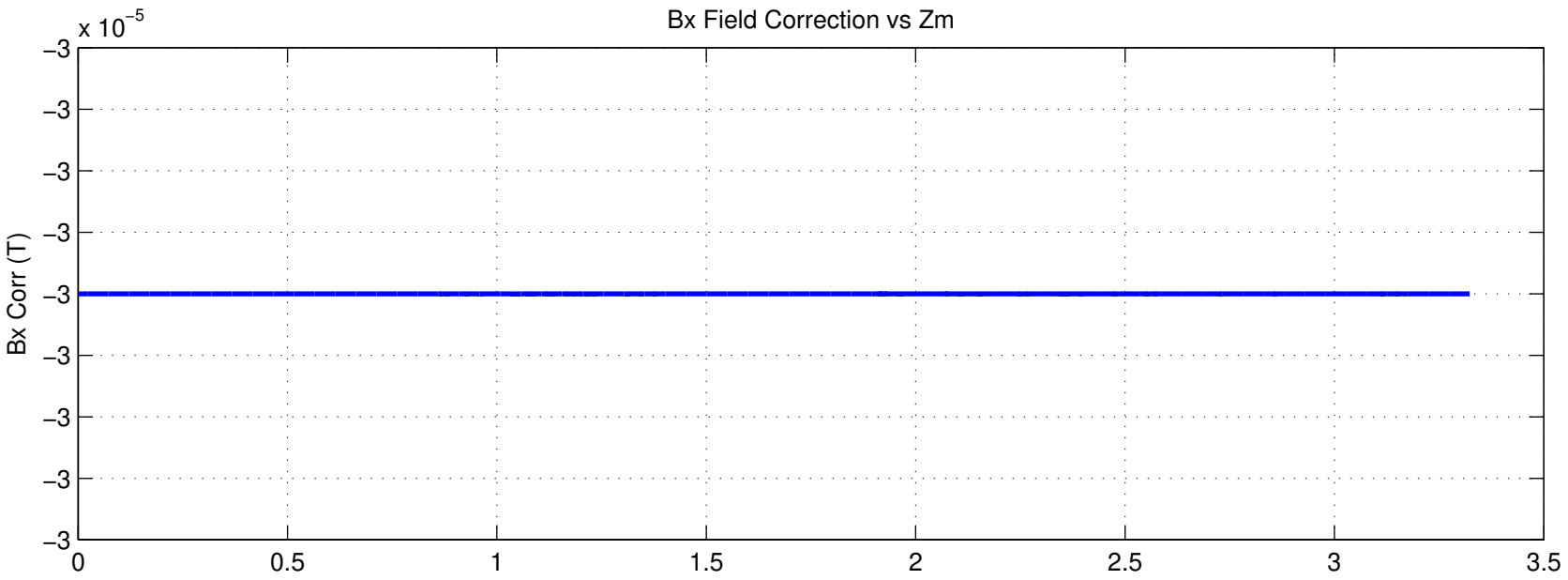
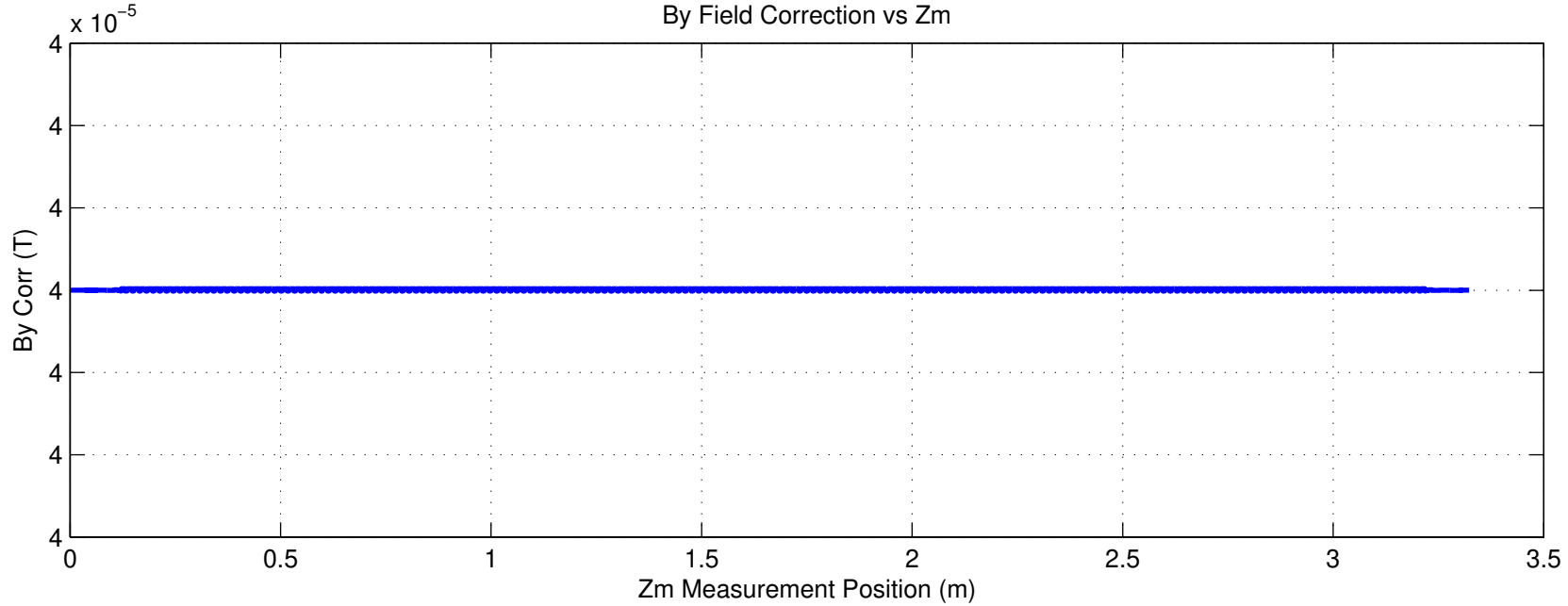
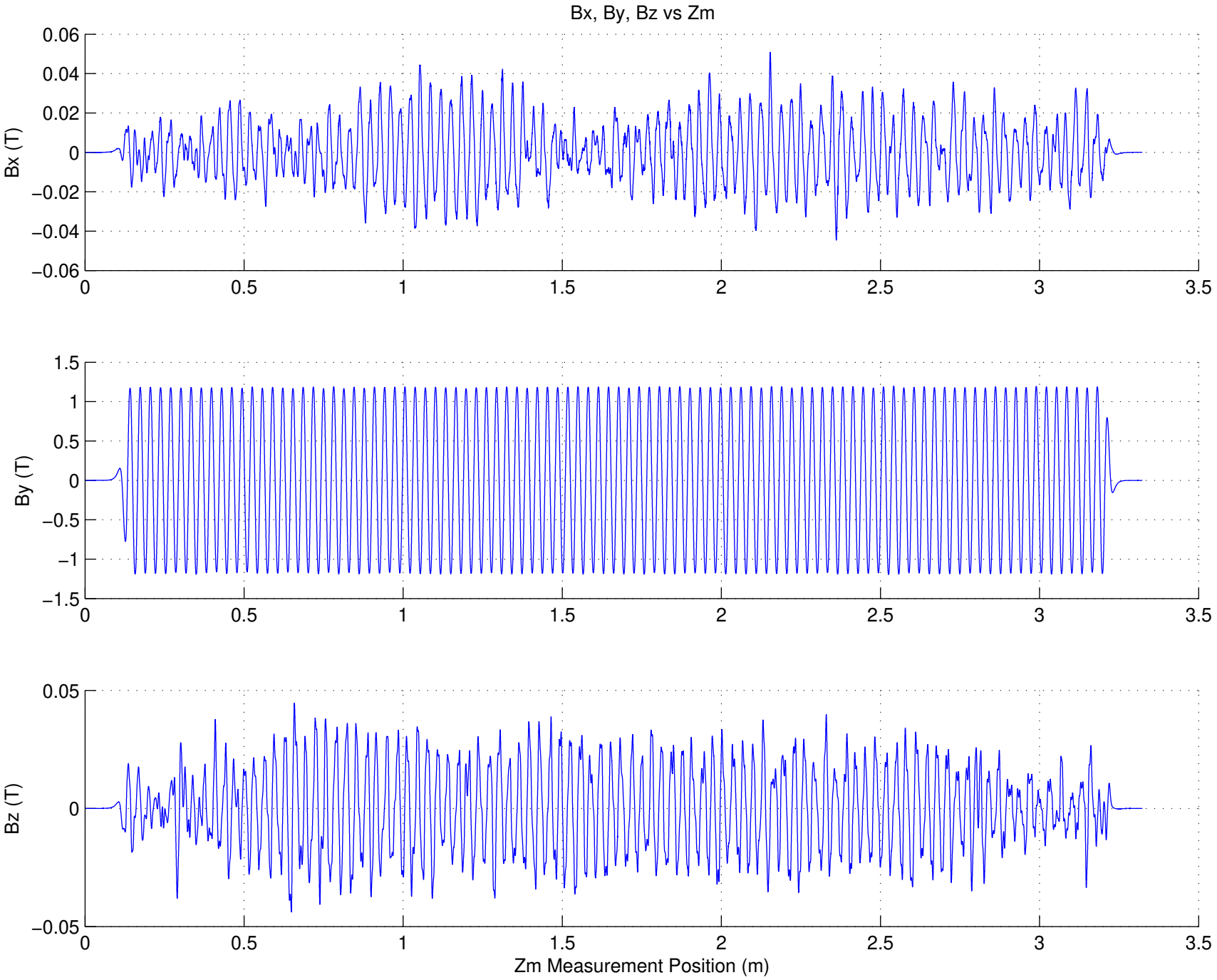
SLAC Magnetic Measurements

