SHIELDING STUDIES FOR IDS80/IDS120 (NO IRON PLUG/YOKE).

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(Jan 11, 2011)

Energy deposition from MARS+MCNP
(10^{-11} MeV NEUTRON ENERGY CUTOFF).

IDS80 GEOMETRY WITHOUT IRON PLUG AND YOKE MATERIAL (TO ACCOMODATE ACCESS TO DIFFERENT PARTS OF THE TARGET STATION).

>SHIELDING :60%WC+40% H_2O

>4 MW proton beam. Np=400,000

>PROTONS ENERGY E=8 GeV.

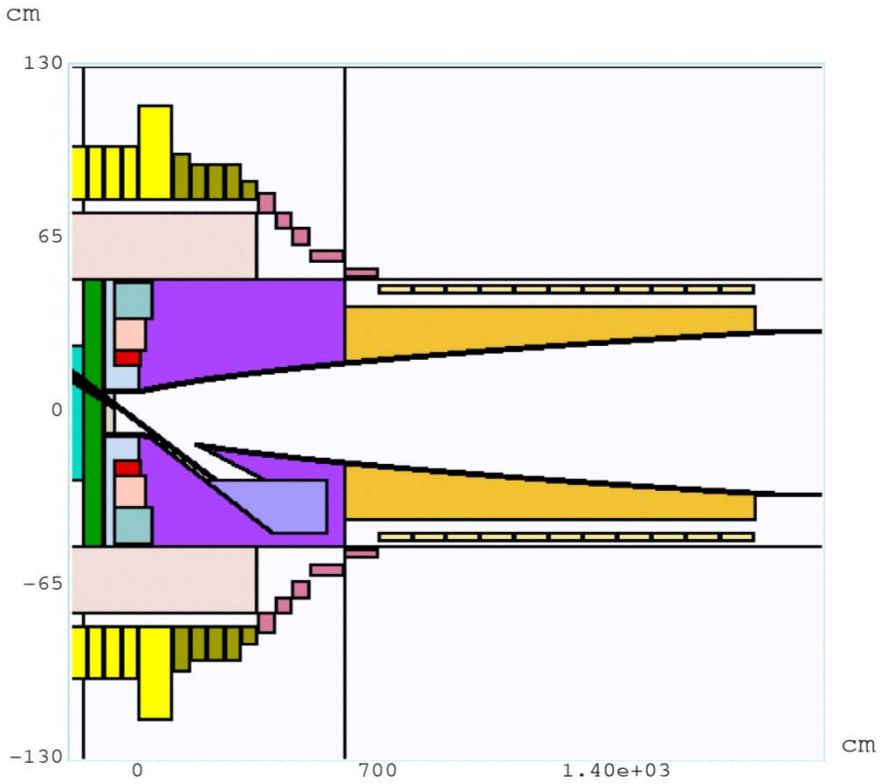
>GAUSSIAN PROFILE: $\sigma_x=\sigma_y=0.12$ cm.

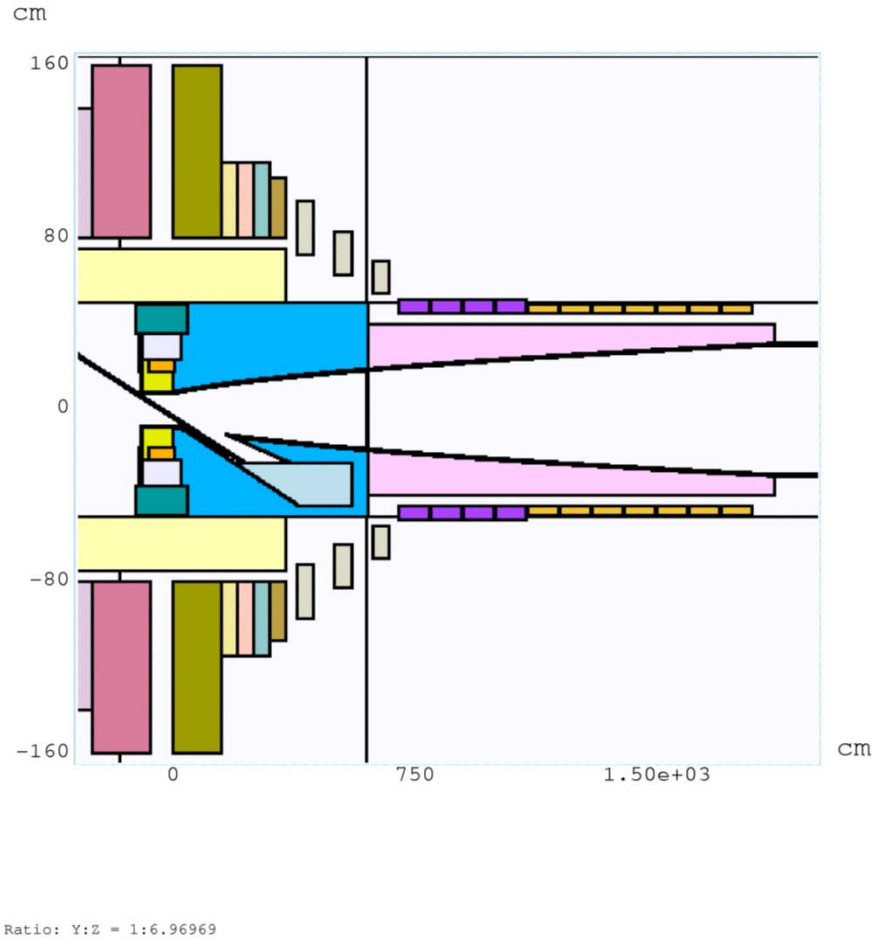
- **ADDING SHIELDING WC/H20 GRADUALLY FROM 50 TO 80 cm.**
- **REPLACING 5 cm WC/H2O WITH BORON CYLIDRICAL LAYER (AT 3 DIFFERENT RADII) .**
- **REPLACING 10 cm WC/H2O WITH BORON CYLIDRICAL LAYER (65<r<75 cm).**

