IDS120j WITHOUT RESISTIVE MAGNETS

PION AND MUON STUDIES WITHIN TAPER REGION
(20 cm GAPS BETWEEN CRYOSTATS)

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IDS120j GEOMETRY, NO RESISTIVE COILS: WITH 20 cm GAPS

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PIONS AND MUONS SPREADING WITHIN THE TAPER REGION AND BEYOND.

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>SIMULATIONS CODE: mars1512 (USING MCNP CROSS SECTION LIBRARIES)

>NEUTRON ENERGY CUTOFF: 10^{-11} MeV

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

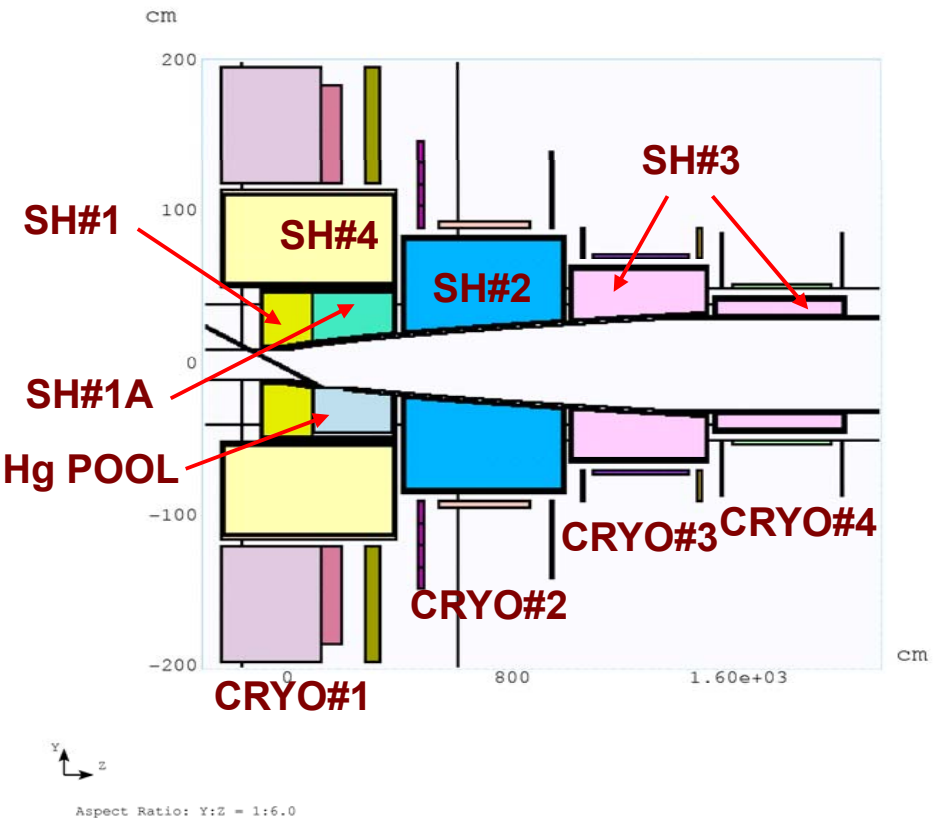
>PROTON BEAM POWER: 4 MW

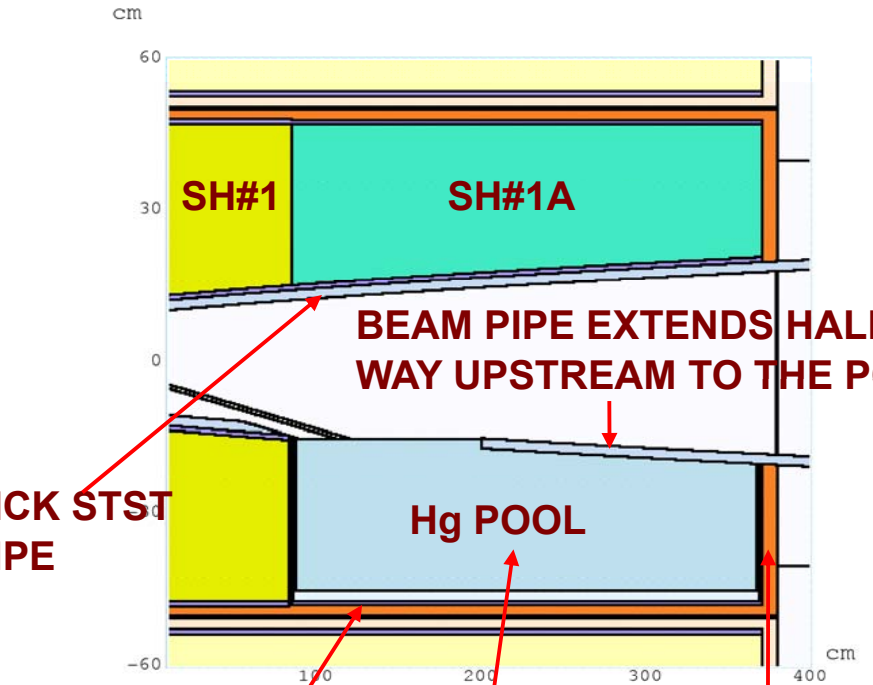
>PROTON ENERGY: E = 8 GeV

>PROTON BEAM PROFILE: GAUSSIAN, $\sigma_x = \sigma_y = 0.12$ cm

>EVENTS IN SIMULATIONS : $N_p = 200{,}000$

IDS120j: REPLACING RESISTIVE MAGNETS AND FILLING UPPER HALF OF Hg POOL WITH SHIELDING. GENERAL OVERVIEW (LEFT), POOL REGION DETAILS (RIGHT). [20 cm GAPS]

