20to2T5mDL WITH RESISTIVE MAGNETS: C TARGET

ENERGY DEPOSITION AND C TARGET ENERGY DISTRIBUTION STUDIES
[WITH UPDATED SHIELDING CONFIGURATION]

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20to2T5mDL WITH RESISTIVE MAGNETS: 10 cm GAPS BETWEEN CRYOSTATS , 10 cm GAPS BETWEEN SHVS AND SCs

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 # { SC#1+2, SC#3 } [WITH AND WITHOUT SH#1I], BeWind#1, C MODULE INNER TUBE, SHVS#1I AND SHVS#1B INNER TUBE AZIMUTHAL TDPD SIMULATIONS AND C TARGET SEGMENTATION STUDIES FOR 20to2T5mDL TARGET STATION [ICEM = 1 MODE SIMULATIONS].

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➡ **SIMULATION CODE: mars15(2014)[USING MCNPDATA x-SECTION LIBRARIES FOR NEUTRON INTERACTIONS WITH KE < 14 MeV]**

➡ **NEUTRON ENERGY CUTOFF: 10^{-12} GeV**

➡ **SHIELDING: 60% W + 40% He [WITH STST VESSELS]**

➡ **B_z (r = 0, z) : 20 T [z = 0.0 cm] ---→ 2.0 T [z ~ 500.0 cm]**

➡ **C ROD RADIUS / ANGLE: 0.80 cm / 65 mrads (~ 3.72 degrees) [-40.0 < z < 40.0 cm]**
{ + C DUMP: 40.0 < z < 160.0 cm R = 2.4 cm }C density ~ 1.8 g/cc

➡ **PROTON BEAM POWER: 4.0 MW**

➡ **PROTON ENERGY: E = 6.75 GeV**

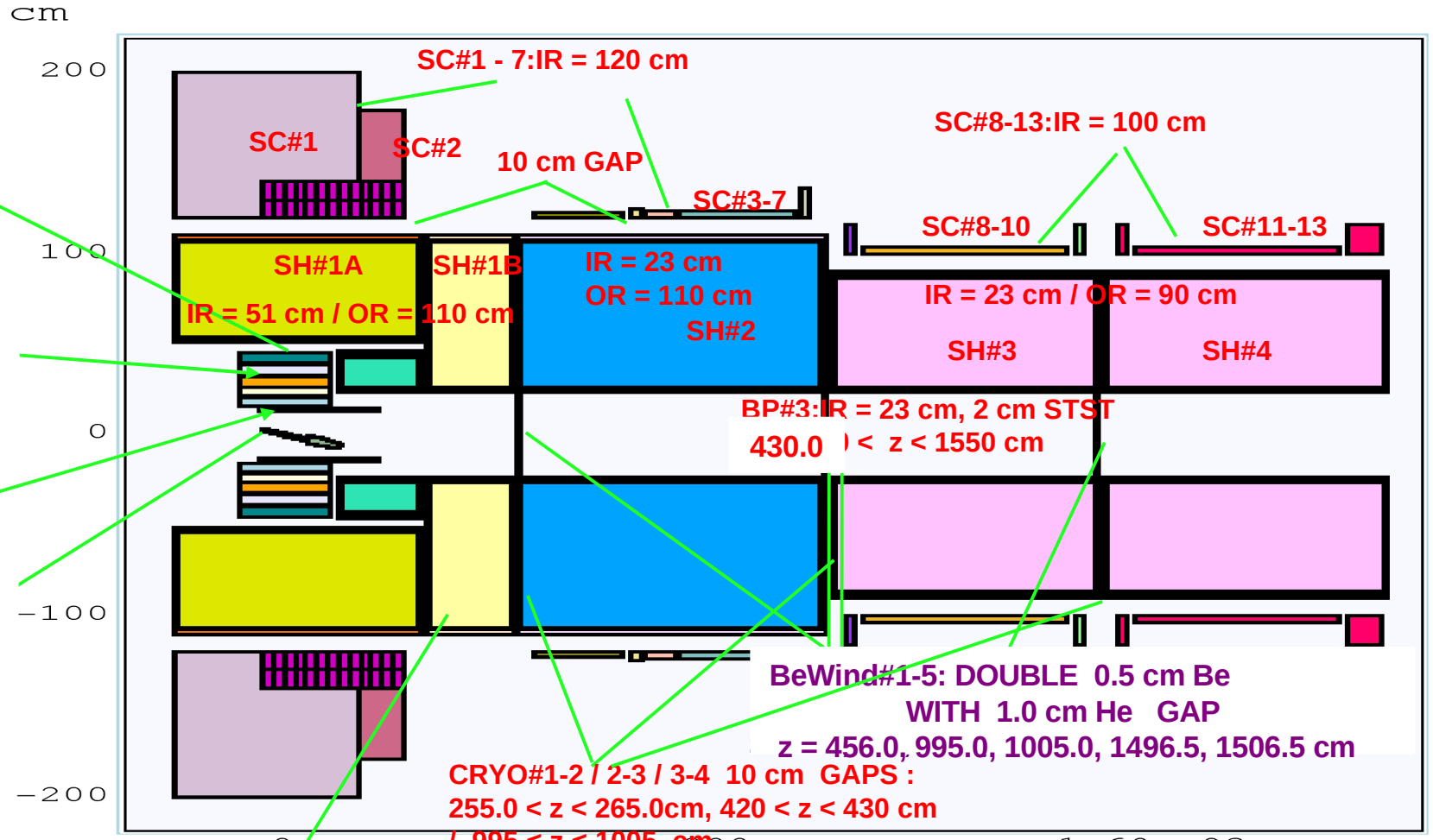
➡ **PROTON BEAM PROFILE : GAUSSIAN, σ_x = 0.317 σ_y = 0.317 cm**
[5 micron emmitance, σ^* = 0.20 cm, β^* = 80 cm at z = 0.0 cm]

➡ **PROTON BEAM LAUNCH : (xo, yo, zo) = (-2.32307, 5.95973, -100.0) cm**
(dcxo, dcyo, dczo) = (0.039324, -0.049940, -0.997978)

➡ **EVENTS IN SIMULATIONS : N_p = 5E6 ==> 100 (SUBDIRECT) x 5E4 (STEP: 10^-3)**

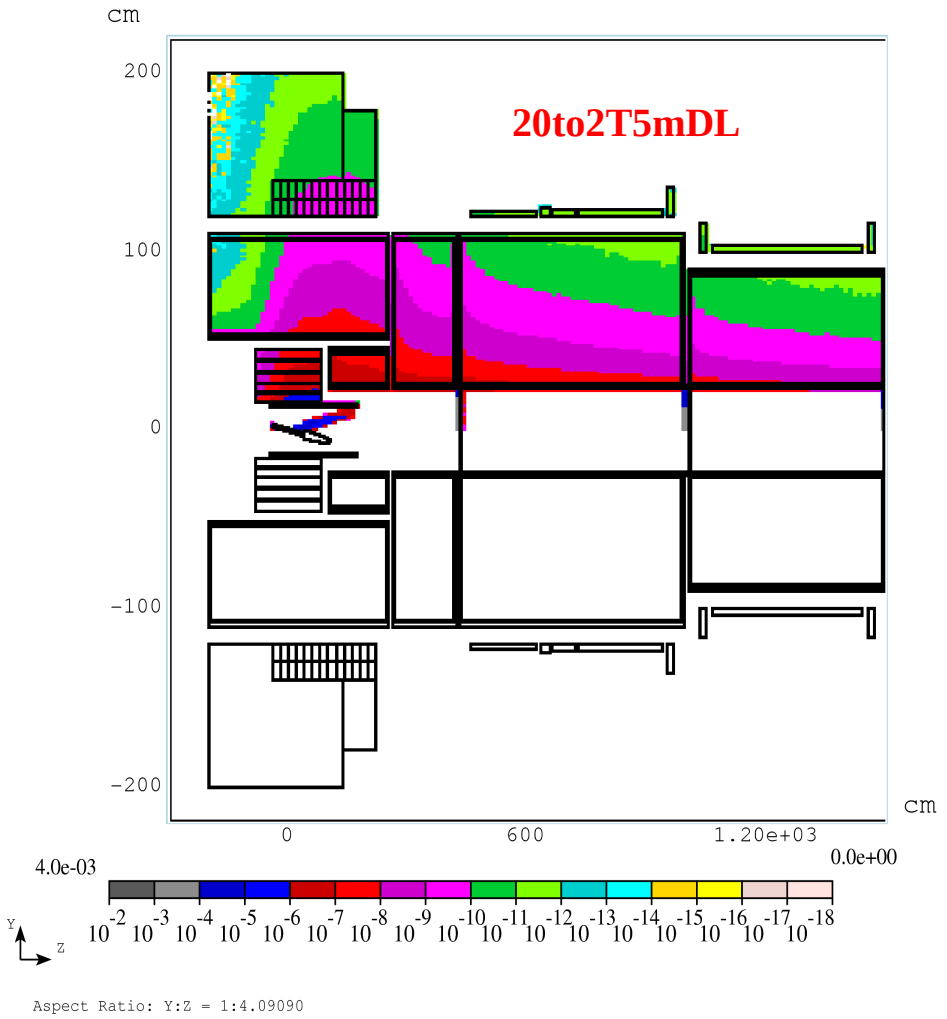
20to2T5mDL: yz CROSS SECTION (x = 0.0 cm) WITH GEOMETRY DIMENSIONS / PARAMETERS.

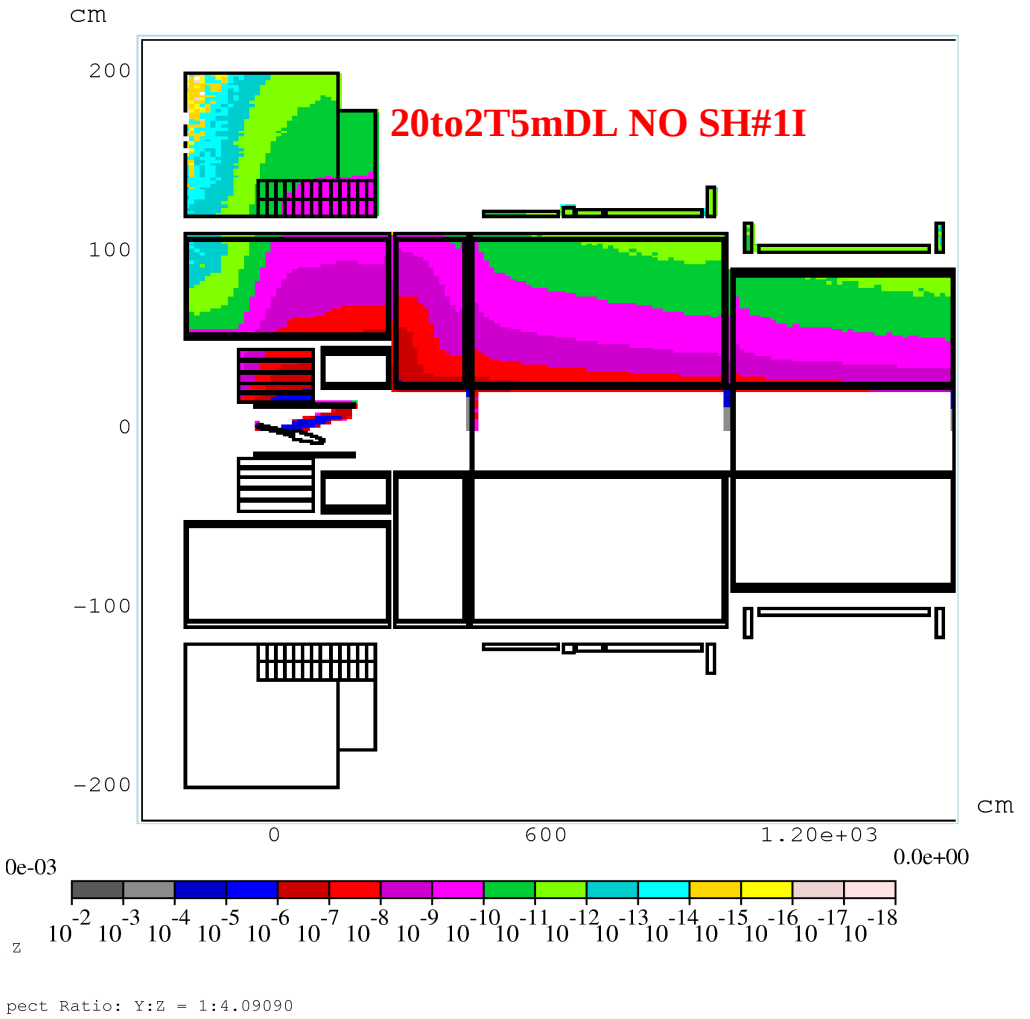
IMPORTANT UPDATE: NOW THERE ARE 10 cm GAPS BETWEEN SHVSs AND SCs



20to2T5mDL: yz CROSS SECTION (x = 0.0 cm) WITH AZIMUTHALLY AVERAGE TDPD DISTRIBUTION WITH [LEFT] AND WITHOUT SH#1I SHIELDING MODULE.

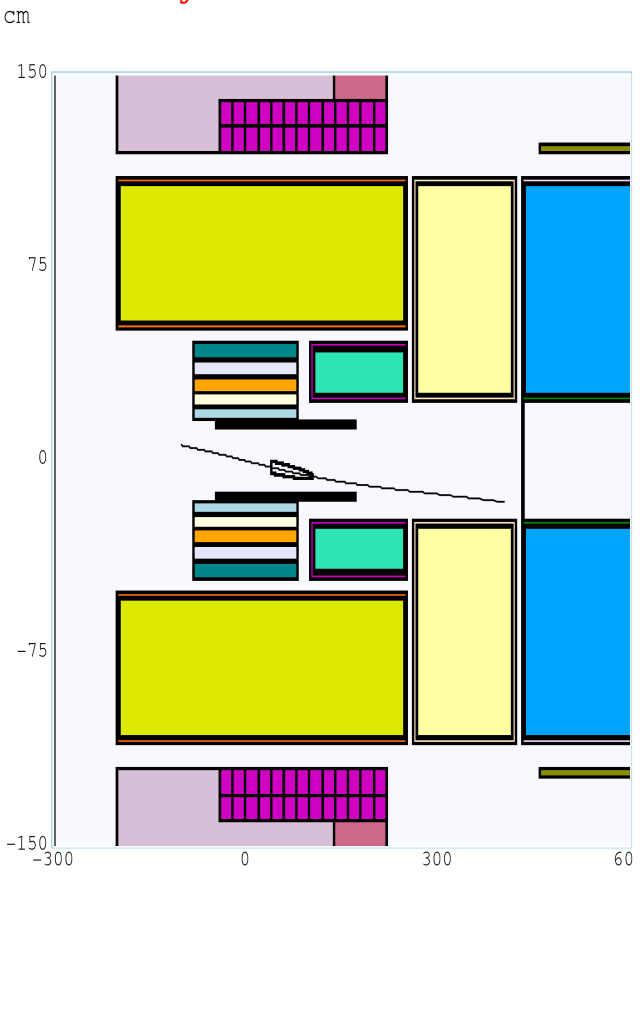
COLOR SCALES ARE THE SAME FOR BOTH PLOTS: UNITS GeV/g/p (x 5.9259 10^{8} FOR mW/g)



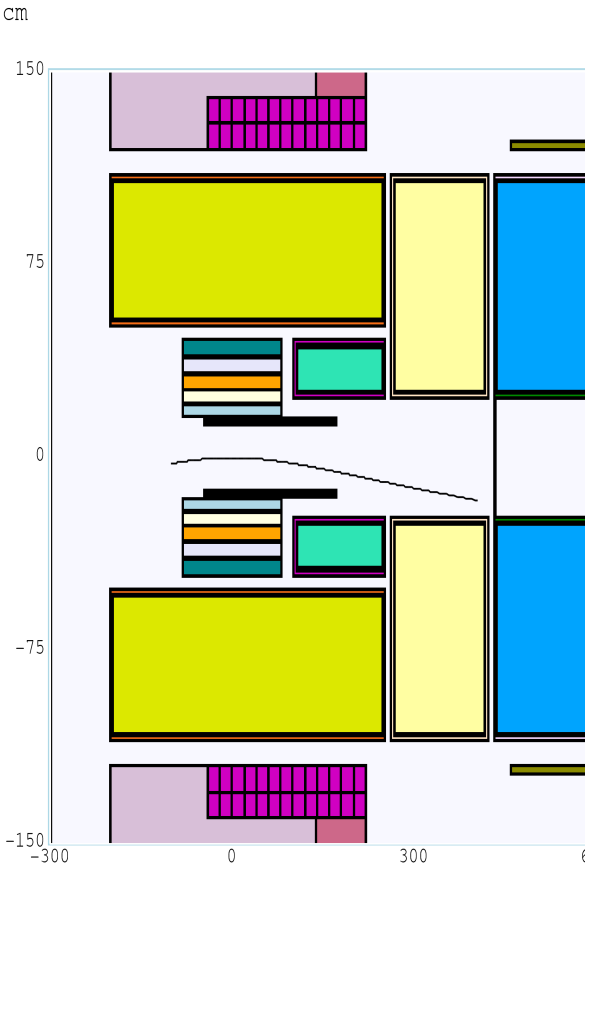


20to2T5mDL: **yz AT x = 0.0 cm (LEFT) , xz AT y = 0.0 cm (MIDDLE), xy AT z = 456.0 cm (RIGHT) CROSS SECTION WITH THE PROTON BEAM CENTROID TRAJECTORY PROJECTION WITHOUT C TARGET/DUMP AND BeWind#1. TRAJECTORY DATA SHOW THAT SOME OF BEAM PROTONS WILL END UP AT z ~ 403.0 cm REGION NEAR THE END OF SHVS#1B INNER TUBE. PEAK TDPD IN SC#3 IS EXPECTED TO BE 180 – 270 DEGREES REGION.**

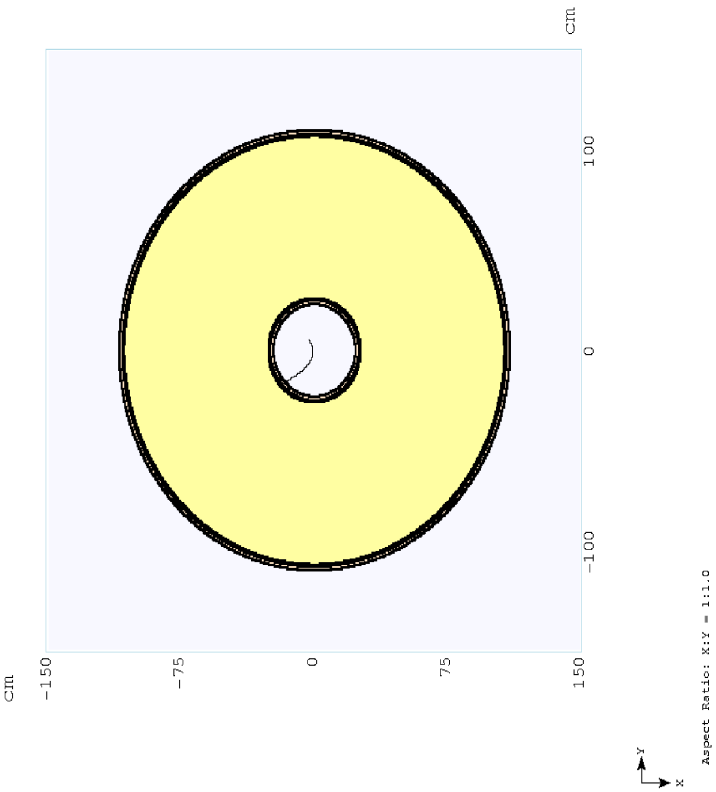
yz AT x = 0.0 cm



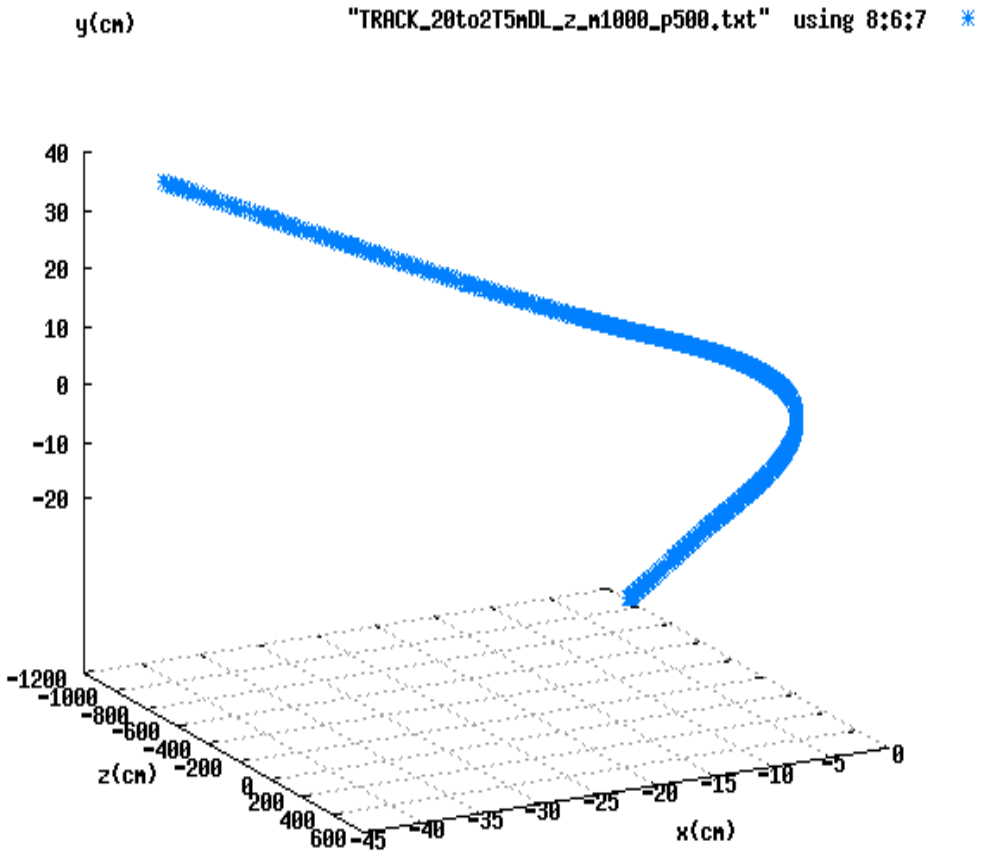
xz AT y = 0.0 cm

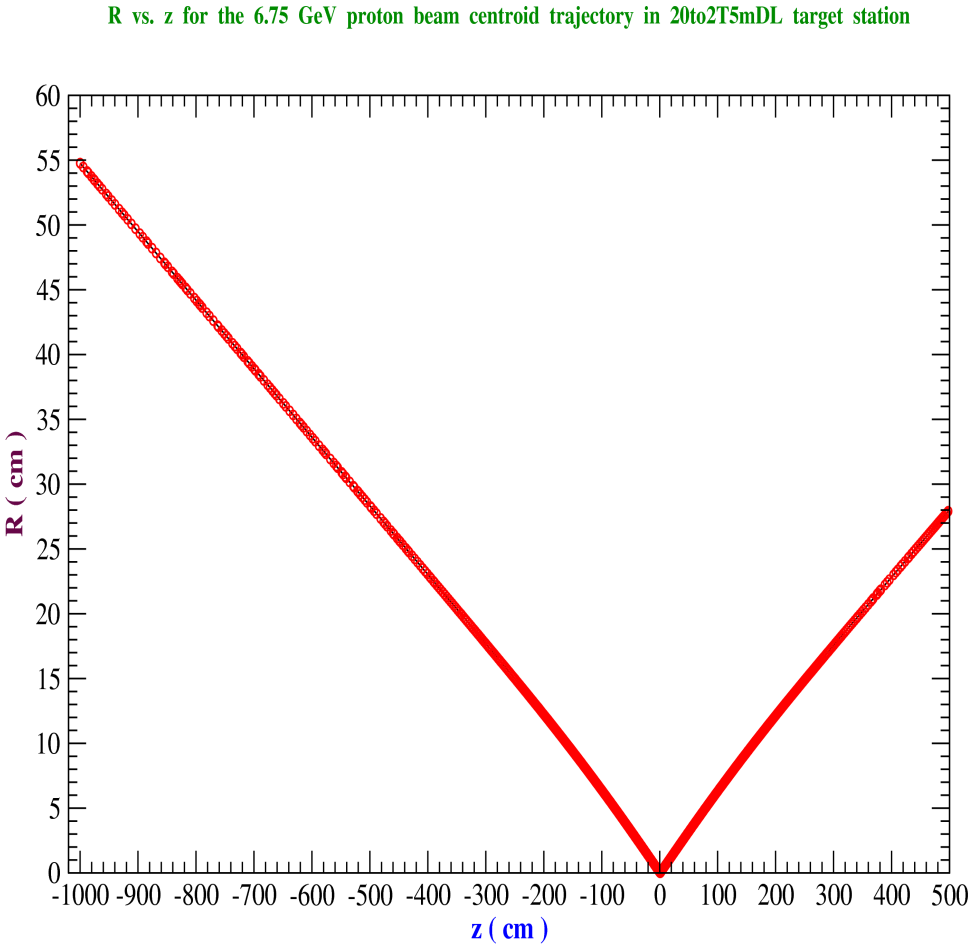


xy AT z = 403.6 cm



20to2T5mDL: 3D PLOT OF PROTON BEAM CENTROID TRAJECTORY (LEFT) , AND RADIUS R vs. z PLOT (RIGHT). AT z ~ 430.0 cm WE ARE IN THE BeWind#1 REGION, AND FOR z > 430 AND R>23 cm WE ARE IN SH#2 REGION. FOR z < 430 cm AND R > 23 cm WE HAVE REACH THE SH#1B MODULE.

