IDS120h GEOMETRY

SHIELDING VESSELS: STAINLESS STEEL vs. TUNGSTEN

SHIELDING MATERIAL: 60%WC+40%H_2O vs. 80%WC+20%He vs. 80%W+20%He

Nicholas Souchlas, PBL (4/10/2011)

IDS120h: introducing shielding vessels (STST OR W)
Different cases of shielding material.

>mars1510/MCNP

>10^{-11} MeV NEUTRON ENERGY CUTOFF

>SHIELDING:60%WC+40%H_2O (STST or W VESSELS),
80%WC+20%He, 80%W+20%He (W VESSELS)

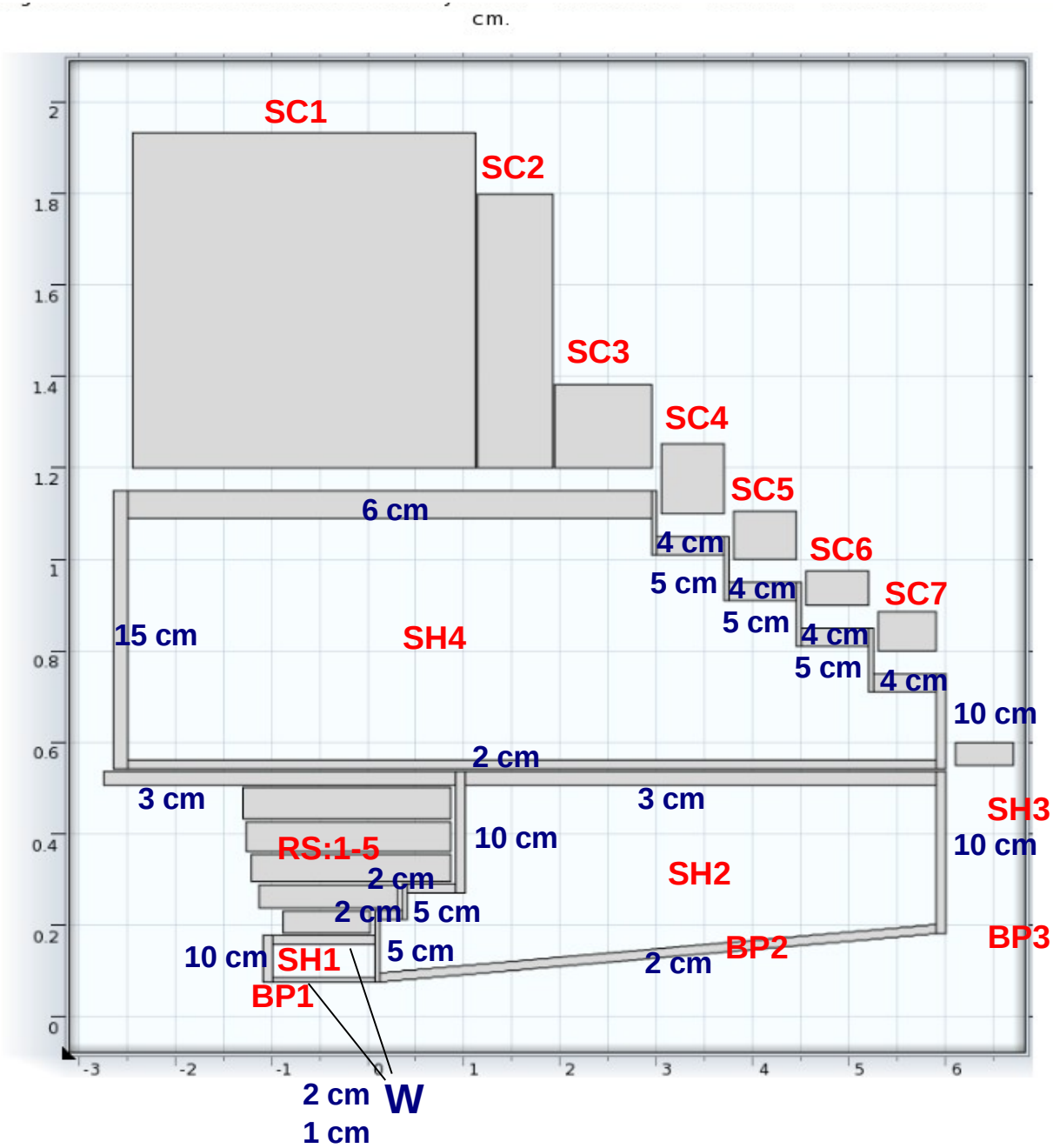
>4 MW proton beam, Np=100,000

>PROTONS ENERGY E=8 GeV.

