IDS120h GEOMETRY WITH MODIFIED Hg POOL VESSEL

SIMULATIONS FOR 60% W + 40% He SHIELDING (P12 'POINT')

WITH STST SHIELDING VESSELS

EFFECTS OF Be WINDOW WATER COOLING ON PION AND MUON YIELD

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IDS120hm: (m IS FOR) modified Hg pool vessel IN IDS120h.

 # 5E5 SIMULATIONS COMPARISON FOR GEOMETRY WITH W AND STST SHIELDING VESSELS (P12 'POINT')

 # PION AND MUON YIELD WITH 1 cm H2O FOR COOLING Be WINDOW (1E5 SIMULATIONS) .

>mars1510/MCNP

>10^{-11} MeV NEUTRON ENERGY CUTOFF

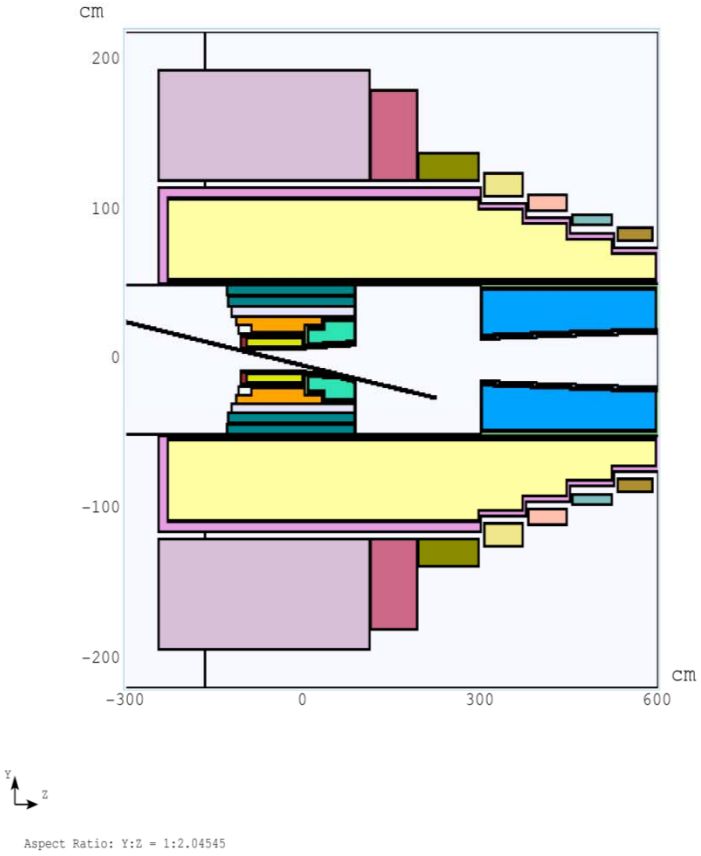
>SHIELDING: 60% W + 40% He (WITH W VESSELS)

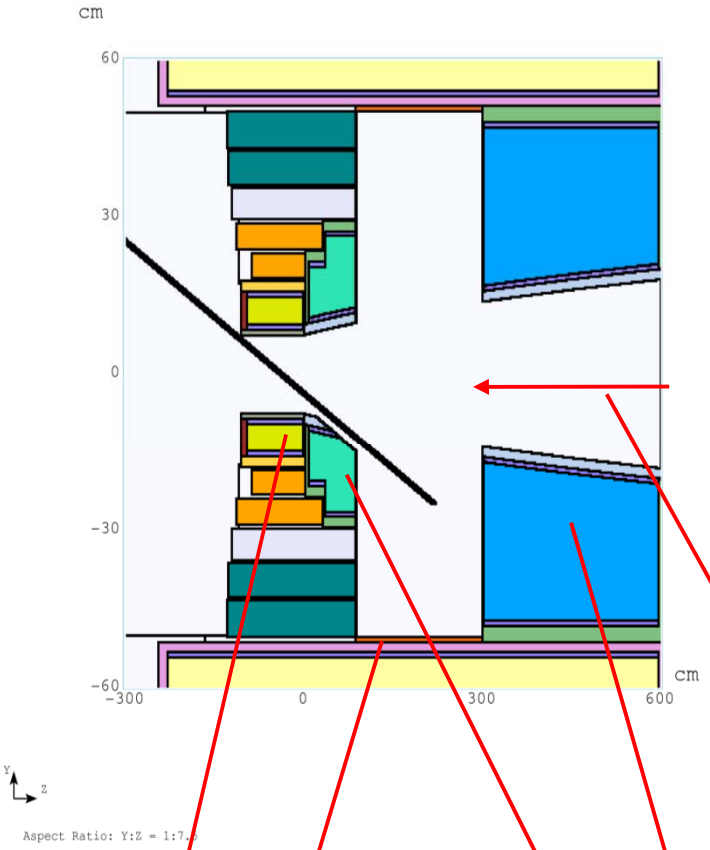
>4 MW proton beam, Np = 100,000/500,000 events.

