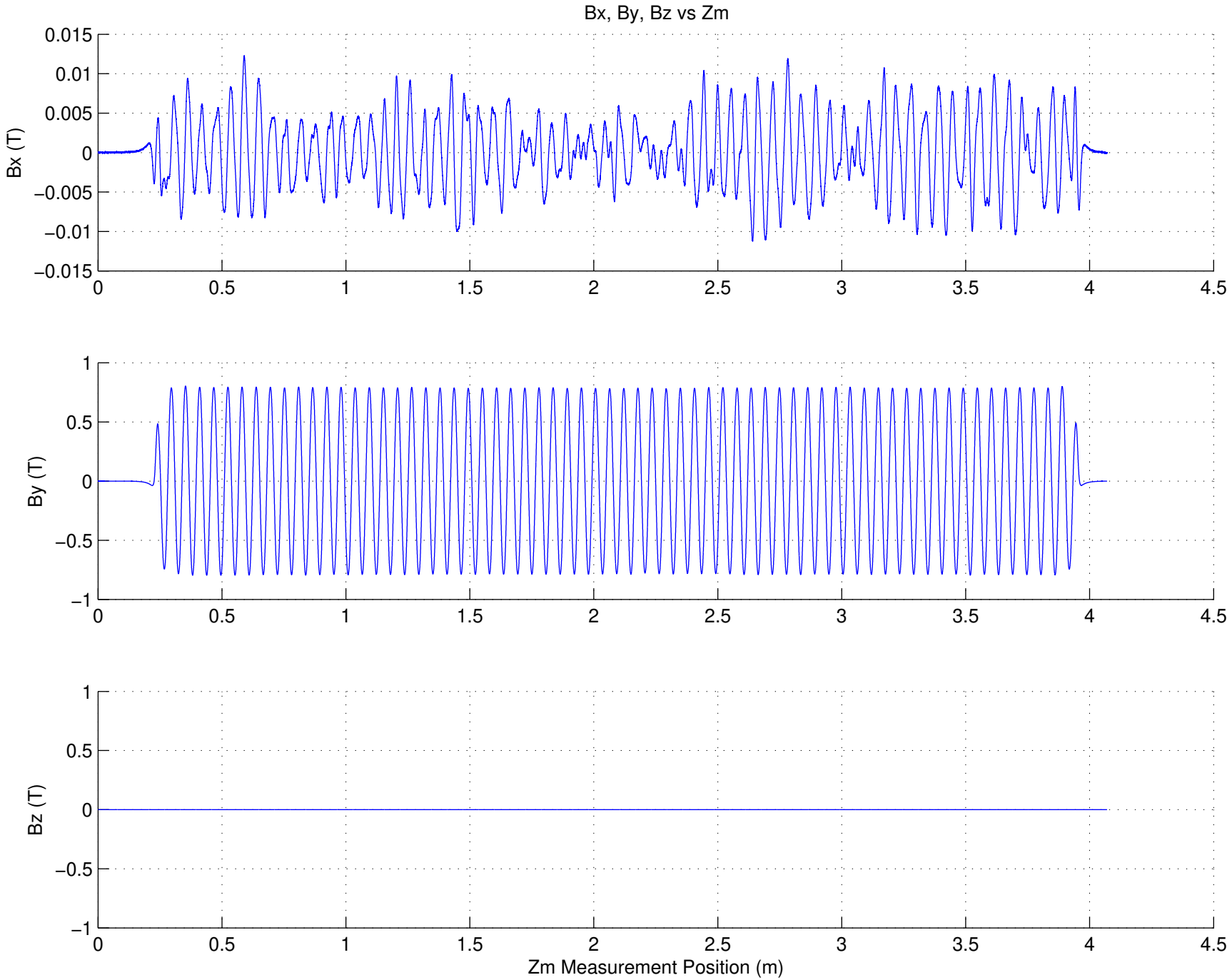
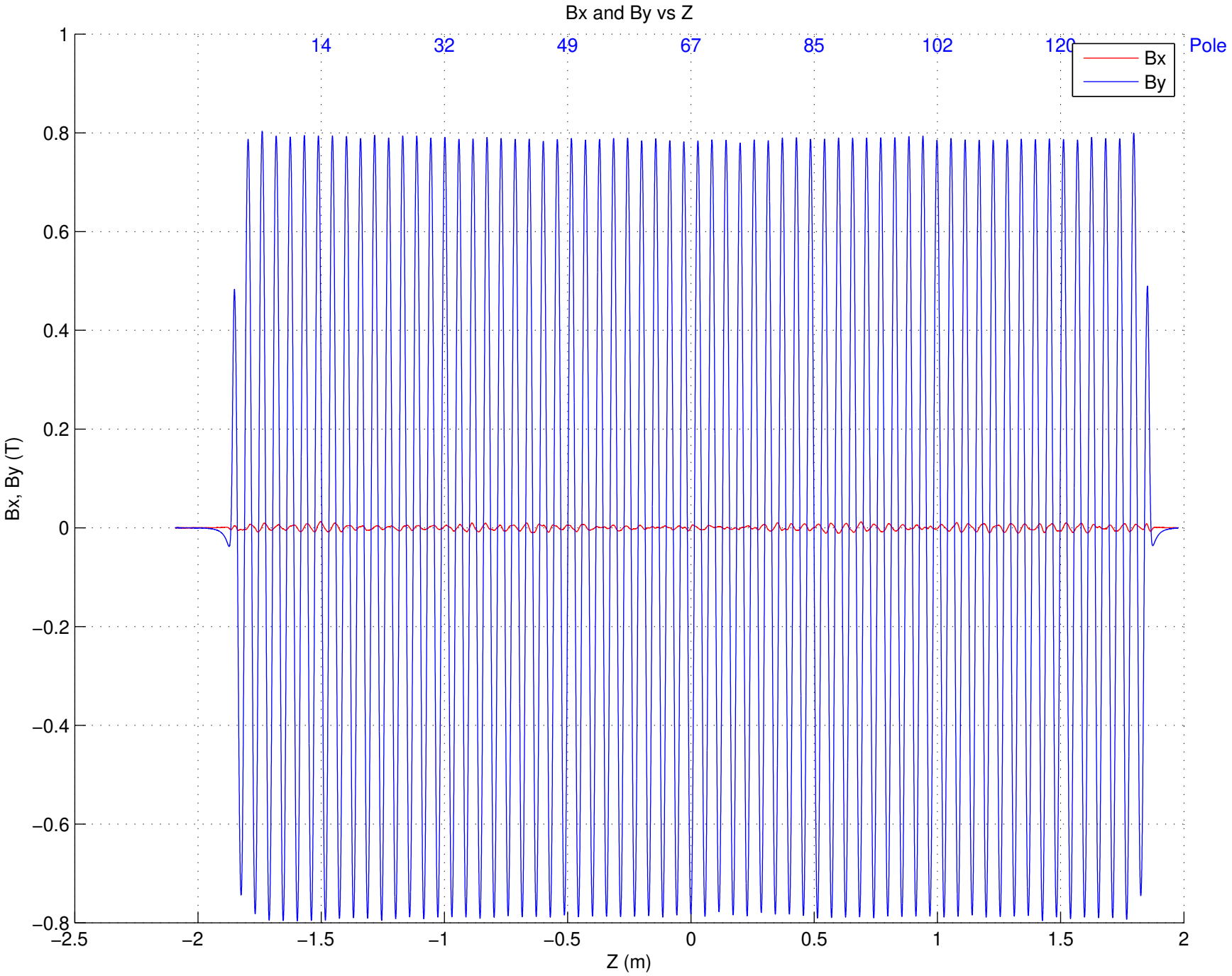
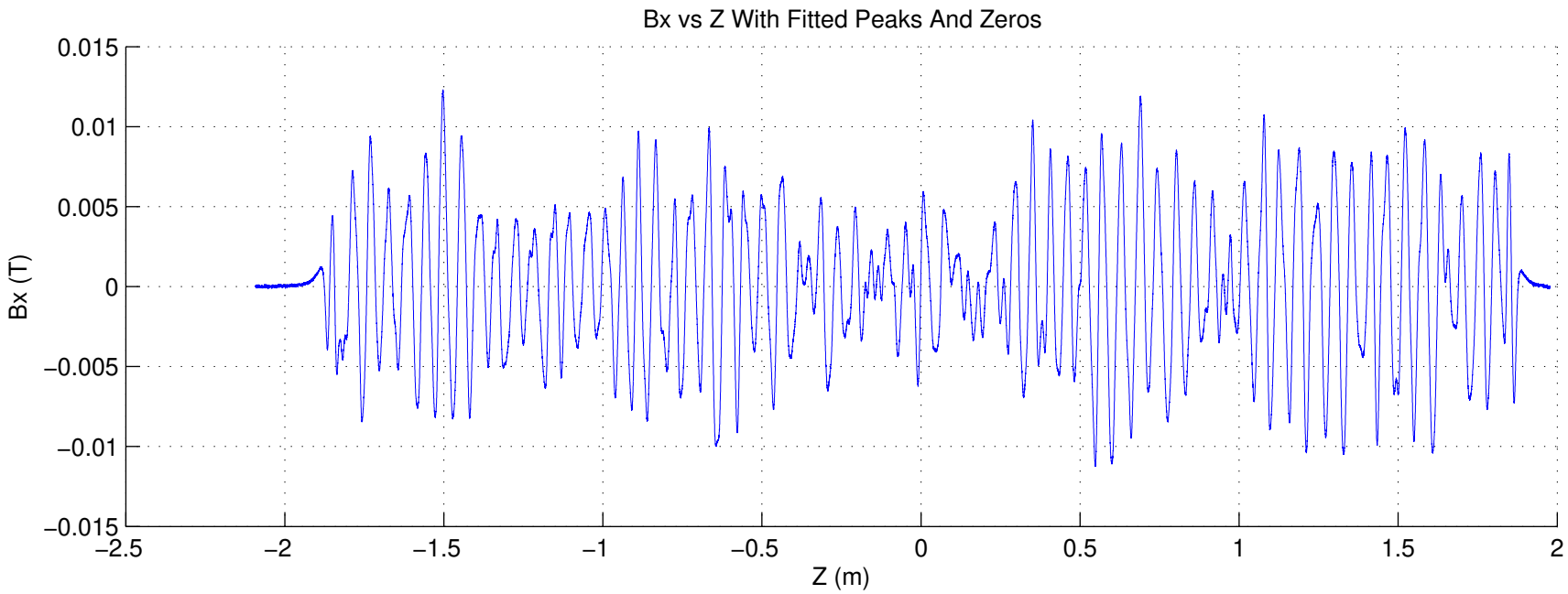
SLAC Magnetic Measurements