>>>>IDS80 WITH E=24 GeV PROTONS BEAM<<<<

>>>>IDS120 WITH E=8 GeV PROTONS BEAM<<<<

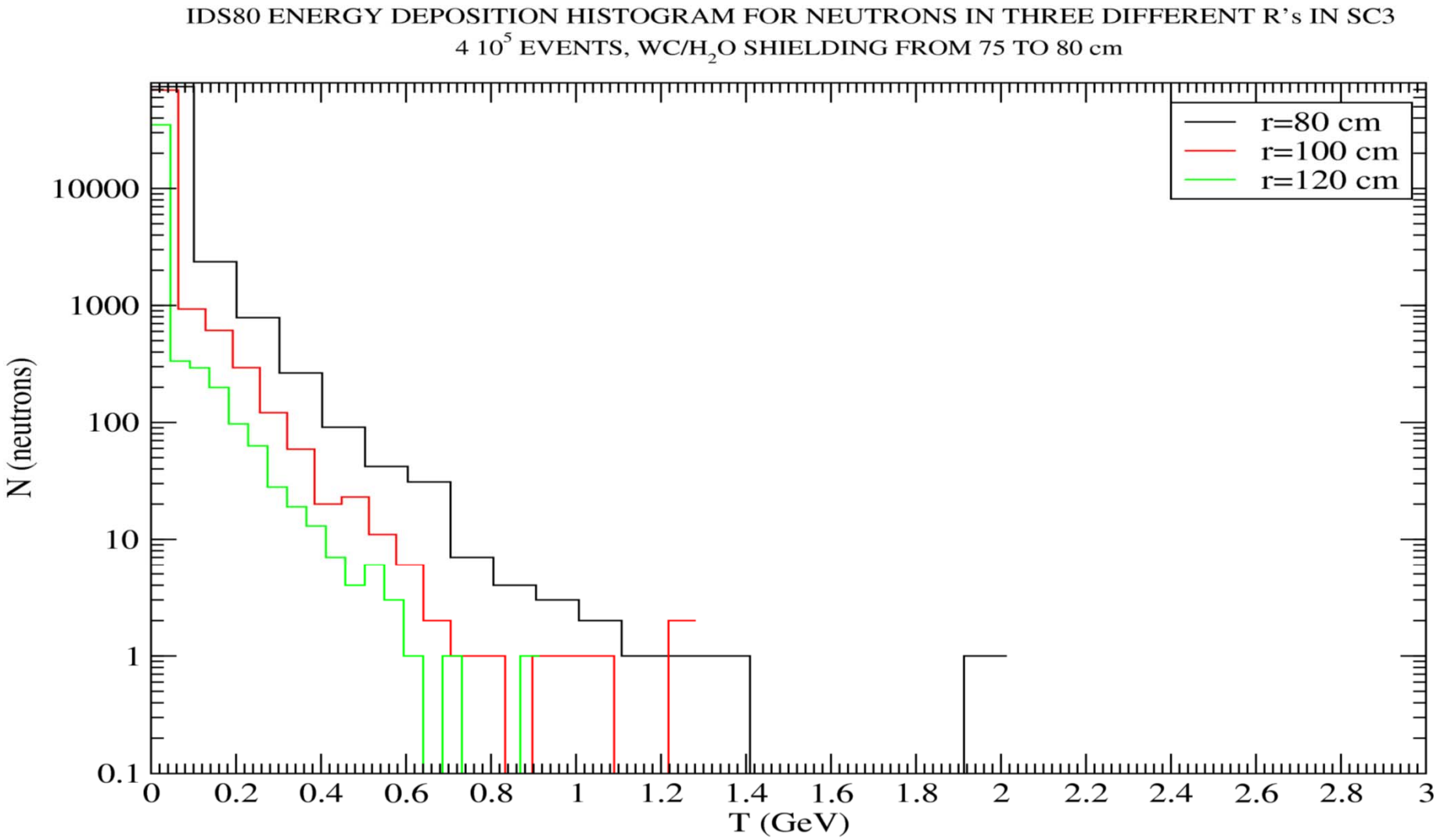
IDS80 GEOMETRY WITH AND WITHOUT IRON PLUG AND YOKE.