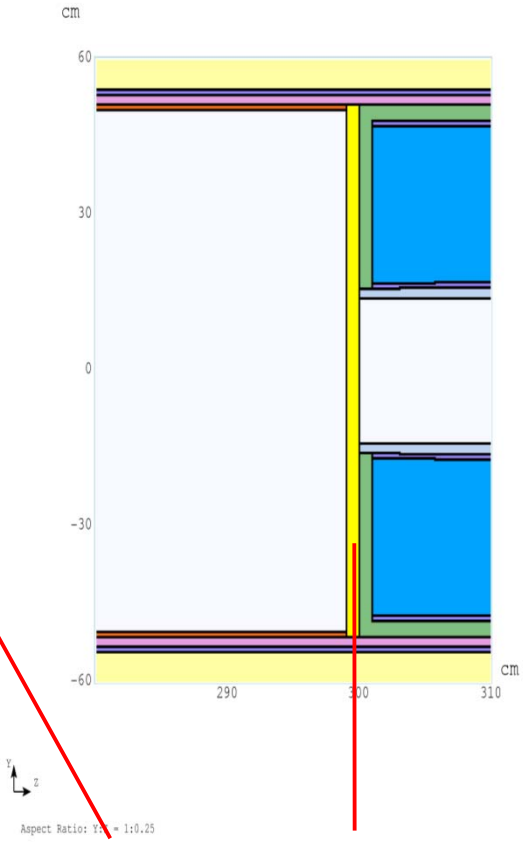
>PROTONS ENERGY E = 8 GeV.

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

IDS120hm GEOMETRY = IDS120h WITH MODIFIED Hg POLL VESSEL AND SHIFTED Be WIDOW FROM 600 cm (0.6 cm THICK) TO 300 cm (1 cm THICK).







