Energy Deposition of 4-MW Beam Power in a Mercury Jet Target

Xiaoping Ding

UCLA

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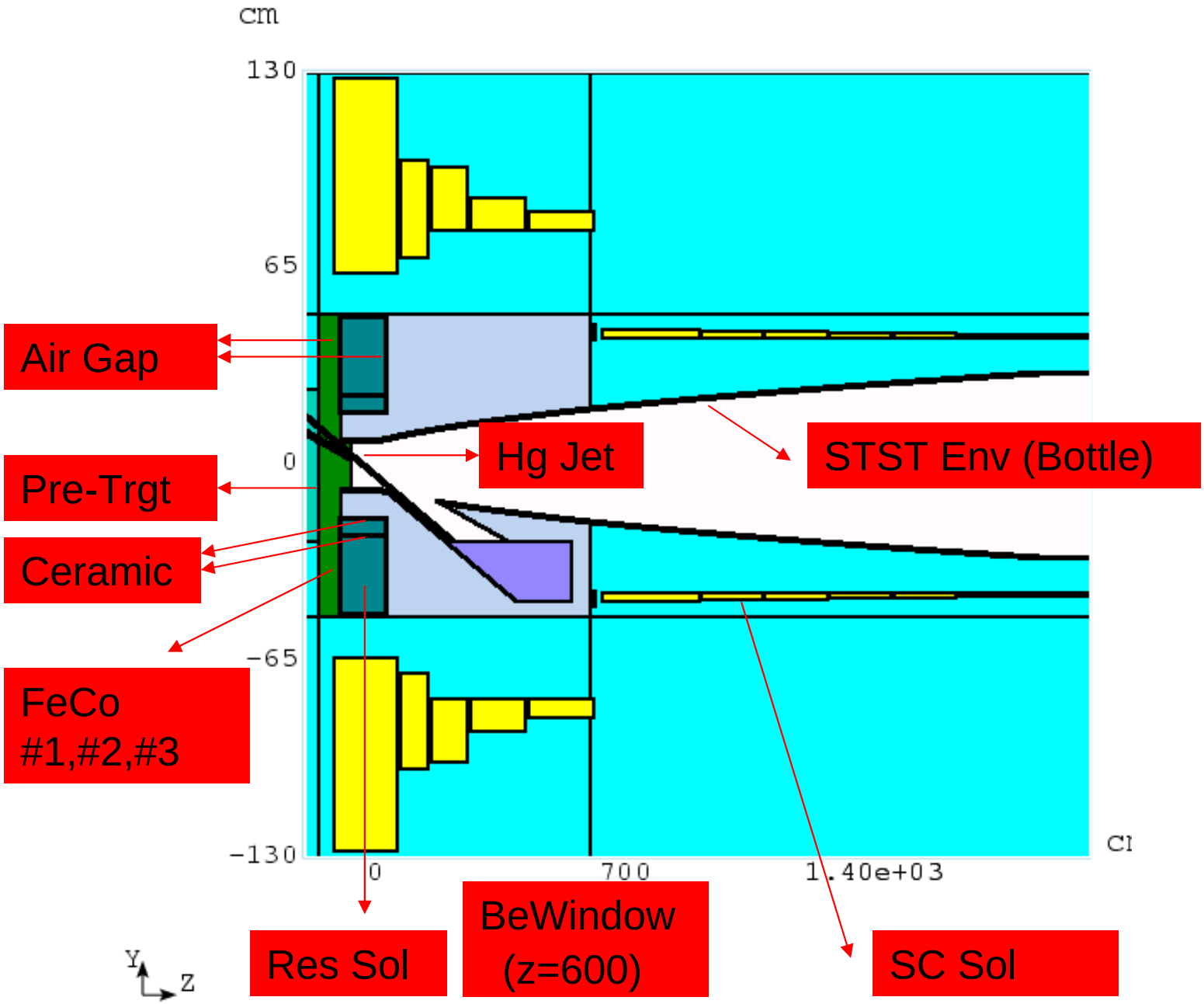
Introduction (I)

- Using MARS15 to study energy deposition.
- Study II geometry and magnetic field map.
- Hg jet: r=0.5cm, tilt 100mrad to sol. axis.
- Proton beam (simple Gaussian distribution): r=0.15cm, tilt 67mrad to sol. axis.

Introduction (II)

- The unit of direct energy deposition is GeV/g p.p (GeV per gram per incident primary particle) or GeV.
- The number of particles in a given pulse of beam (4MW, 10GeV) is $2.5*10^{15}$ ppp (incident primary particles per pulse). $(2.5*10^{15})*(10*10^{9})*[1.6*10^{-19}]=4*10^{6}$ [W]

Target Geometry



Map of Region Numbers and Material Indices in the Standard Geometry Sector

	Z range (-200cm,-165cm)	Z range (-165cm,600cm)	Z range (600cm,5000cm)
R range (50cm,130cm)	**No. 4** Region IM=(1) air	**No. 5** Region IM=(-1)	**No. 6** Region IM=(1) air
R range (0cm,50cm)	**No. 1** Region IM=(-1)	**No. 2** Region IM=(15) tungsten-carbide & Water shielding	**No. 3** Region IM=(-1)