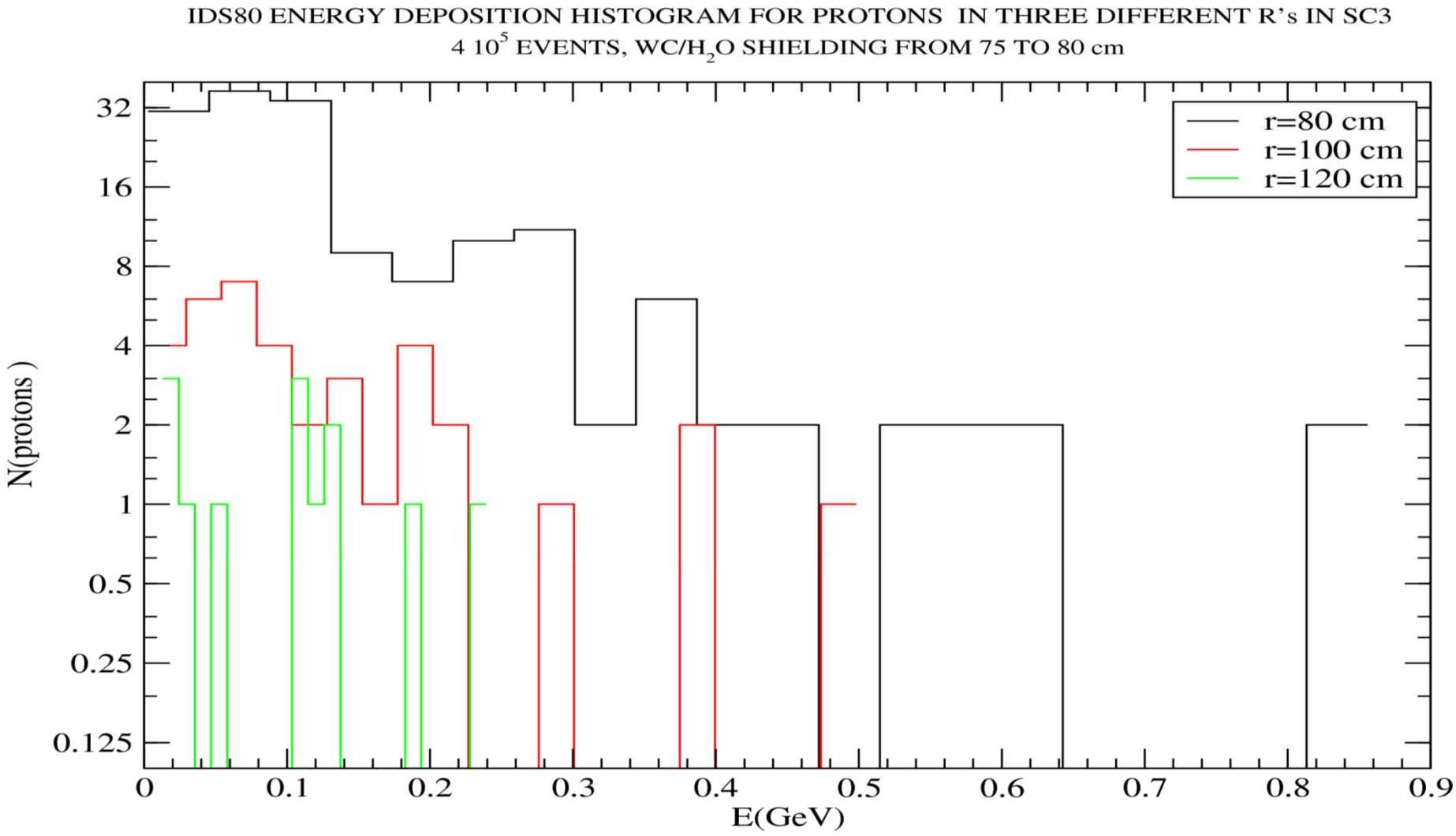


NEW: SC#1-7 -300<z<345 cm R_{in}=80.0 cm R_{out}=140 (1)/160 (2,3)/115 (5-6)/108(7) cm(NbSn)
SC#8-10 383<z<667 cm R_{in}=72/63/54 cm R_{out}=97.0/83/69 cm (NbTi)
SC#11-14 700<z<1090 cm R_{in}=45 cm R_{out}=51 cm (NbTi)
SC#15-21 7190<z<1090 cm R_{in}=45 cm R_{out}=49 cm (NbTi) (TOTAL # SC=21)

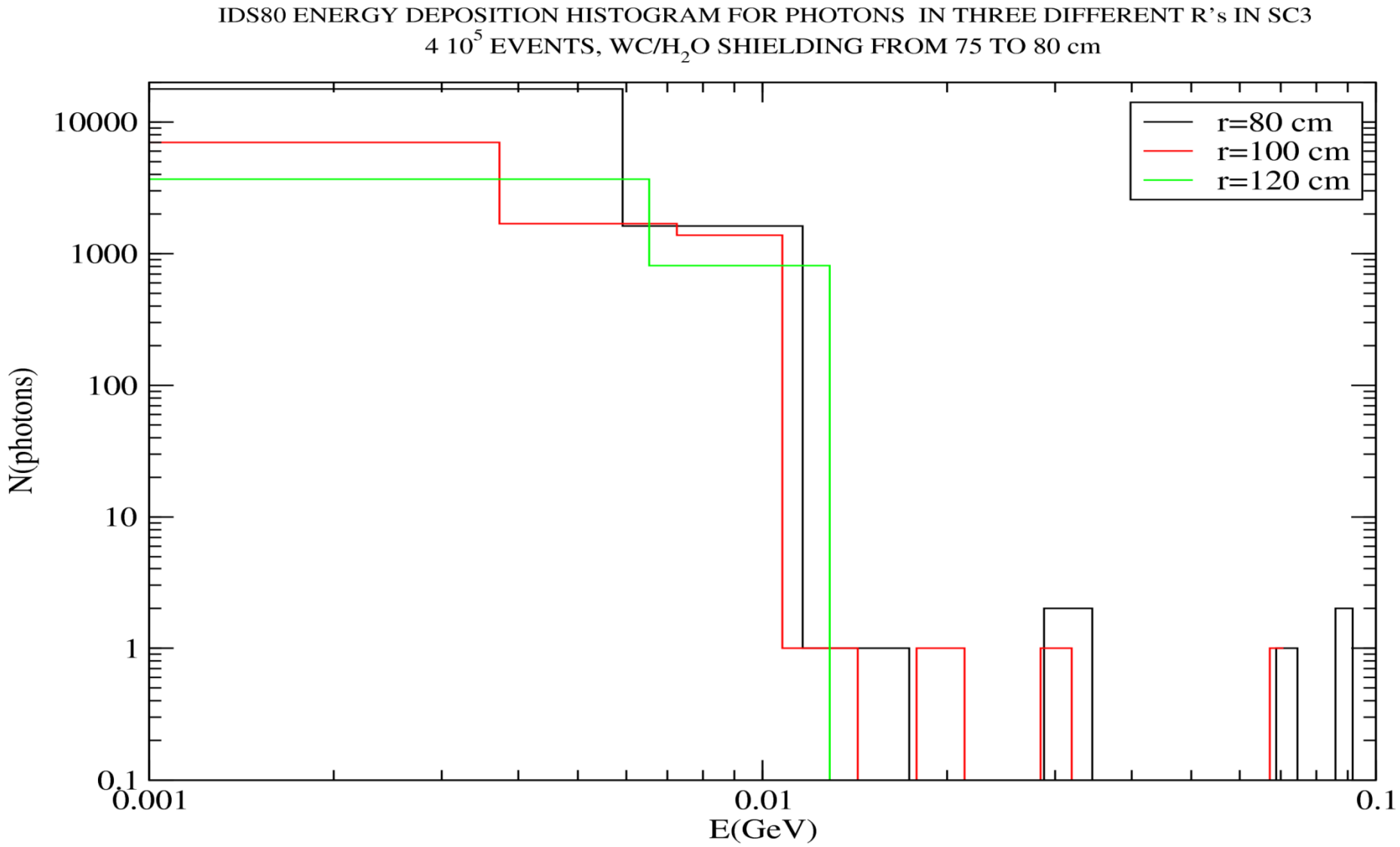
NEUTRONS SPECTRUM IN SC#3 (3 CYLIDRICAL SURFACES AT 80, 100 AND 120 cm) WC/H2O FROM 75<r<80cm (4. 10^5 p).