SH1-->SH1A

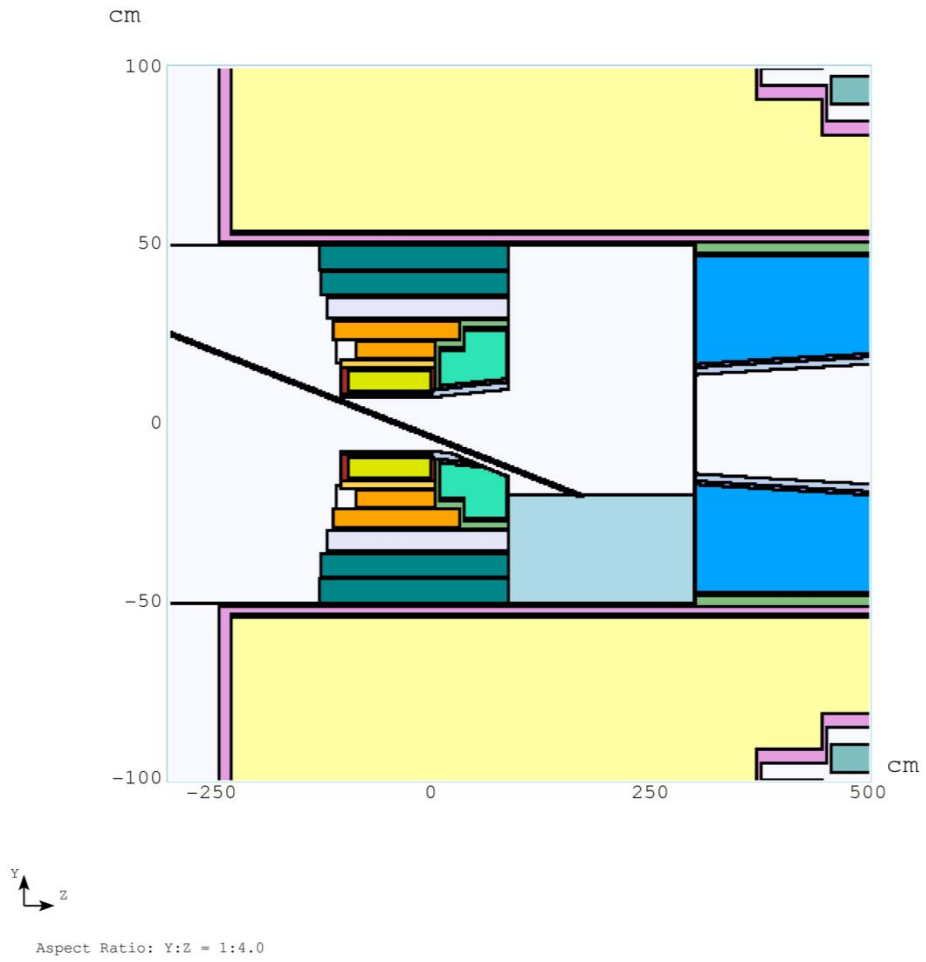
SH2-->SH1B + SH2

1 cm THICK Be WINDOW IS LOCATED AT 300 cm (ORIGINALLY 0.6 cm THICK PLACED AT 600 cm)

MODIFIED Hg POOL EXTENTS FROM 86 cm TO ~ 300 cm ALONG THE z-AXIS AND UP ~ 50 cm RADIALLY

1 cm THICK STST WALLS USED FOR THE Hg POOL VESSEL

IDS120hm Hg POOL SURFACE AT y = - 20 cm, STST SHIELDING VESSELS



TABLES NOTATION: C2(P12)(A/B) = IDS120hm WITH Hg IN THE POOL VESSEL, SURFACE AT y = - 20 cm (A = W VESSELS, B = STST VESSELS)

POWER DEPOSITED IN THE SC COILS

NiSn/NiTi	C2(P12)A	C2(P12)B
SC#1	0.204	0.282
SC#2	0.060	0.059
SC#3	0.043	0.055
SC#4	0.025	0.028
SC#5	0.005	0.009
SC#6	0.002	0.002
SC#1-6	0.339	0.435
SC#7-9	0.062	0.065
SC#10-12	0.055	0.065
SC#13-15	0.038	0.042
SC#16-19	0.064	0.070
SC#1-19	0.558	0.614

ONLY A SMALL INCREASE IN THE DP IN SC#1,
OTHERWISE INSIGNIFICANT CHANGES

POWER DEPOSITED IN THE SHIELDING (SH#), SHIELDING VESSELS (SHVS#)

–	C2(P12)A	C2(P12)B
SH#1A	559.50	713.50
SH#1B	389.90	440.05
SH#2	184.35	193.70
SH#3	22.73	23.53
SH#4	81.45	107.35
SH#1-4	1237.93	1478.13

MORE DP IN SH#1A, SH#1B (~ +204 kW) AND SH#4 (~ +26 kW)
---> MORE ENERGY WILL END UP IN THE SHIELDING (~ +240 kW)

–	C2(P12)A	C2(P12)B
SHVS#1	58.30	118.75
SHVS#2	94.20	69.00
SHVS#3	0.85	0.57
SHVS#4	44.11	25.04
SHVS#1-4	197.46	213.36
SH1T2(W)	69.95	–

~ 54 kW LESS ENERGY DEPOSITED IN THE VESSELS (BP SECTIONS NOT INCLUDED) .