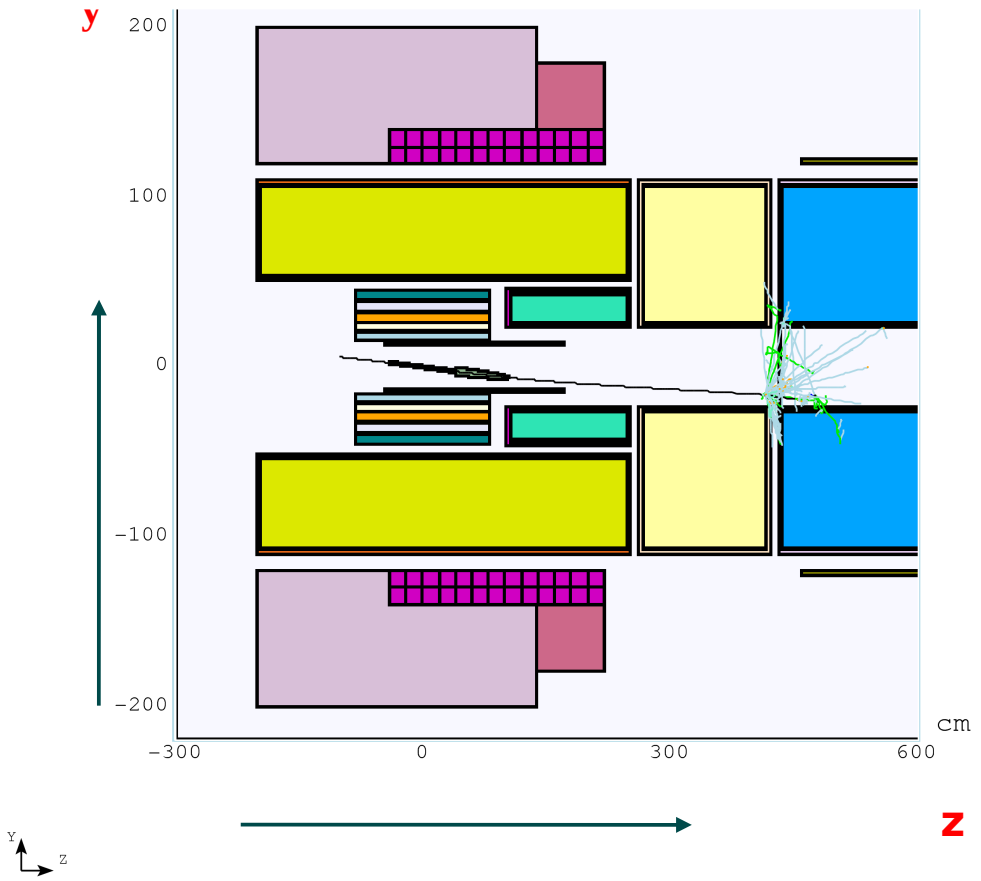


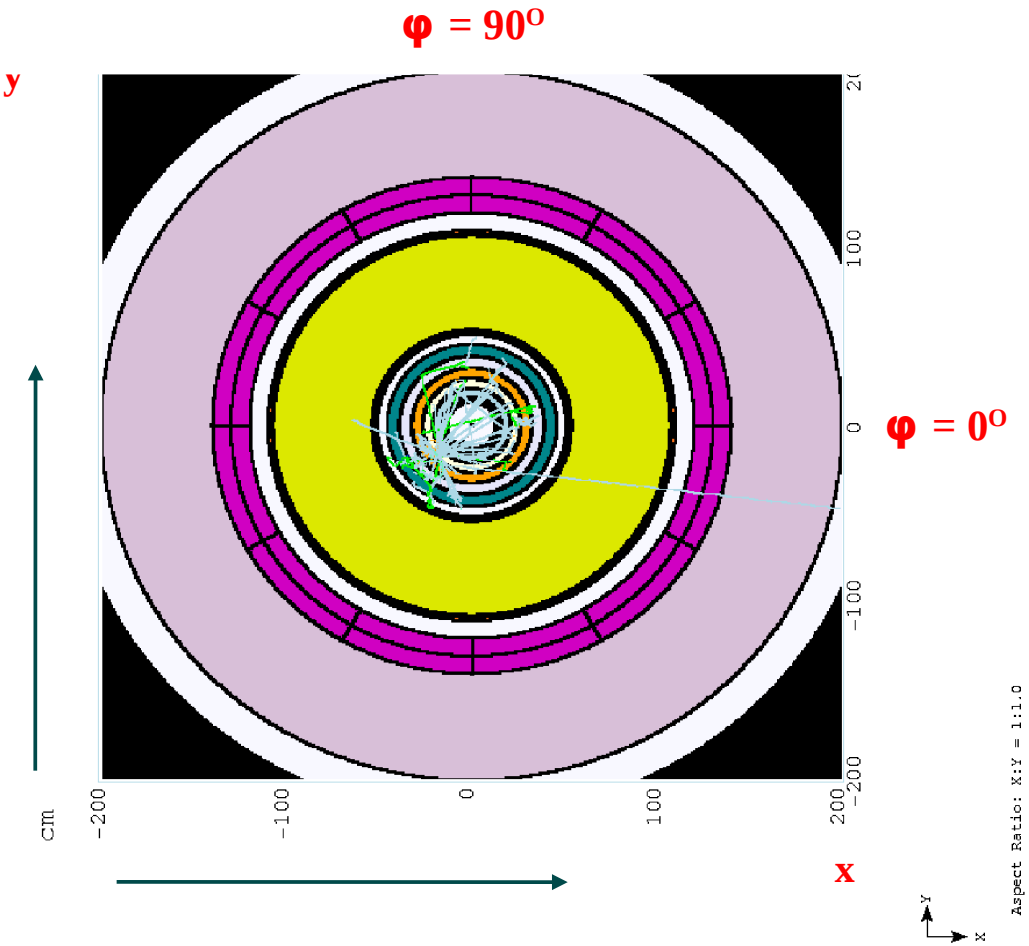


SC#1+SC#2 AZIMUTHAL TDPD DISTRIBUTION [UPDATED]

WITH AND WITHOUT SH#1I MODULE

SC#1+2 SEGMENTATION DETAILS : yz AT x = 0.0 cm [LEFT] AND xy AT z = 0.0 cm [RIGHT] CROSS SECTION.





$120.0 < r < 140.0$ cm $dr = 10.0$ cm $N_r = 2$ bins

$-41.0 < z < 219.0$ cm $dz = 20.0$ cm $N_z = 13$ bins

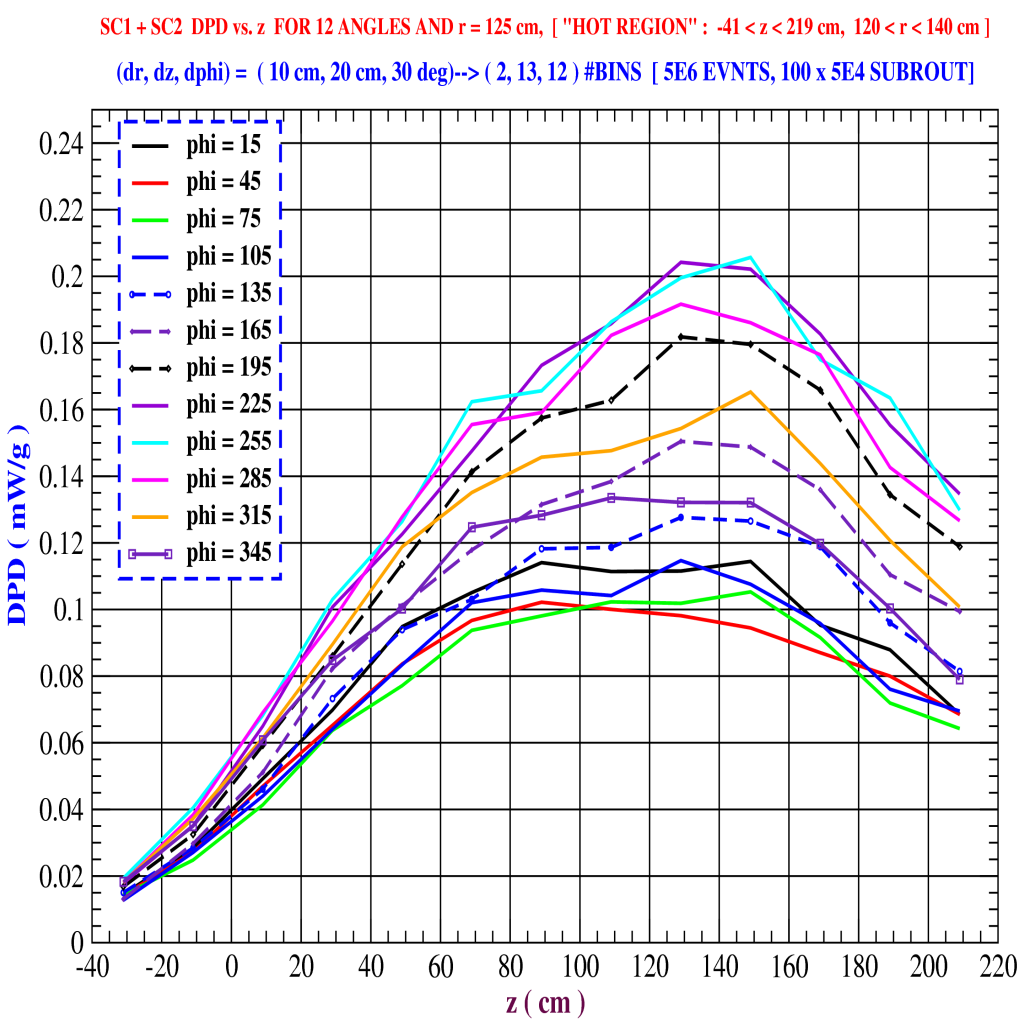
$0.0 < \varphi < 360.0$ deg. $d\varphi = 30$ deg. $N_\varphi = 12$ bins

$N_{tot} = 312$ "pieces"

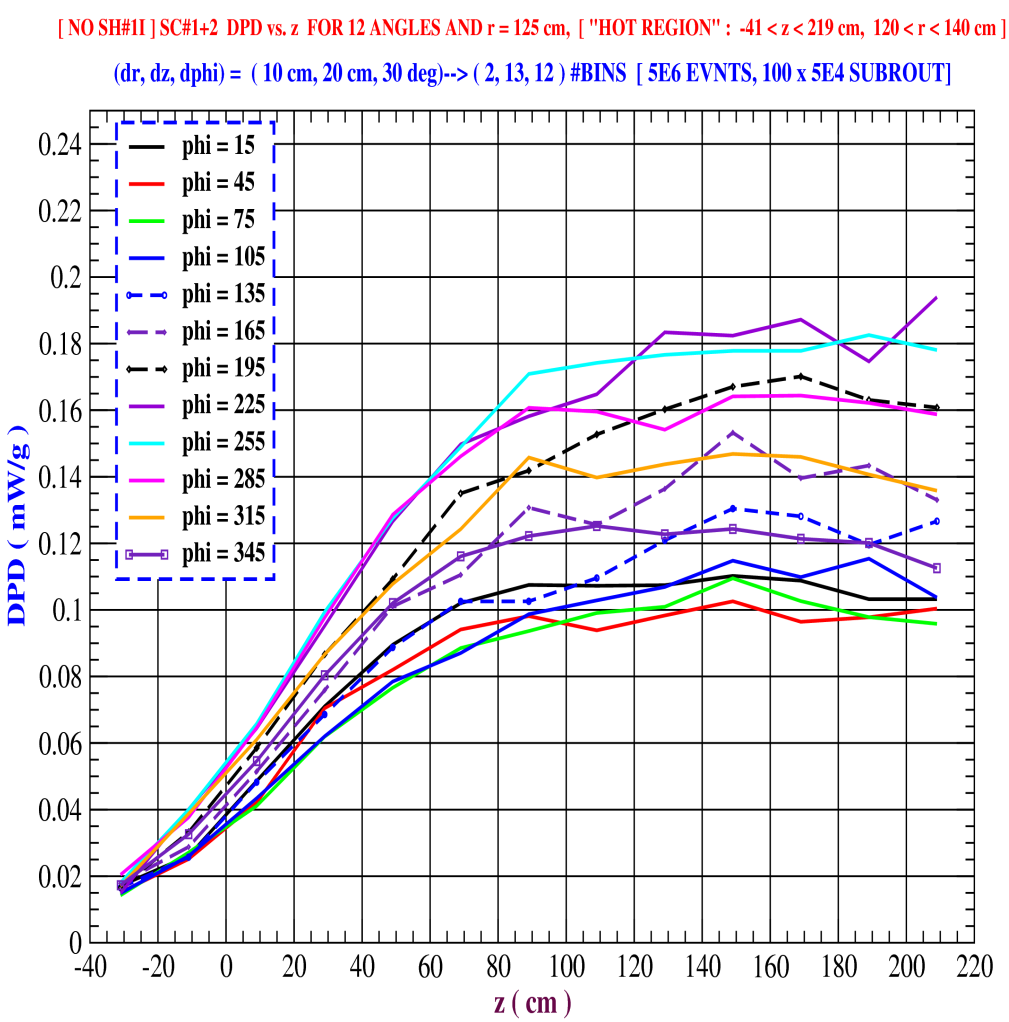
SC#1+2 : TDPD AZIMUTHAL DISTRIBUTION FOR 12 ANGLES.

R = 125.0 cm "PIECES"

20To2T5mDL



20to2T5mDL [NO SH#1I]



PEAK: 0.206 mW/g AT (r, z, phi) = (125.0 149.0 255) **PEAK: 0.194 mW/g AT (r, z, phi) = (125.0 225.0 255)**

20to2T5m TDP: 2.40 kW ("PIECES") + 1.61 kW (REST) = 4.00 kW vs. 4.01 kW (NO SEGMENTATION)

20to2T5mDL TDP: 2.44 kW ("PIECES") + 1.67 kW (REST) = 4.10 kW vs. 4.11 kW (NO SEGMENTATION)

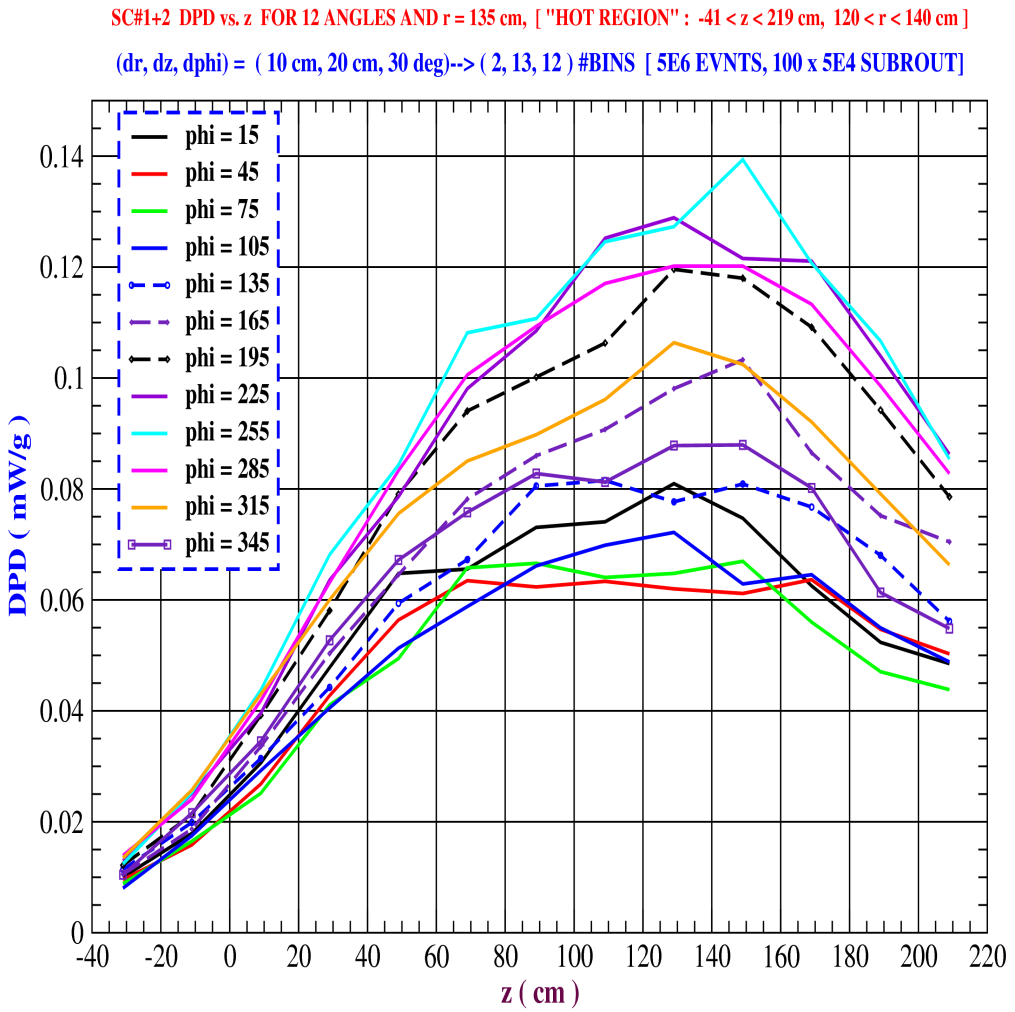
FROM THE LEFT PLOT WE CAN SEE THE BACKSCATERING EFFECT OF SH#1I FOR THE RADIATION PARTICLES WITH MORE ENERGY FOCUSED IN THE z ~ 140 cm REGION GIVING A SLIGTLY HIGHER PEAK THAN THE CASE WITHOUT SH#1I (RIGHT PLOT). FOR UP TO 2 MW BEAM WE CAN HAVE ~ 10 yr OPERATIONAL LIFETIME.

~ 4 KW OF POWER IN SC#1+2. SH#1I CAN BE USED TO REDUCE POWER LOAD IN SH#1B (FROM ~ 930 kW ---> ~ 284 kW)

SC#1+2 : TDPD AZIMUTHAL DISTRIBUTION FOR 12 ANGLES.

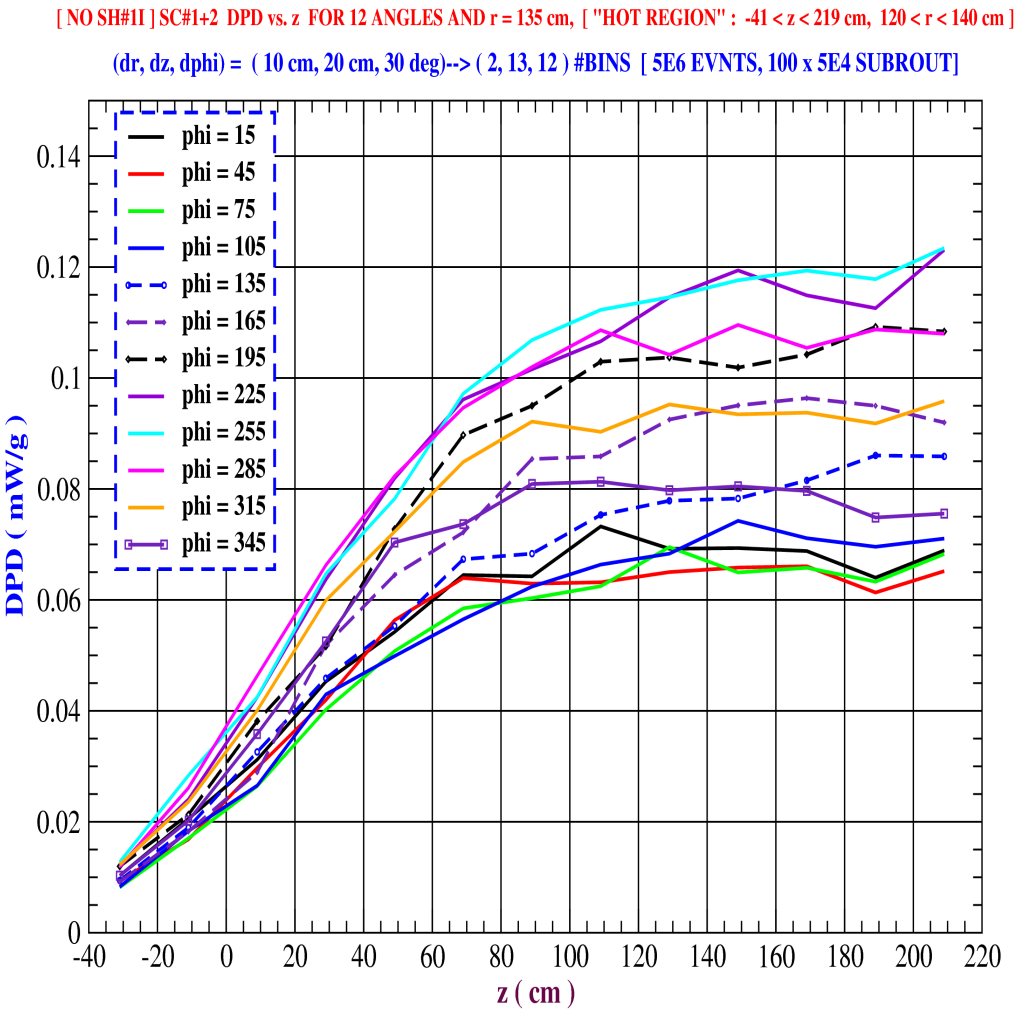
R = 135.0 cm ''PIECES

20to2T5mDL



PEAK: 0.14 mW/g AT (r, z, phi) = (135.0 149.0 255)

20to2T5mDL (NO SH#1I)



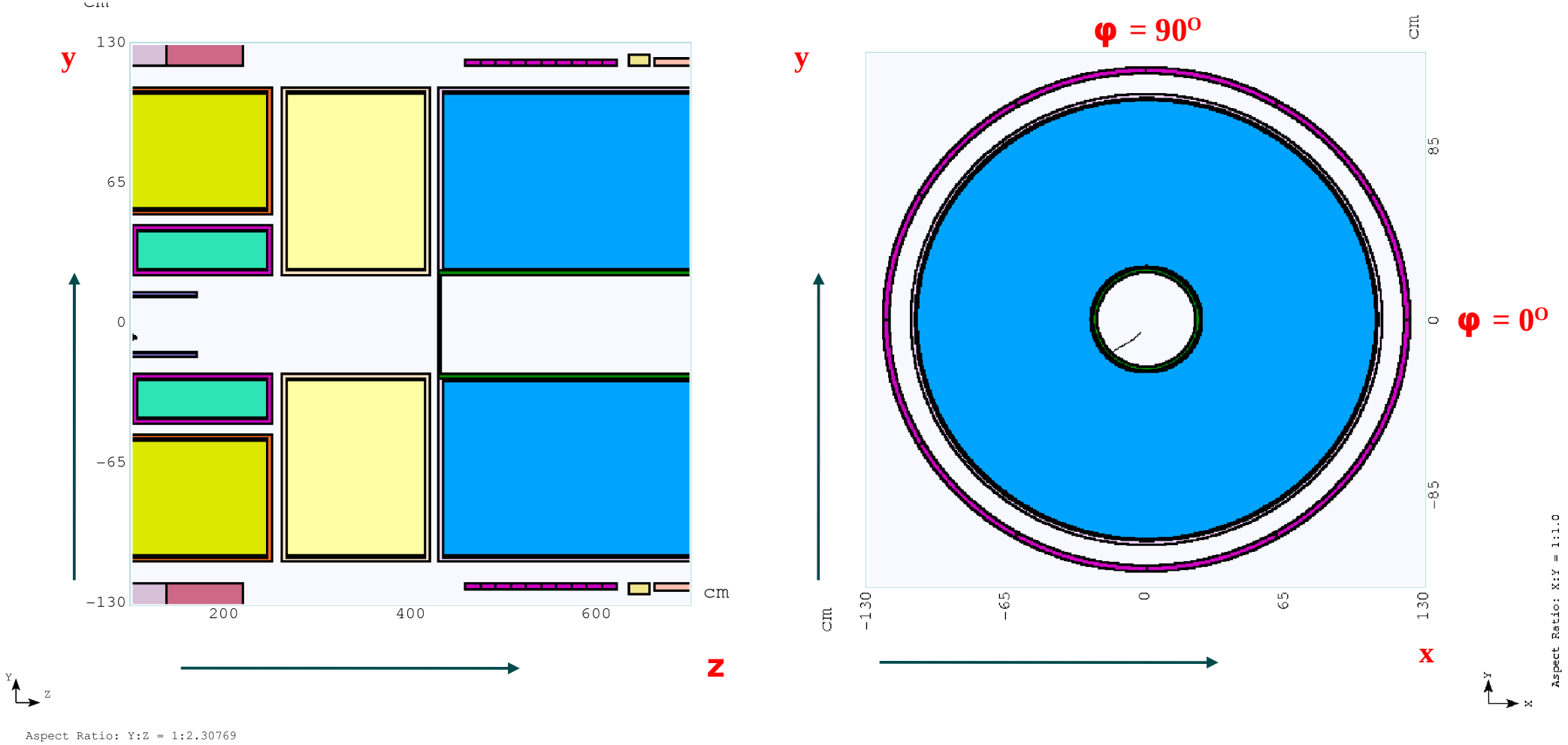
PEAK: 0.12 mW/g AT (r, z, phi) = (135.0 209.0 255)

FOR THE R= 135.0 RADIUS “PIECES WE HAVE ~ 0.02 mW/g DECREASE IN THE PEAK TDPD AT 255 deg.

