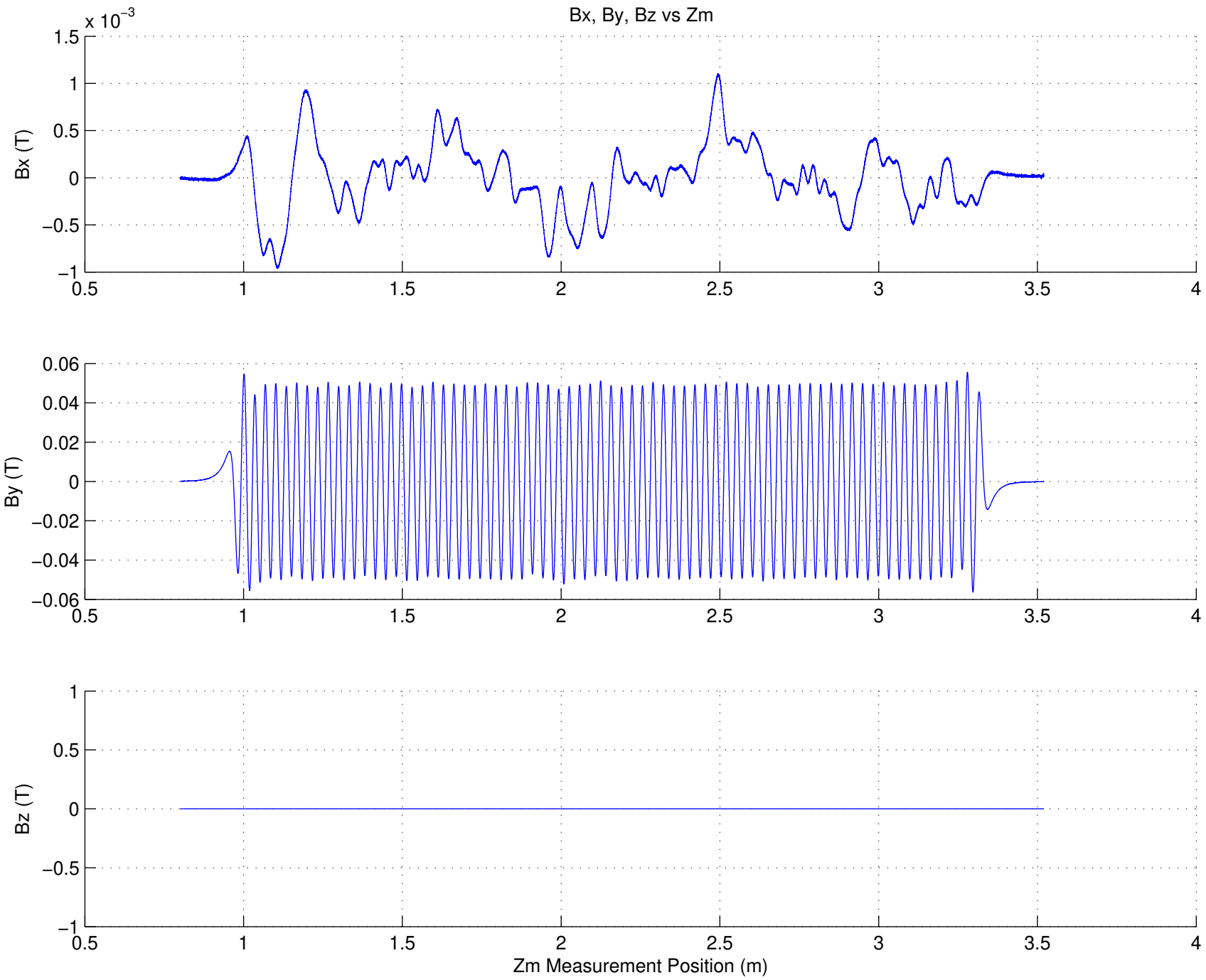
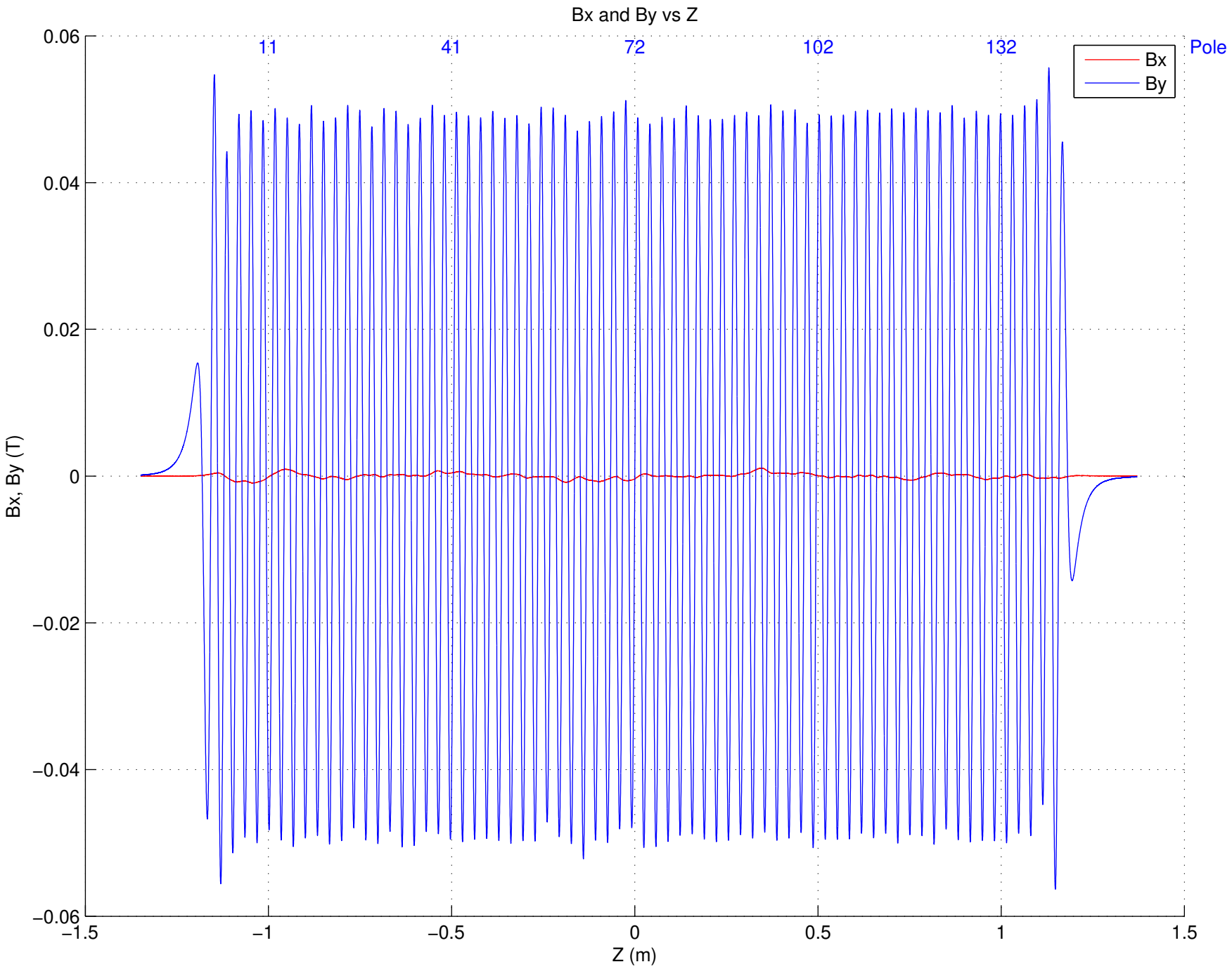
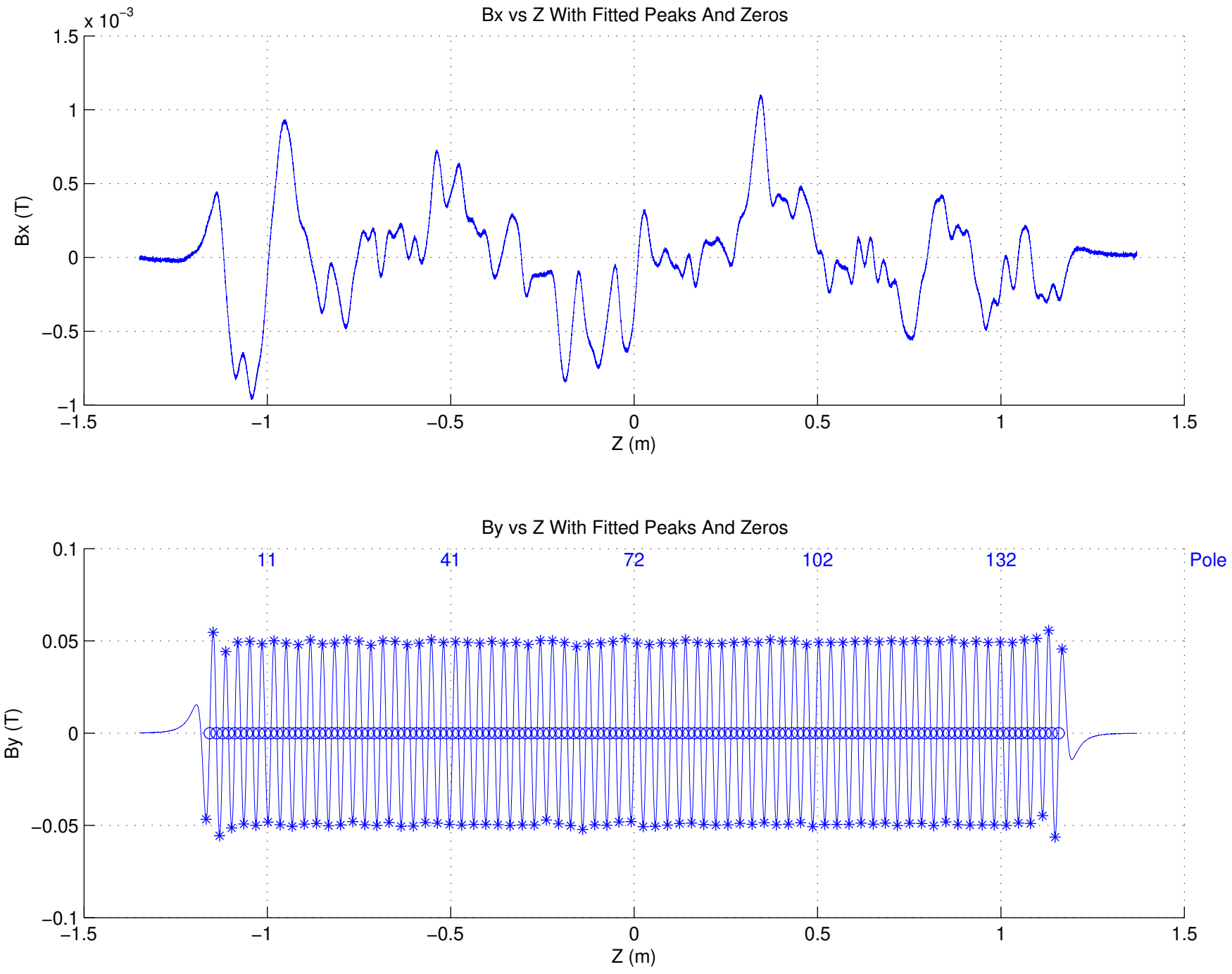
SLAC Magnetic Measurements

