Project X-doc-1346

Energy deposition studies for Booster injection absorber at 800 MeV

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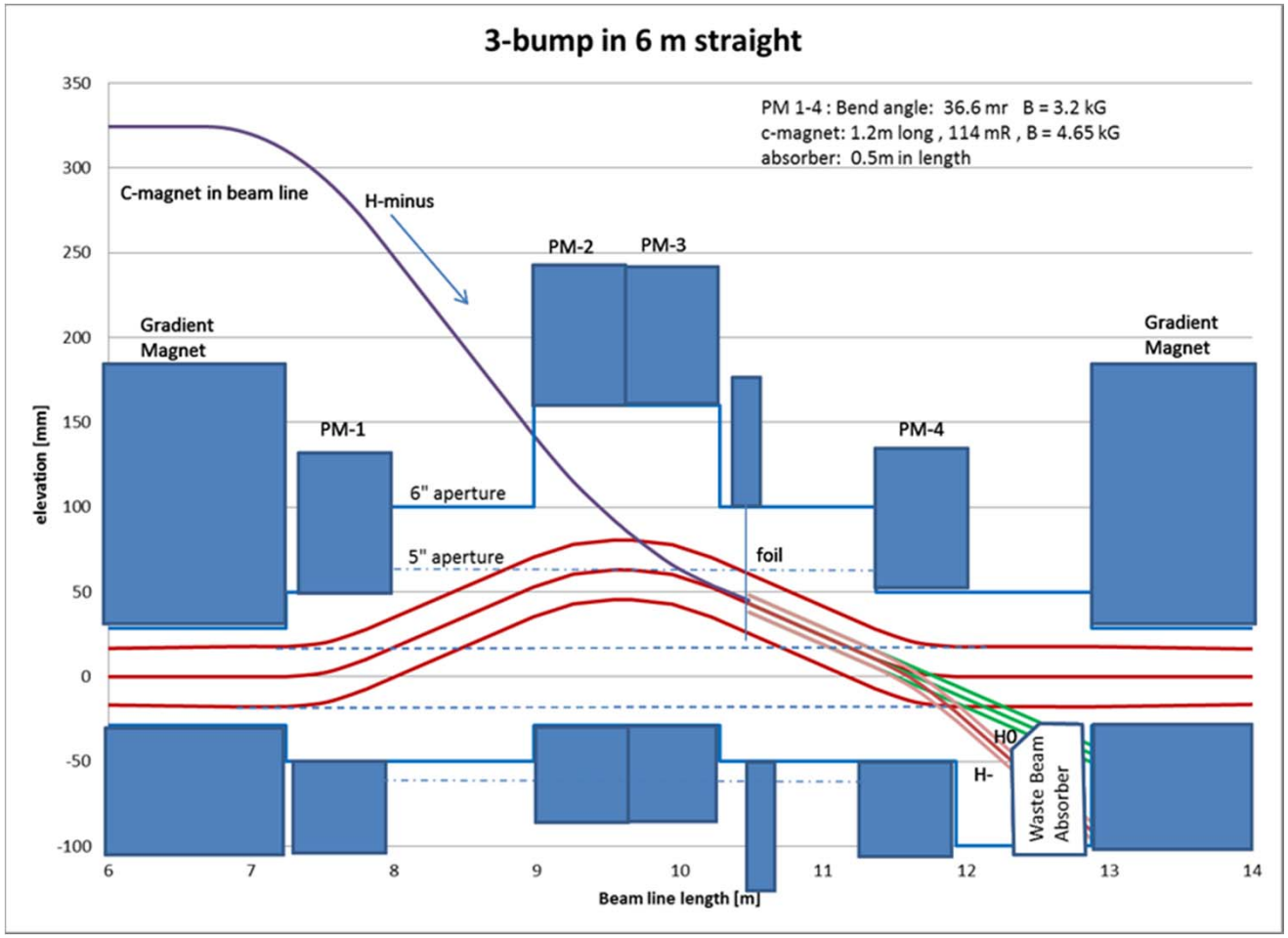
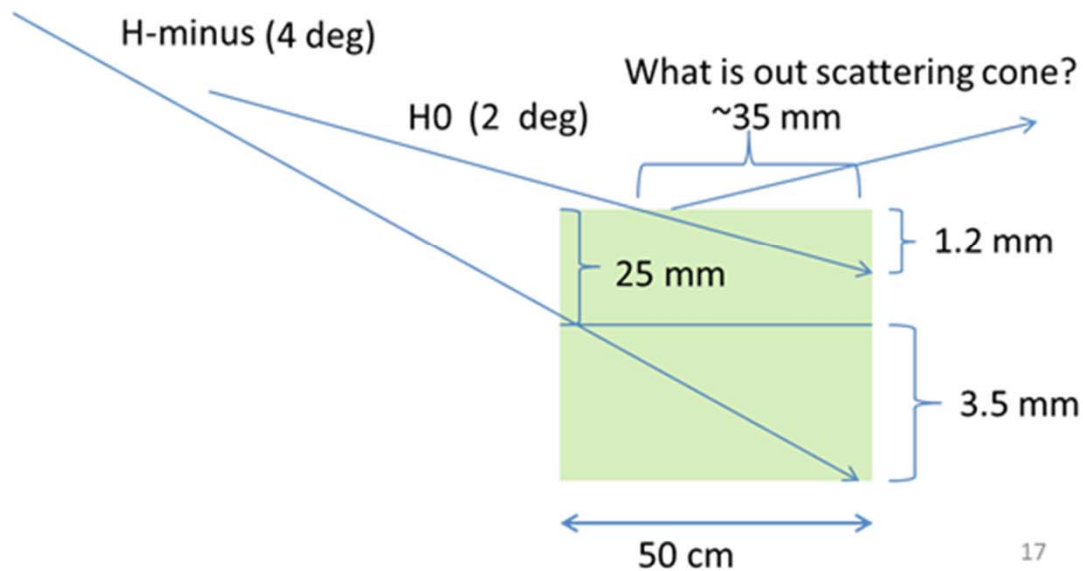
General layout

