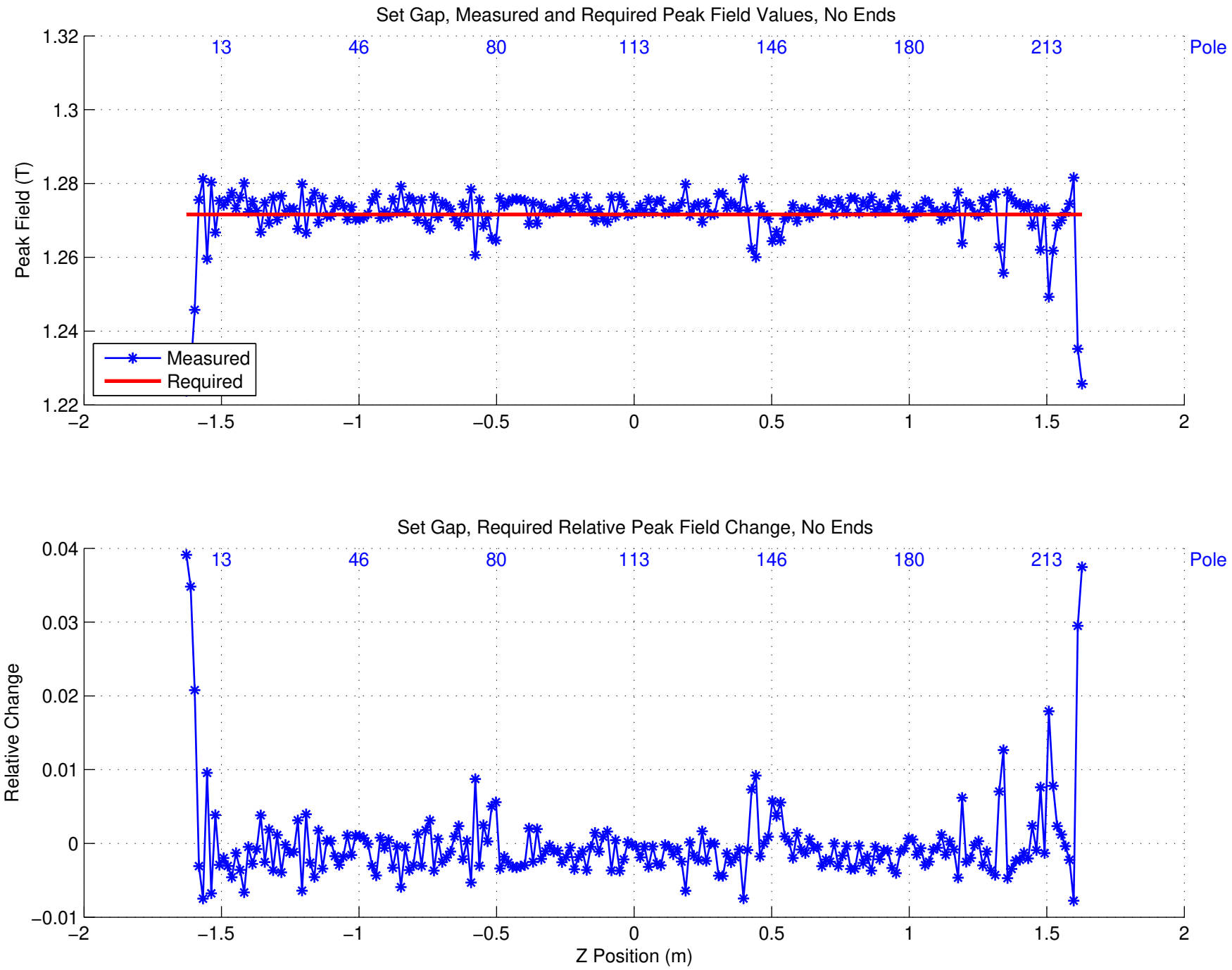
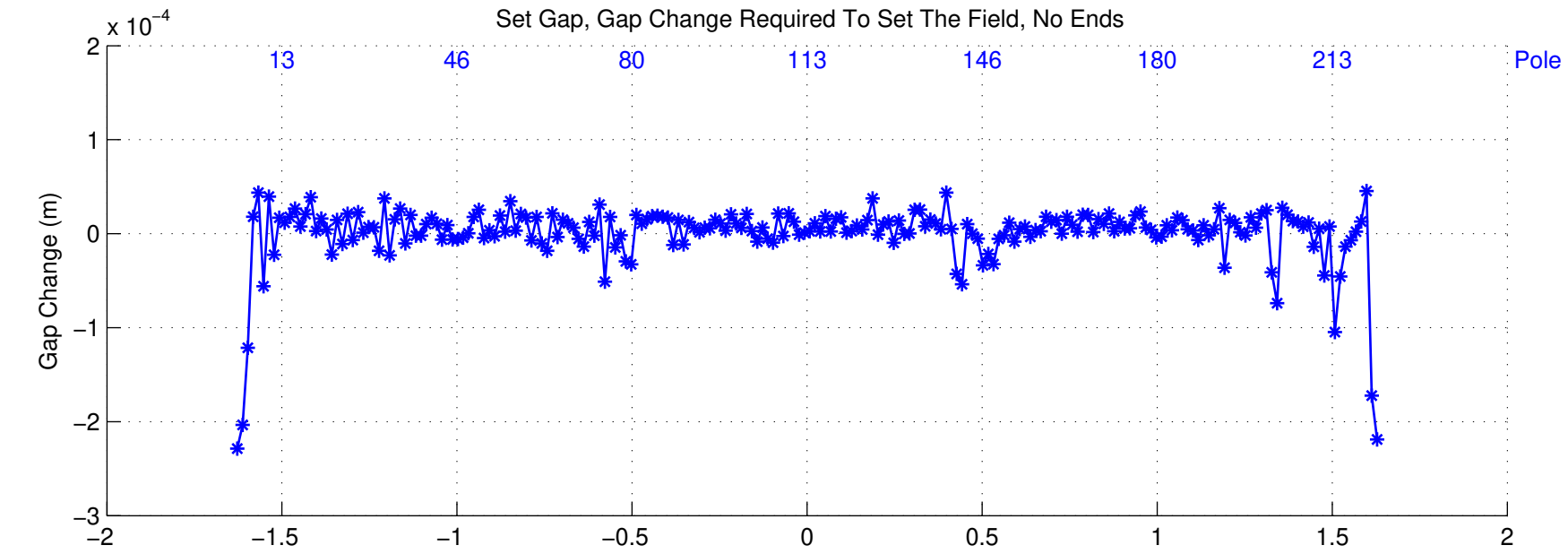