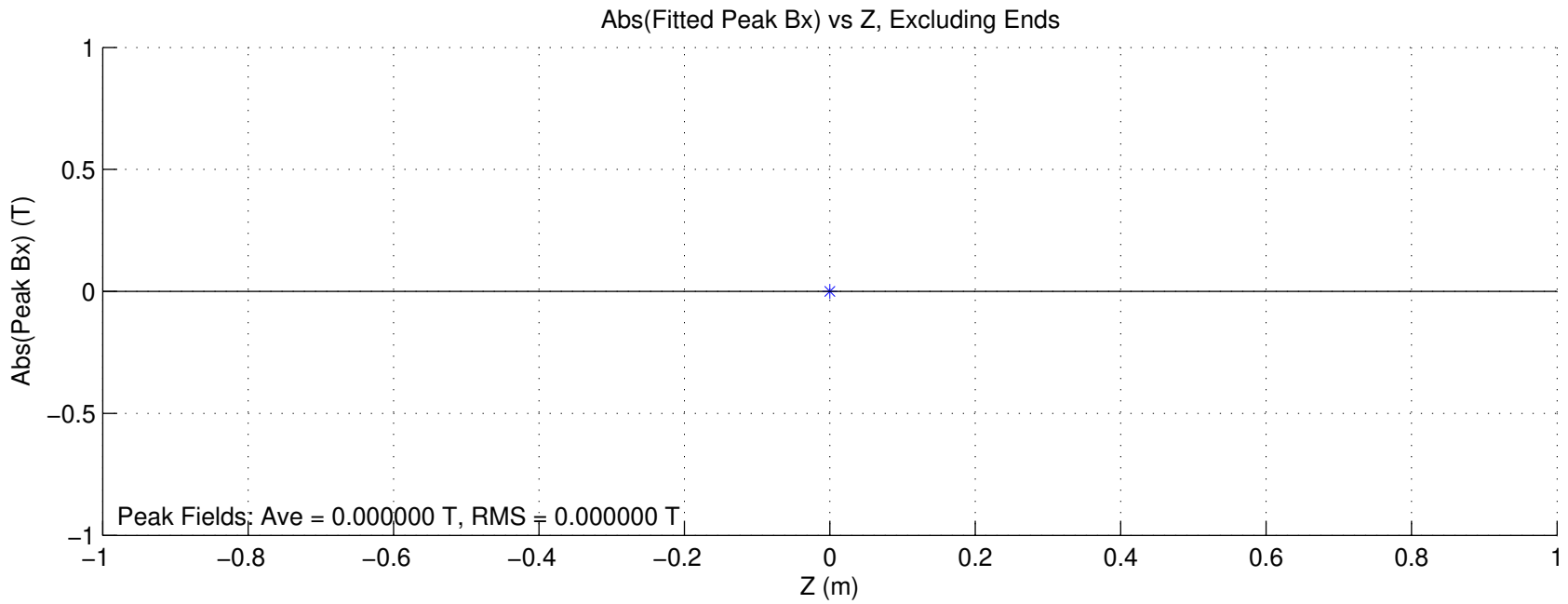
EPU Analysis
−−−−−−−−−−−

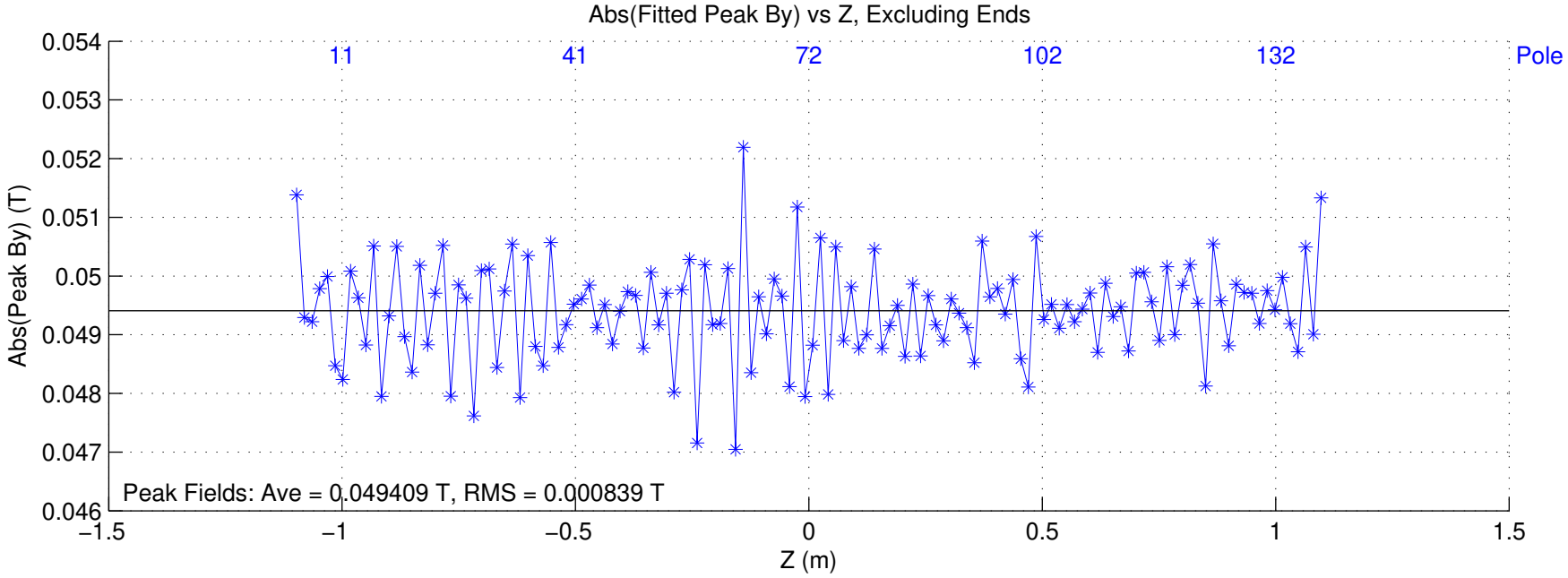
Parameters:
INPUT−FILE−DIR =S:\MagData\LCLS\Undulator\A1−ANL\DATASET0001\Rough Tuning\Z Scans\Run 003\
INPUT−FILE−NAME =x+00000−y+000−bscanz.dat
INPUT−FILE−TYPE =ZVXYBXYH
CORR−REQUIRED =0
GAMMA =26627.1
NOM−LAMBDA−U =0.033
NOM−K−VALUE =1.047
NOM−LAMBDA−R =3.6028e−011
NUM−POLES =144
NUM−END−POLES =4
CELL−LENGTH =4

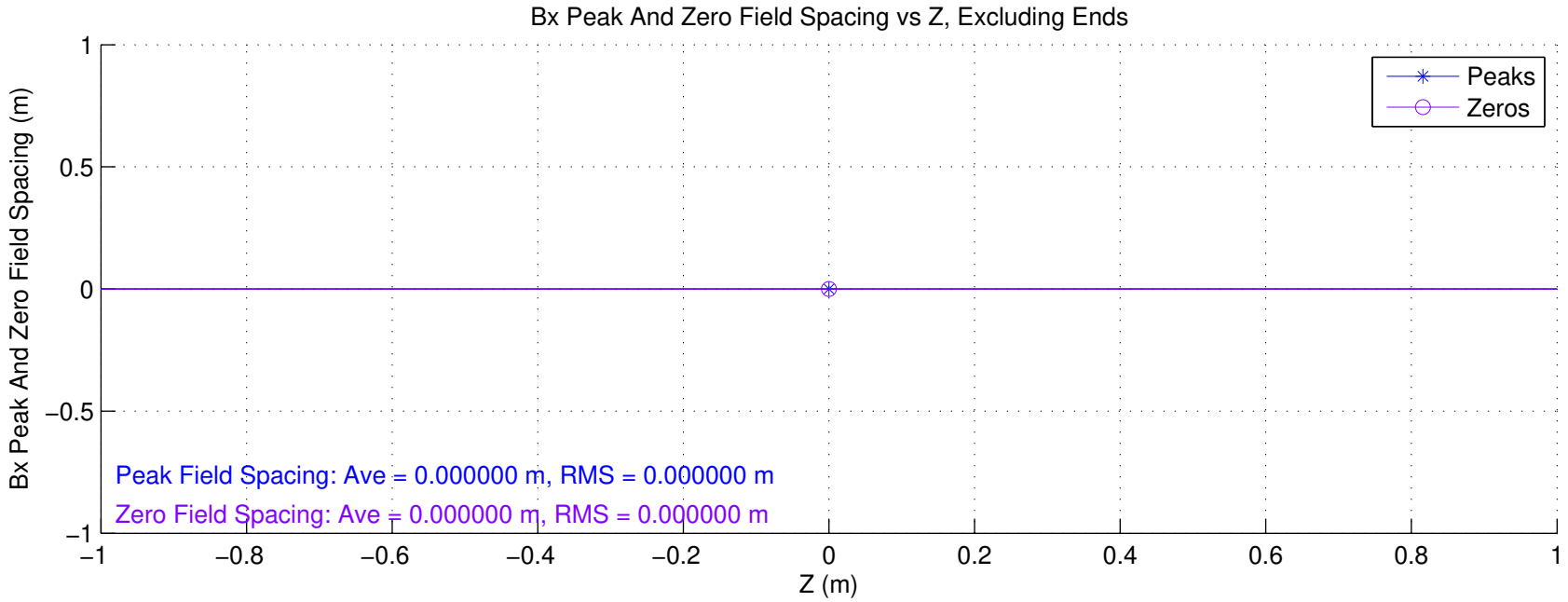

Bx, By, Bz vs Zm
x 10^-3
Bx (T)
By (T)
Bz (T)
Zm Measurement Position (m)