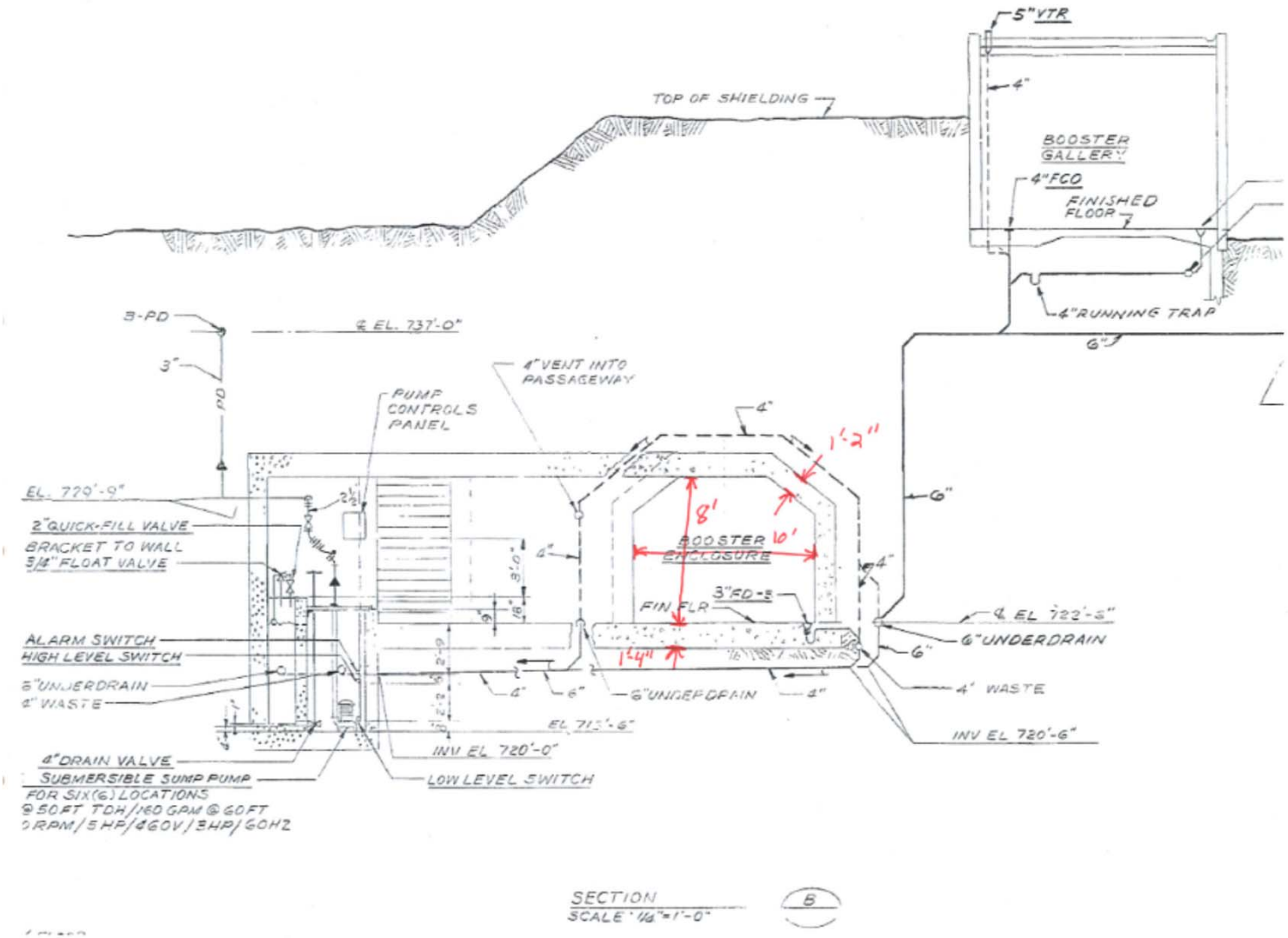


General considerations

- Should handle ~400 watts routine running
  - 0.2% Neutrals & 2% H-minus (optimistic)
- Design for factor 2 larger (?)
- Loss protection for X % linac pulse full intensity
- Should provide at least 3 nuclear interaction lengths. 10 cm in W and 17 cm Fe)
  - 30cm W and 51 cm Fe
- Absorber material Tungsten alloy
- Need to define shielding around absorber (how much, what type)