(IM=-1 are for the regions redefined in non-standard geometry)

Regional Energy Deposition of 4MW Beam Power

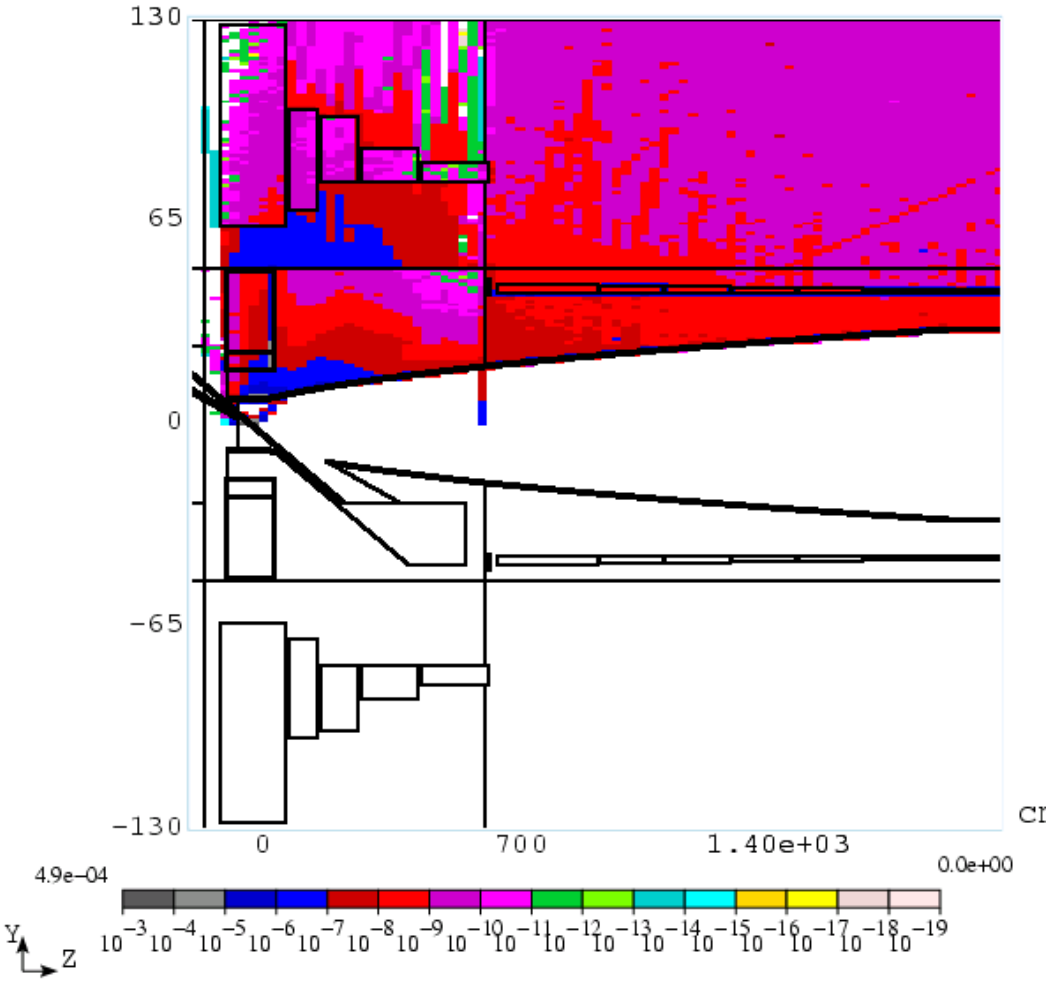
Regional Name	ED [GeV]	P [kW]	P/P_{beam} [%]
No. 1	0	0	0
No. 2 (WC shield)	3.063	1225.2	30.63
No. 3	0	0	0
No. 4	0	0	0
No. 5 (air)	$6.47*10^{-6}$	0.0026	0.0000647
No. 6 (air)	$1.015*10^{-4}$	0.0406	0.001015

In WC shield, the energy deposited by EMS (electro-magnetic shower) is 1.464GeV and 1.589 GeV through DEX (ionization losses from all charged hadrons and muons).

Regional Energy Deposition of 4MW Beam Power

Regional Name	ED [GeV]	P [kW]	P/P_{beam} [%]
Air Gap	$9.27*10^{-5}$	0.0371	0.000927
Pre Trgt	$7.1*10^{-7}$	0.00284	0.00007
SC Sol	$3.776*10^{-2}$	15.104	0.3775
Hg Jet	1.168	467.2	11.68
Be Window	$4.542*10^{-3}$	1.8168	0.045
STST Env	$8.242*10^{-1}$	329.68	8.242
Res Sol	$9.778*10^{-2}$	39.112	0.9778
Ceramic	$2.517*10^{-3}$	1.0068	0.025
FeCo #3	$1.052*10^{-2}$	0.4208	0.105

Visual Display of Energy Deposition



The max. energy deposition at the SC coil is 10^{-8} [GeV/g per 1ppp]. So the energy deposition at SC coil is10^{-8}*(10^{9})*($1.6*10^{-19}$)* $2.5*10^{15}$ [W/g] or 0.004 [W/g].