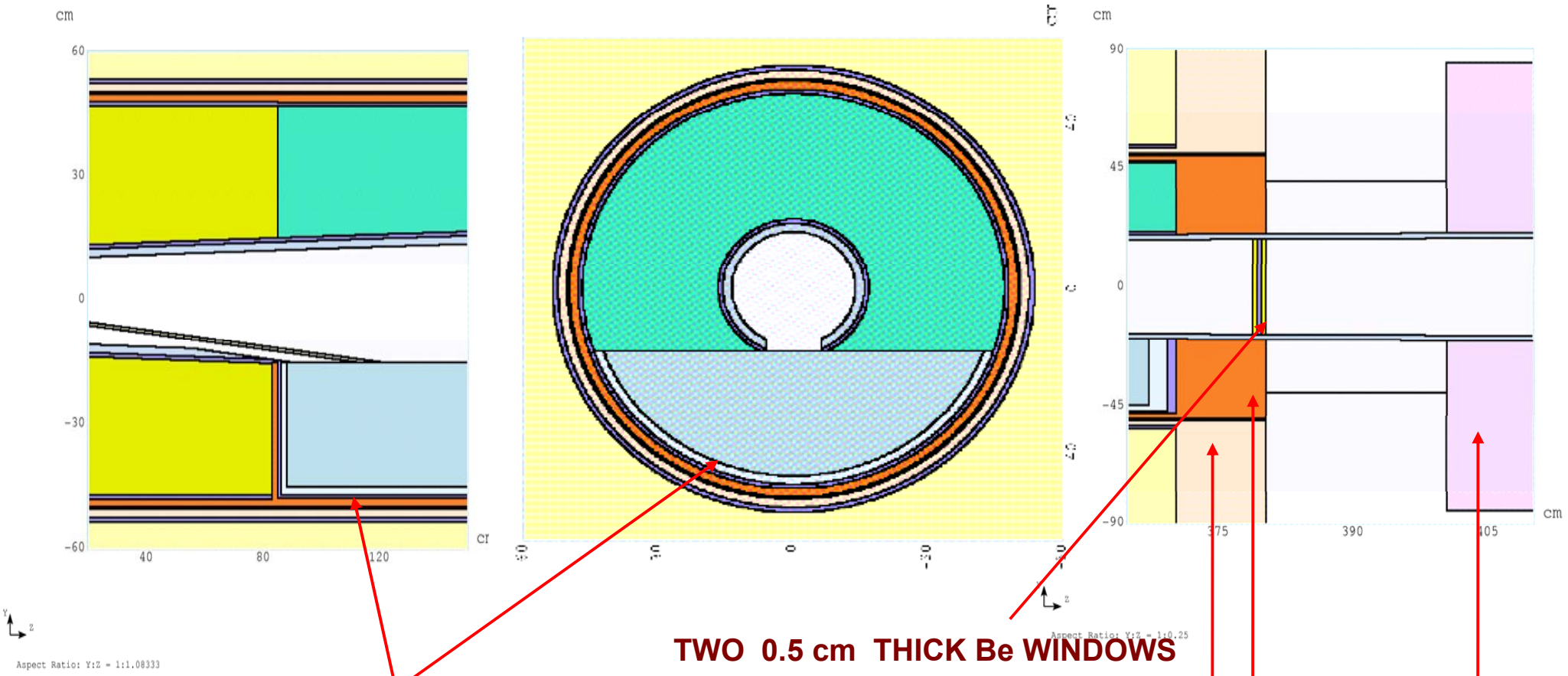




Hg POOL STARTS ~ 85 cm AND EXTENDS ALL THE WAY TO THE END OF THE FIRST CRYOSTAT ~ 370 cm.

SHVS WALLS, Hg POOL VESSEL DOUBLE WALLS, Be WINDOW, He GAP IN Be WINDOW AND IN HG POOL HAVE NOMINAL VALUES FOR THEIR THIKNESS. STRESS FORCES ANALYSIS AND LOCAL DPD DISTRIBUTION WILL BE USED TO DETERMINE THEIR VALUES.

IDS120j: WITHOUT RESISTIVE MAGNETS. DETAILS OF THE DOUBLE STST Hg POOL VESSEL (LEFT, MIDDLE) AND THE DOUBLE Be WINDOW (RIGHT). [20 cm GAPS]