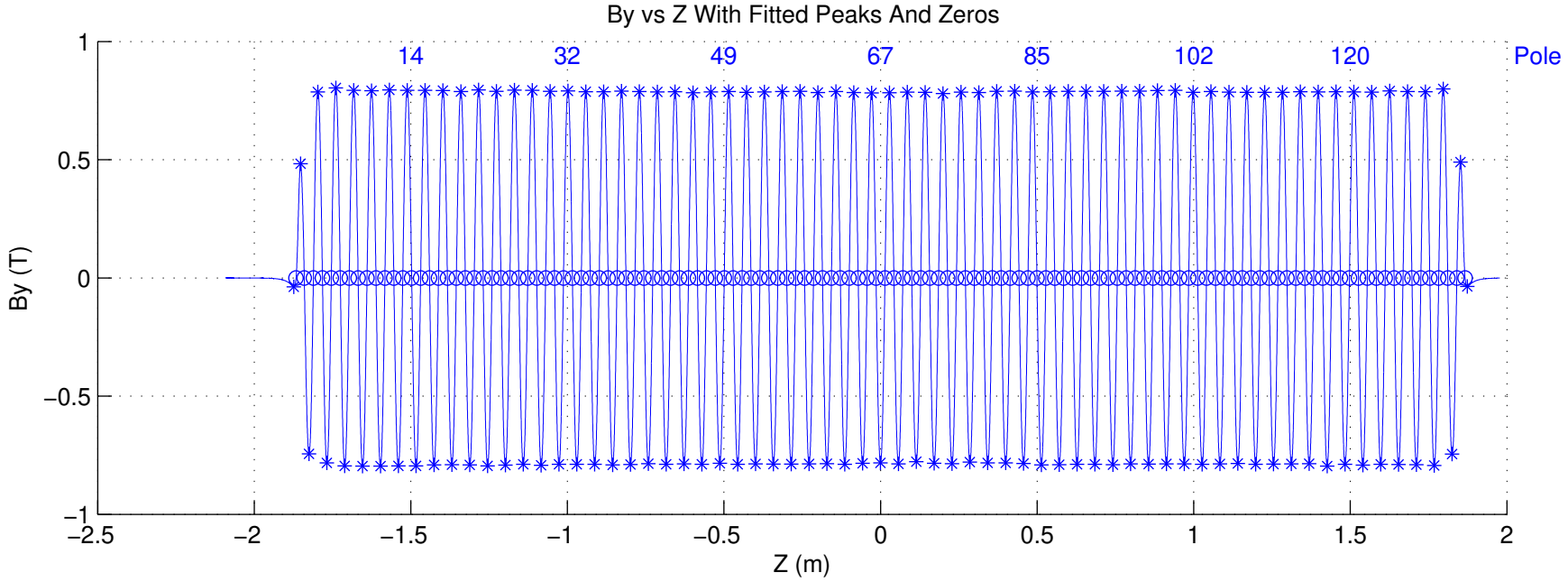
EPU Analysis
−−−−−−−−−−−

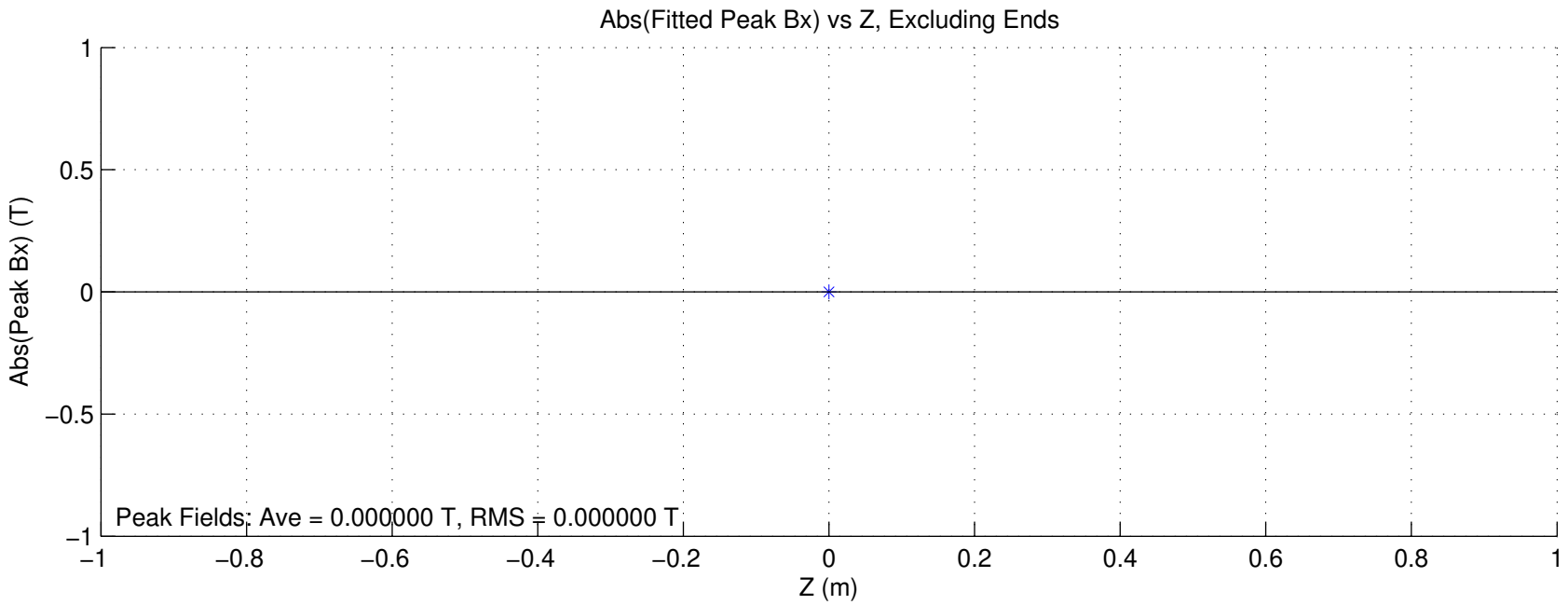
Parameters:
INPUT−FILE−DIR =S:\MagData\LCLS\Undulator\EPU\DATASET0001\Rough Tuning\Z Scans\Run 009\
INPUT−FILE−NAME =x+00000−y+000−bscanz.dat
INPUT−FILE−TYPE =ZVXYBXYH
CORR−REQUIRED =0
GAMMA =26627.1
NOM−LAMBDA−U =0.05708
NOM−K−VALUE =3.4858
NOM−LAMBDA−R =2.8481e−010
NUM−POLES =133
NUM−END−POLES =4
CELL−LENGTH =4

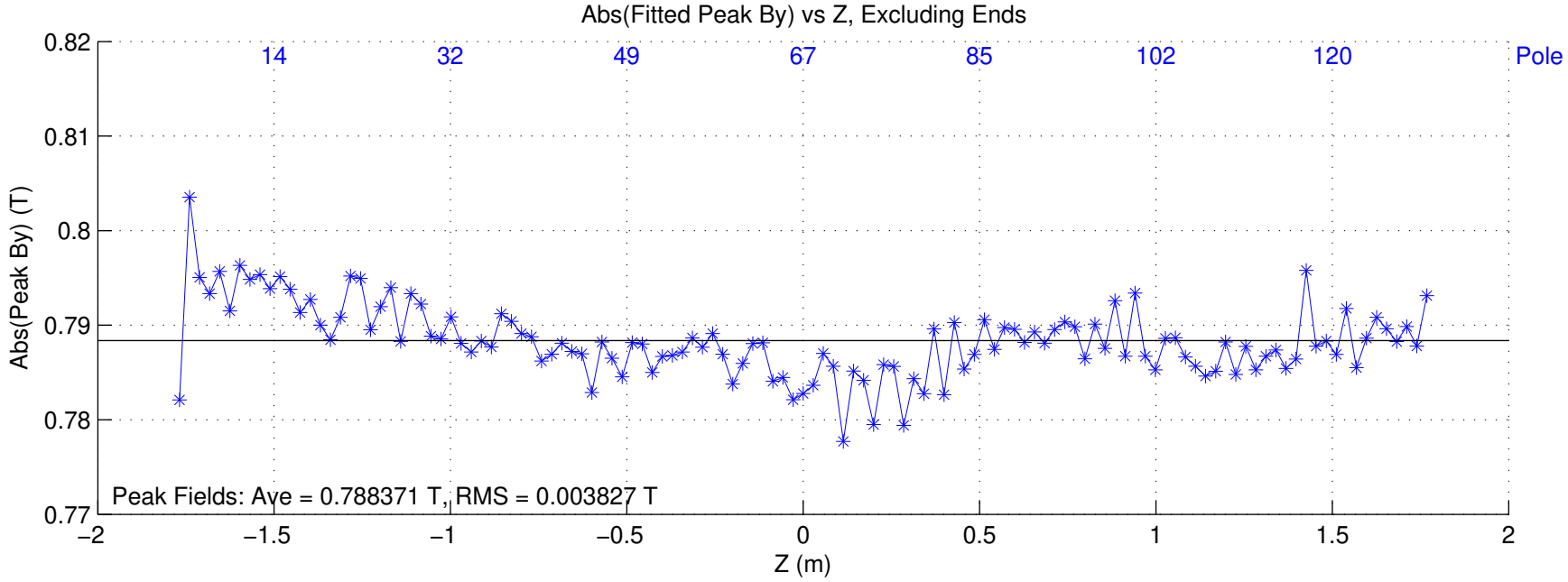

Bx, By, Bz vs Zm
Bx (T)
0.015
0.01
0.005
0
−0.005
−0.01
−0.015
By (T)
1
0.5
0
−0.5
−1
Bz (T)
1
0.5
0
−0.5
−1
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Zm Measurement Position (m)