SC#3 AZIMUTHAL TDPD DISTRIBUTION [UPDATED]

WITH AND WITHOUT SH#1I MODULE

SC#3 SEGMENTATION DETAILS : yz AT x = 0.0 cm [LEFT] AND xy AT z = 540.0 cm [RIGHT] CROSS SECTION.



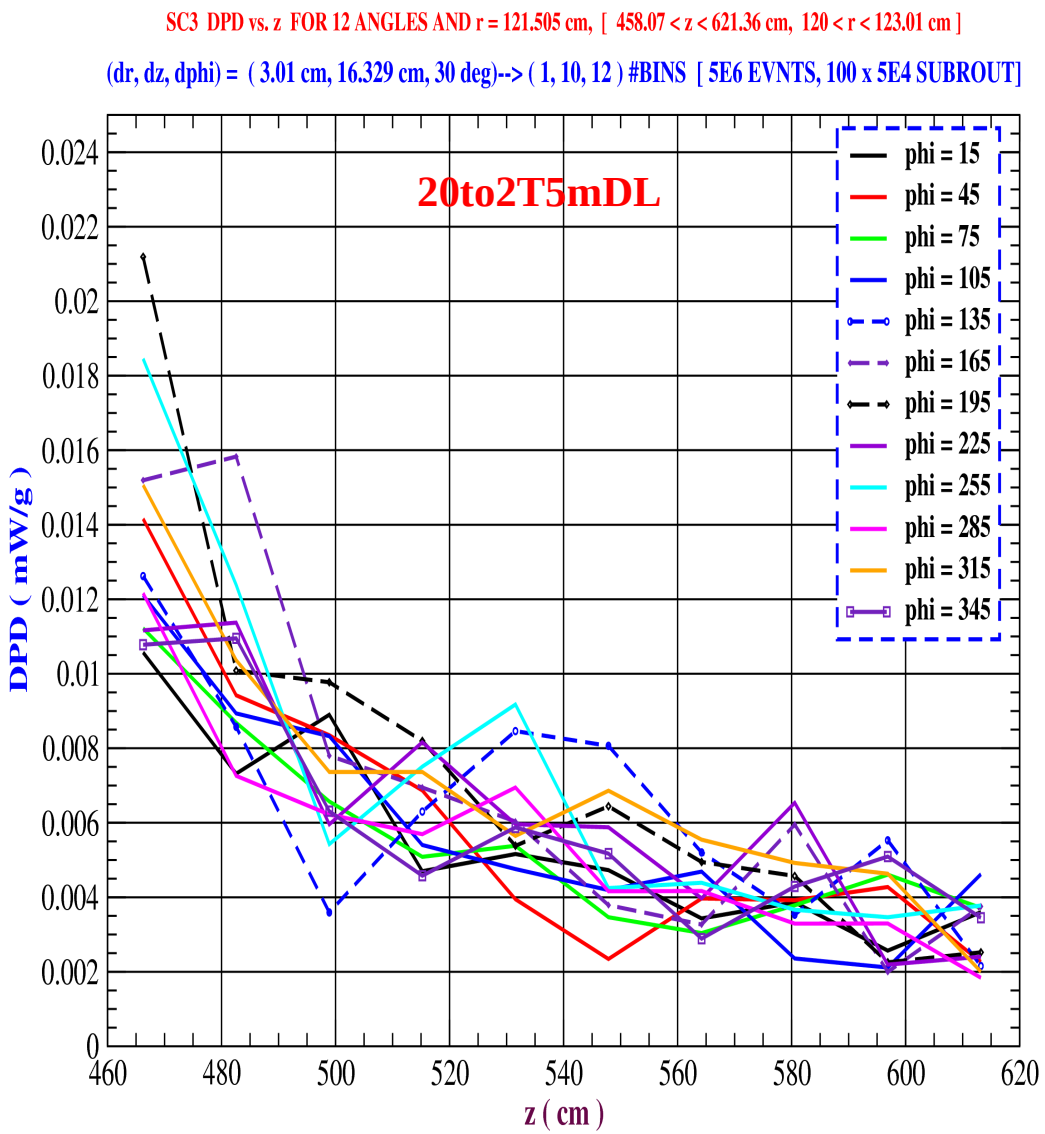
$120.0 < r < 123.01$ cm $dr = 3.01$ cm $N_r = 1$ bins

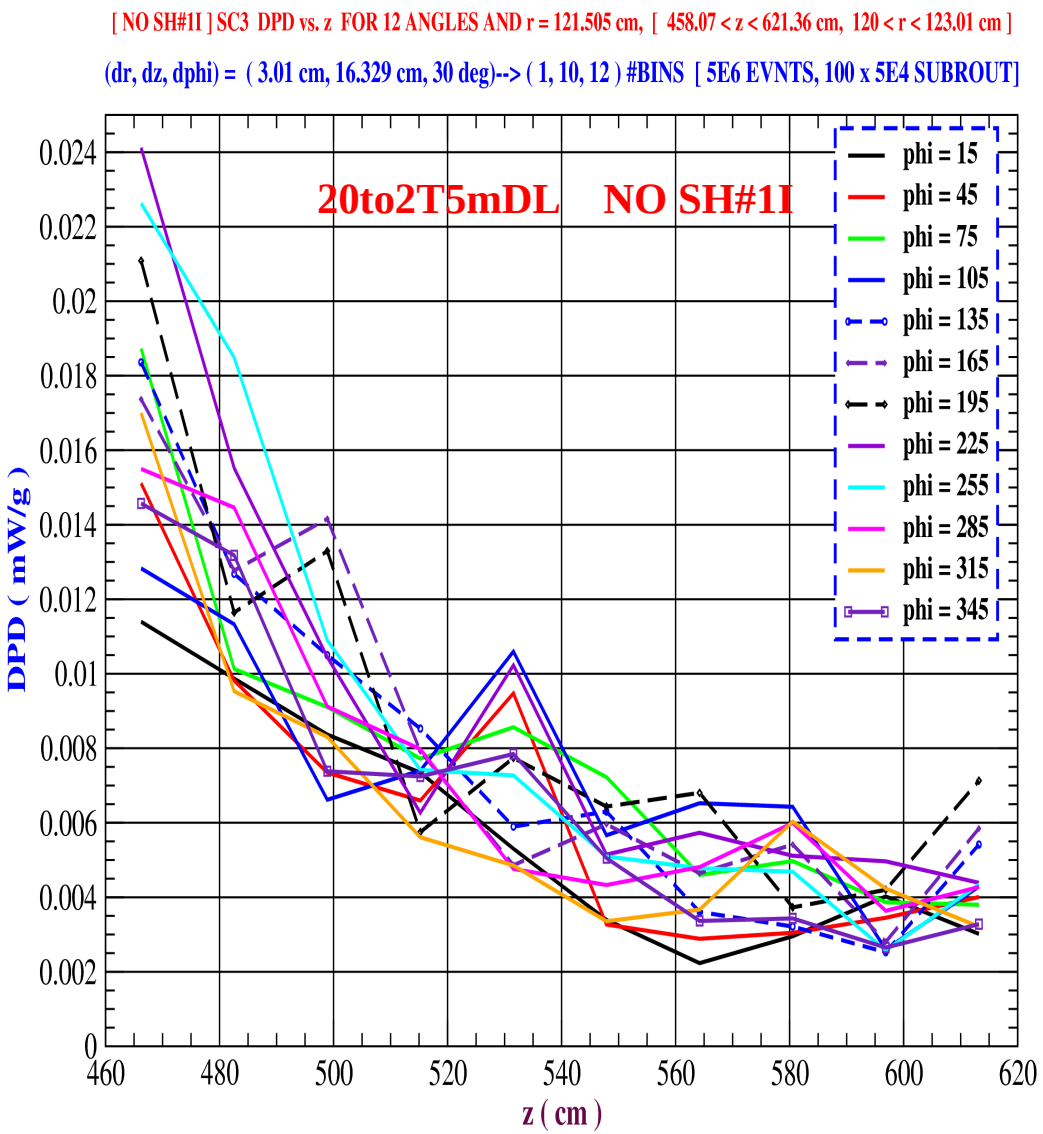
$458.07 < z < 621.36$ cm $dz = 16.329$ cm $N_z = 10$ bins

$0.0 < \varphi < 360.0$ deg. $d\varphi = 30$ deg. $N_\varphi = 12$ bins

$N_{tot} = 120$ "pieces"

SC#3 : TDPD AZIMUTHAL DISTRIBUTION FOR 12 ANGLES. WITH (LEFT) AND WITHOUT (RIGHT) SH#1I MODULE





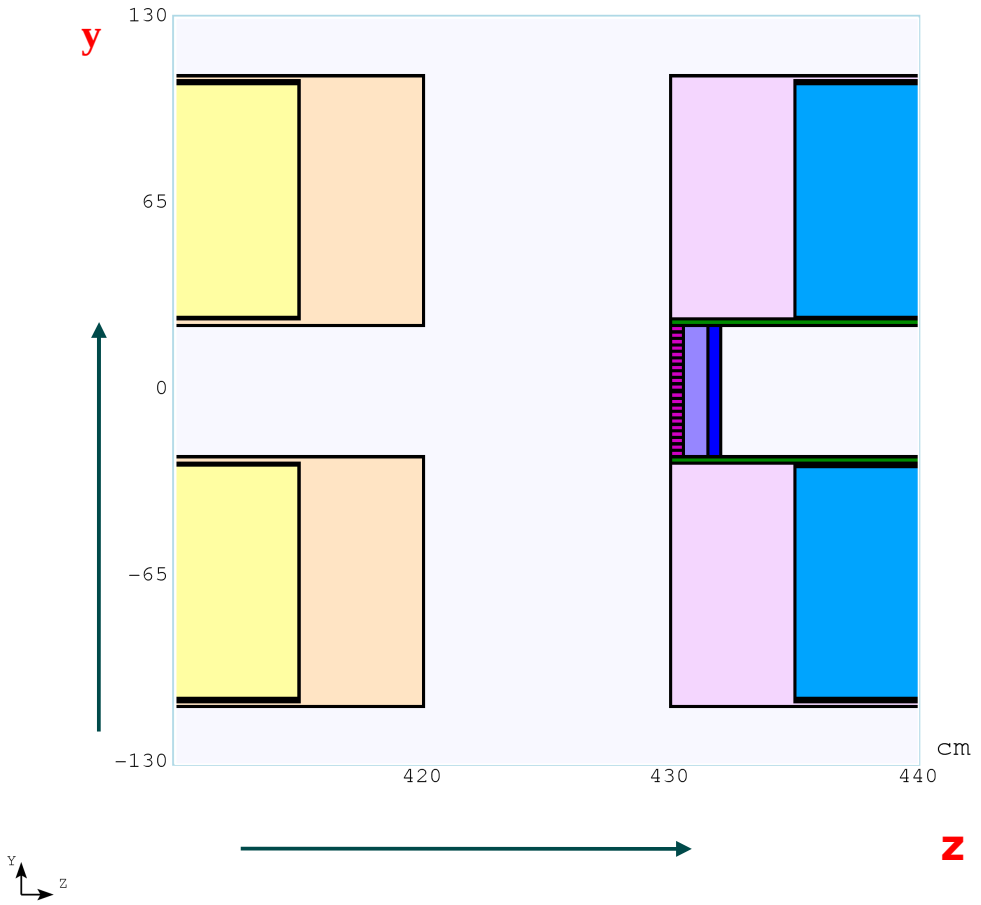
PEAK: 0.021 mW/g AT (r, z, phi) = (121.505 466.234 195)
TDP: 0.016 kW (''PIECES'') vs. 0.016 kW (NO SEGMNT)

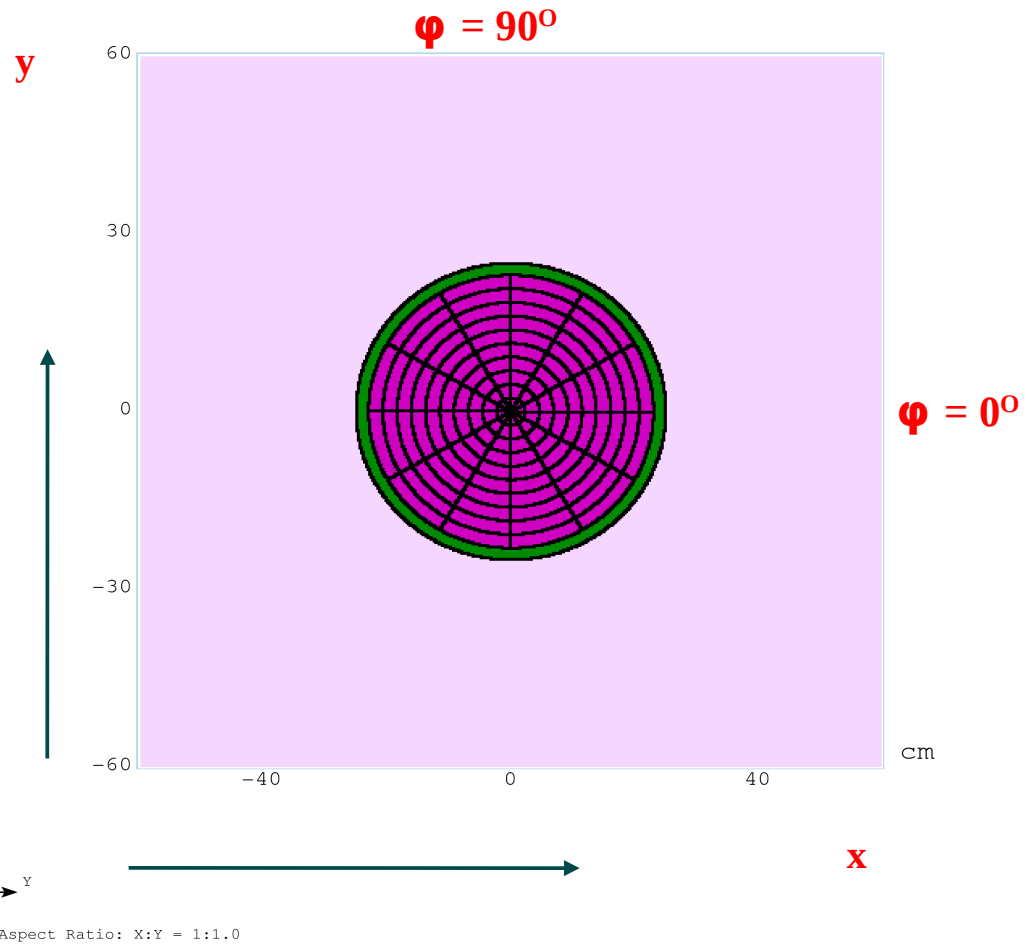
PEAK: 0.024 mW/g AT (r, z, phi) = (121.505 466.234 225)
TDP: 0.019 kW (''PIECES'') vs. 0.020 kW (NO SEGMNT)

THERE IS ONLY AN INSIGNIFICANT INCREASE IN THE PEAK TDPD (FROM 0.021 mW/g TO 0.024 mW/g) WITHOUT SH#1I MODULE. THIS MODULE IS NOT NECESSARY FRO PROTECTING SC#3 EVEN FOR A 4 MW BEAM.

BeWind#1 AZIMUTHAL TDPD DISTRIBUTION (UPDATED)
(COMPARE AT z = 460 cm AND UPDATED AT z= 430 cm)

BeWind#1 SEGMENTATION DETAILS : yz AT x = 0.0 cm [LEFT] AND xy AT z = 430.1 cm [RIGHT]
CROSS SECTIONS FOCUSED IN THE GAP#1 BeWind#1 REGION.





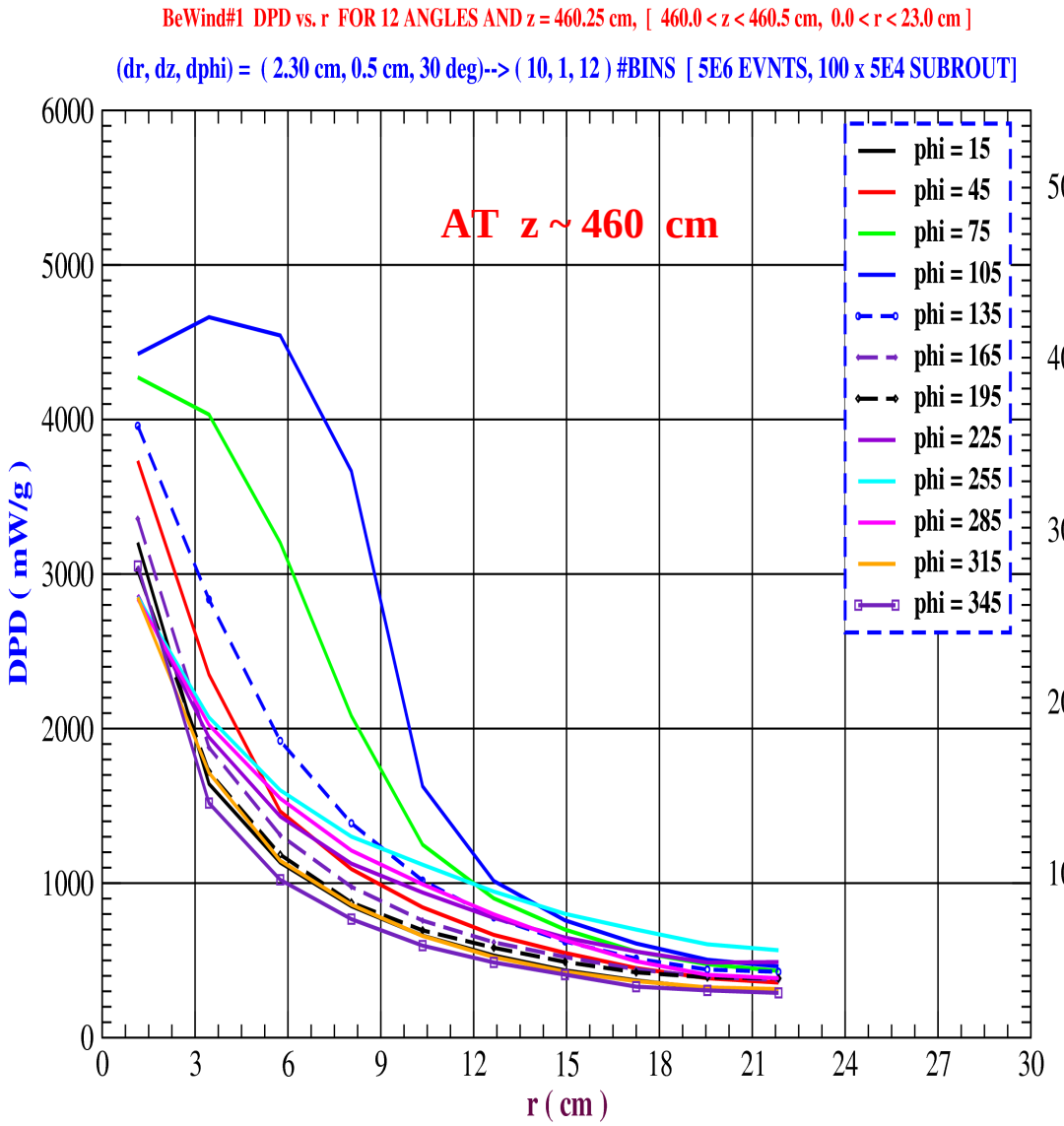
$0.0 < r < 23.0$ cm $dr = 2.3$ cm $N_r = 10$ bins