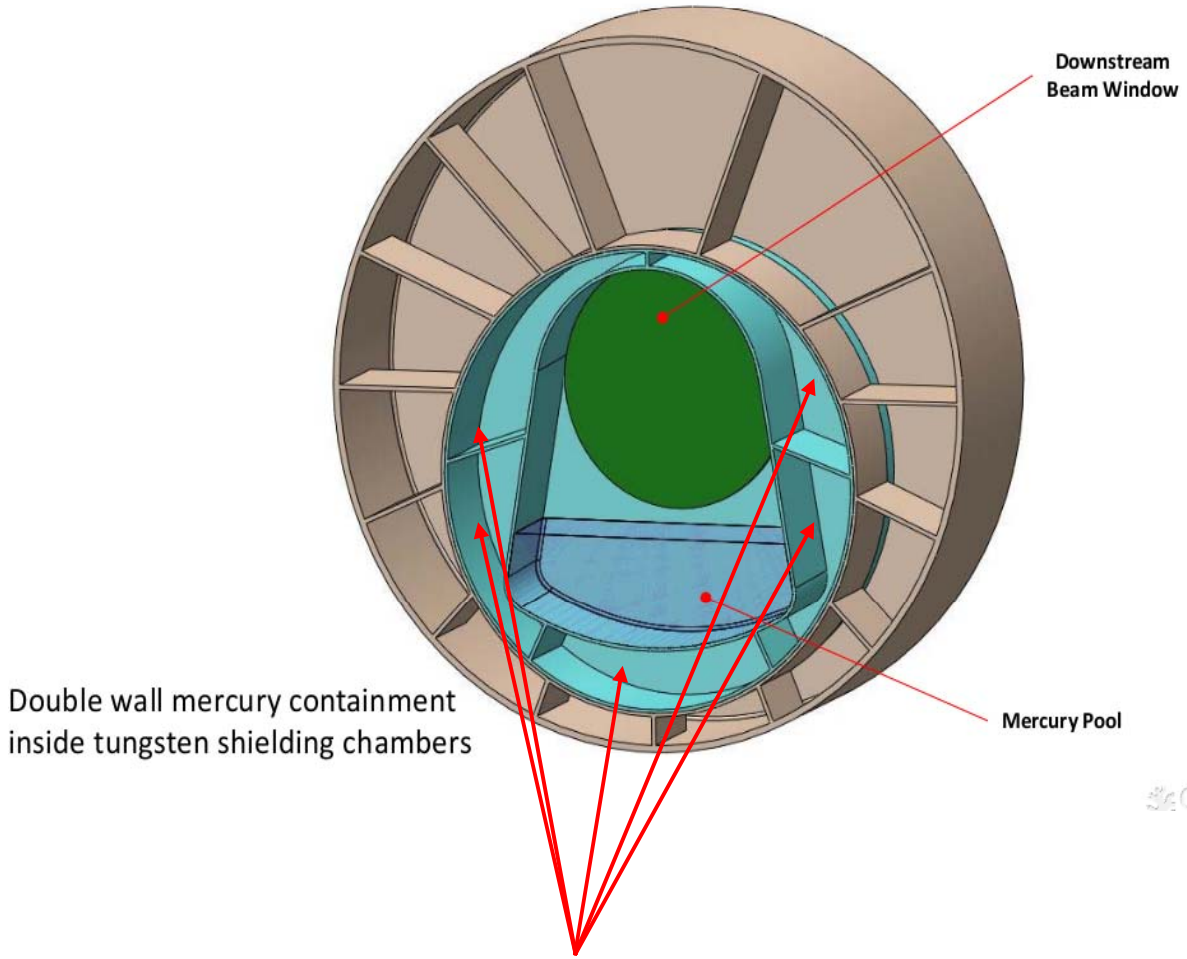


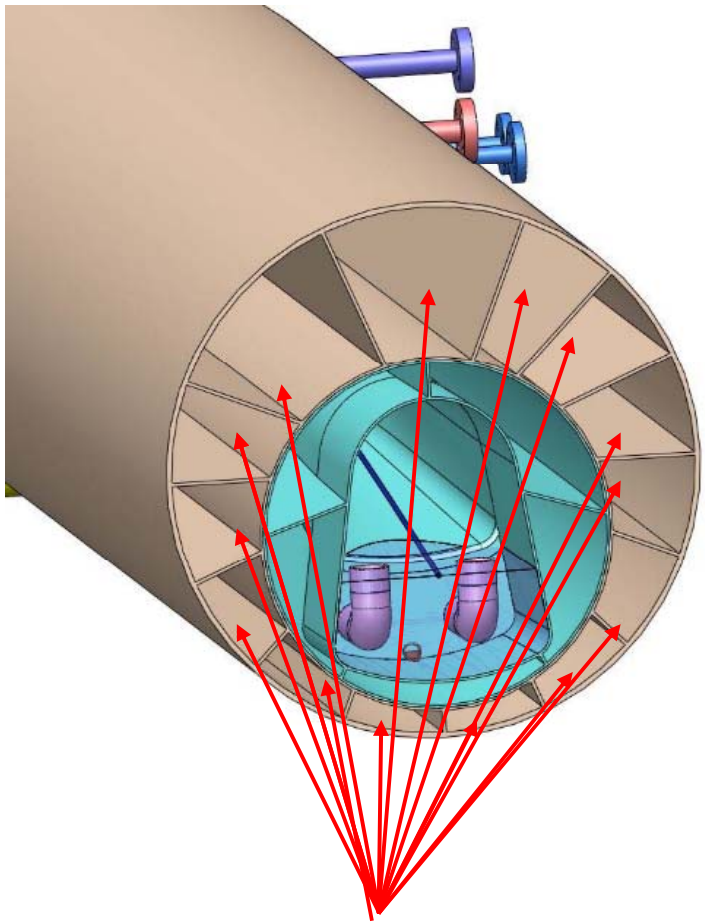
2 cm THICK STST INNER Hg POOL VESSEL WITH 1 cm He GAP FOR COOLING.

TWO 0.5 cm THICK Be WINDOWS AT THE END OF CRYO#1 WITH 0.5 cm He GAP BETWEEN THEM FOR COOLING.

10 cm THICK STST RIGHT / LEFT FLANGE OF SHVS#4, SHVS#1 / SHVS#2 WITH 20 cm GAP BETWEEN THEM.

IDS120j: DETAILS OF THE DOUBLE WALL Hg POOL VESSEL ENVISIONED BY VAN GRAVE. (PLOTS ARE FROM VAN GRAVE'S 6/12/2012 PRESENTATION)