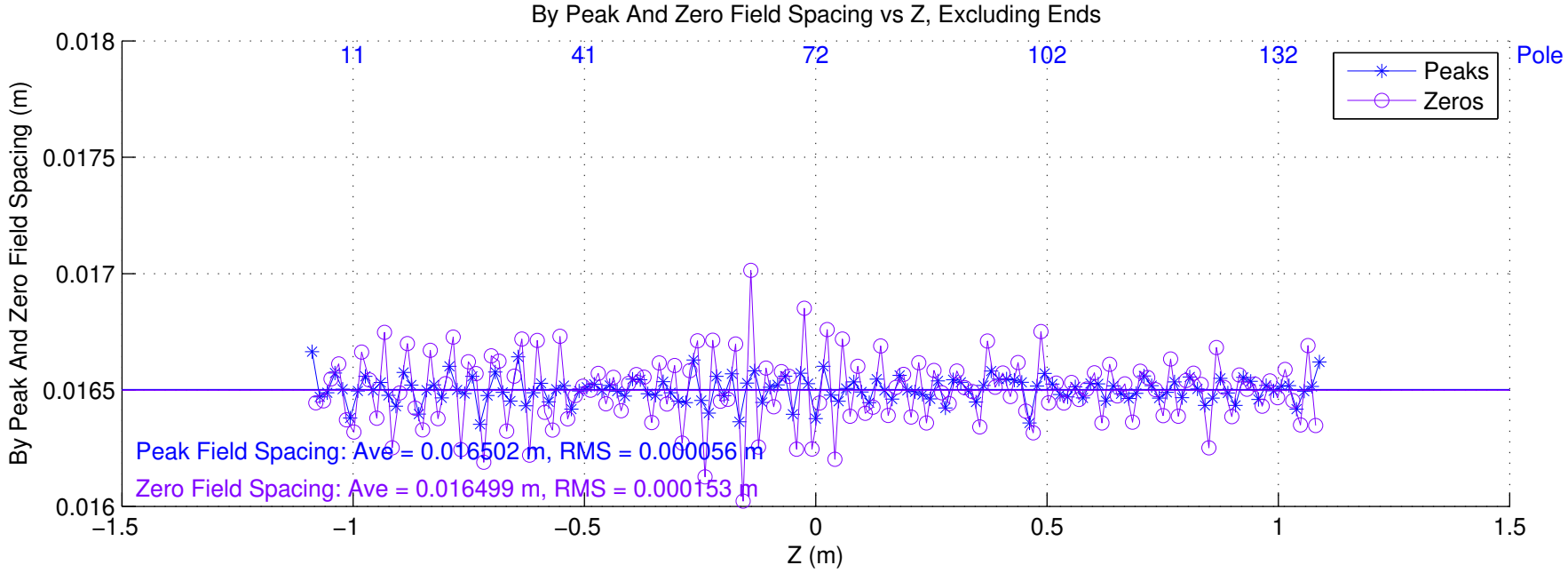

Bx and By vs Z
11
41
72
102
132
Pole
Bx
By
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
Bx, By (T)
−1.5
−1
−0.5
0
0.5
1
1.5
Z (m)

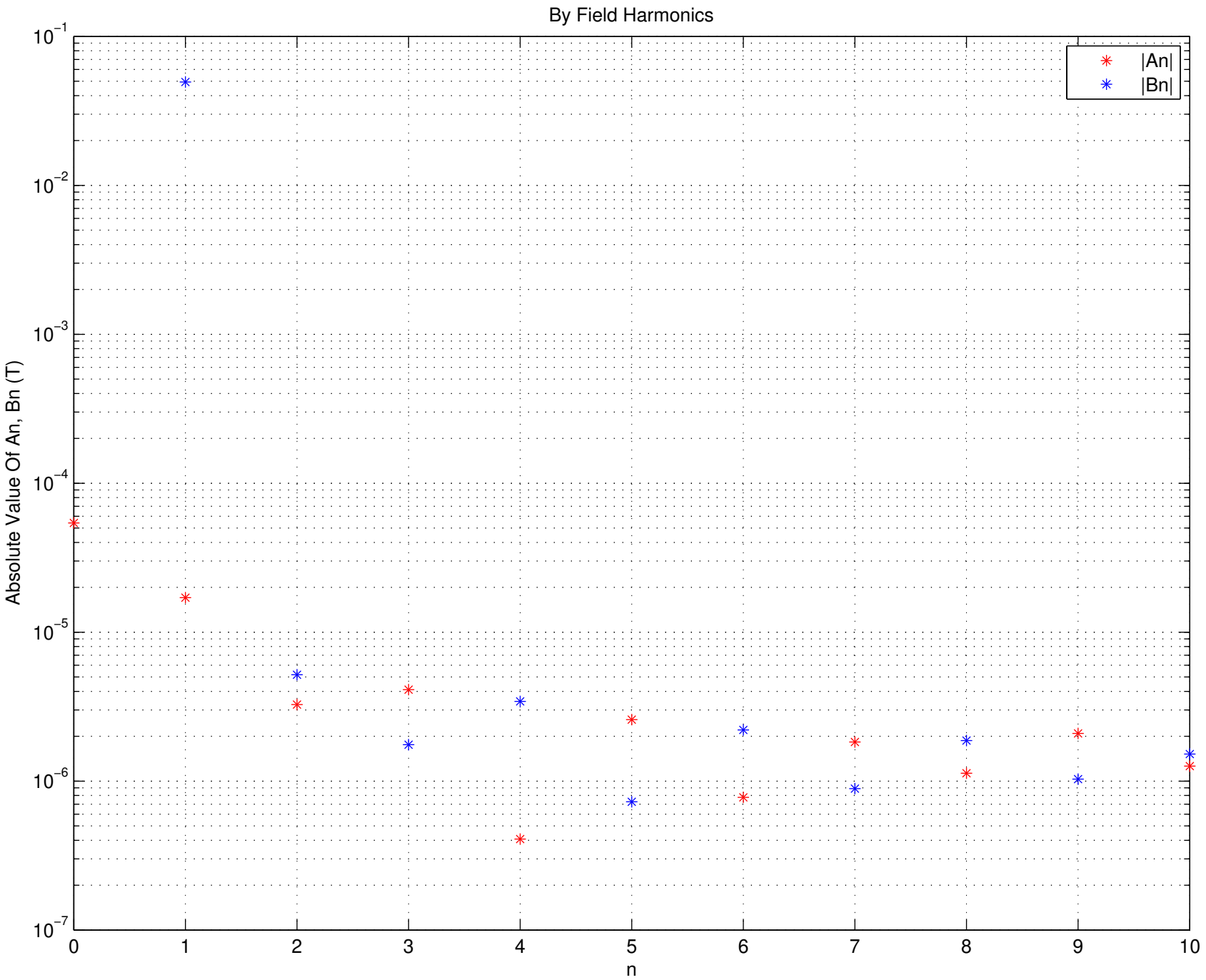

Bx vs Z With Fitted Peaks And Zeros
x 10^-3
Bx (T)
Z (m)
By vs Z With Fitted Peaks And Zeros
11
41
72
102
132
Pole
By (T)
Z (m)

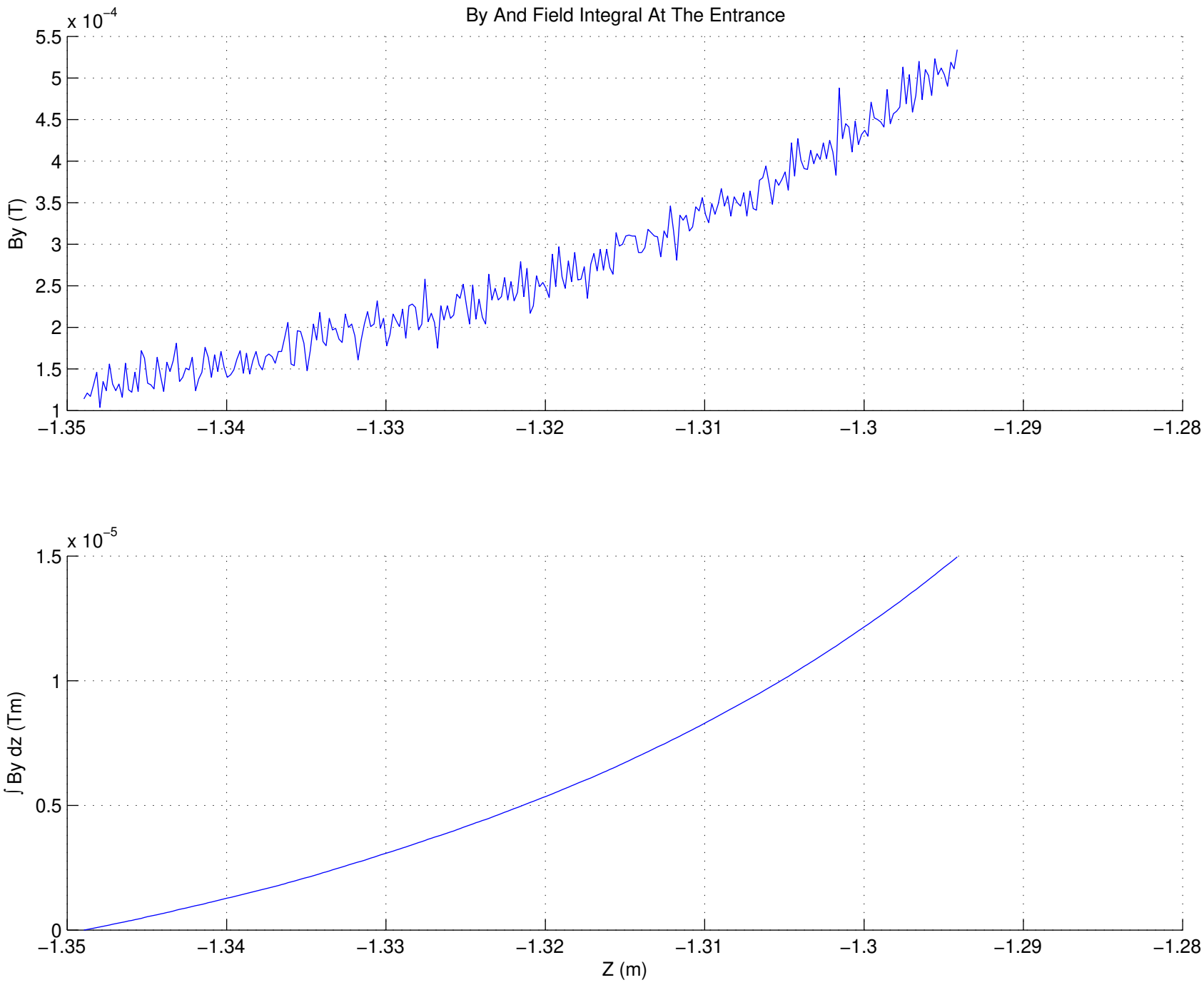

Abs(Fitted Peak Bx) vs Z, Excluding Ends
Abs(Peak Bx) (T)
Z (m)
Peak Fields: Ave = 0.000000 T, RMS = 0.000000 T
1
0.5
0
−0.5
−1
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1