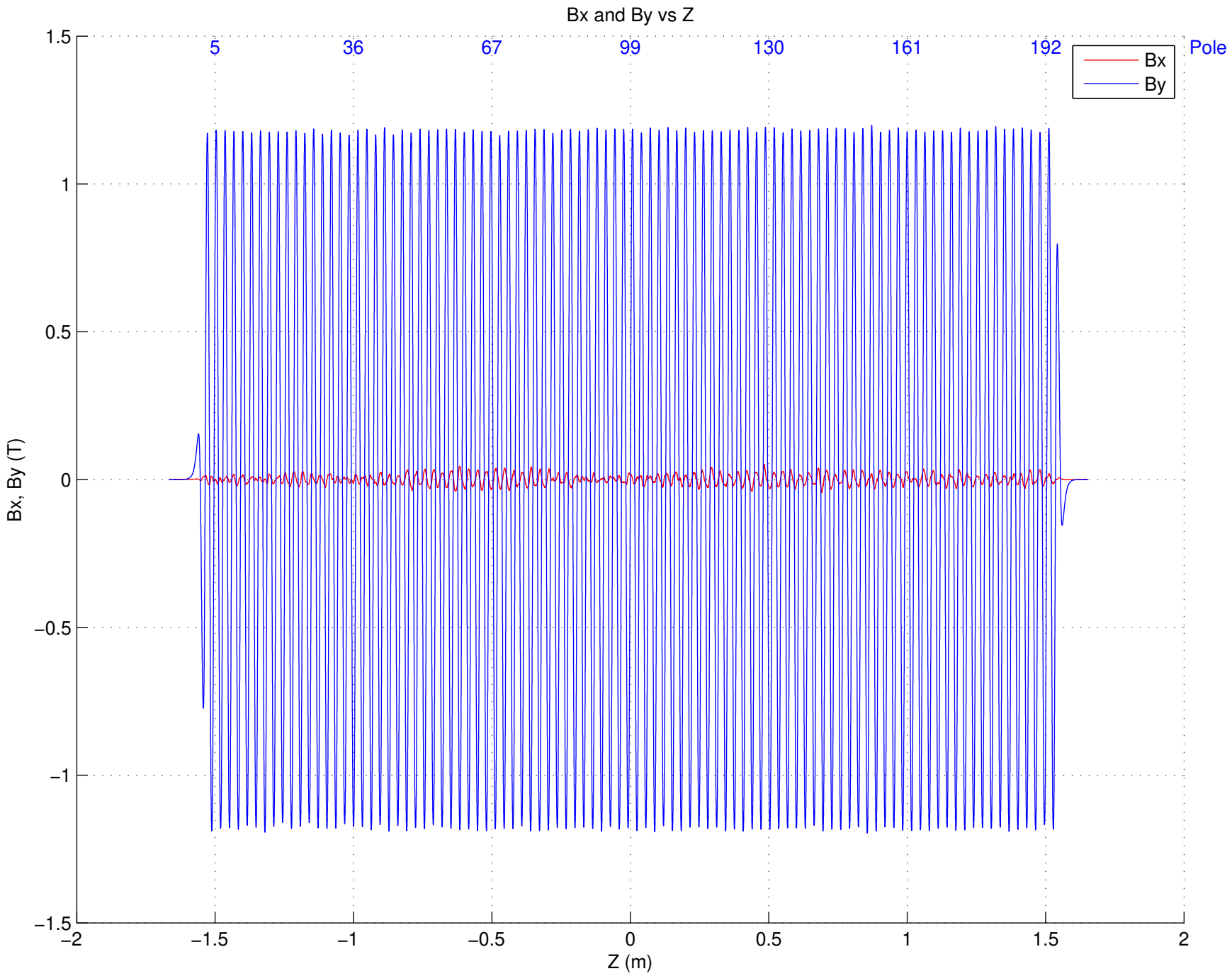
EPU Analysis
−−−−−−−−−−−

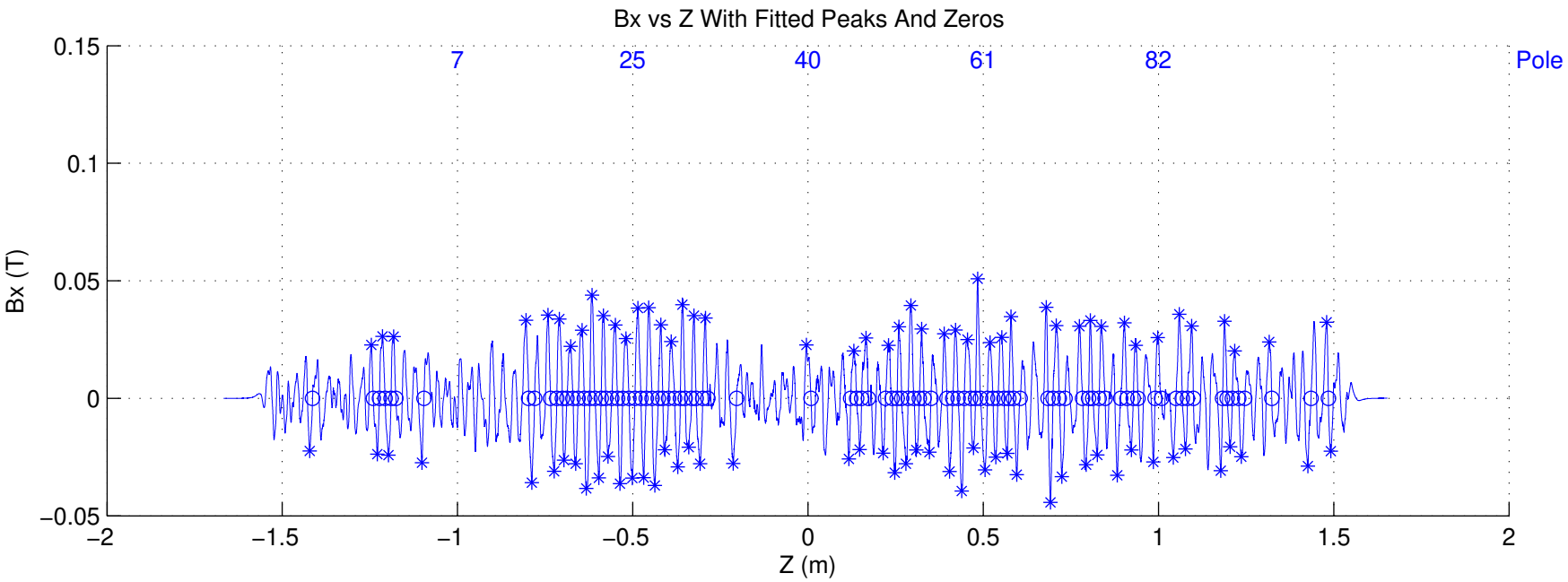
Parameters:
INPUT−FILE−DIR =s:\MagData\LCLS\Undulator\DELTA\Data\Assembled Measurements\Run 011\MANUAL\Z+0000\
INPUT−FILE−NAME =hall2−anal−meas−field.dat
INPUT−FILE−TYPE =ZBXYZH
CORR−REQUIRED =1
GAMMA =26627.1
NOM−LAMBDA−U =0
NOM−K−VALUE =3.48
NOM−LAMBDA−R =0
NUM−POLES =196
NUM−END−POLES =4
CELL−LENGTH =3.126

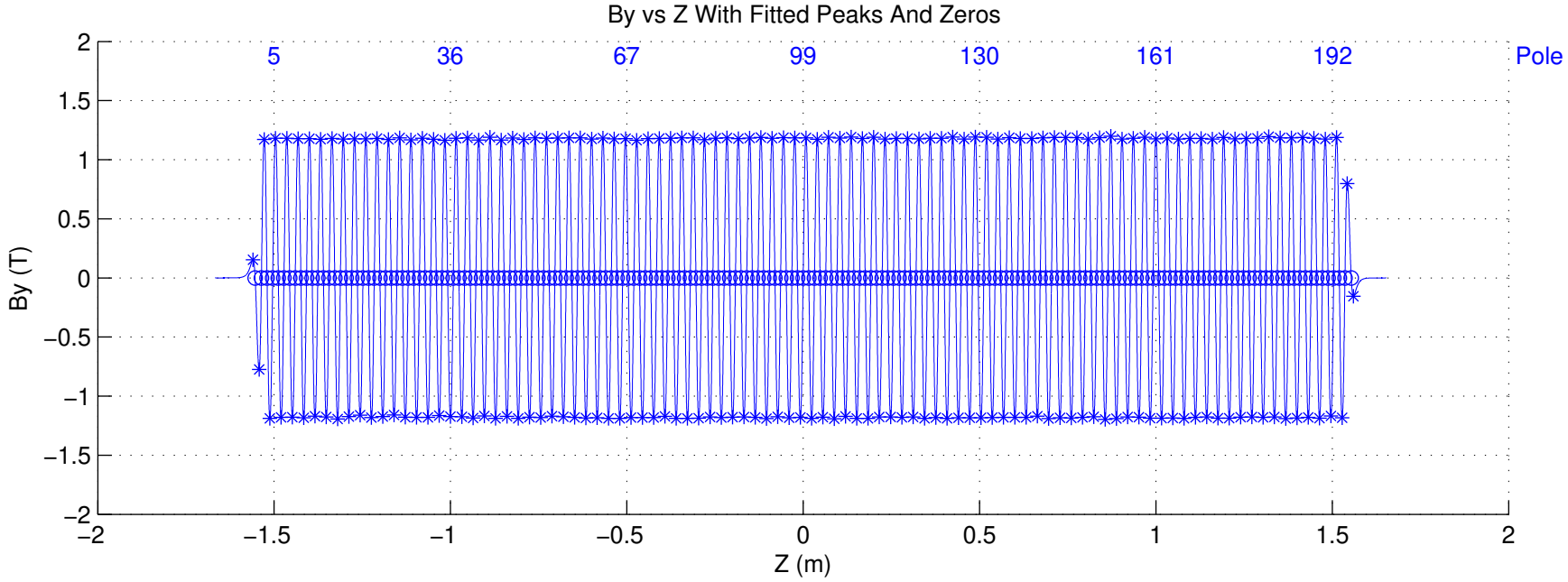

Bx Field Correction vs Zm
x 10^-5
−3
−3
−3
−3
−3
−3
−3
−3
Bx Corr (T)
0
0.5
1
1.5
2
2.5
3
3.5

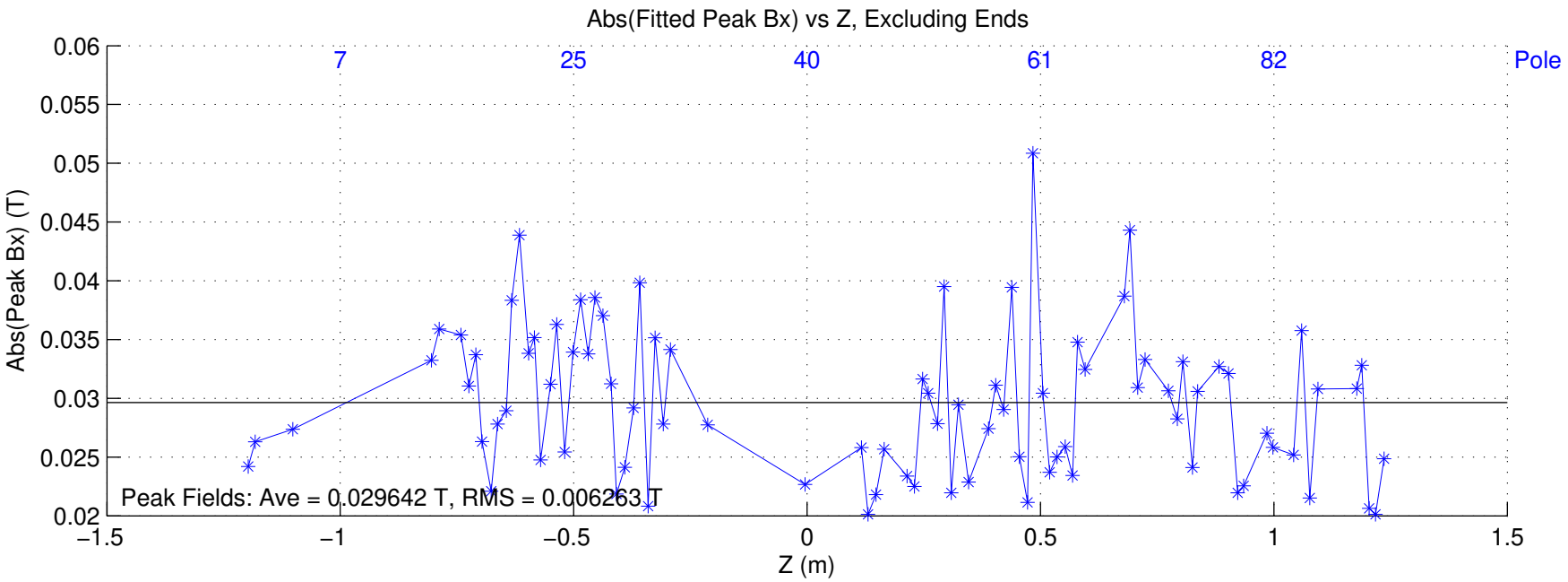

By Field Correction vs Zm
x 10^-5
4
4
4
4
4
4
4
4
By Corr (T)
0
0.5
1
1.5
2
2.5
3
3.5
Zm Measurement Position (m)