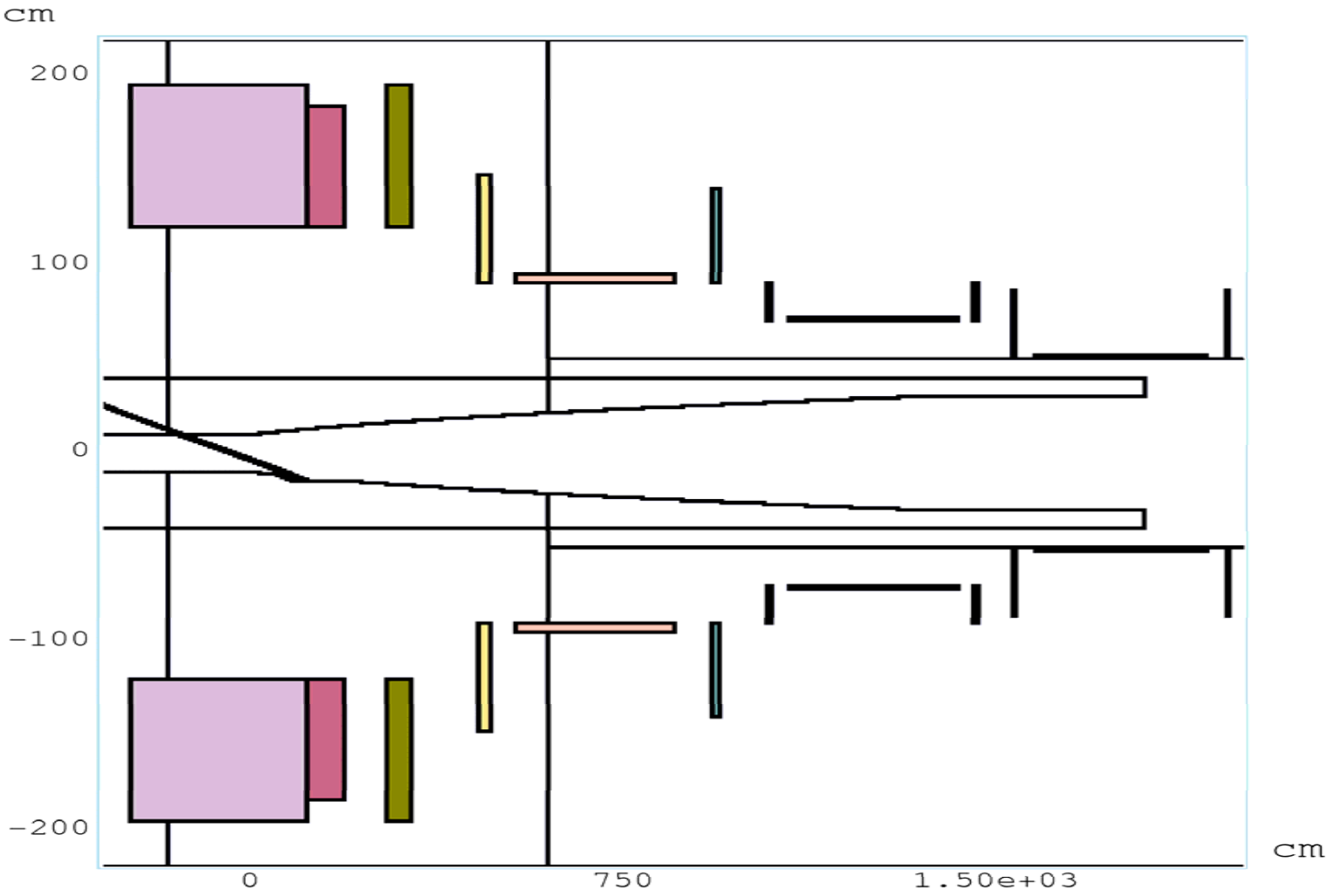




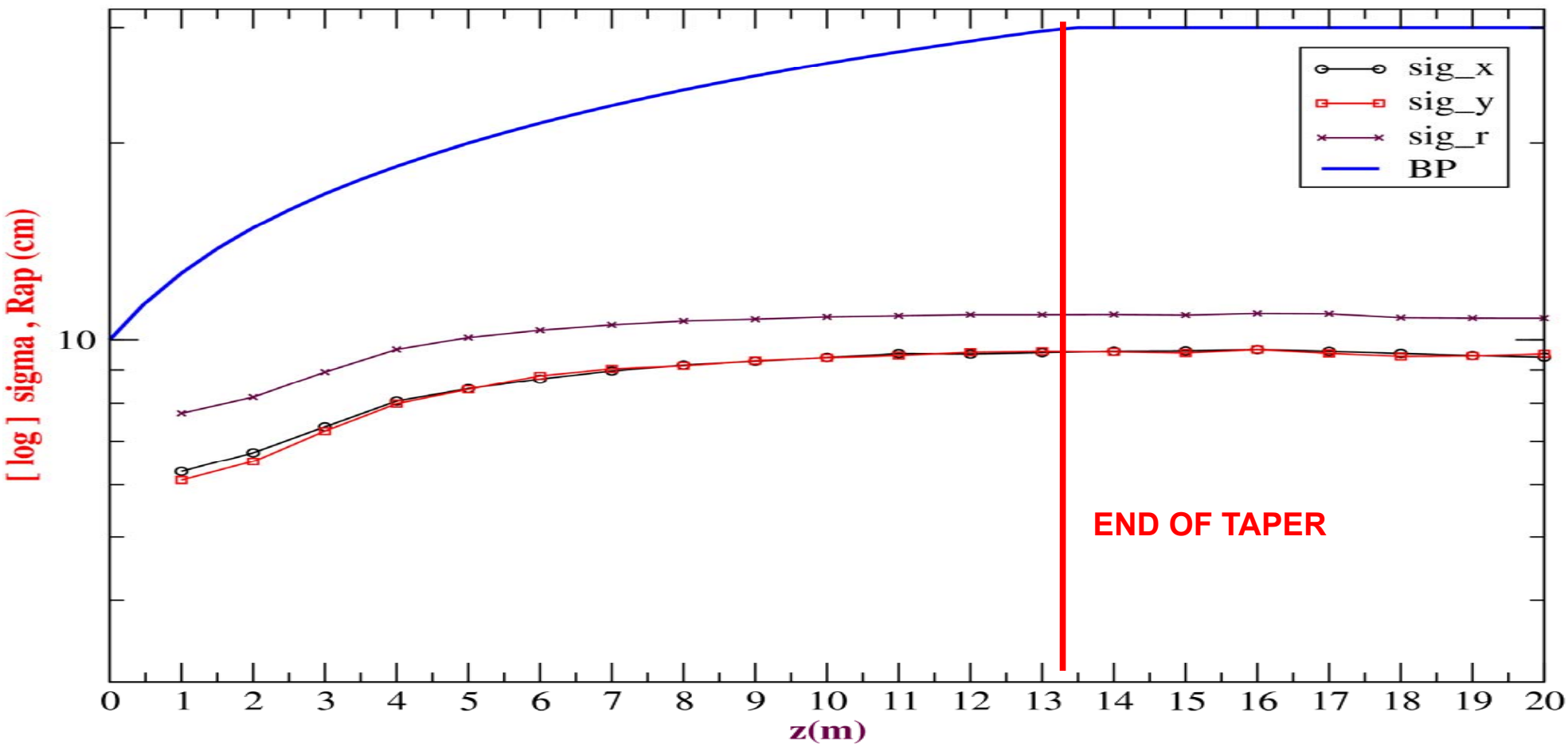
He GAS WILL BE FLOWING BETWEEN THE TWO WALLS FOR COOLING. THE BEAM PIPE IN THAT AREA WILL BE PART OF THE POOL VESSEL SHIELDING. REMOVING THE HEAT LOAD WILL BE A CHALLENGING TASK. SEGMENTATION ANALYSIS WILL BE PERFORMED TO DETERMINE THE AZIMUTHAL DPD DISTRIBUTION.

