Dose Estimate for the Extra Vacuum Pump in SS15 under Irradiation

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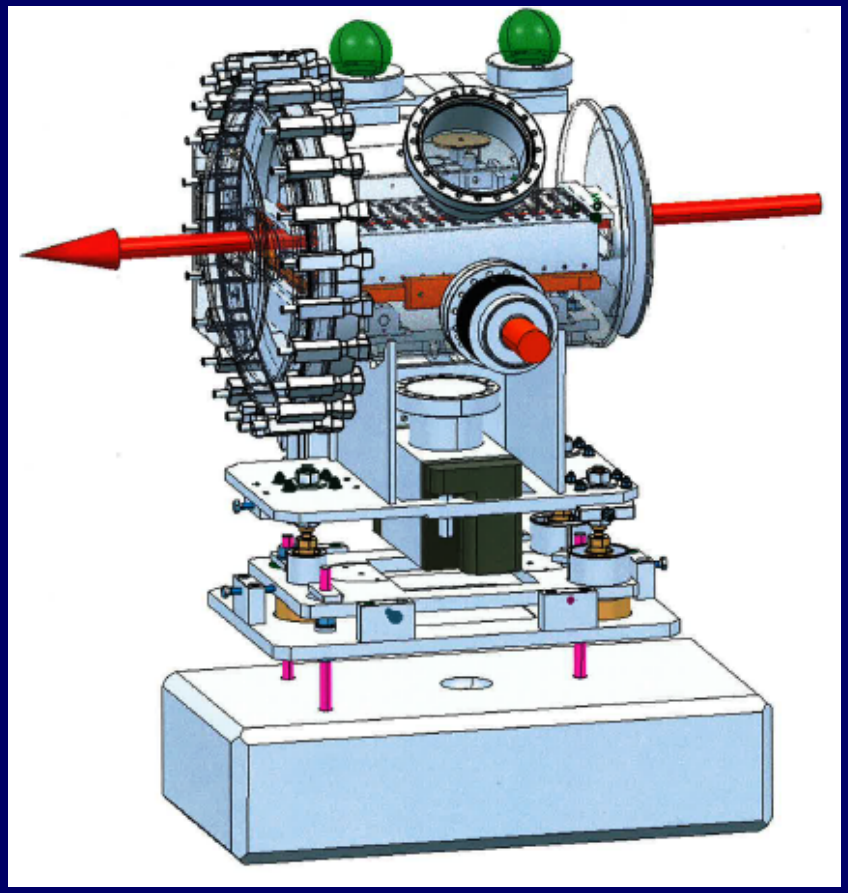
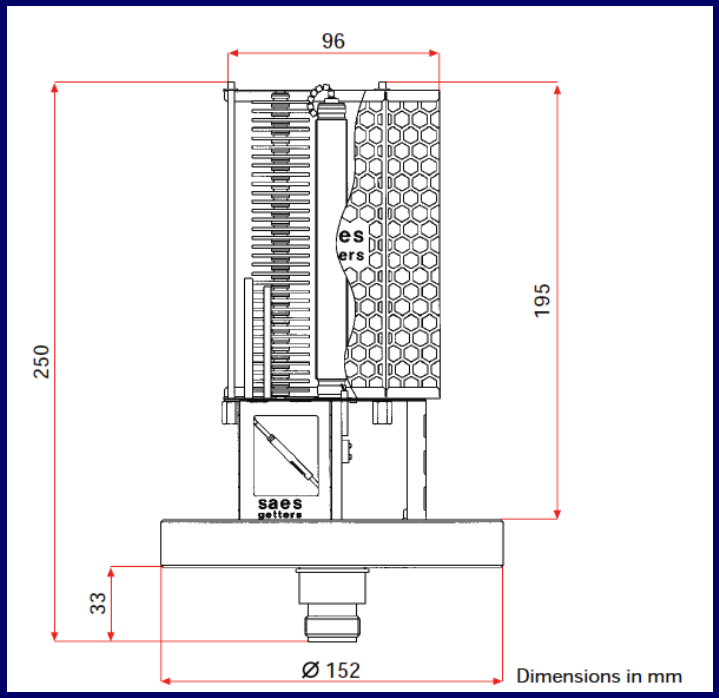
Dummy septum 15 – room for an extra pump