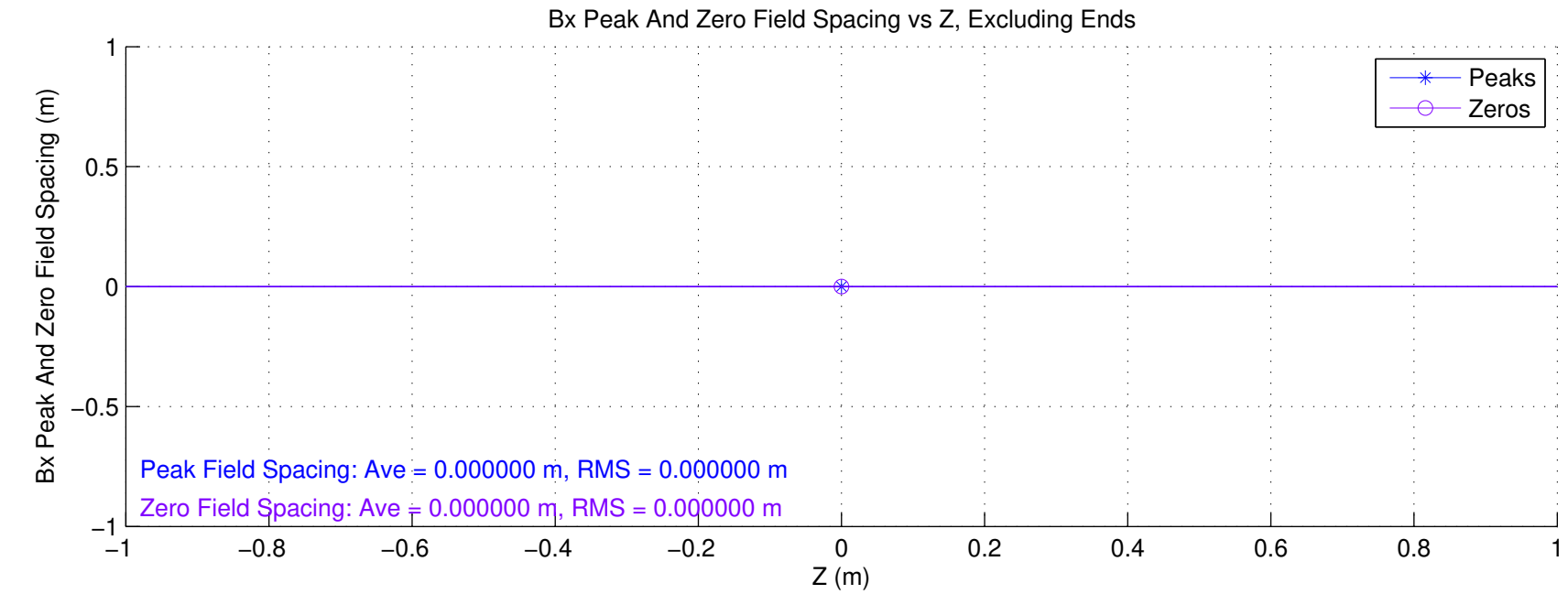

Bx and By vs Z
14
32
49
67
85
102
120
Pole
Bx
By
Bx, By (T)
Z (m)
1
0.8
0.6
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

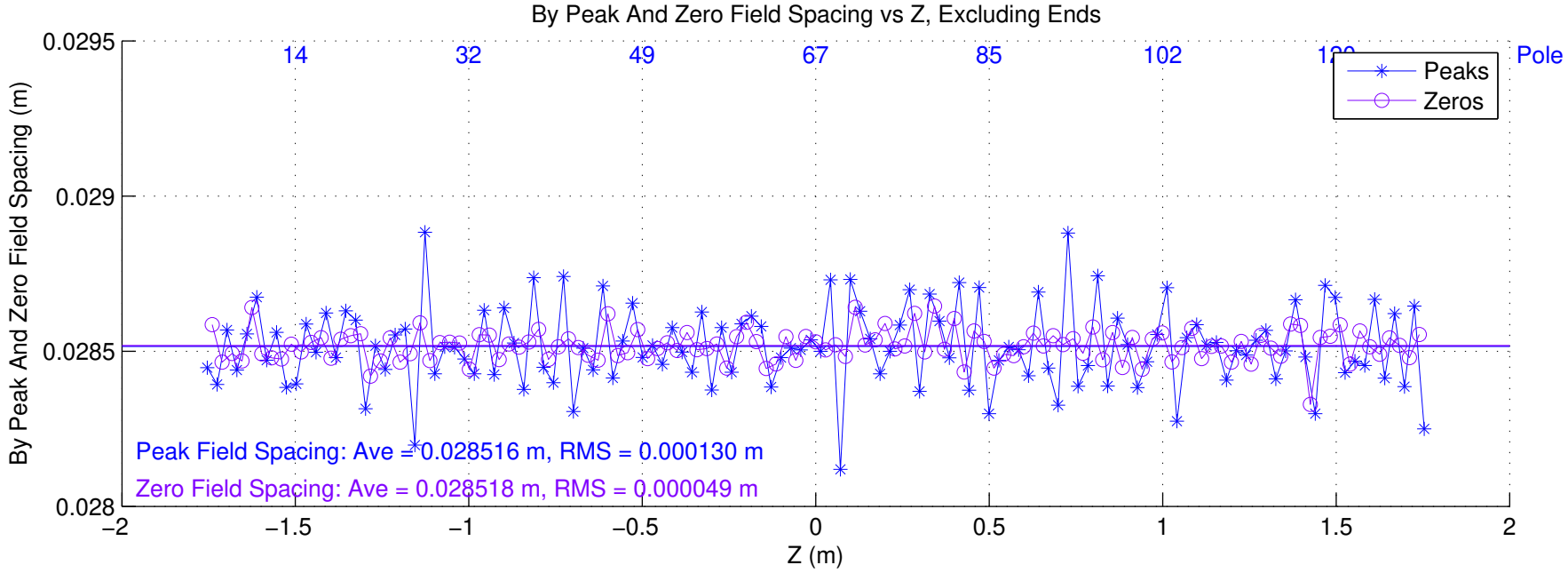

Bx vs Z With Fitted Peaks And Zeros
Bx (T)
Z (m)
0.015
0.01
0.005
0
−0.005
−0.01
−0.015
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

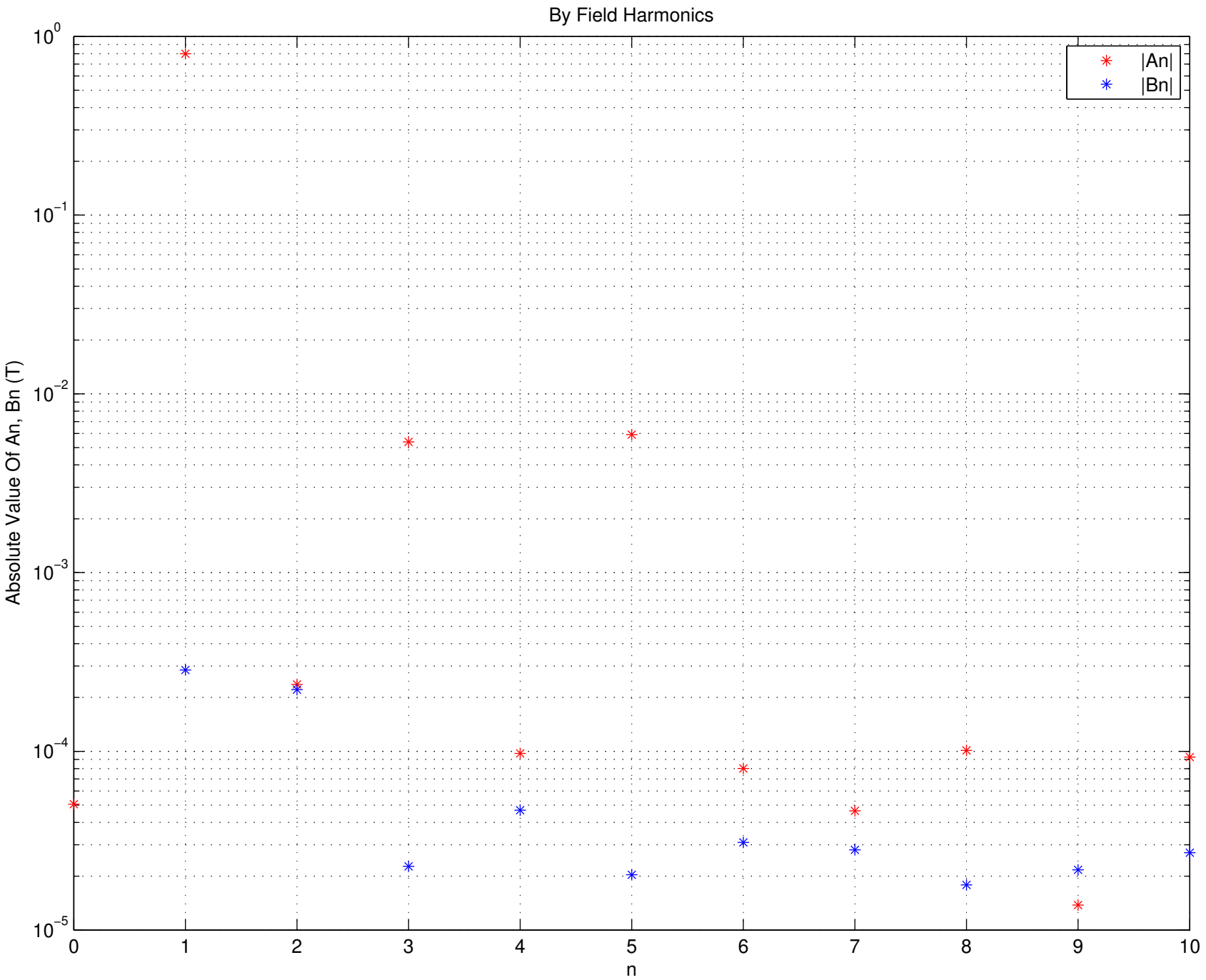

By vs Z With Fitted Peaks And Zeros
By (T)
Z (m)
Pole
14
32
49
67
85
102
120
1
0.5
0
−0.5
−1
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