PROTONS SPECTRUM IN SC#3 (3 CYLIDRICAL SURFACES AT 80, 100 AND 120 cm) WC/H2O FROM 75<r<80cm (4. 10^5 p).



PHOTONS SPECTRUM IN SC#3 (3 CYLIDRICAL SURFACES AT 80, 100 AND 120 cm) WC/H2O FROM 75<r<80cm (4. 10^5 p).

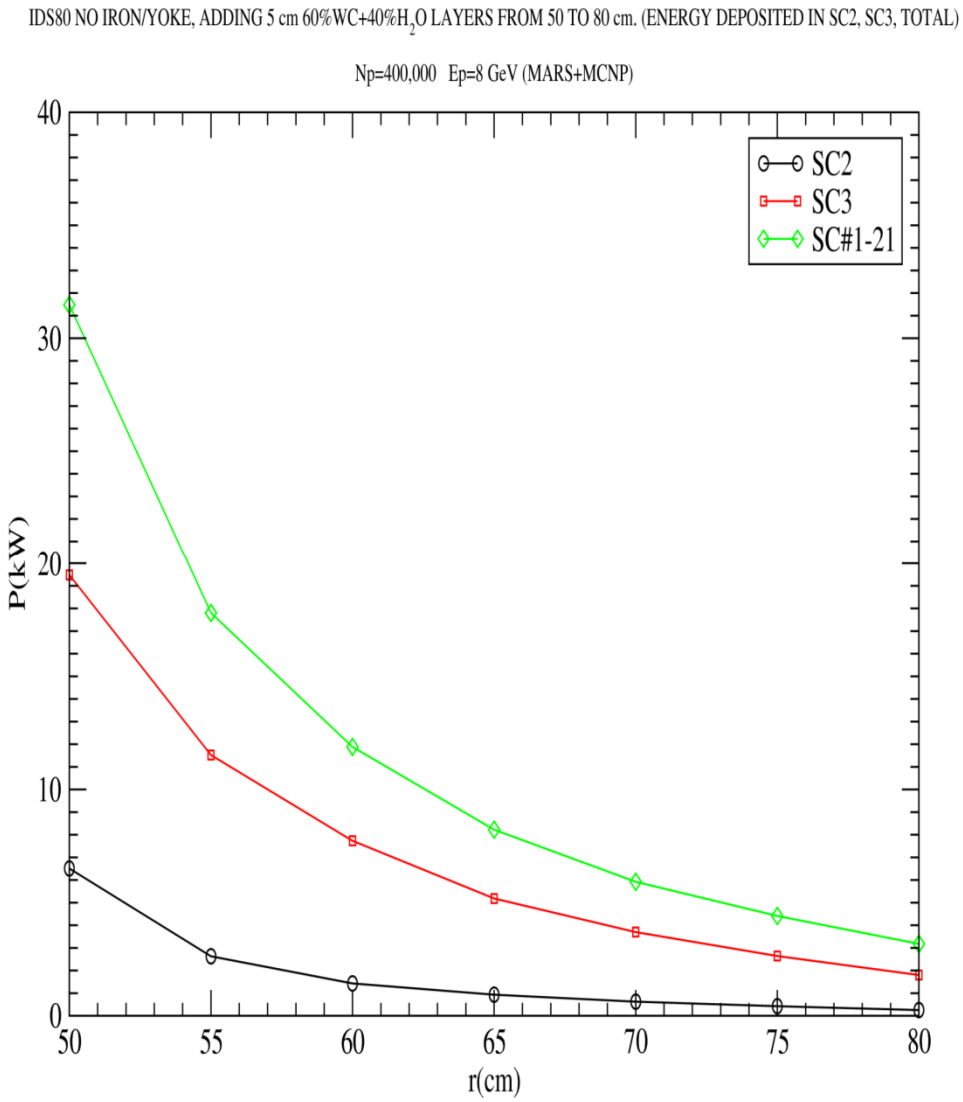


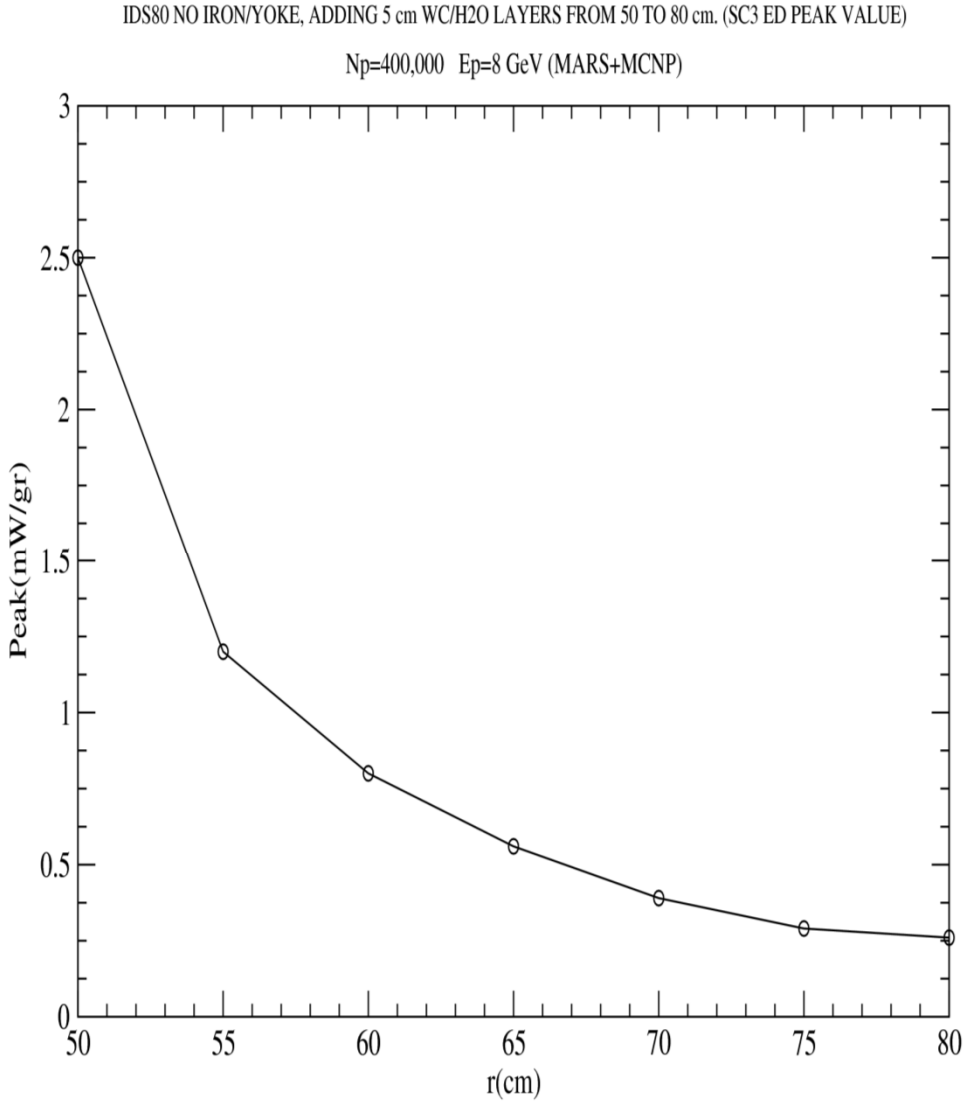
IDS80 GEOMETRY WITHOUT IRON PLUG AND YOKE.
ADDING 5 cm 60% WC+40% H_2O LAYERS FROM 50 TO 80 cm (DATA).

R(cm)	SC2(kW)	SC3(kW)	SC#1-21(kW)	SC3 PEAK(mW/gr)