VESSEL FILLED WITH He CO W BEADS FOR SCs

IDS120j: **FOR THE PION AND MUON DISTRIBUTION STUDIES WITHIN THE TAPER REGION ONLY THE SCs ARE PRESENT IN MARS SIMULATIONS.**

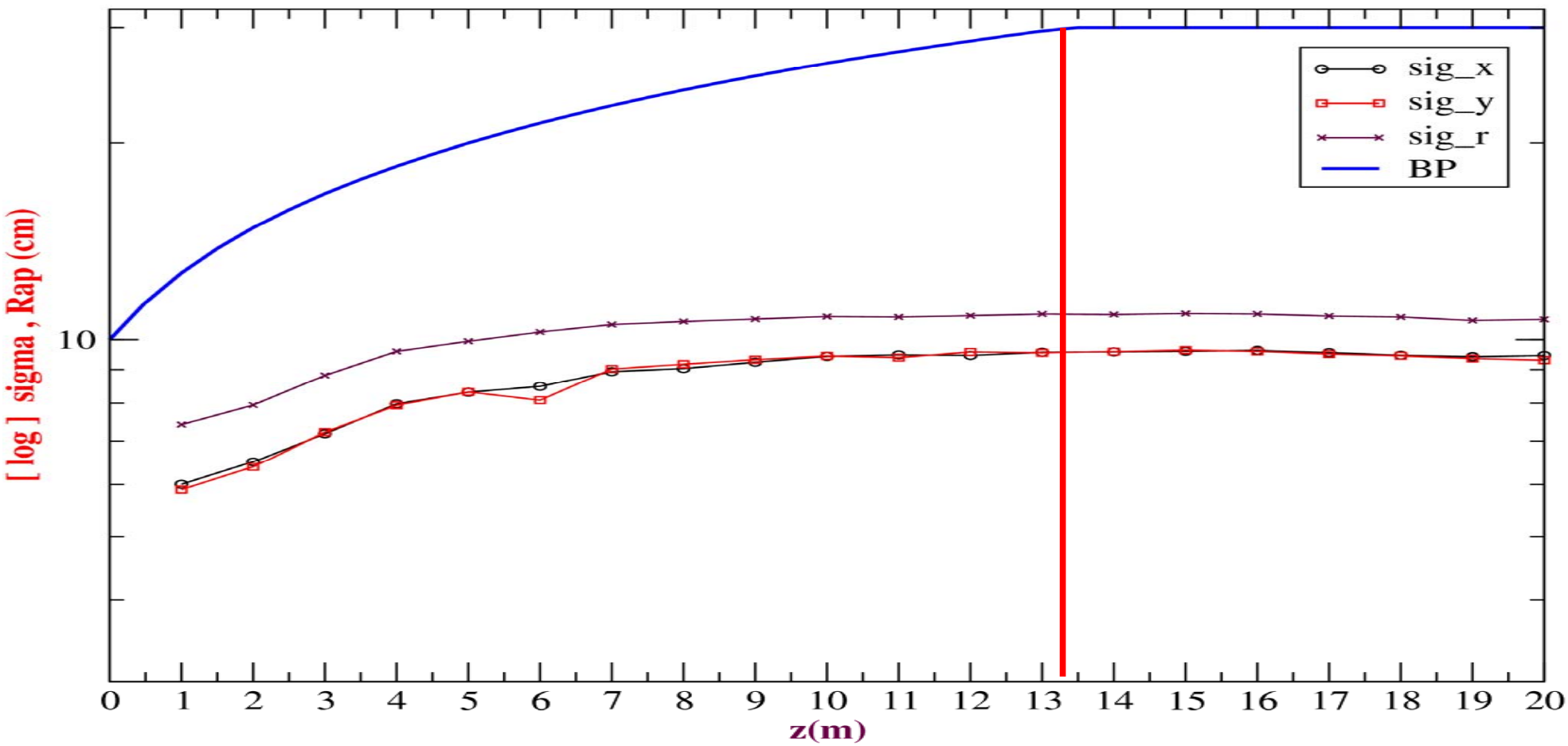


POSITIVE PIONS x, y AND r DEVIATIONS AS FUNCTIONS OF AXIAL DISTANCE.