Original Slide of Chiara Pasquino, MTE meeting 11/10/2012



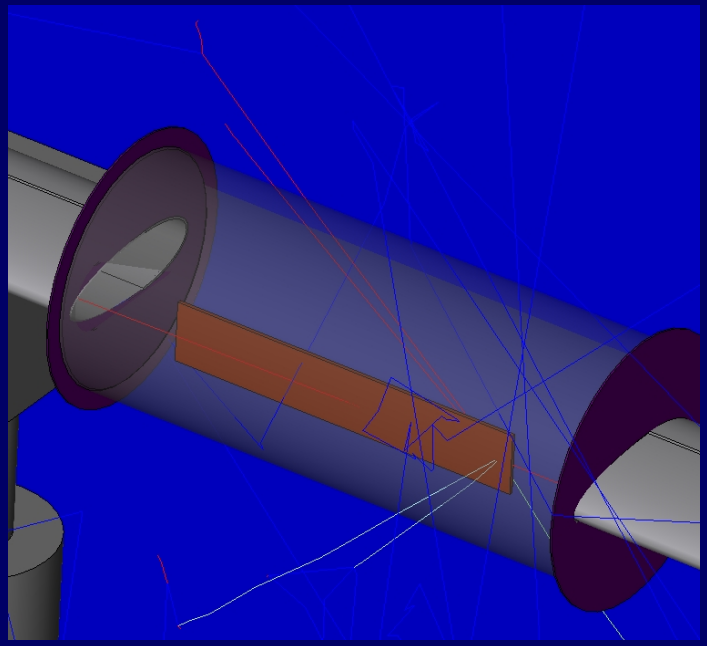


Under the tank there is room only for a SIP of 75 l/s…
What if we install a NEG pump?

Consider ≈ 15 cm more for cabling, and that we have to make sure it is radiation resistant!!!

Total Ionizing Dose - Assumptions for the Simulation

- proton beam of p=14 GeV/c
- beam loss intensity: 10^{11} p/s (~1% of the primary intensity 10^{13} p/s)
  100% shadowing efficiency
- Cu blade
- total operation time 2550 h/y
- source: dummy septum 15 with realistic beam tracking