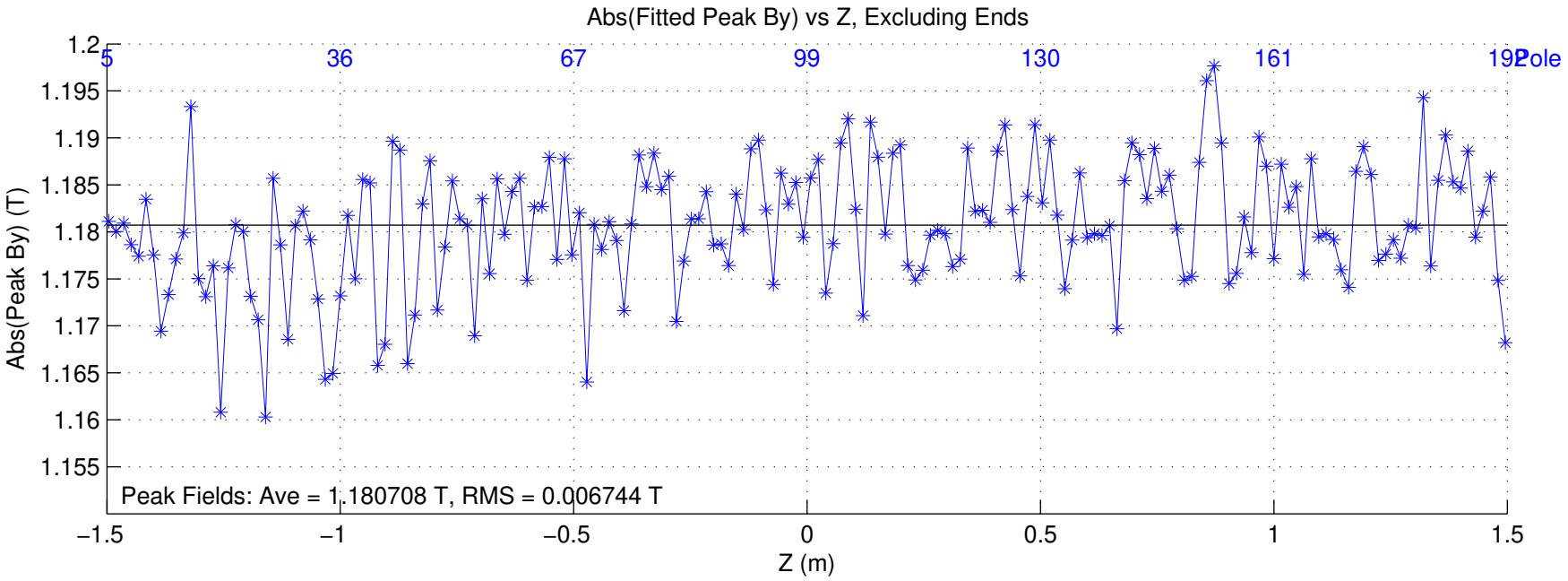

Bx, By, Bz vs Zm
Bx (T)
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
By (T)
1.5
1
0.5
0
−0.5
−1
−1.5
Bz (T)
0.05
0
−0.05
0
0.5
1
1.5
2
2.5
3
3.5
Zm Measurement Position (m)

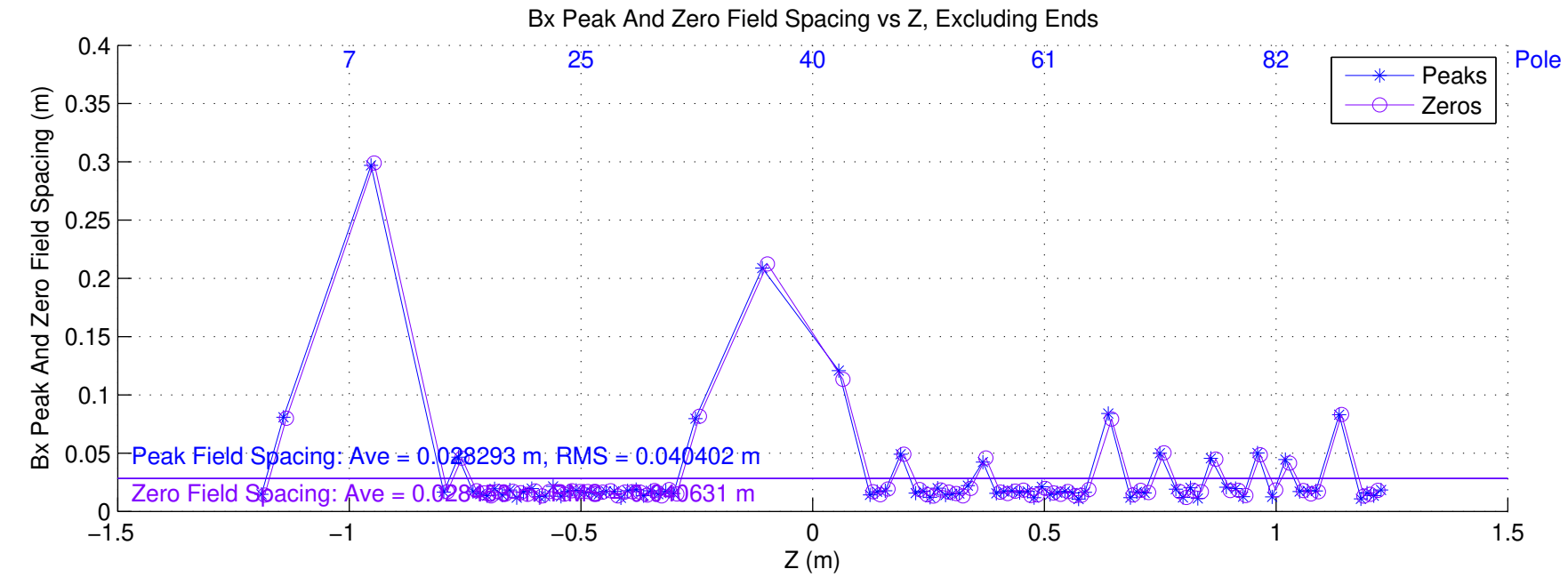

Bx and By vs Z
5
36
67
99
130
161
192
Pole
Bx
By
1.5
1
0.5
0
−0.5
−1
−1.5
Bx, By (T)
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)

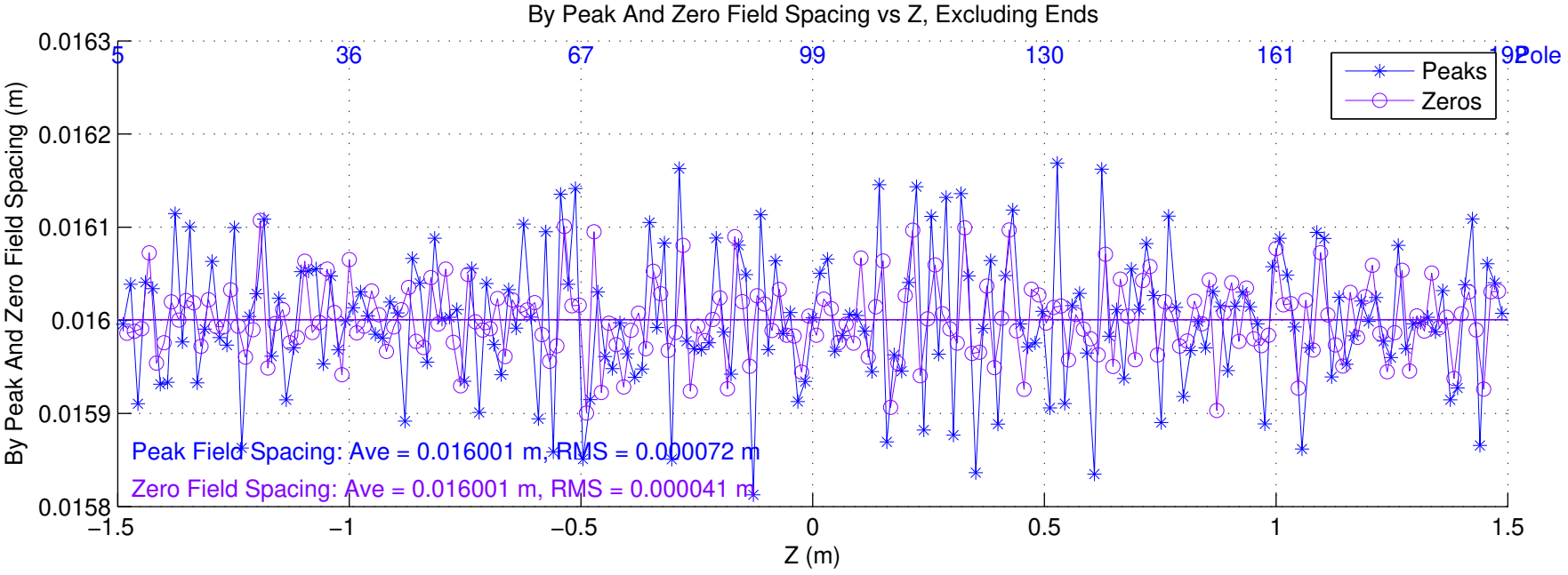

Bx vs Z With Fitted Peaks And Zeros
7
25
40
61
82
Pole
0.15
0.1
0.05
0
−0.05
Bx (T)
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)

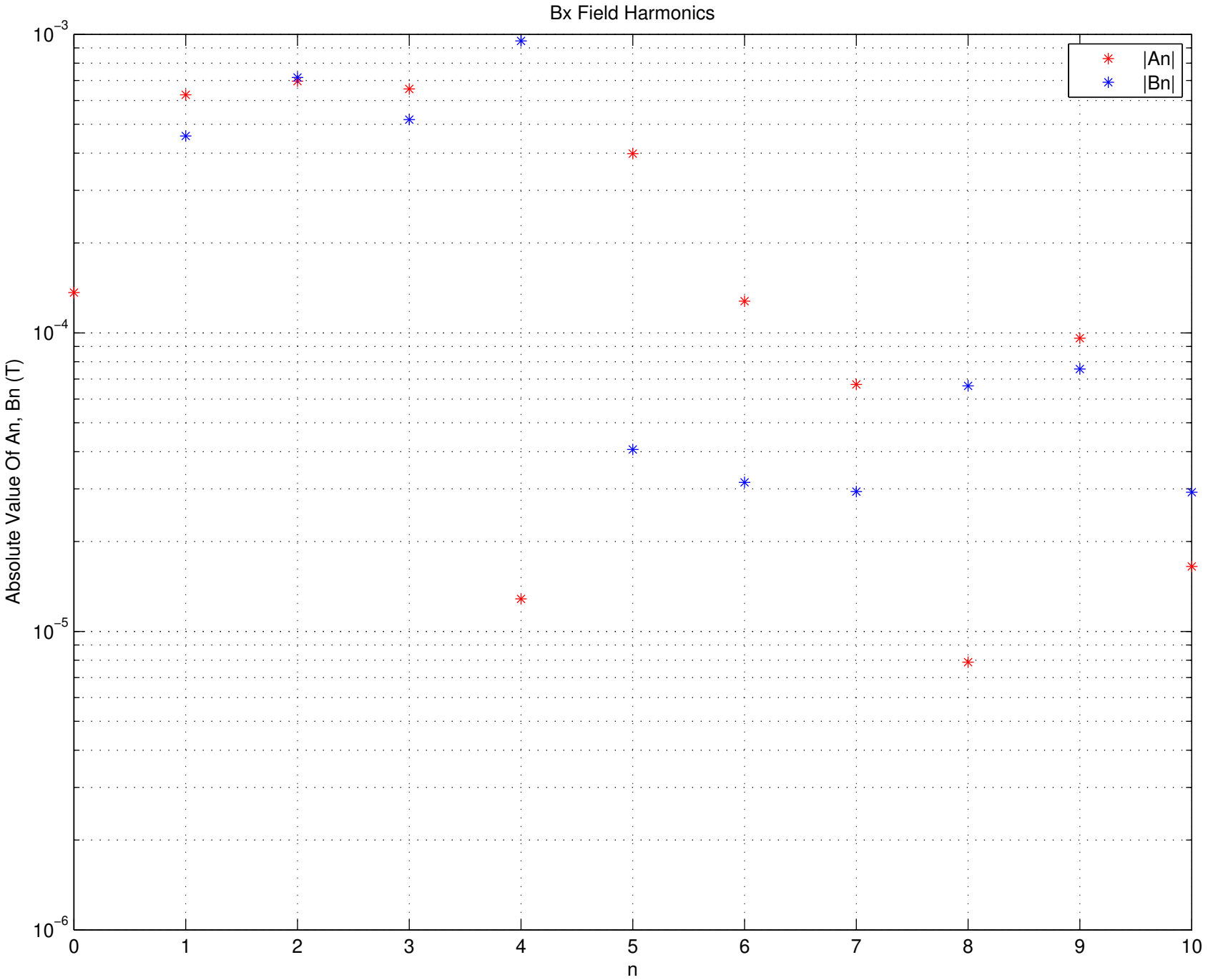

By vs Z With Fitted Peaks And Zeros
5
36
67
99
130
161
192
Pole
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2
By (T)
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)