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

Cu	C2(P12)A	C2(P12)B
RS#1+2	111.05	135.0
RS#3	48.81	54.85
RS#4+5	64.45	69.05
RS#1-5	224.31	258.90

~24 kW MORE POWER IN RS#1+2, ~35 kW MORE IN RS#1-5

BP	C2(P12)A	C2(P12)B
BP#1(W)	437.15 (W)	206.00 (STST)
BP#2(ST)	246.80	266.90
BP#3(ST)	8.75	8.95
BP#1-3	692.70	482.05

BP#1 (W --> STST) DP DECREASED BY MORE THAN HALF (-231.15 kW), SLIGHTLY MORE DP IN BP#2 (2 cm STST IN BOTH CASES)

SUMMARY FOR TOTAL POWER DEPOSITED IN DIFFERENT AREAS AND ENERGY FLOW.

TOTALS	C2(P12)A	C2(P12)B
SC#1-19	0.56	0.61
SH#1-4	1237.93	1478.13
SHVS#1-4	197.46	213.36
RS#1-5	224.31	258.90
BP#1-3	692.70	482.05
Hg TARG.	408.80	408.45
Hg POOL	327.70	332.75
HgP.WALLS	12.87	13.24
Be WIND.	7.39	7.32
TOTAL	3179.67	3194.81

TDP FLOW (kW)	C2(P12)A	C2(P12)B
R=200 cm	151.72	140.04
z=-250 cm	173.39	158.32
z=1900 cm	400.55	398.09
TOTAL FLOW	725.66	696.45
TOTAL	3905.33	3891.26
(TOTAL-4 MW)	-99.67	-108.71

SC#1-19: ~ 0.6 kW
SH#1-4: ~ +240.2 kW
RS#1-5: ~ +35.0 kW
BP#1-3: ~- 210.7 kW
BeWind: ~ 7.3 kW

LESS ENERGY WILL FLOW UPSTREAM (~ -15.1 kW) AND RADIALLY (~ -11.7 kW).

SC#1-11 PEAK VALUES.

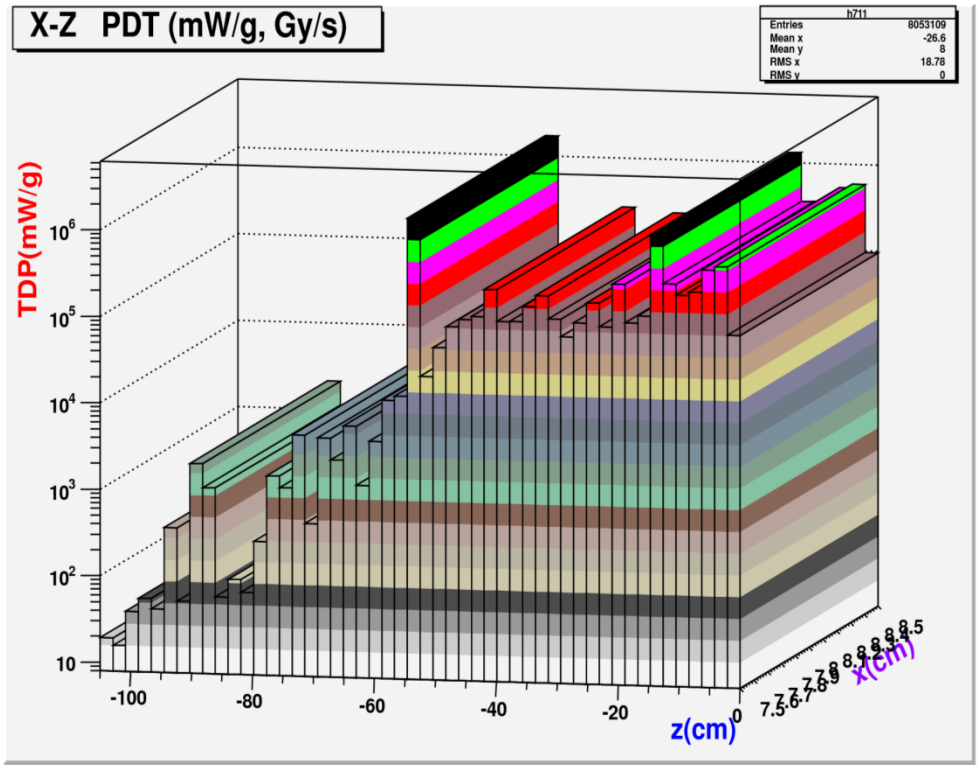
PEAK(mW/g)	C2(P12)A	C2(P12)B
SC#1	0.016	0.023
SC#2	0.014	0.009
SC#3	0.008	0.018
SC#4	0.012	0.015
SC#5	0.003	0.009
SC#6	0.001	0.004
SC#7	0.001	0.005
SC#8	0.055	0.054
SC#9	0.060	0.055
SC#10	0.045	0.080
SC#11	0.035	0.050