50	6.51	19.48	31.48	2.50
55	2.63	11.52	17.80	1.20
60	1.43	7.73	11.88	0.80
65	0.93	5.18	8.22	0.56
70	0.62	3.70	5.92	0.39
75	0.42	2.64	4.41	0.29
80	0.25	1.80	3.18	0.26

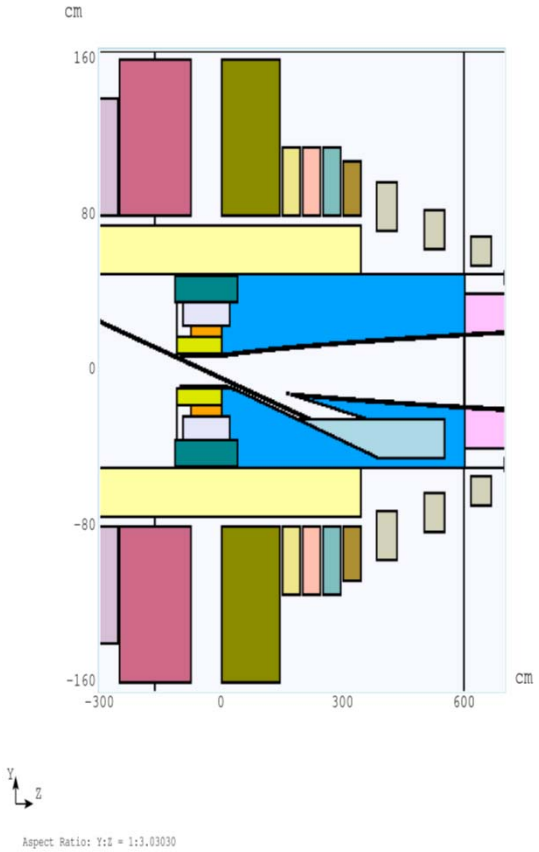
CASES ARE WITH dRxdZ=1.6 cm x 30 cm BINNING.
UNCERTAINTY TO PEAK VALUES BECAUSE OF BINNING.
CRITERIA FOR CHOOSING THE “RIGHT” BINNING ??

IDS80 GEOMETRY WITHOUT IRON PLUG AND YOKE. ADDING 5 cm WC/H20 LAYERS FROM 50 TO 80 cm (PLOTS).