>GAUSSIAN PROFILE: $\sigma_x=\sigma_y=0.12$ cm.

IDS120h:SHIELDING VESSELS (INITIALLY STST).

Bob Weggel(7/26/11)



BEAM PIPE

BP1: 1 cm STST → 1 cm W

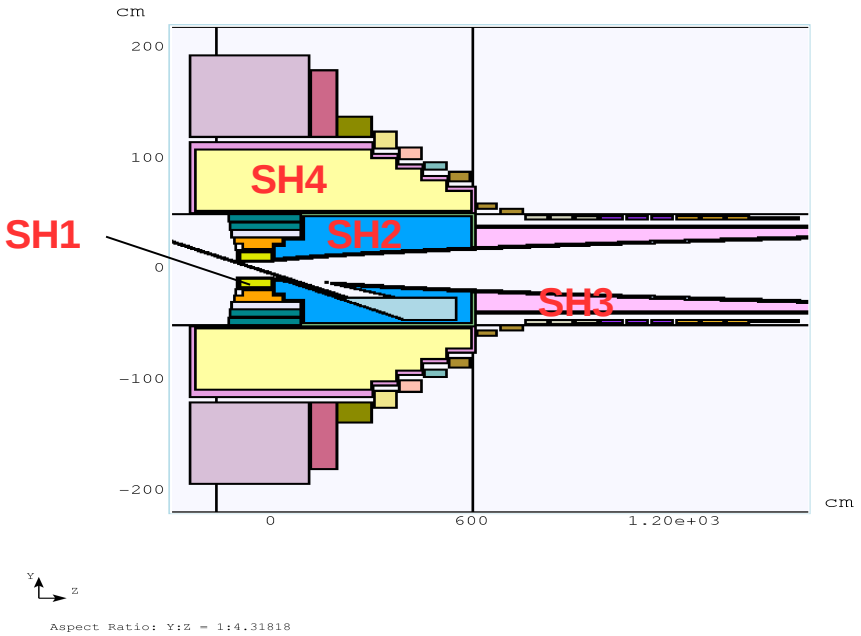
BP2/BP3: 1 cm STST → 2 cm STST

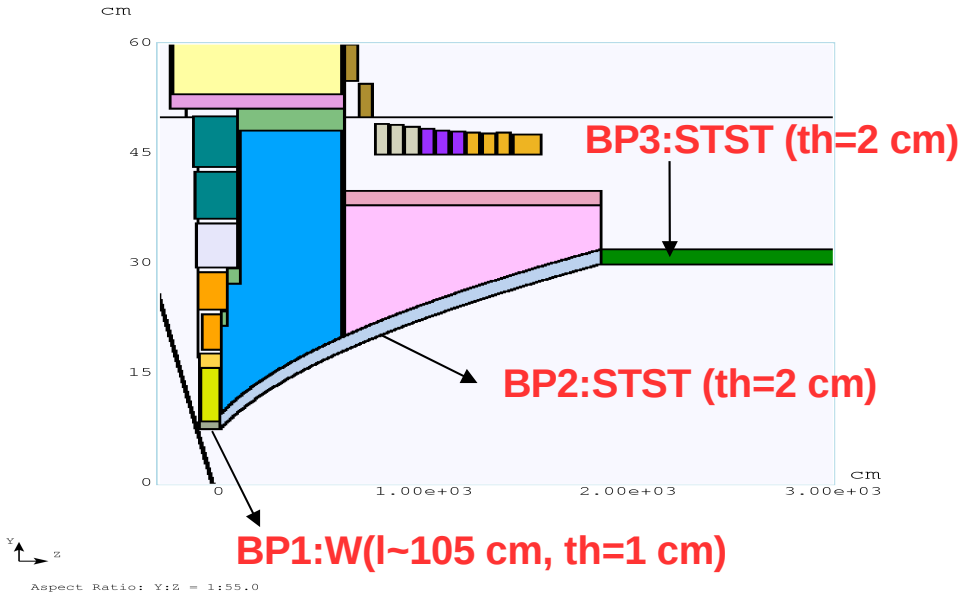
TUBE 1(=BP1) AND TUBE 2 WITH 1 cm AND 2 cm THIKNESS IN THE SH1 VESSEL ARE MADE OF W TO FURTHER REDUCE THE POWER DEPOSITED IN THE RESISTIVE COILS.

