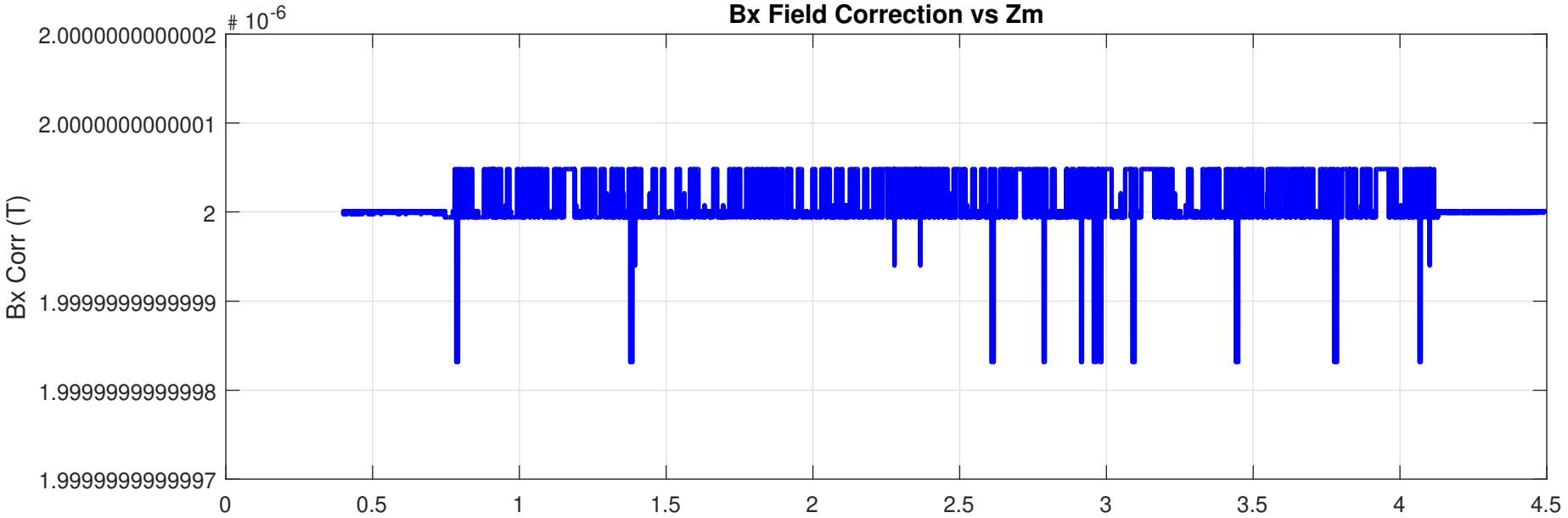
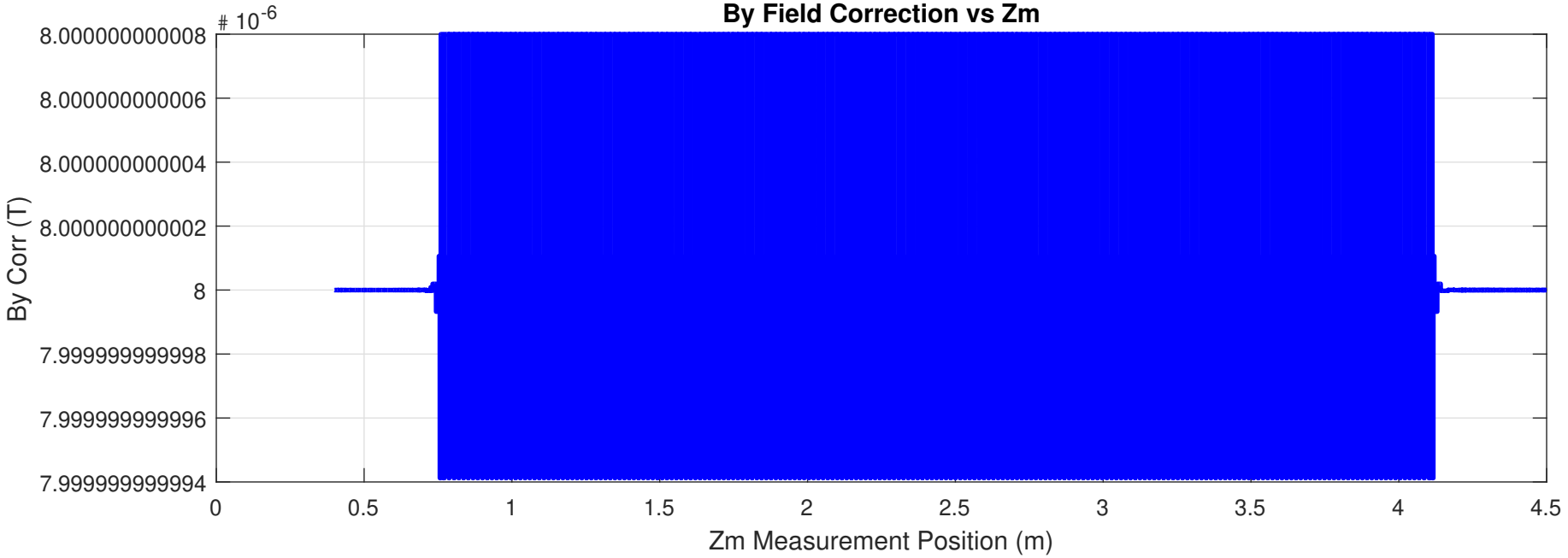
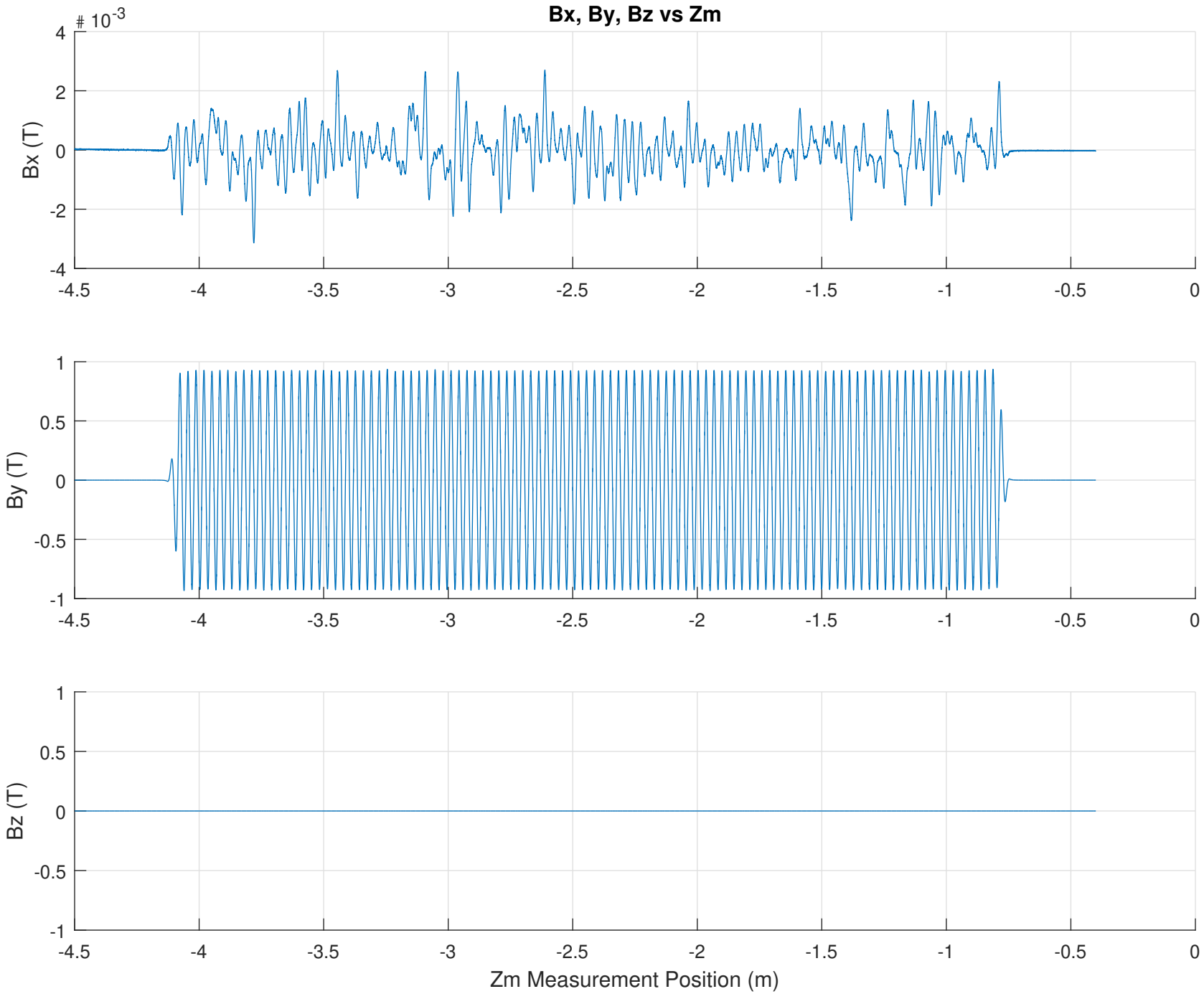
SLAC Magnetic Measurements

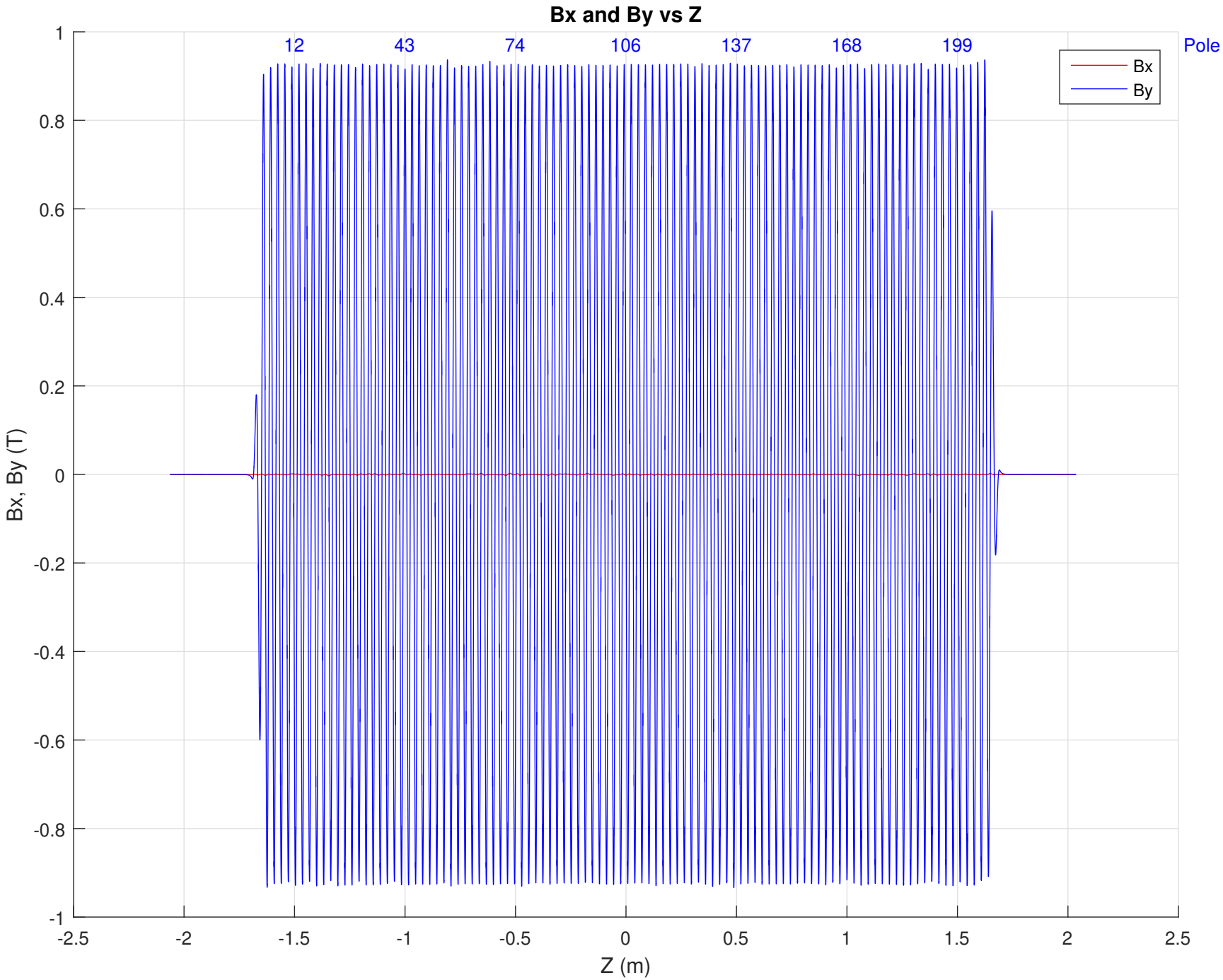
EPU Analysis

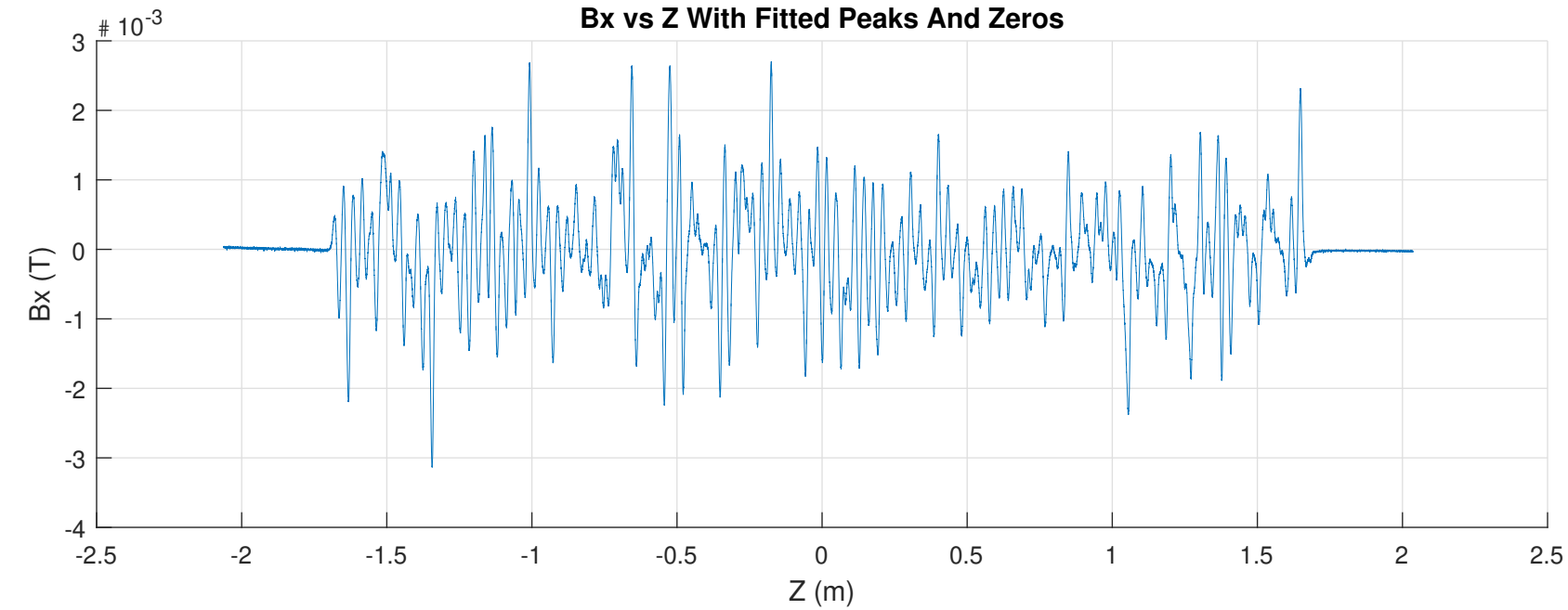
Parameters:
INPUT-FILE-DIR =S:\MagData\LCLS\Undulator\HXU-32\DATASET0001\Fine Tuning\Z Scans\Run 041\
INPUT-FILE-NAME =x+00000-y+000-bscanz.dat
INPUT-FILE-TYPE =ZVXYBXYH
CORR-REQUIRED =1
GAMMA =7827.79
NOM-LAMBDA-U =0.032
NOM-K-VALUE =2.6963
NOM-LAMBDA-R =1.2103e-09
NUM-POLES =210
NUM-END-POLES =4
CELL-LENGTH =3.656