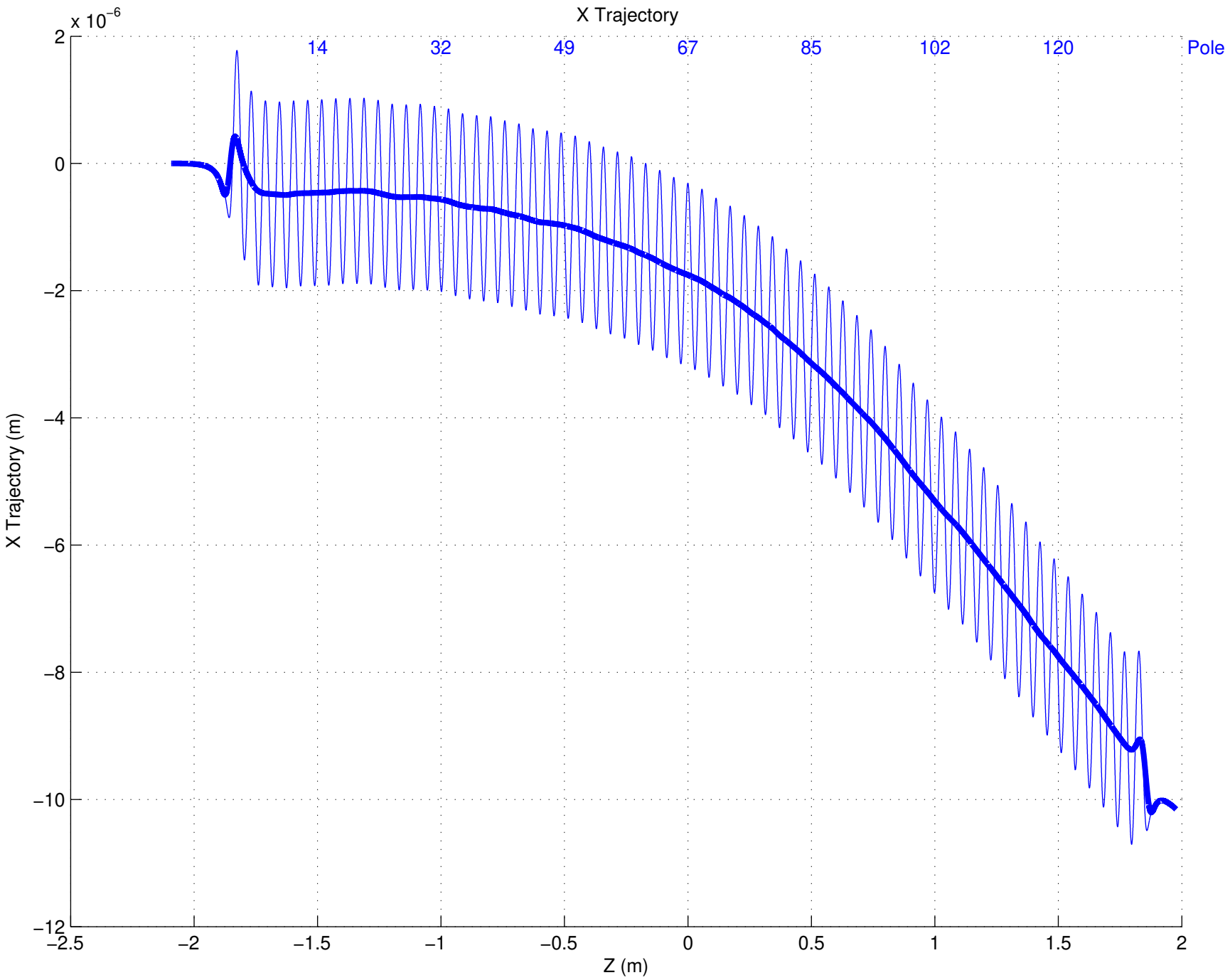

Abs(Fitted Peak Bx) vs Z, Excluding Ends
Abs(Peak Bx) (T)
Z (m)
Peak Fields: Ave = 0.000000 T, RMS = 0.000000 T
1
0.5
0
−0.5
−1
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1

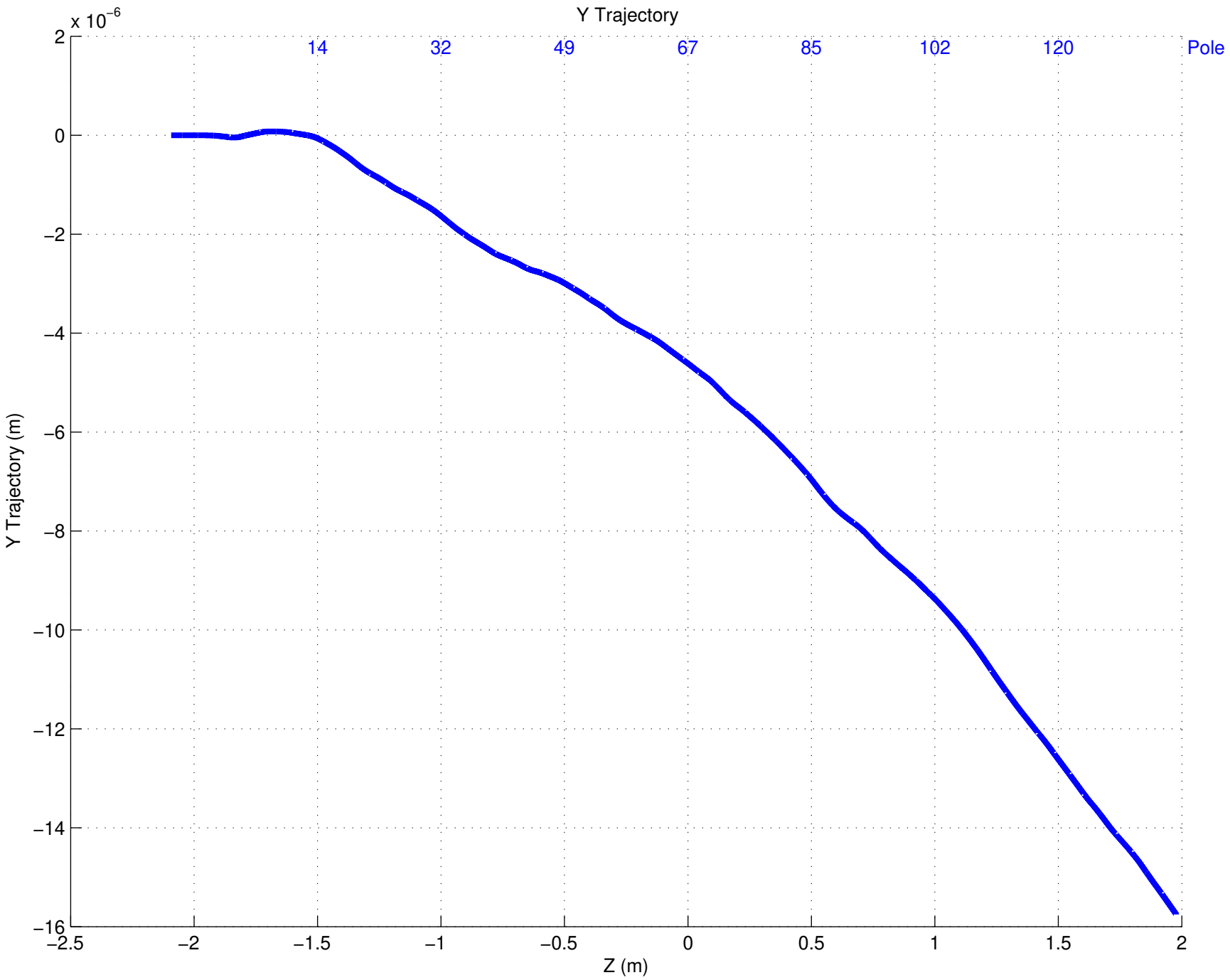

Abs(Fitted Peak By) vs Z, Excluding Ends
Abs(Peak By) (T)
Z (m)
Peak Fields: Ave = 0.788371 T, RMS = 0.003827 T
14
32
49
67
85
102
120
Pole
0.82
0.81
0.8
0.79
0.78
0.77
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

