

Magnetic Sector Bend Results

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TRIUMF

Configuration 1

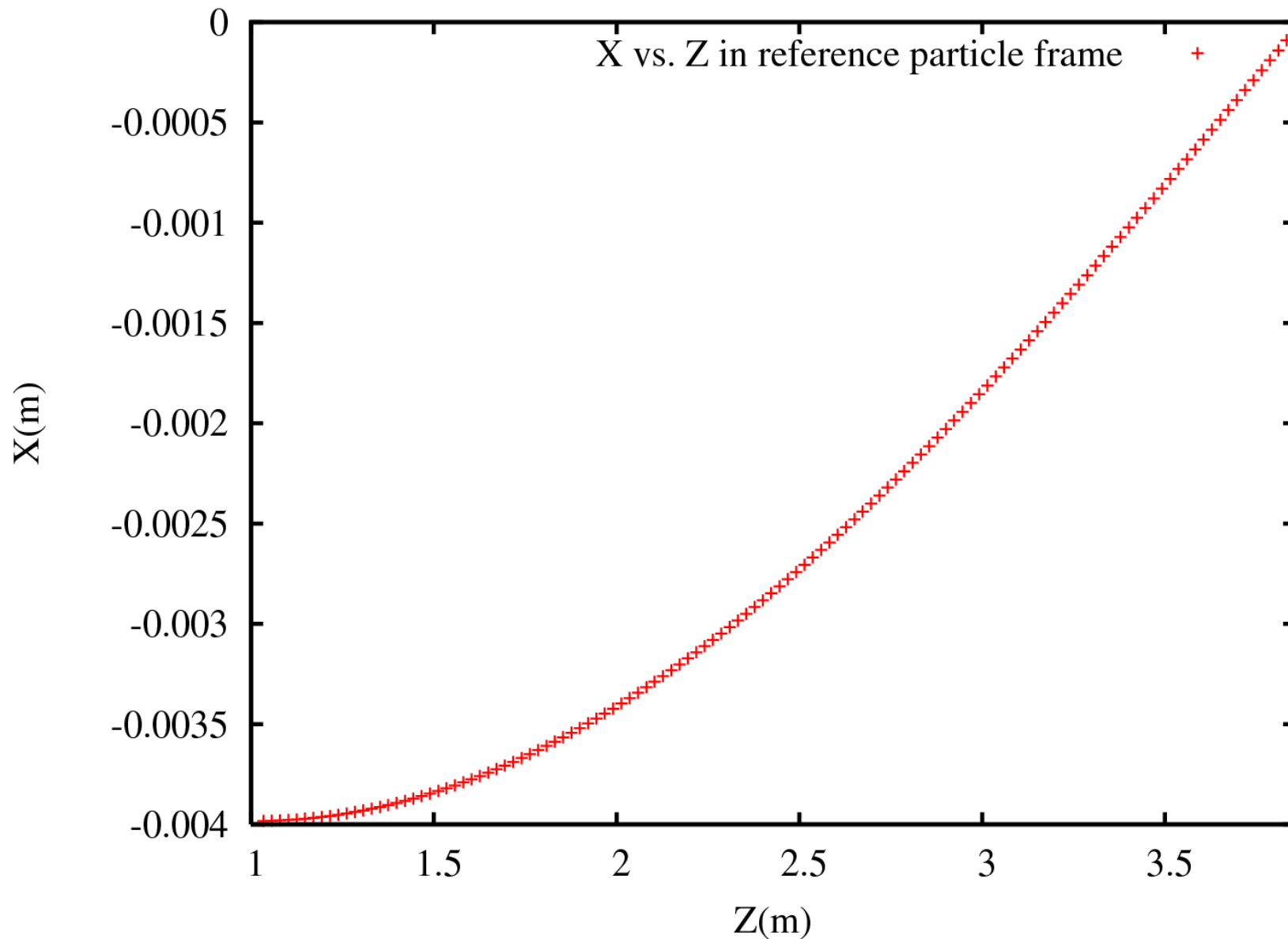
- Using a 90 degree magnetic sector bend towards negative X, particle is a proton
- **Fringe field is off**, by setting the 1st order Enge coefficient to be 1e10

- Input line:

```
AND1:SBEND, L=2.855796, ELEMEDGE=1.0, ALPHA=0.0, K0=2.0,  
FMAPFN='FAND1.T7', DESIGNENERGY=500.0, EXITANGLE=0.0;
```