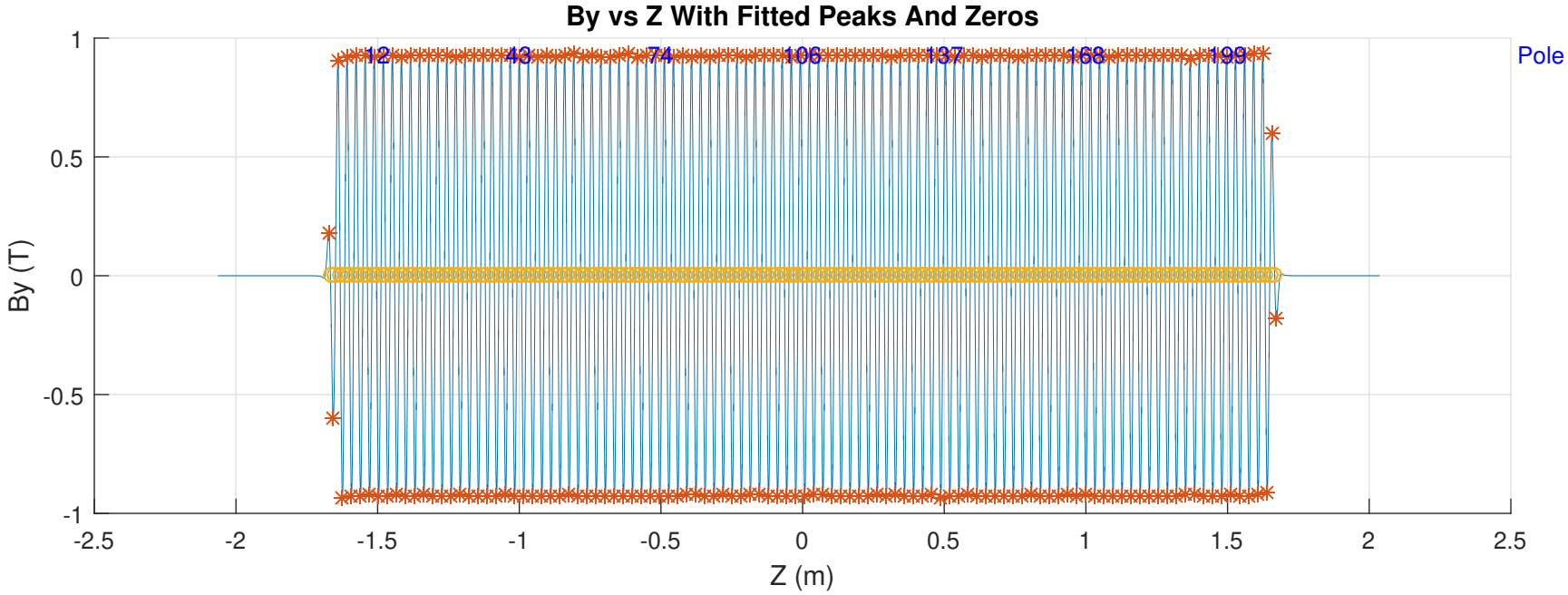

Bx Field Correction vs Zm
10^-6
2.0000000000002
2.0000000000001
2
1.9999999999999
1.9999999999998
1.9999999999997
Bx Corr (T)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5

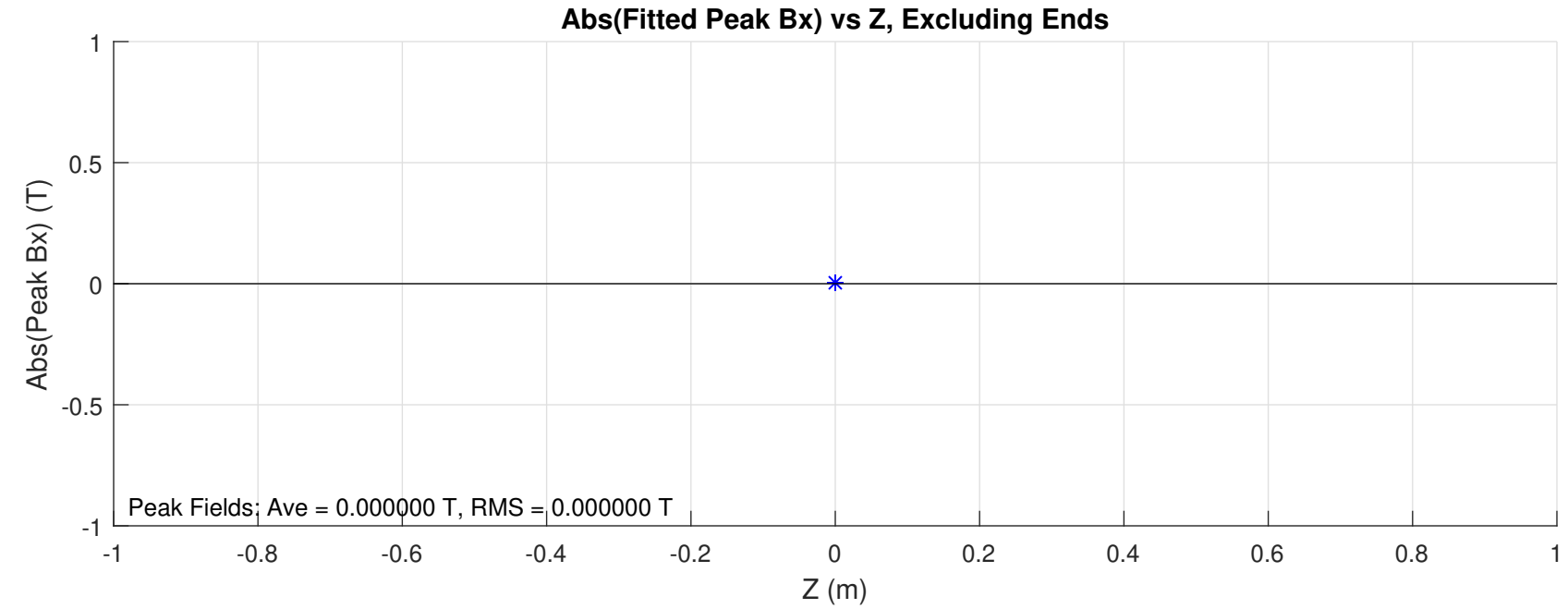

By Field Correction vs Zm
10^-6
8.000000000008
8.000000000006
8.000000000004
8.000000000002
8
7.999999999998
7.999999999996
7.999999999994
By Corr (T)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Zm Measurement Position (m)

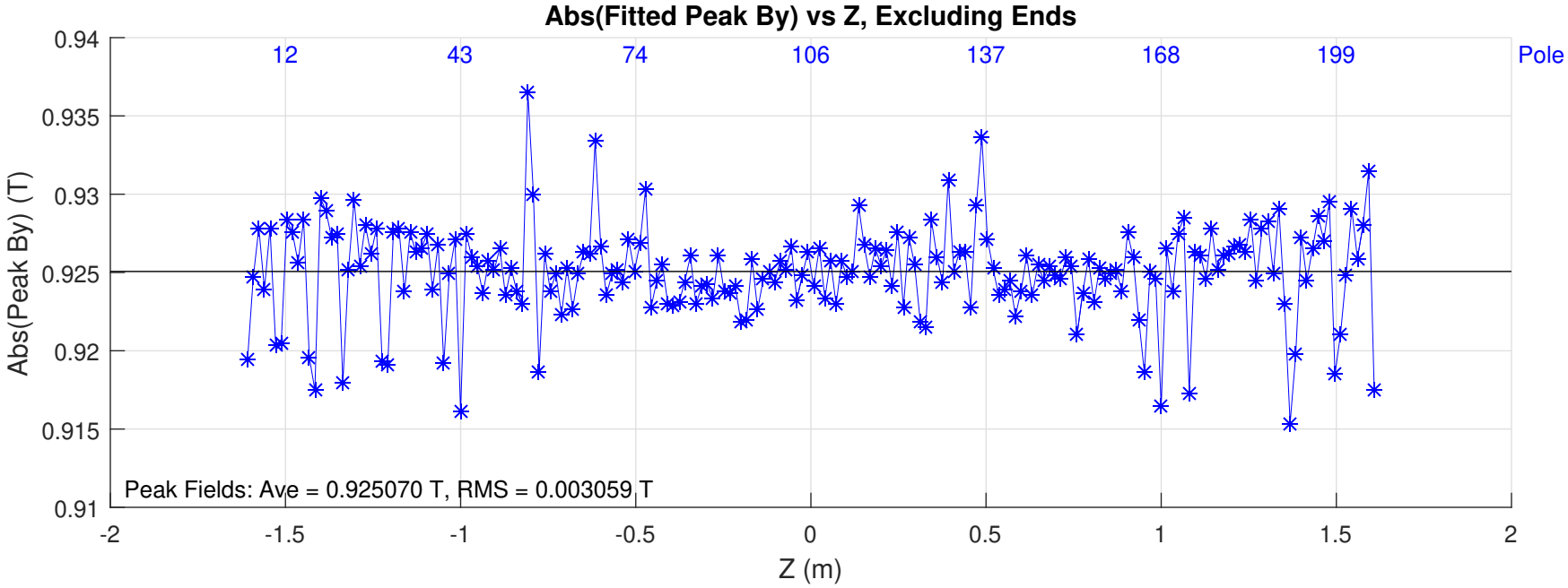

Bx, By, Bz vs Zm
10^-3
Bx (T)
By (T)
Bz (T)
Zm Measurement Position (m)
4
2
0
-2
-4
1
0.5
0
-0.5
-1
-4.5
-4
-3.5
-3
-2.5
-2
-1.5
-1
-0.5
0

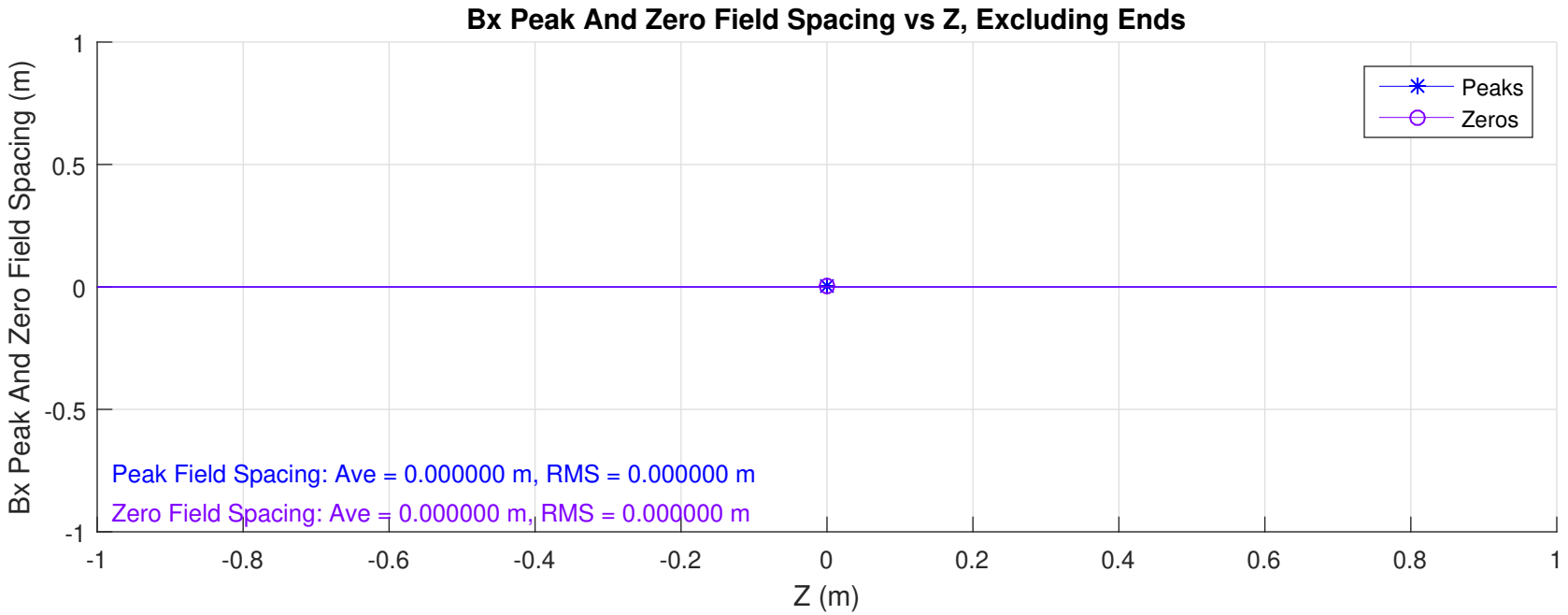

Bx and By vs Z
12
43
74
106
137
168
199
Pole
Bx
By
Bx, By (T)
Z (m)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5