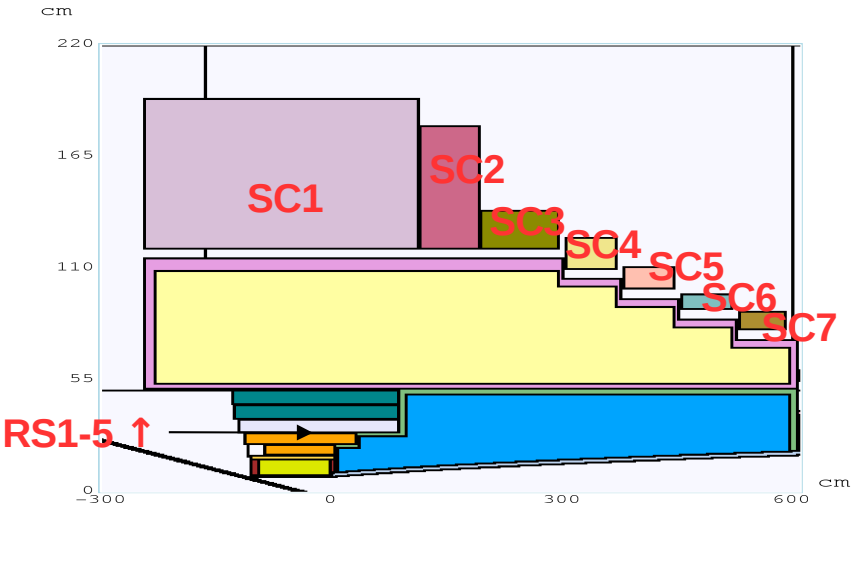
5 cm DISTANCE BETWEEN VESSELS AND SC COILS FOR CRYOGENIC COOLING COMPONENTS

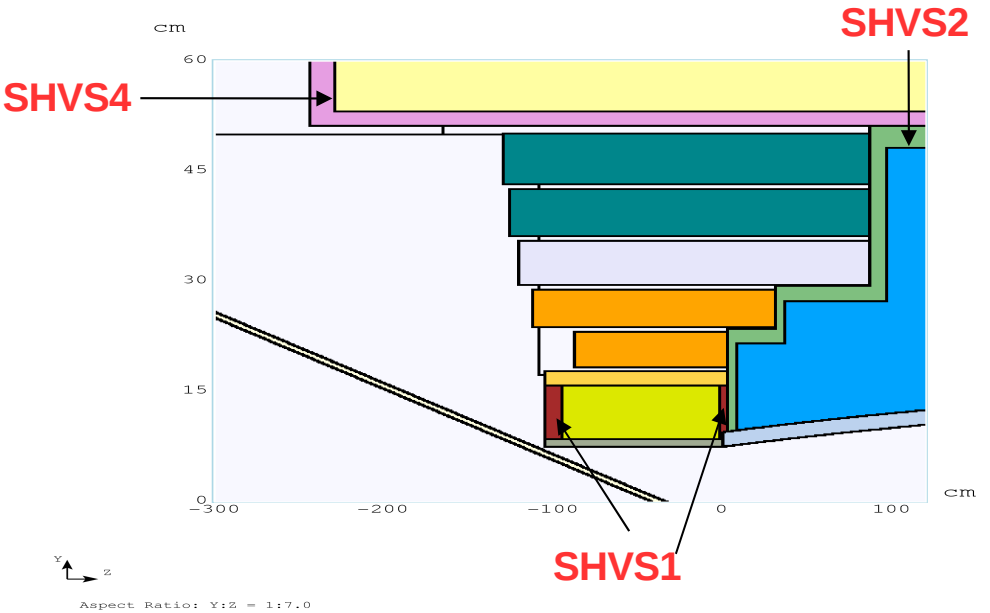
0.5 cm SPACE BETWEEN TUBE 2 OF SH1 AND RS1,
AND 1.0 cm BETWEEN TUBE 1 OF SH4 AND RS5