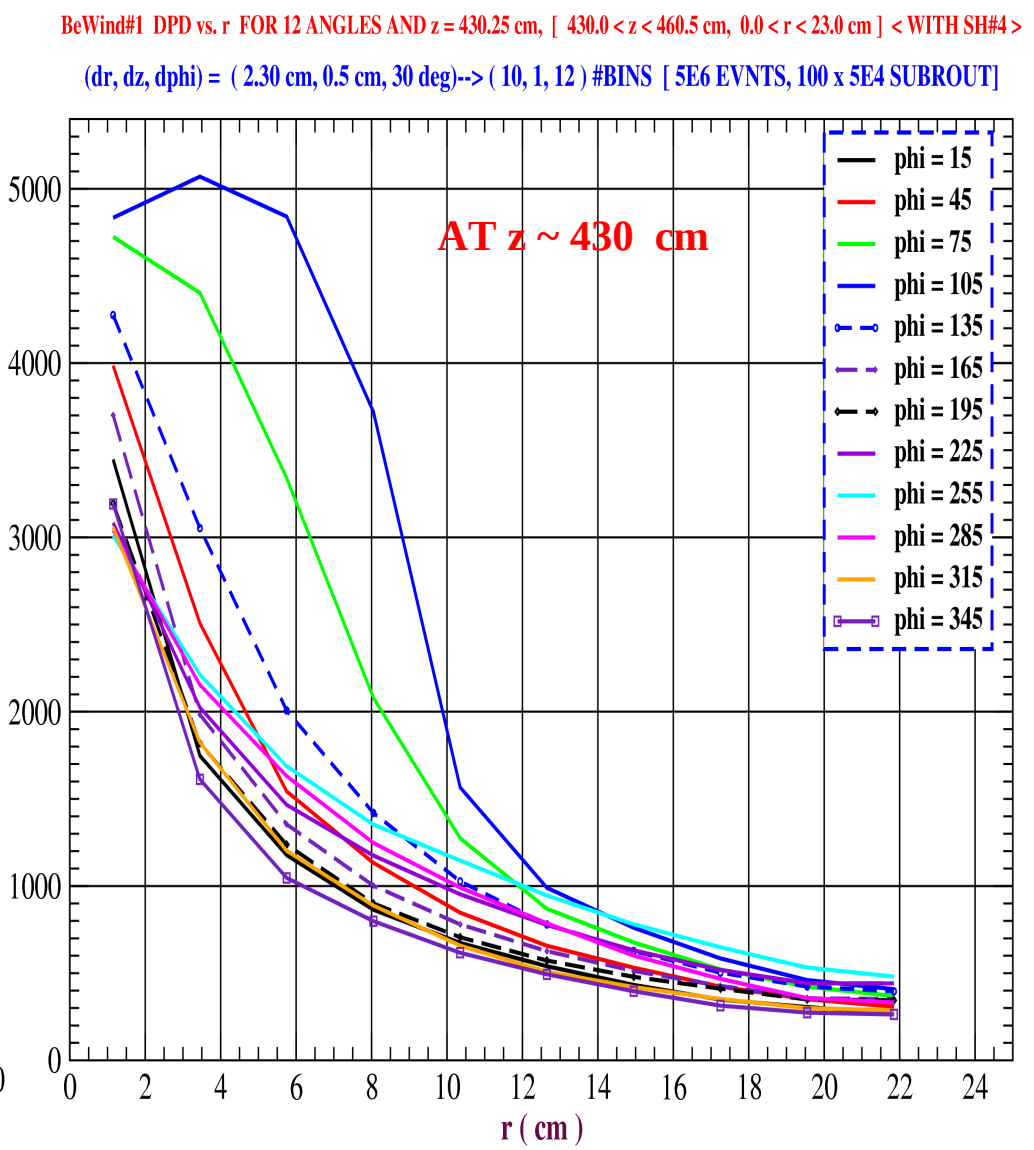
$430.0 < z < 430.5$ cm $dz = 0.5$ cm $N_z = 1$ bins

$0.0 < \varphi < 360.0$ deg. $d\varphi = 30$ deg. $N_\varphi = 12$ bins

$N_{tot} = 120$ "pieces"

BeWind#1 : TDPD AZIMUTHAL DISTRIBUTION (vs. r) FOR 12 ANGLES
20to2T5mDL





PEAK: 4661.91 mW/g AT (r, z, phi) = (3.45 460.25 105) **PEAK: 5070.20 mW/g AT (r, z, phi) = (3.45 430.25 105)**

AT z ~ 460 cm TDP: 1.147 kW ("PIECES") + 1.153 (REST) ~ 2.3 vs. 2.6 kW (NO SEGMNT)

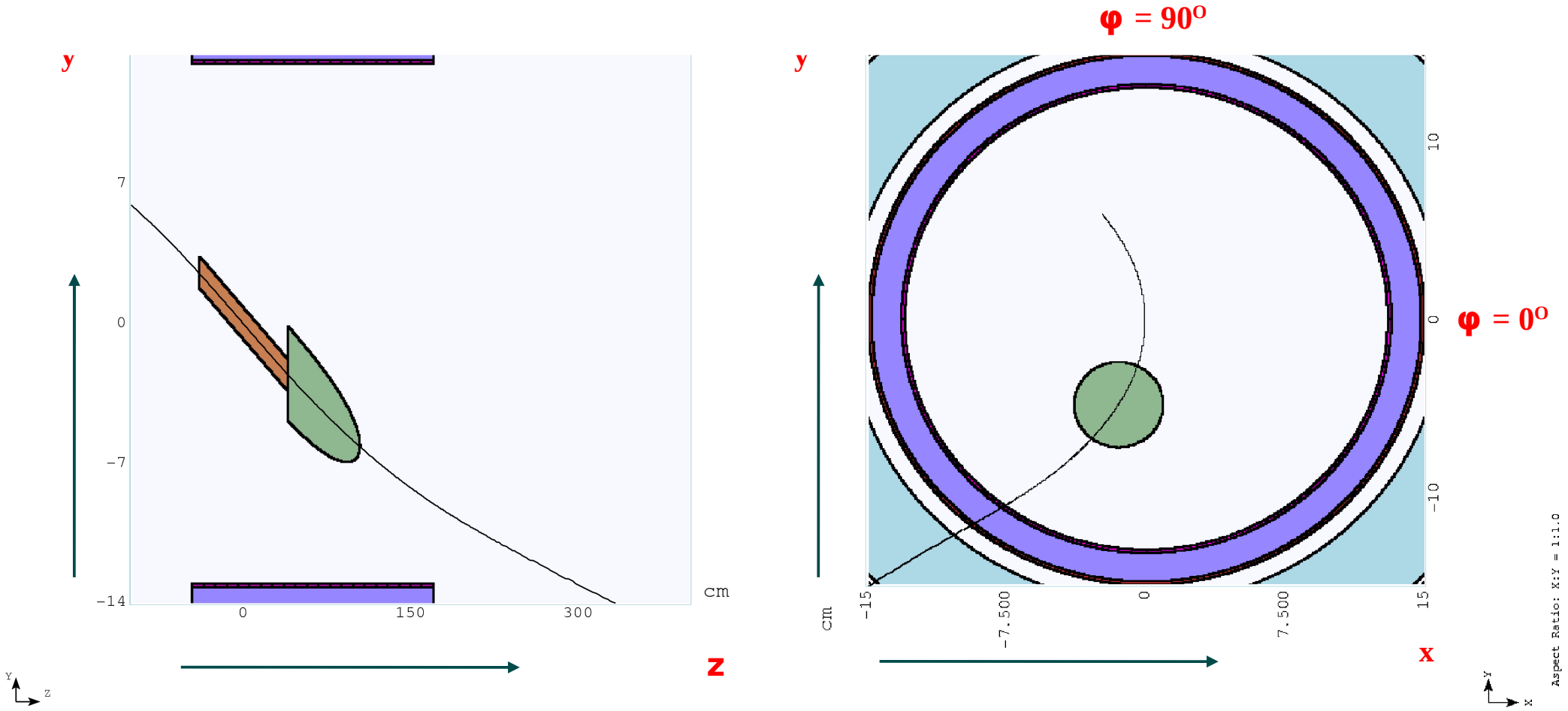
AT z ~ 430 cm TDP: 1.137 kW ("PIECES") + 1.129 (REST) ~ 2.3 vs. 2.6 kW (NO SEGMNT)

BeWind#1 TDP IN BOTH LOCATIONS IS ~ SAME BUT THE PEAK TDPD IS HIGHER BY ~ 408 mW / g FOR z ~ 430 cm

C TARGET VESSEL INNER TUBE AZIMUTHAL TDPD DISTRIBUTION (UPDATED)
(COMPARE 0.5 cm WITH UPDATED 0.2 cm THICK STST C MODULE INNER TUBE)

BP#1 SEGMENTATION DETAILS : yz AT x = 0.0 cm [LEFT] AND xy AT z = 80.0 cm [RIGHT]

CROSS SECTION WITH SEGMENTATION DETAILS OF INNER TUBE (BP#1).



$13.0 < r < 13.2$ cm $dr = 0.2$ cm $N_r = 1$ bins

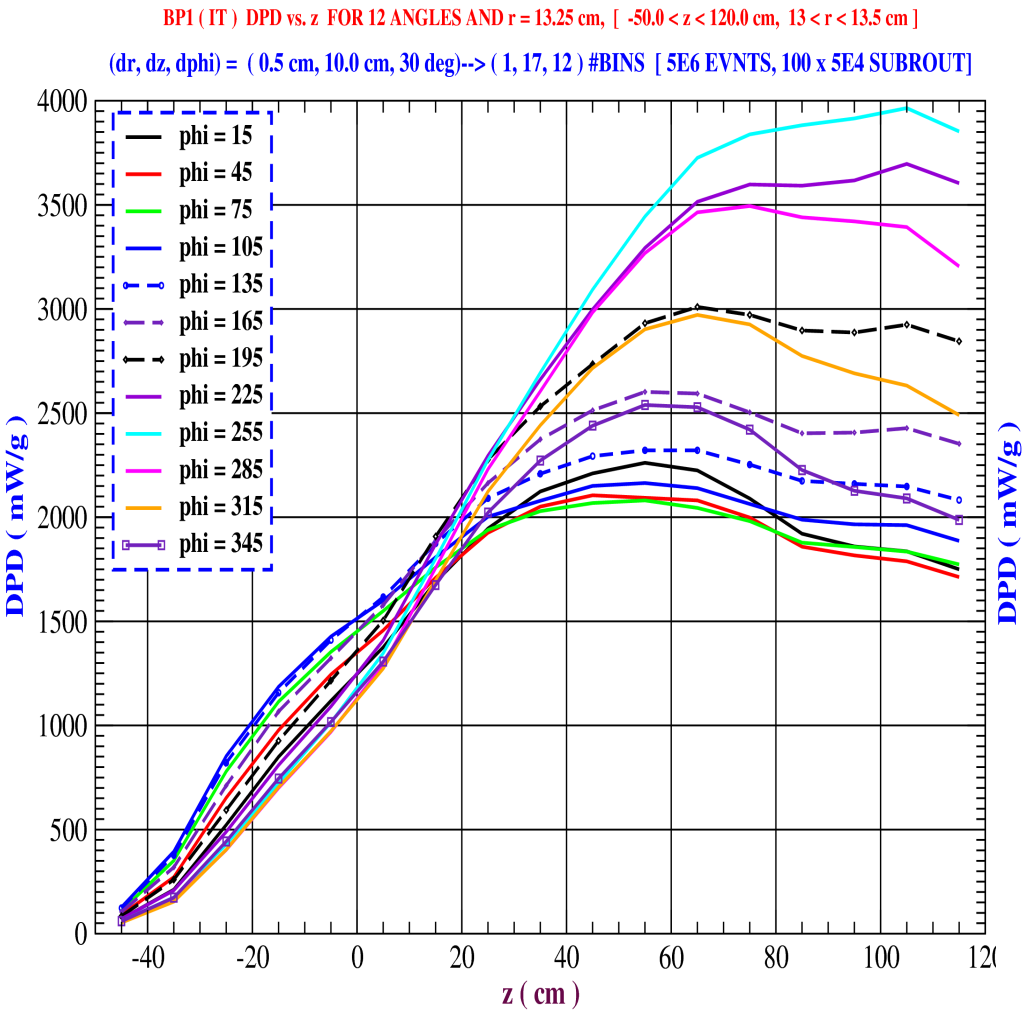
$-46.0 < z < 170.0$ cm $dz = 10.286$ cm $N_z = 21$ bins

$0.0 < \varphi < 360.0$ deg. $d\varphi = 30$ deg. $N_\varphi = 12$ bins

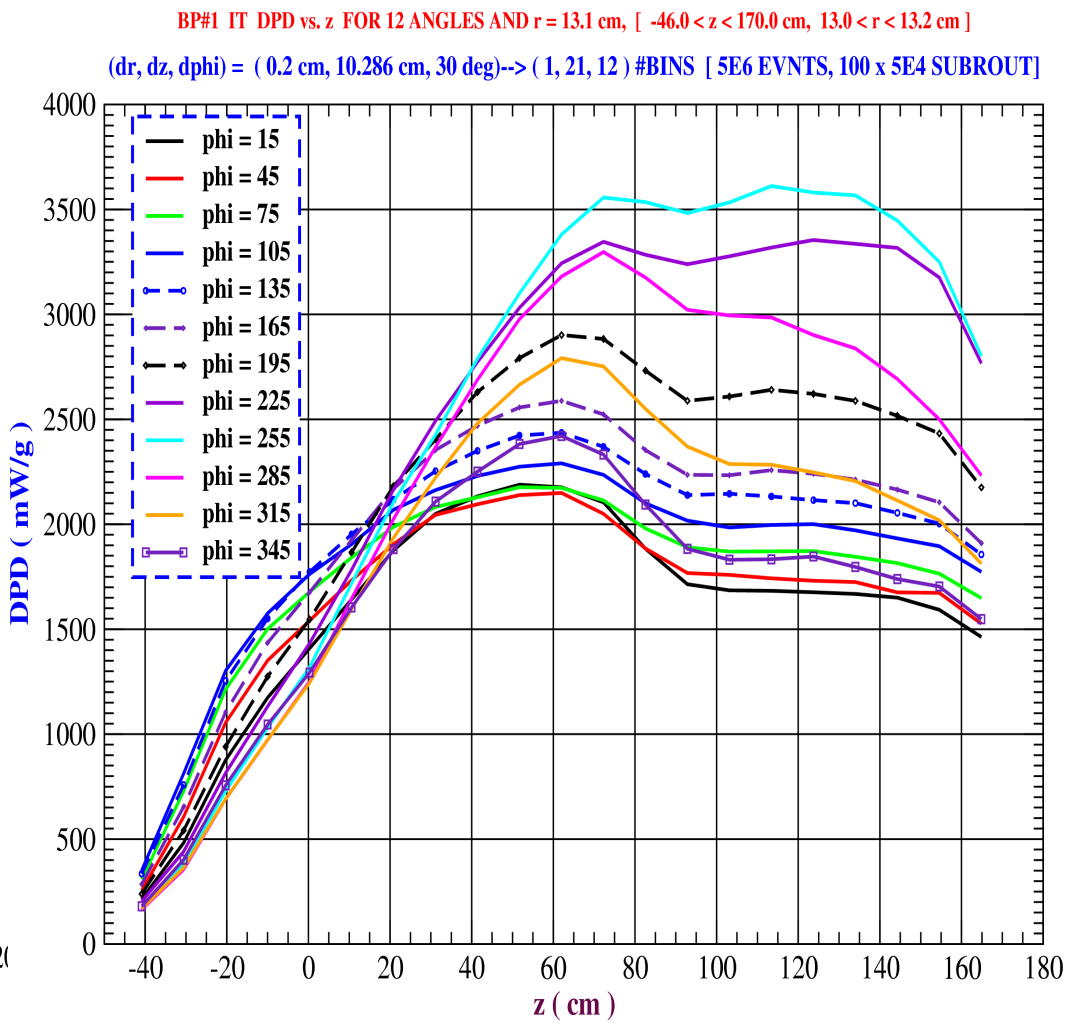
$N_{tot} = 252$ "pieces"

BP#1 (C MODULE INNER TUBE): TDPD AZIMUTHAL DISTRIBUTION FOR 12 ANGLES

ORIGINAL Dr=0.5 cm



UPDATED Dr = 0.2 cm



PEAK: 3964.43 mW/g (r, z, phi) = (13.25 105.0 255)

PEAK: 3611.24 mW/g (r, z, phi) = (13.1 113.429 255)

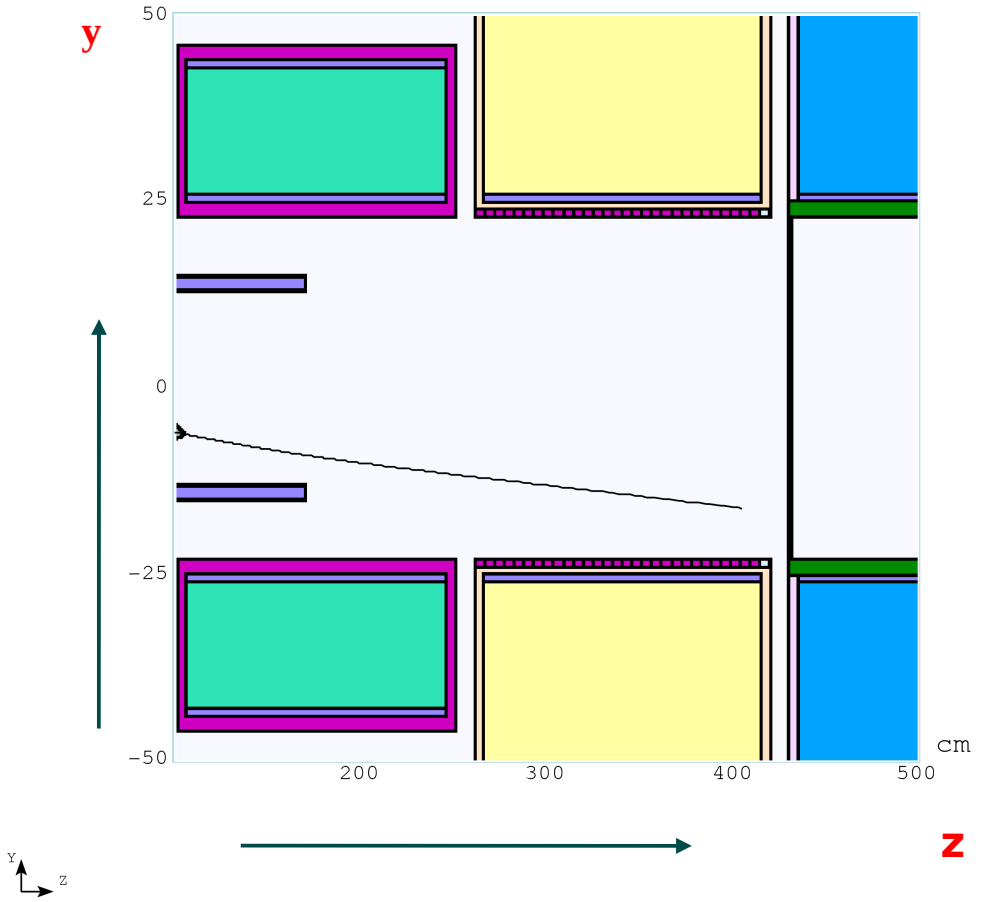
Dr = 0.5 cm: 103.66 kW (PIECES) + 117.47 (REST) = 224.13 kW vs. 240.57 kW (NO SEGM.)

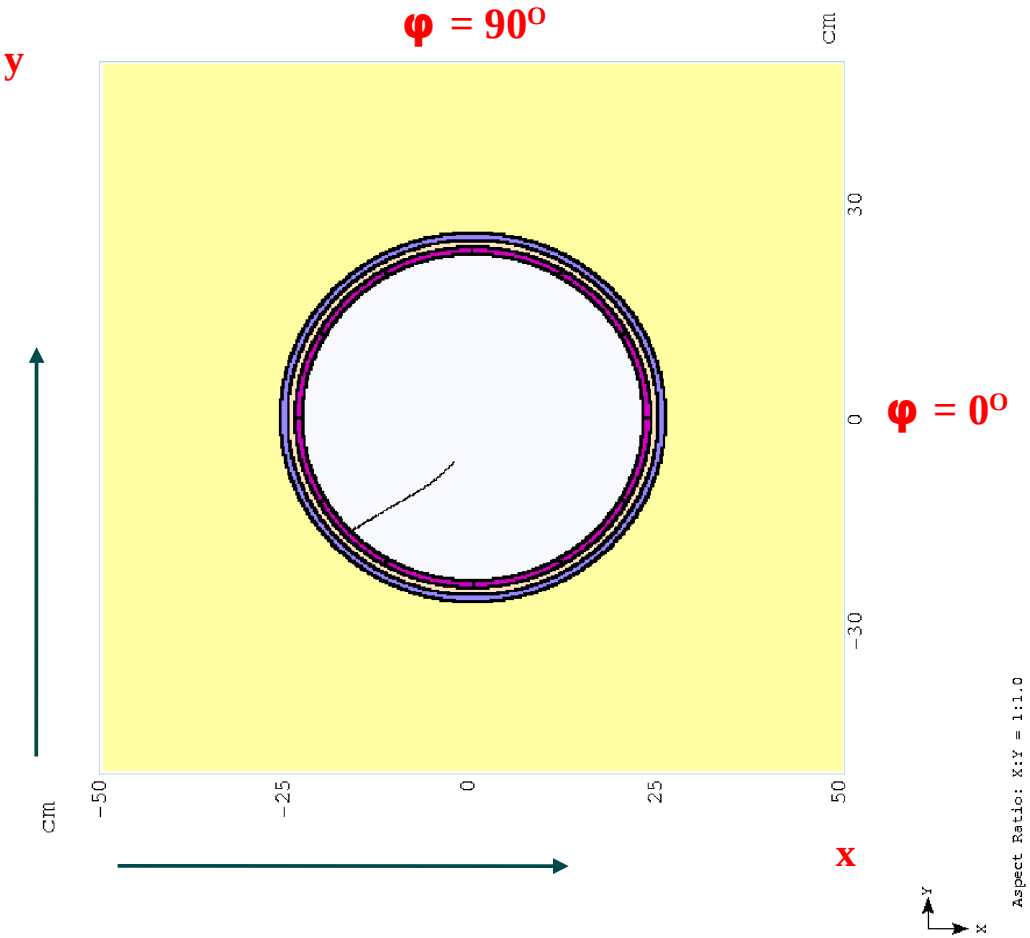
Dr = 0.2 cm: 55.53 kW (PIECES) + 53.93 (REST) = 109.46 kW vs. 111.11 kW (NO SEGM.)

PEAK TDPD SMALLER FOR THINNER C MODULE TUBES .

SHVS#1B VESSEL INNER TUBE AZIMUTHAL TDPD DISTRIBUTION (UPDATED)
(COMPARE SHVS#1B TUBE FOR IR = 51 cm AND UPDATED WITH IR = 23 cm)

SHSV#1B INNER TUBE SEGMENTATION DETAILS : yz AT x = 0.0 cm [LEFT] AND xy AT z = 320.0 cm [RIGHT] CROSS SECTION.