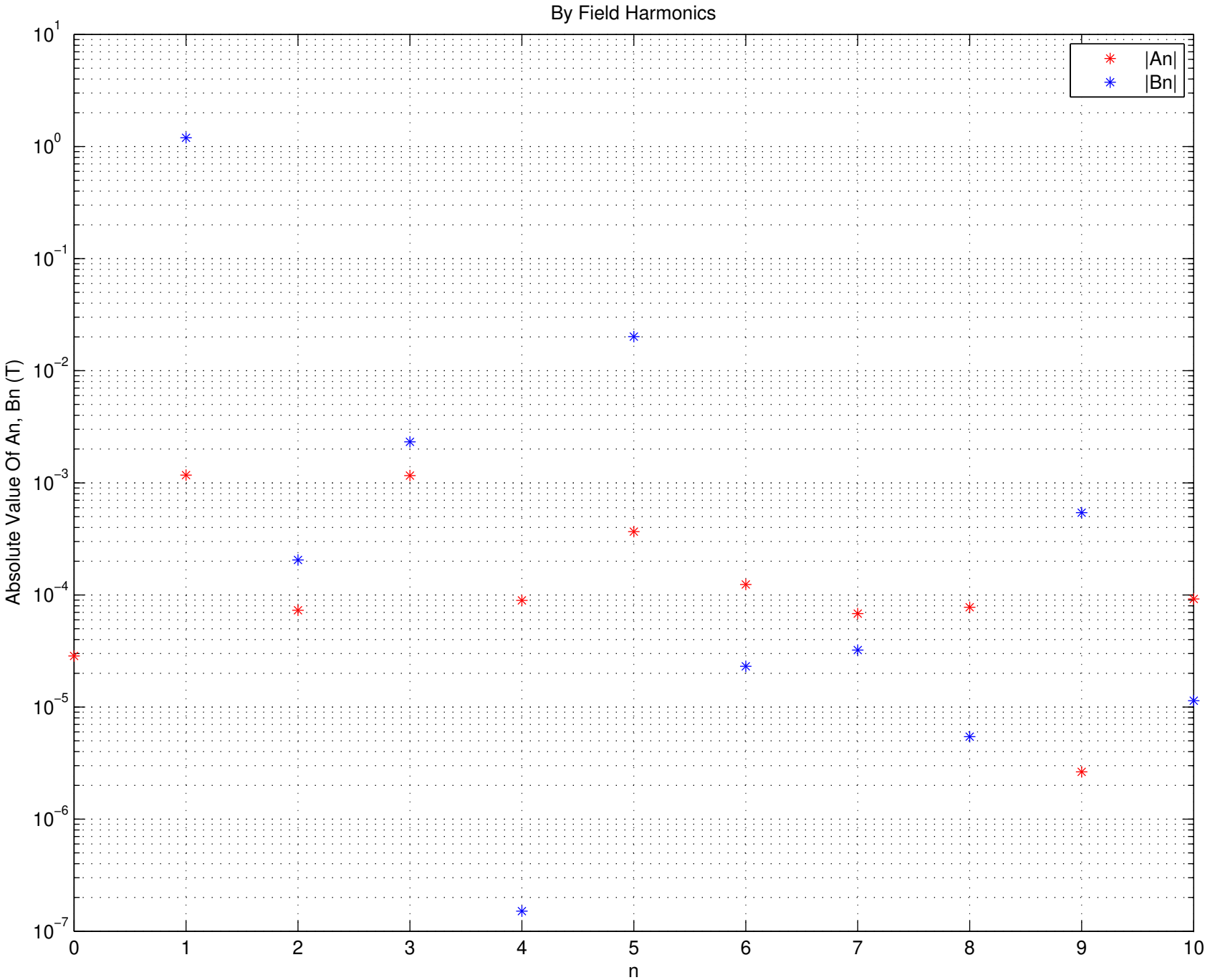

Abs(Fitted Peak Bx) vs Z, Excluding Ends
7
25
40
61
82
Pole
0.06
0.055
0.05
0.045
0.04
0.035
0.03
0.025
0.02
Abs(Peak Bx) (T)
Peak Fields: Ave = 0.029642 T, RMS = 0.006263 T
−1.5
−1
−0.5
0
0.5
1
1.5
Z (m)

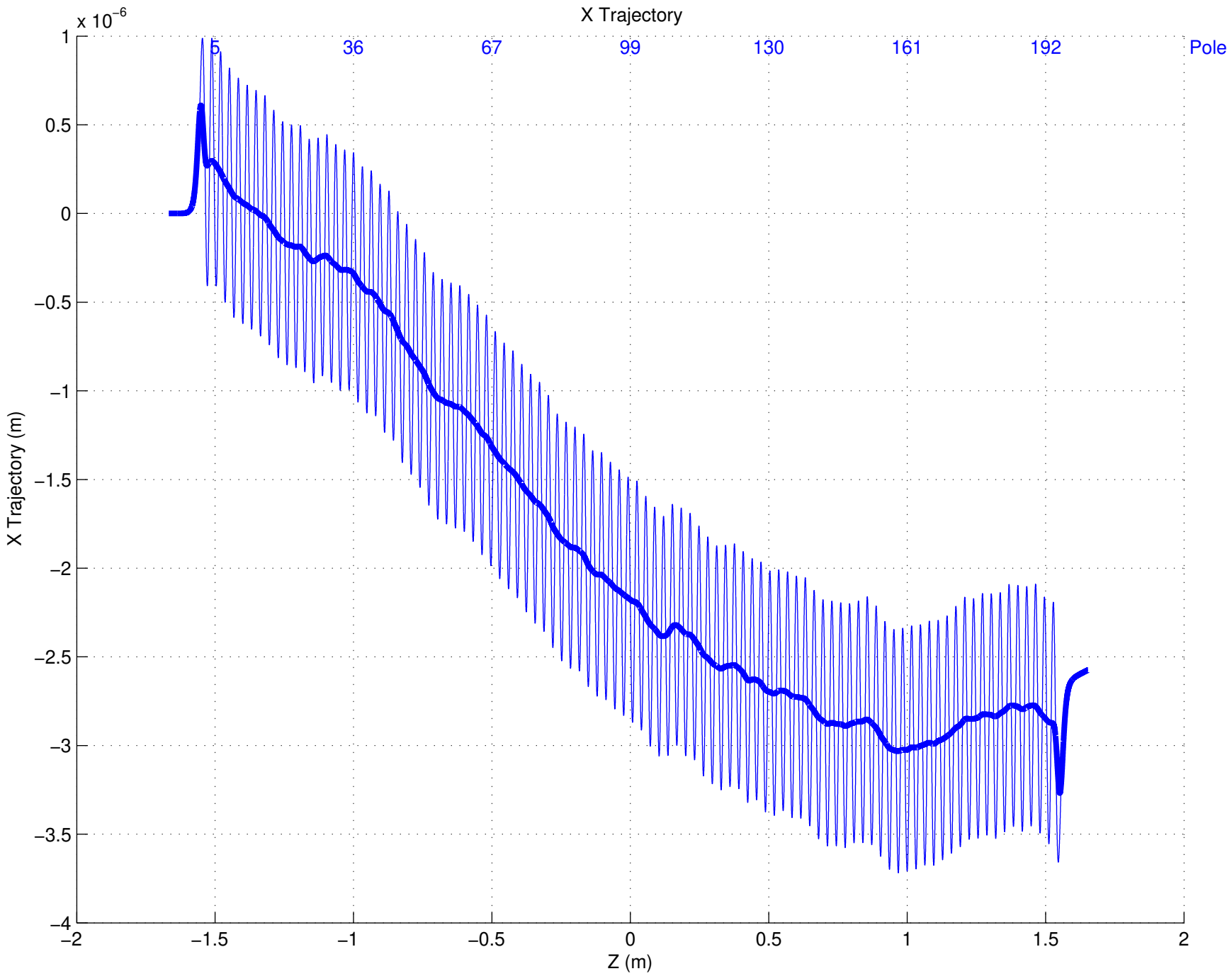

Abs(Fitted Peak By) vs Z, Excluding Ends
5
36
67
99
130
161
192
Pole
1.2
1.195
1.19
1.185
1.18
1.175
1.17
1.165
1.16
1.155
Abs(Peak By) (T)
Peak Fields: Ave = 1.180708 T, RMS = 0.006744 T
−1.5
−1
−0.5
0
0.5
1
1.5
Z (m)

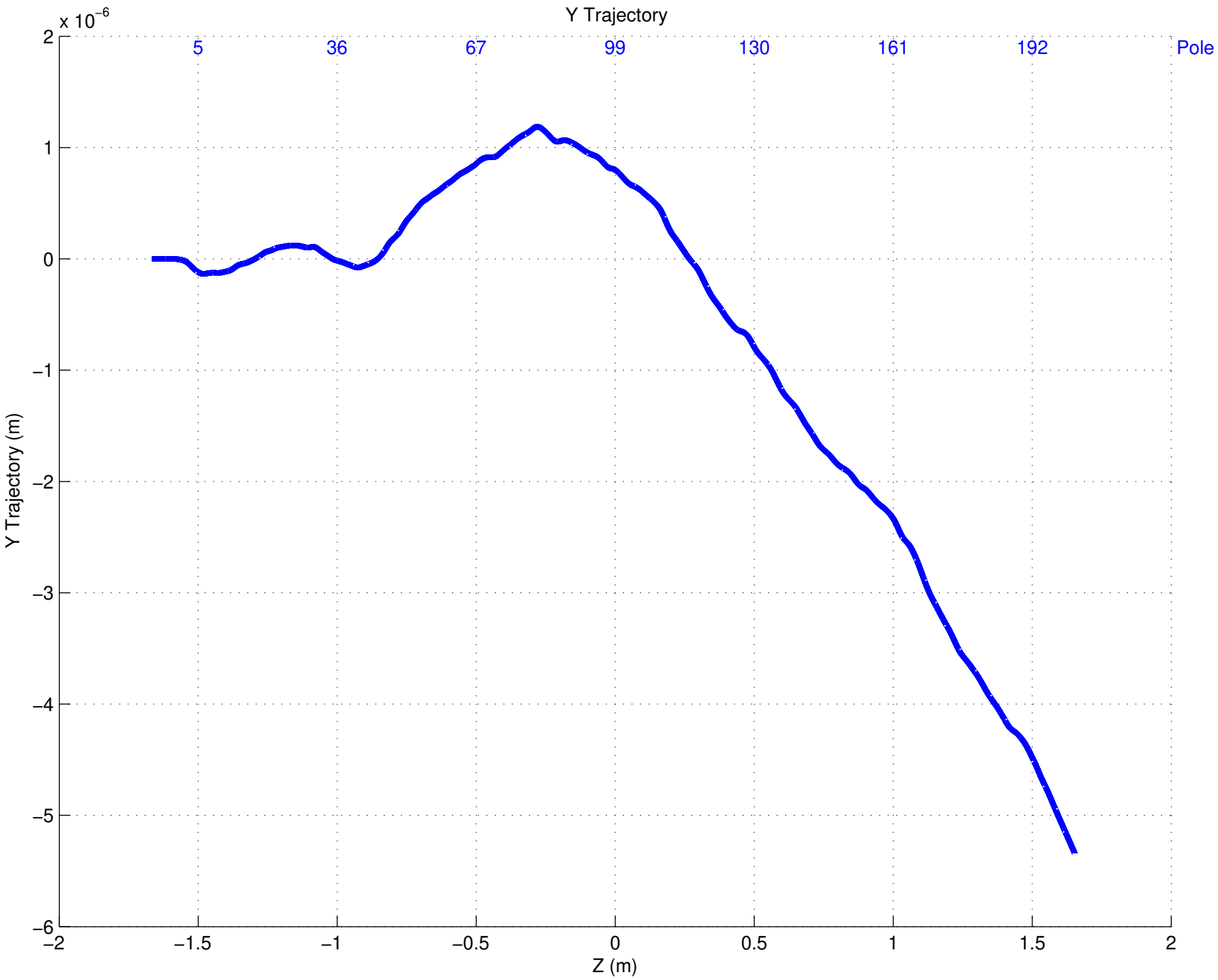

Bx Peak And Zero Field Spacing vs Z, Excluding Ends
Bx Peak And Zero Field Spacing (m)
Z (m)
7
25
40
61
82
Pole
Peaks
Zeros
Peak Field Spacing: Ave = 0.028293 m, RMS = 0.040402 m
Zero Field Spacing: Ave = 0.028
0631 m