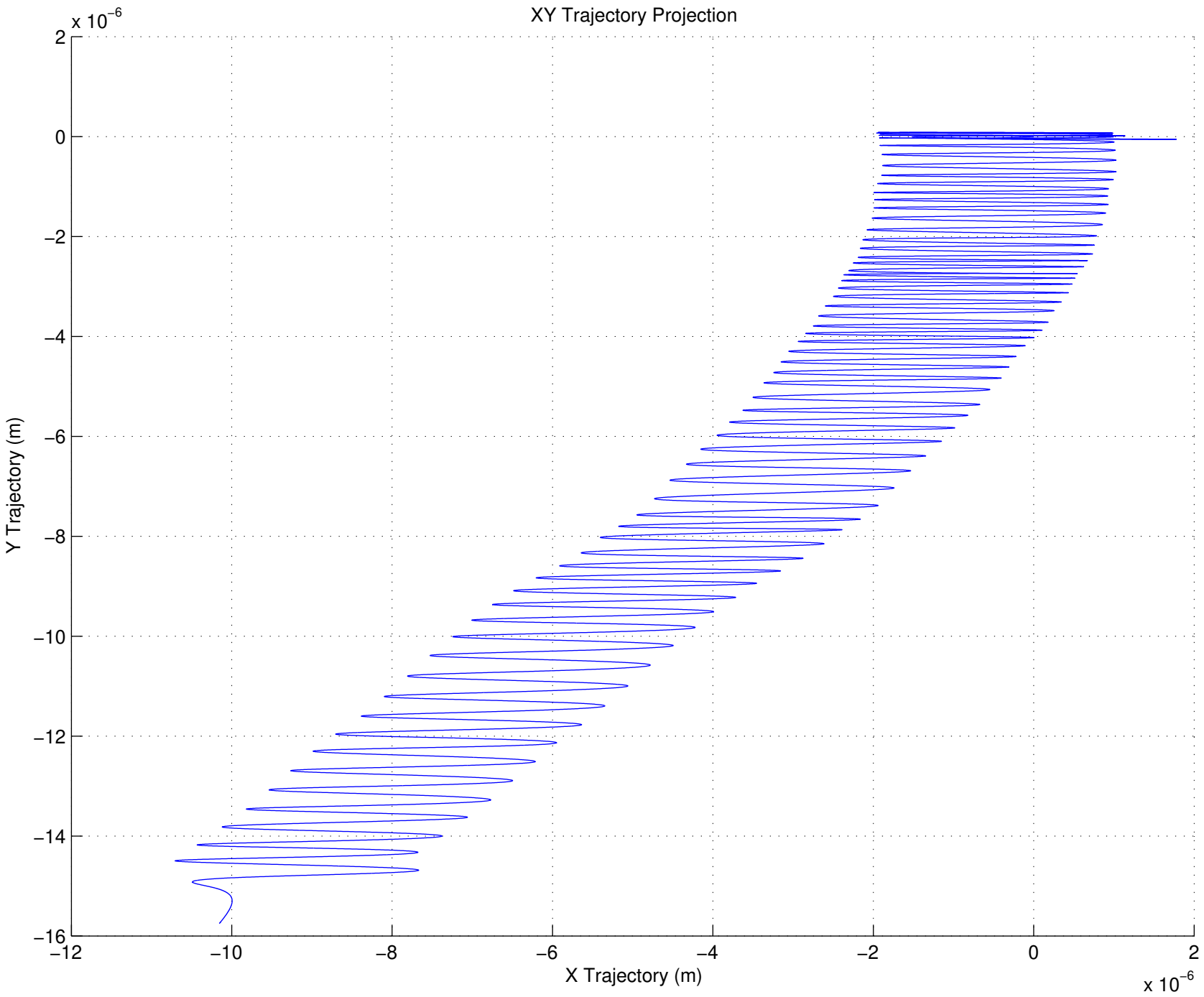

Bx Peak And Zero Field Spacing vs Z, Excluding Ends
Bx Peak And Zero Field Spacing (m)
Z (m)
Peaks
Zeros
Peak Field Spacing: Ave = 0.000000 m, RMS = 0.000000 m
Zero Field Spacing: Ave = 0.000000 m, RMS = 0.000000 m
1
0.5
0
−0.5
−1
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1

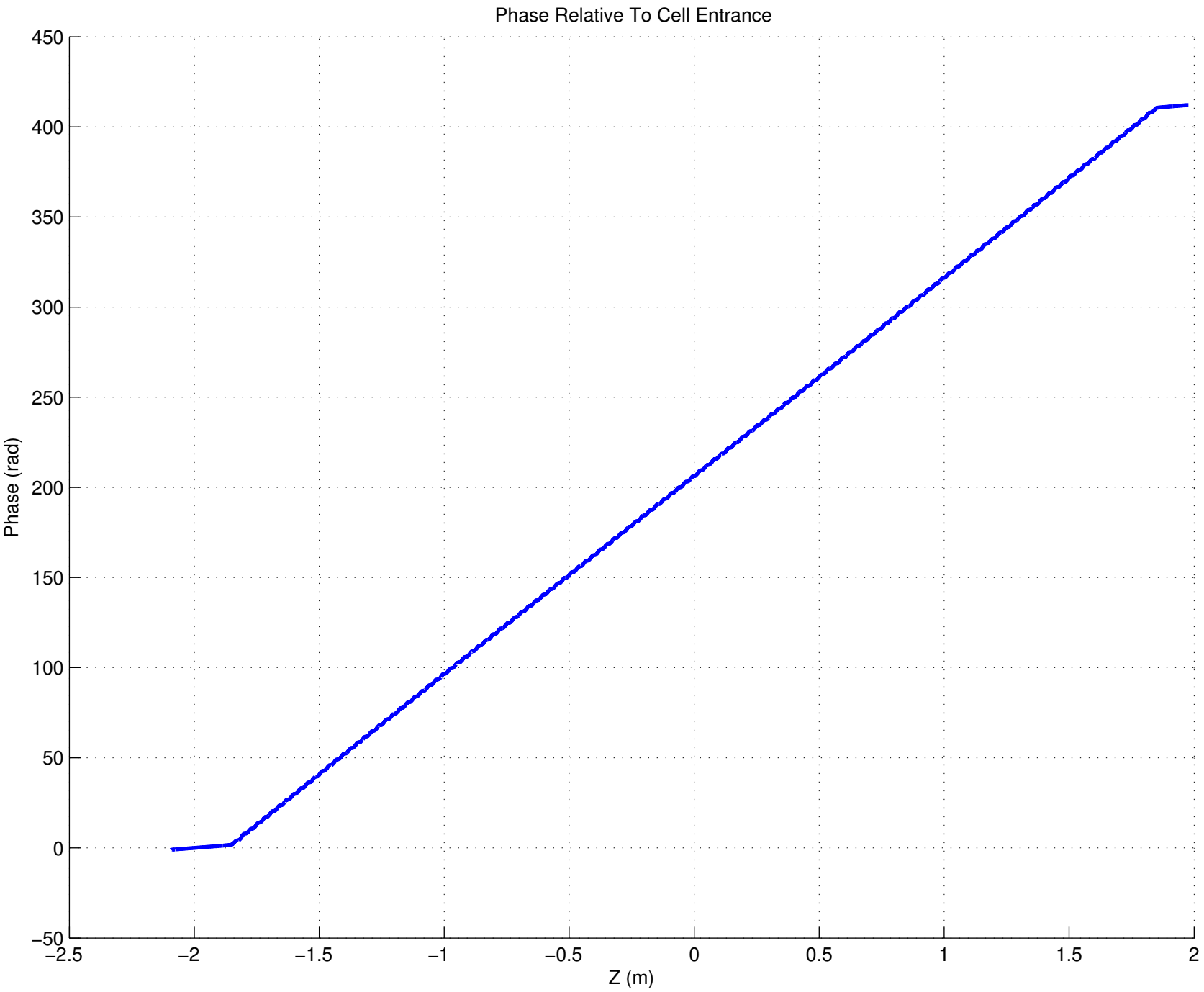

By Peak And Zero Field Spacing vs Z, Excluding Ends
By Peak And Zero Field Spacing (m)
Z (m)
14
32
49
67
85
102
Pole
Peaks
Zeros
Peak Field Spacing: Ave = 0.028516 m, RMS = 0.000130 m
Zero Field Spacing: Ave = 0.028518 m, RMS = 0.000049 m
0.0295
0.029
0.0285
0.028
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

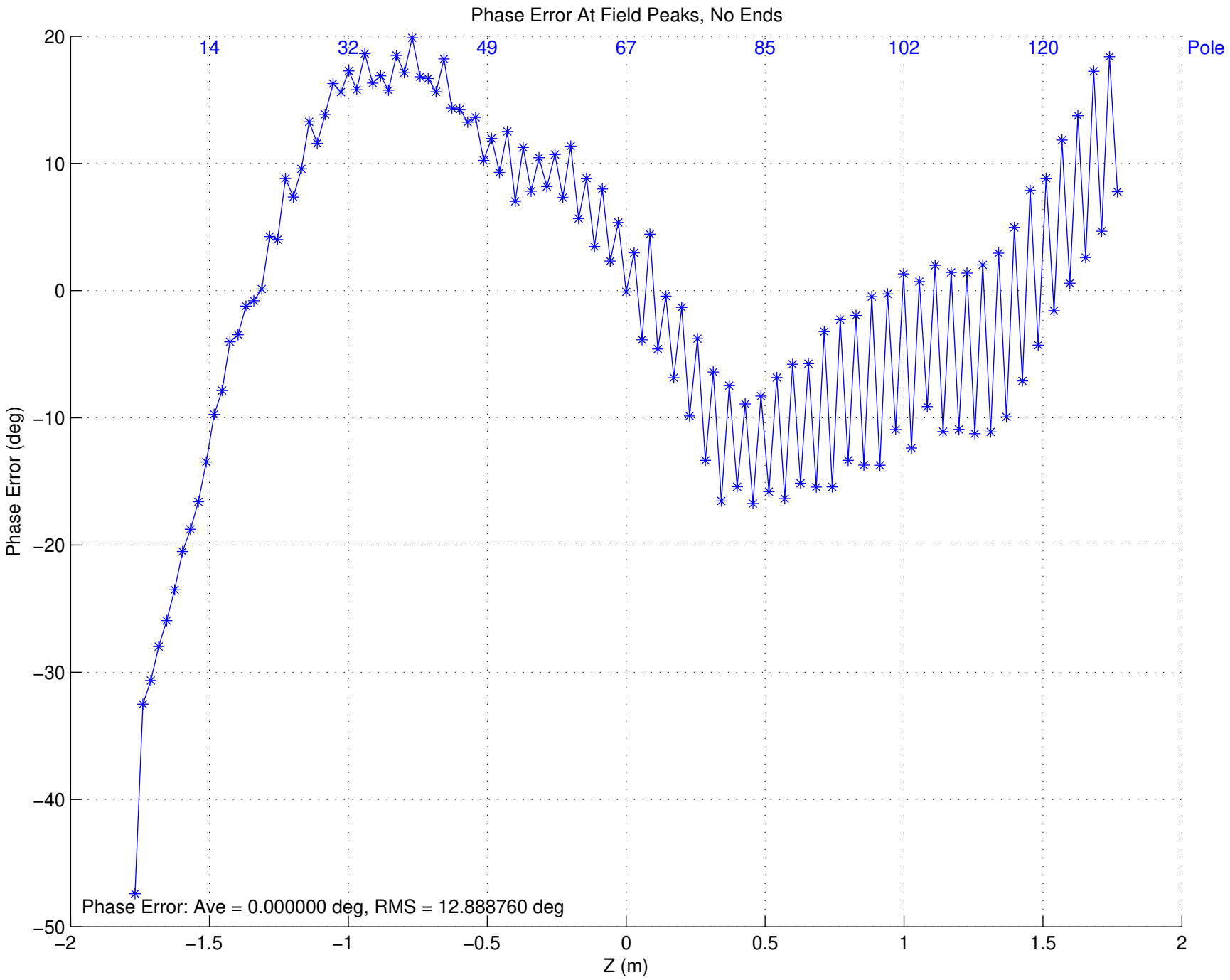

By Field Harmonics
|An|
|Bn|
Absolute Value Of An, Bn (T)
n
$10^{0}$
$10^{-1}$
$10^{-2}$
$10^{-3}$
$10^{-4}$
$10^{-5}$
0
1
2
3
4
5
6
7
8
9
10