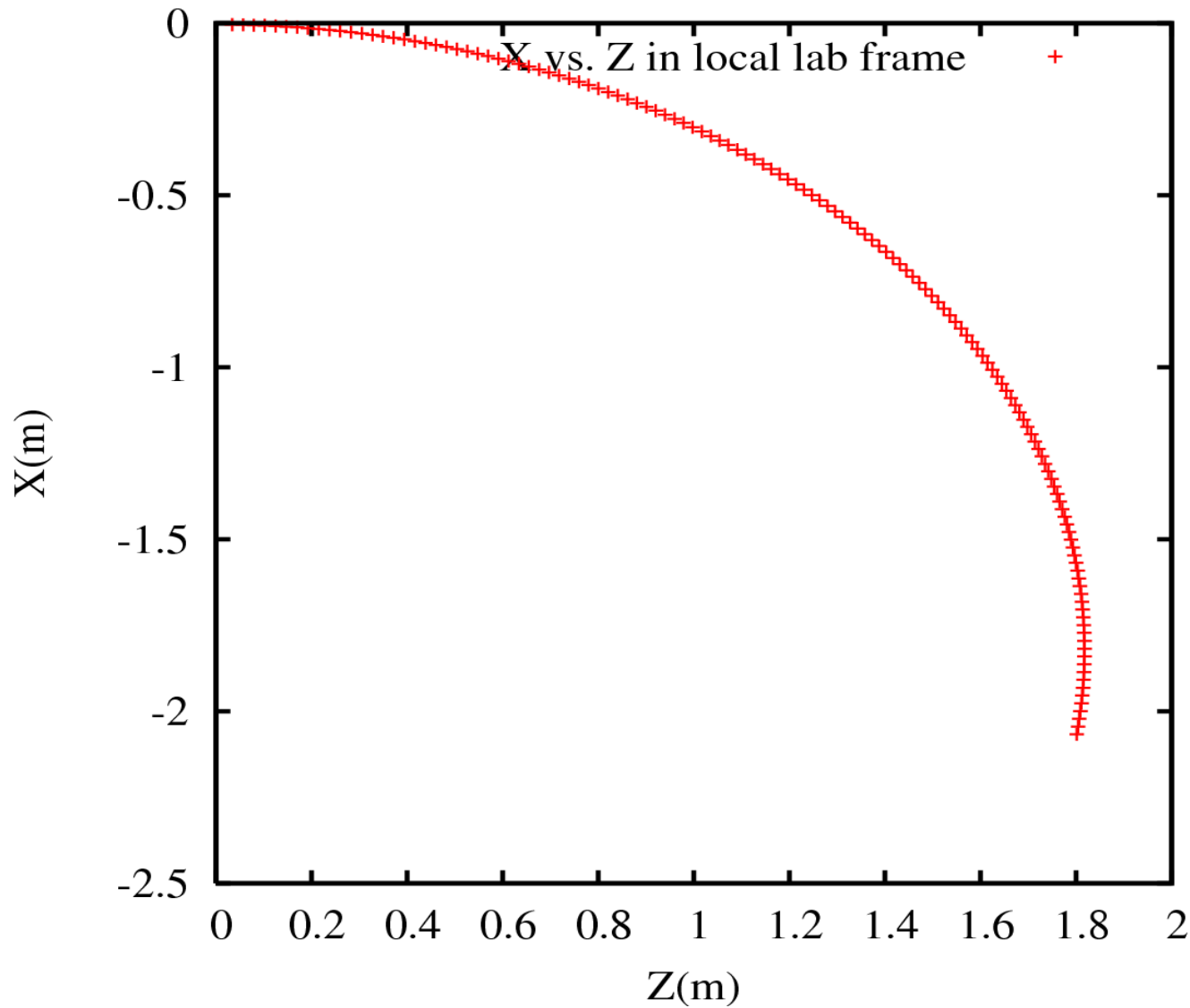
- Our bender starts at 1.0m along the track, and has an arc length of 2.855796m

Single Particle Tracking in X



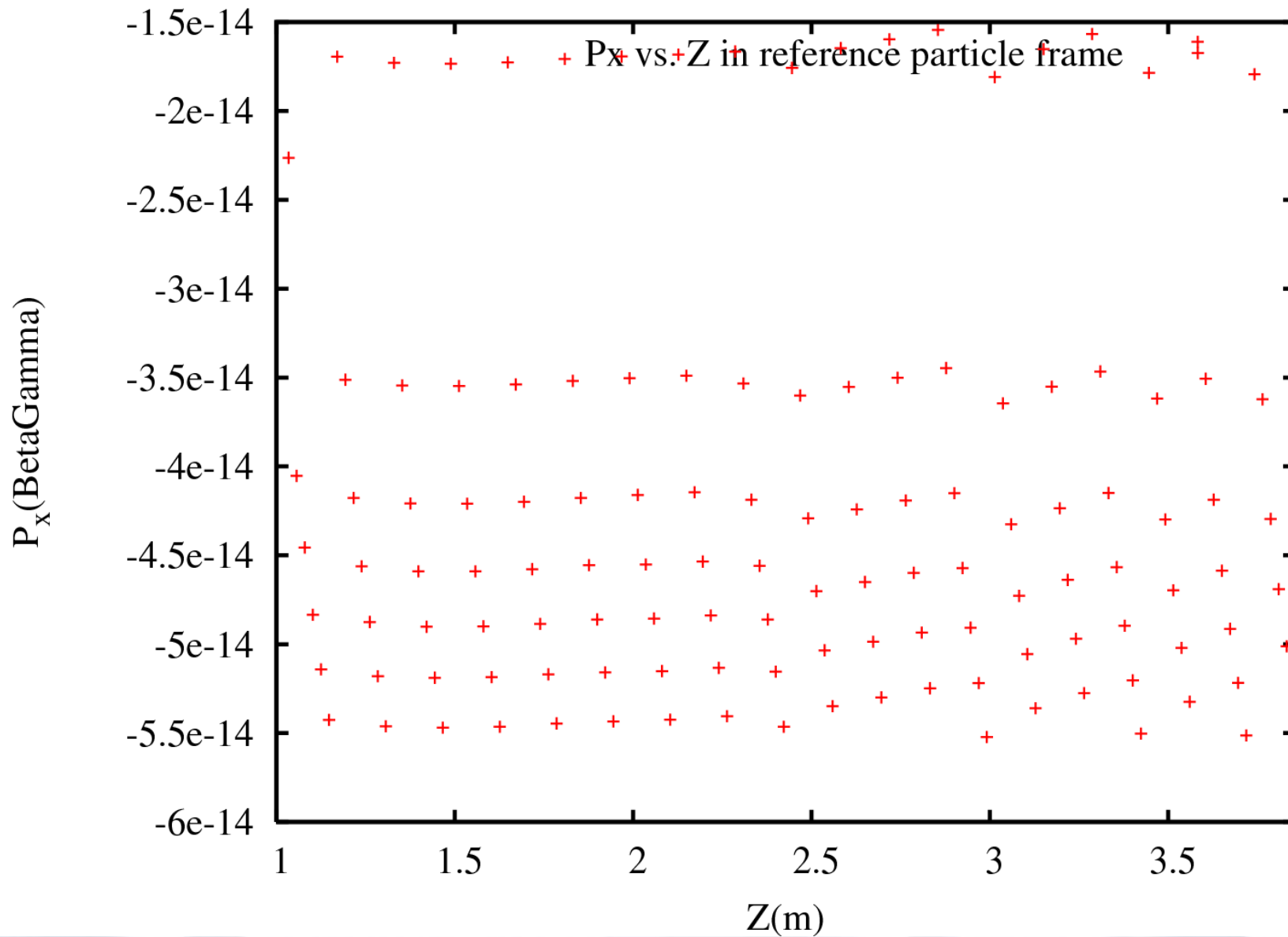
- X vs. Z in the local reference frame, where Z is always in the direction of the reference particle
- The plot describes a single off-axis particle as it travels through the SBEND
- As expected, it's X value reaches 0 at the end of the element
- In OPAL, this information (x,y,z) is captured in the vector called R