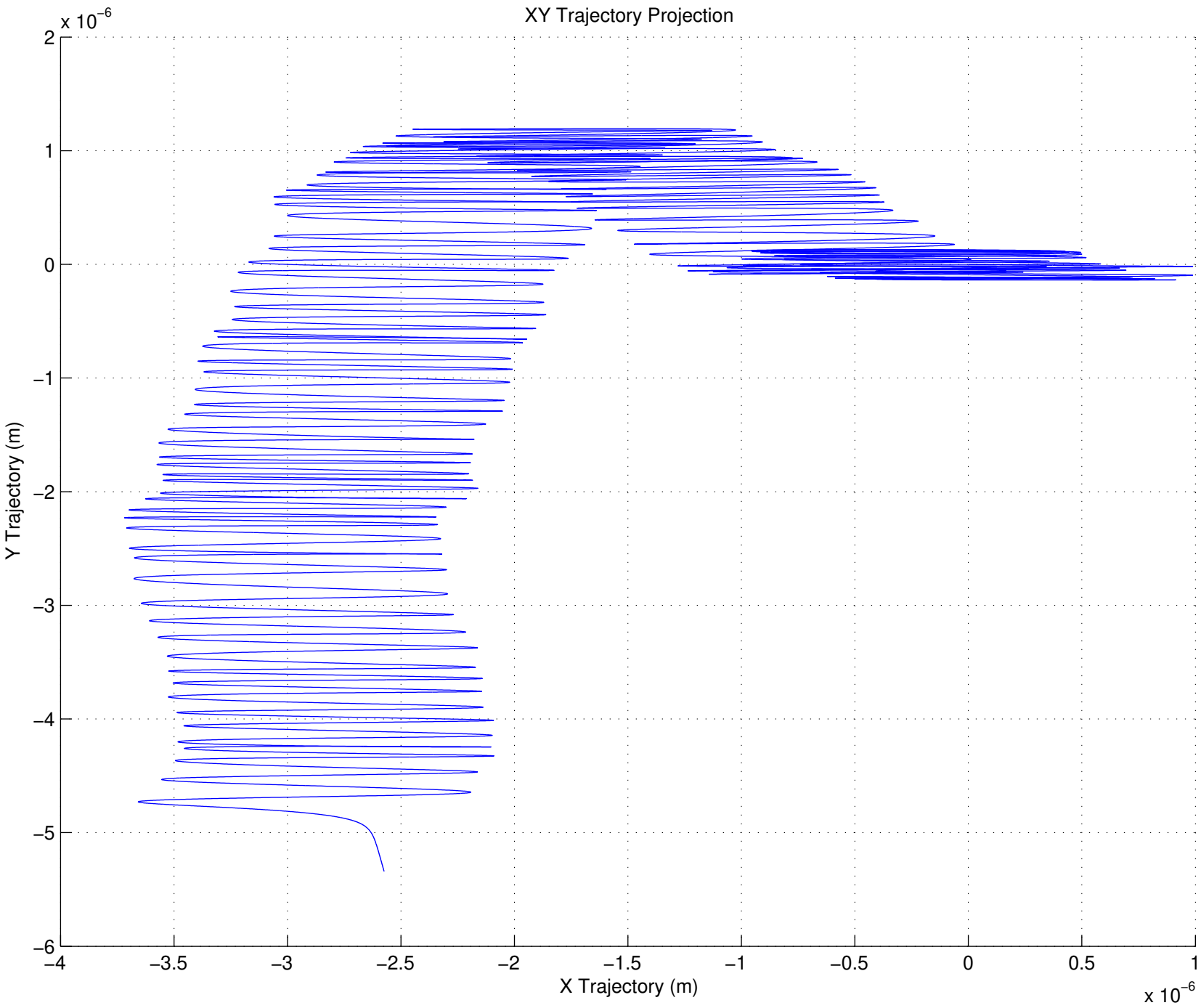

By Peak And Zero Field Spacing vs Z, Excluding Ends
By Peak And Zero Field Spacing (m)
Z (m)
5
36
67
99
130
161
192
Pole
Peaks
Zeros
Peak Field Spacing: Ave = 0.016001 m, RMS = 0.000072 m
Zero Field Spacing: Ave = 0.016001 m, RMS = 0.000041 m

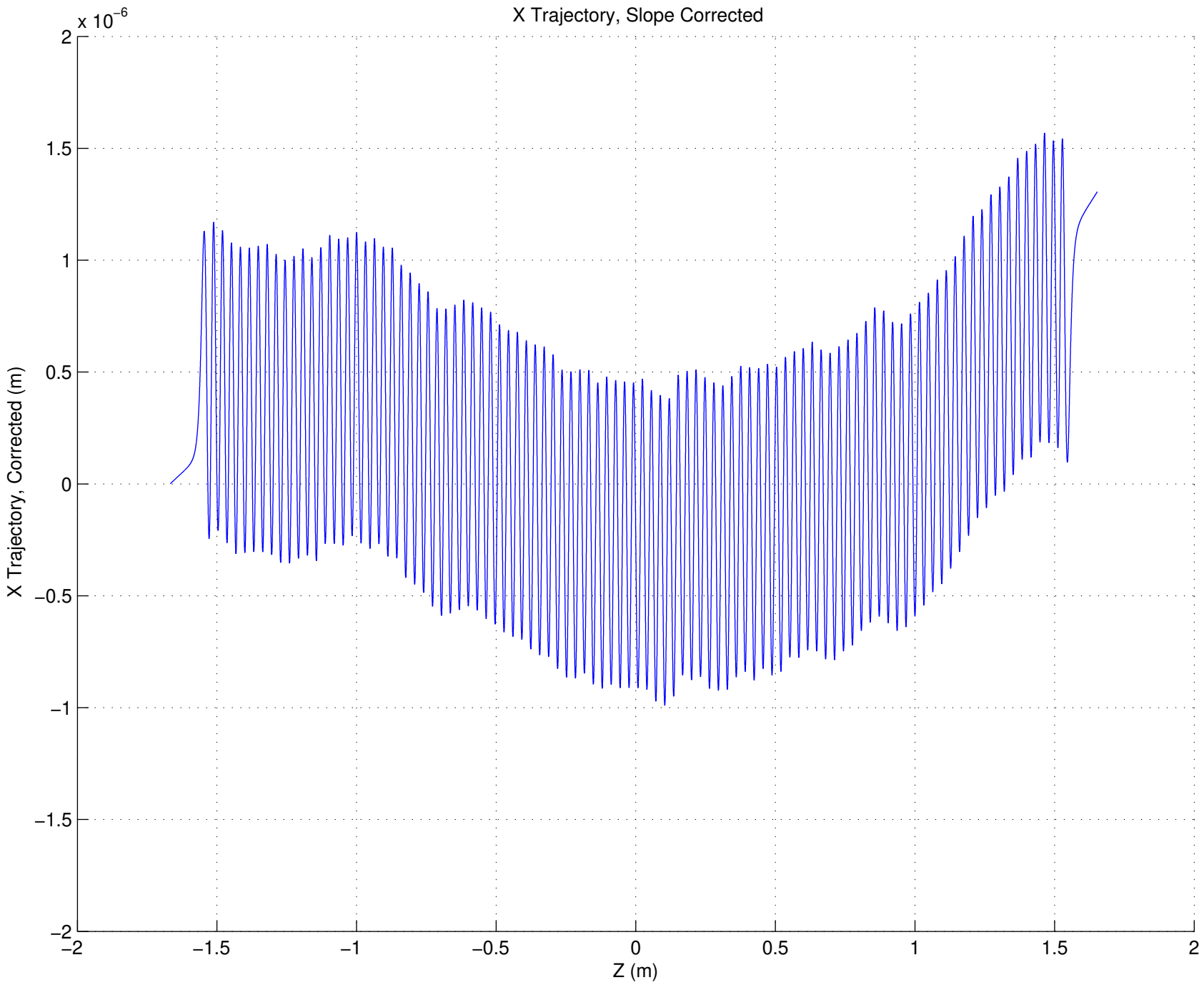

Bx Field Harmonics
|An|
|Bn|
Absolute Value Of An, Bn (T)
n
10^{-3}
10^{-4}
10^{-5}
10^{-6}
0
1
2
3
4
5
6
7
8
9
10

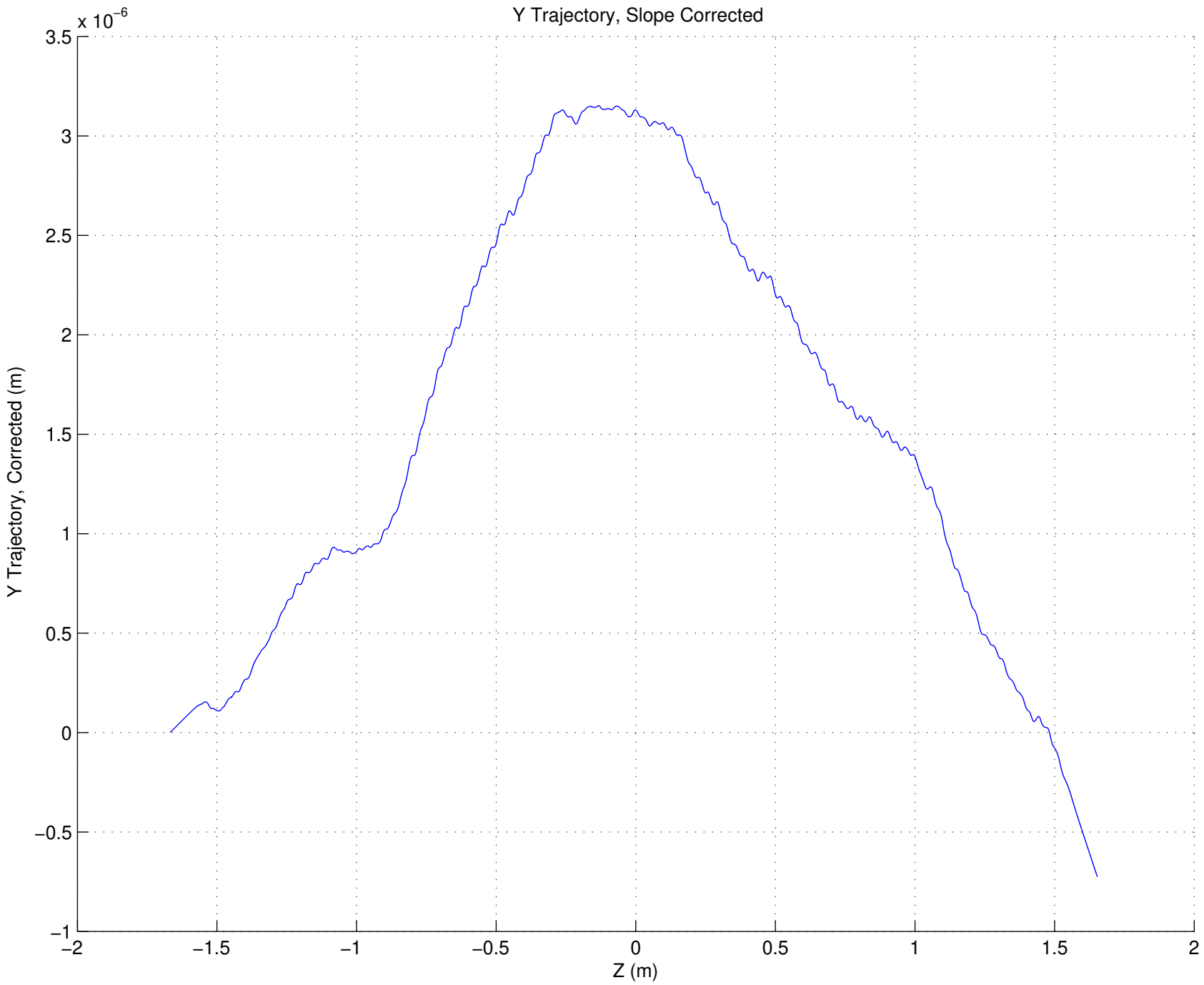

By Field Harmonics
|An|
|Bn|
Absolute Value Of An, Bn (T)
n
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
0
1
2
3
4
5
6
7
8
9
10