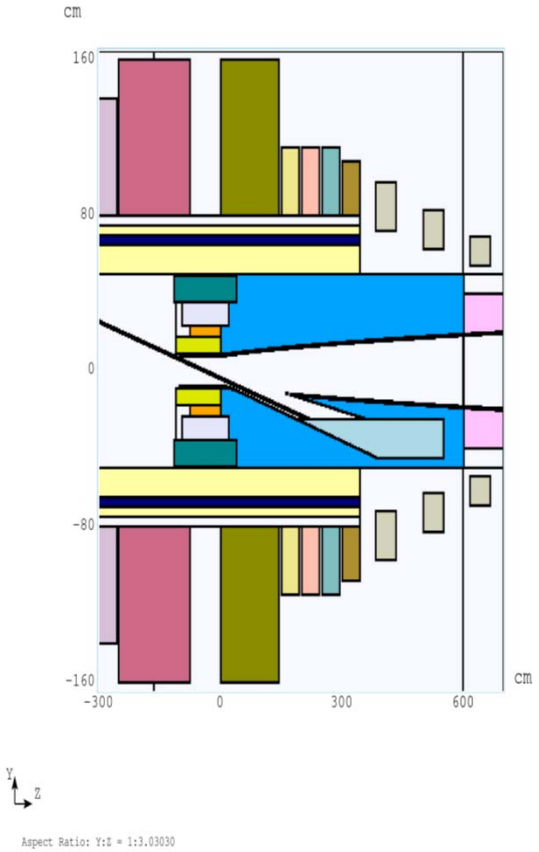




IDS80 GEOMETRY WITHOUT IRON PLUG AND YOKE(75<r<80 VAC.) ADDING A 5 cm B10/B11 LAYER AT DIFFERENT RADII.

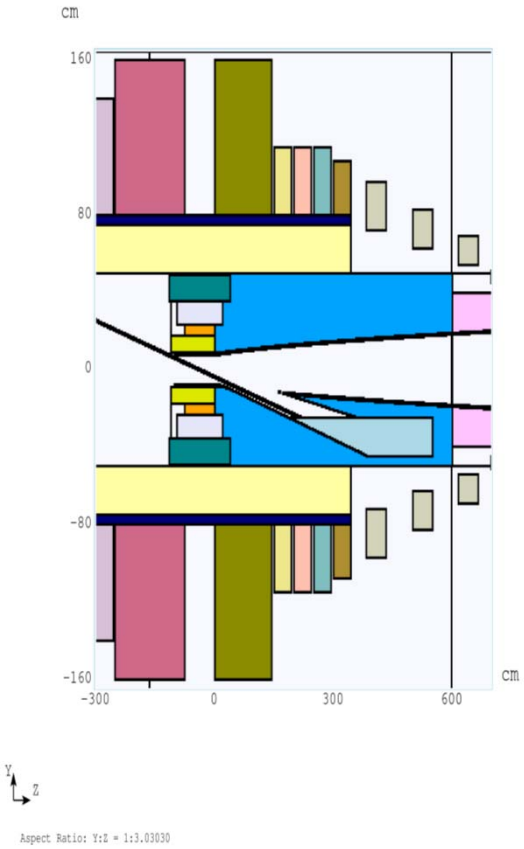


SC3: 2.2 kW
Peak: 0.28 mW/gr
VACUUM:75<r<80 cm

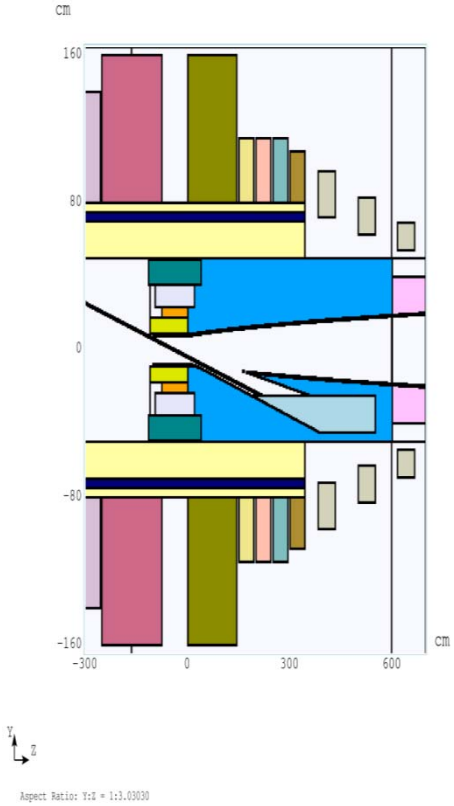


SC3: 3.3 kW
Peak: 0.38 mW/gr
B10/B11:65<r<70 cm

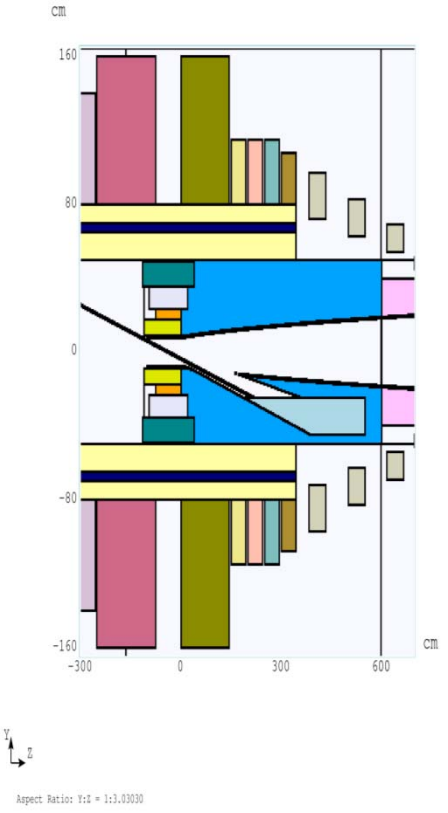
IDS80 GEOMETRY WITHOUT IRON PLUG AND YOKE. ADDING A 5 cm B10/B11 LAYER AT DIFFERENT RADII.