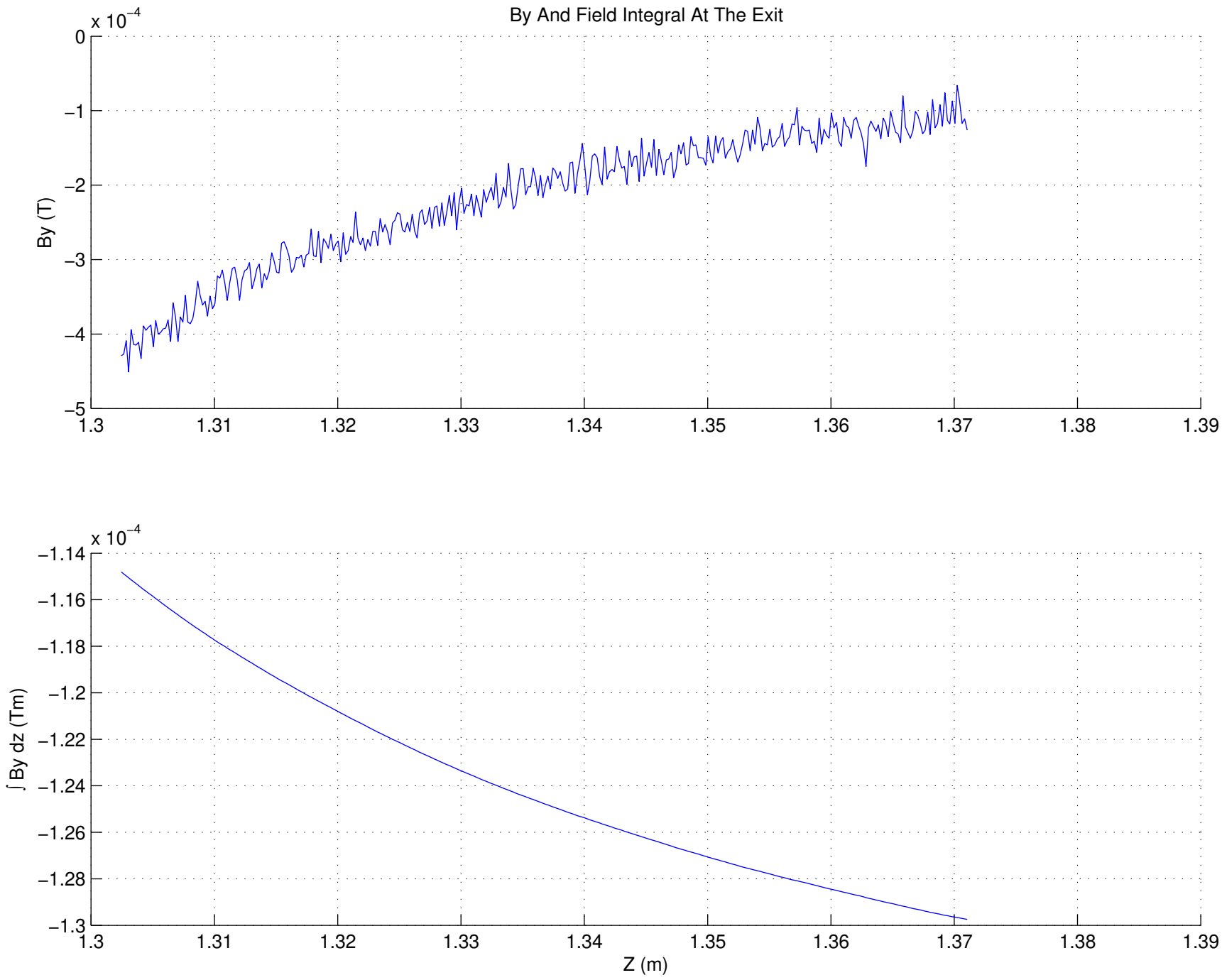

Abs(Fitted Peak By) vs Z, Excluding Ends
Abs(Peak By) (T)
Z (m)
Peak Fields: Ave = 0.049409 T, RMS = 0.000839 T
11
41
72
102
132
Pole
0.054
0.053
0.052
0.051
0.05
0.049
0.048
0.047
0.046
−1.5
−1
−0.5
0
0.5
1
1.5

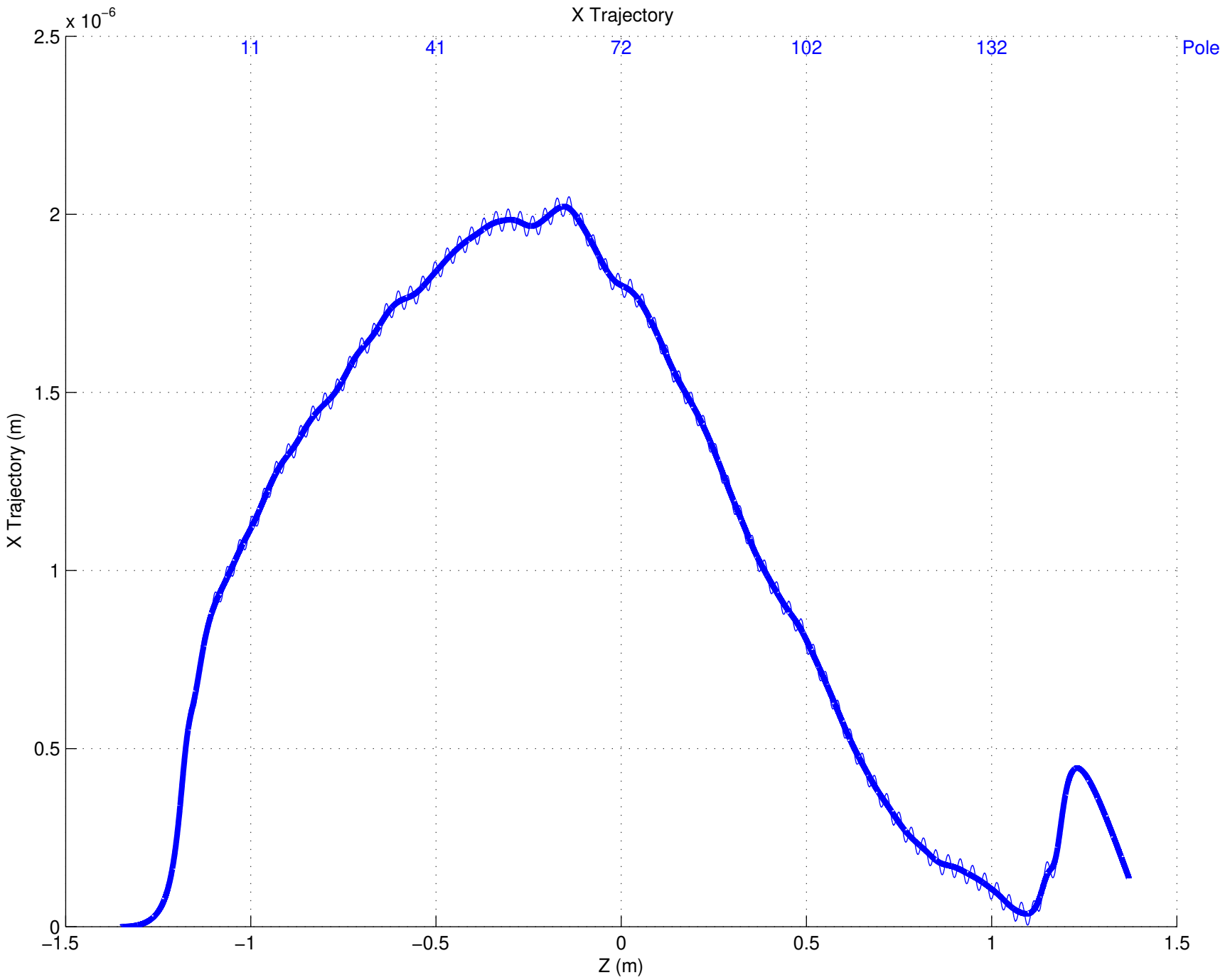

Bx Peak And Zero Field Spacing vs Z, Excluding Ends
Bx Peak And Zero Field Spacing (m)
Z (m)
Peaks
Zeros
Peak Field Spacing: Ave = 0.000000 m, RMS = 0.000000 m
Zero Field Spacing: Ave = 0.000000 m, RMS = 0.000000 m
1
0.5
0
−0.5
−1
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1

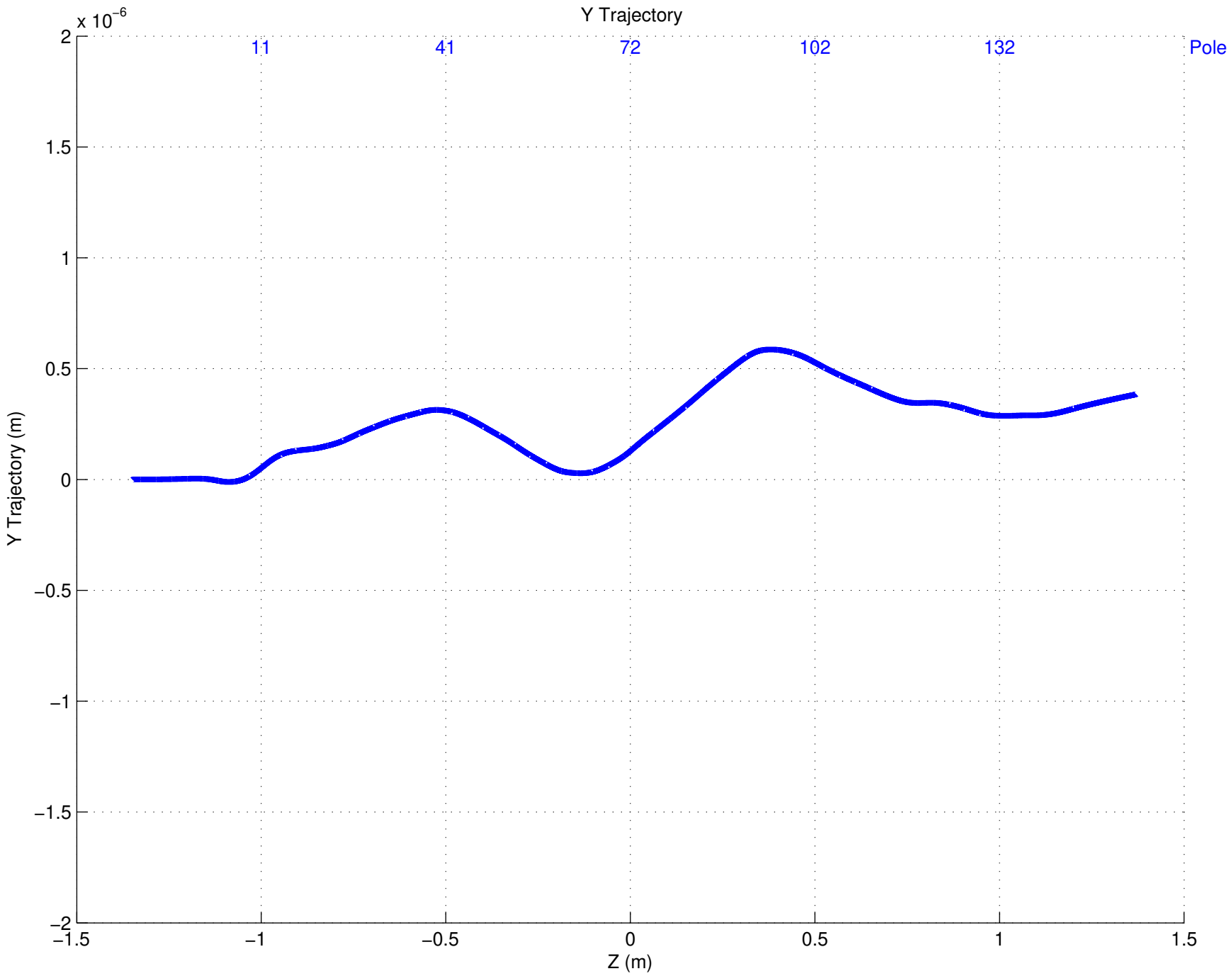

By Peak And Zero Field Spacing vs Z, Excluding Ends
By Peak And Zero Field Spacing (m)
Z (m)
11
41
72
102
132
Pole
Peaks
Zeros
Peak Field Spacing: Ave = 0.016502 m, RMS = 0.000056 m
Zero Field Spacing: Ave = 0.016499 m, RMS = 0.000153 m
0.018
0.0175
0.017
0.0165
0.016
−1.5
−1
−0.5
0
0.5
1
1.5

