Showing the difference between sagitta and displacement
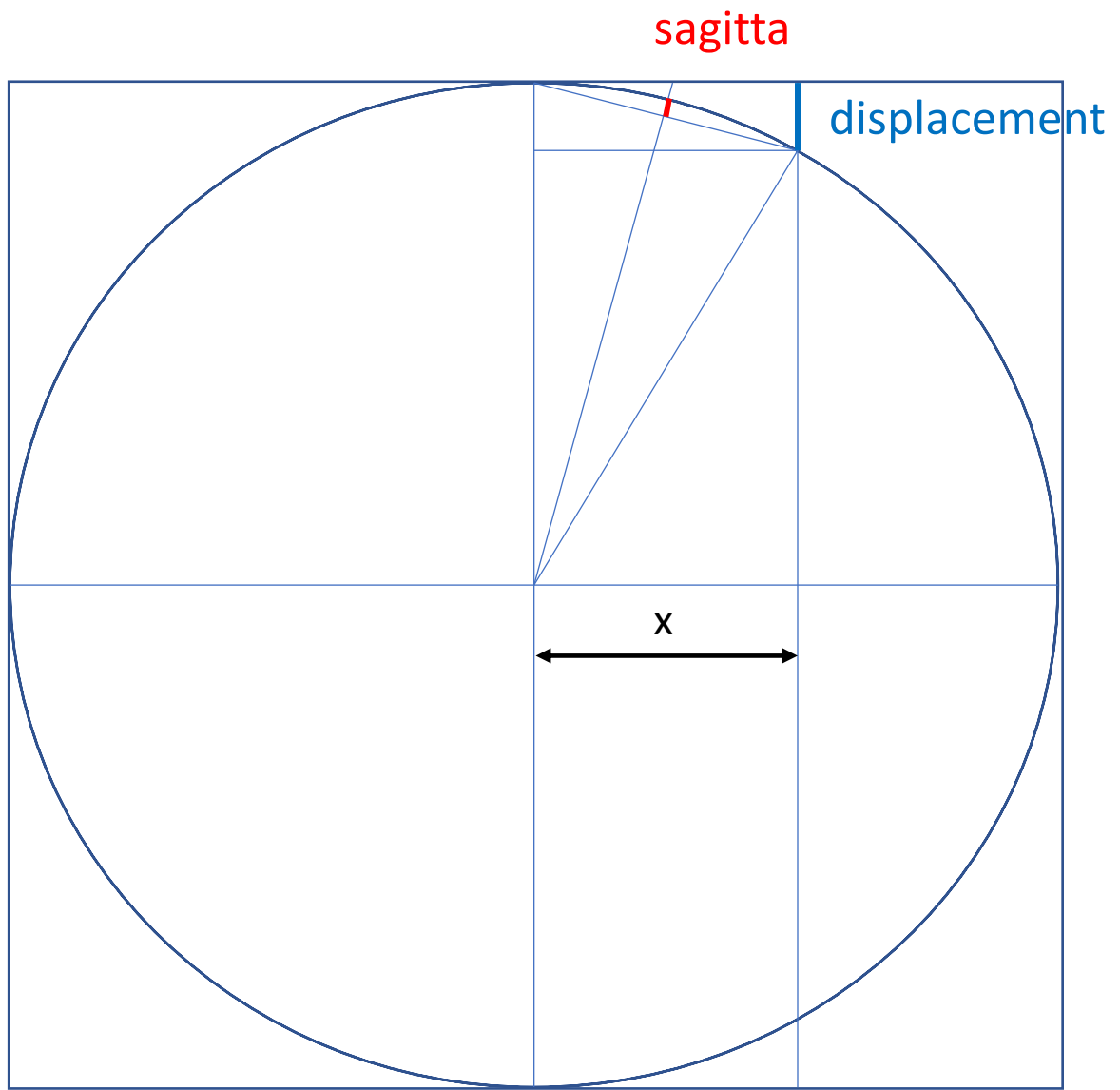
and

Measured beam momentum spectrum and (simulated) beam profile at T24/1

sagitta

displacement

x

- **Sagitta:**
  - Approx.: $s \sim L^2/8R$ (L = "tracklength")=(arclength or length of straight line between endpoints)
  - Exact: $s = R(1 - (1 - (L/2R)^2)^{1/2})$ (L is length of straightline between endpoints)