Single Particle Tracking in X



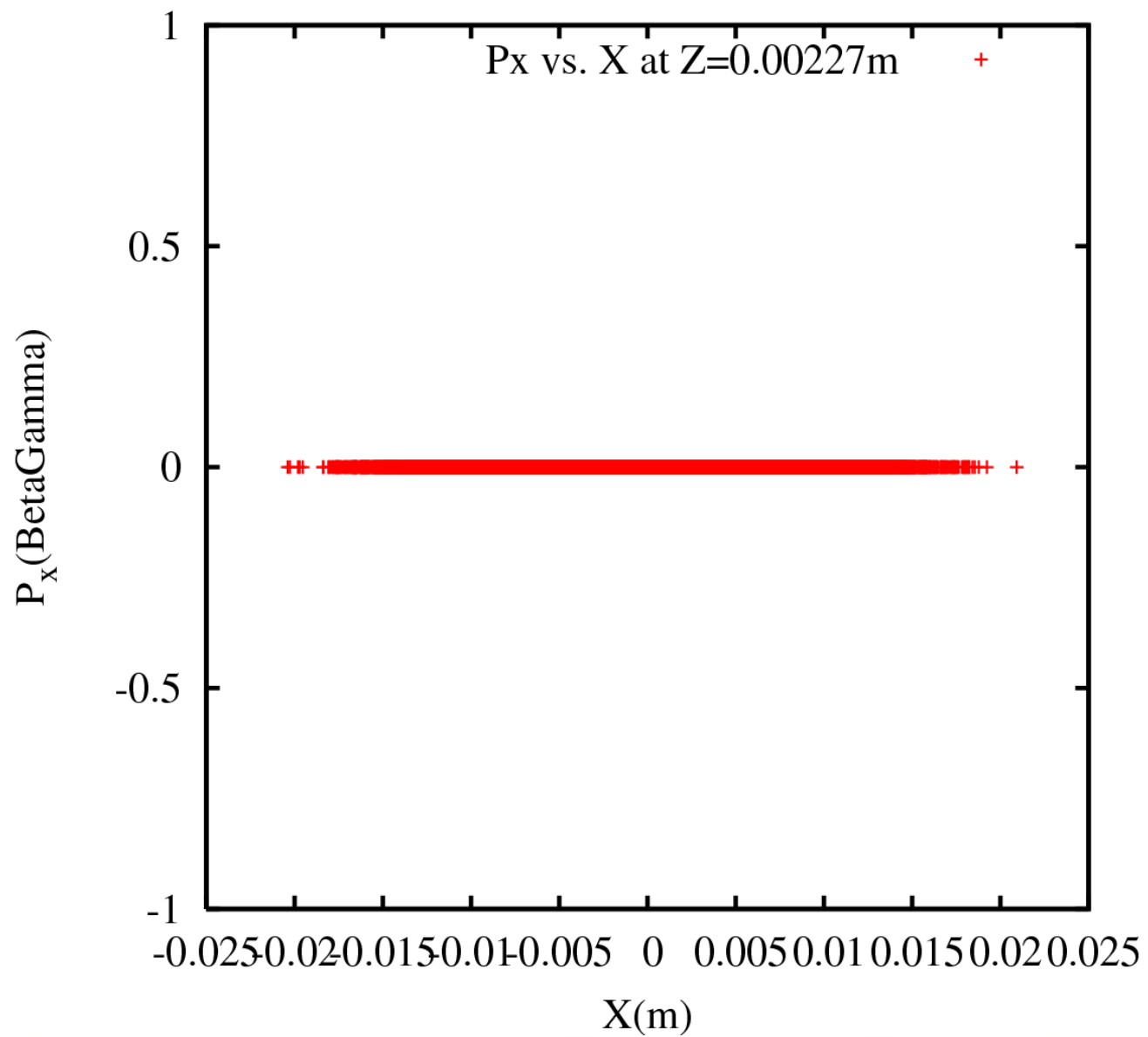
- X vs. Z in the local lab frame, relative to the current element (SBEND)
- This plot is of the same particle going through the SBEND, but in a different frame
- Notice that Z is relative to the Element Edge, so it starts at 0
- The plot actually extends outside the SBEND's exit, that might explain the extra curve at the end
- In OPAL, this information (x,y,z) is captured in the vector called X