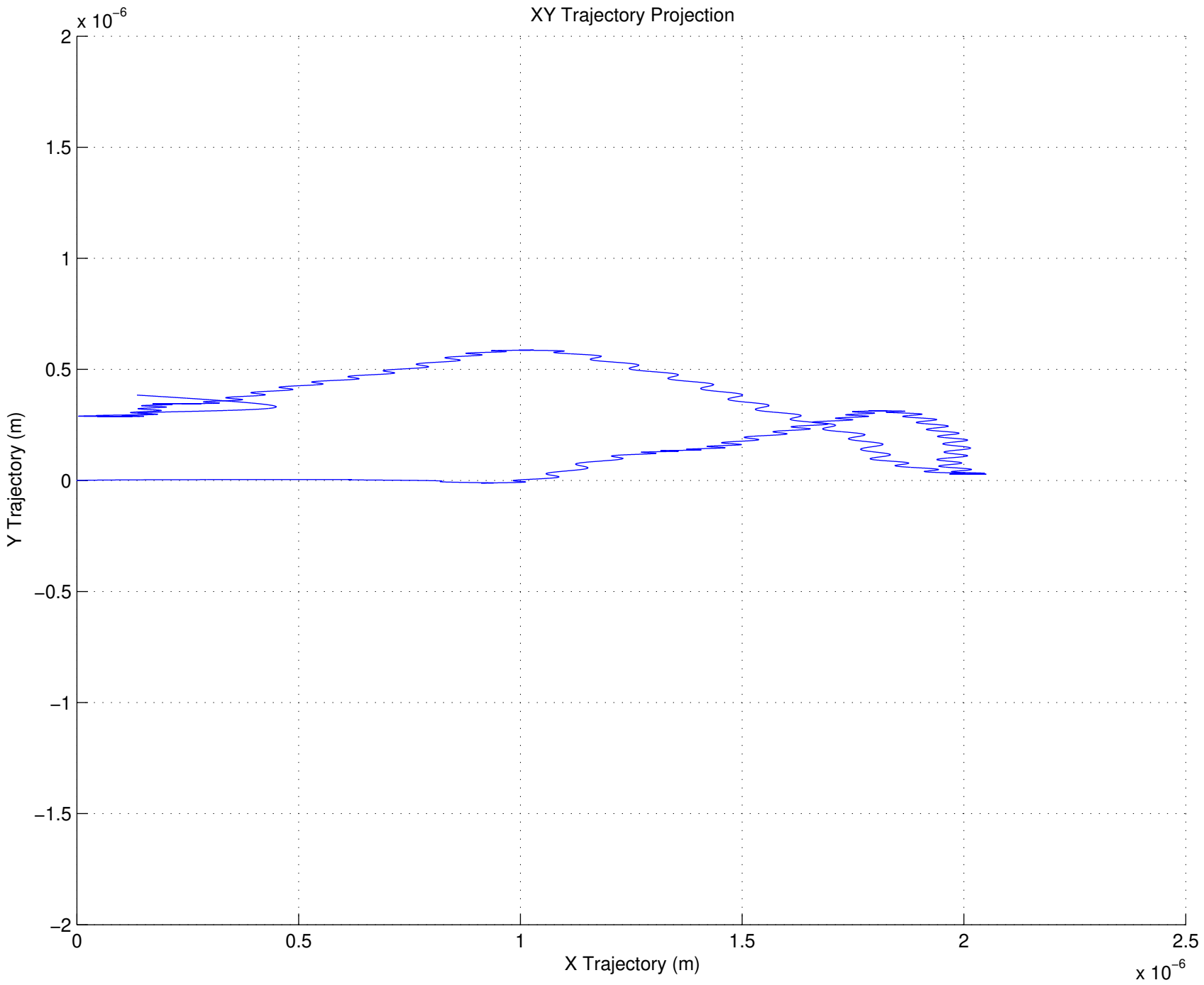

By Field Harmonics
|An|
|Bn|
Absolute Value Of An, Bn (T)
n
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
0
1
2
3
4
5
6
7
8
9
10

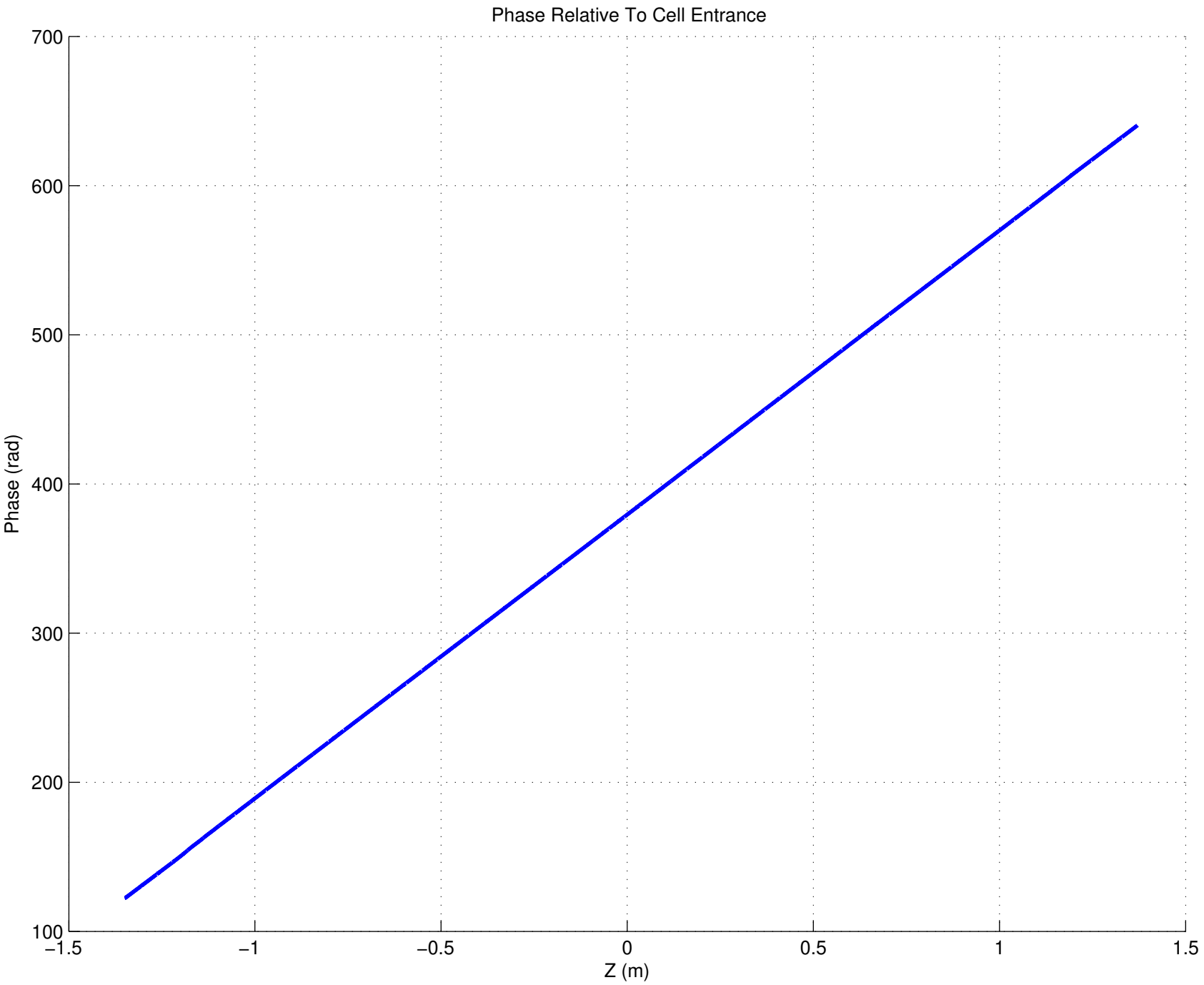

By And Field Integral At The Entrance
x 10^-4
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
By (T)
−1.35
−1.34
−1.33
−1.32
−1.31
−1.3
−1.29
−1.28
x 10^-5
1.5
1
0.5
0
∫ By dz (Tm)
Z (m)