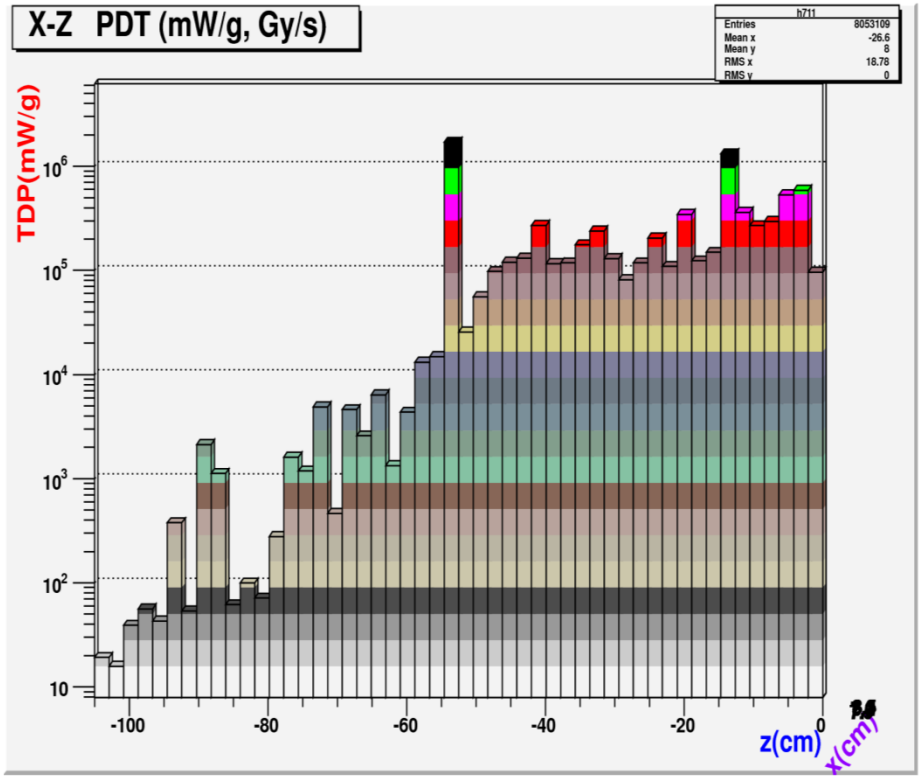
SMALL INCREASE IS SC#1 PEAK VALUE, NO PROBLEMS IS SC's NEAR THE END OF THE ”STAIRS”.

END OF GOOD NEWS...

AND NOW THE BAD NEWS...

TDP 3D (LEFT) AND vs. z (RIGHT) PLOTS FOR BP#1 SLAB (1 cm THICK, +x DIRECTION)