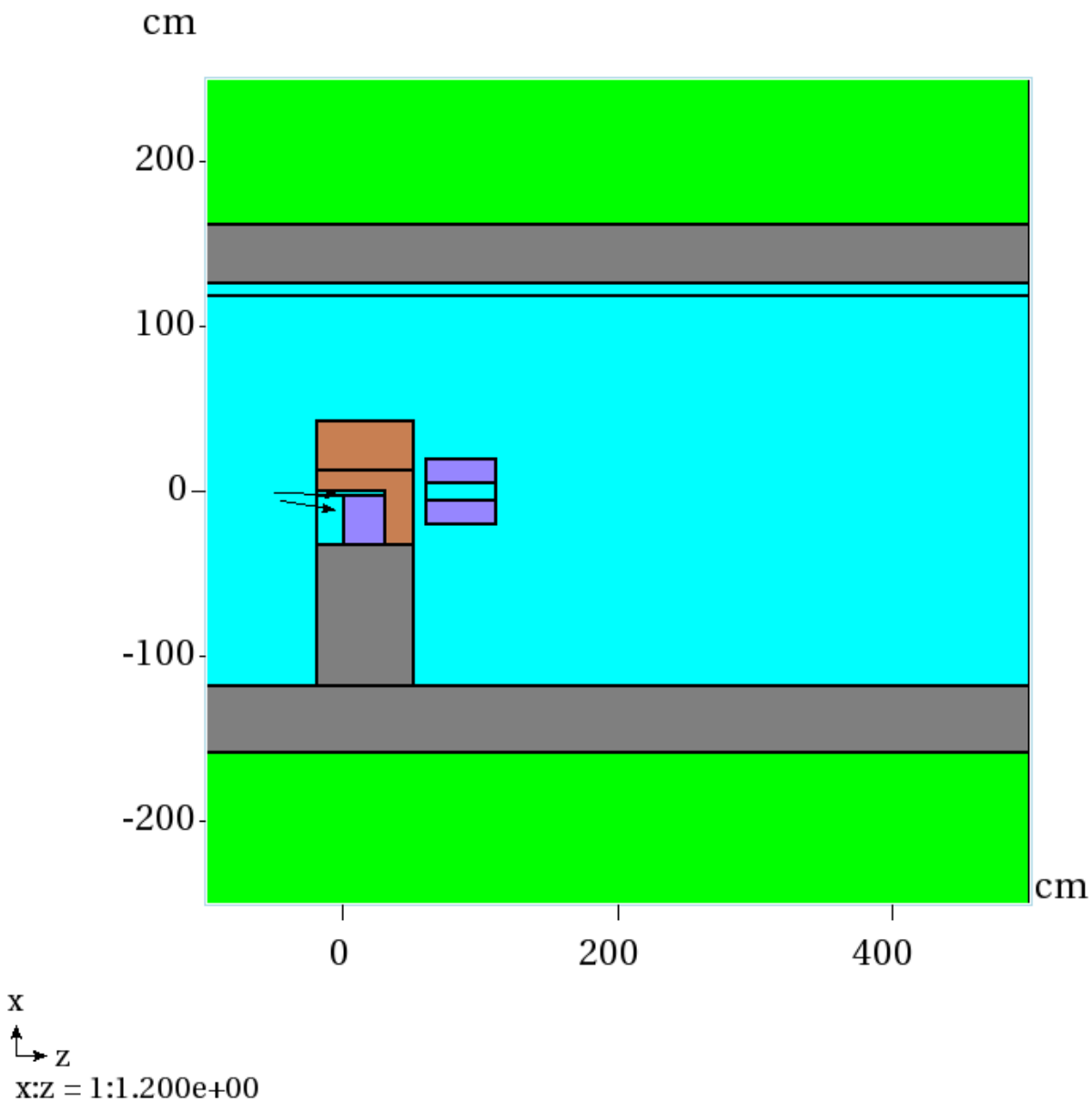
Tunnel cross section



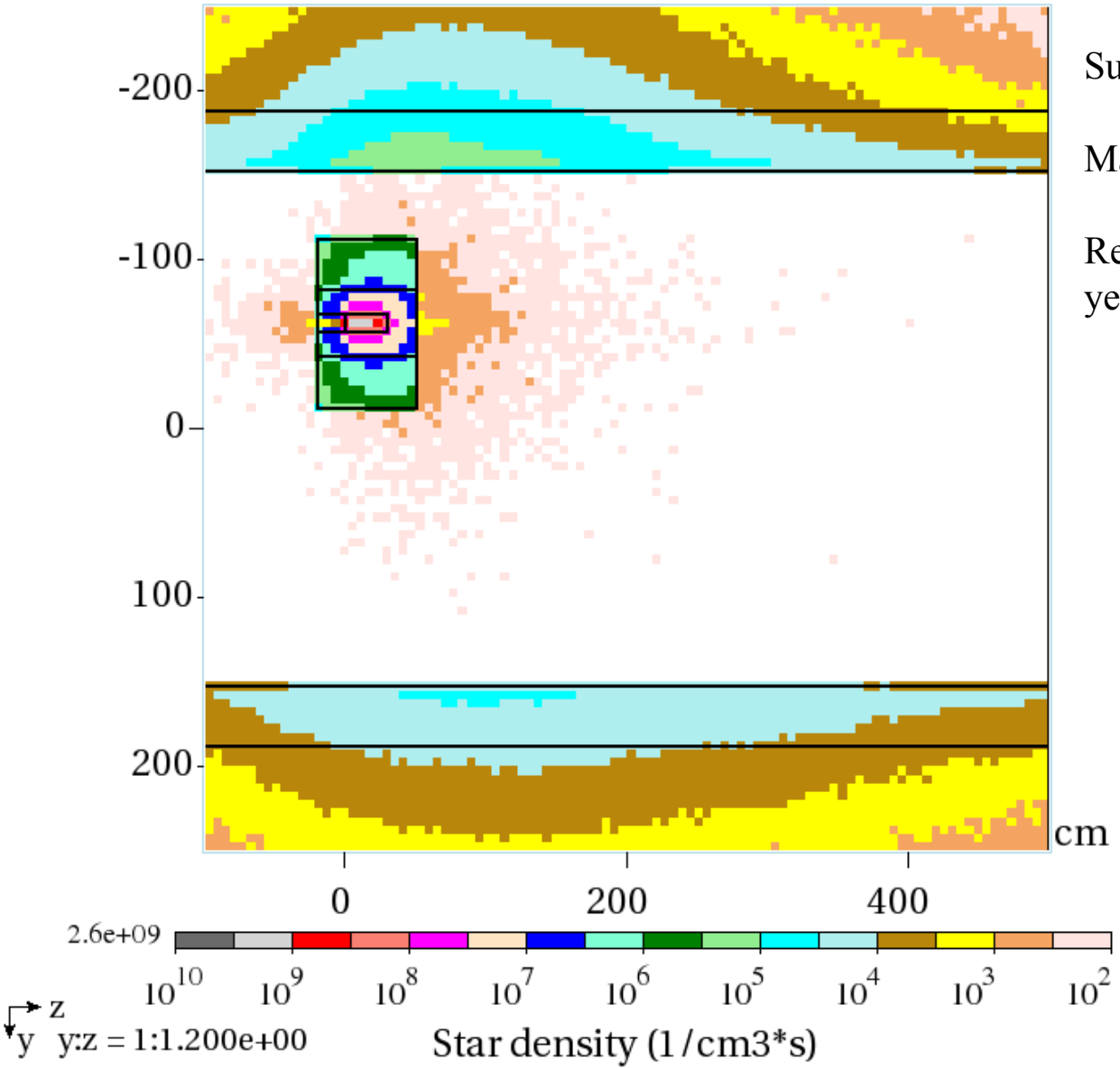
Lattice & incoming beam parameters

- β_x = 2.1 m; β_y = 8.0 m; $\boldsymbol{\alpha_x = \alpha_y = 0}$.
- Injection emittance (95% normalized) 1.5 π-mm-mr.
- σ_x = 0.58 mm; σ_y = 1.13 mm.
- Four Gaussians for x, x′, y, y′.