Single Particle Tracking in Px

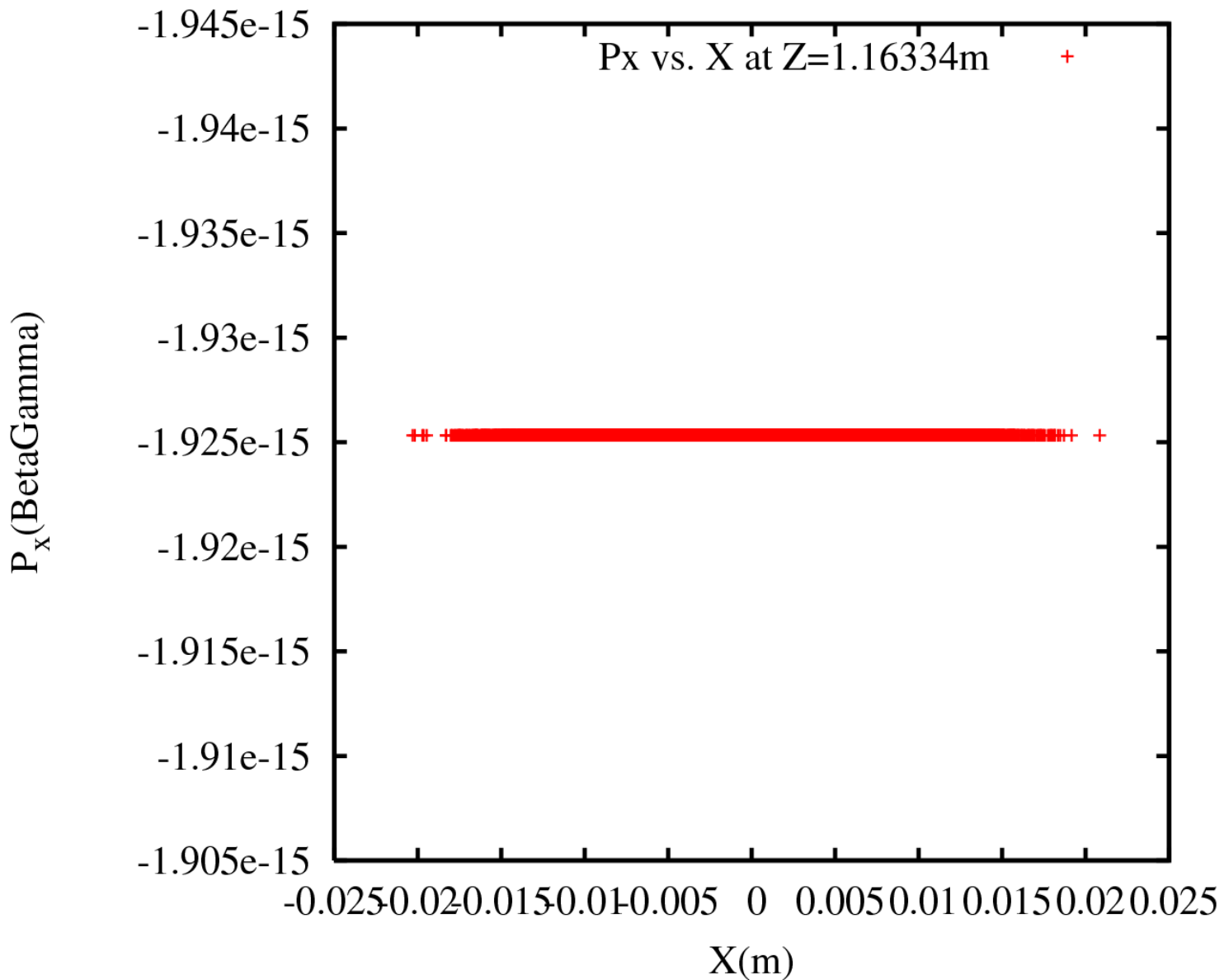


- P_x vs. Z in reference particle frame
- Plot of the same particle's momentum in X as it travels through the SBEND
- Appears to be noise, as the values are actually very small
- Following phase plots should see P_x close to 0 along the track