IDS120h: SHIELDING VESSELS DETAIL PLOTS.









CODES FOR THE DIFFERENT CASES

CASE	SHIELDING	SH VESSELS
VS0SH0	60%WC+40%H_2O	NO VESSELS
VS1SH0	60%WC+40%H_2O	STST (SH1=2 W TUBES)
VS2SH0	60%WC+40%H_2O	W (2 SH1 FL,BP2,BP3=STST)
VS2SH1	80%WC+20%He	W (2 SH1 FL,BP2,BP3=STST)
VS2SH2	80%W+20%He	W (2 SH1 FL,BP2,BP3=STST)

POWER DEPOSITED IN SC SOLENOIDS (SC#).

NiSn/NiTi	VS0SH0	VS1SH0	VS2SH0	VS2SH1	VS2SH2
SC#1	0.516	0.366	0.232	0.124	0.060
SC#2	0.041	0.026	0.037	0.007	0.003
SC#3	0.027	0.030	0.017	0.013	0.005
SC#4	0.043	0.022	0.012	0.008	0.003
SC#5	0.017	0.009	0.013	0.007	0.003
SC#6	0.004	0.004	0.002	0.002	0.003
SC#1-6	0.684	0.457	0.313	0.161	0.074
SC#7-9	0.051	0.043	0.044	0.022	0.031
SC#10-12	0.046	0.059	0.040	0.050	0.030
SC#13-15	0.032	0.030	0.033	0.024	0.014
SC#16-19	0.048	0.049	0.043	0.036	0.035
SC#1-19	0.825	0.638	0.473	0.293	0.184

SC1:0.516 kW -->0.06 kW SC1-6:0.684 kW-->0.074 kW SC#1-19:0.825 kW-->0.184 kW.

POWER DEPOSITED IN SHIELDING (SH#), SHIELDING VESSELS (SHVS#), AND SH1 W TUBE 2(SH1T2).

–	VS0SH0	VS1SH0	VS2SH0	VS2SH1	VS2SH2
SH#1	918.5	896.5	885.0	819.0	854.50
SH#2	1089.5	818.5	799.5	707.0	717.50
SH#3	34.2	22.63	22.02	20.55	20.96
SH#4	50.4	56.4	48.58	28.29	24.26
SH#1-4	2092.6	1794.03	1755.10	1574.84	1617.22

MUCH LESS POWER IN SH1, SH2
SH1:918.5 kW-->854.5 kW (-64 kW)
SH2:1089.5 kW-->717.5 kW (-372 kW)
SH1-4: 2092.6 kW-->1617.22 kW (-475.38 kW)

–	VS0SH0	VS1SH0	VS2SH0	VS2SH1	VS2SH2
SHVS#1	–	80.70	79.05	75.5	79.95
SHVS#2	–	51.10	84.55	65.5	56.05
SHVS#3	–	0.465	0.74	0.51	0.35
SHVS#4	–	0.086	14.46	7.47	6.42
SHVS#1-4	–	132.35	178.8	148.98	142.77
SH1T2(W)	–	68.00	69.35	42.37	33.45

THE TWO SH1 STST FLANGES RECIEVE~80 kW
SH1 2 cm W TUBE#2:68 kW-->33.45 kW

POWER DEPOSITED IN RESISTIVE MAGNETS (RS#) AND BEAM PIPE (BP#).