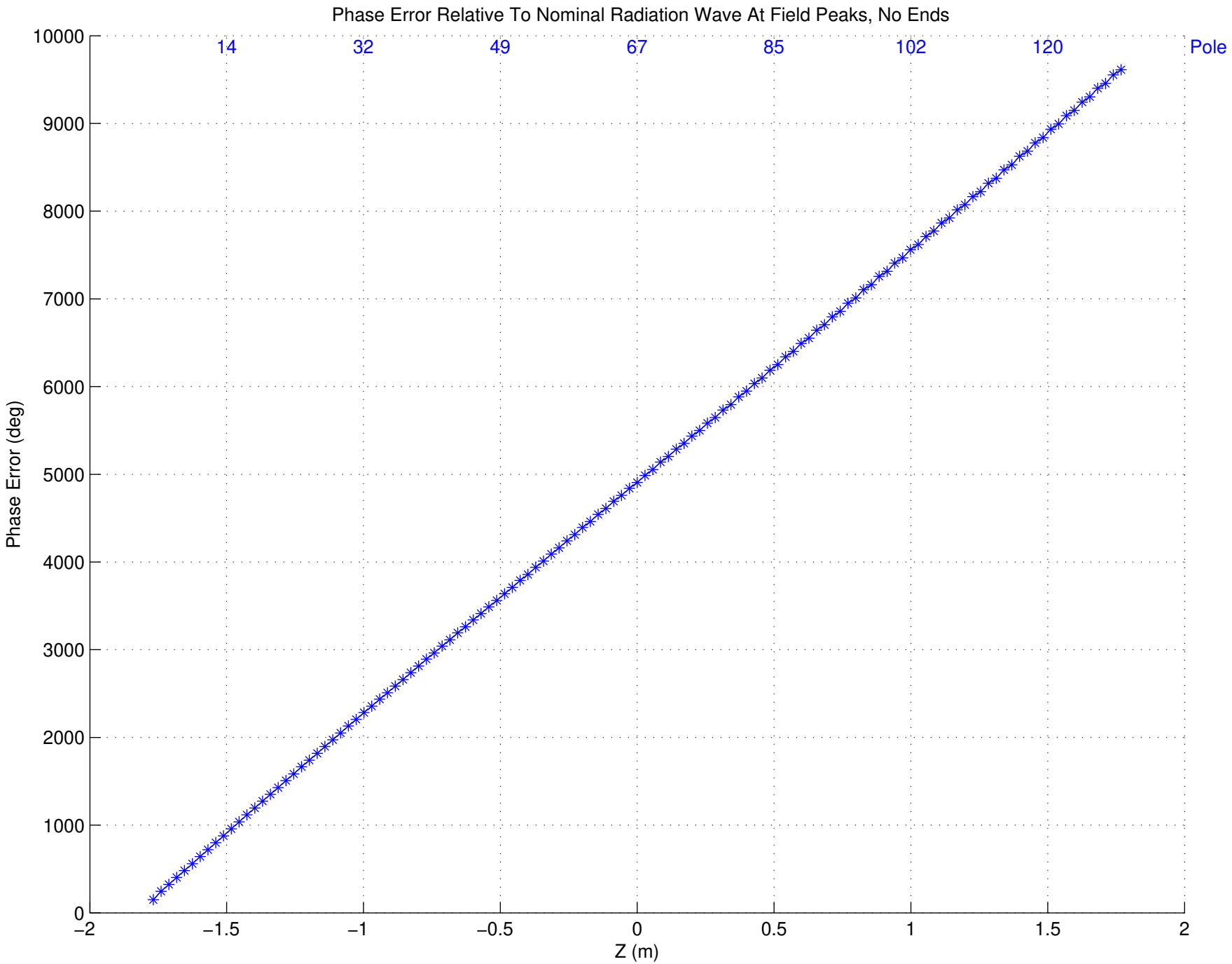

X Trajectory
x 10^-6
14
32
49
67
85
102
120
Pole
2
0
−2
−4
−6
−8
−10
−12
X Trajectory (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)

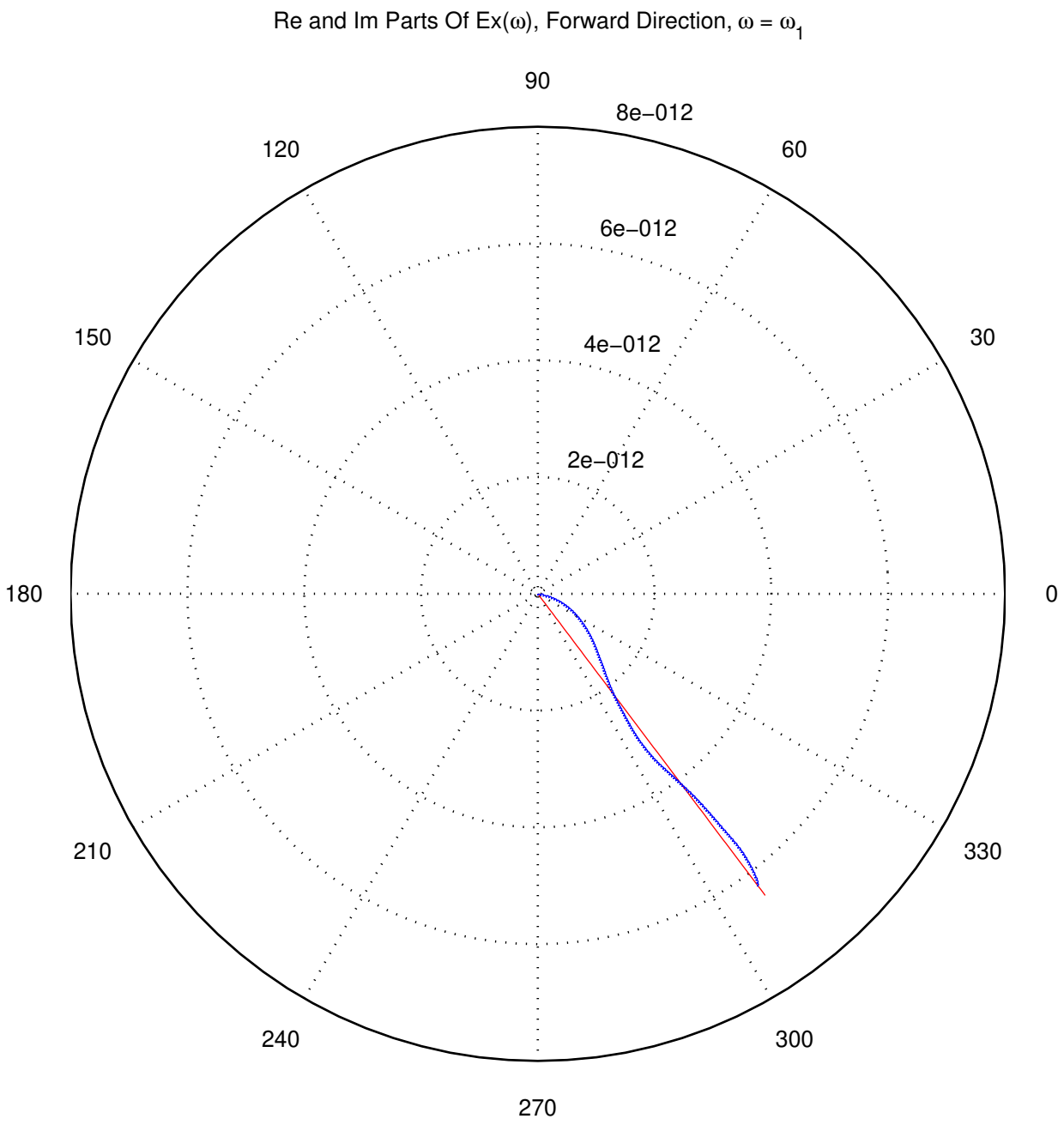

Y Trajectory
x 10^-6
2
0
−2
−4
−6
−8
−10
−12
−14
−16
14
32
49
67
85
102
120
Pole
Y Trajectory (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)