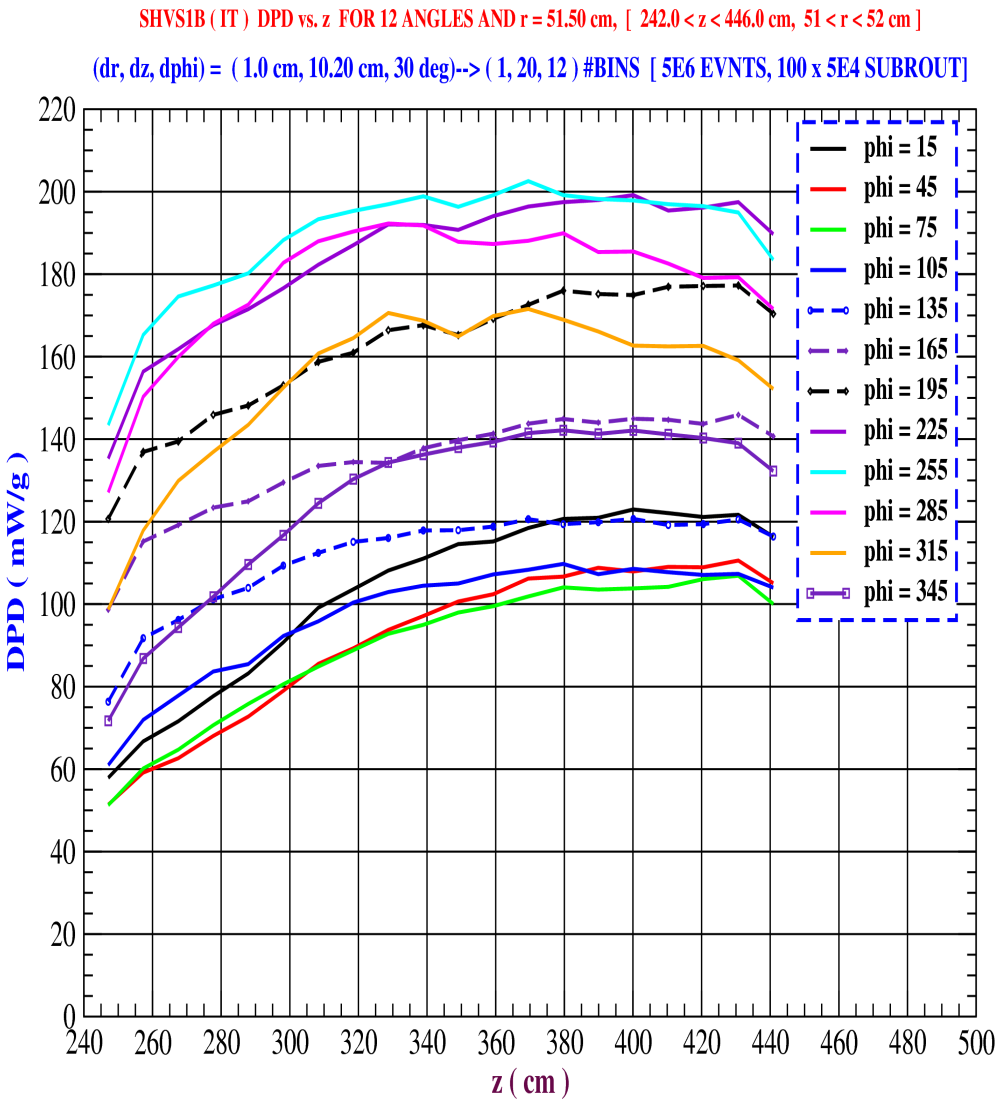
$23.0 < r < 24.0$ cm dr = 1.0 cm N_r = 1 bins

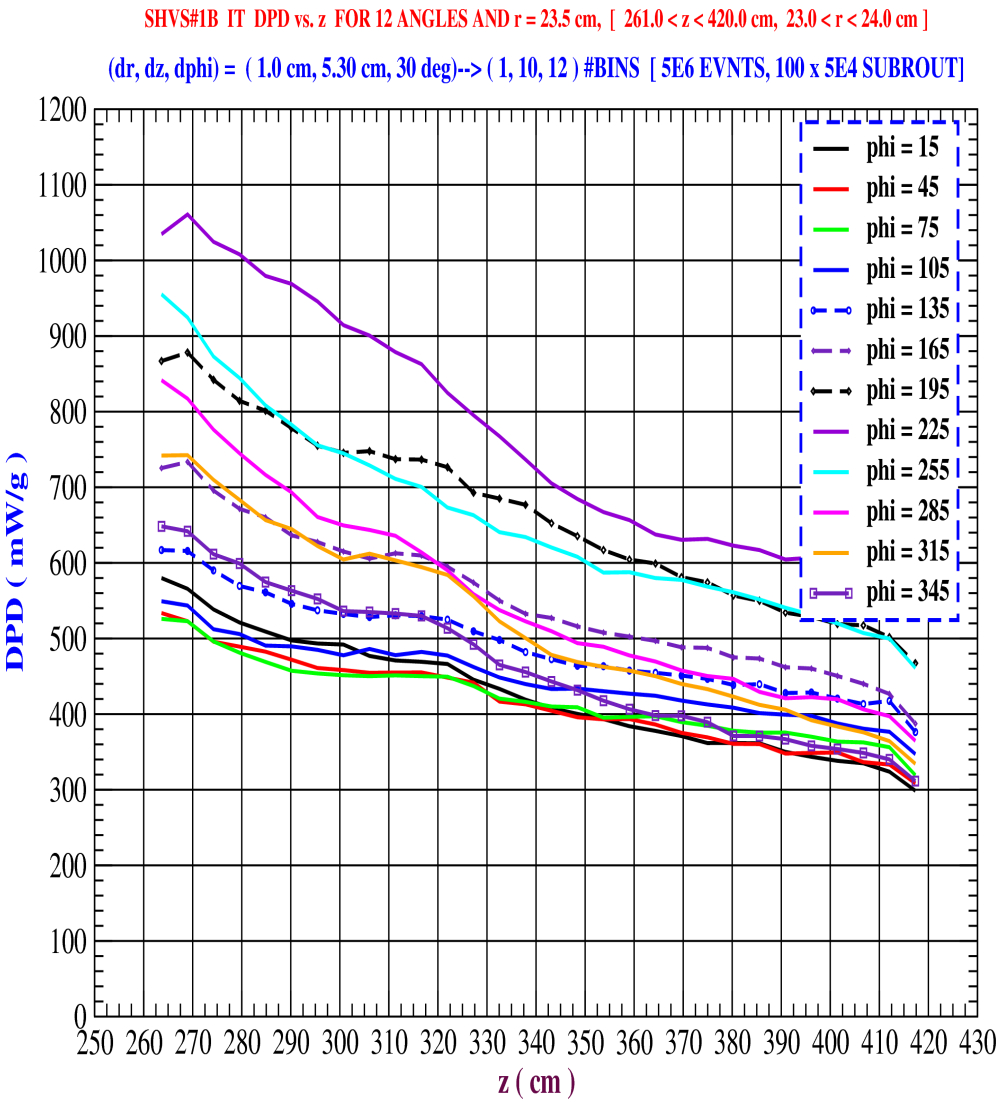
$261.0 < z < 420.0$ cm dz = 5.3 cm N_z = 30 bins

$0.0 < \varphi < 360.0$ deg. $d\varphi$ = 30 deg. N_φ = 12 bins

N_{tot} = 360 "pieces"

SHVS#1B INNER TUBE : TDPD AZIMUTHAL DISTRIBUTION (vs. z) FOR 12 ANGLES.





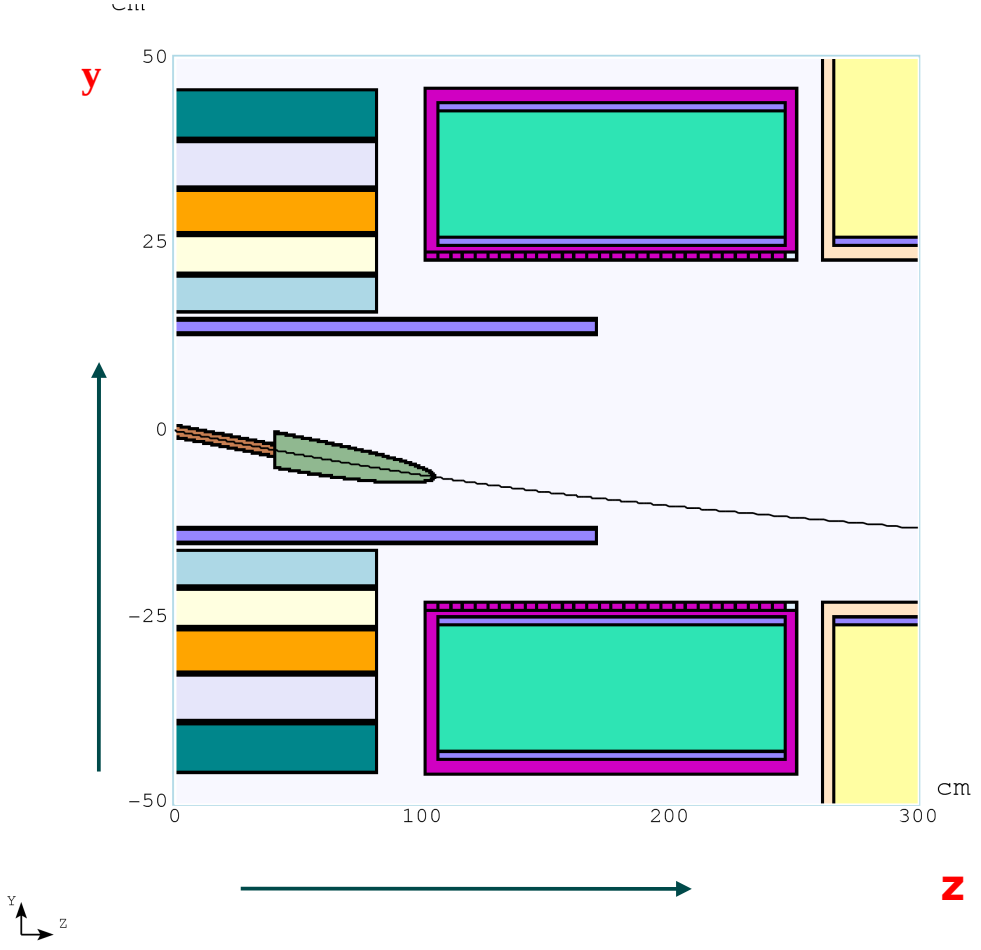
PEAK: 202.547 mW/g AT (r, z, phi) = (51.5 369.5 255) 1060.74 mW/g AT (r, z, phi) = (23.5 268.95 225)

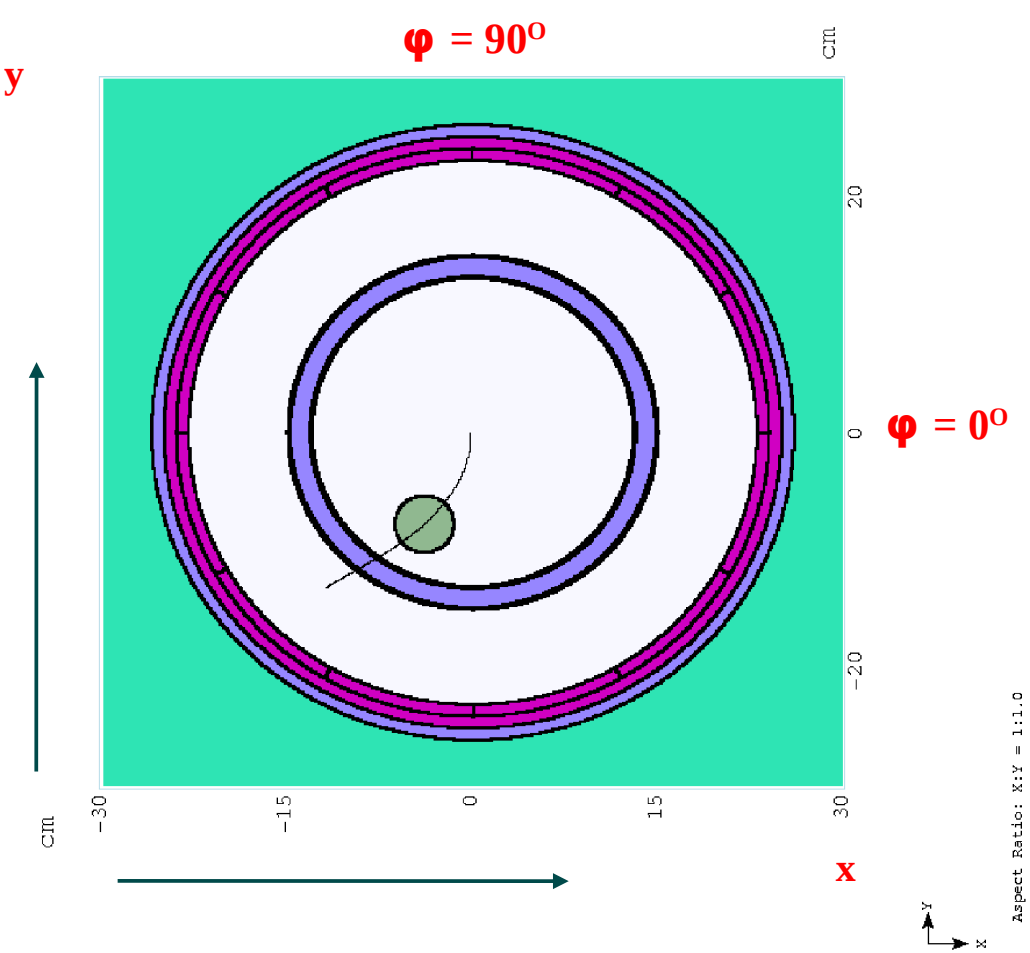
TDP (R = 51): 70.54 kW (''PIECES'') + 81.125 (REST) = 151.67 vs. 151.79 kW (NO SEGMNT)

TDP (R= 23): 98.94 kW (''PIECES'') + 87.72 (REST) = 186.66 vs. 186.71 kW (NO SEGMNT)

SHVS#1I INNER TUBE AZIMUTHAL TDPD DISTRIBUTION

SHVS#1I INNER TUBE SEGMENTATION DETAILS : yz AT x = 0.0 cm [LEFT] AND xy AT z = 140.0 cm [RIGHT] CROSS SECTION.





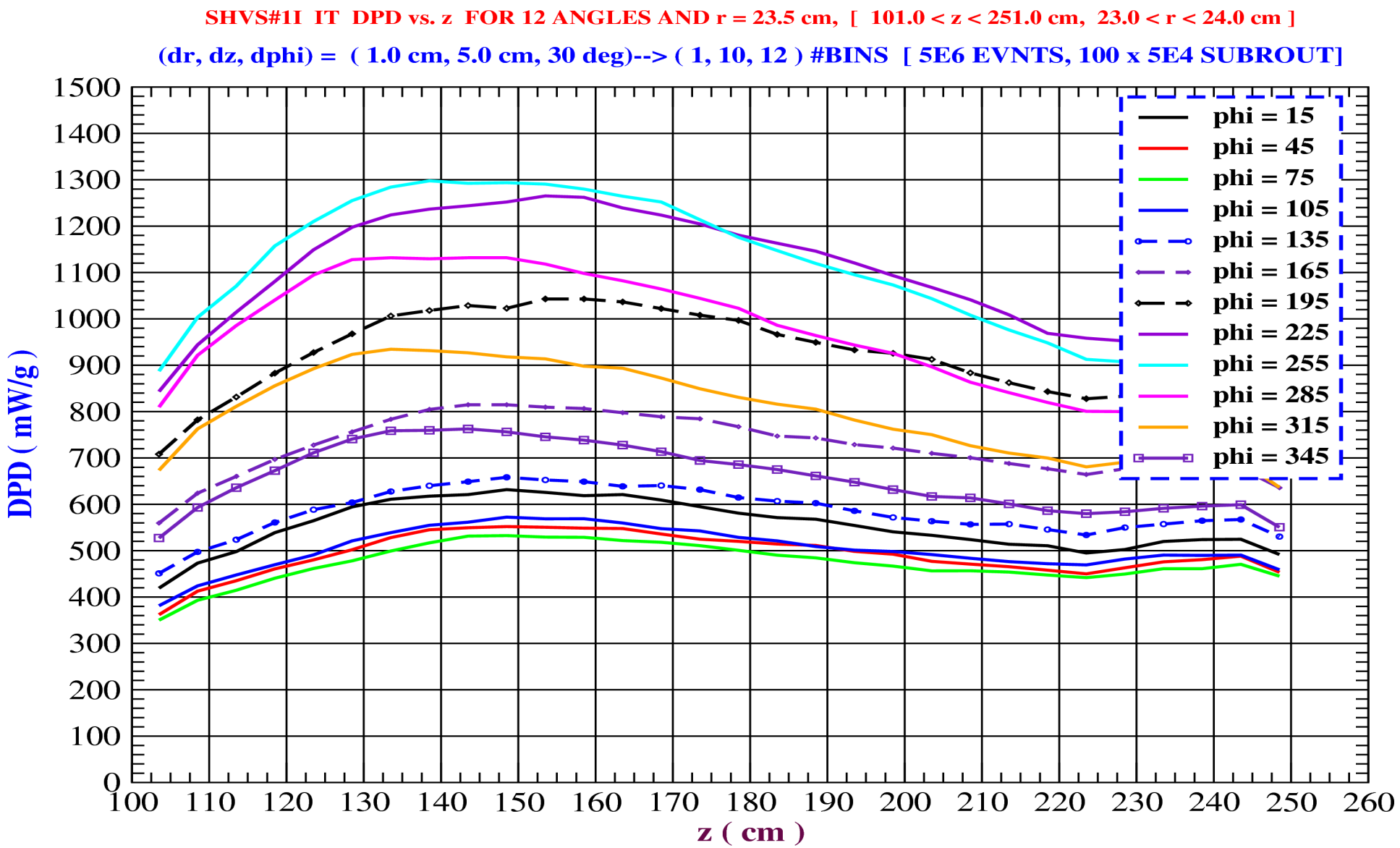
$23.0 < r < 24.0$ cm $dr = 1.0$ cm $N_r = 1$ bins

$101.0 < z < 251.0$ cm $dz = 5.0$ cm $N_z = 30$ bins

$0.0 < \varphi < 360.0$ deg. $d\varphi = 30$ deg. $N_\varphi = 12$ bins

$N_{tot} = 360$ "pieces"

SHVS#1I INNER TUBE : TDPD AZIMUTHAL DISTRIBUTION (vs. z) FOR 12 ANGLES.



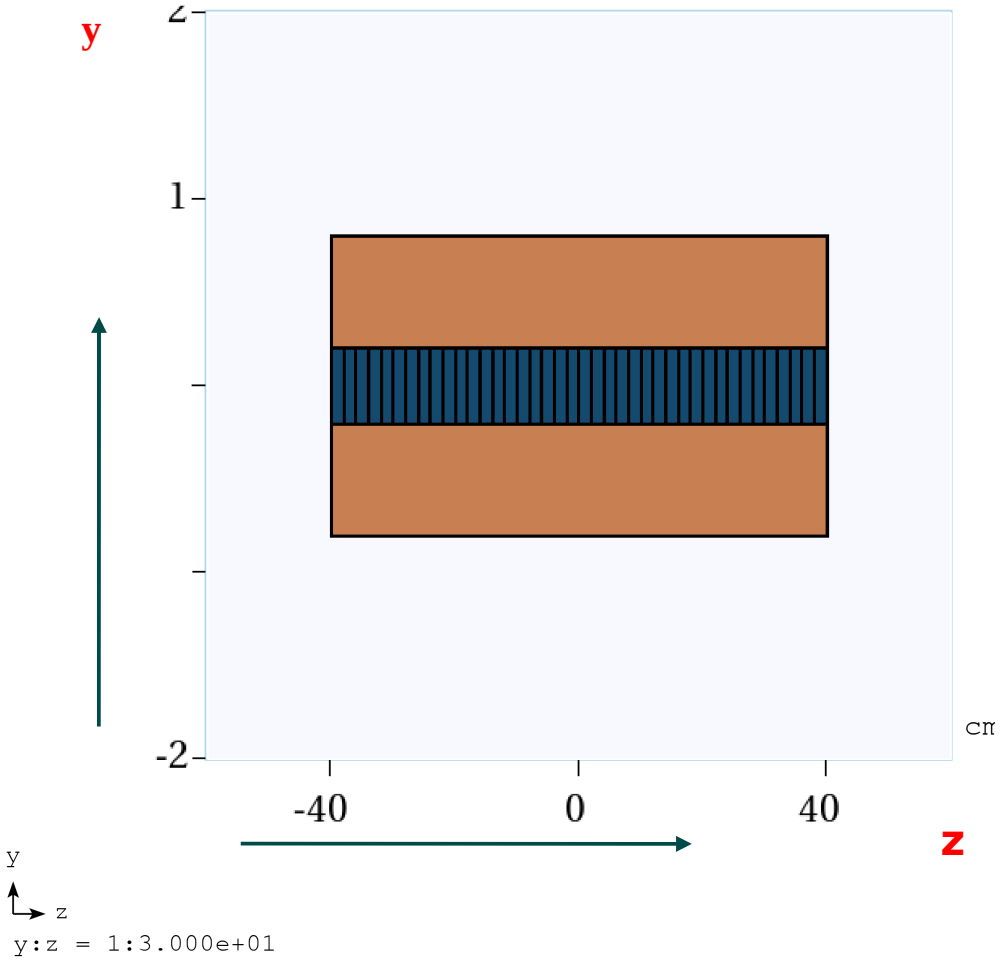
PEAK: 1297.77 mW/g AT (r, z, phi) = (23.5 138.5 255)

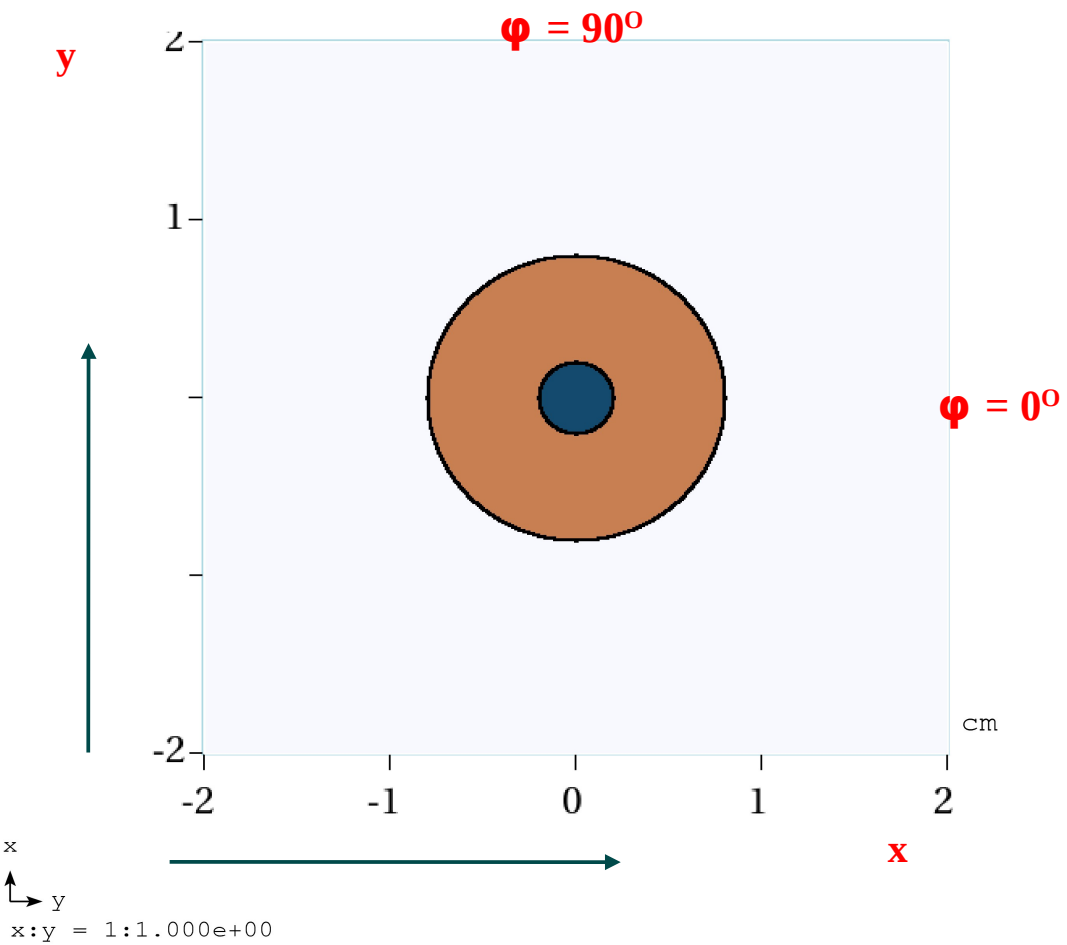
TDP: 129.54 kW ("PIECES") + 179.25 (REST) = 308.79 vs. 308.34 kW (NO SEGMNT)

(CURRENTLY USING A dr = 1 cm THICK He LAYER FOR COOLING)

C TARGET AXIAL TDP DISTRIBUTION FOR 0 < r < 0.2 cm (0 and 65 mrad TILT)
C TARGET AXIAL TDP DISTRIBUTION FOR 0 < r < 0.8 cm (0 and 65 mrad TILT)
1 cm THICK C DISC AT z = 0.0 cm

C TARGET 0 < r < 0.2 cm SEGMENTATION DETAILS (0 mrad) : yz AT x = 0.0 cm [LEFT] AND xy AT z = 0.0 cm [RIGHT] CROSS SECTION OF THE C TARGET .