SC3: 2.3 kW
Peak: 0.68 mW/gr
B10/B11:75<r<80 cm

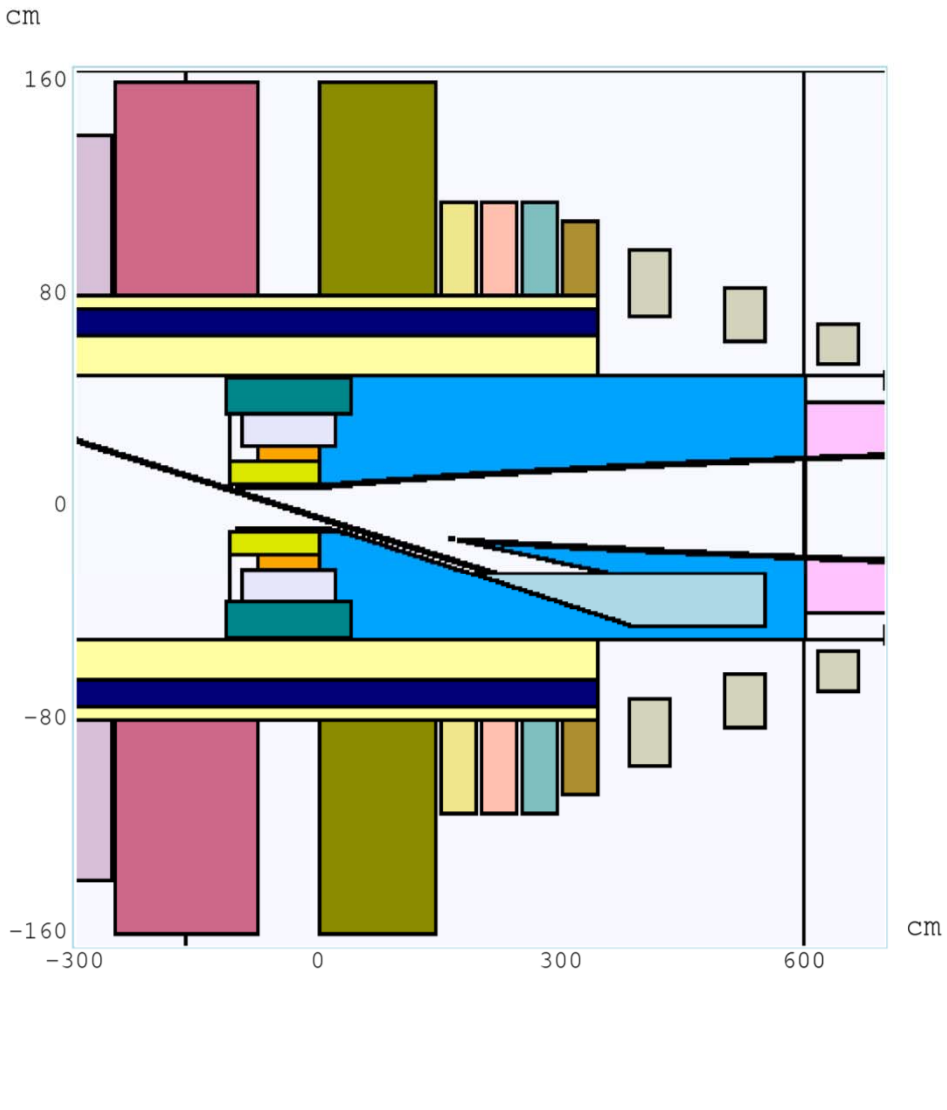


SC3: 2.3 kW
Peak: 0.36 mW/gr
B10/B11:70<r<75 cm



SC3: 2.3 kW
Peak: 0.33 mW/gr
B10/B11:65<r<70 cm

IDS80 GEOMETRY WITHOUT IRON PLUG AND YOKE. ADDING A 10 cm B10/B11 LAYER AT 65<r<75 cm.



SC3: 2.3 kW
Peak: 0.45 mW/gr
B10/B11:65<r<75 cm

Energy deposition from MARS+MCNP
(10^{-11} MeV NEUTRON ENERGY CUTOFF).

IDS80 GEOMETRY WITHOUT IRON PLUG AND YOKE MATERIAL

SHIELDING:60%WC+40% H_2O 75<r<80 cm in Vacuum

4 MW proton beam. Np=400,000

PROTONS ENERGY E=24 GeV.

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

SC3: 1.58 kW SC#1-21: 4.11 kW
peak SC3: 0.20 mW/gr
[For 8 GeV beam, peak in SC3 ~ 0.28 MW/gr; see slide 9]

Energy deposition from MARS+MCNP
(10^{-11} MeV NEUTRON ENERGY CUTOFF).