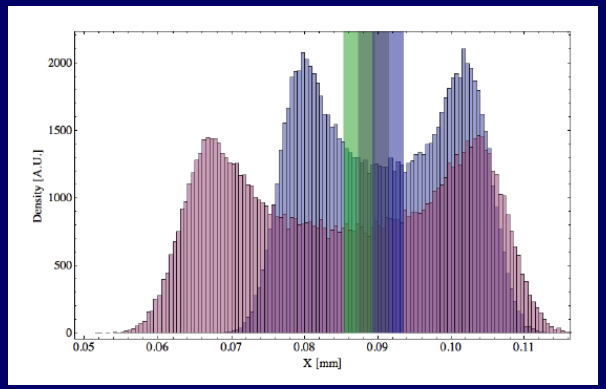
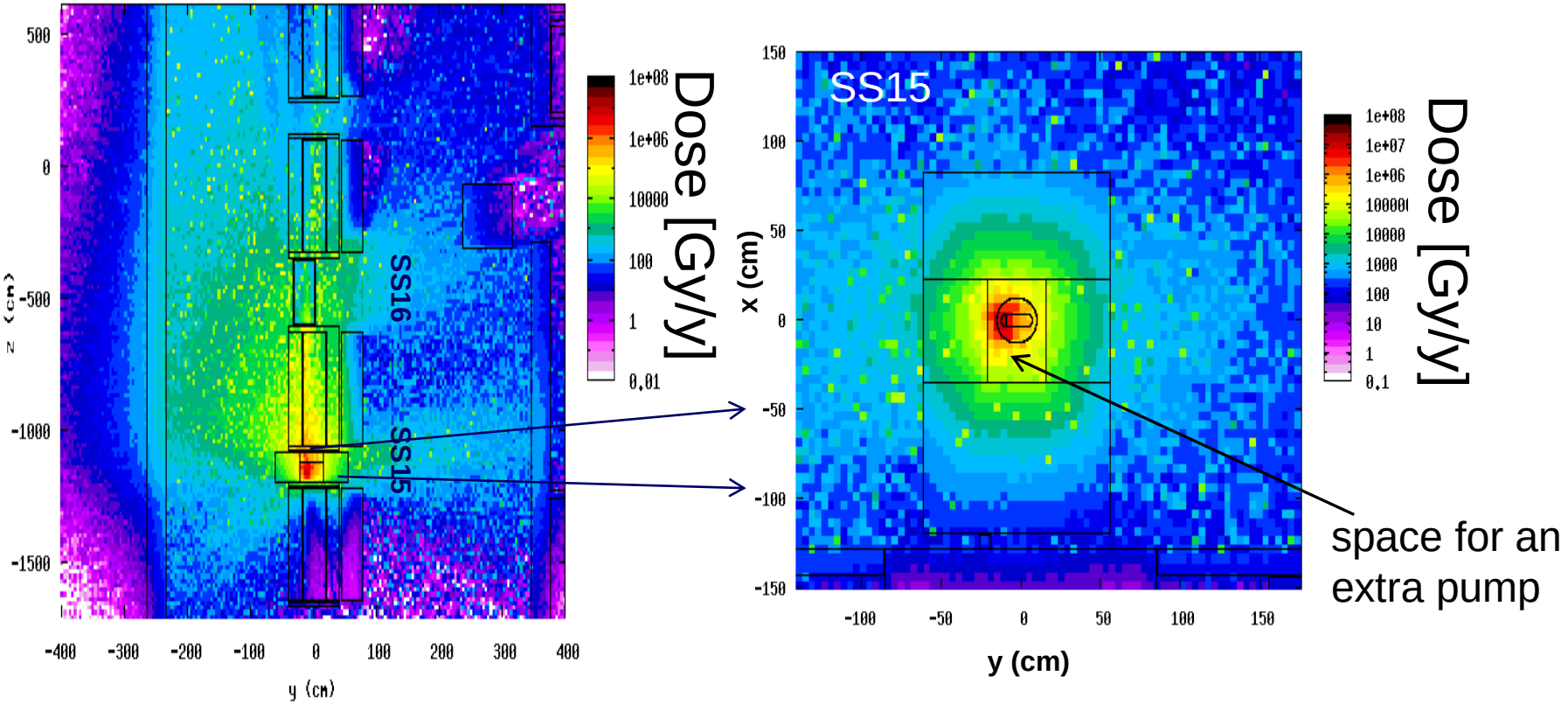


Figure 8: Aggregated distribution at the start of SS15 for the core (red) and for the outer island (blue)

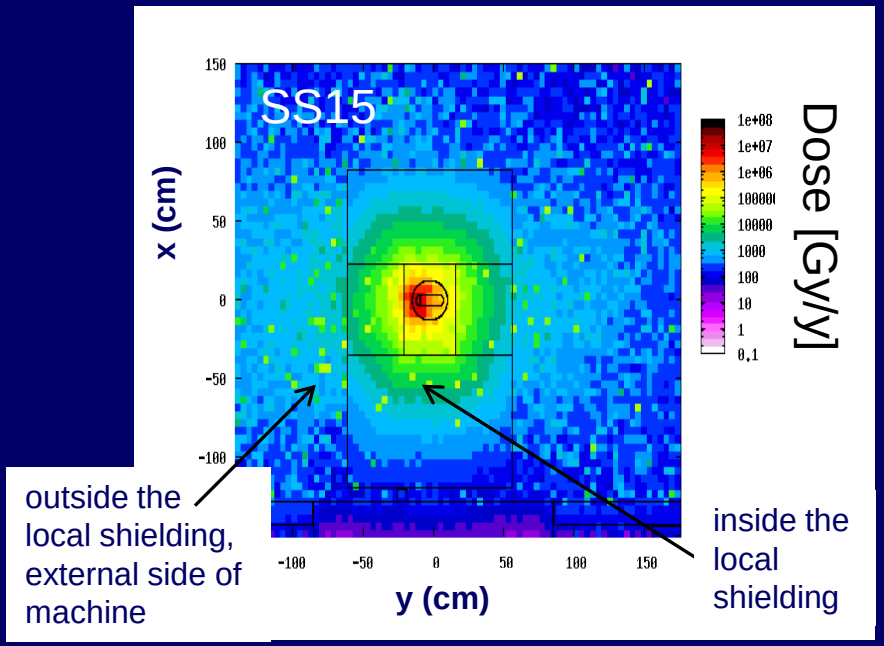
Annual Dose for a nominal MTE operation year with 9.2×10^{17} lost p in the dummy septum of SS15