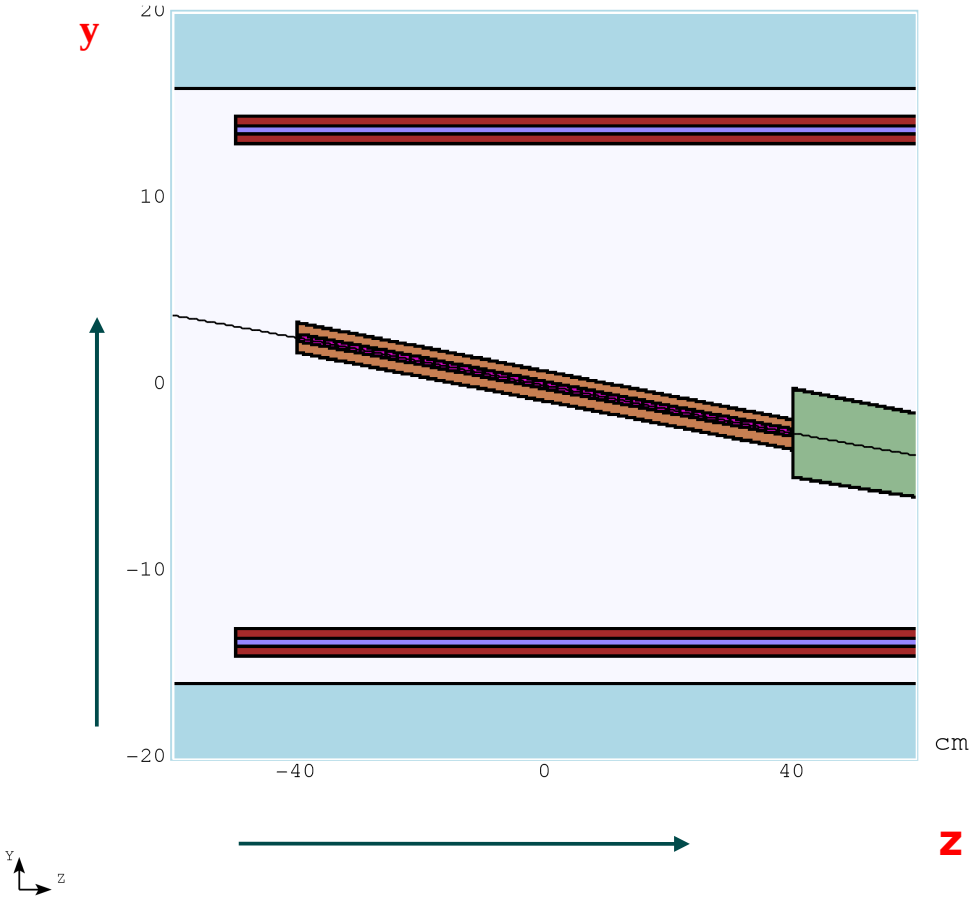
$0.0 < r < 0.2$ cm $dr = 0.2$ cm $N_r = 1$ bins

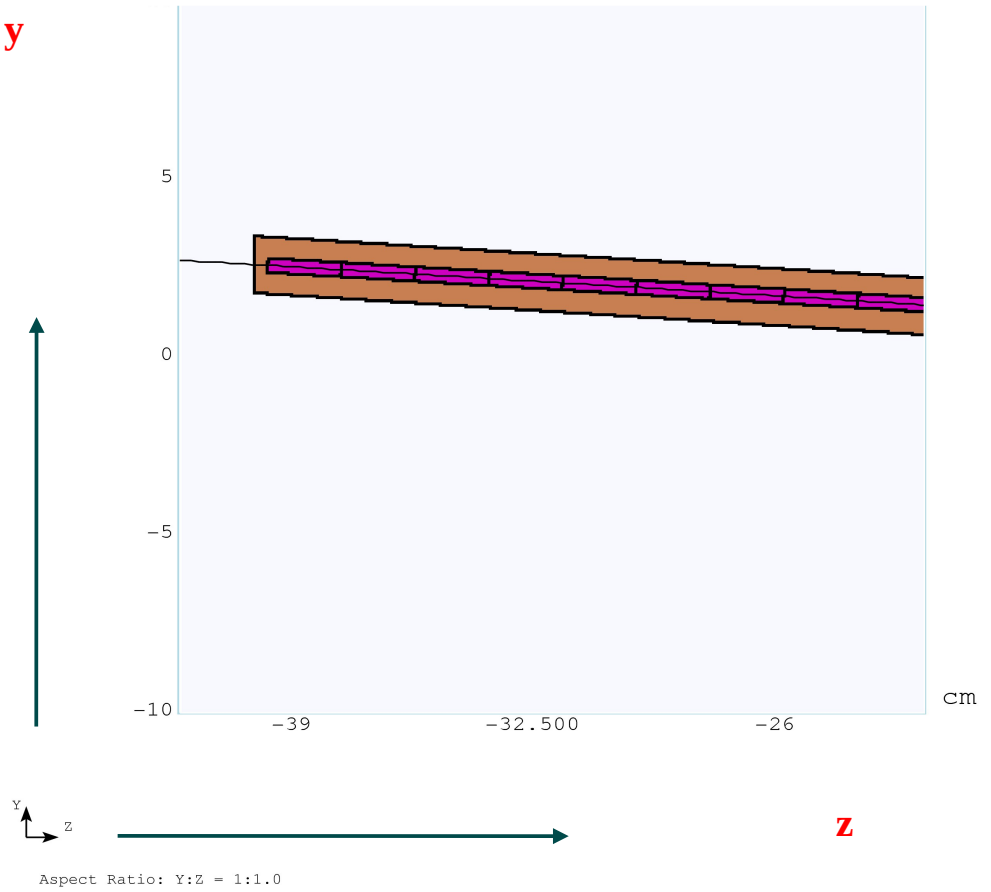
$-40.0 < z < 40.0$ cm $dz = 2.0$ cm $N_z = 40$ bins

$0.0 < \varphi < 360.0$ deg. $d\varphi = 360$ deg. $N_\varphi = 1$ bins

$N_{tot} = 40$ "pieces"

C TARGET 0 < r < 0.2 cm SEGMENTATION DETAILS (65 mrad) : yz AT x = 0.0 cm [LEFT] AND yz WITH FOCUS ON THE FIRST HALF OF THE TARGET (1:1) [RIGHT] CROSS SECTION.





$0.0 < r < 0.2$ cm dr = 0.2 cm N_r = 1 bins

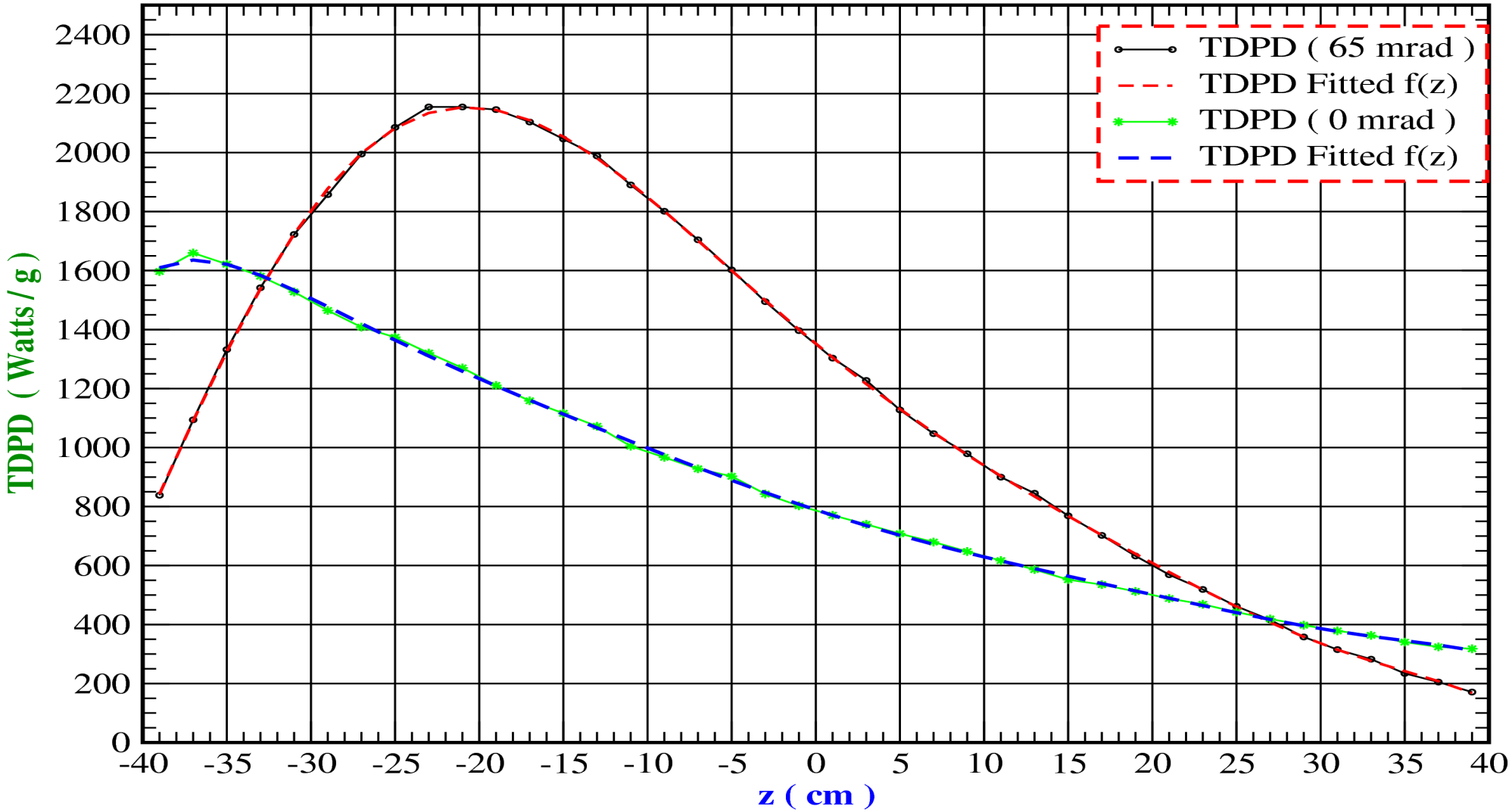
$-40.0 < z < 40.0$ cm dz = 2.0 cm N_z = 40 bins

$0.0 < \varphi < 360.0$ deg. $d\varphi$ = 360 deg. N_φ = 1 bins

N_{tot} = 40 "pieces"

20to2T5mDL C TRGT SGNT for [0.0 < r < 0.2 cm, -40.0 < z < 40.0 cm] 1.8 g/cc density

(dr, dz, dphi) = (0.2 cm, 2.0 cm, 360.0)---> (Nr, Nz, Nphi) = (1, 40, 1) # BINS



TDPD PEAK: [65 mrad] 2154.805 W/g AT z ~ - 22 cm [0 mrad] 1659.66 W/g AT z ~ - 37 cm

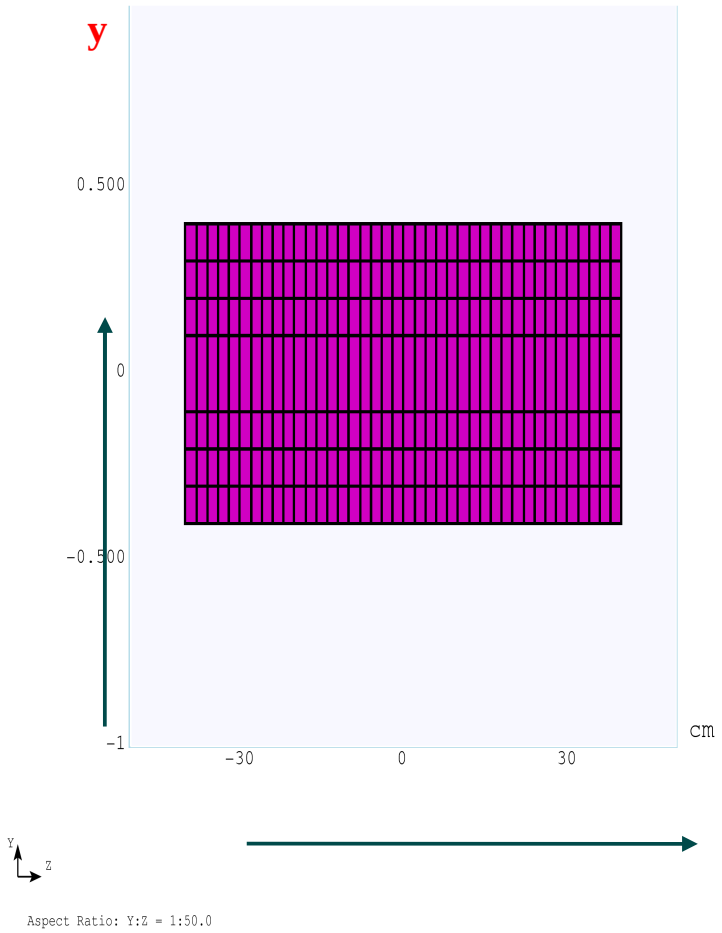
TDP: 21.72 kW (''PIECES'') + 91.08 (REST) = 112.80 vs. 112.83 kW (NO SEGMNT)

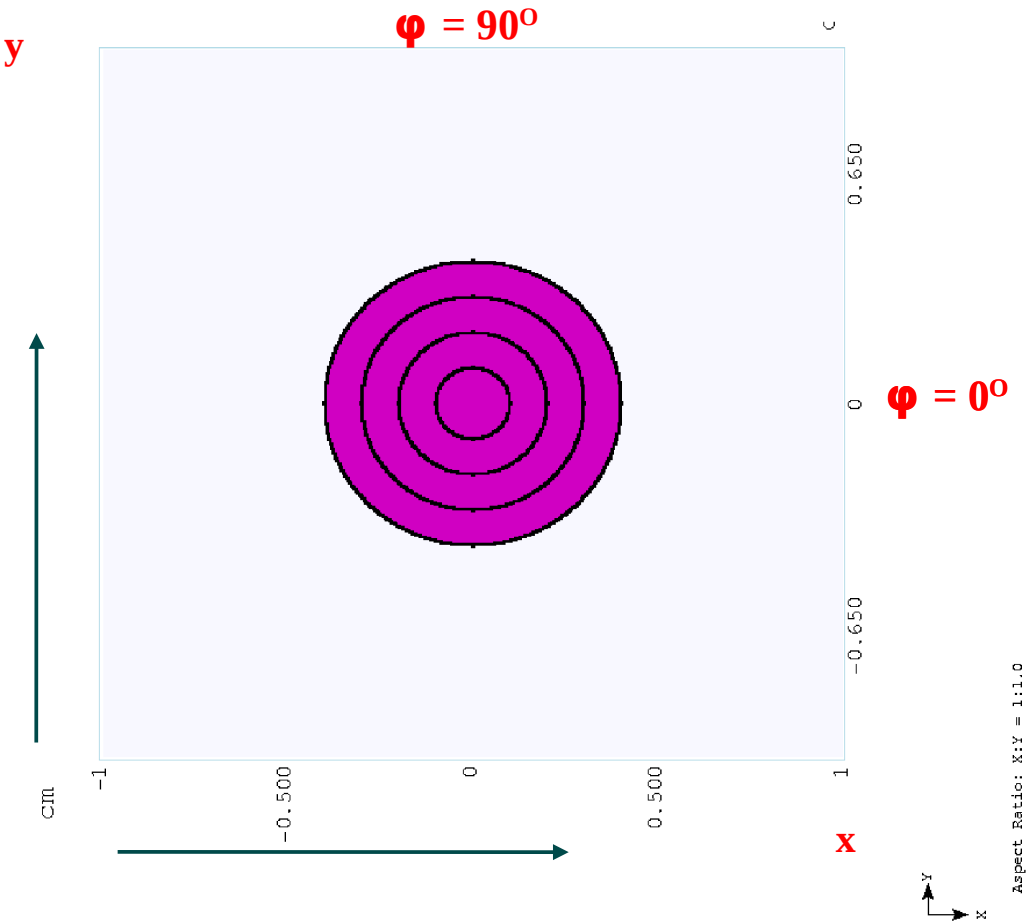
8th ORDER FITTED POLYNOMIAL FUNCTION TO TDP: [65 mrad] TDP (z) = 611.74 - 21.426 * z+ 0.25202 * z^2 + 0.0076365 * z^3 - 0.00065839 * z^4 + 6.8115e-06 * z^5 + 2.8994e-07 * z^6 - 2.8021e-09 * z^7 - 4.9265e-11 * z^8

[0 mrad] TDP (z)= 788.92 - 18.728 * z + 0.27801 * z^2 + 0.0032023 * z^3 - 0.00032769 * z^4 - 6.7805e-06 * z^5 + 3.6939e-07 * z^6 + 3.6709e-09 * z^7 - 1.4803e-10 * z^8

(TO GET TDPD (z) IN W/g DIVIDE WITH 0.452 g = MASS OF EACH “PIECE”)

C TARGET 0 < r < 0.8 cm SEGMENTATION DETAILS Nr x Nz = 4 x 40 (0 mrad) :
yz AT x = 0.0 cm [LEFT] AND xy AT z = 0.0 cm [RIGHT] CROSS SECTION.





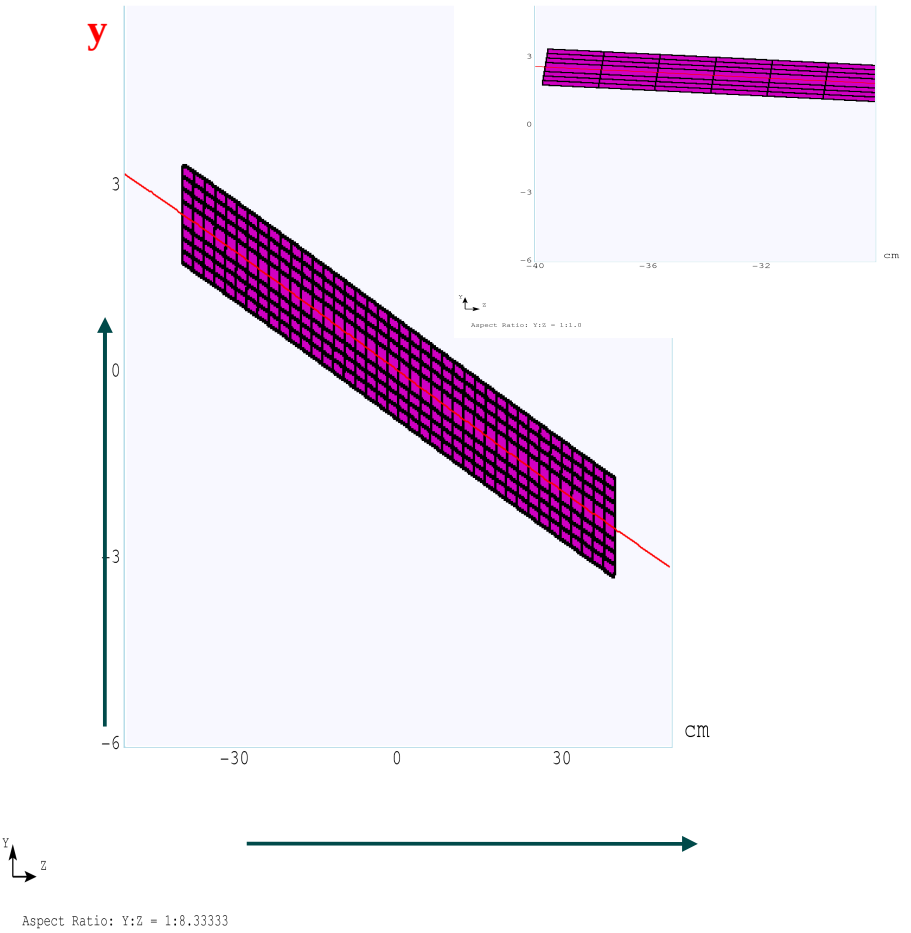
$0.0 < r < 0.8$ cm $dr = 0.2$ cm $N_r = 4$ bins

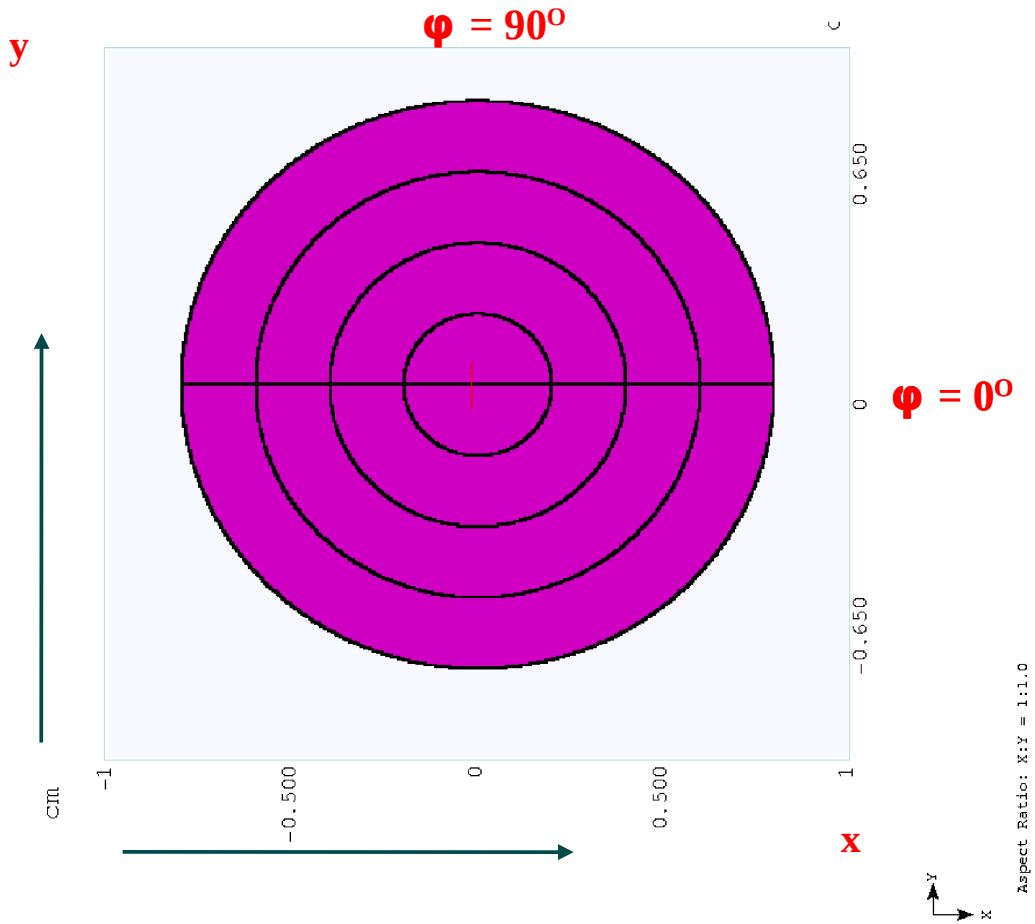
$-40.0 < z < 40.0$ cm $dz = 2.0$ cm $N_z = 40$ bins

$0.0 < \varphi < 360.0$ deg. $d\varphi = 360$ deg. $N_\varphi = 1$ bins

$N_{tot} = 160$ "pieces"

C TARGET 0 < r < 0.8 cm SEGMENTATION DETAILS Nr x Nz = 4 x 40 (65 mrad) : yz AT x = 0.0 cm WITH SMALL INSERT OF 1:1 SCALE [LEFT] AND xy AT z = 0.0 cm [RIGHT] CROSS SECTION.