IDS120 GEOMETRY WITHOUT IRON PLUG AND YOKE MATERIAL

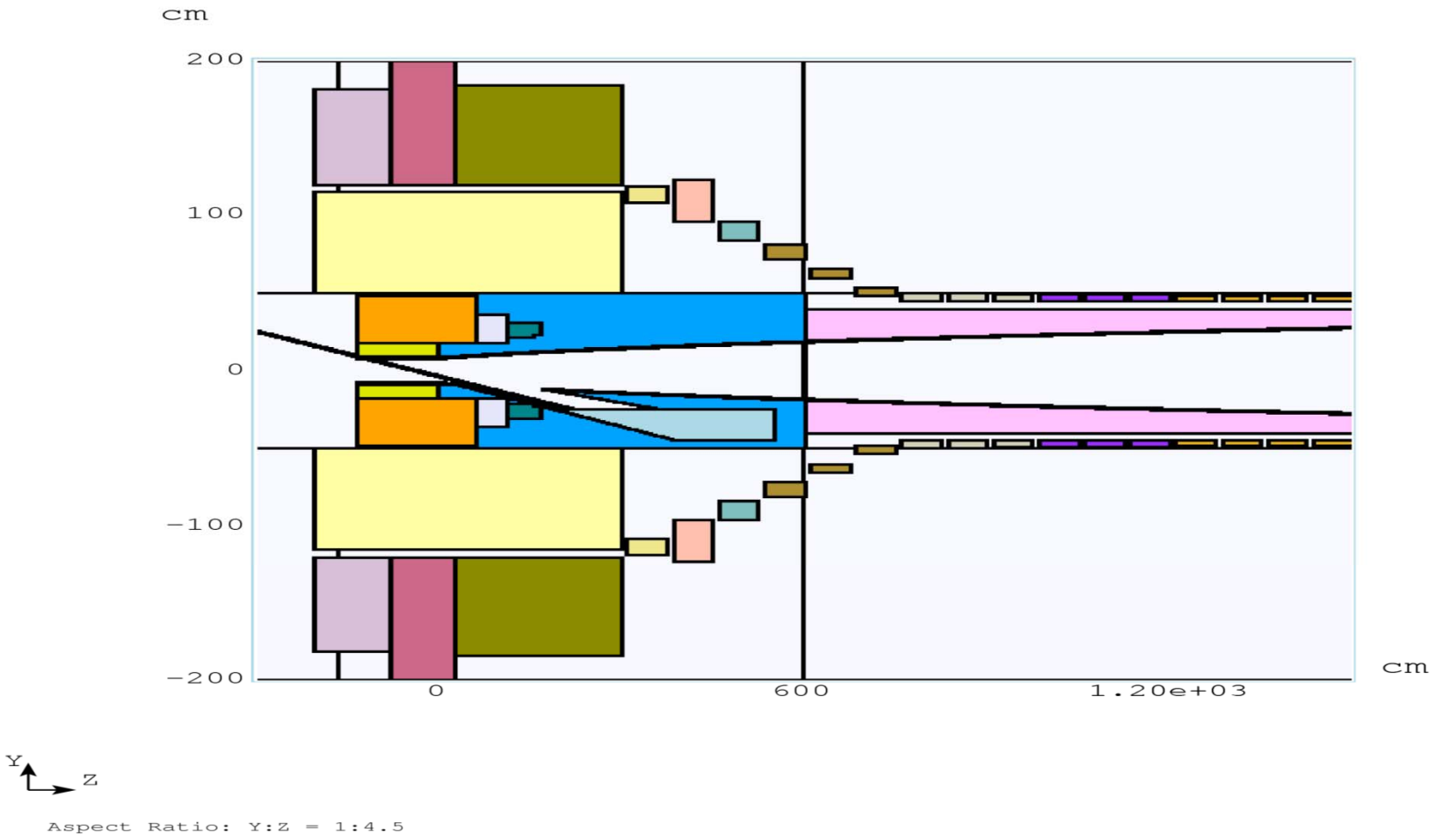
SHIELDING: 60%WC+40% H_2O

4MW proton beam. Np=400,000

PROTONS ENERGY E=8 GeV.

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

IDS120 GEOMETRY.



SC#1-3 -204<z<300 cm R_{in}=120 cm R_{out}=181.5/217.47/183.45 cm (NbSn)
SC#4-6 310<z<525 cm R_{in}=108/96/84 cm R_{out}=118.93/122.65/149 cm (NbSn)
SC#7-9 535<z<750 cm R_{in}= 72/60/48cm R_{out}=81.6/65.9/53.31 cm (NbTi)
SC#10-19 760<z<1593 cm R_{in}=45 cm R_{out}=49.87-->48.24 cm (NbTi) (TOTAL # SC=19)

ENERGY DEPOSITED IN SC SOLENOIDS (SC#), SHIELDING (SH#).

NiSn/NiTi	P(kW)
SC#1	$9.9\ 10^{-3}$
SC#2	0.14
SC#3	0.20
SC#4	0.11
SC#5	0.25
SC#6	0.06
SC#1-6	0.76
SC#7-9	0.13
SC#10-12	0.09
SC#13-15	0.07
SC#16-19	0.09
SC#1-19	1.14

NiSn/NiTi	P(kW)	60/40	P(kW)
SC#1-6	0.76	SH#1	923.50
SC#7-9	0.13	SH#2	1011.00
SC#10-12	0.09	SH#3	38.44
SC#13-15	0.07	SH#4	45.15
SC#15-19	0.09	–	–
SC#1-19	1.14	SH#1-4	2019.09

ENERGY DEPOSITED IN RESISTIVE COILS (RS#), BEAM PIPE (BP#).

(Cu)	P(kW)	(STST)	P(kW)
RS#1	258.15	BP#1	203.50
RS#2	49.52	BP#2	251.10
RS#3	27.35	BP#3	5.63
RS#1-3	335.02	BP#1-3	460.23

IDS120:ENERGY DEPOSITED IN OTHER PARTS AND TOTALS.

TOTALS	P(kW)
SC#1-21	1.14
SH#1-5	2018.09
RS#1-3	335.02
BP#1-3	460.23
Hg TARG.	376.40
Hg POOL	9.58
Be WIND.	0.56
TOTAL	3201.02

SC#2: 0.14 kW

SC#3: 0.20 kW **SC#5: 0.25 kW** **SC#7-9: 0.13 kW**

Peak:SC#3: 0.017 mW/gr **SC#5: 0.06 mW/gr** **SC#9: 0.062 mW/gr**

THE END.

ENERGY DEPOSITED IN DIFFERENT PARTS OF TERGET STATION: OTHER PARTS, TOTALS, PEAK VALUES.

VAC 75<R<80 cm

TOTALS	P(kW)
SC#1-21	3.72
SH#1-4	2145.71
RS#1-3	170.77
BP#1-3	462.71
Hg TARG.	376.00
Hg POOL	9.19
Be WIND.	0.50
TOTAL	3176.38

PEAK VALUE SC3: 0.24 mW/gr

WC/H2O 75<R<80 cm

TOTALS	P(kW)
SC#1-21	2.94
SH#1-5	2324.21
RS#1-3	WC/H2O(SH1)
BP#1-3	461.51
Hg TARG.	375.90
Hg POOL	10.20
Be WIND.	0.52
TOTAL	3174.95

PEAK VALUE SC3: 0.23 mW/gr