1. Surface water activation; 2. Residual activity; 3. Absorbed dose



Plan view; W core surrounded with Fe and Concrete

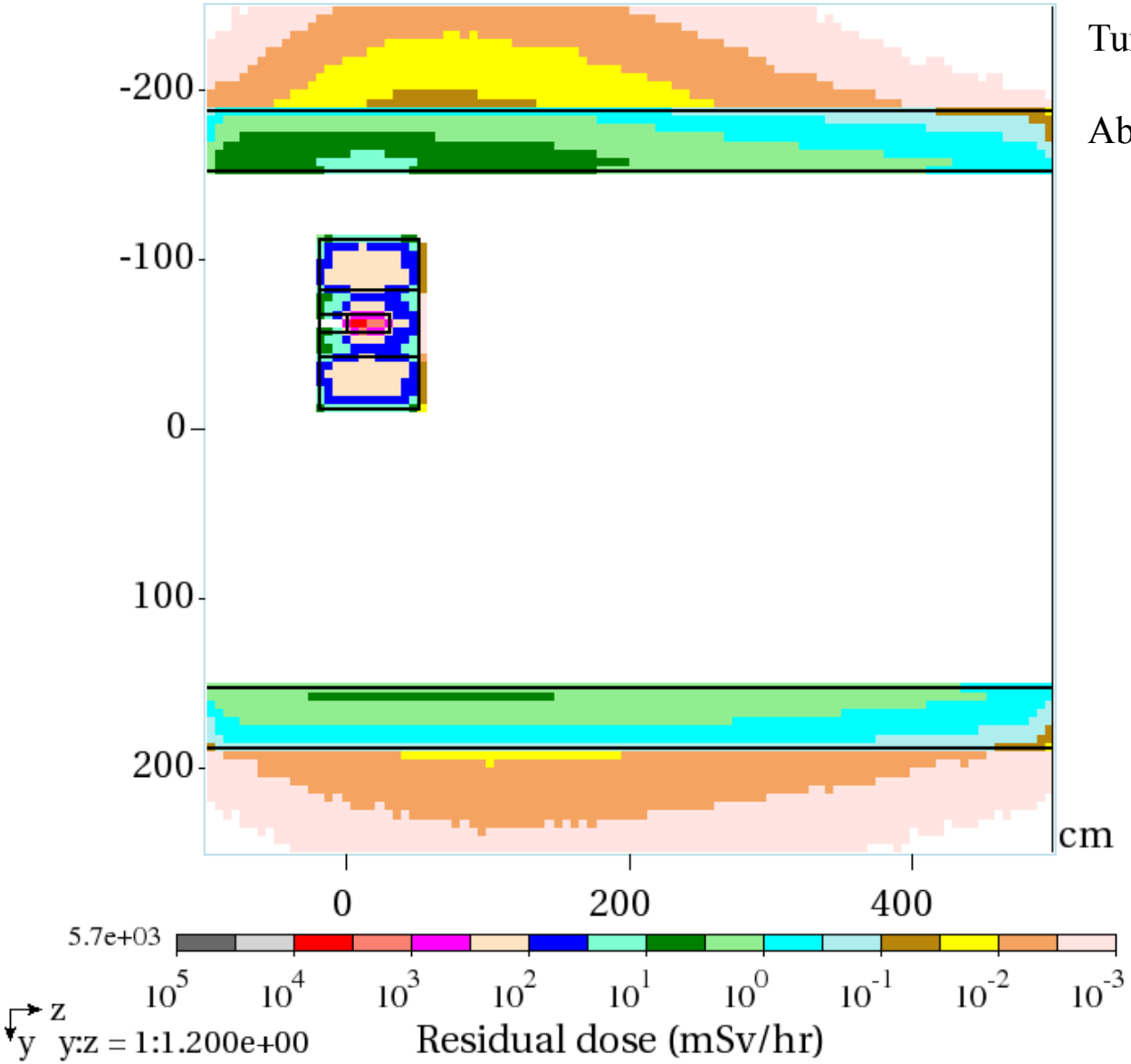


Surface water activation→sump pumps