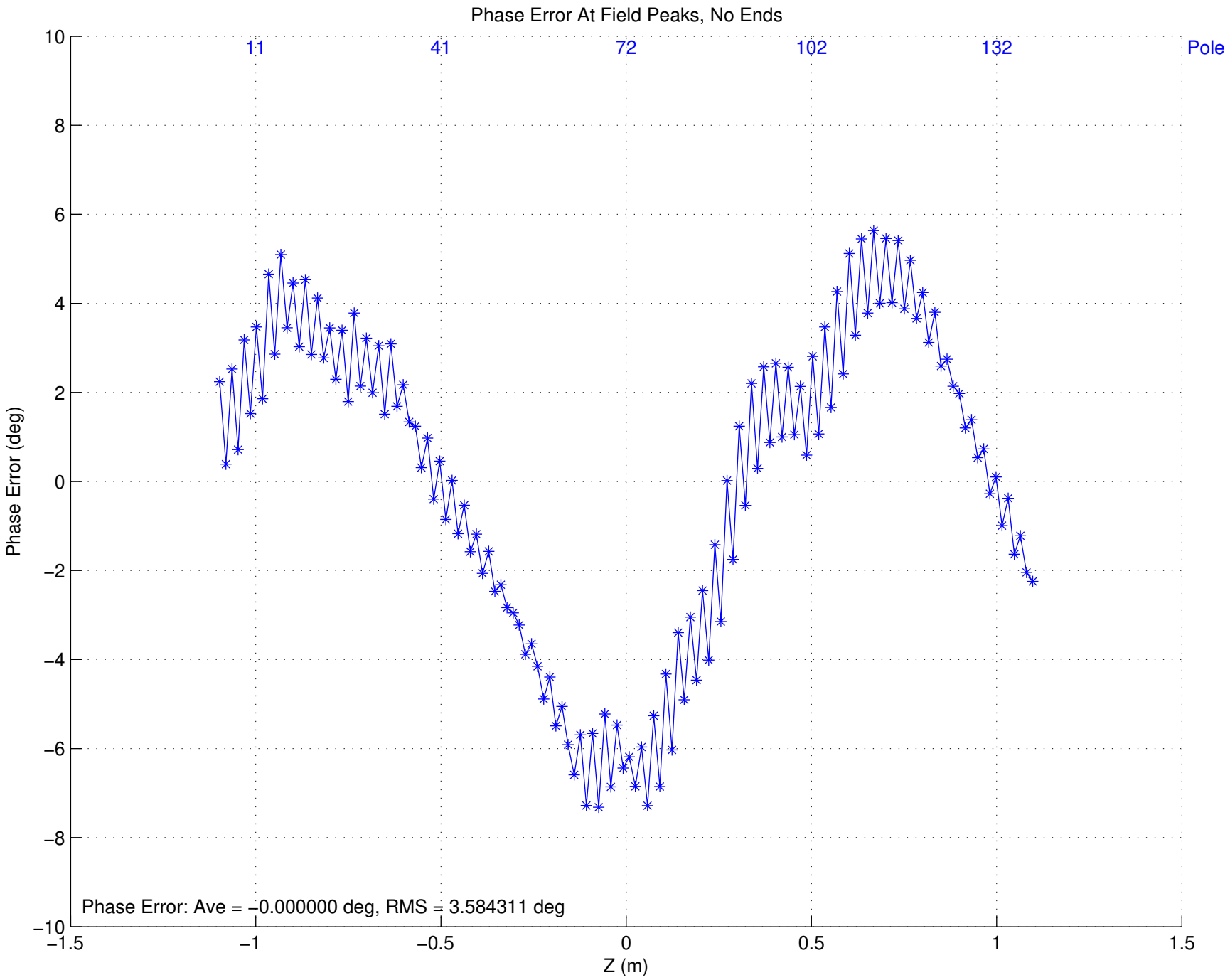

By And Field Integral At The Exit
x 10^-4
By (T)
0
−1
−2
−3
−4
−5
1.3
1.31
1.32
1.33
1.34
1.35
1.36
1.37
1.38
1.39
x 10^-4
∫ By dz (Tm)
−1.14
−1.16
−1.18
−1.2
−1.22
−1.24
−1.26
−1.28
−1.3
Z (m)

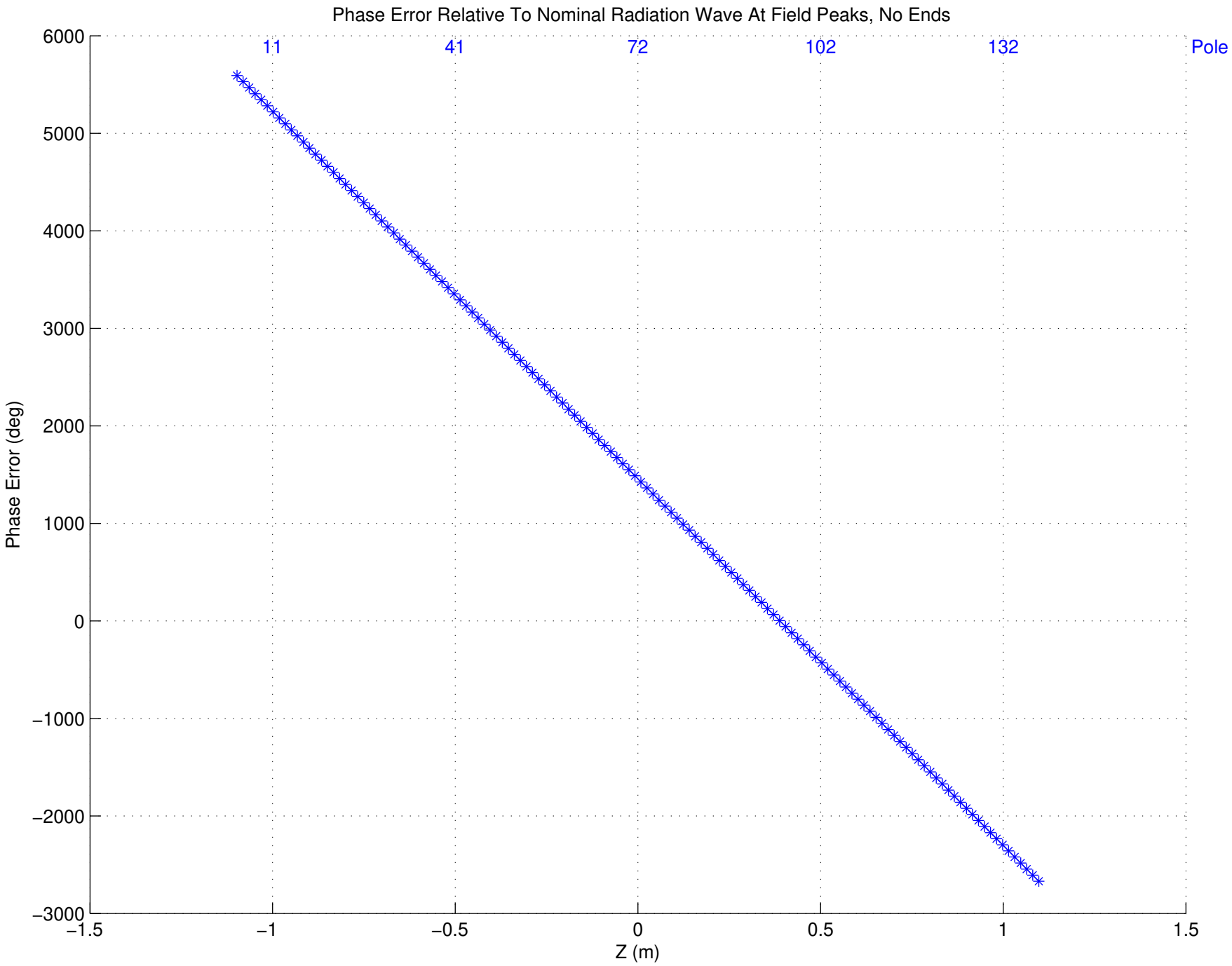

X Trajectory
x 10^-6
2.5
2
1.5
1
0.5
0
11
41
72
102
132
Pole
X Trajectory (m)
−1.5
−1
−0.5
0
0.5
1
1.5
Z (m)

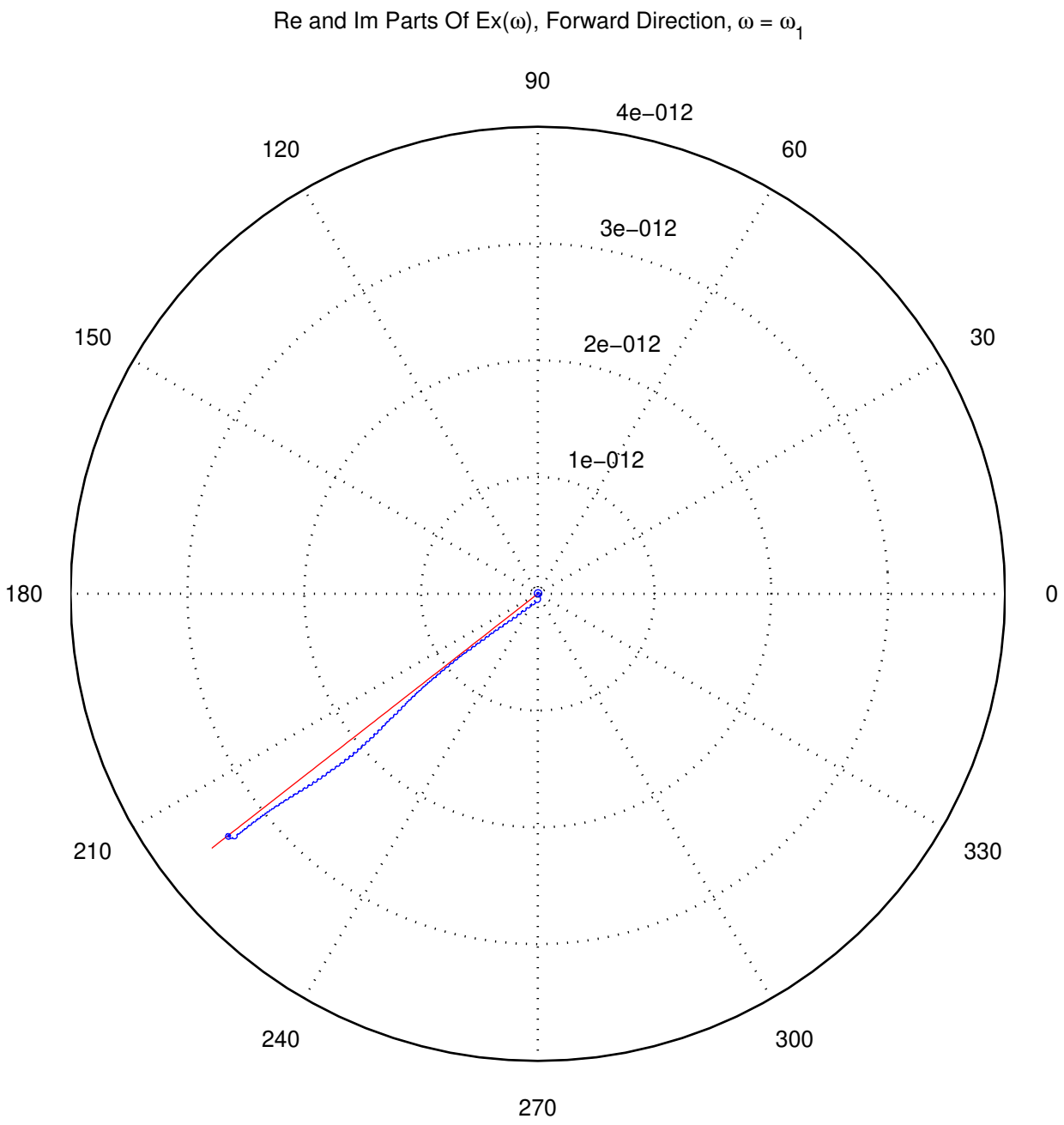

Y Trajectory
x 10^-6
11
41
72
102
132
Pole
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2
Y Trajectory (m)
−1.5
−1
−0.5
0
0.5
1
1.5
Z (m)