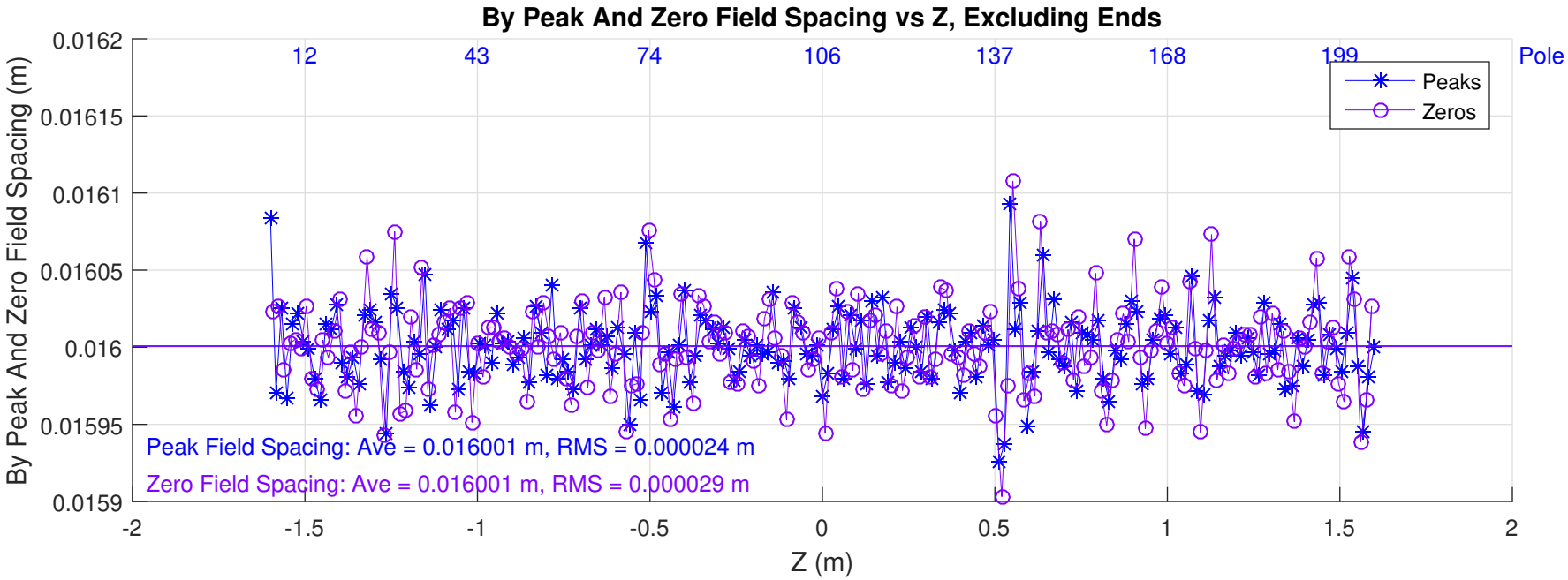

Bx vs Z With Fitted Peaks And Zeros
10^-3
Bx (T)
Z (m)

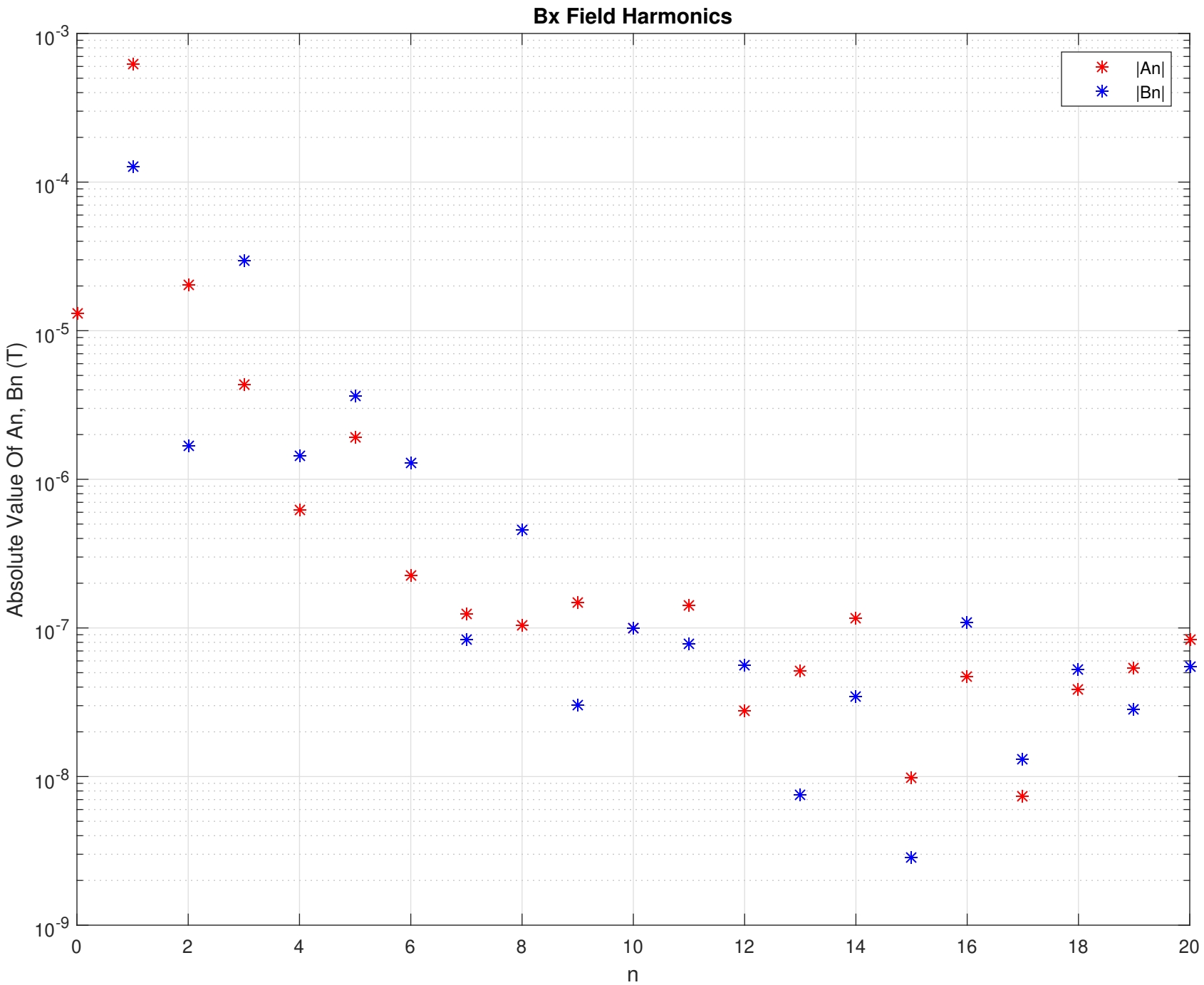

By vs Z With Fitted Peaks And Zeros
12
43
74
106
137
168
199
Pole
By (T)
Z (m)

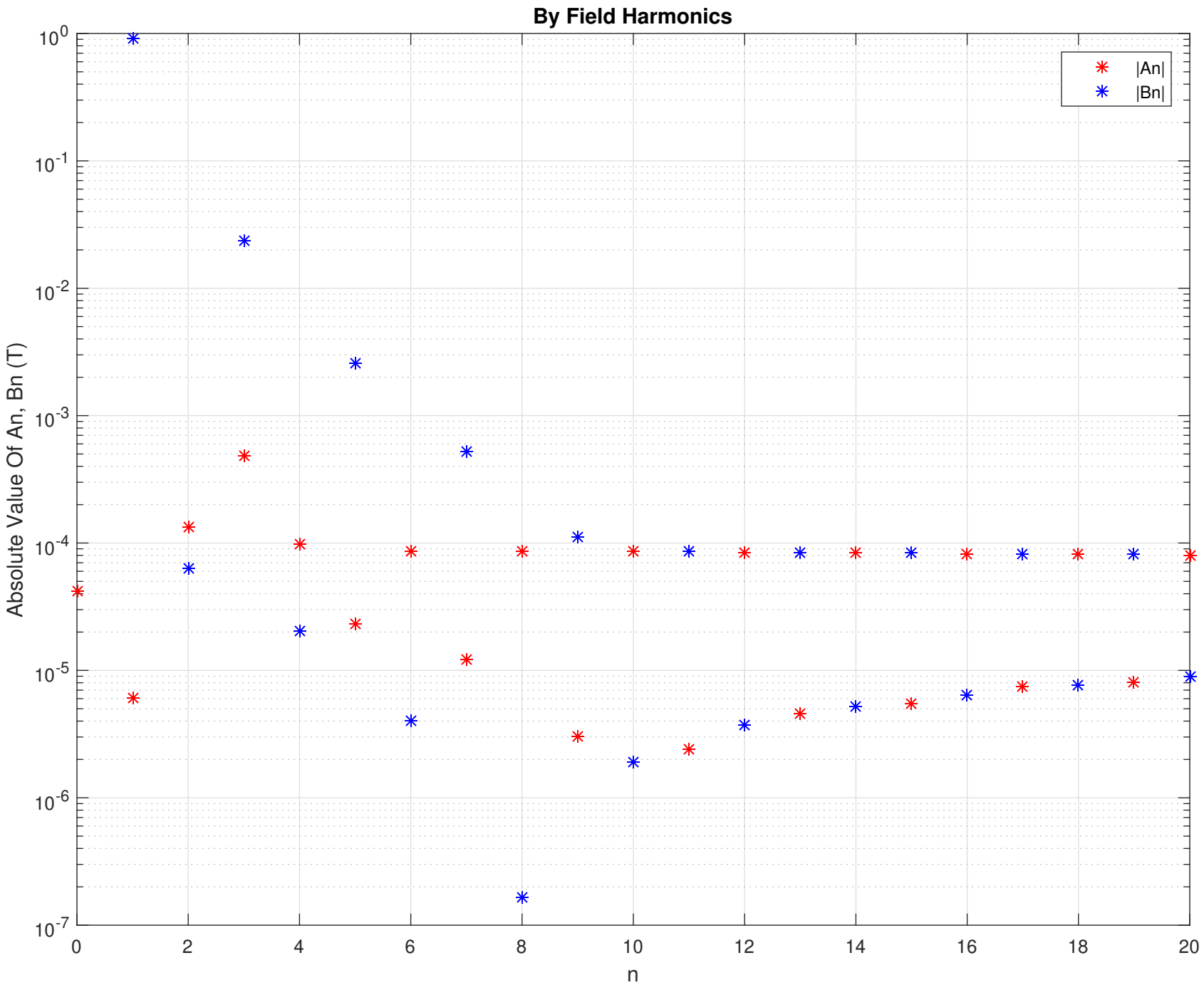

Abs(Fitted Peak Bx) vs Z, Excluding Ends
Abs(Peak Bx) (T)
Z (m)
Peak Fields: Ave = 0.000000 T, RMS = 0.000000 T
1
0.5
0
-0.5
-1
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1

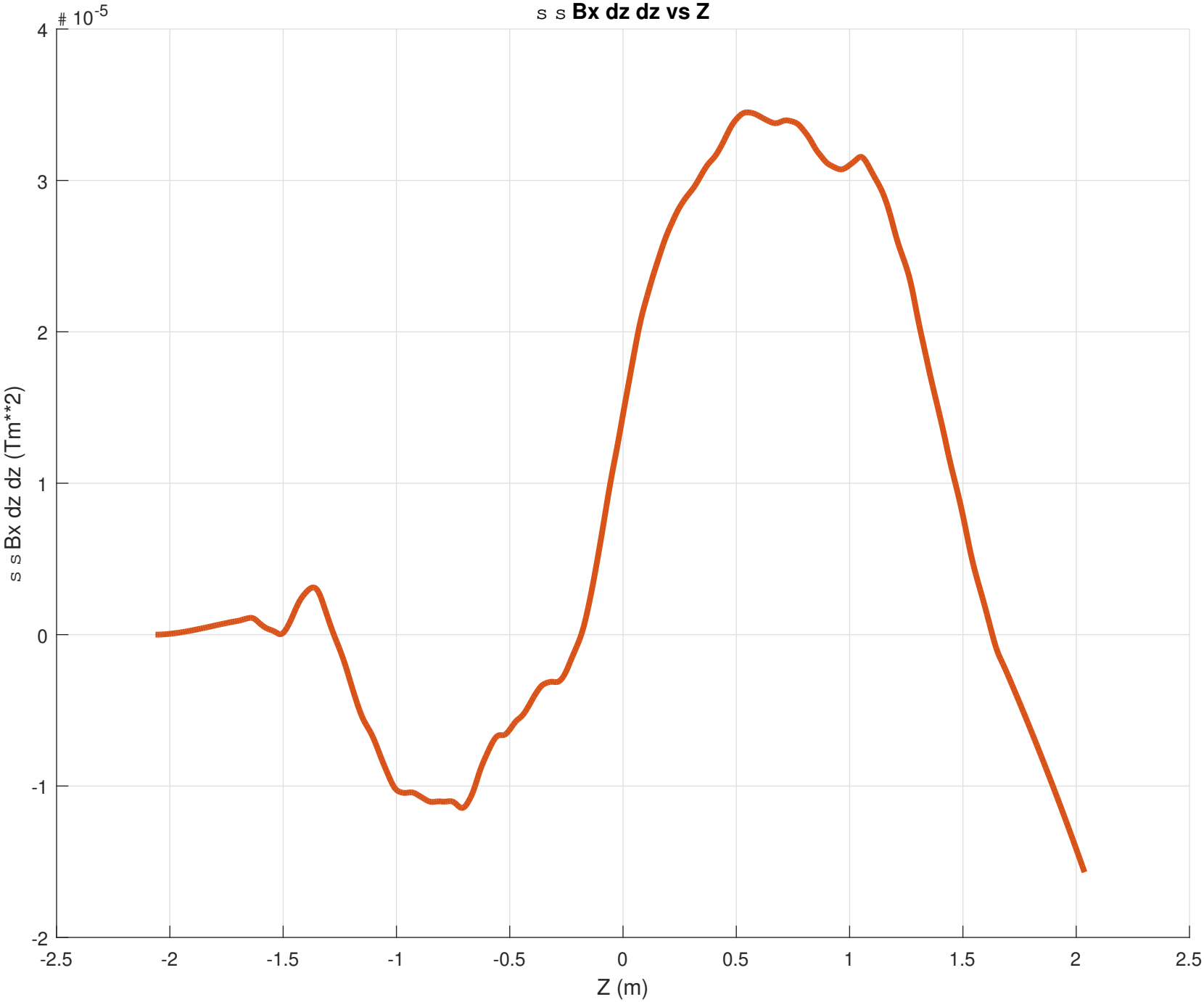

Abs(Fitted Peak By) vs Z, Excluding Ends
Abs(Peak By) (T)
Z (m)
Peak Fields: Ave = 0.925070 T, RMS = 0.003059 T
12
43
74
106
137
168
199
Pole
0.94
0.935
0.93
0.925
0.92
0.915
0.91
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2