Max. star density ≈ 1.9×10^{-8} cm^{-3} p^{-1}

Removal of activated water twice a year.

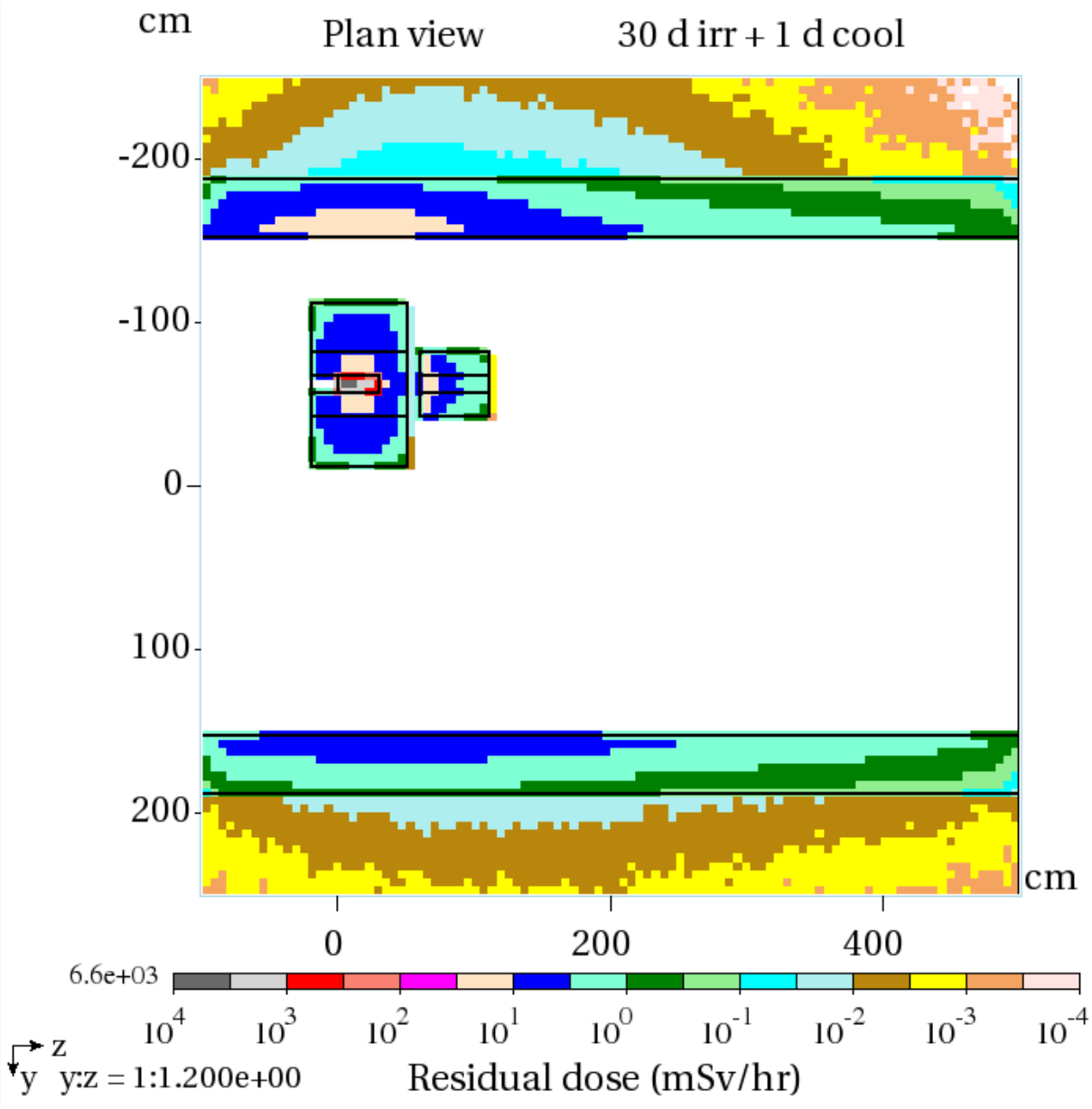
Plan view; W core surrounded with Fe and Concrete