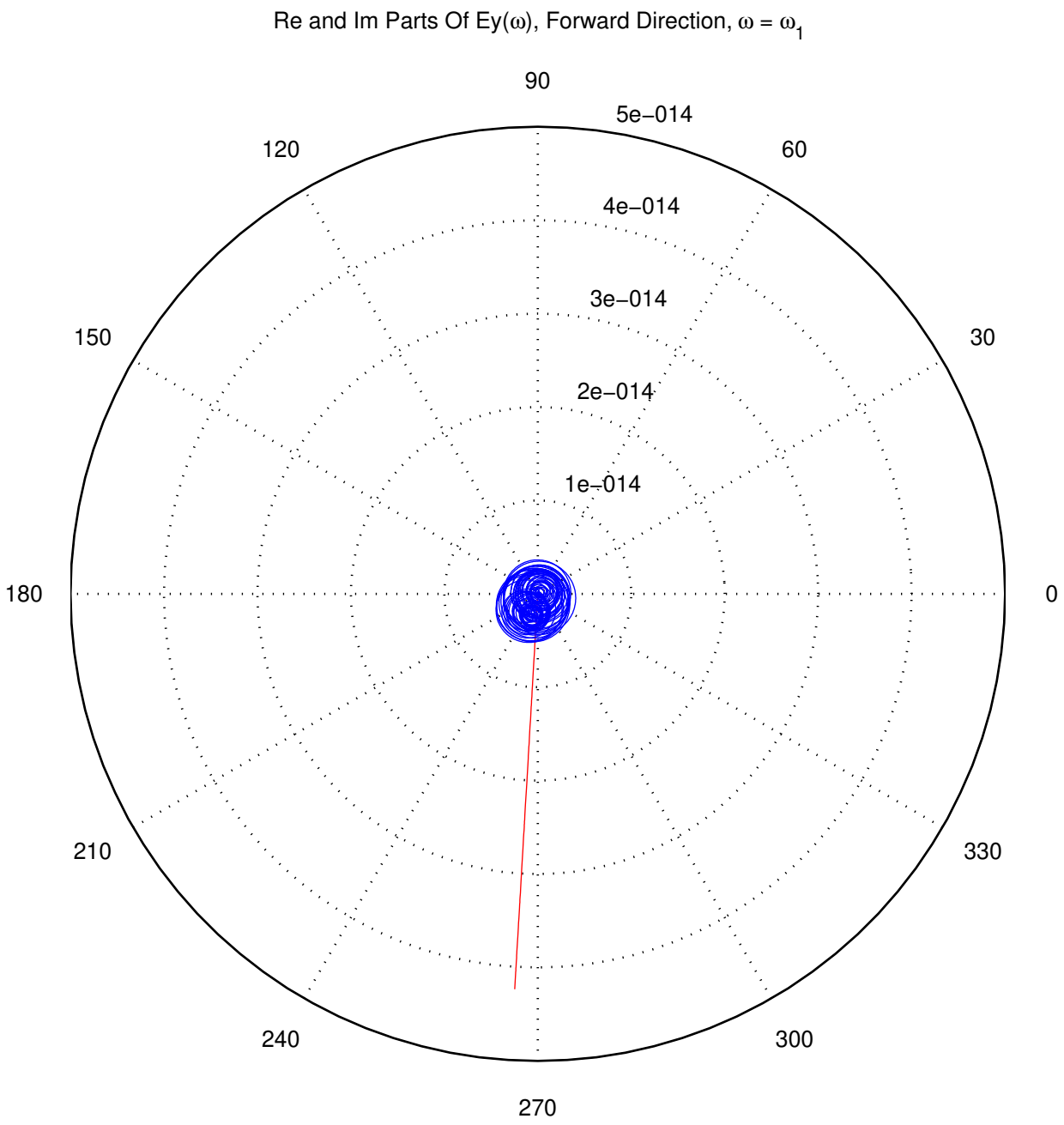

XY Trajectory Projection
x 10^-6
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2
Y Trajectory (m)
0
0.5
1
1.5
2
2.5
X Trajectory (m)
x 10^-6

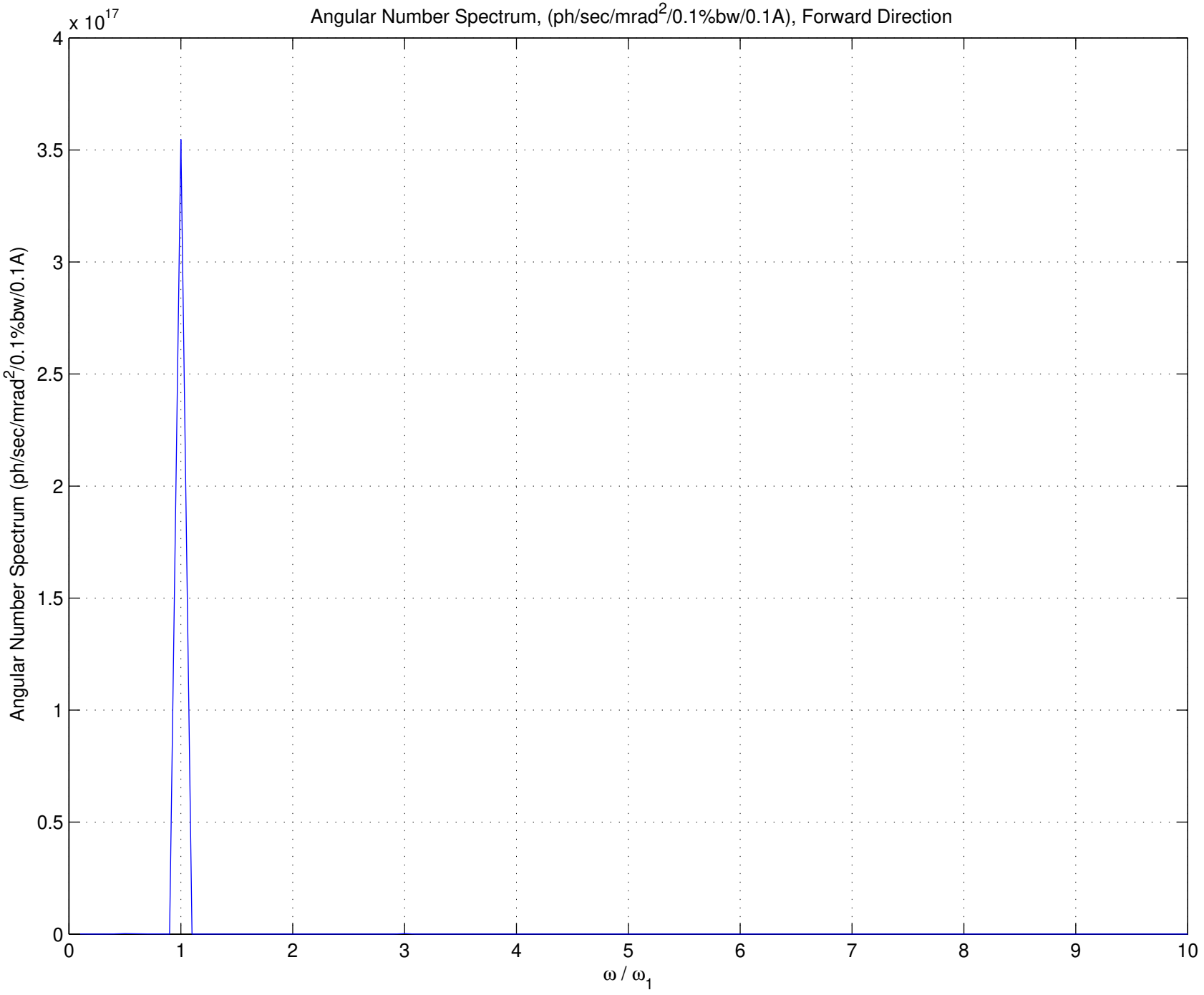

Phase Relative To Cell Entrance
700
600
500
400
300
200
100
Phase (rad)
−1.5
−1
−0.5
0
0.5
1
1.5
Z (m)

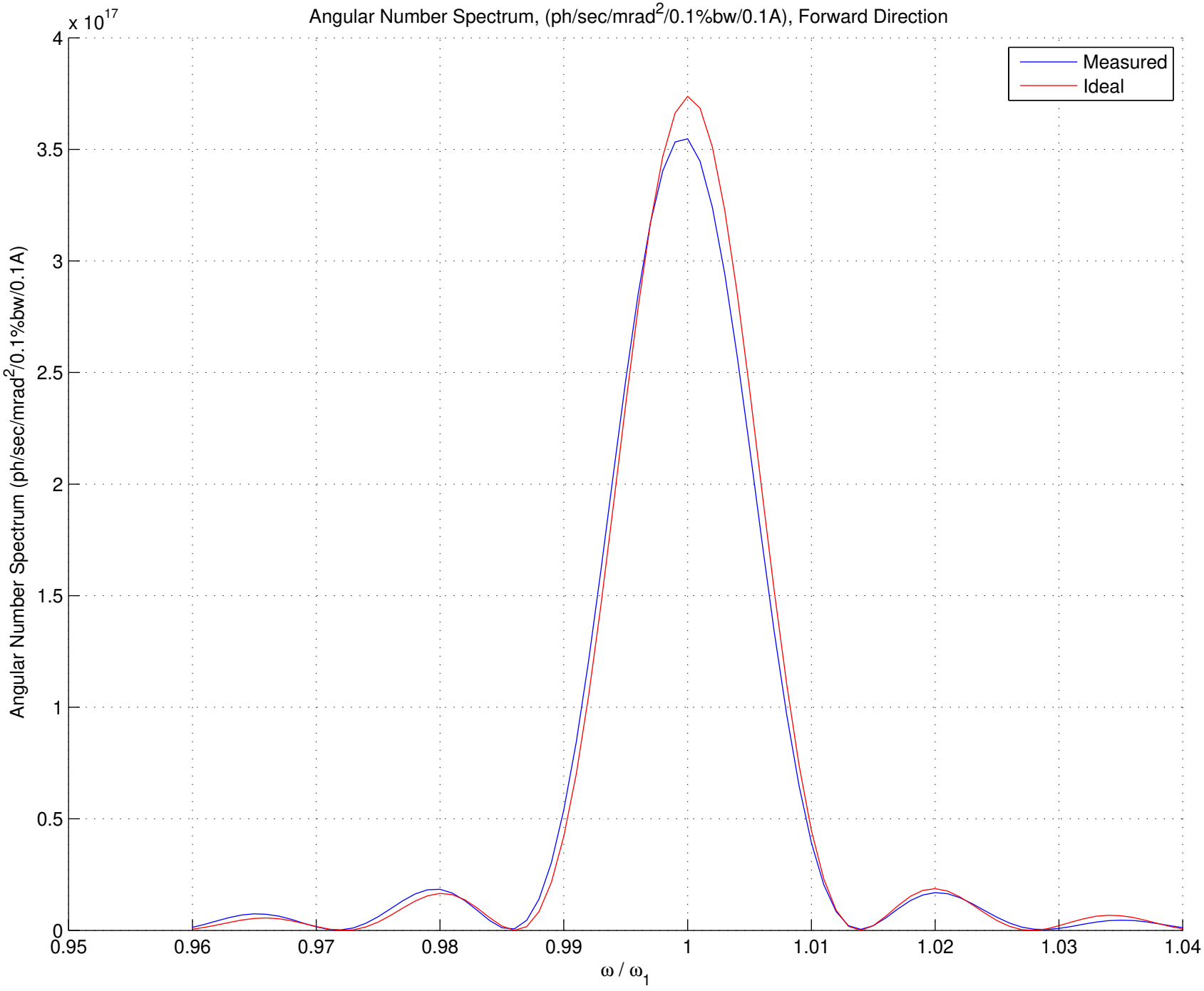

Phase Error At Field Peaks, No Ends
11
41
72
102
132
Pole
10
8
6
4
2
0
−2
−4
−6
−8
−10
Phase Error (deg)
−1.5
−1
−0.5
0
0.5
1
1.5
Z (m)
Phase Error: Ave = −0.000000 deg, RMS = 3.584311 deg

