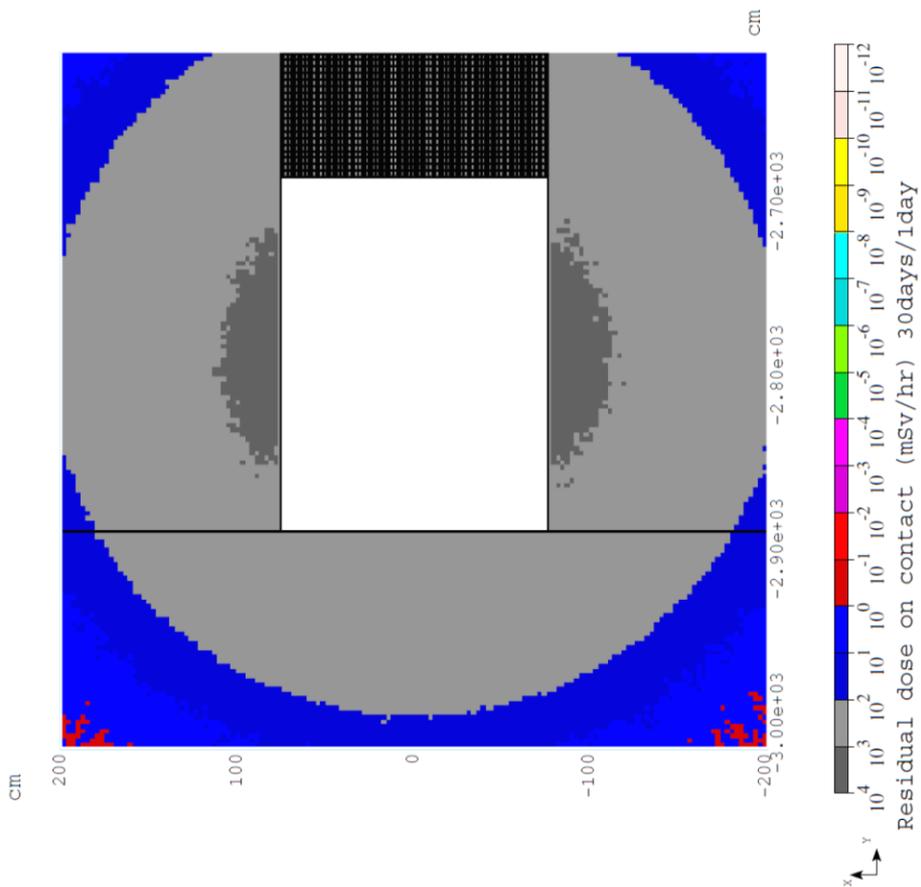
Power dissipation in all absorber components sent to Sasha

Star Density and Residual Dose

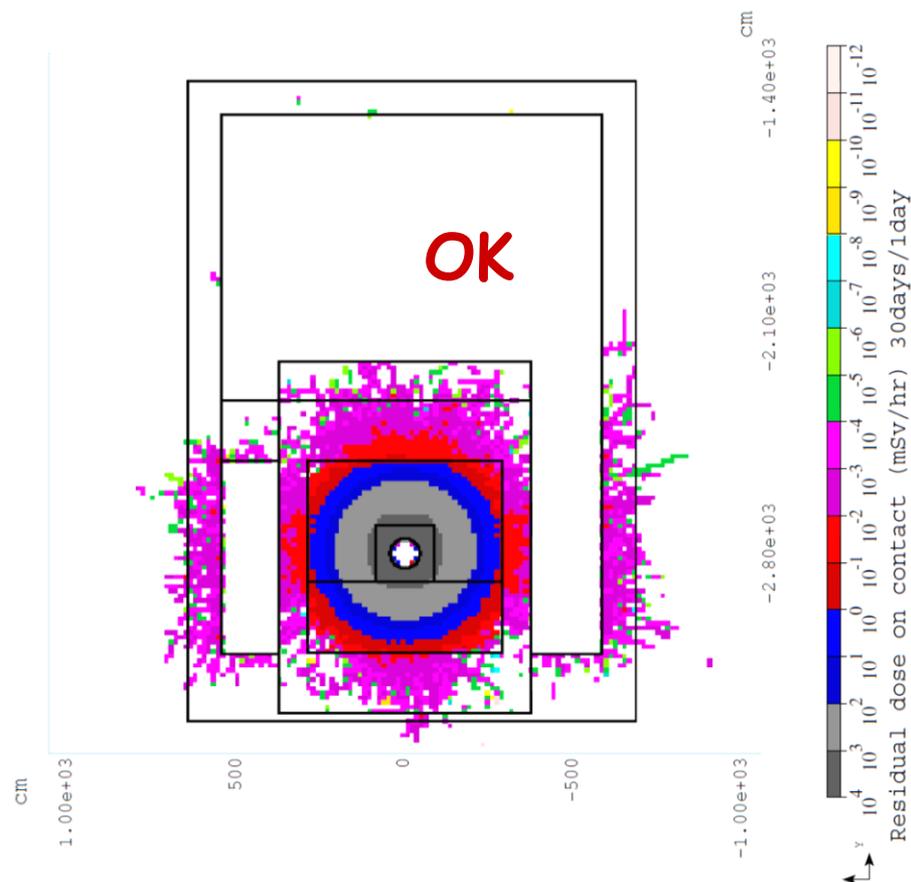


Safe for ground water!

Residual Dose on Contact (mSv/hr) at 30d/1d



Entrance



At shower max

Residual Dose Scaling in Absorber Shielding

$$R = \text{Dose}(T_i, T_c) / \text{Dose}(30\text{d}, 1\text{d})$$

(histograms are given for $T_i=30\text{d}$ and $T_c=1\text{d}$
irradiation and cooling times)

R for $T_i = 0.5\text{yr}$

T_c	4hr	1d	1.5yr
Iron	1.8	1.5	0.12
Concrete	2.6	1.4	0.19

Prompt Dose (mSv/hr)