- **Displacement:** $d = R(1 - (1 - x^2/R^2)^{1/2})$

```
momentum:                              p= 1.      p= 2.      p= 3.      p= 4.      p= 5.

y=     0.0 beam posit. =               0.000      0.000      0.000      0.000      0.000
y=     0.0 sag_approx  =               0.000      0.000      0.000      0.000      0.000
y=     0.0 sag_exact   =               0.000      0.000      0.000      0.000      0.000


y=    25.5 beam posit. =               0.098      0.049      0.033      0.024      0.020
y=    25.5 sag_approx  =               0.024      0.012      0.008      0.006      0.005
y=    25.5 sag_exact   =               0.024      0.012      0.008      0.006      0.005


y=    51.0 beam posit. =               0.390      0.195      0.130      0.098      0.078
y=    51.0 sag_approx  =               0.098      0.049      0.033      0.025      0.020
y=    51.0 sag_exact   =               0.098      0.049      0.033      0.025      0.020


y=   203.5 beam posit. =               6.218      3.107      2.071      1.553      1.242
y=   203.5 sag_approx  =               1.554      0.777      0.518      0.388      0.311
y=   203.5 sag_exact   =               1.555      0.777      0.518      0.388      0.311


y=   356.0 beam posit. =              19.065      9.512      6.339      4.753      3.803
y=   356.0 sag_approx  =               4.766      2.378      1.585      1.188      0.951
y=   356.0 sag_exact   =               4.770      2.378      1.585      1.189      0.951


y=   381.5 beam posit. =              21.903     10.925      7.280      5.459      4.367
y=   381.5 sag_approx  =               5.476      2.731      1.820      1.365      1.092
y=   381.5 sag_exact   =               5.480      2.732      1.820      1.365      1.092


y=   407.0 beam posit. =              24.941     12.435      8.286      6.213      4.970
y=   407.0 sag_approx  =               6.235      3.109      2.071      1.553      1.243
y=   407.0 sag_exact   =               6.241      3.110      2.072      1.554      1.243
```
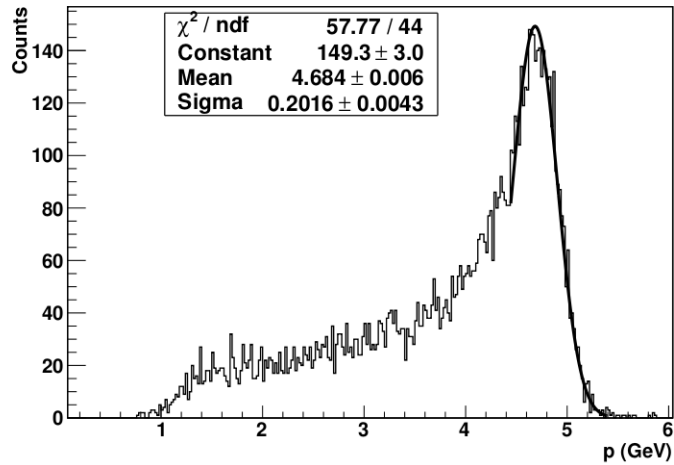
Figure 7.35: Momentum distribution from a run with a magnetic field of 1T and a drift distance of 150mm.

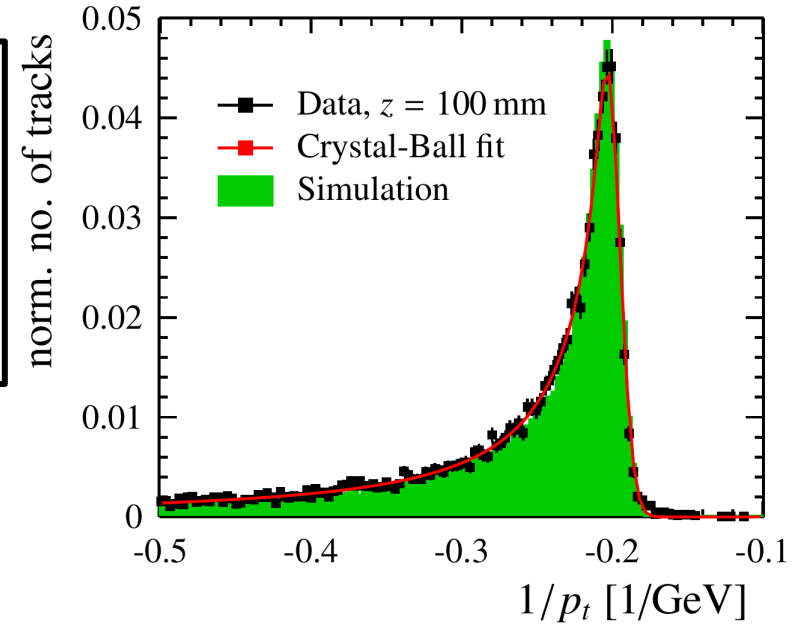**Thesis Uwe Kraemer (DESY) Dec. 2020**

Figure 6.1 – Particle momentum distribution after interaction with magnet wall through Data in black and simulation in green [57].
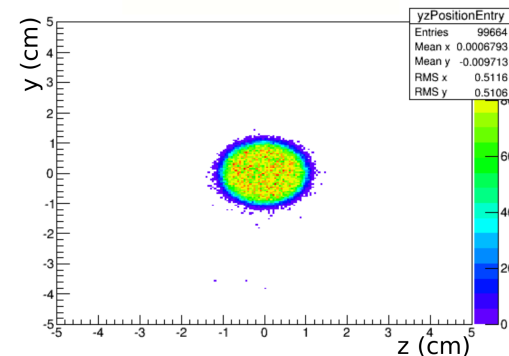
High Momentum Resolution Tracking in a Linear Collider

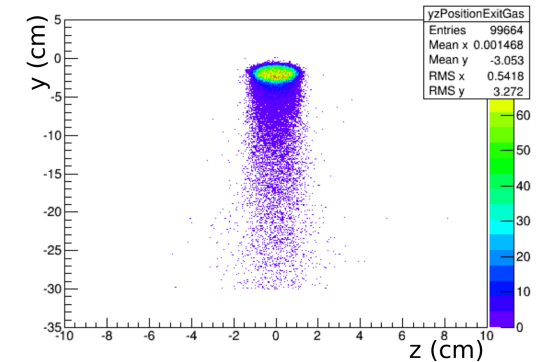### Experiment; Test Results from a Prototype TPC.

2011

Master's Thesis
by

Martin Ljunggren

(a) Particle distribution before the TPC field cage

(b) Particle distribution after the TPC field cage

Figure 6.3 – *GEANT*4 simulation result for the particle hit location at the entry and exit of the PCMAG [56].