$0.0 < r < 0.8$ cm $dr = 0.2$ cm $N_r = 4$ bins

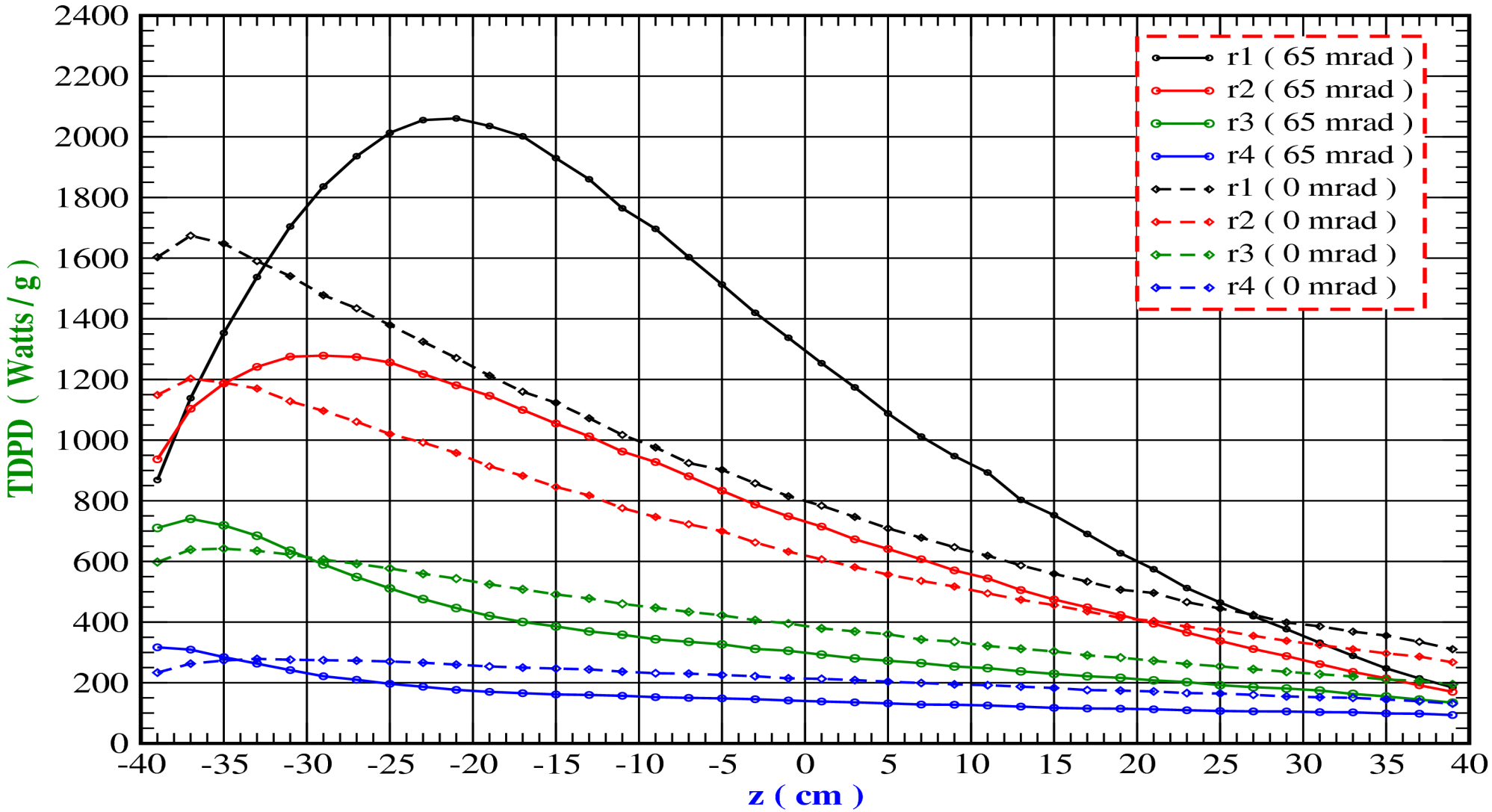
$-40.0 < z < 40.0$ cm $dz = 2.0$ cm $N_z = 40$ bins

$0.0 < \varphi < 360.0$ deg. $d\varphi = 360$ deg. $N_\varphi = 1$ bins

$N_{tot} = 160$ "pieces"

20to2T5mDL C TRGT SGNT for [0.0 < r < 0.8 cm, -40.0 < z < 40.0 cm] 1.8 g/cc density

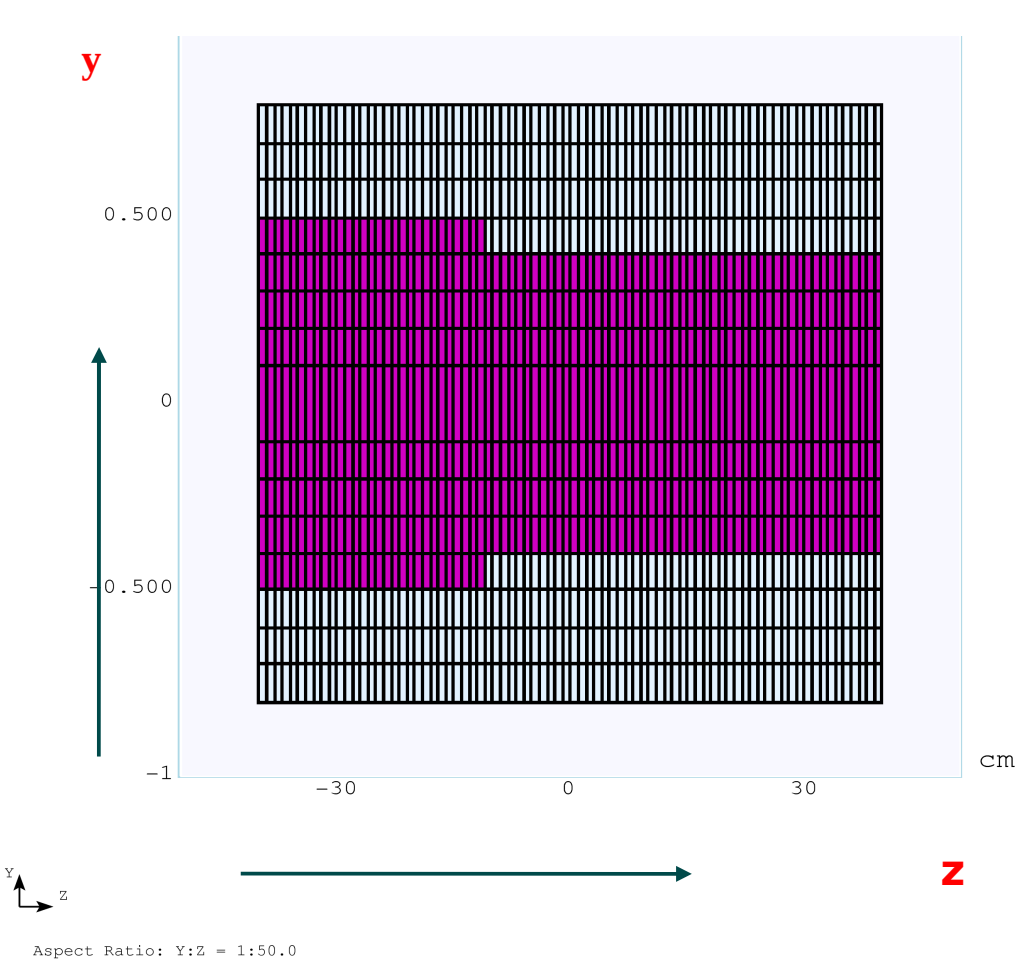
(dr, dz, dphi) = (0.2 cm, 2.0 cm, 360.0)---> (Nr, Nz, Nphi) = (4, 40, 1) # BINS (2E5 EVENTS)

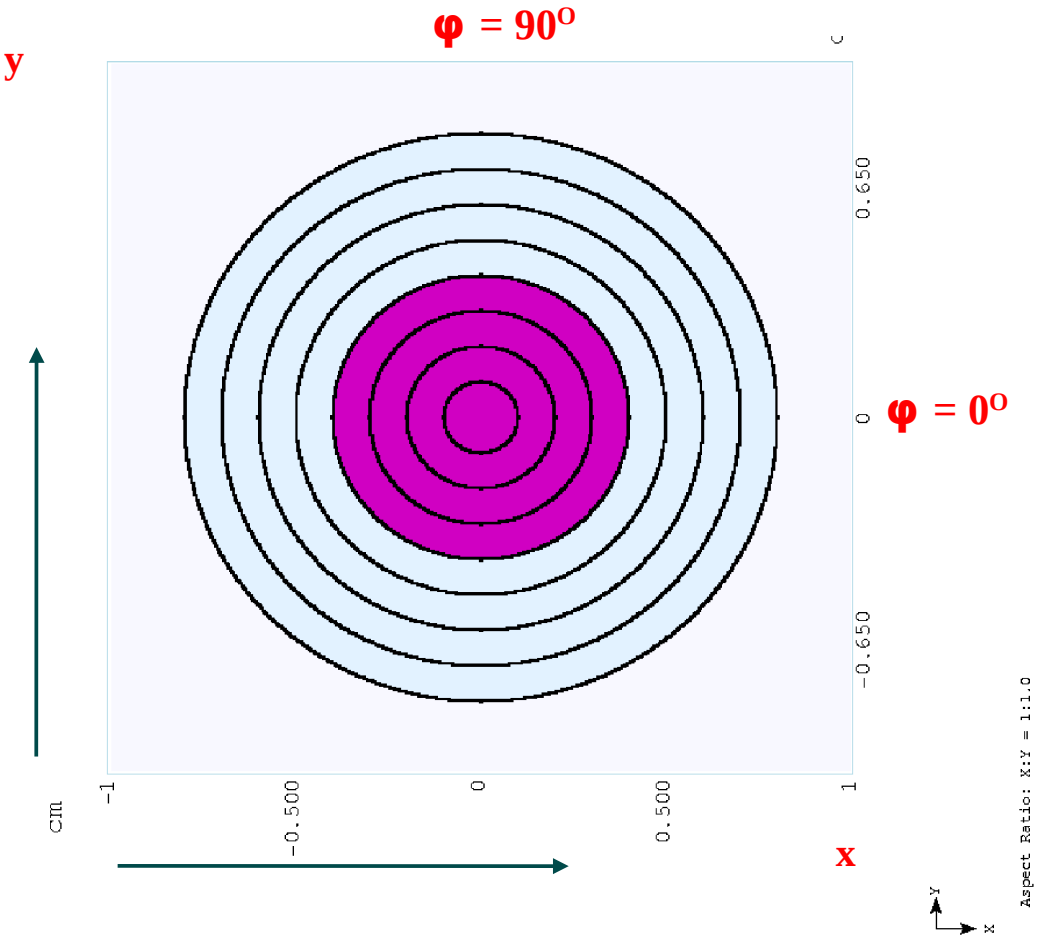


TDPD PEAK: [65 mrad] 2060.49 W/g AT z ~ - 21 cm [0 mrad] 1674.07 W/g AT z ~ - 37 cm

TDP: [65 mrad] 112.71 kW ("PIECES") vs. 112.83 kW (NO SEGMNT) [0 mrad] 116.29 kW "PIECES" vs. ??

C TARGET 0 < r < 0.8 cm SEGMENTATION DETAILS Nr x Nz = 8 x 80 (0 mrad) : yz AT x = 0.0 cm [LEFT] AND xy AT z = 0.0 cm [RIGHT] CROSS SECTION.





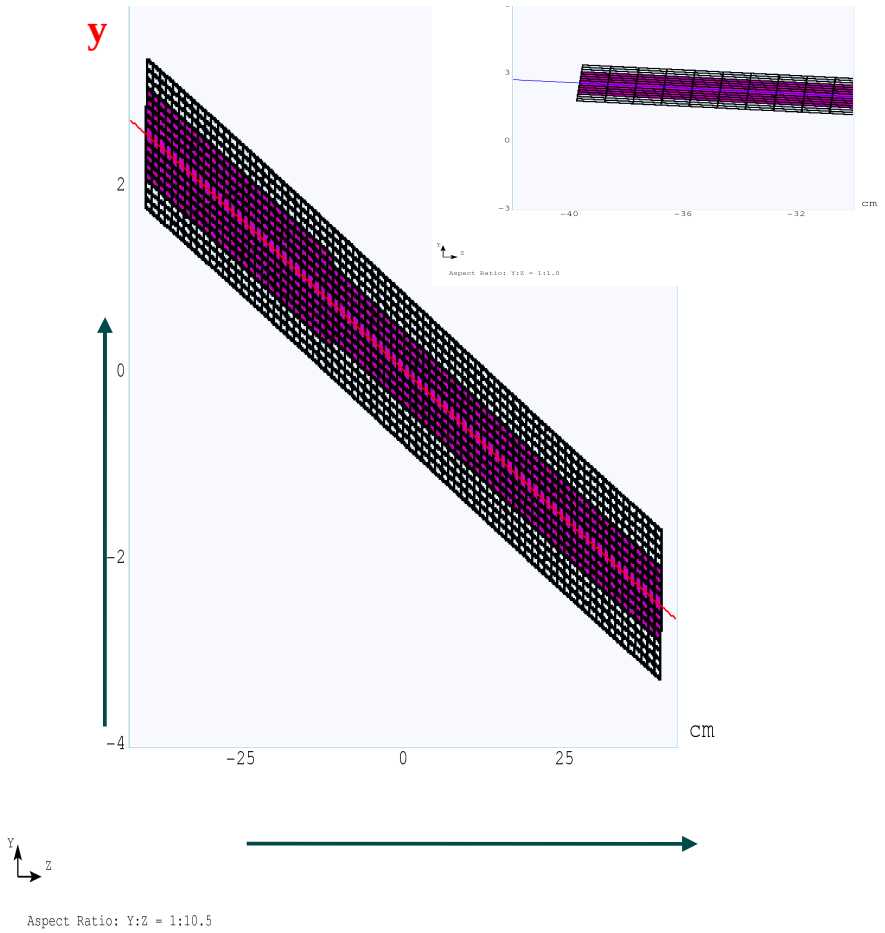
$0.0 < r < 0.8$ cm dr = 0.1 cm N_r = 8 bins

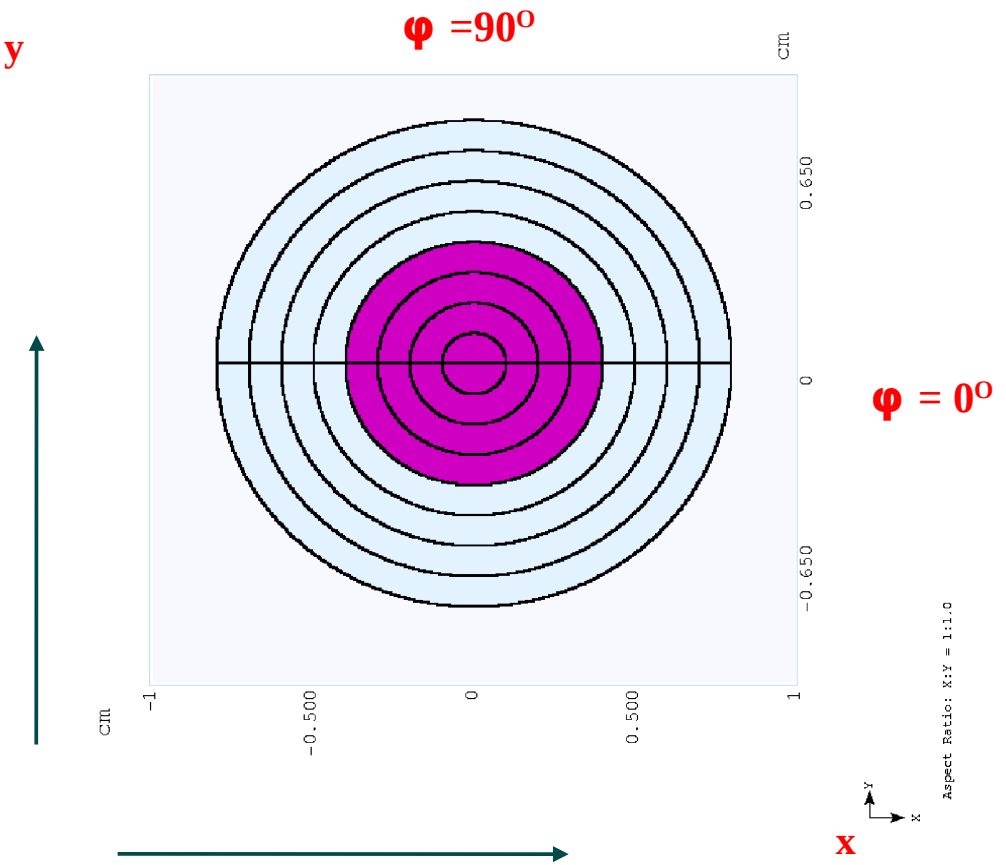
$-40.0 < z < 40.0$ cm dz = 1.0 cm N_z = 80 bins

$0.0 < \varphi < 360.0$ deg. $d\varphi$ = 360 deg. N_φ = 1 bins

N_{tot} = 640 "pieces"

C TARGET 0 < r < 0.8 cm SEGMENTATION DETAILS Nr x Nz = 8 x80 (65 mrad) : yz AT x = 0.0 cm WITH SMALL INSERT OF 1:1 SCALE [LEF T } AND xy AT z = 0.0 cm [RIGHT] CROSS SECTION.



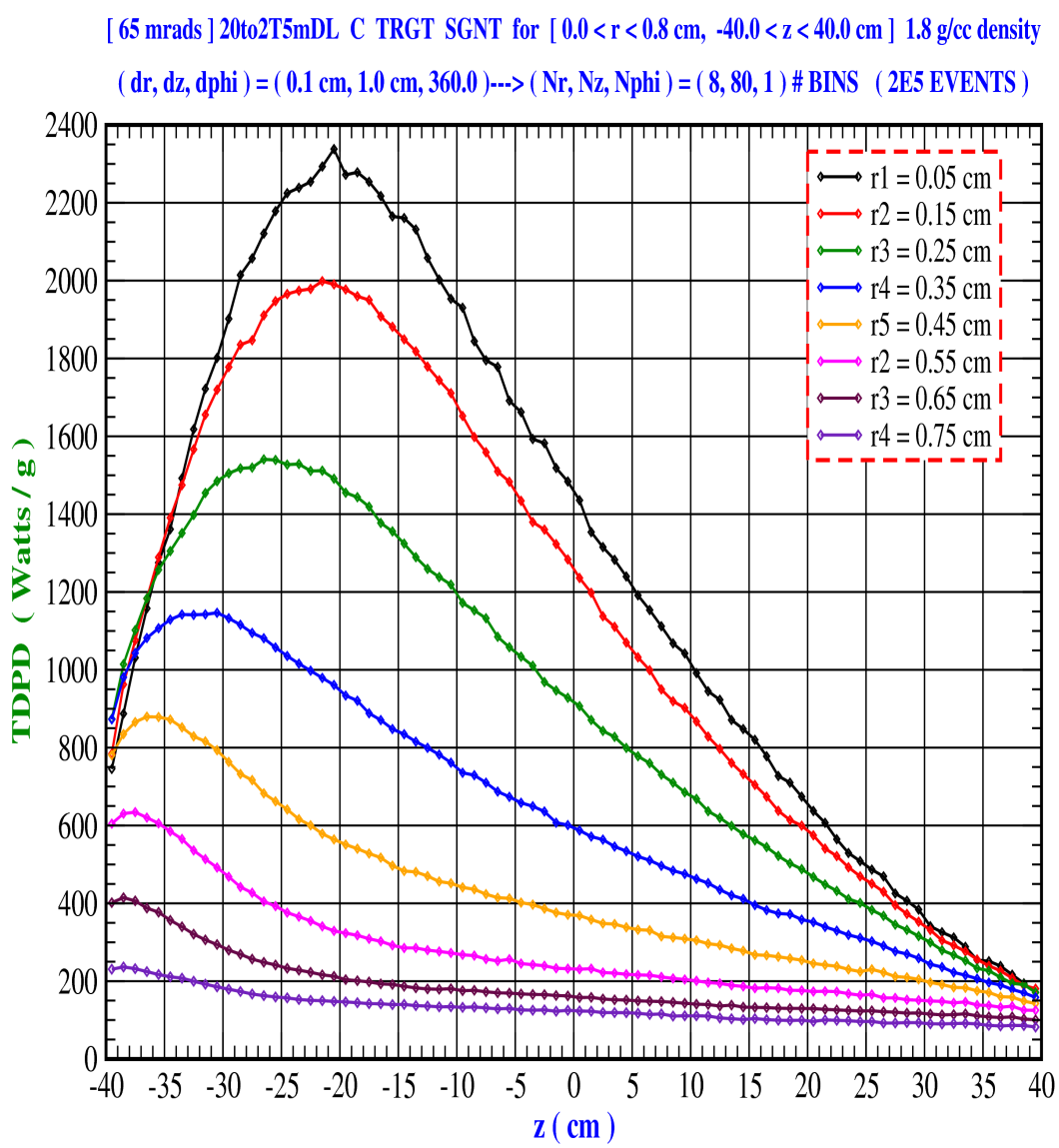


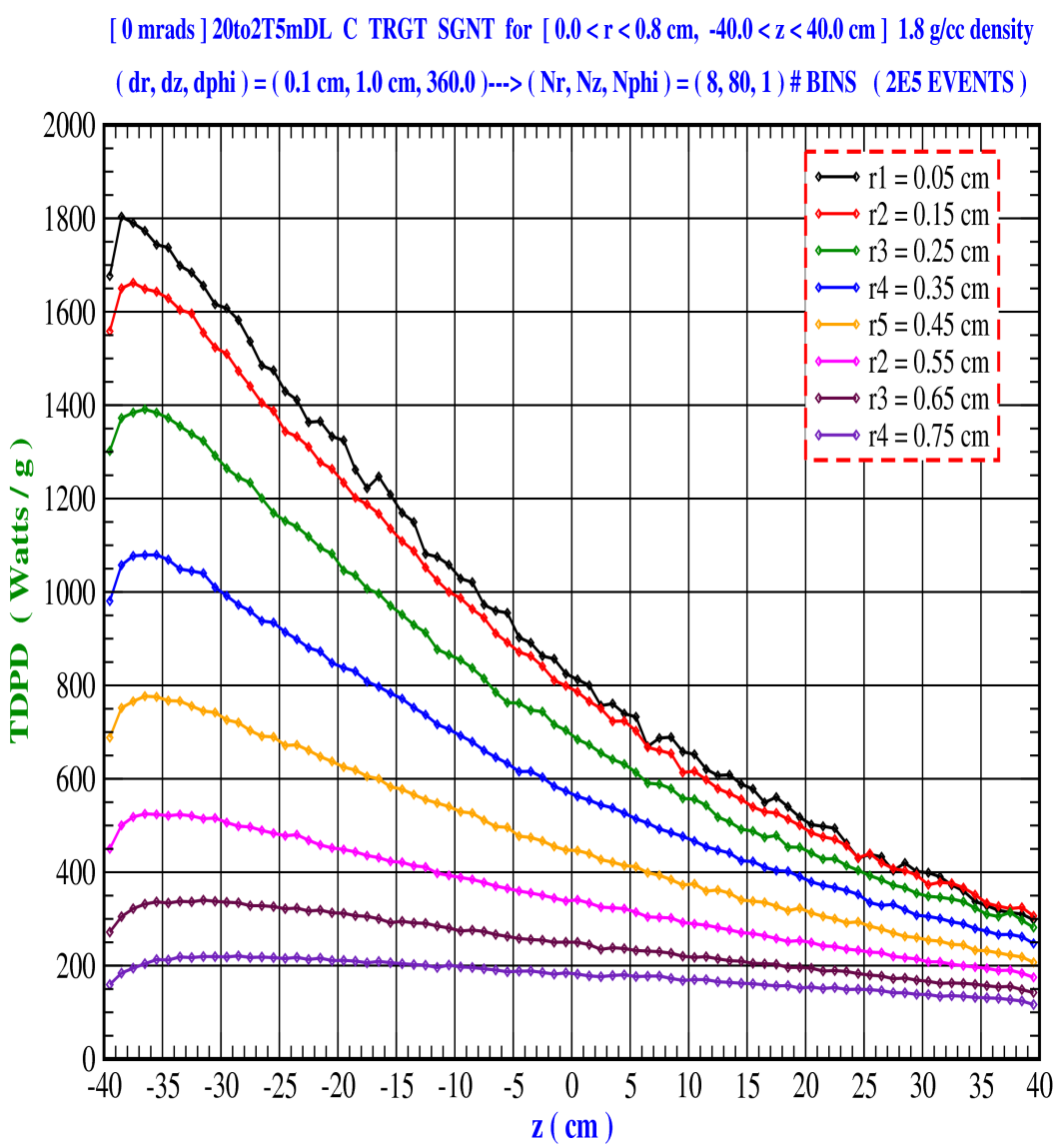
$0.0 < r < 0.8$ cm $dr = 0.1$ cm $N_r = 8$ bins