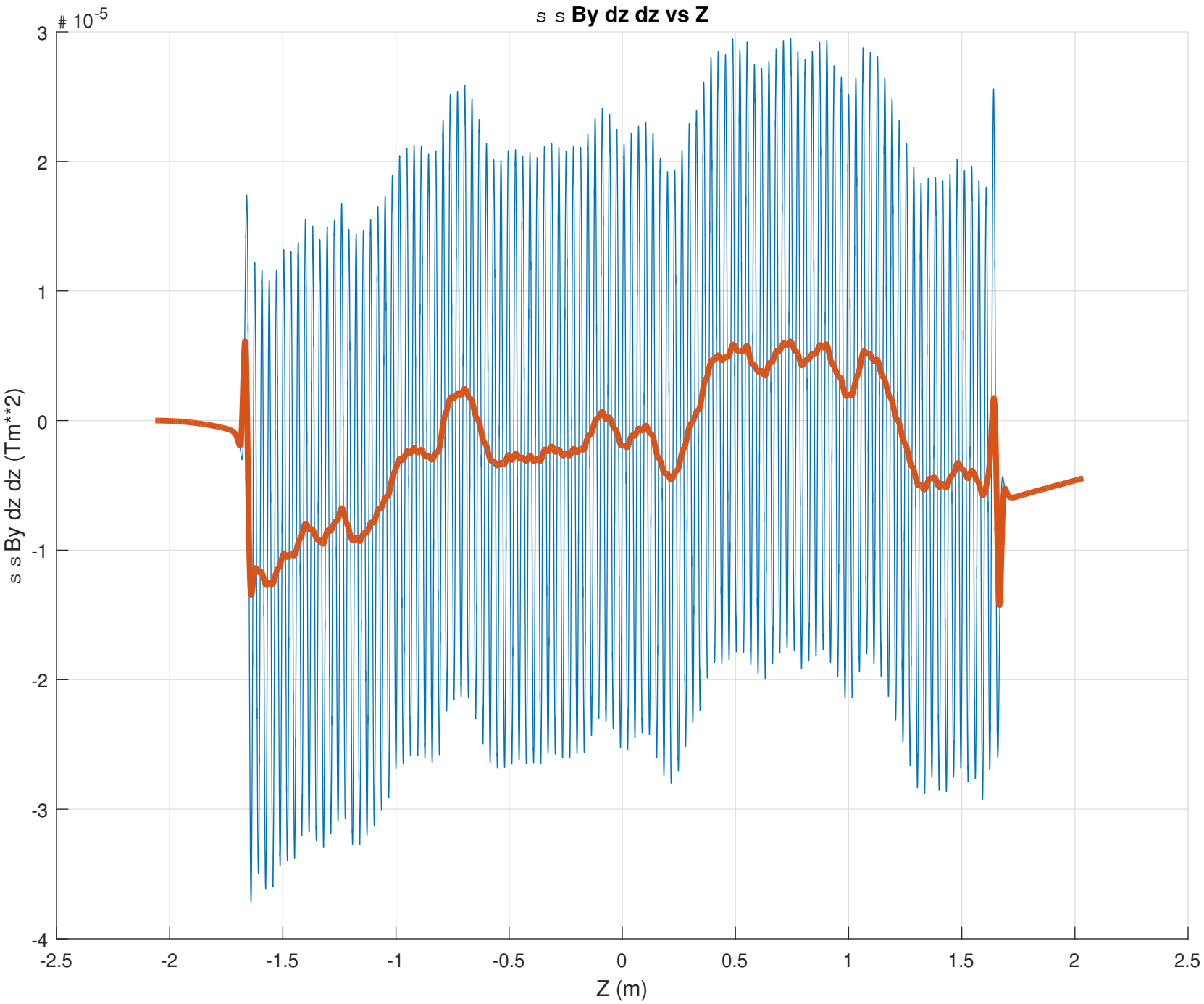

Bx Peak And Zero Field Spacing vs Z, Excluding Ends
Bx Peak And Zero Field Spacing (m)
Z (m)
Peaks
Zeros
Peak Field Spacing: Ave = 0.000000 m, RMS = 0.000000 m
Zero Field Spacing: Ave = 0.000000 m, RMS = 0.000000 m

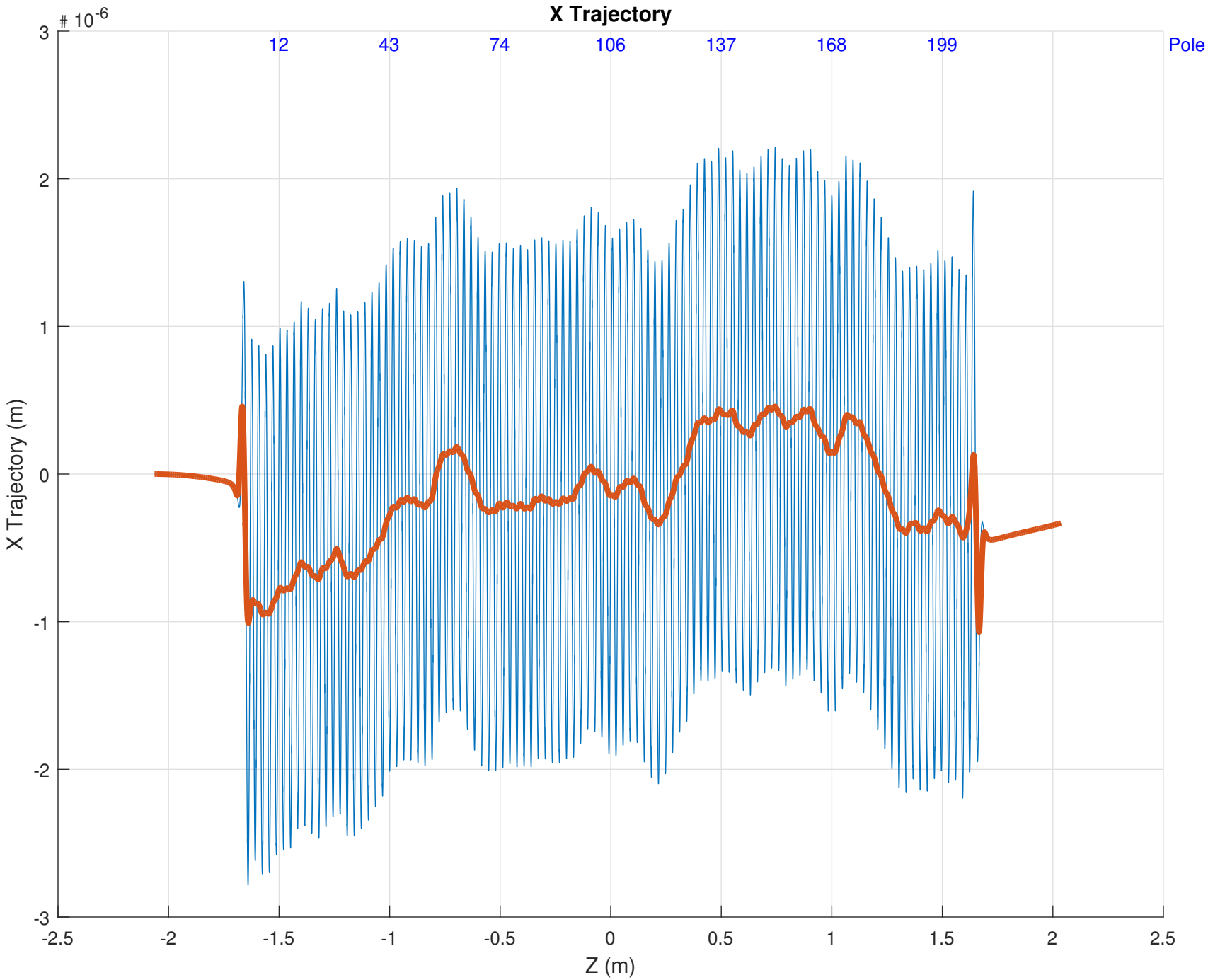

By Peak And Zero Field Spacing vs Z, Excluding Ends
By Peak And Zero Field Spacing (m)
Z (m)
12
43
74
106
137
168
199
Pole
Peaks
Zeros
Peak Field Spacing: Ave = 0.016001 m, RMS = 0.000024 m
Zero Field Spacing: Ave = 0.016001 m, RMS = 0.000029 m

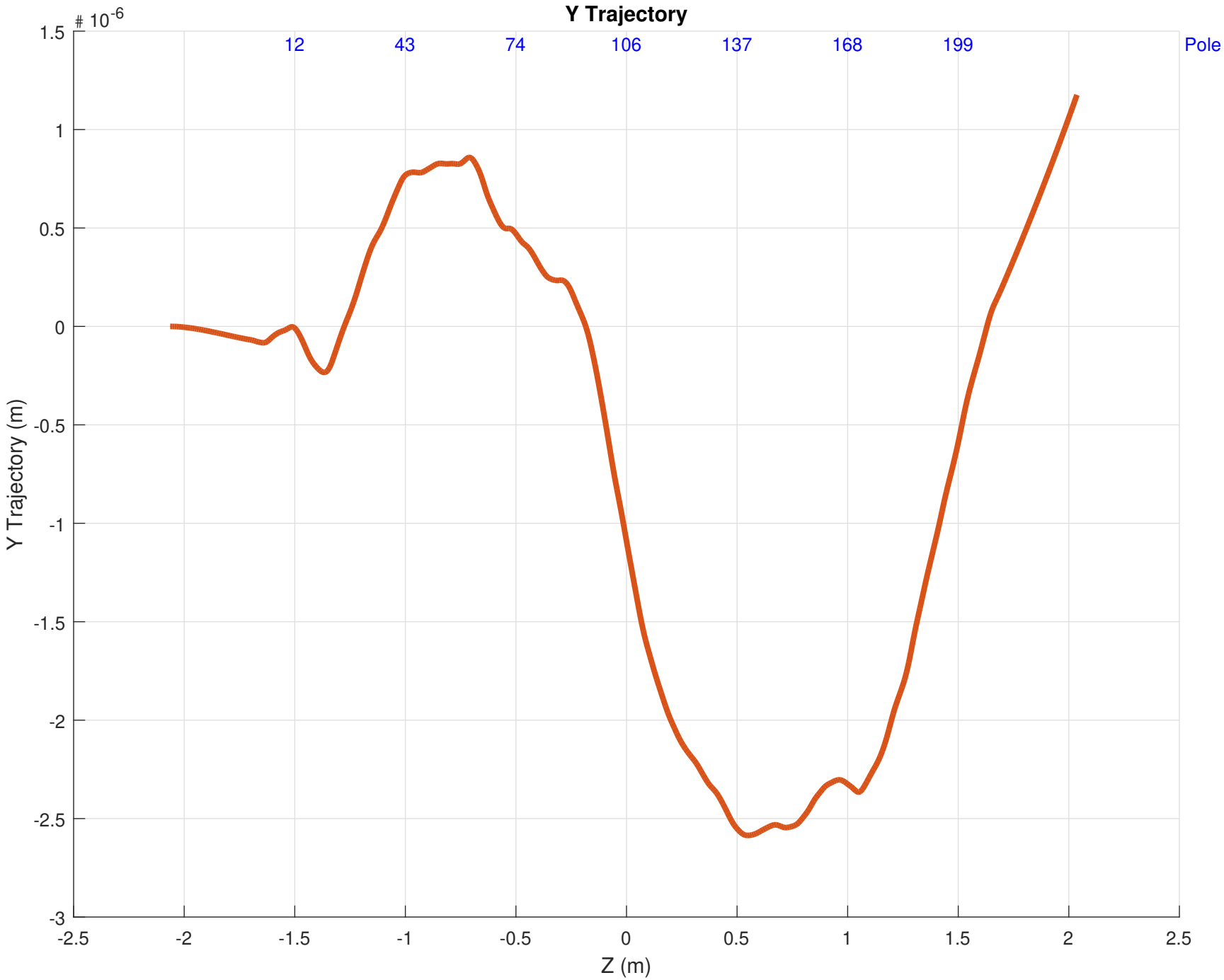

Bx Field Harmonics
|An|
|Bn|
Absolute Value Of An, Bn (T)
n
10^-3
10^-4
10^-5
10^-6
10^-7
10^-8
10^-9
0
2
4
6
8
10
12
14
16
18
20

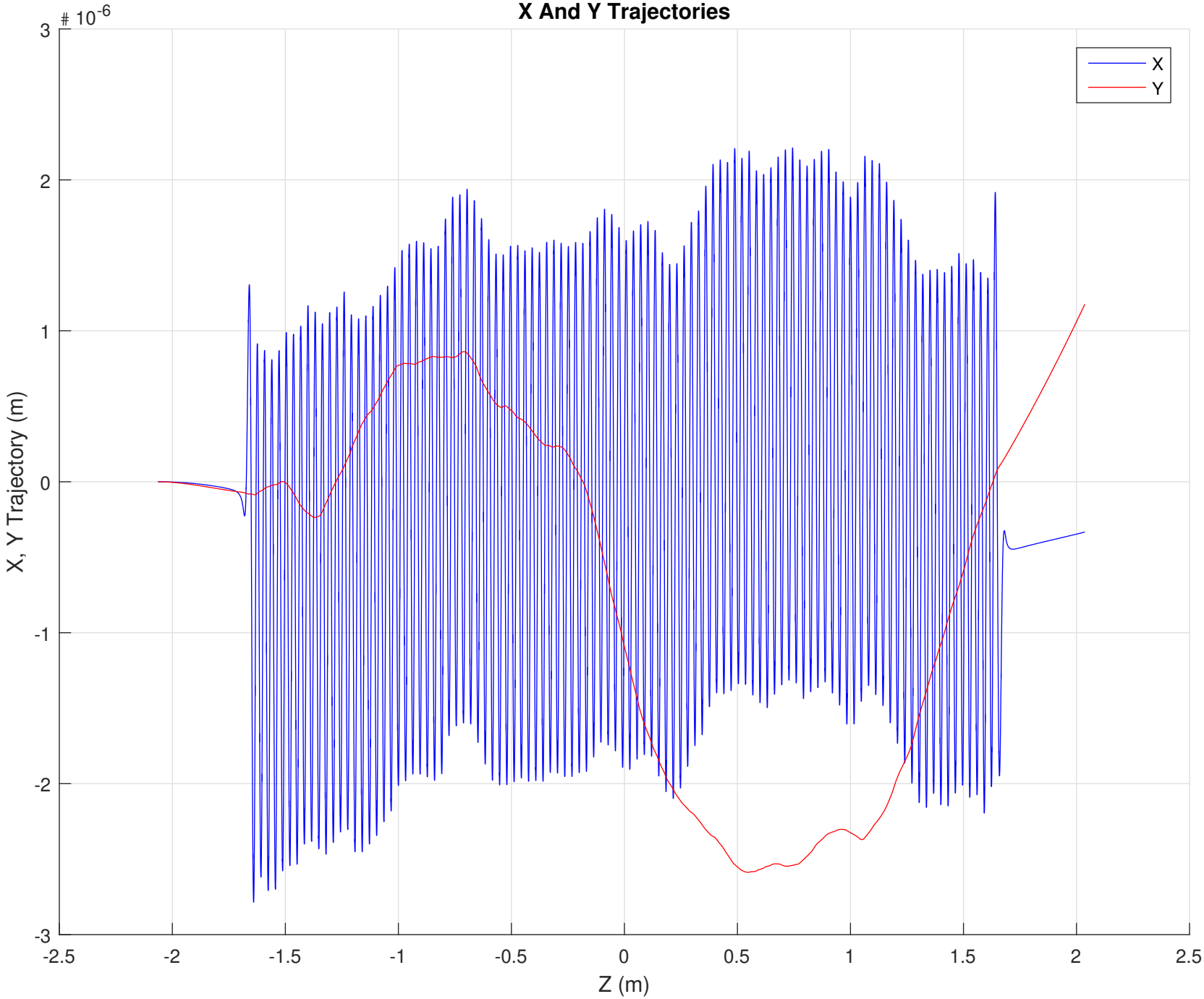

By Field Harmonics
|An|
|Bn|
Absolute Value Of An, Bn (T)
n
10^0
10^-1
10^-2
10^-3
10^-4
10^-5
10^-6
10^-7
0
2
4
6
8
10
12
14
16
18
20