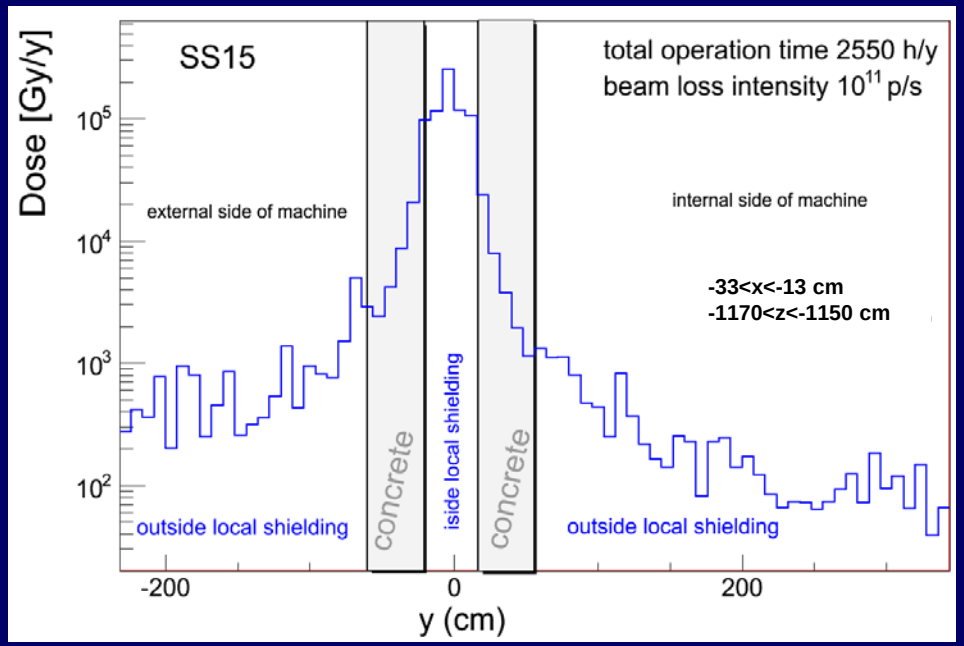


2-dim projection of Dose in y-z plane, averaged over $-30<x_{beam}<30$; x-vertical, y-transverse, z-beam direction

2-dim projection of Dose in x-y plane, for $\Delta z=120$ cm (middle of SS15)