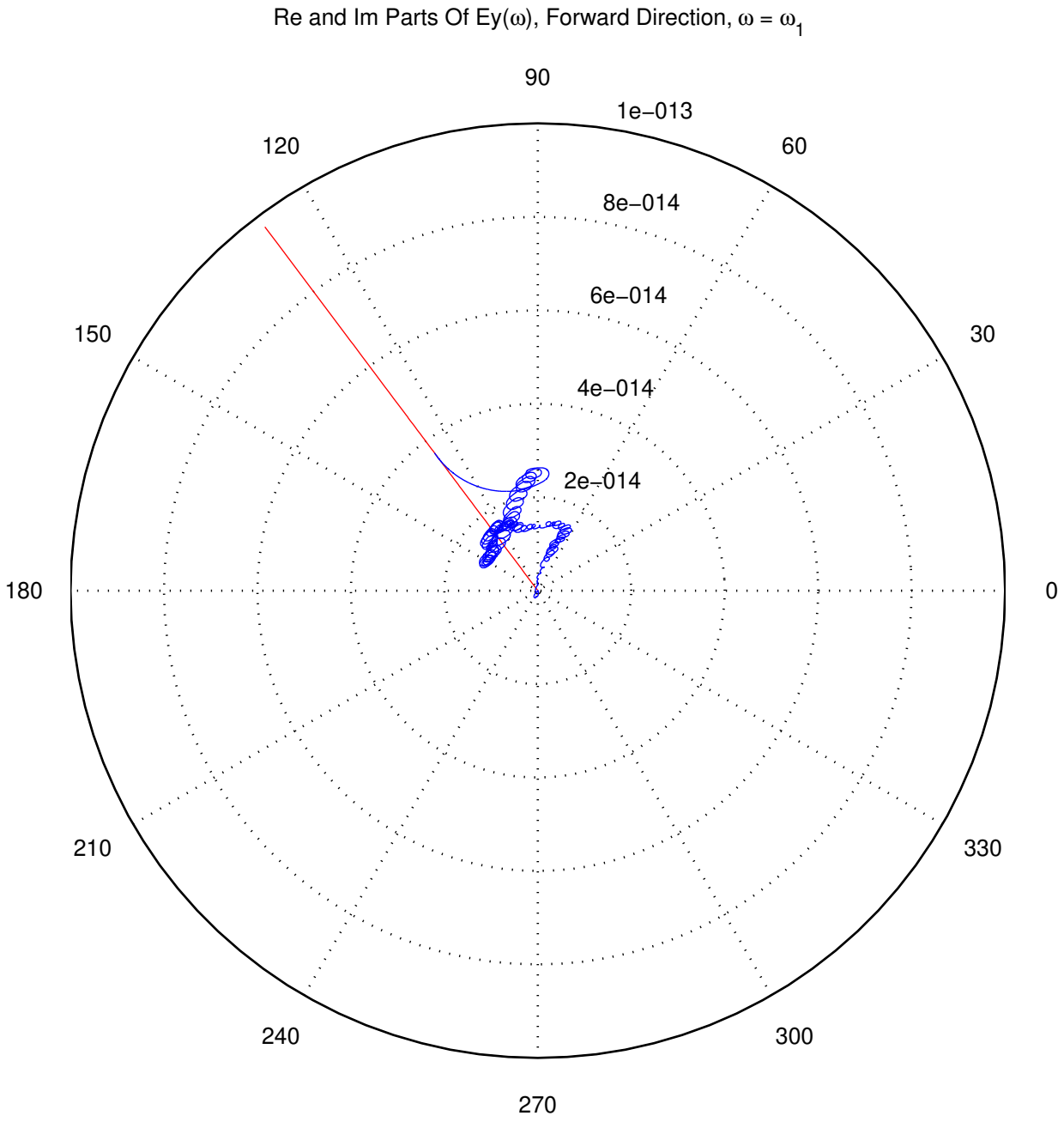

XY Trajectory Projection
x 10^-6
2
0
−2
−4
−6
−8
−10
−12
−14
−16
Y Trajectory (m)
−12
−10
−8
−6
−4
−2
0
2
X Trajectory (m)
x 10^-6

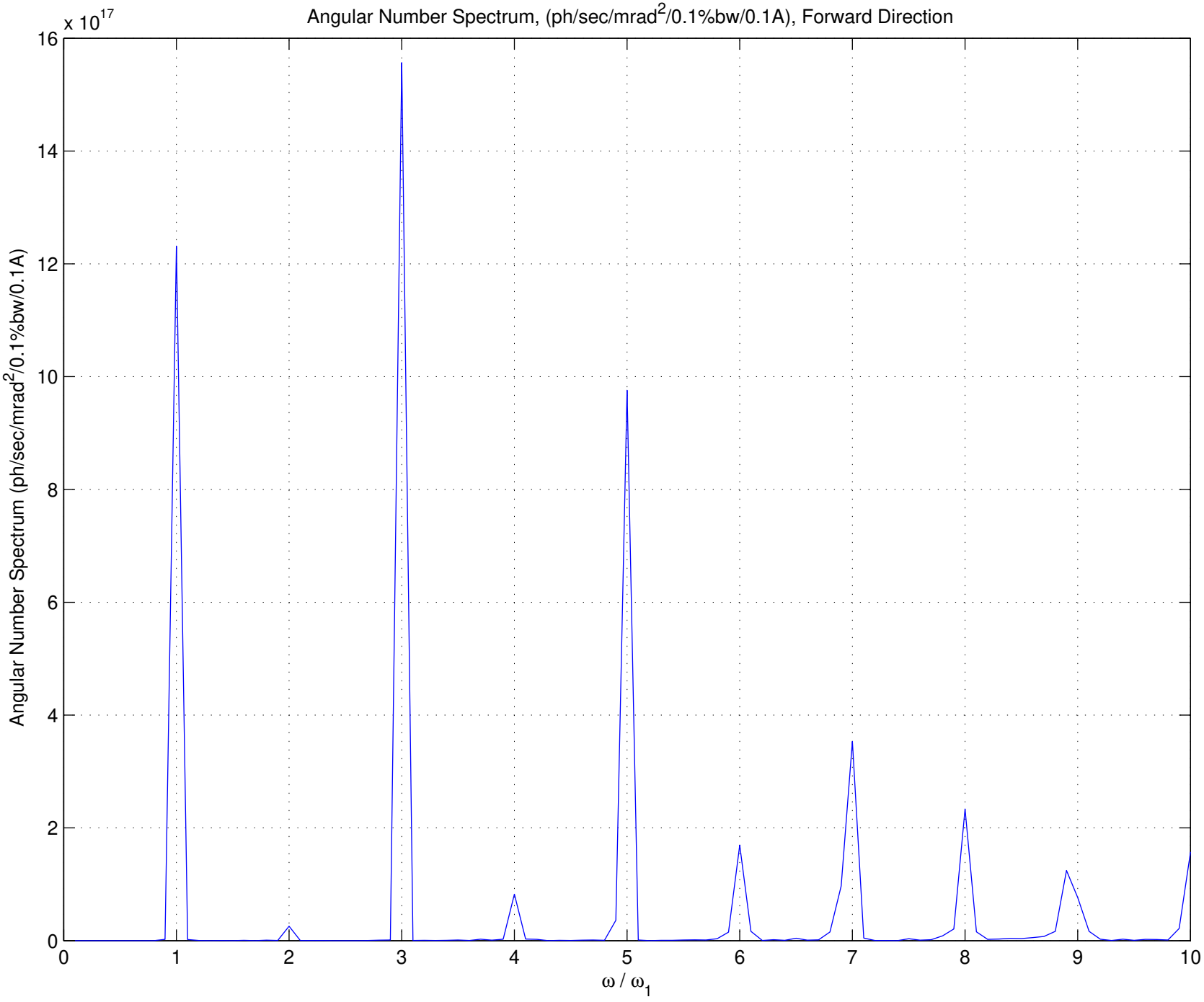

Phase Relative To Cell Entrance
Phase (rad)
Z (m)
450
400
350
300
250
200
150
100
50
0
−50
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

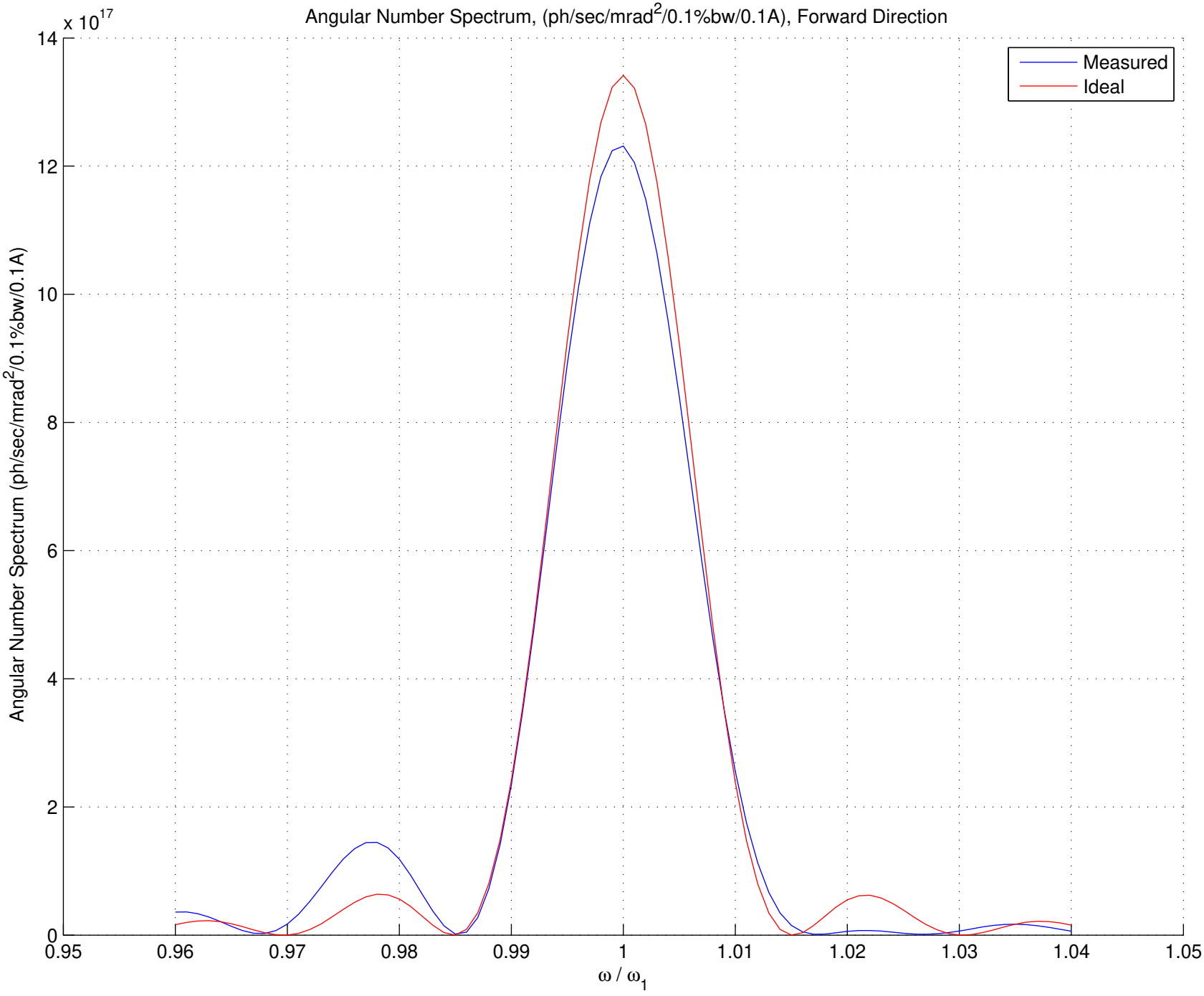

Phase Error At Field Peaks, No Ends
14
32
49
67
85
102
120
Pole
20
10
0
−10
−20
−30
−40
−50
Phase Error (deg)
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)
Phase Error: Ave = 0.000000 deg, RMS = 12.888760 deg