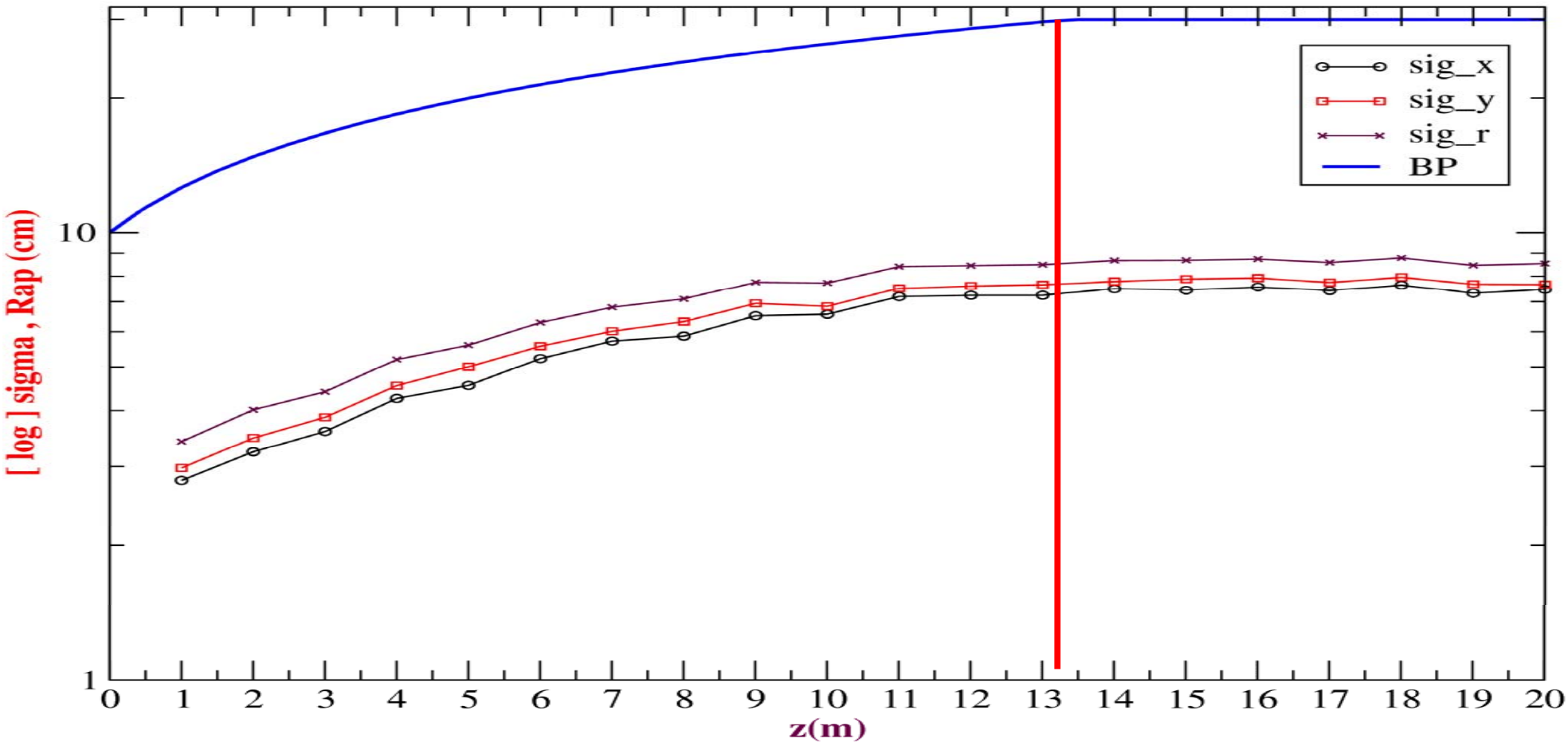
x AND y SPREADING HAVE ONLY A SMALL DIFERENCE. FROM THE RADIAL SPREADING WITHIN THE FIRST 10 m OR SO IT APPEARS A PORTION OF THE PARTICLES COULD BE LOST IN THE BEAM PIPE AND SHIELDING MATERIAL. THE RADIAL SPREADING HAS REACH ITS LIMIT VALUE OF ~ 11 cm AT z ~ 10 cm. [GAUSSIAN DISTRIBUTION ?]

NEGATIVE PIONS x, y AND r DEVIATIONS AS FUNCTIONS OF AXIAL DISTANCE.