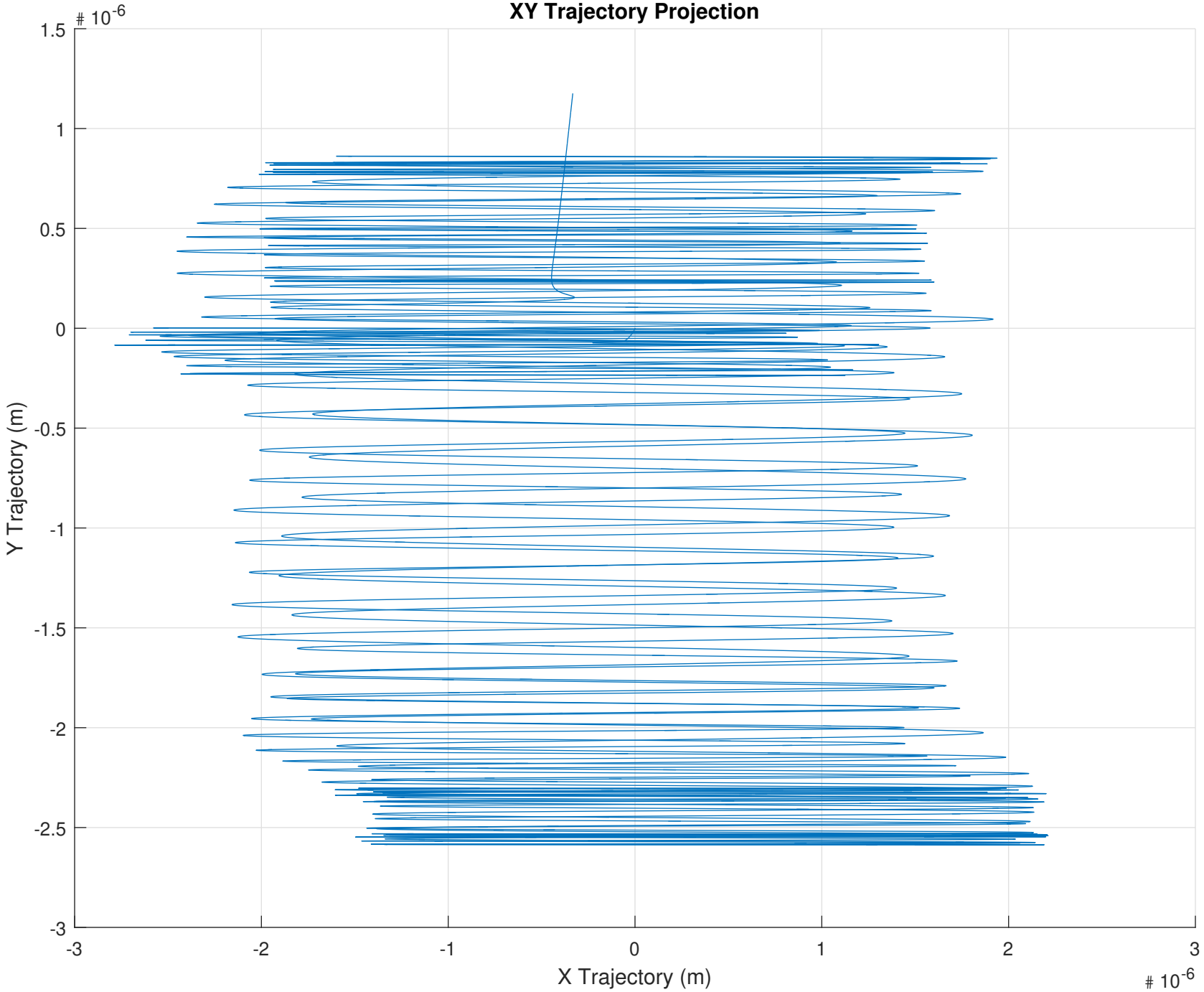

s s Bx dz dz vs Z
10^-5
4
3
2
1
0
-1
-2
s s Bx dz dz (Tm**2)
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
Z (m)

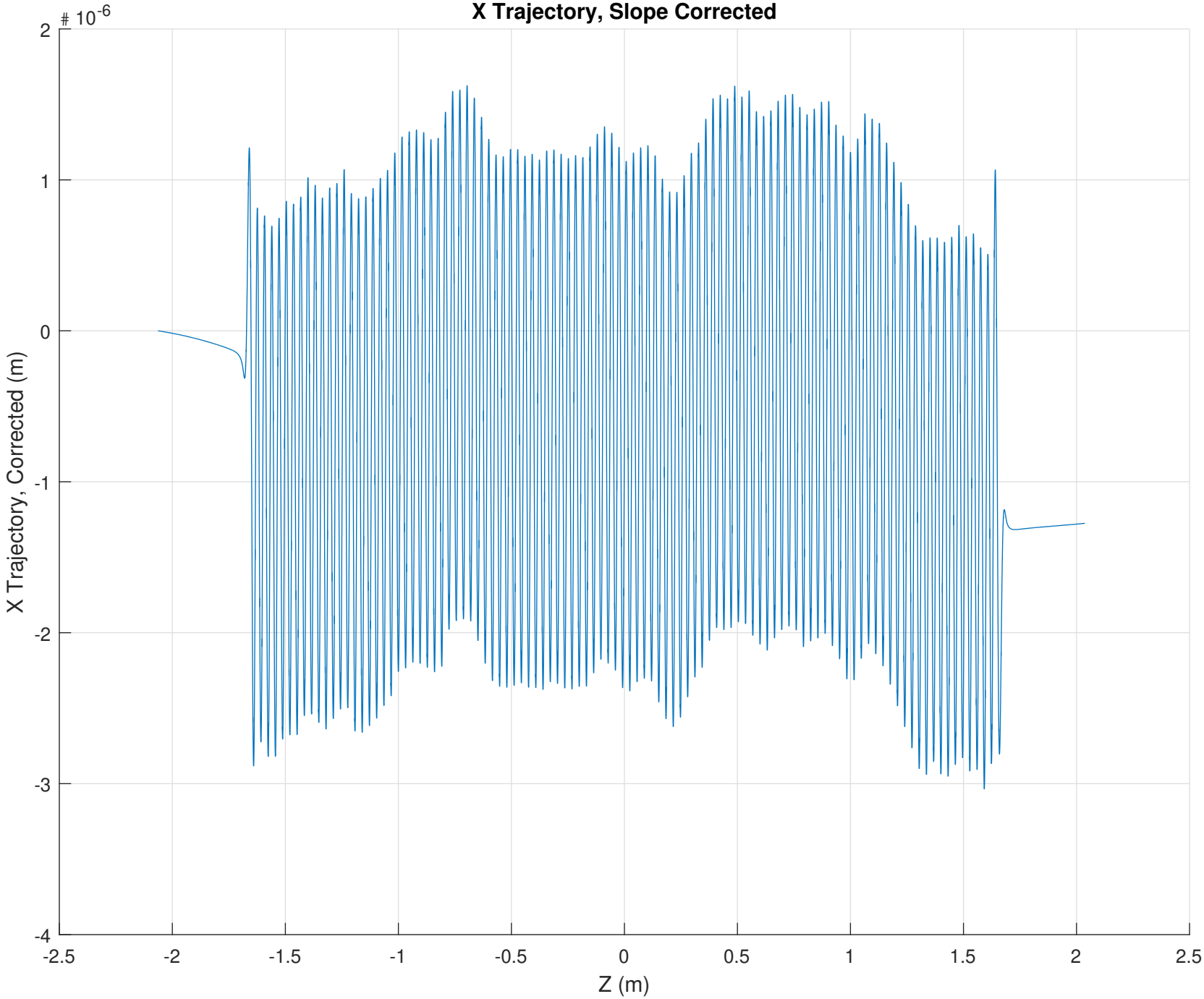

s s By dz dz vs Z
10^-5
3
2
1
0
-1
-2
-3
-4
s s By dz dz (Tm**2)
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
Z (m)

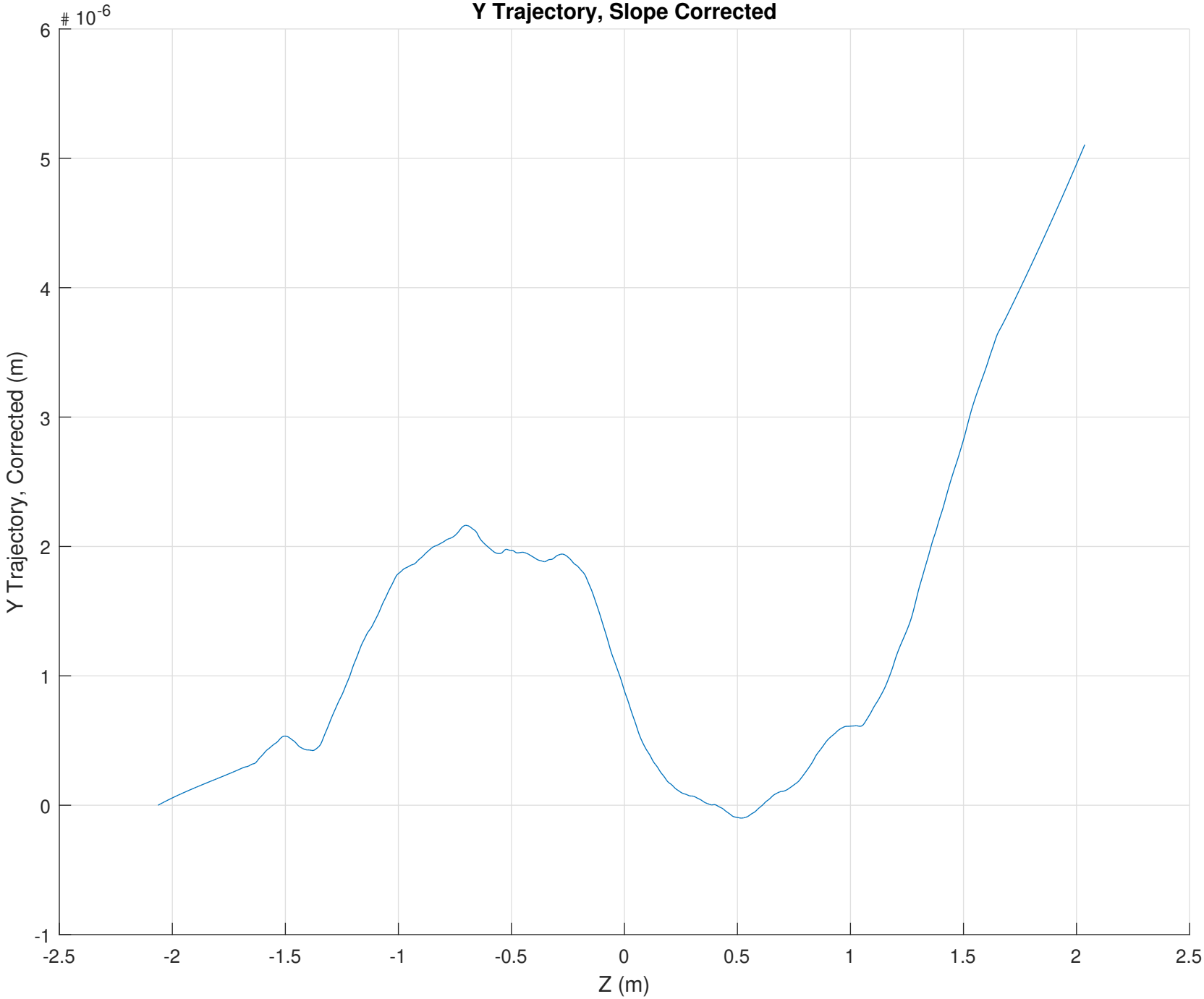

X Trajectory
10^-6
12
43
74
106
137
168
199
Pole
3
2
1
0
-1
-2
-3
X Trajectory (m)
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
Z (m)