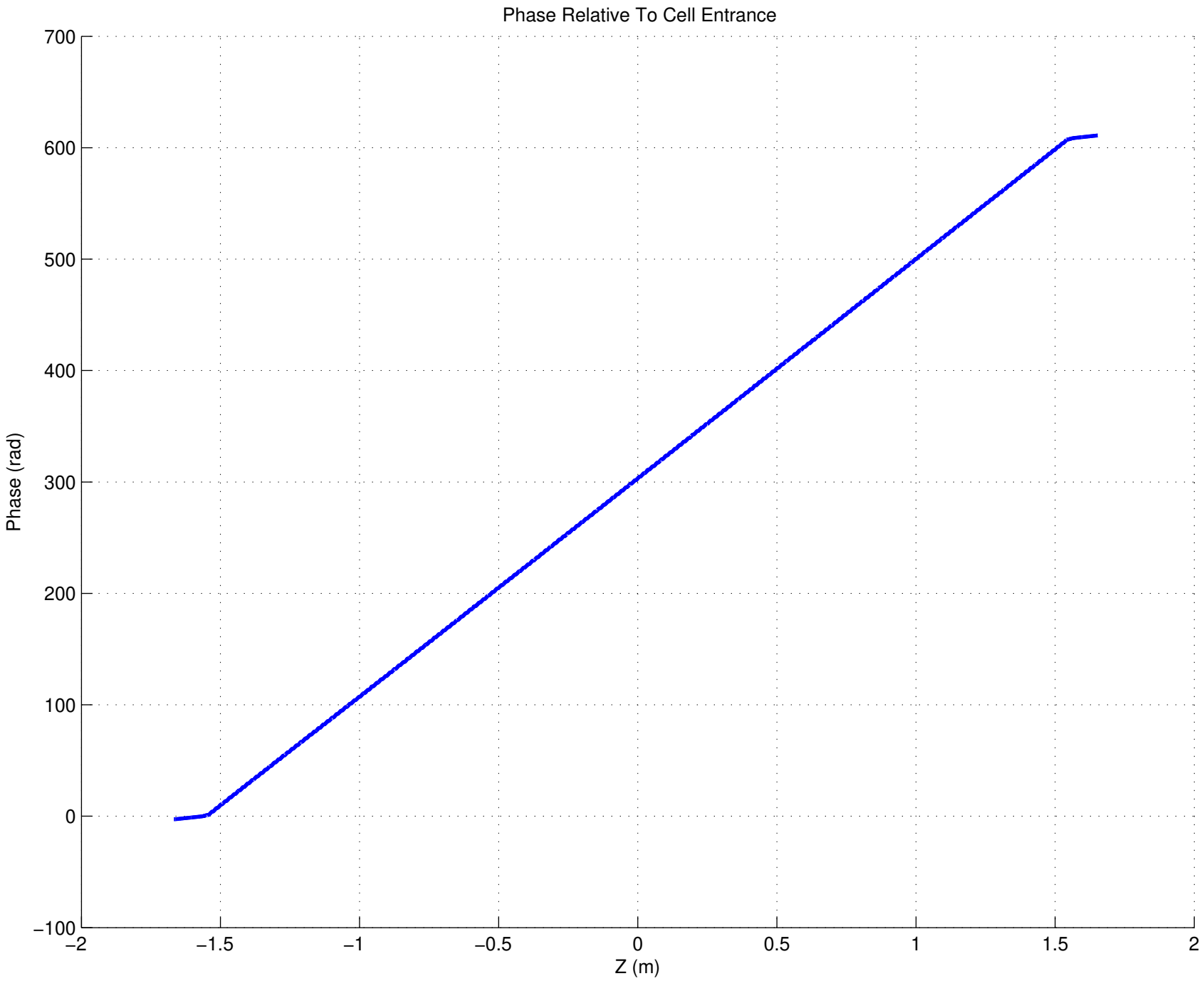

X Trajectory
x 10^-6
5
36
67
99
130
161
192
Pole
1
0.5
0
−0.5
−1
−1.5
−2
−2.5
−3
−3.5
−4
X Trajectory (m)
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)

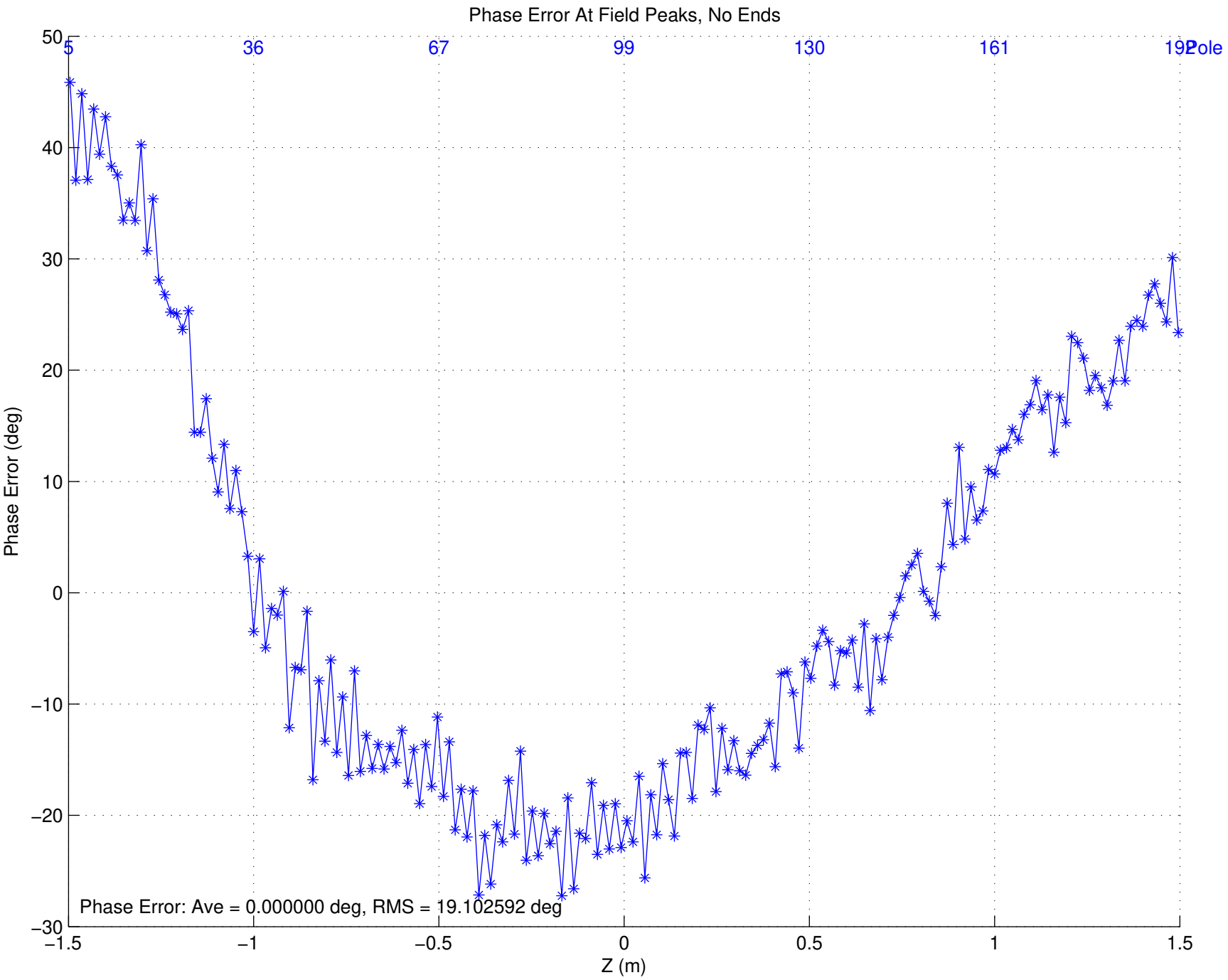

Y Trajectory
x 10^-6
5
36
67
99
130
161
192
Pole
2
1
0
−1
−2
−3
−4
−5
−6
Y Trajectory (m)
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)

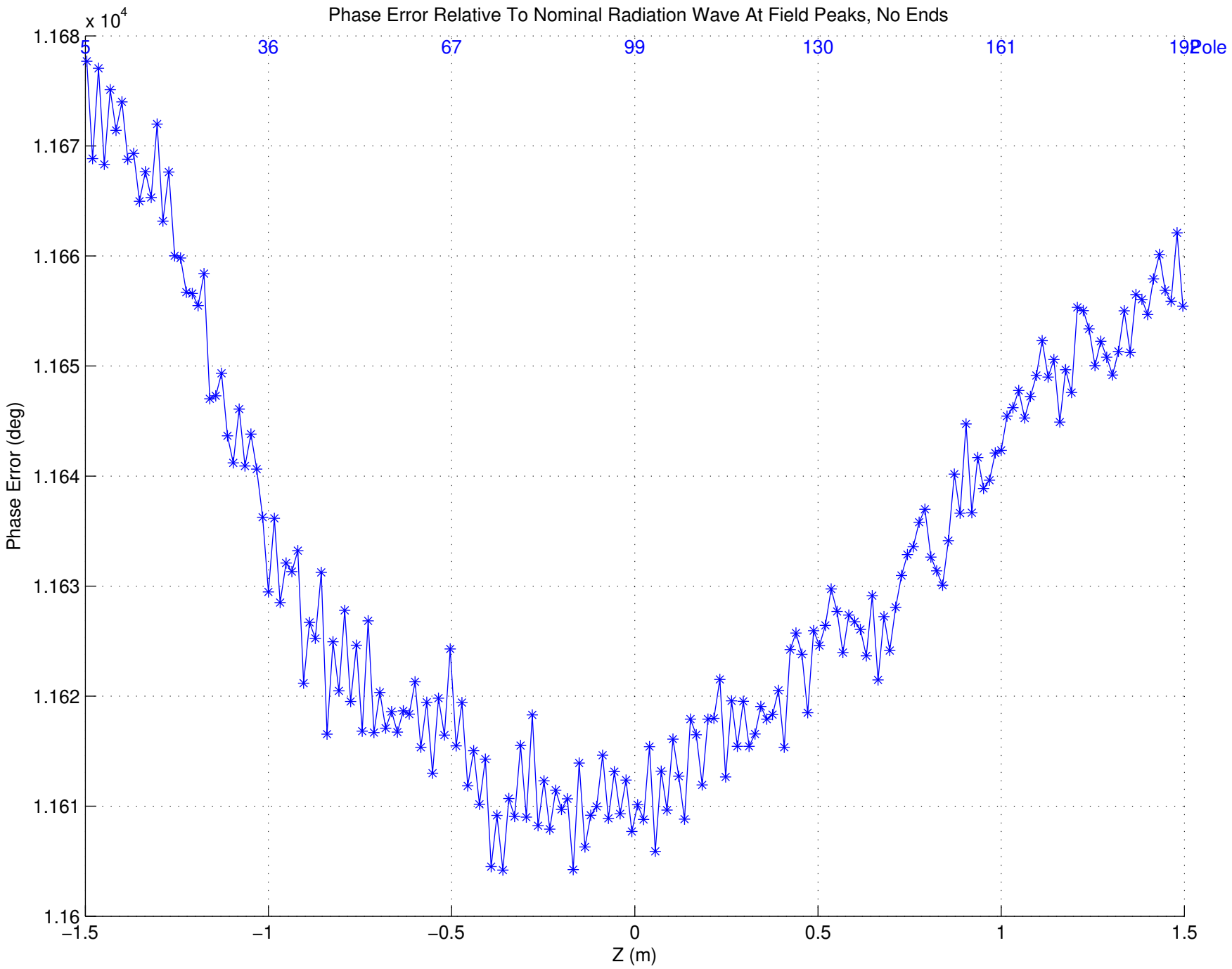

XY Trajectory Projection
x 10^-6
2
1
0
−1
−2
−3
−4
−5
−6
Y Trajectory (m)
−4
−3.5
−3
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
X Trajectory (m)
x 10^-6