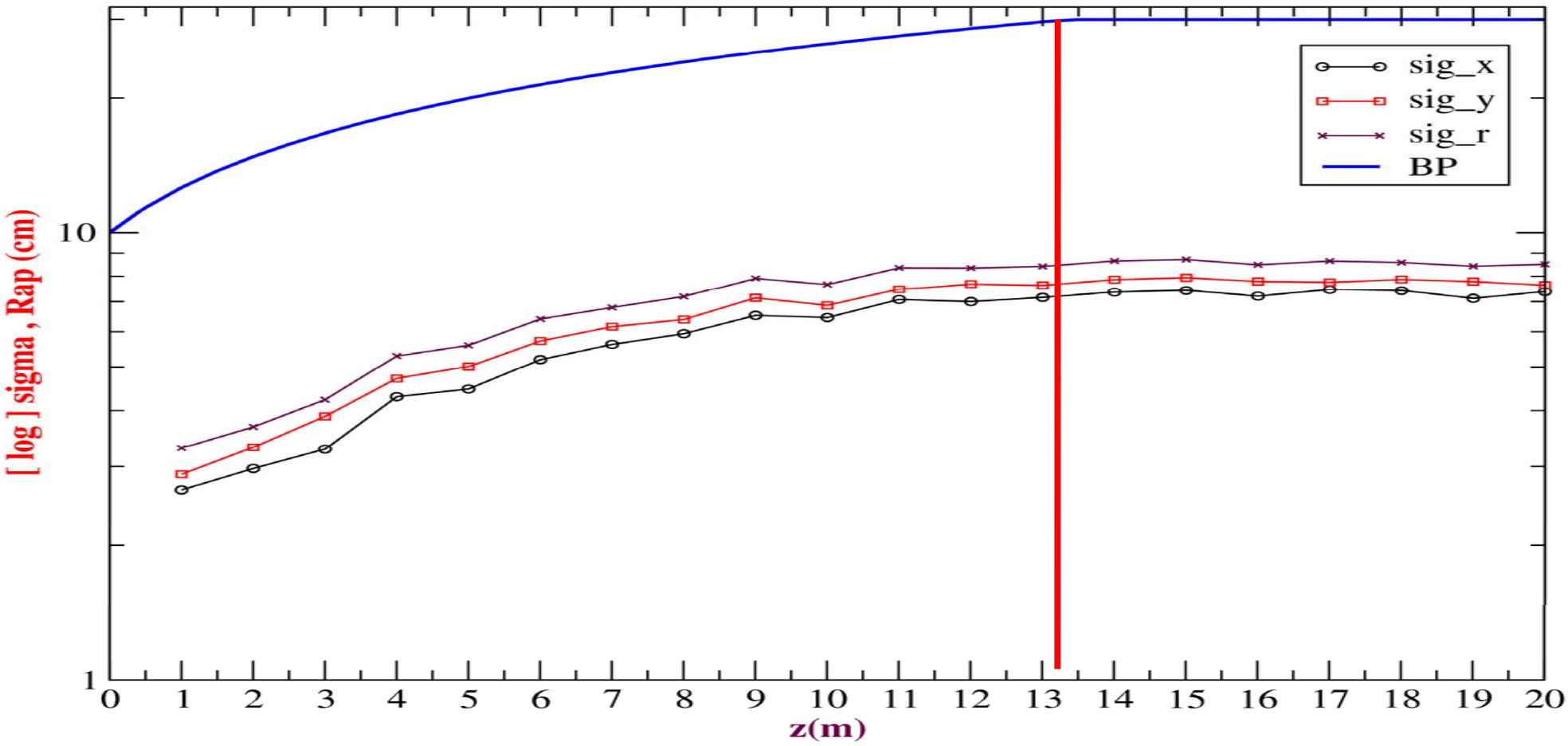
SAME CONCLUSIONS CAN BE DRAWN FROM ABOVE PLOT FOR NEGATIVE PIONS TOO.

POSITIVE MUONS x, y AND r DEVIATIONS AS FUNCTIONS OF AXIAL DISTANCE.



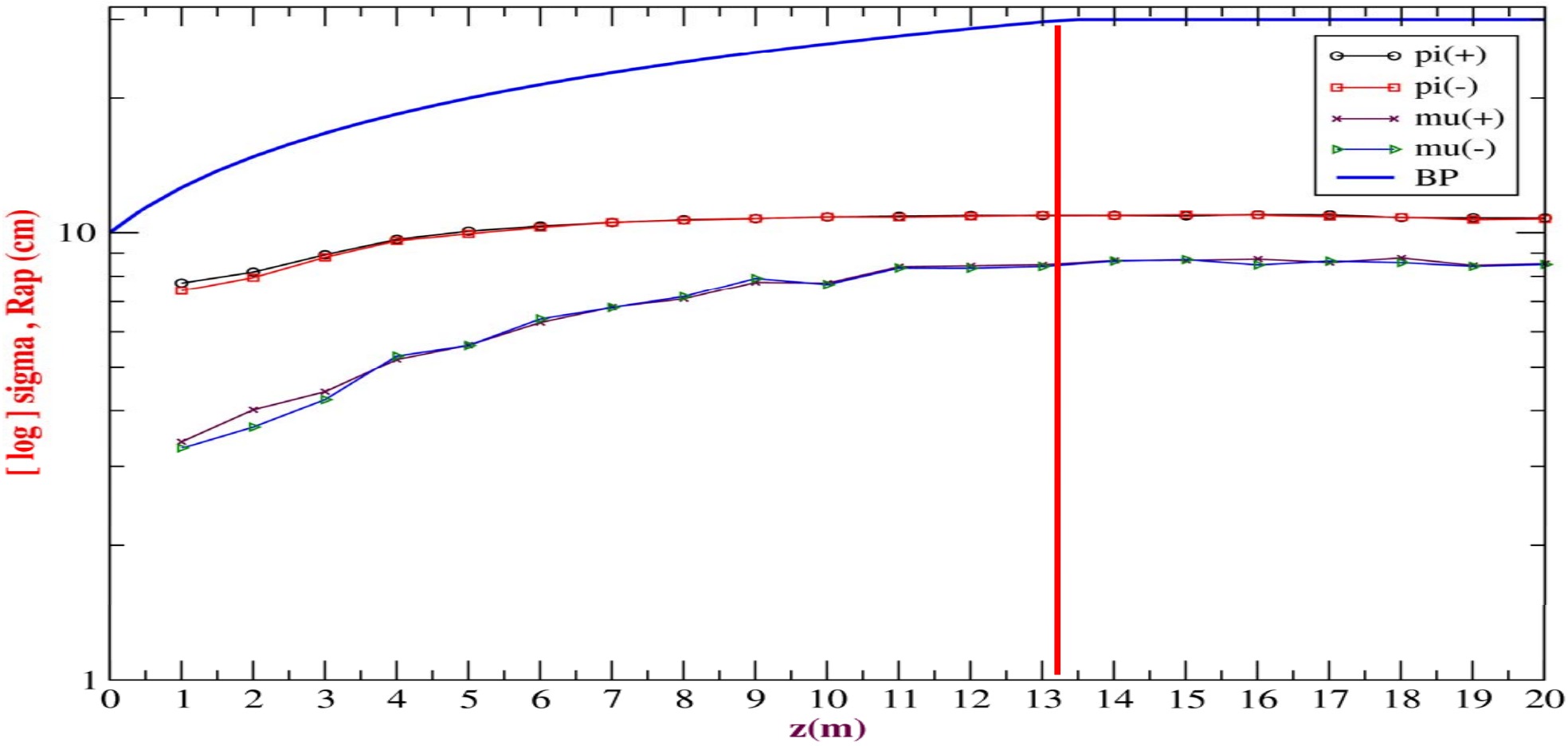
x AND y SPREADING IS MORE ASYMETRIC THAN THAT OF PIONS . RADIAL SPREADING LIMIT IS ~ 9 cm AND THERE IS A COUPLE OF METERS REGION (7-9 m) WHERE A RELATIVELY SIGNIFICANT NUMBER OF MUONS COULD BE LOST IN THE SHIELDING.