Tunnel wall max: 15 mSv/hr

Absorber walls max: 60 mSv/hr

Plan view; W core surrounded with Marble

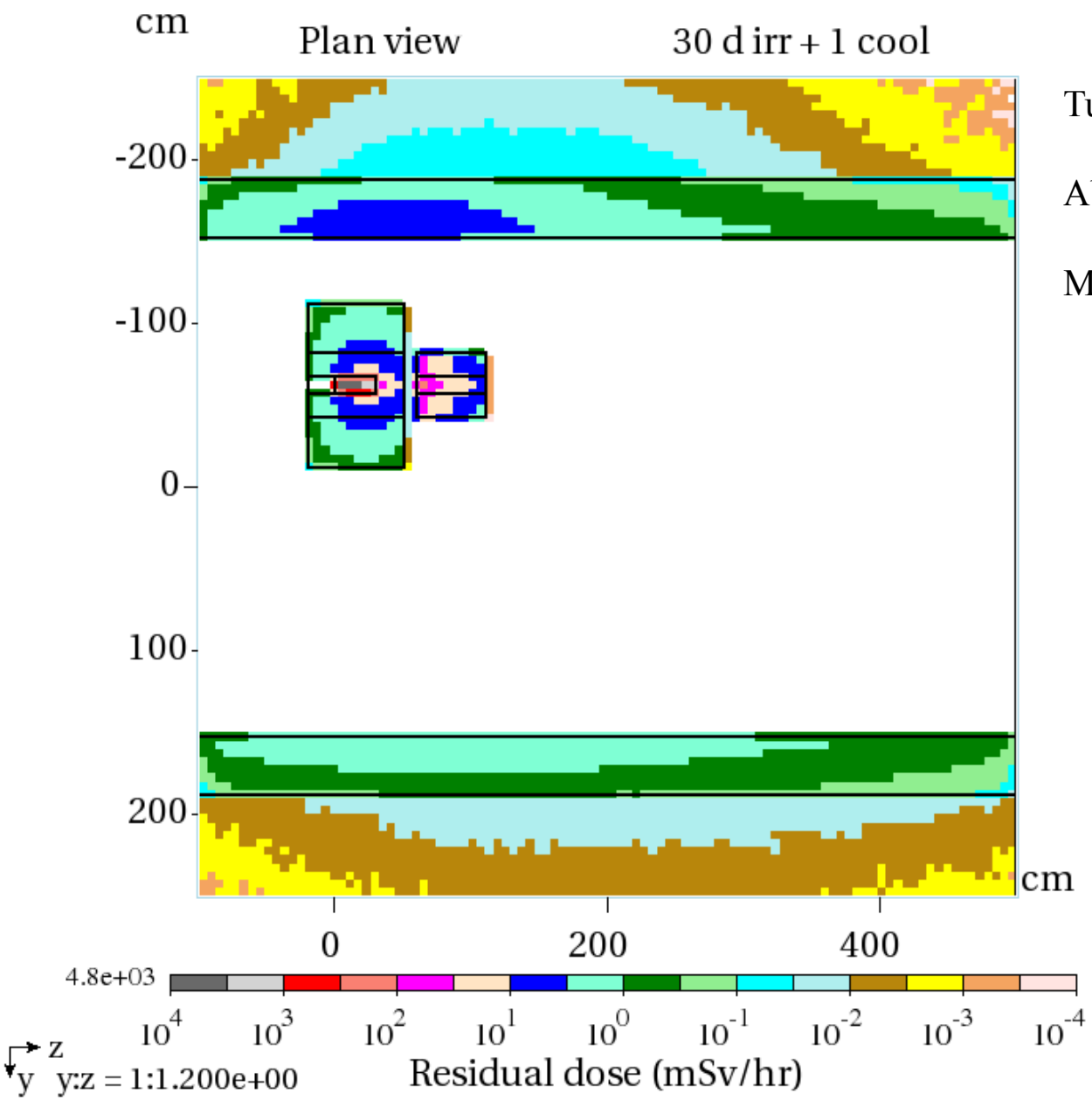


Tunnel wall max: 15 mSv/hr

Absorber walls max: 4 mSv/hr

Magnet DS max: 13 mSv/hr

Plan view; Fe core surrounded with Marble

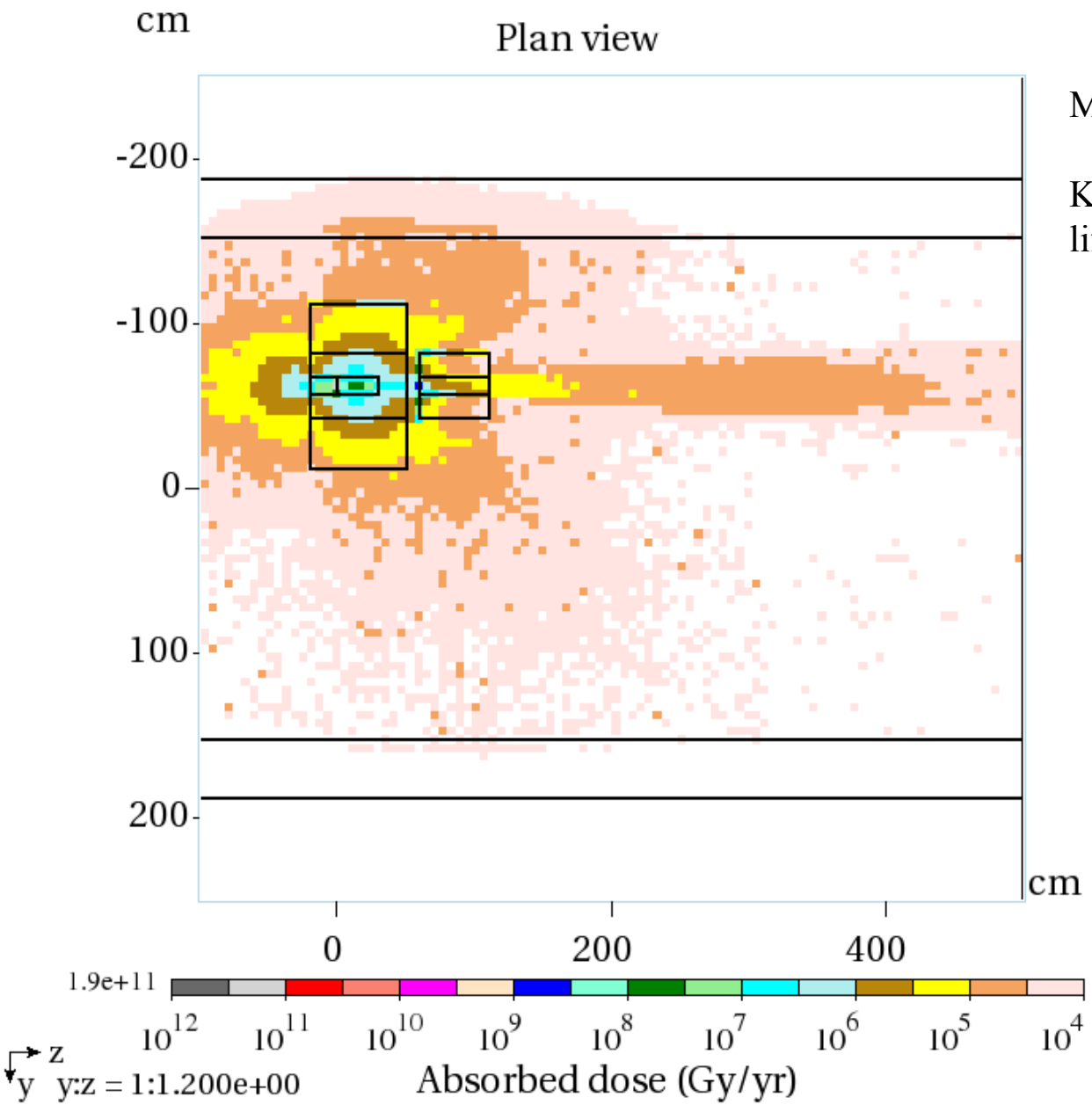


Tunnel wall max: 5 mSv/hr

Absorber walls max: 5 mSv/hr

Magnet DS max: 45 mSv/hr

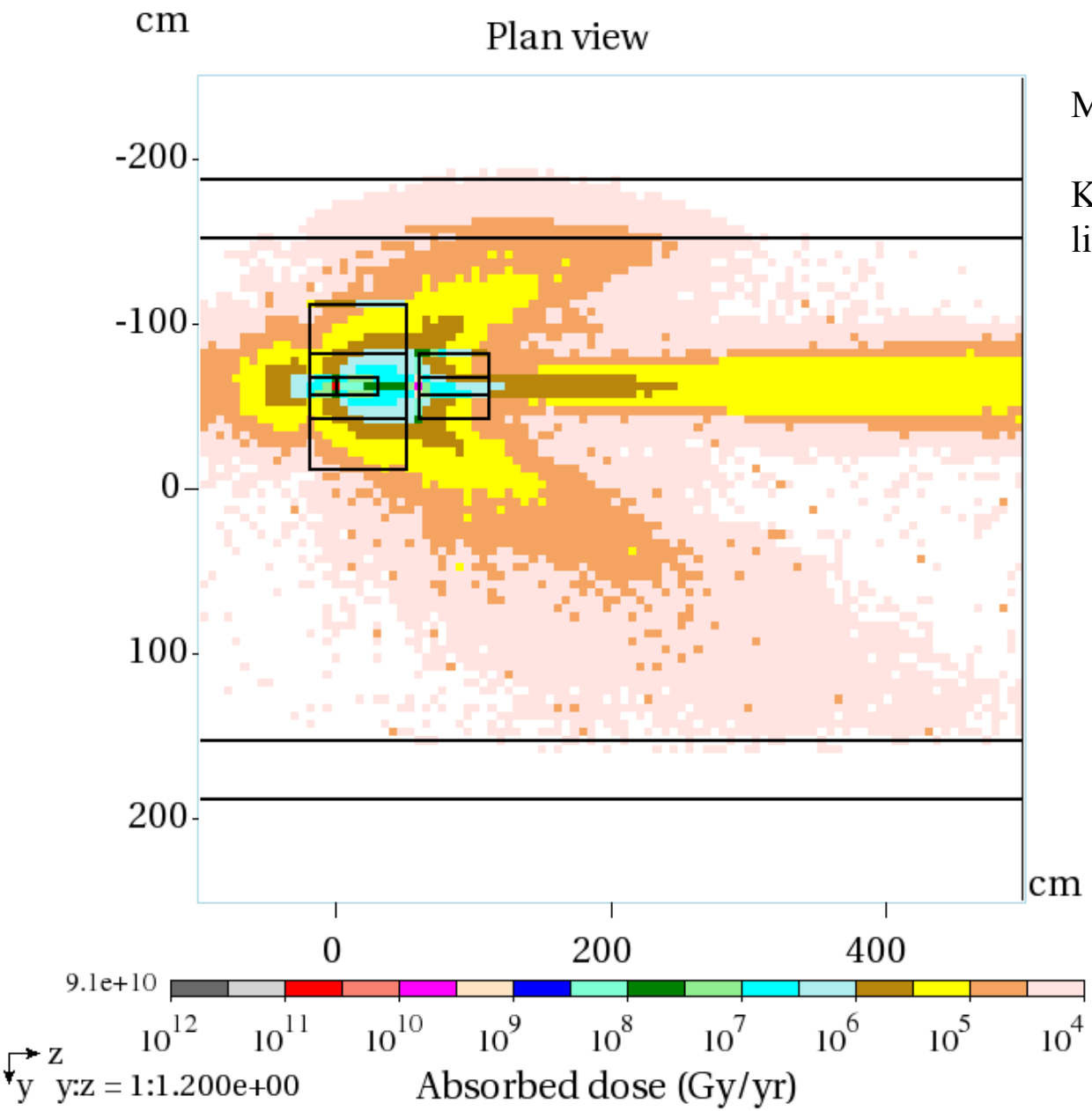
Plan view; W core surrounded with Marble



Magnet DS max: 1.0 MGy/yr

Kapton, insulation/G10, epoxy lifetime: ≈ 20-30 MGy

Plan view; Fe core surrounded with Marble



Magnet DS max: 4.0 MGy/yr

Kapton, insulation/G10, epoxy lifetime: ≈ 20-30 MGy

Residual & absorbed dose for different designs

(residual dose is for 30-day irradiation and 1-day cooling)

Max. residual dose (mSv/hr)	W core + Fe layer + Concrete 6” + 6” + 12”	W core + marble 6” + 18”	Fe core + marble 6” + 18”
Absorber wall	60	4	5
Magnet DS		13	45
Tunnel wall	15	15	5
Max. absorbed dose in magnet DS (MGy/yr)		1.0	4.0