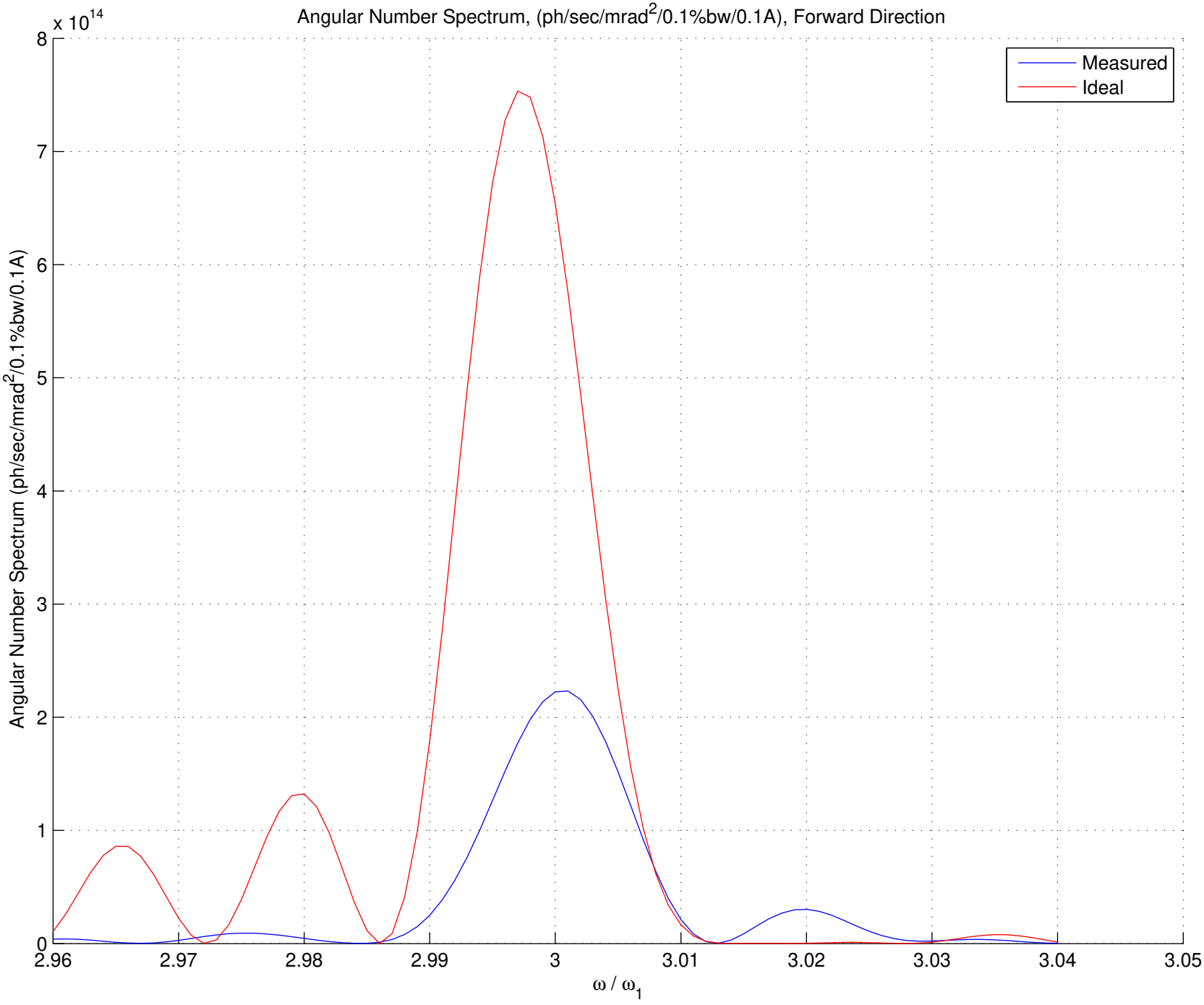

Phase Error Relative To Nominal Radiation Wave At Field Peaks, No Ends
11
41
72
102
132
Pole
6000
5000
4000
3000
2000
1000
0
−1000
−2000
−3000
Phase Error (deg)
−1.5
−1
−0.5
0
0.5
1
1.5
Z (m)

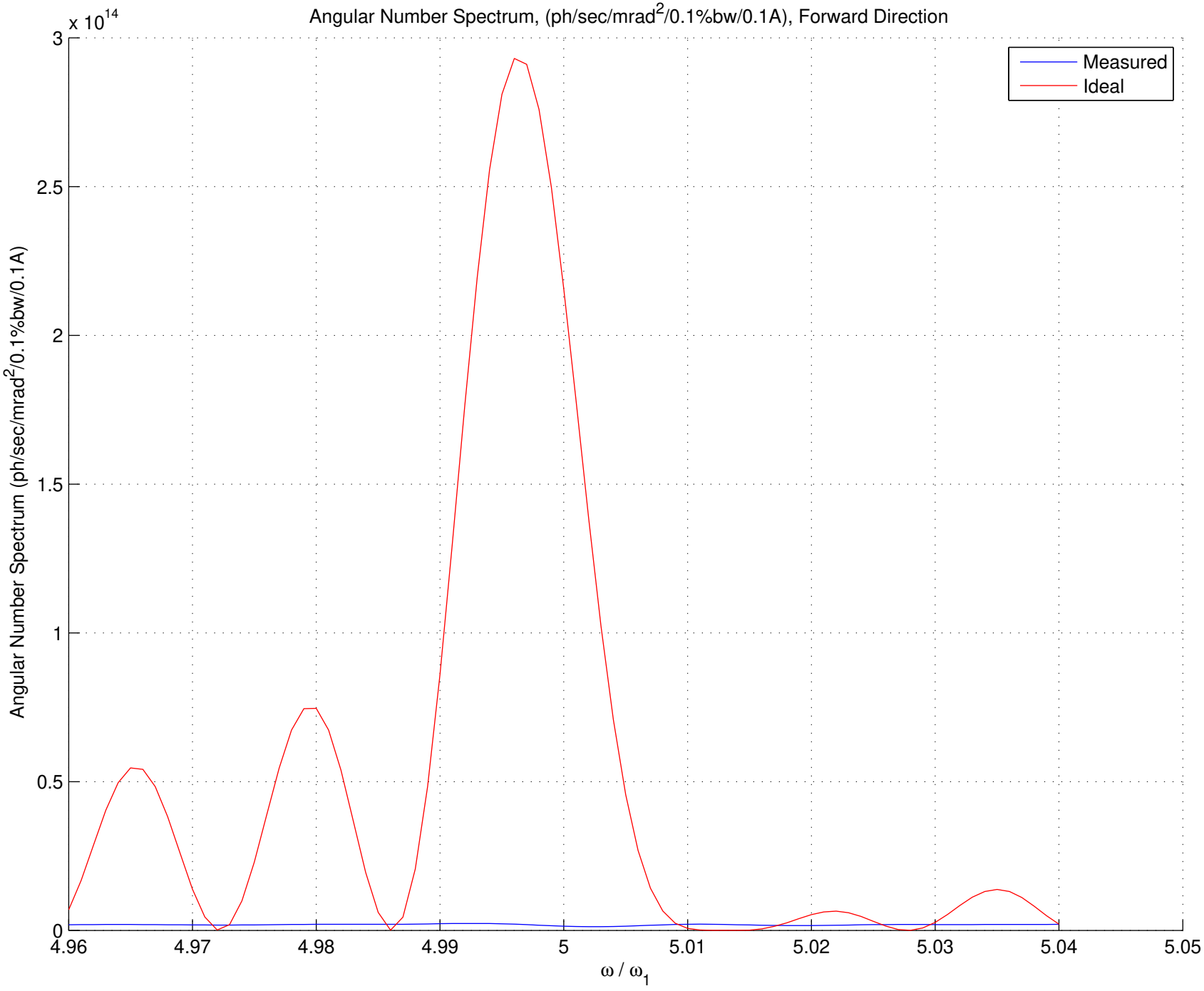

Re and Im Parts Of Ex(ω), Forward Direction, ω = ω1
90
4e−012
120
60
3e−012
150
30
2e−012
1e−012
180
0
210
330
240
300
270


Re and Im Parts Of Ey(ω), Forward Direction, ω = ω1
90
5e−014
120
60
4e−014
3e−014
150
30
2e−014
1e−014
180
0
210
330
240
300
270


Angular Number Spectrum, (ph/sec/mrad2/0.1%bw/0.1A), Forward Direction
x 10^17
Angular Number Spectrum (ph/sec/mrad2/0.1%bw/0.1A)
ω / ω1
0
0.5
1
1.5
2
2.5
3
3.5
4
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^{17}
Angular Number Spectrum (ph/sec/mrad^2/0.1%bw/0.1A)
ω / $ω_1$
Measured
Ideal
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


Angular Number Spectrum, (ph/sec/mrad2/0.1%bw/0.1A), Forward Direction
x 10^14
8
7
6
5
4
3
2
1
0
Angular Number Spectrum (ph/sec/mrad2/0.1%bw/0.1A)
2.96
2.97
2.98
2.99
3
3.01
3.02
3.03
3.04
3.05
ω / ω1
Measured
Ideal


Angular Number Spectrum, (ph/sec/mrad2/0.1%bw/0.1A), Forward Direction
x 10^14
Angular Number Spectrum (ph/sec/mrad2/0.1%bw/0.1A)
ω / ω1
Measured
Ideal
3
2.5
2
1.5
1
0.5
0
4.96
4.97
4.98
4.99
5
5.01
5.02
5.03
5.04
5.05