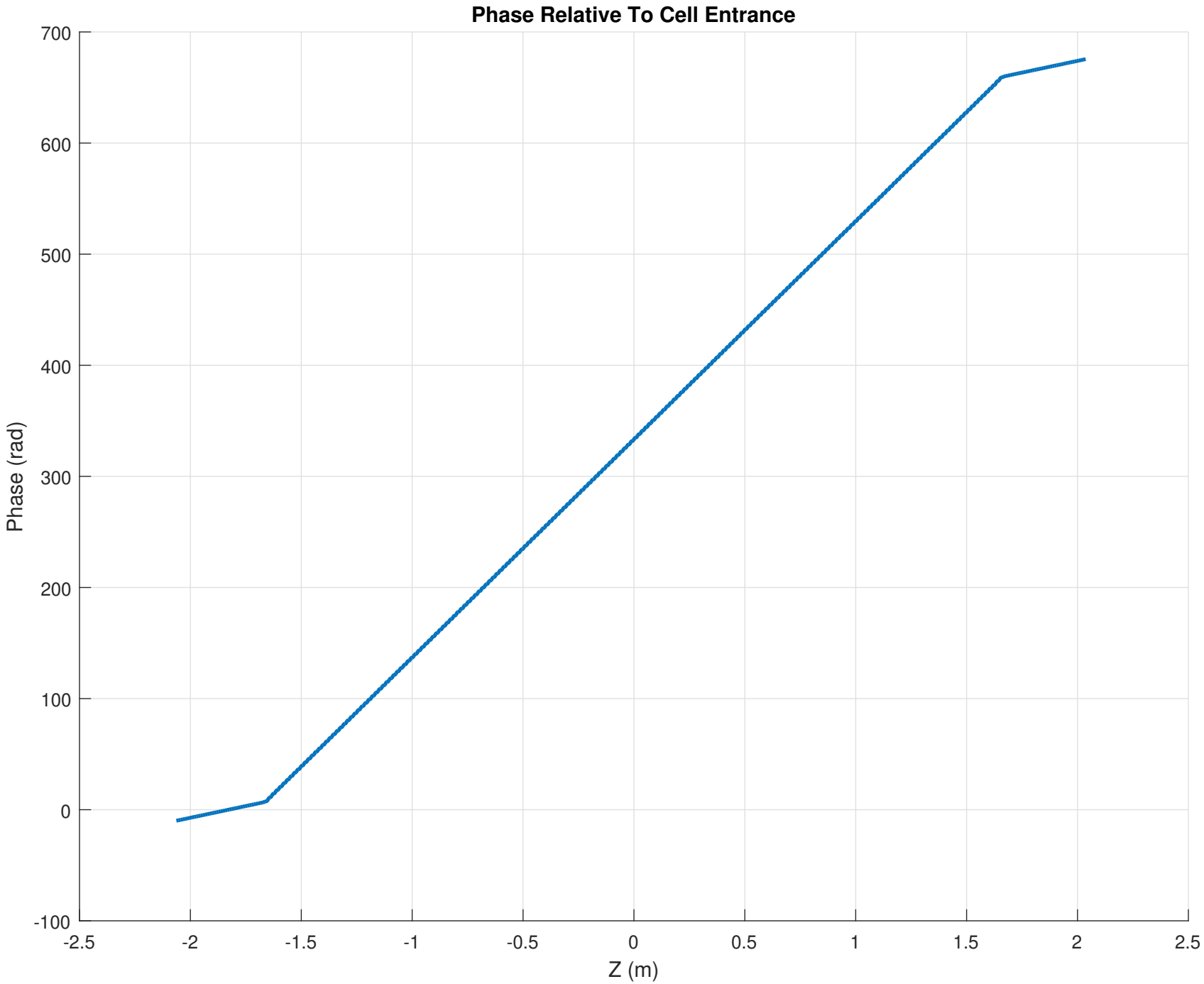

Y Trajectory
10^-6
12
43
74
106
137
168
199
Pole
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
Y Trajectory (m)
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
Z (m)

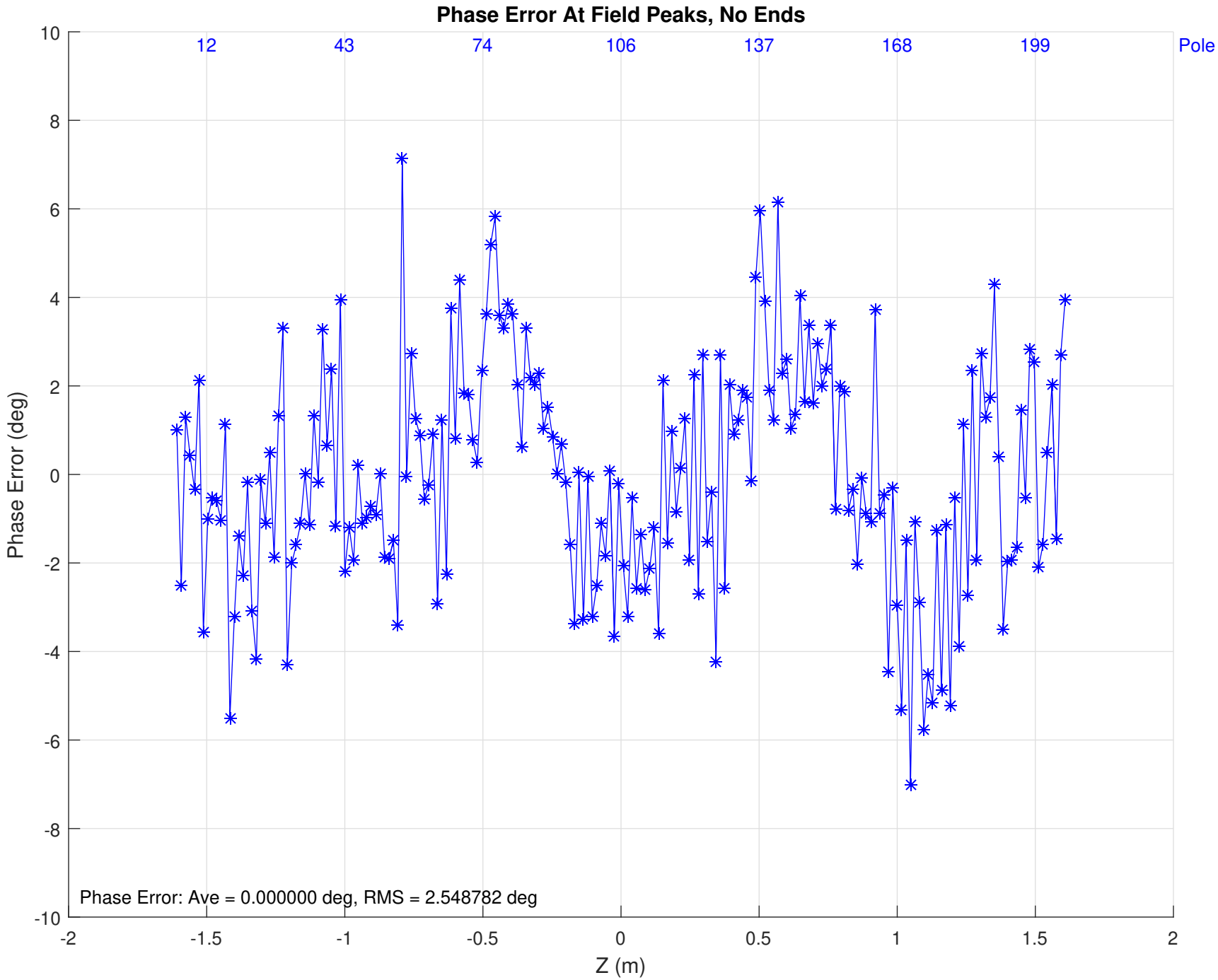

X And Y Trajectories
10^-6
3
2
1
0
-1
-2
-3
X, Y Trajectory (m)
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
Z (m)
X
Y

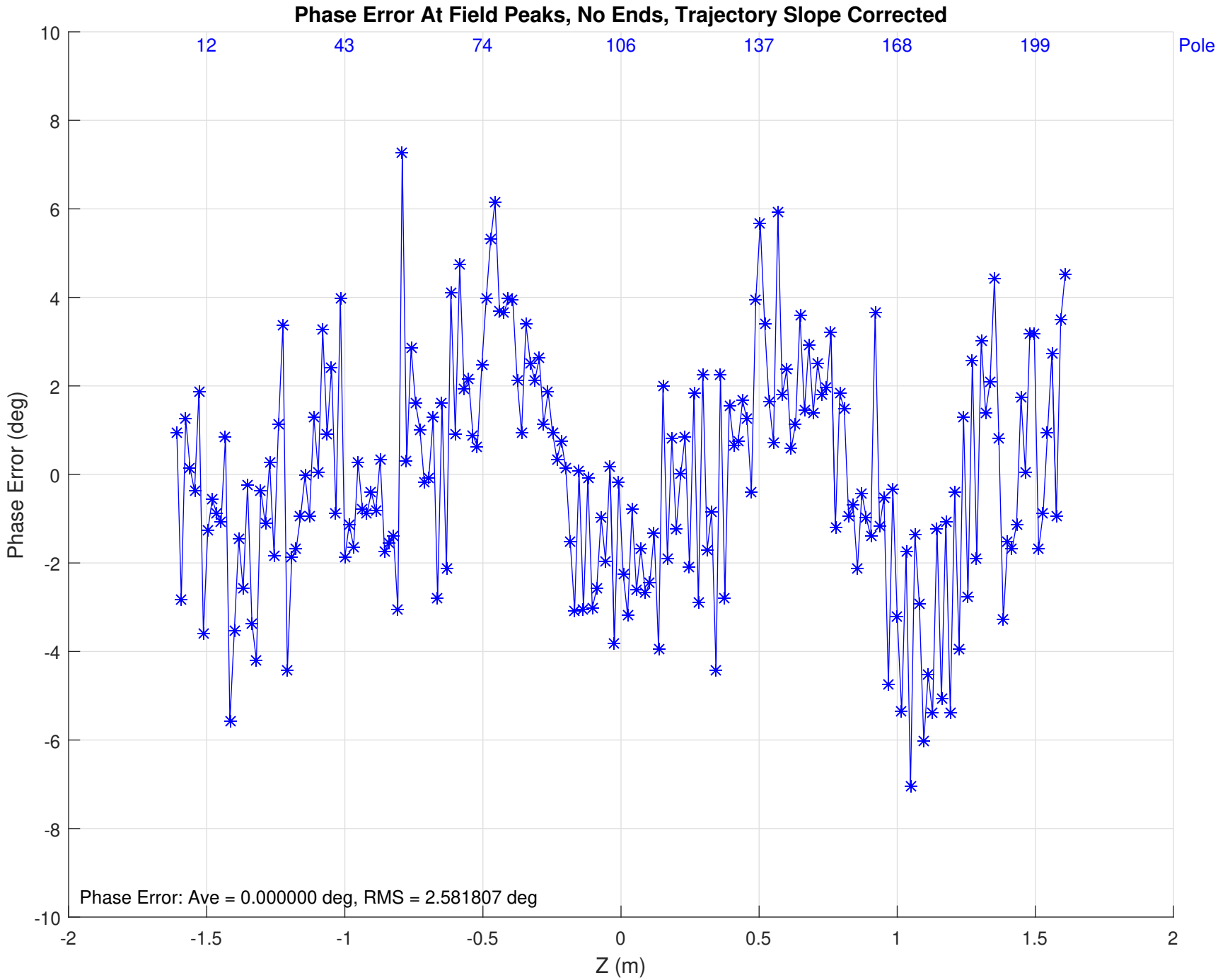

XY Trajectory Projection
10^-6
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
Y Trajectory (m)
-3
-2
-1
0
1
2
3
X Trajectory (m)
10^-6

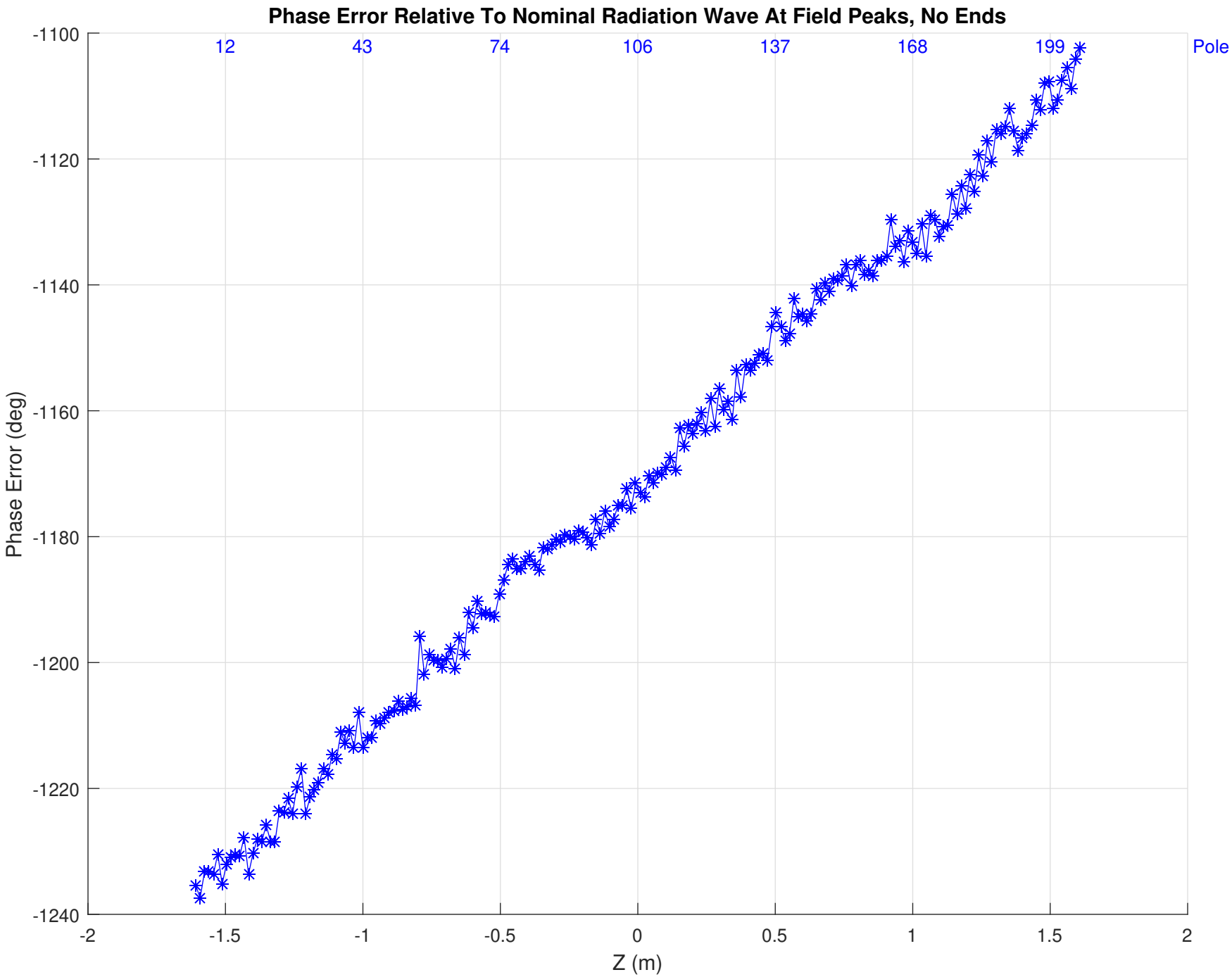

X Trajectory, Slope Corrected
10^-6
2
1
0
-1
-2
-3
-4
X Trajectory, Corrected (m)
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
Z (m)