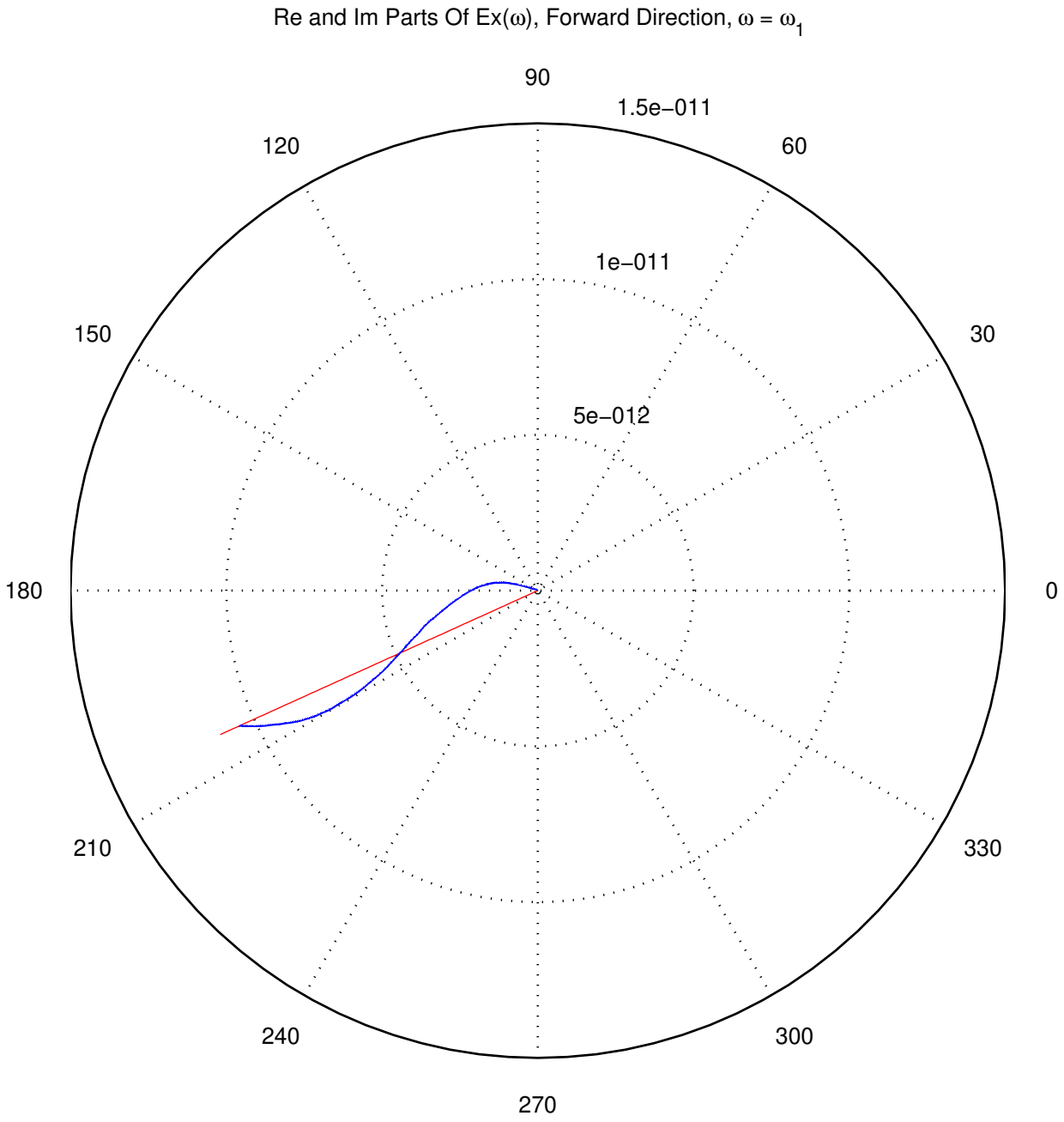

X Trajectory, Slope Corrected
x 10^-6
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2
X Trajectory, Corrected (m)
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)

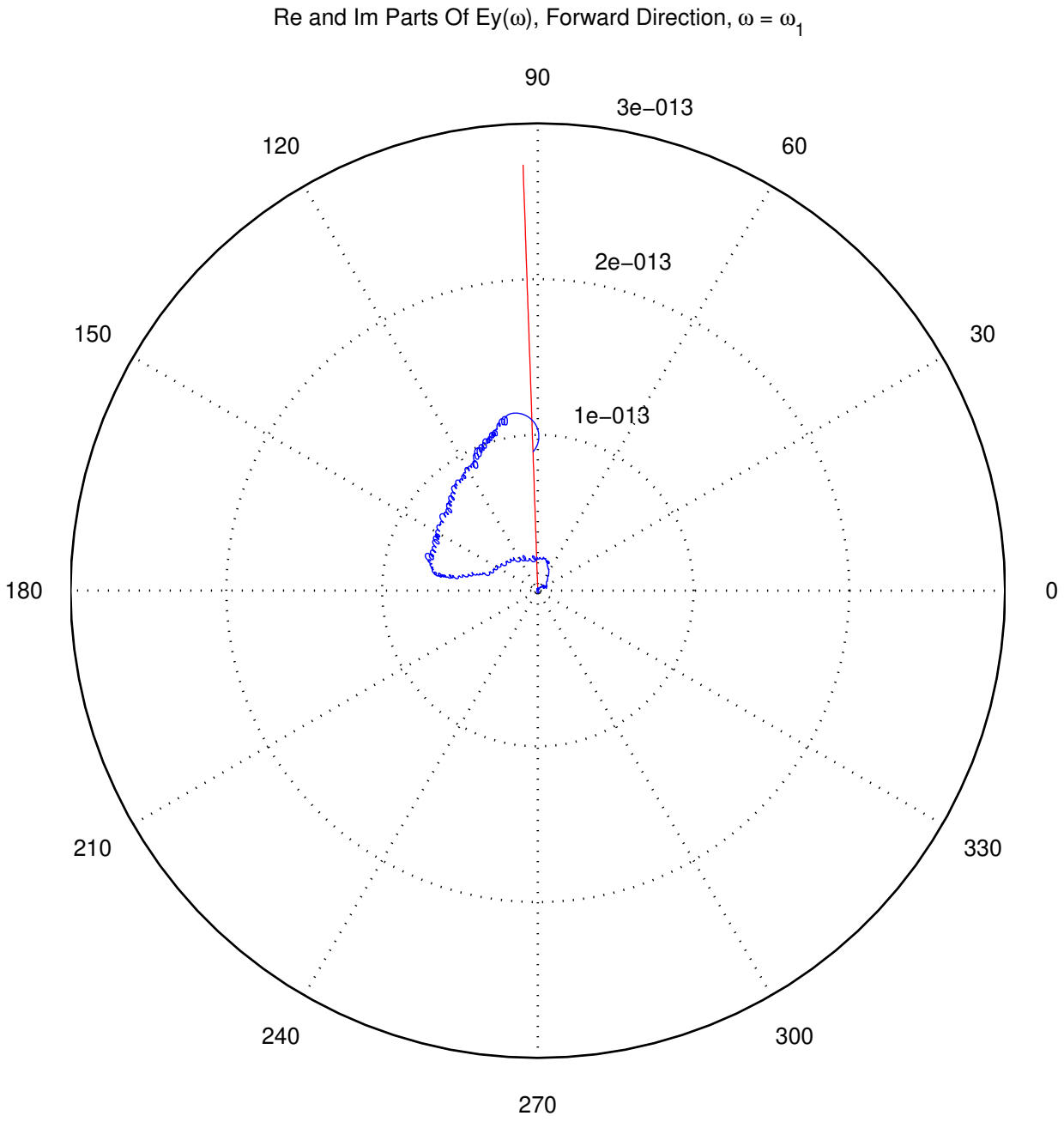

Y Trajectory, Slope Corrected
x 10^-6
3.5
3
2.5
2
1.5
1
0.5
0
−0.5
−1
Y Trajectory, Corrected (m)
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)

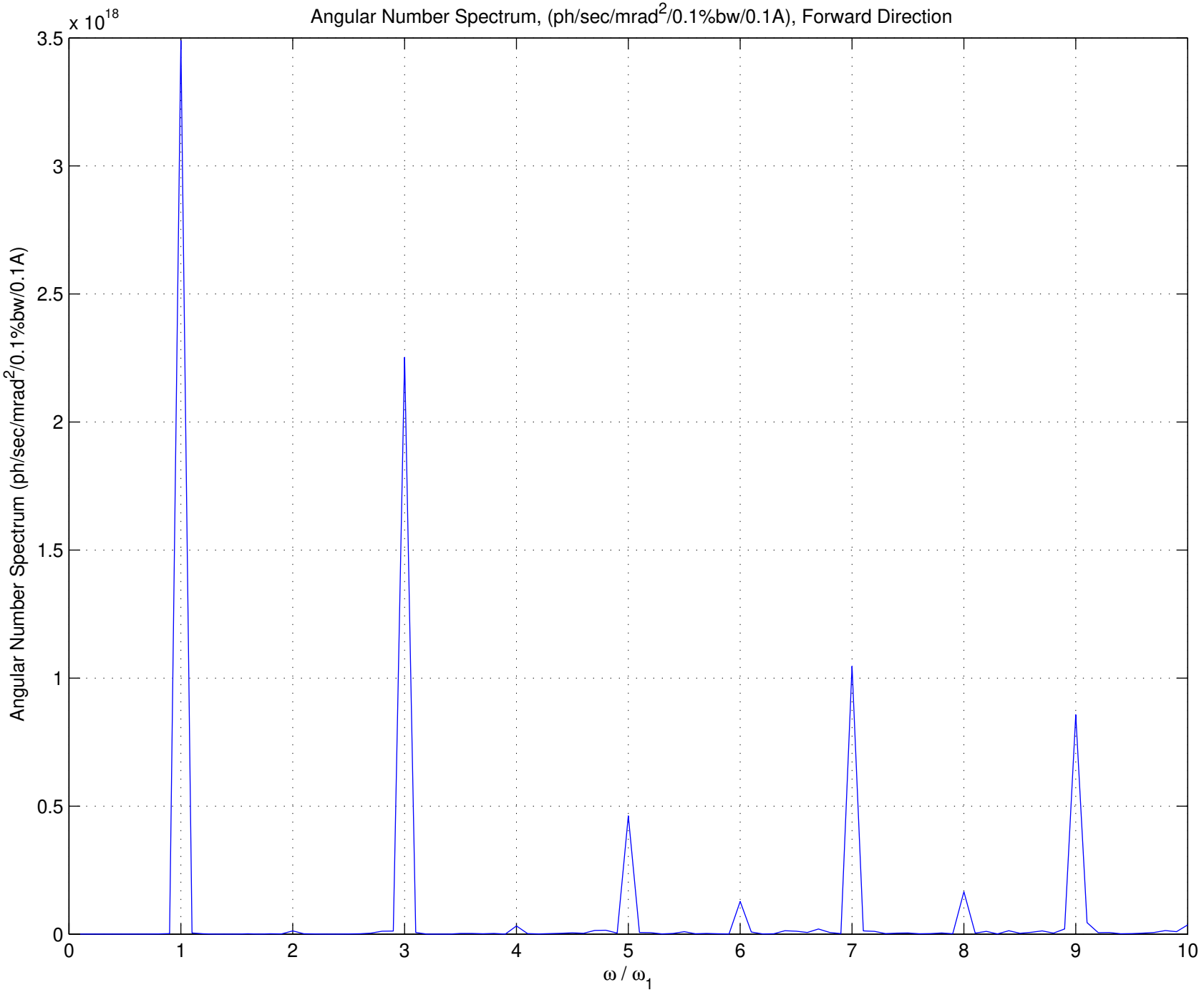

Phase Relative To Cell Entrance
700
600
500
400
300
200
100
0
−100
Phase (rad)
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)