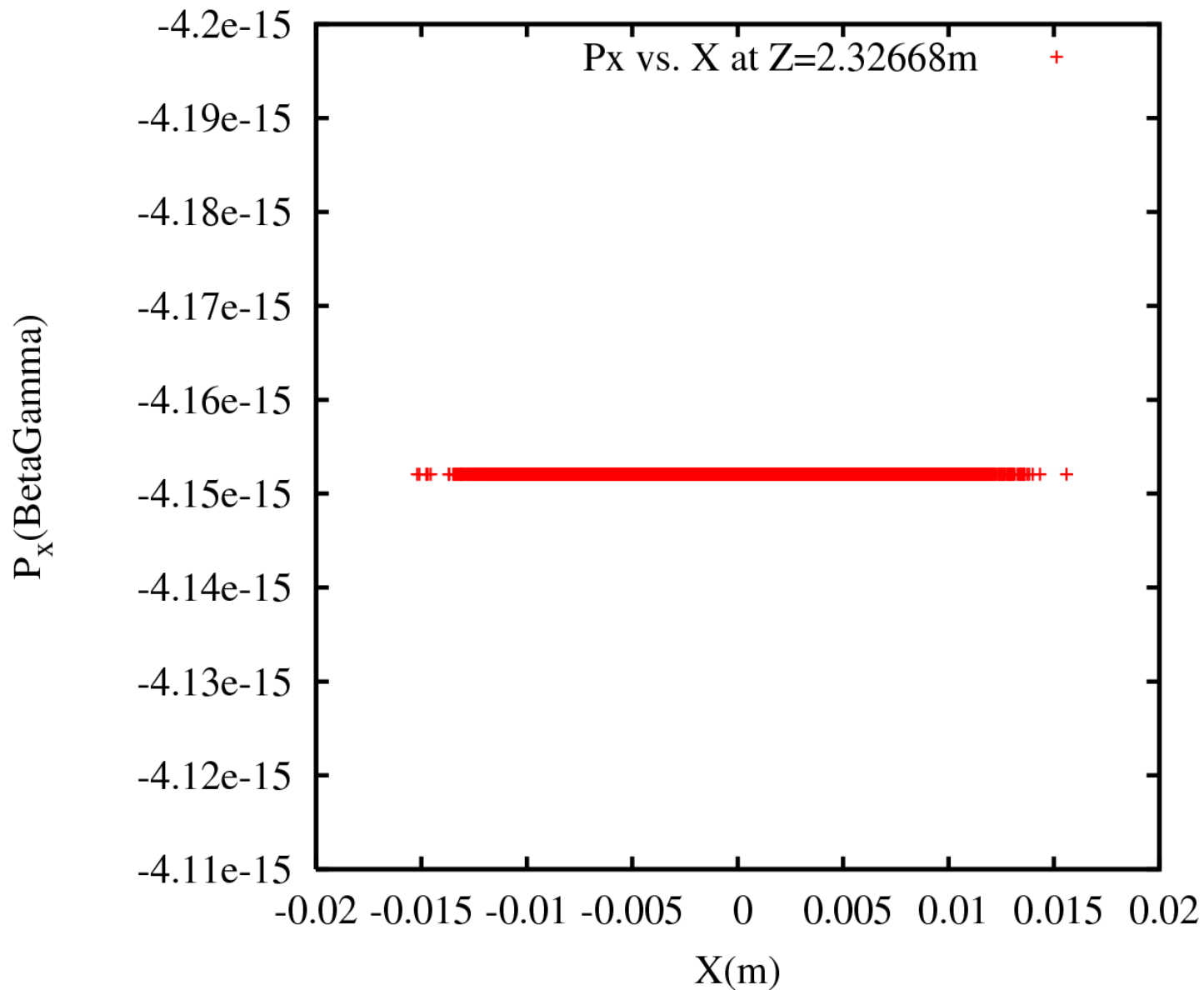
Phase Plot – Initial



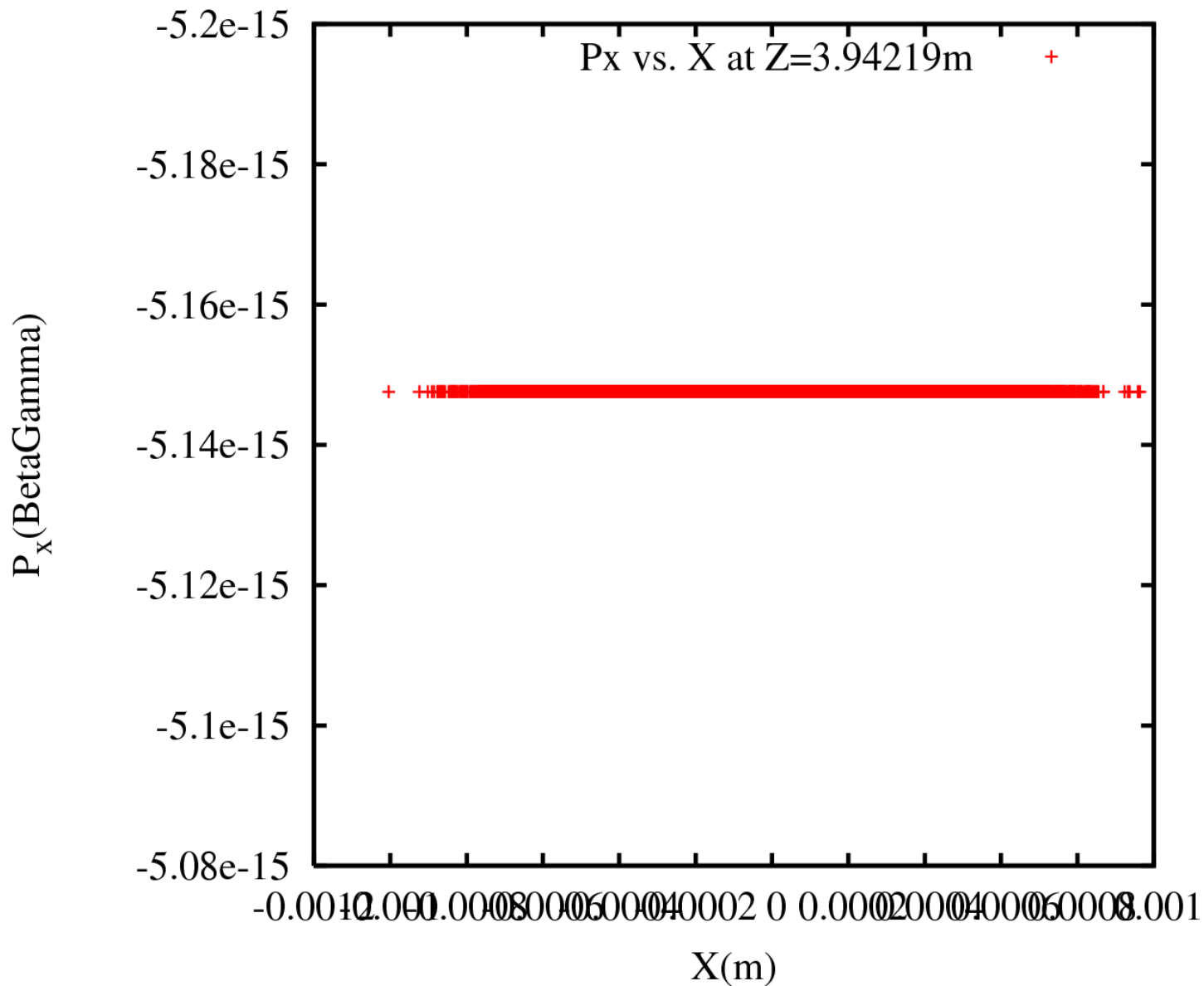
Phase Plot – Start of Bend



Phase Plot – Middle of Bend



Phase Plot – After Bend



- Notice the change in scaling of X axis
- The distribution of P_x stays 0 throughout, while X gets squished in

Configuration 2

- Using the same setting as Configuration 1, but this time **Fringe Field is On**