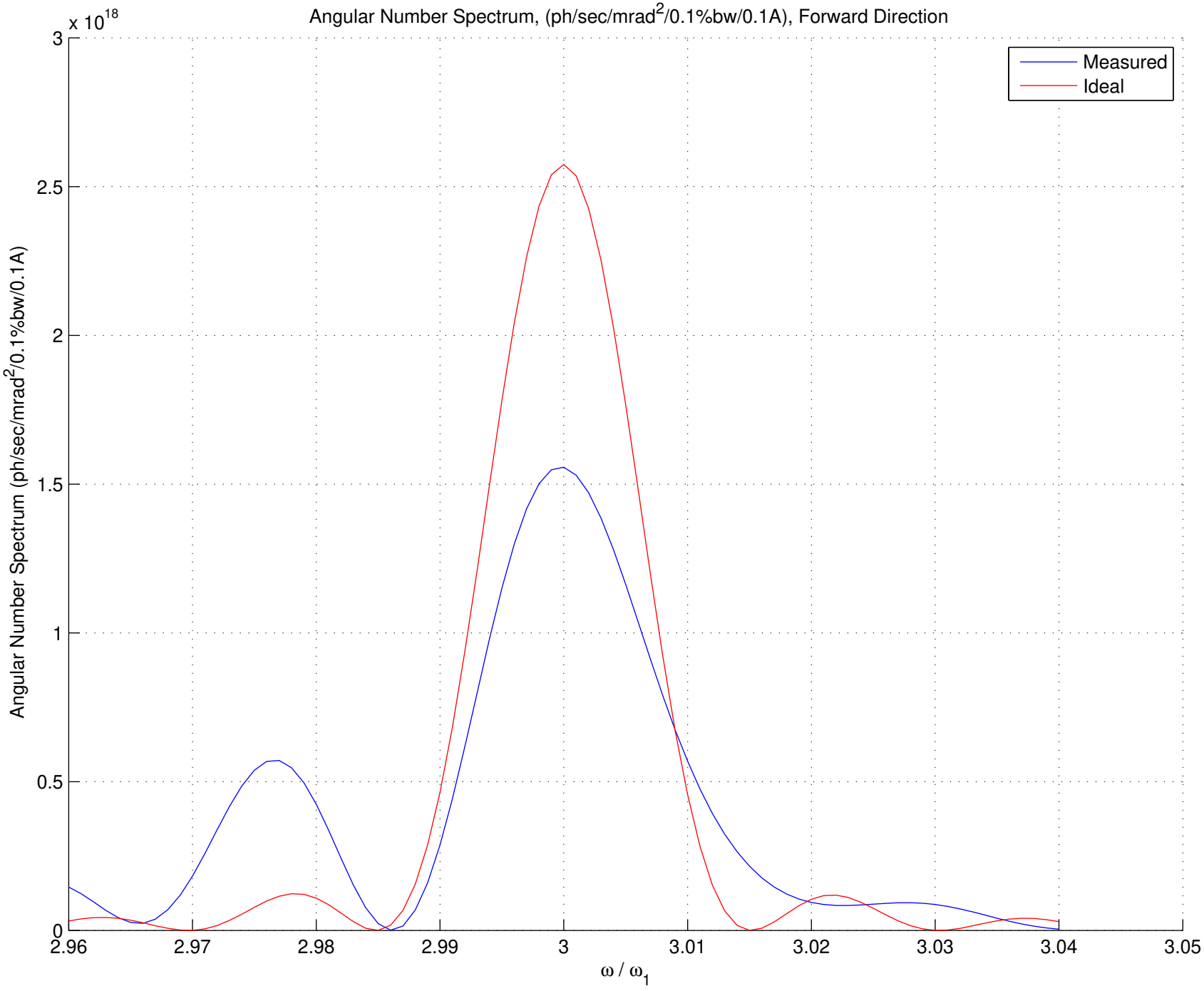

Phase Error Relative To Nominal Radiation Wave At Field Peaks, No Ends
14
32
49
67
85
102
120
Pole
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Phase Error (deg)
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z (m)

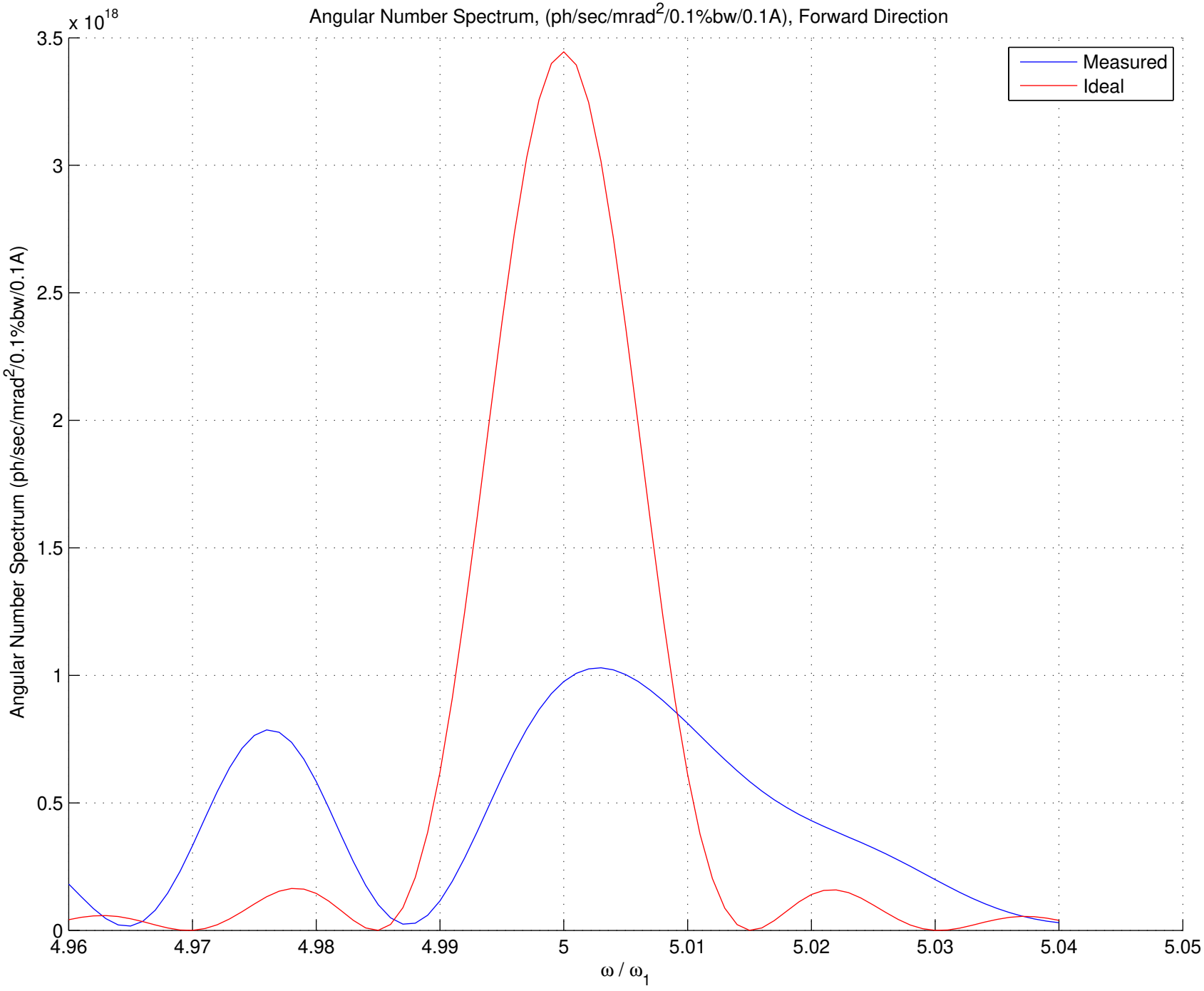

Re and Im Parts Of Ex(ω), Forward Direction, ω = ω1
90
8e−012
120
60
6e−012
150
30
4e−012
2e−012
180
0
210
330
240
300
270


Re and Im Parts Of Ey(ω), Forward Direction, ω = ω1
90
1e−013
120
60
8e−014
6e−014
150
30
4e−014
2e−014
180
0
210
330
240
300
270


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)
$\omega$ / $\omega_1$
0
2
4
6
8
10
12
14
16
0
1
2
3
4
5
6
7
8
9
10


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
Measured
Ideal
0
2
4
6
8
10
12
14
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/mrad2/0.1%bw/0.1A), Forward Direction
x 10^18
Measured
Ideal
Angular Number Spectrum (ph/sec/mrad2/0.1%bw/0.1A)
ω / ω1
3
2.5
2
1.5
1
0.5
0
2.96
2.97
2.98
2.99
3
3.01
3.02
3.03
3.04
3.05


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 / $ω_1$
Measured
Ideal
3.5
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