Quantifying Annual Dose Expected in three possible locations



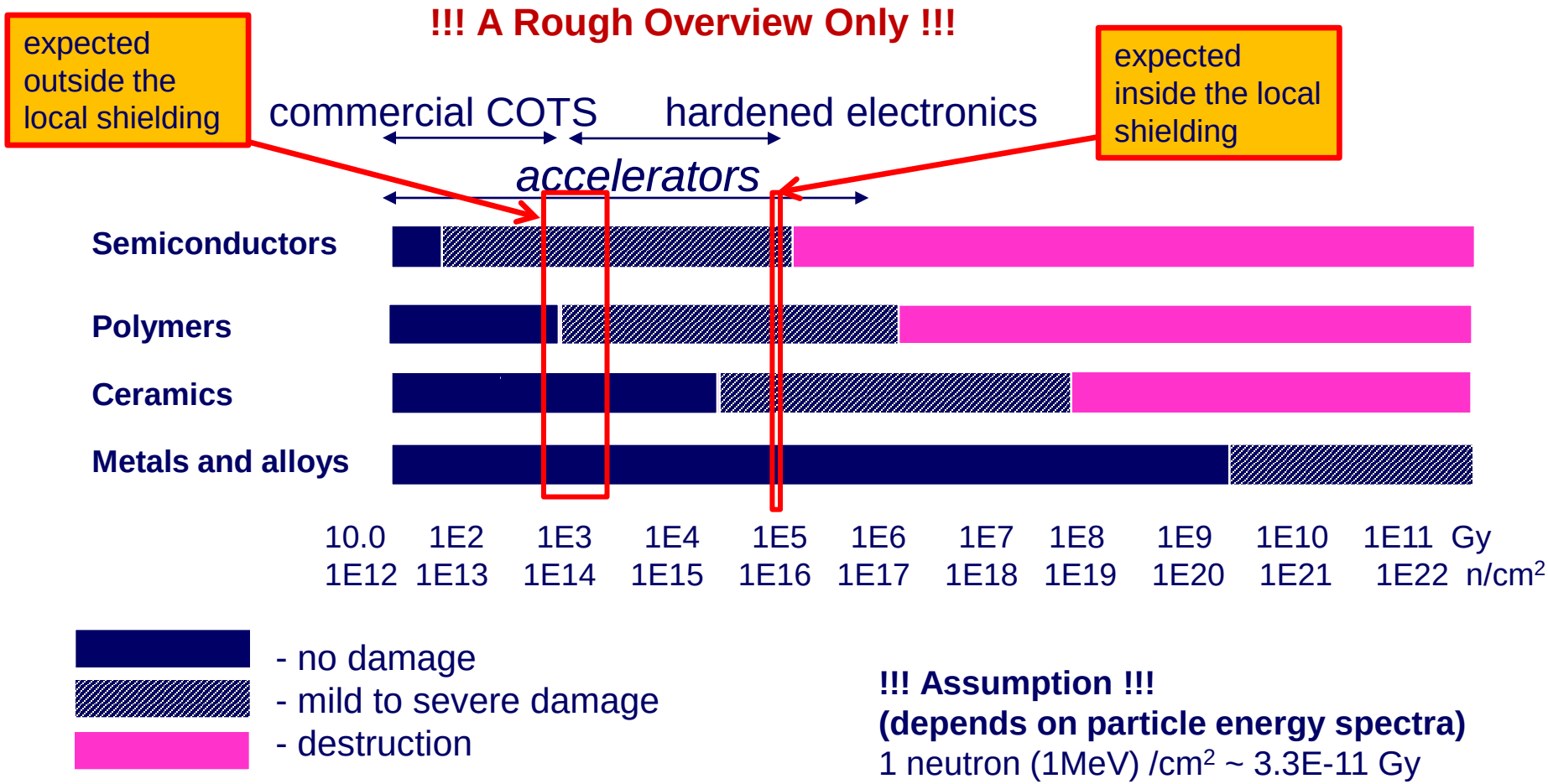


Location for an extra pump	Dose [kGy/year]
Inside the local shielding	200 kGy/y
Outside the local shielding, external side of machine	4.5 kGy/y
Outside the local shielding – internal side of machine	~1 kGy/y

Outside the local shielding, expected Dose lower by 2 orders of magnitude

Dose & Displacement Damage

Radiation Damage to Materials/Electronics



!!! Assumption !!!
(depends on particle energy spectra)
1 neutron (1MeV) /cm^2 ~ 3.3E-11 Gy

Outside the local shielding in SS15, expected Dose lower by 2 orders of magnitude

Review of irradiated cables in the SPS

Part I – Present strategy

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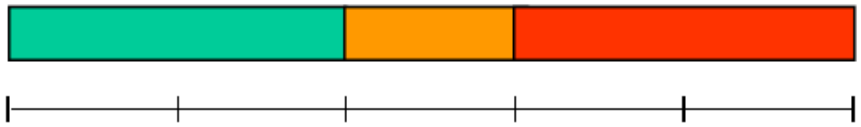
Classification of materials according to their radiation resistance.

(Comp. of radiation damage test data : M. Talvet – H. Schönbacher - 1989)

Polyethylene/Polyolefin.



Dose in Gy: 10^{E+3} 10^{E+4} 10^{E+5} 10^{E+6} 10^{E+7} 10^{E+8}