-0.0170

1.8055

-0.2819

0.5680

0.3817

0.0966 // Enge coefficients for Entrance Fringe, E0 to E5

-0.0170

1.8055

-0.2819

0.5680

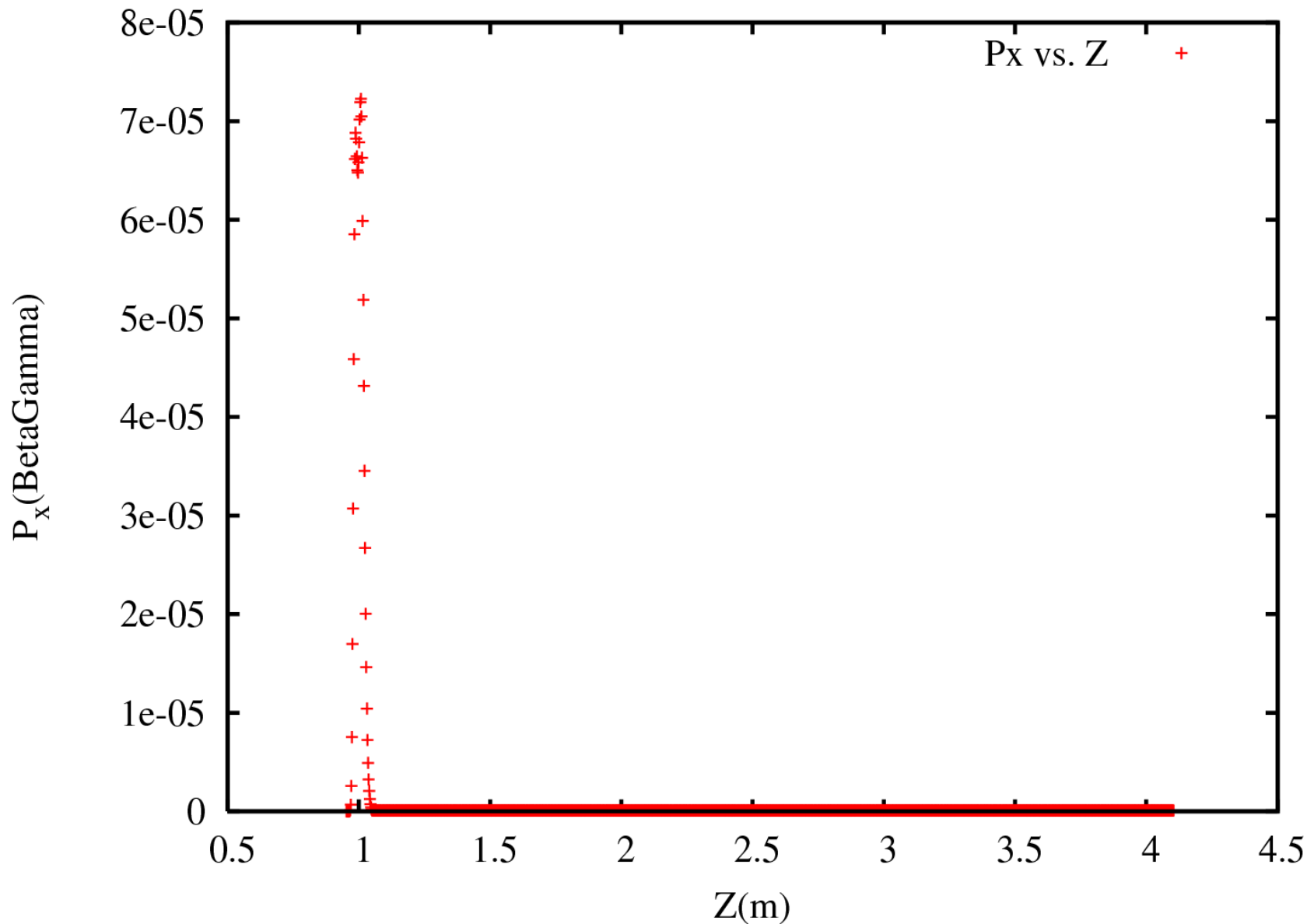
0.3817

0.0966 // Enge coefficients for Exit Fringe, E0 to E5

Single Particle Tracking Results

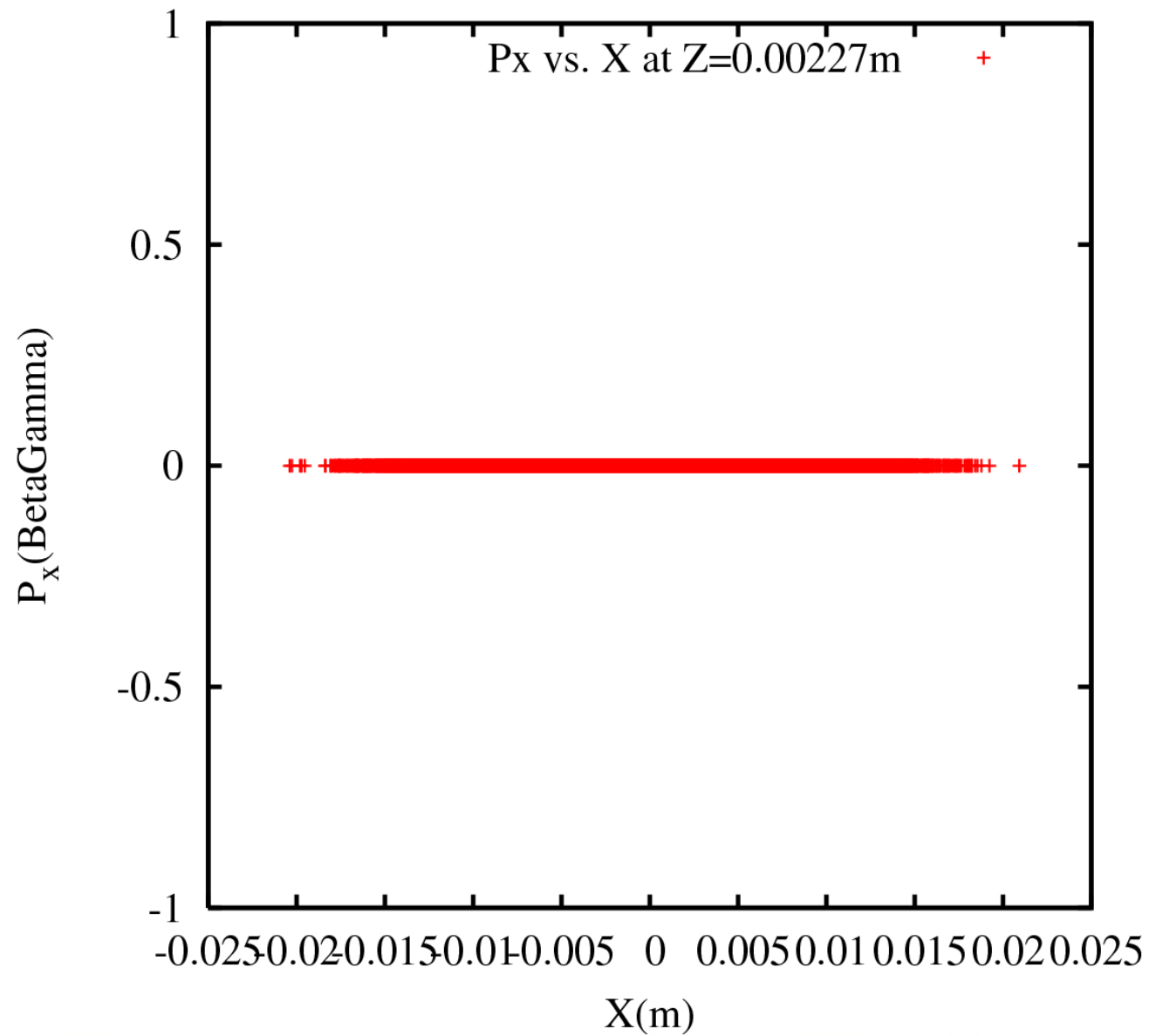
- X vs. Z in reference frame looks identical
- X vs. Z in local lab frame looks identical
- P_x vs. Z is different
- Phase Plots are very different