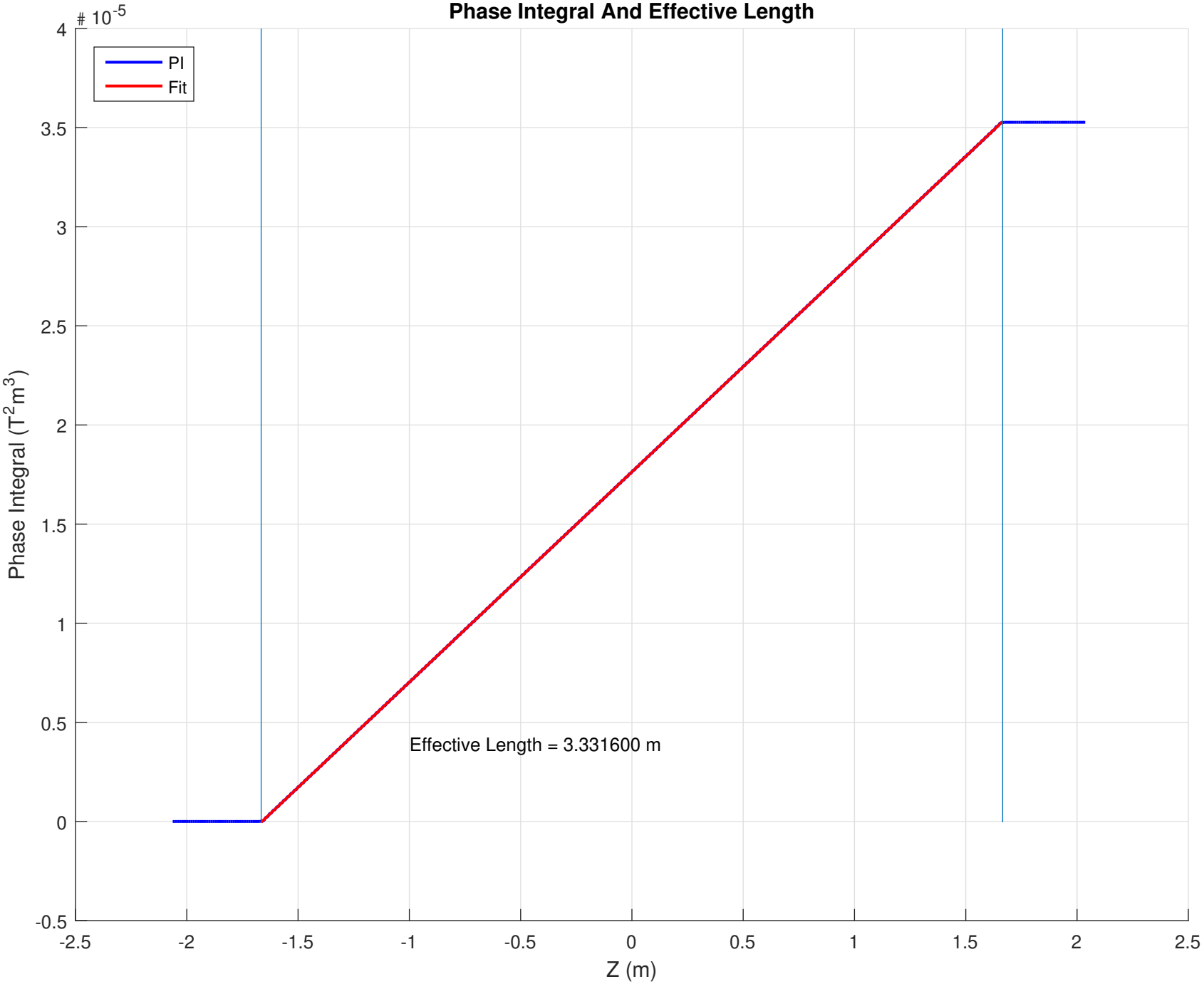

Y Trajectory, Slope Corrected
10^-6
6
5
4
3
2
1
0
-1
Y Trajectory, Corrected (m)
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
Z (m)

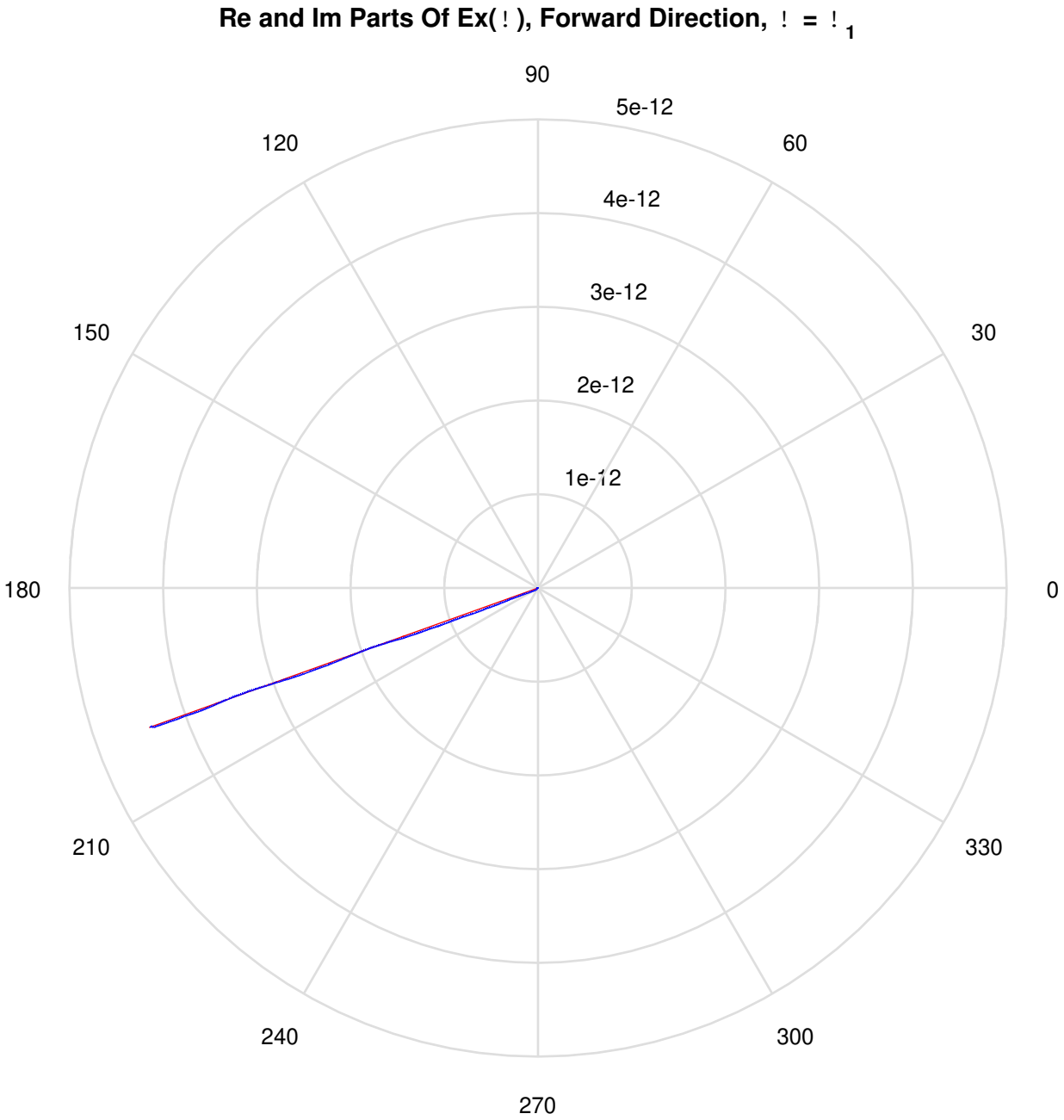

Phase Relative To Cell Entrance
700
600
500
400
300
200
100
0
-100
Phase (rad)
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
Z (m)

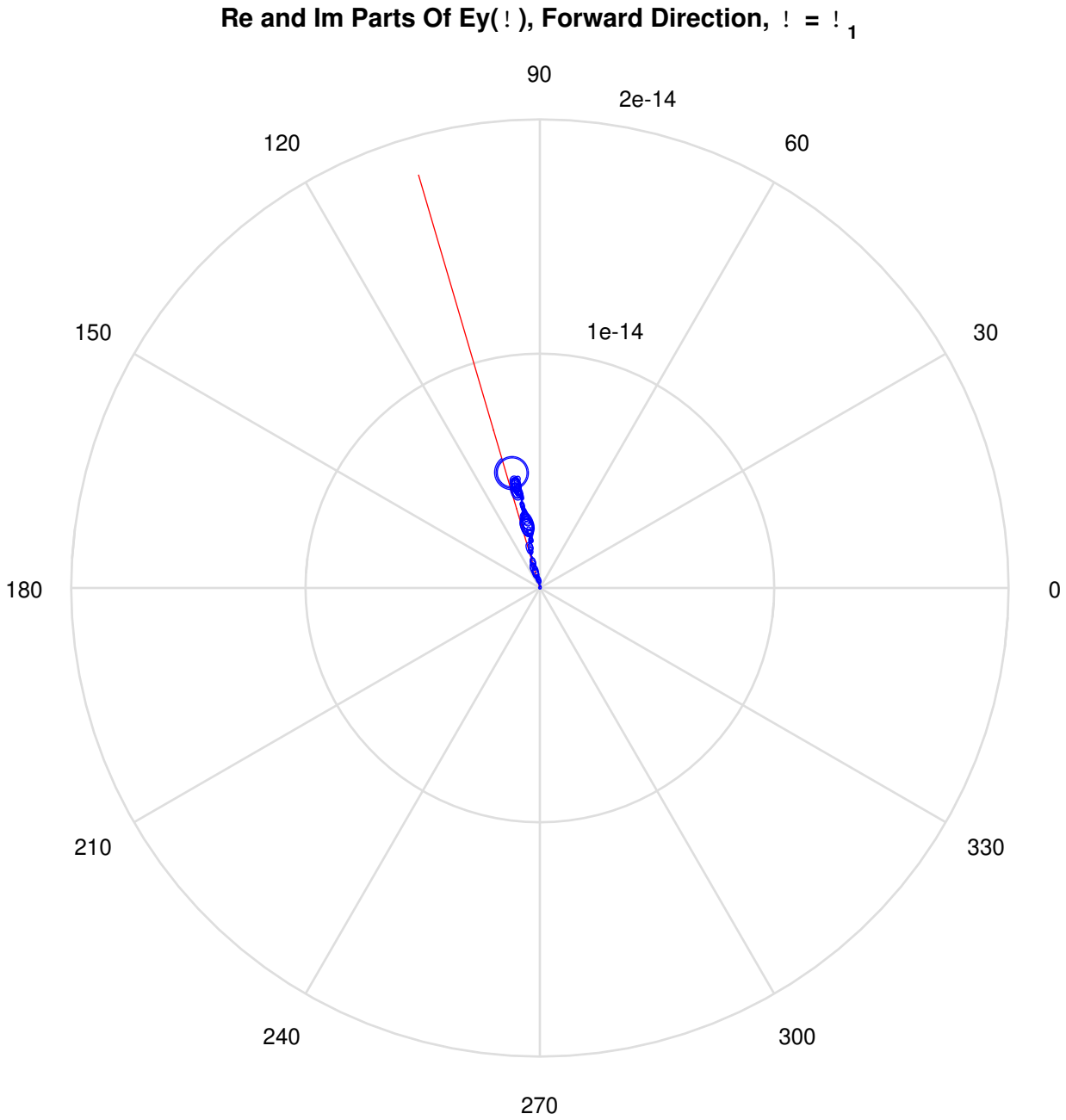

Phase Error At Field Peaks, No Ends
12
43
74
106
137
168
199
Pole
10
8
6
4
2
0
-2
-4
-6
-8
-10
Phase Error (deg)
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
Z (m)
Phase Error: Ave = 0.000000 deg, RMS = 2.548782 deg

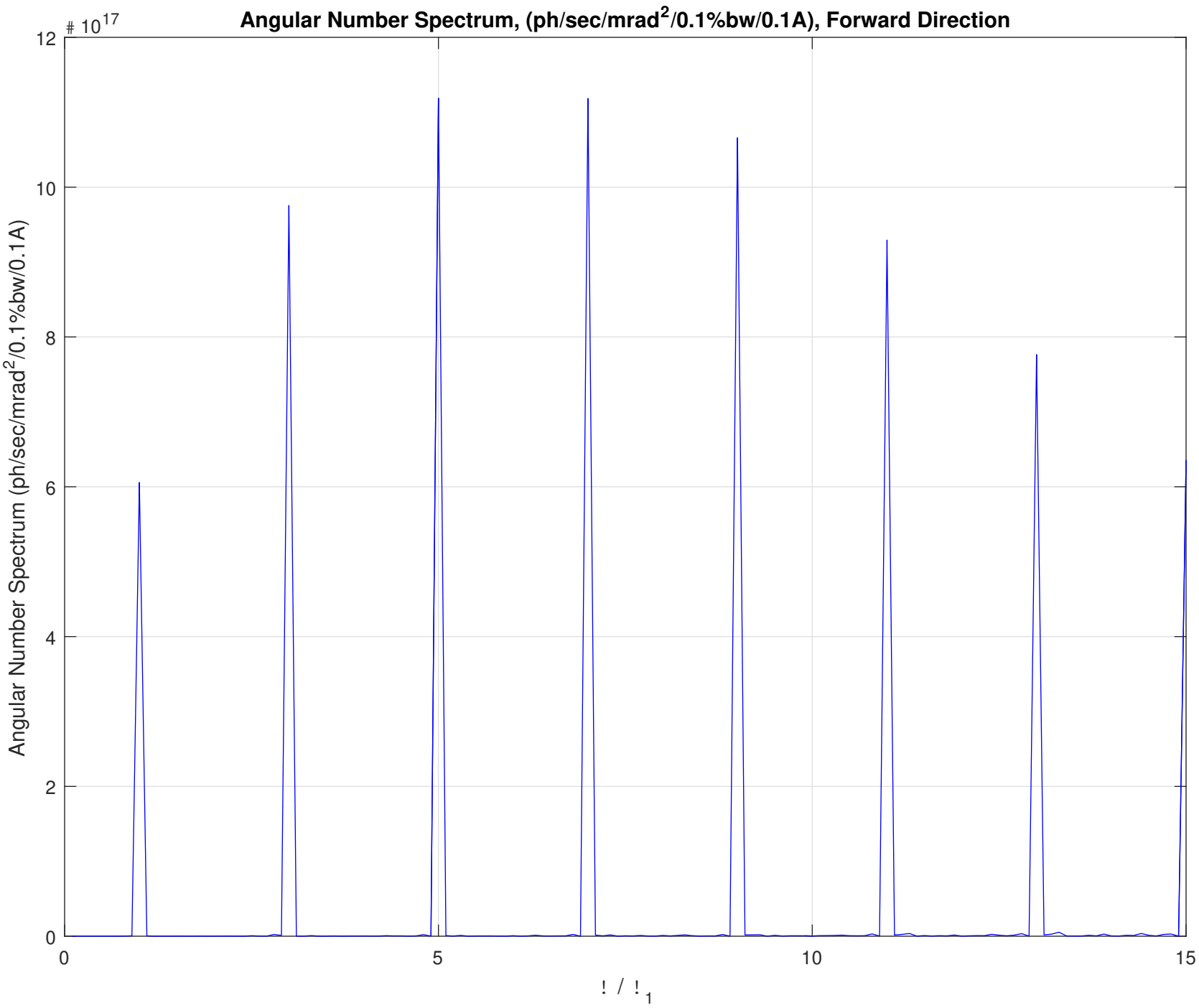

Phase Error At Field Peaks, No Ends, Trajectory Slope Corrected
12
43
74
106
137
168
199
Pole
10
8
6
4
2
0
-2
-4
-6
-8
-10
Phase Error (deg)
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
Z (m)
Phase Error: Ave = 0.000000 deg, RMS = 2.581807 deg