NEGATIVE MUONS x, y AND r DEVIATIONS AS FUNCTIONS OF AXIAL DISTANCE.



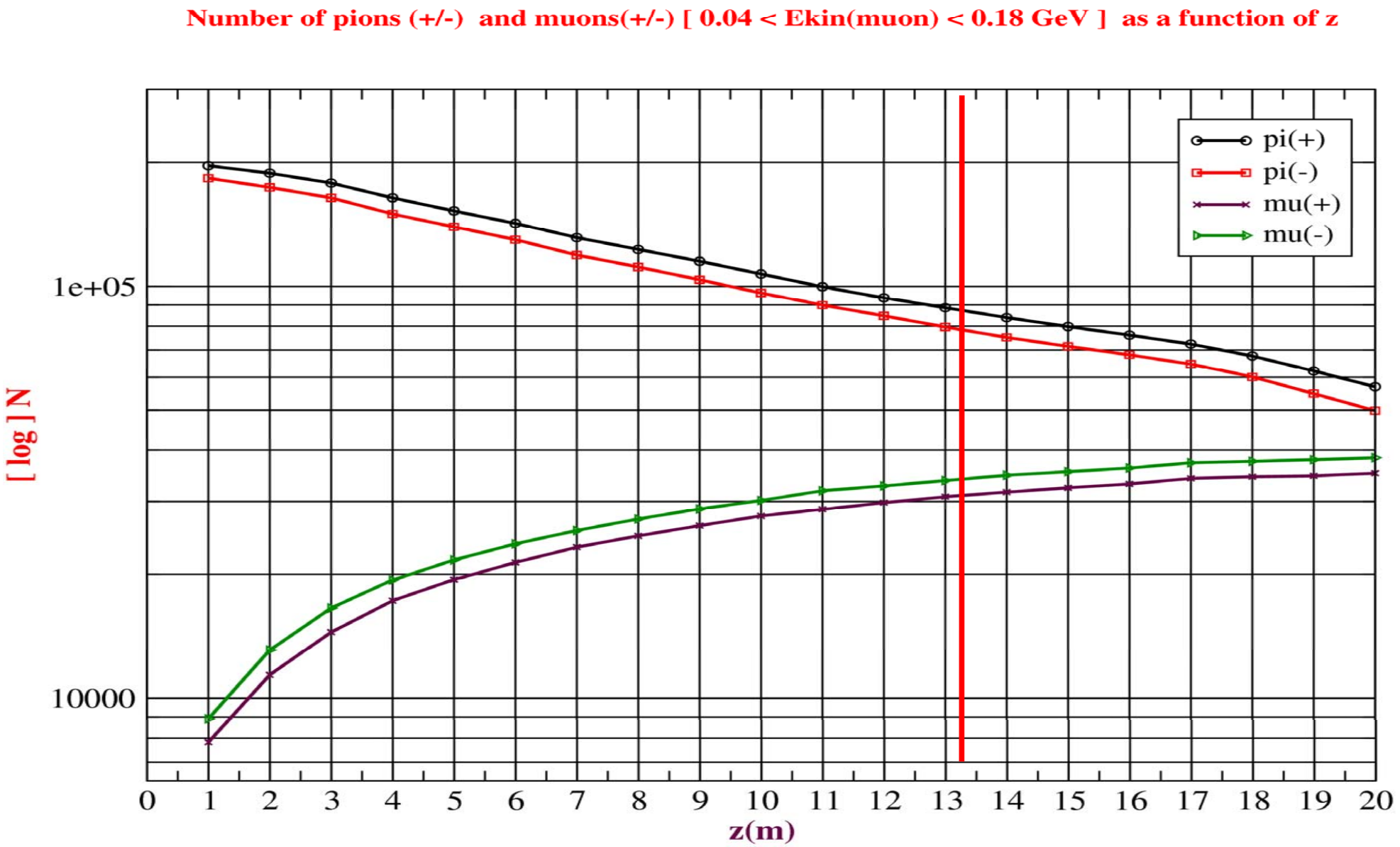
SAME OBSERVATIONS FOR NEGATIVE MUONS.

PIONS AND MUONS RADIAL SPREADING COMPARISON.



MUONS RADIAL SPREADING HAS A FASTER INCREASE WITHIN FIRST FEW METERS SINCE MORE AND MORE PIONS DECAY TO MUONS INCREASING THEIR NUMBER AND THEIR SPREADING.

NUMBER OF PIONS AND MUONS AS FUNCTIONS OF AXIAL DISTANCE.



AT THE END OF THE TAPER: MUONS YIELD FROM 2 x 10^4 EVENTS SIMULATION ~ 6.5 x 10^4