Cu	VS0SH0	VS1SH0	VS2SH0	VS2SH1	VS2SH2
RS#1+2	115.8	93.05	92.05	81.25	70.50
RS#3	43.82	43.03	40.60	37.63	33.01
RS#4+5	53.55	57.70	54.90	50.80	45.39
RS#1-5	213.17	193.78	187.55	169.68	148.90

MUCH LESS POWER IN RS#1+2
RS#1+2:115.8 kW-->70.50 kW (-45.3 kW)
RS#1-5:213.17 kW-->148.9 kW (-64.8 kW)

BP	VS0SH0	VS1SH0	VS2SH0	VS2SH1	VS2SH2
BP#1	203.0	450.15	452.25	427.80	423.35
BP#2(ST)	175.75	287.75	282.40	270.1	272.60
BP#3(ST)	6.96	8.415	8.41	9.72	8.56
BP#1-3	385.71	746.32	743.06	707.62	704.51

MUCH MORE POWER IN BP#1, BP#2
BP#1:(1 cm STST) 203.0 kW-->(1 cm W) 423.35 kW (+220.35 kW)
BP#2:(1 cm STST) 175.75 kW-->(2 cm STST) 272.60 kW (+96.85 kW)
BP#1-5:385.71 kW-->704.51 kW (+318.8 kW)
BP#3 TDP INDICATES MORE ENERGY IS NOW SPREAD DOWNSTREAM.

TOTAL POWER DEPOSITED IN DIFFERENT AREAS AND SC#1-11 PEAK VALUES.

TOTALS	VS0SH0	VS1SH0	VS2SH0	VS2SH1	VS2SH2
SC#1-19	0.825	0.638	0.473	0.293	0.184
SH#1-4	2092.6	1794.03	1755.10	1574.84	1617.22
SHVS#1-4	–	132.35	178.80	148.98	142.77
RS#1-5	213.17	193.78	187.55	169.68	148.90
BP#1-3	385.71	746.32	743.06	707.62	704.51
Hg TARG.	409.5	409.05	408.85	409.60	408.70
Hg POOL	228.85	231.55	229.85	217.85	215.00
HgP.WALLS	0.42	0.44	0.41	0.31	0.30
Be WIND.	0.86	0.85	0.86	0.90	0.85
TOTAL	3353.58	3532.00	3405.31	3272.13	3271.89

MUCH LESS POWER IN SC#1-19:0.825 kW-->0.184 kW (-0.641 kW)
MUCH LESS POWER IN SH#1-4:2029.6 kW-->1617.22 kW (-412.38 kW)
MUCH LESS POWER IN RS#1-5:213.17 kW-->148.9 kW (-64.8 kW)
MUCH MORE POWER IN BP#1-3:385.71 kW-->704.51 kW (+318.8 kW)
TOTAL POWER IS TRG STATION:3353.58 kW--> 3271.89 kW(-81.69 kW)

PEAK TDP(mW/g)	VS0SH0	VS1SH0	VS2SH0	VS2SH1	VS2SH2
SC#1	0.060	0.040	0.036	0.018	0.018
SC#2	0.005	0.010	0.012	0.006	0.016
SC#3	0.010	0.016	0.008	0.007	0.004
SC#4	0.024	0.011	0.007	0.006	0.002
SC#5	0.022	0.009	0.017	0.008	0.002
SC#6	0.009	0.008	0.012	0.003	0.001
SC#7	0.004	0.002	0.004	0.001	0.001
SC#8	0.070	0.120	0.043	0.020	0.025
SC#9	0.038	0.039	0.054	0.022	0.046
SC#10	0.070	0.055	0.041	0.041	0.014
SC#11	0.038	0.060	0.040	0.070	0.060

SC#1 PEAK:0.060 WITHOUT VESSELS-->0.040 mW/g STST VESSELS-->0.018mW/g FOR VS2SH2
SC#8 PEAK:0.070 WITHOUT VESSELS-->0.120 mW/g STST VESSELS-->0.043mW/g WITH W VESSELS