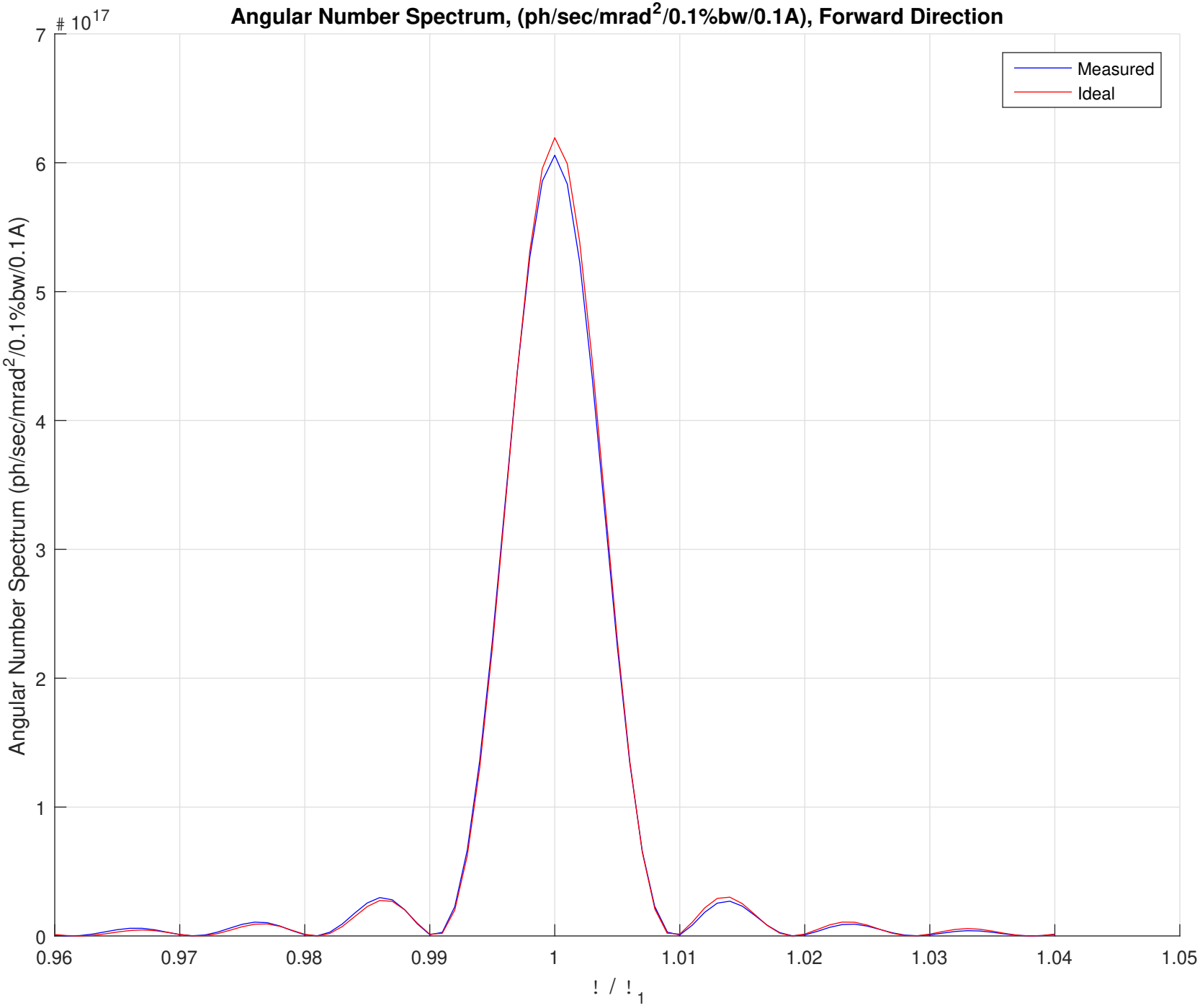

Phase Error Relative To Nominal Radiation Wave At Field Peaks, No Ends
12
43
74
106
137
168
199
Pole
-1100
-1120
-1140
-1160
-1180
-1200
-1220
-1240
Phase Error (deg)
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
Z (m)

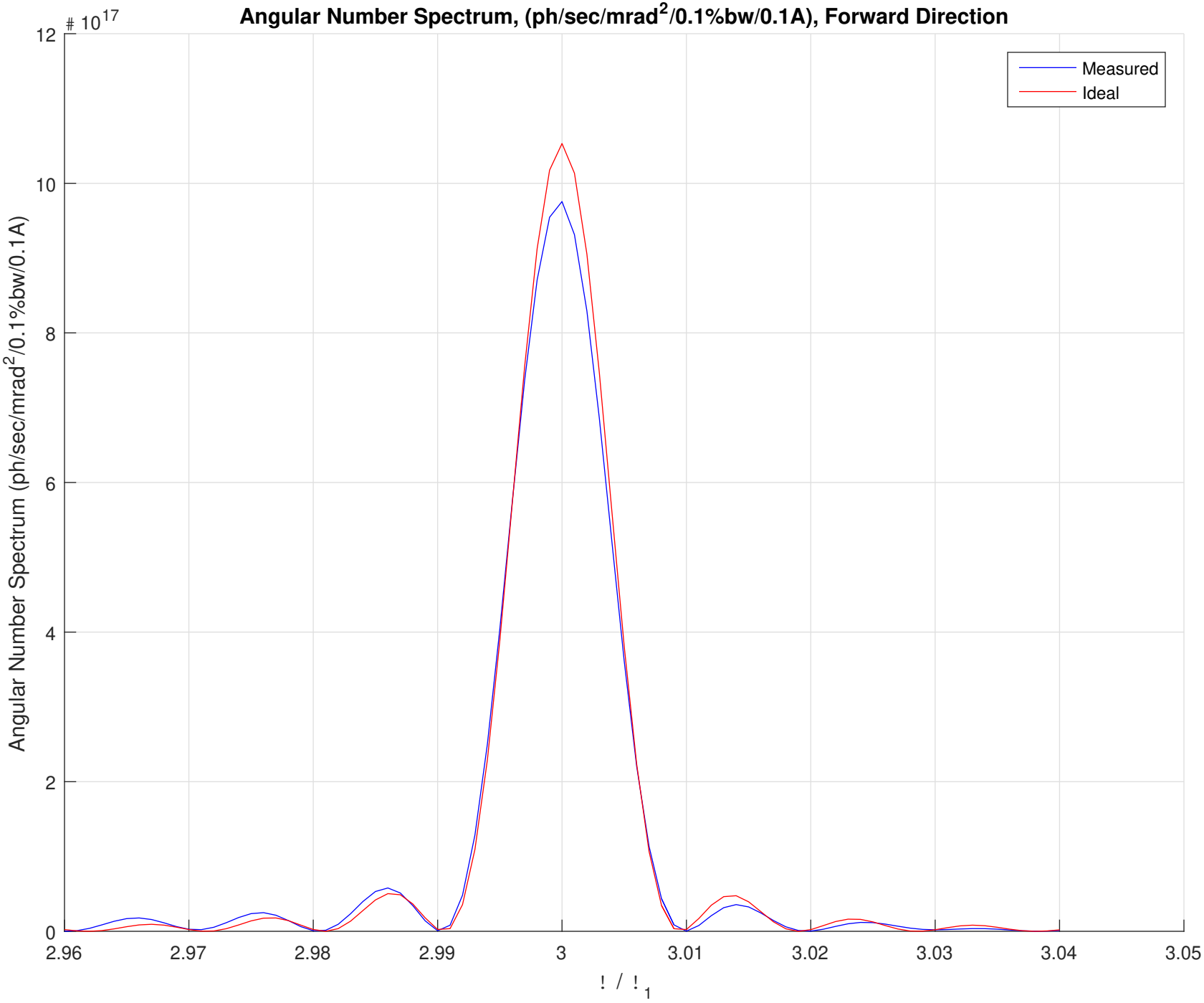

Phase Integral And Effective Length
10^-5
PI
Fit
Effective Length = 3.331600 m
Phase Integral (T^2m^3)
Z (m)
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5

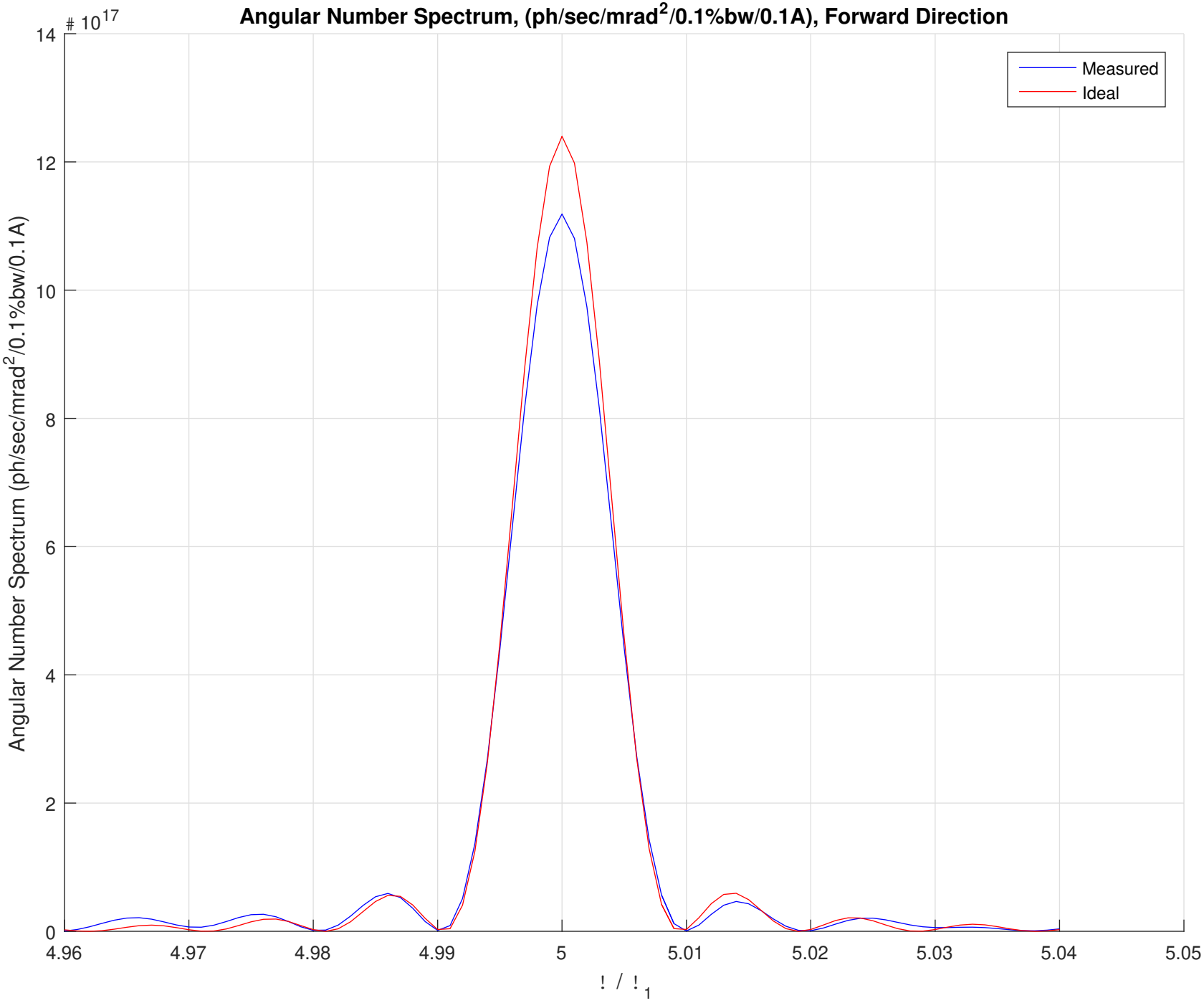

Re and Im Parts Of Ex(!), Forward Direction, ! = !1
90
5e-12
120
60
4e-12
3e-12
150
30
2e-12
1e-12
180
0
210
330
240
300
270


Re and Im Parts Of Ey(!), Forward Direction, ! = !1
90
2e-14
120
60
150
1e-14
30
180
0
210
330
240
300
270


Angular Number Spectrum, (ph/sec/mrad^2/0.1%bw/0.1A), Forward Direction
10^{17}
Angular Number Spectrum (ph/sec/mrad^2/0.1%bw/0.1A)
12
10
8
6
4
2
0
0
5
10
15
! / !$_1$


Angular Number Spectrum, (ph/sec/mrad^2/0.1%bw/0.1A), Forward Direction
10^{17}
Angular Number Spectrum (ph/sec/mrad^2/0.1%bw/0.1A)
! / $!_1$
Measured
Ideal
0
1
2
3
4
5
6
7
0.96
0.97
0.98
0.99
1
1.01
1.02
1.03
1.04
1.05


Angular Number Spectrum, (ph/sec/mrad^2/0.1%bw/0.1A), Forward Direction
10^{17}
Measured
Ideal
Angular Number Spectrum (ph/sec/mrad^2/0.1%bw/0.1A)
12
10
8
6
4
2
0
2.96
2.97
2.98
2.99
3
3.01
3.02
3.03
3.04
3.05
! / !$_1$


Angular Number Spectrum, (ph/sec/mrad^2/0.1%bw/0.1A), Forward Direction
10^{17}
Measured
Ideal
Angular Number Spectrum (ph/sec/mrad^2/0.1%bw/0.1A)
14
12
10
8
6
4
2
0
4.96
4.97
4.98
4.99
5
5.01
5.02
5.03
5.04
5.05
! / !$_1$