Single Particle Tracking in Px

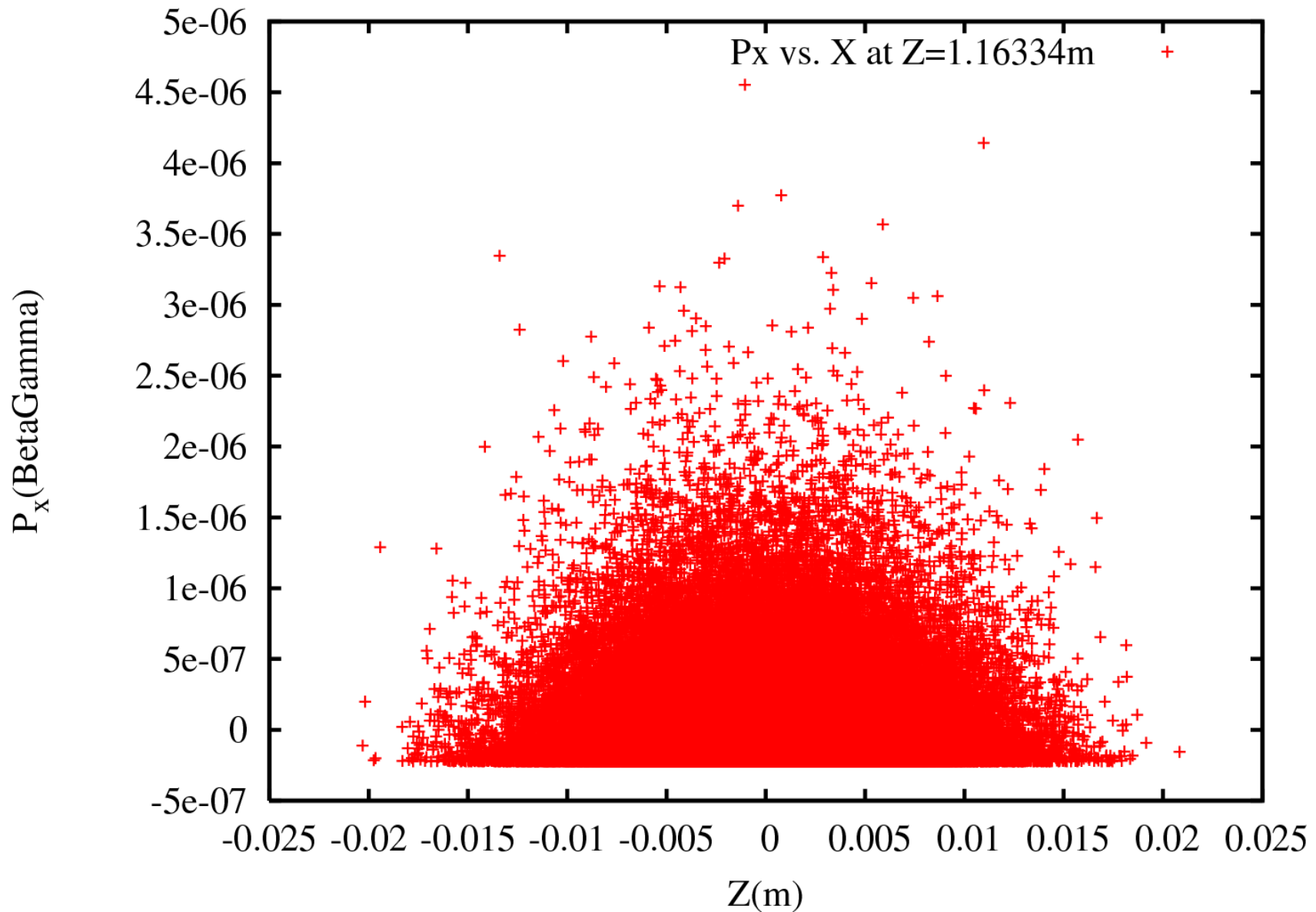


- Observable effect on P_x by the entrance fringe
- Nothing from the exit fringe (error in the input file?)