$-40.0 < z < 40.0$ cm $dz = 1.0$ cm $N_z = 80$ bins

$0.0 < \varphi < 360.0$ deg. $d\varphi = 360$ deg. $N_\varphi = 1$ bins

$N_{tot} = 640$ "pieces"





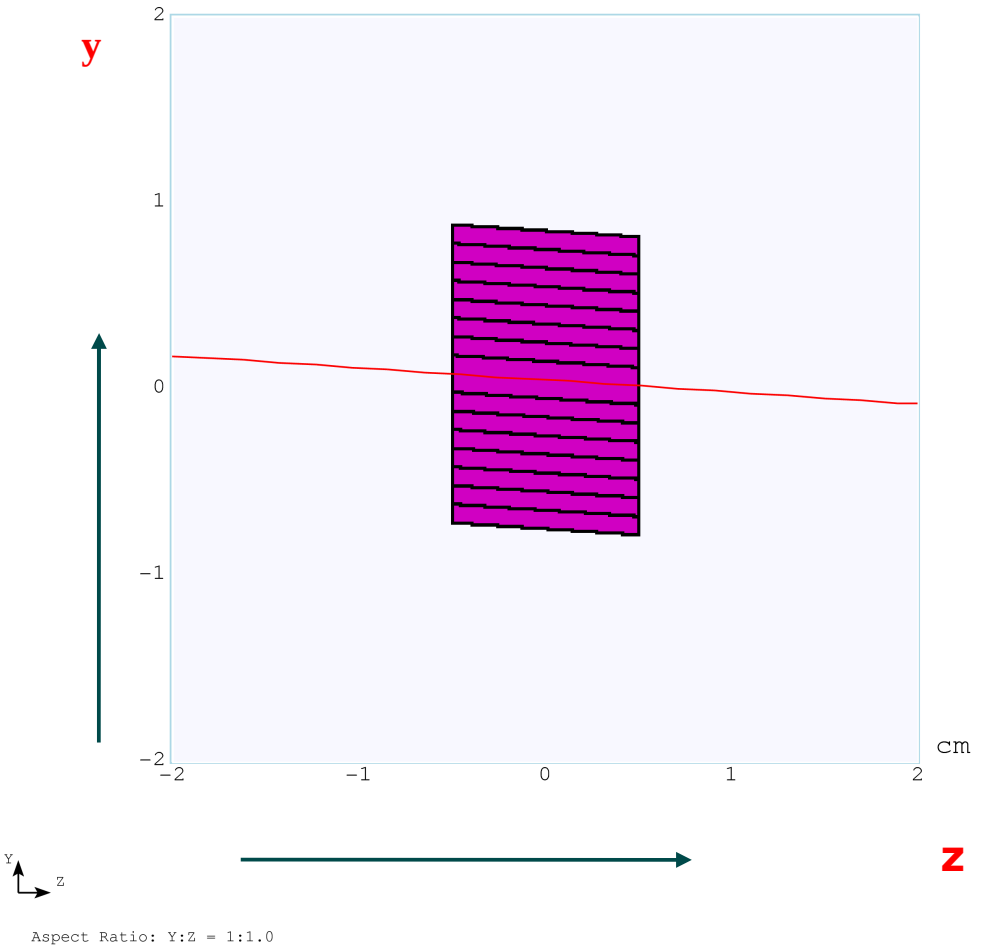
TDPD PEAK: [65 mrad] 2337.93 W/g AT z ~ - 20.5 cm [0 mrad] 1803.49 W/g AT z ~ - 38.5 cm

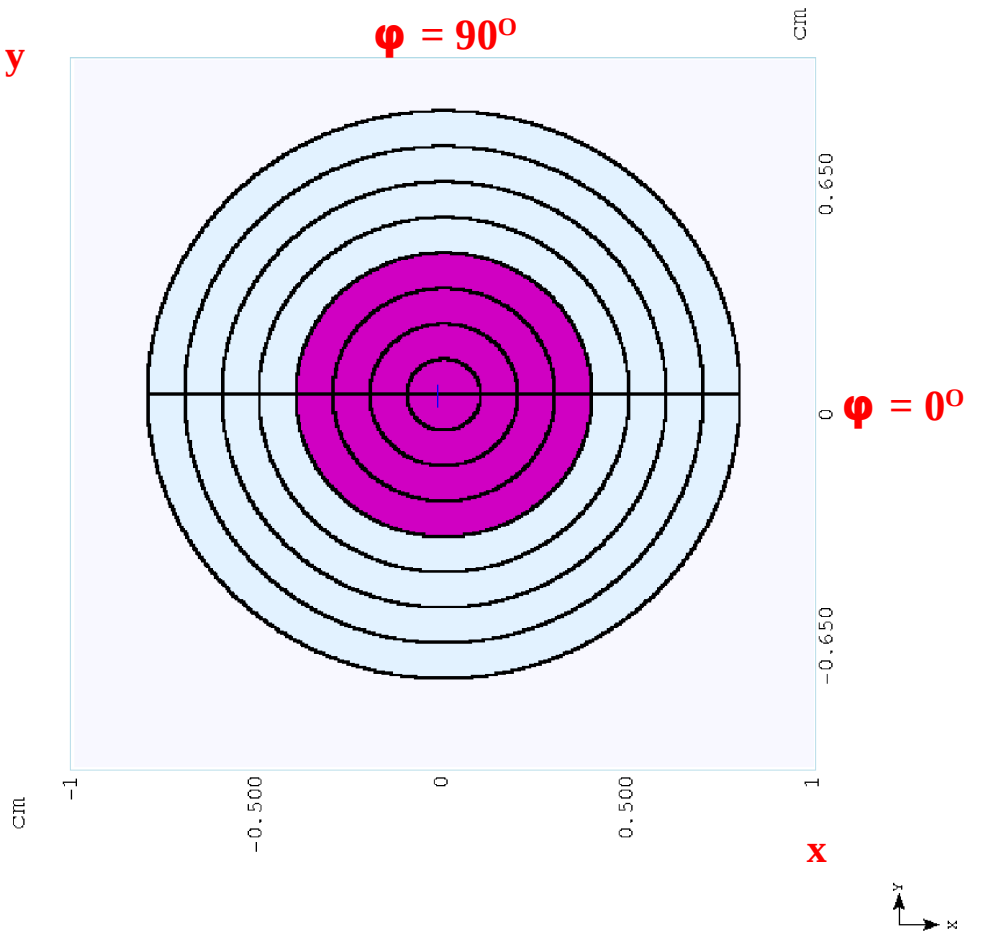
TDP [65 mrad] : 112.24 kW [0 mrad] 116.24 kW

WITH THE SMALLER BINS SIZE PEAK TDPD IN GENERAL HIGHER THAN BEFORE (2154.8 ==> 2337.9 mW / g FOR 65 mrad, 1659.7 ==> 1803.5 mW / g FOR 0 mard) BUT STILL MUCH LOWER THAN ESTIMATED TDPD FROM dE/dx (~ 3555 W/g) AND THE 1 cm THICK C DISC STUDY (~ 3911 W/ g).

THE MYSTERY REMAINS ...

C TARGET Dz = 1 cm DISC 0 < r < 0.8 cm SEGMENTATION DETAILS (65 mrad) :
yz AT x = 0.0 cm [LEFT] AND xy AT z = 0.0 cm [RIGHT] CROSS SECTION.





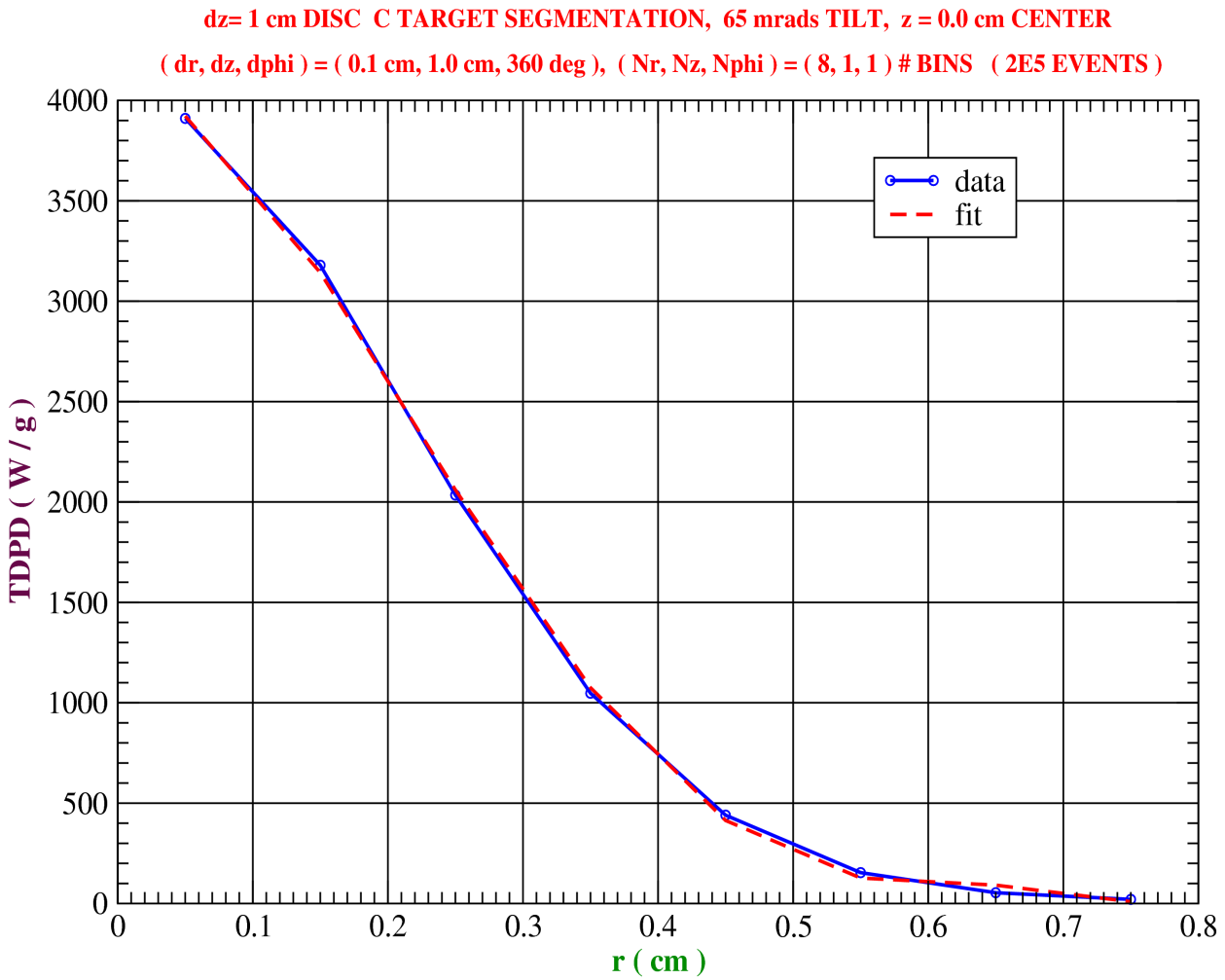
$0.0 < r < 0.8$ cm $dr = 0.1$ cm $N_r = 8$ bins

$-0.5 < z < 0.5$ cm $dz = 1.0$ cm $N_z = 1$ bins

$0.0 < \varphi < 360.0$ deg. $d\varphi = 360$ deg. $N_\varphi = 1$ bins

$N_{tot} = 8$ "pieces"

C TARGET DISC TDPD FOR THE 8 dr = 0.1 cm RINGS



r(cm)	TDPD (W/g)
0.05	3,910.5
0.15	3,178.7
0.25	2,034.5
0.35	1,047.7
0.45	440.2
0.55	153.7
0.65	54.0
0.75	20.5

dz = 1 cm THICK C DISC PEAK TDPD ~ 3911 W/ g REASONABLY CLOSE TO dE/dx ESTIMATED (Dr. Kirk McDonald)
TDPD ~ 3555 W/g. FAST RADIAL DECREASE.
4th ORDER POLYNOMIAL FIT : TDPD (z) = 4025.1 + 670.83 * z - 60812 * z^2 + 1.2493e+05 * z^3 - 72742 * z^4

mars15 (2014) : ***100 x 5E4 SIMULATIONS*** **[BOTH:MCNP, ICEM =1]**

******* DEPOSITED POWER IN DIFFERENT PARTS OF THE TARGET STATION IN kW (Np / STEP): 5E6 / 10^{-3} *******

GEOMETRY COLOR CODE: 20to2T5mDL ***20to2T5mDL (NO SH#1I)***

A) SC# 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 : 2.518 / 1.500 / 0.017 / 0.002 / 0.003 / 0.006 / 0.002 / 0.008 / 0.012 / 0.001
2.399 / 1.708 / 0.019 / 0.002 / 0.003 / 0.007 / 0.002 / 0.008 / 0.012 / 0.001
TOTAL DP SC#1-10: 4.069 / 4.162 { WITH ~ 4.04 / 4.13 kW JUST IN SC#1+2+3 }

B) DP IN RS COILS RS# 1 / 2 / 3 / 4 / 5 : 445.177 / 204.684 / 105.527 / 61.039 / 37.693
444.454 / 204.109 / 104.892 / 60.517 / 37.325
TOTAL: 854.121 / 851.297 (USING A 65% Cu + 7% H_2O +288% MgO MIXTURE WITH ~ 7.0 g/cc DENSITY)

C) DP IN SHIELDING SH# 1 / 2 / 3 : 167.45 / (1B) 284.359 / (1I) 613.197 / 250.763 / 37.996
296.62 / (1B) 930.396 / (1I) 0.0 / 251.186 / 38.084
TOTAL : 1,353.770 / 1,516.29 (~ 34 % / 38 % OF 4 MW)

D) DP IN VESSELS SHVS# 1 / 2 / 3 : 23.357 / (1B) 186.711 / (1I) 308.336 / 8.949 / 1.358
80.406 / (1B) 277.153 / (1I) 0.0 / 9.548 / 1.364
TOTAL: 528.711 / 368.17

E) DP IN C TRGT : 112.51 / 112.50 (USING 1.8 g/cc DENSITY FOR BOTH TARGET AND DUMP)
C DUMP : 75.26 / 75.47 (R= 2.4 cm 40.0 < z < 160 cm)

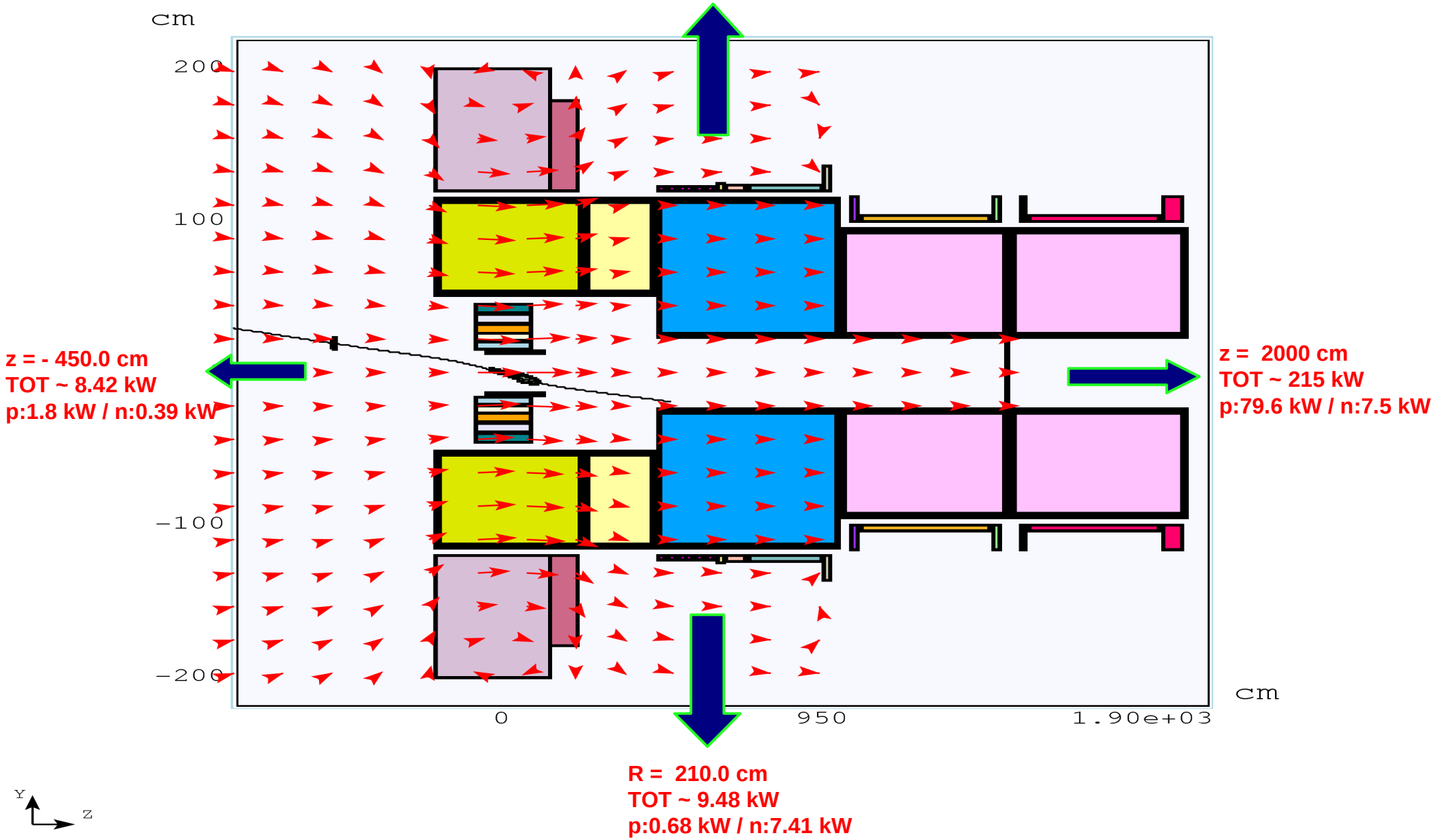
F) DP IN Be WINDOW 1 / 2 / 3 / 4 : 2.582 / 1.479 / 1.399 / 1.162
2.593 / 1.479 / 1.401 / 1.160
TOTAL: 6.622 / 6.633

G) DP IN BP# 1 / 3 : 111.108 / 189.458 TOT: 300.566
111.479 / 189.61 TOT: 301.089

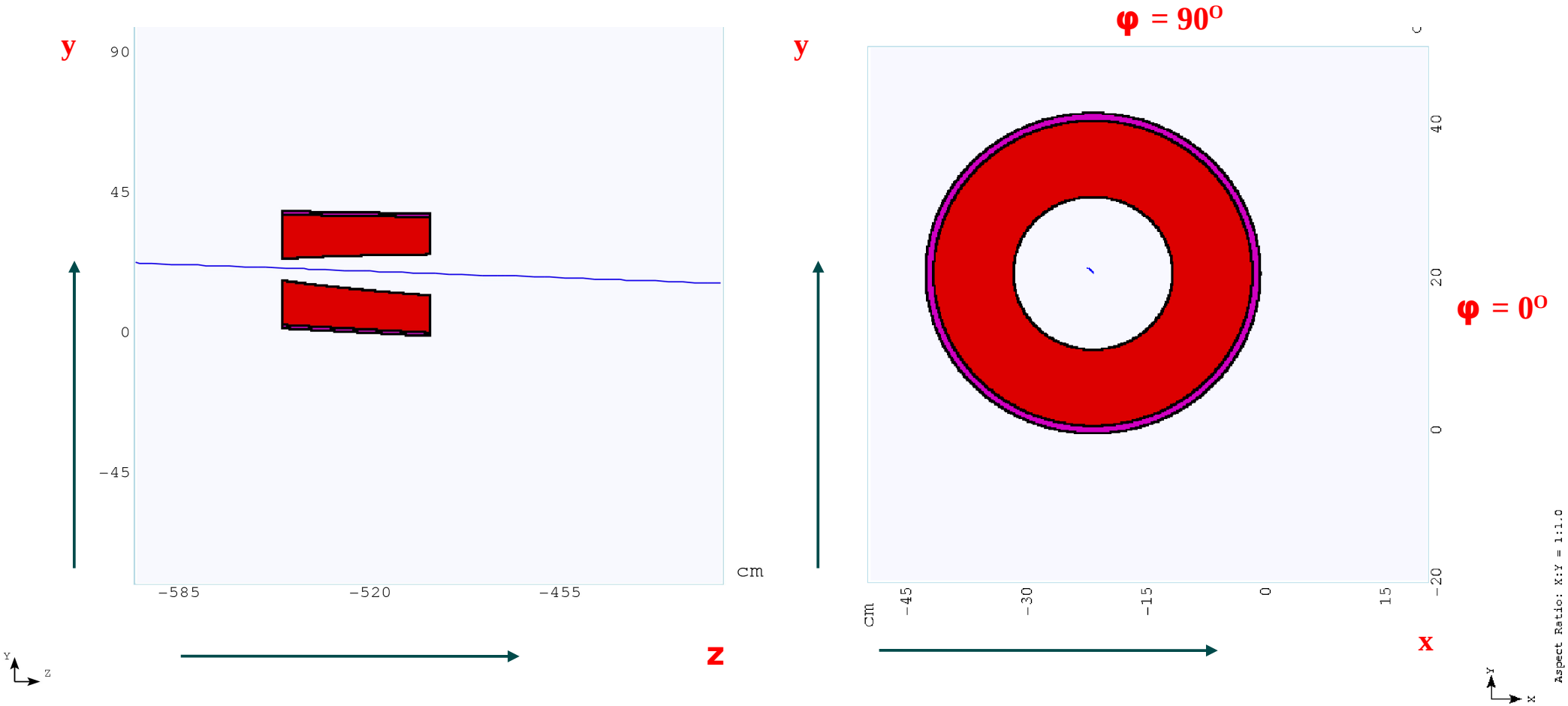
TOTAL DP IN TARGET STATION :3,235.65/ 3,235.64

20to2T5mDL : yz CROSS SECTION (x = 0.0 cm) WITH B FIELD MAP AND CENTROID TRAJECTORY WITHOUT C TARGET / DUMP / BeWind#1 PRESENT . THE BEAM WILL REACH THE CRYO#1 UPSTREAM Be WINDOW (AT z ~ 456 cm) NEAR THE BOTTOM AREA. POWER LEAK FLOW { ENERGY FLOW = KE (p, n)+E($e^{\pm}$, $\pi^{\pm}$, π^{0}, $\mu^{\pm}$, $K^{\pm}$, γ) } .

z = - 450.0 , 2000.0 cm, R = 210.0 cm SURFACE DETECTORS].



QUANTRUPOLE SEGMENTATION DETAILS : yz AT x = - 13 cm [LEFT] AND xy AT z = -540.0 cm [RIGHT] CROSS SECTION.



GEOMETRY SET UP: -550.0 < z < -500 cm, 0 < r < 10 cm ==> AIR, 10 < r < 20 cm ==> Fe, 20 < r < 21 cm ==> Nb3Sn, FOLLOWING THE 6.75 GeV BEAM CENTROID TRAJECTORY SAGGITA IN THAT LOCATION.

SEGMENTATION CONSISTS OF 10 RINGS WITH dr= 1.0 cm AND dz = 5.0 cm (NO TILTED SEGMENTATION WAS USED)

TDP: Fe (1.57 kW), SC (0.399 kW).

AZIMUTHALLY AVERAGE TDPD FIRST RING = 3.52 mW / g AND LAST THREE RINGS (CLOSEST TO THE TARGET) = 7.7, 11.86, 35.38 mW / g