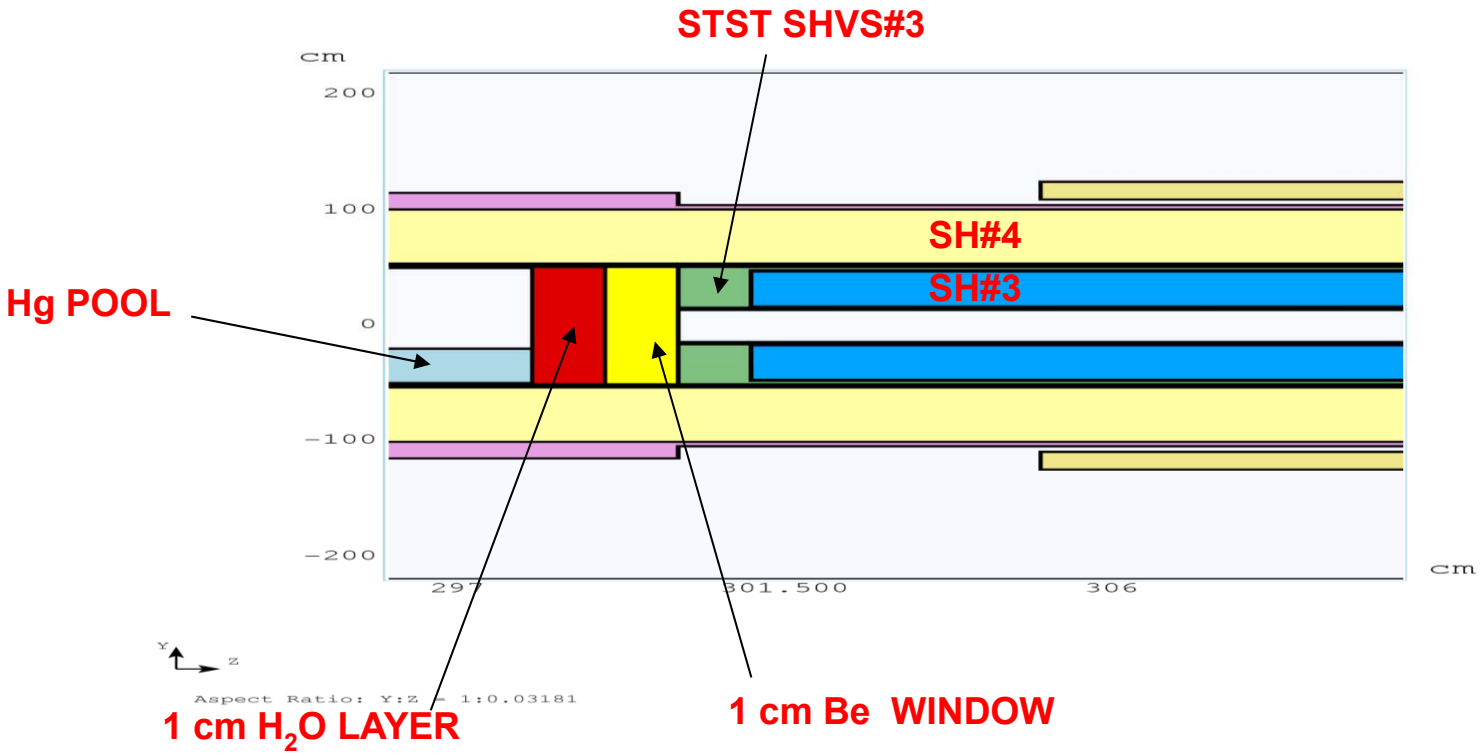


TDP IN BP#1 DECREASED FROM ~ 437 kW TO ~ 206 kW BUT THE PEAK VALUE INCREASED FROM ~10 W/g TO ~100 W/g OR MORE,
MATERIAL DENSITY DECREASED FROM ~ 19.3 g/cc (W) TO ~ 7.9 g/cc (STST)

THAT IS ALSO AN ANSWER ABOUT THE USE OF LIGHTER MATERIAL FOR PART OF BP TO DECREASE PEAK VALUES (WHICH OF COURSE YOU FORGOT)

PEAK VALUE FOR SH#1A APPEARS TO BE ALSO HIGHER NOW ~ 11-12 W/g

EFFECT OF 1 cm WATER LEAYER FOR Be WINDOW COOLING IN PION AND MUON YIELD



FLOW OF PIONS AND MUONS (40 < T < 180 MeV) AT z = 1900 cm

BEFORE: $N(\pi^+) = 1691$
$N(\pi^-) = 1696$
$N(\mu^+) = 9022$
$N(\mu^-) = 9483$

AFTER: $N(\pi^+) = 1586$ (-105)
$N(\pi^-) = 1653$ (-43)
$N(\mu^+) = 8908$ (-114)
$N(\mu^-) = 9351$ (-132)