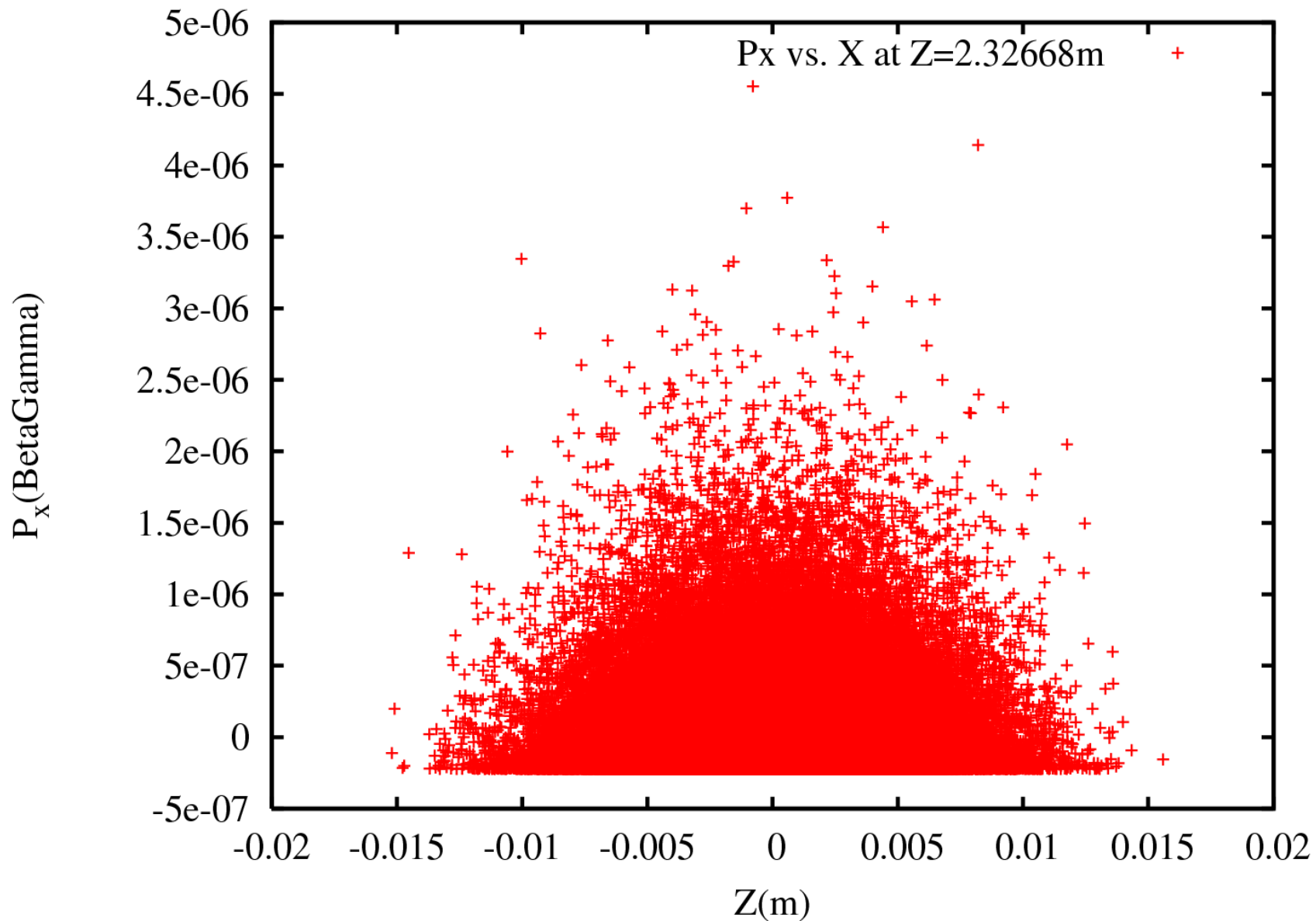
Phase Plot - Initial



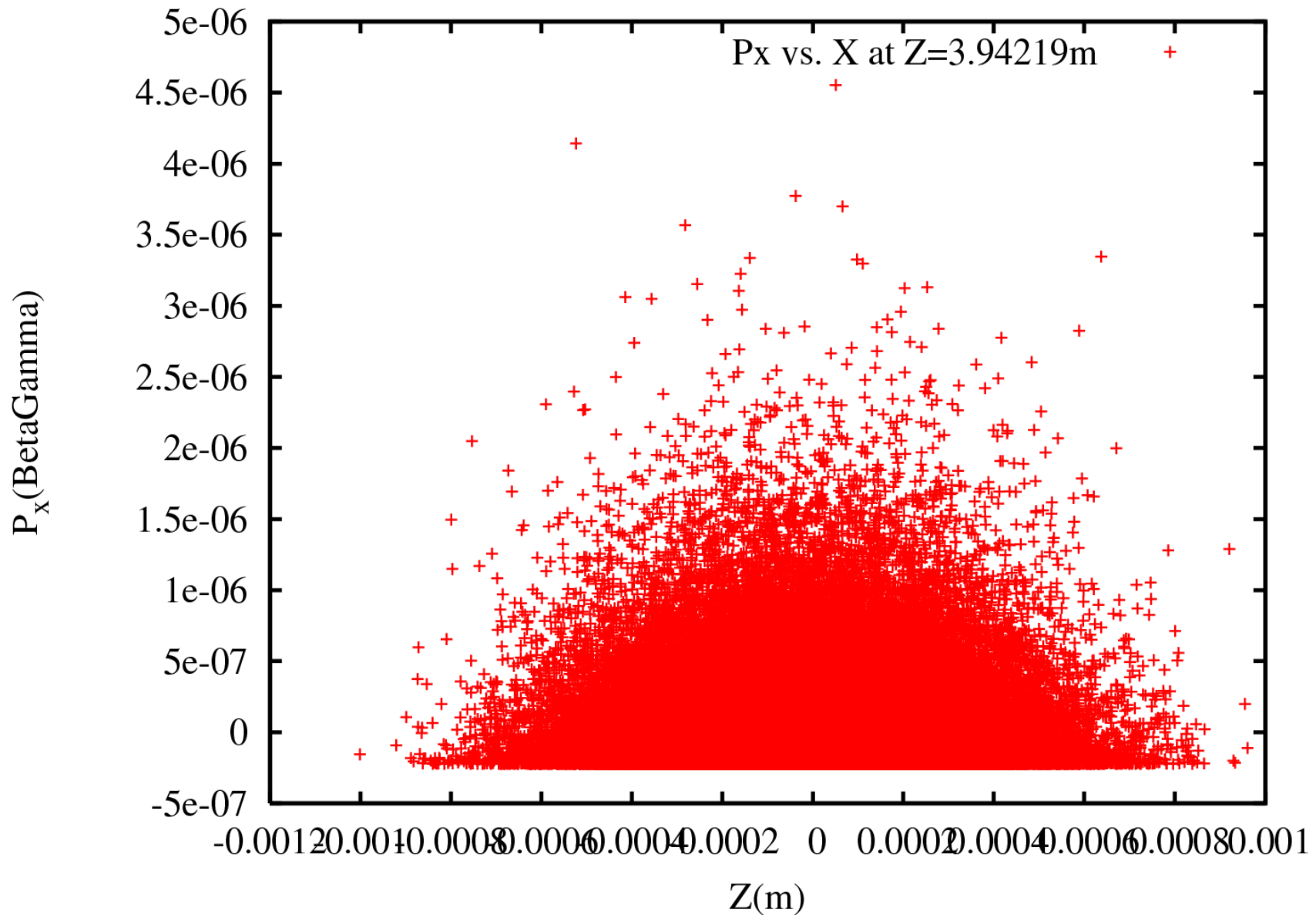
Phase Plot – Start of Bend



Phase Plot – Middle of Bend



Phase Plot – After Bend



- Notice the shrinking of the X-axis scaling. It is consistent with what we saw in Configuration 1.
- P_x is non-zero now, but in an asymmetric distribution
- Is this a non-physical behavior?