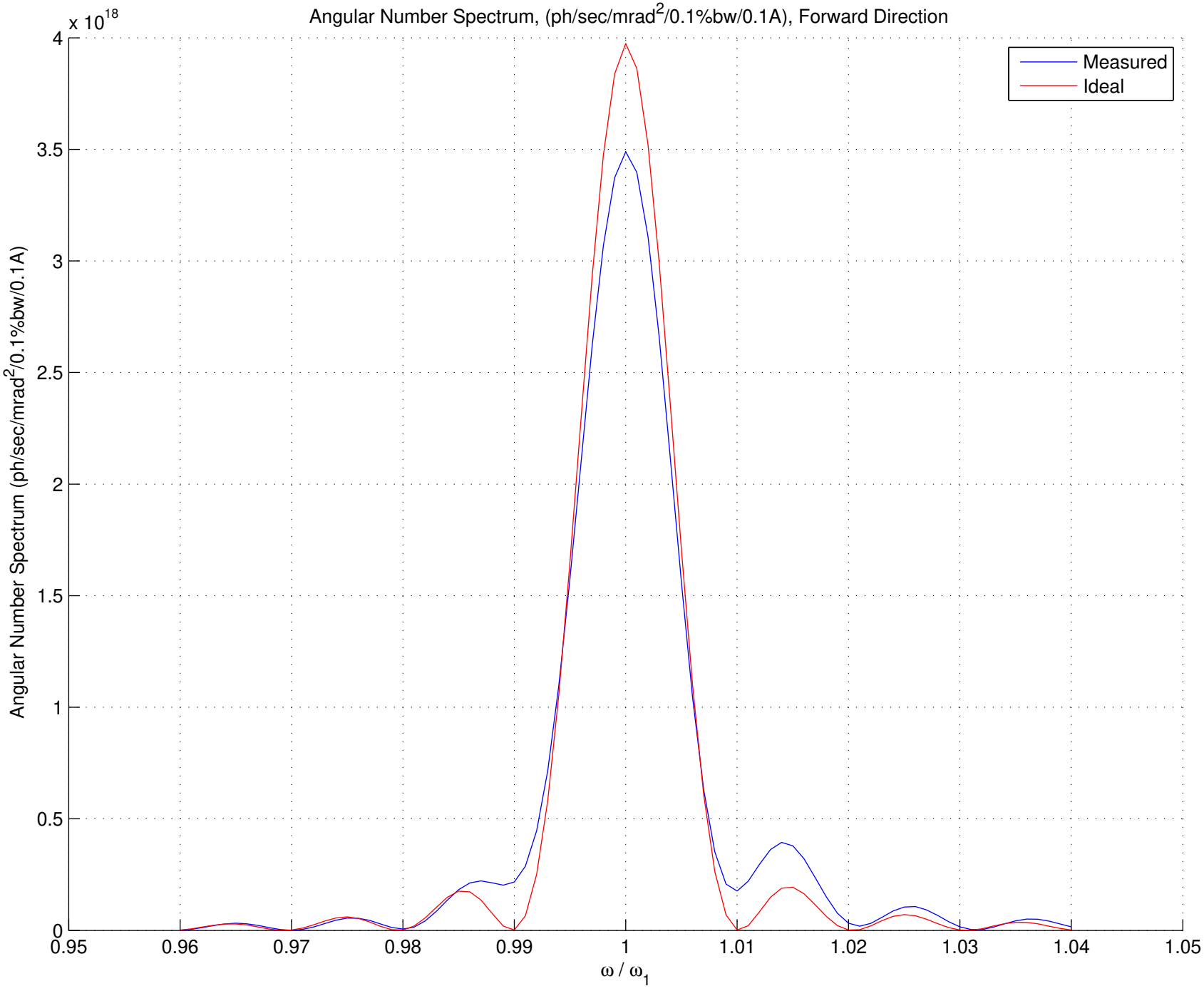

Phase Error At Field Peaks, No Ends
5
36
67
99
130
161
192
Pole
50
40
30
20
10
0
−10
−20
−30
Phase Error (deg)
−1.5
−1
−0.5
0
0.5
1
1.5
Z (m)
Phase Error: Ave = 0.000000 deg, RMS = 19.102592 deg

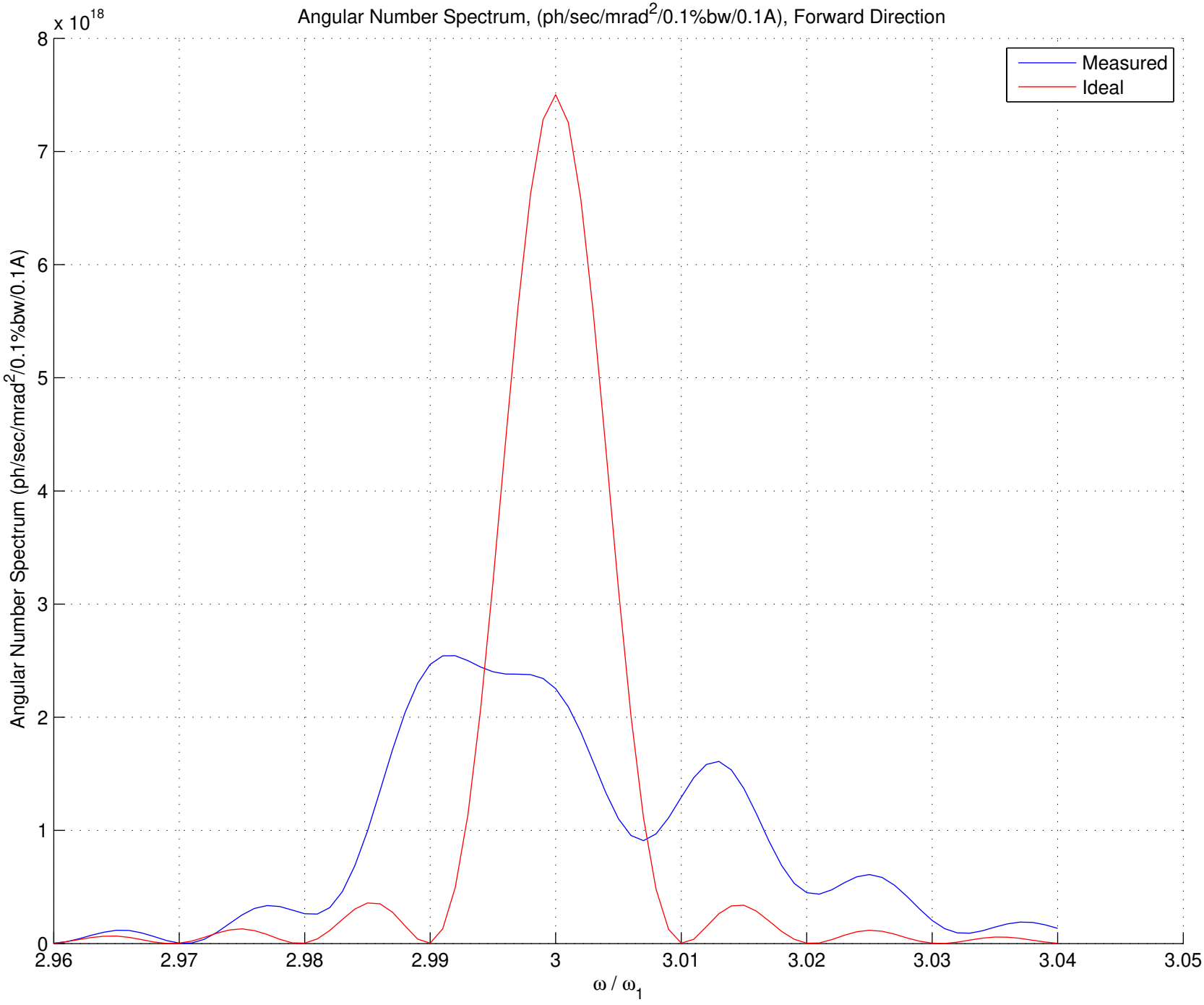

Phase Error Relative To Nominal Radiation Wave At Field Peaks, No Ends
x 10^4
1.168
1.167
1.166
1.165
1.164
1.163
1.162
1.161
1.16
Phase Error (deg)
5
36
67
99
130
161
192
Pole
−1.5
−1
−0.5
0
0.5
1
1.5
Z (m)

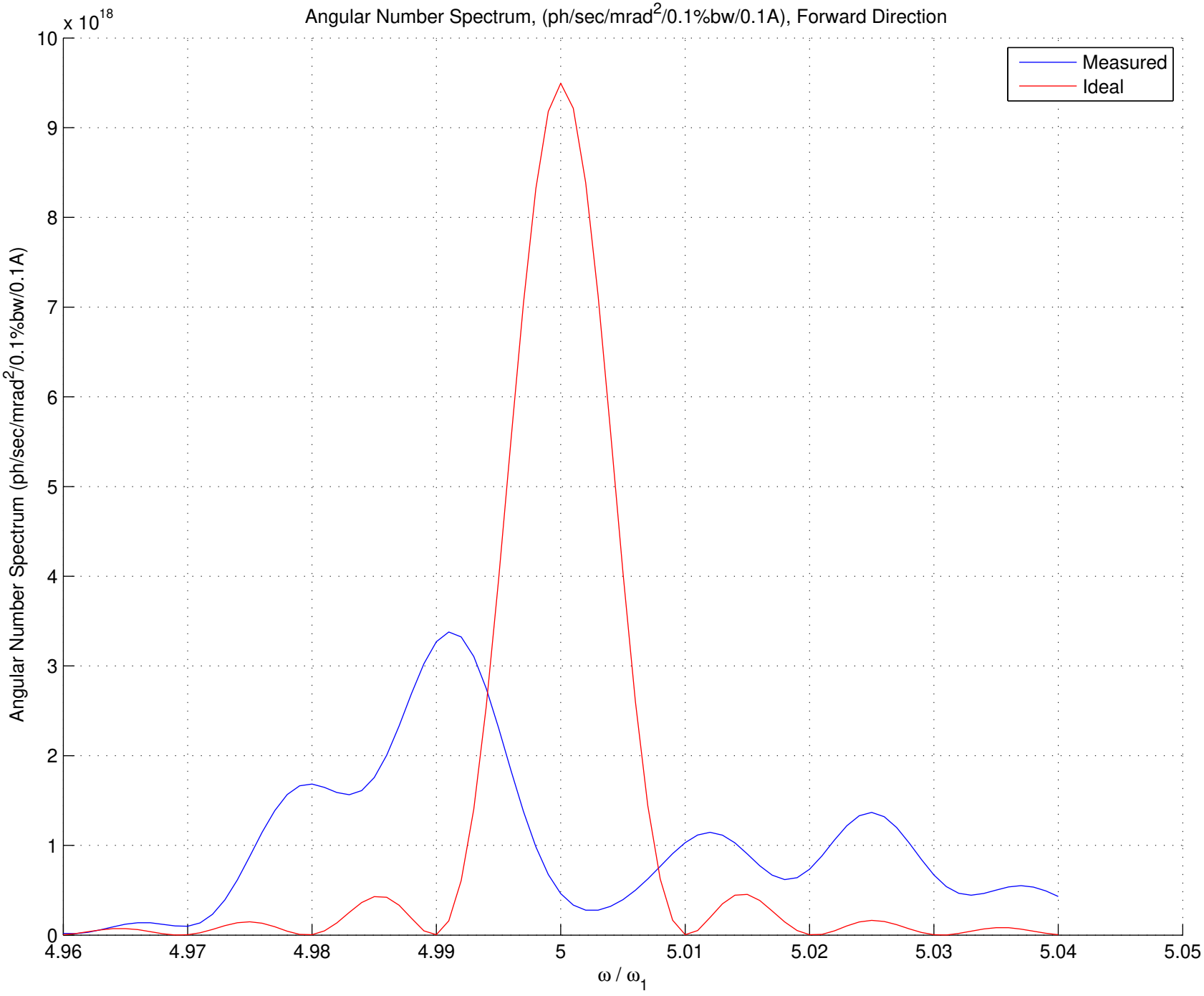

Re and Im Parts Of Ex(ω), Forward Direction, ω = ω1
90
1.5e−011
120
60
1e−011
150
30
5e−012
180
0
210
330
240
300
270


Re and Im Parts Of Ey(ω), Forward Direction, ω = ω1
90
3e−013
120
60
2e−013
150
30
1e−013
180
0
210
330
240
300
270


Angular Number Spectrum, (ph/sec/mrad^2/0.1%bw/0.1A), Forward Direction
x 10^{18}
Angular Number Spectrum (ph/sec/mrad^2/0.1%bw/0.1A)
ω / ω_1
0
0.5
1
1.5
2
2.5
3
3.5
0
1
2
3
4
5
6
7
8
9
10


Angular Number Spectrum, (ph/sec/mrad^2/0.1%bw/0.1A), Forward Direction
x 10^{18}
Measured
Ideal
Angular Number Spectrum (ph/sec/mrad^2/0.1%bw/0.1A)
ω / ω_1
0
0.5
1
1.5
2
2.5
3
3.5
4
0.95
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
x 10^{18}
Measured
Ideal
Angular Number Spectrum (ph/sec/mrad^2/0.1%bw/0.1A)
0
1
2
3
4
5
6
7
8
2.96
2.97
2.98
2.99
3
3.01
3.02
3.03
3.04
3.05
ω / $ω_1$


Angular Number Spectrum, (ph/sec/mrad^2/0.1%bw/0.1A), Forward Direction
x 10^{18}
Measured
Ideal
Angular Number Spectrum (ph/sec/mrad^2/0.1%bw/0.1A)
ω / ω_1
10
9
8
7
6
5
4
3
2
1
0
4.96
4.97
4.98
4.99
5
5.01
5.02
5.03
5.04
5.05