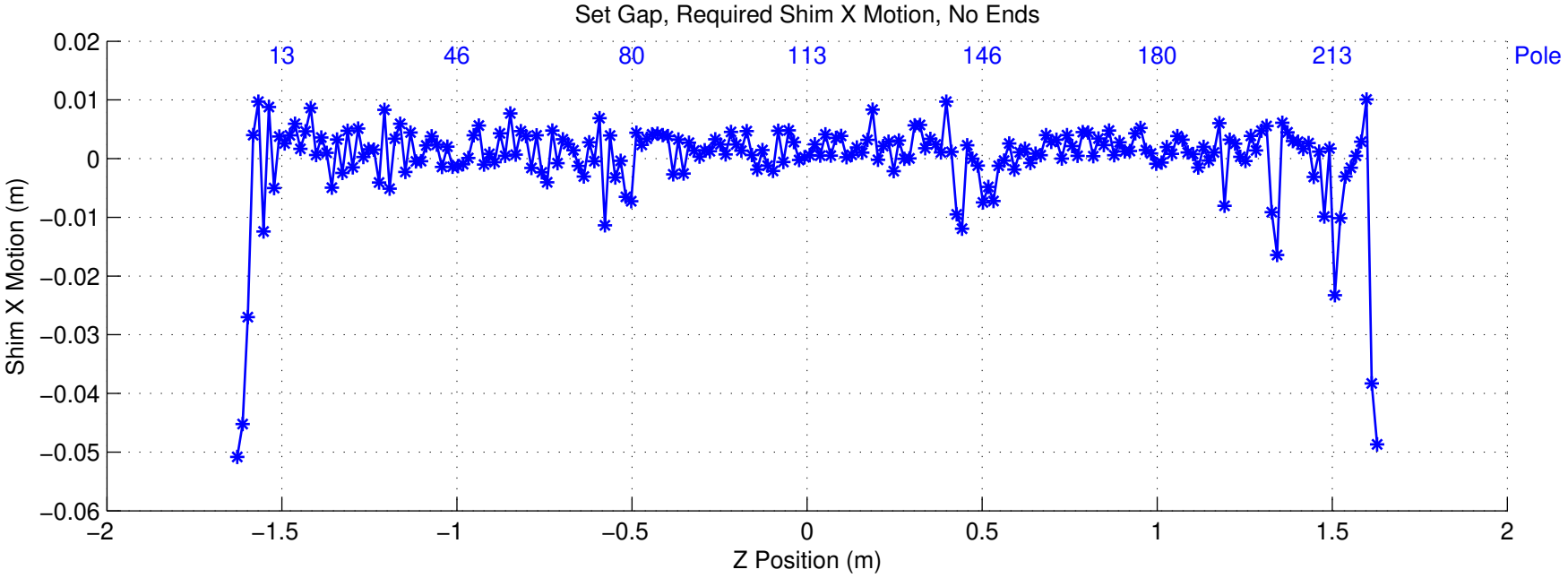
SLAC Magnetic Measurements

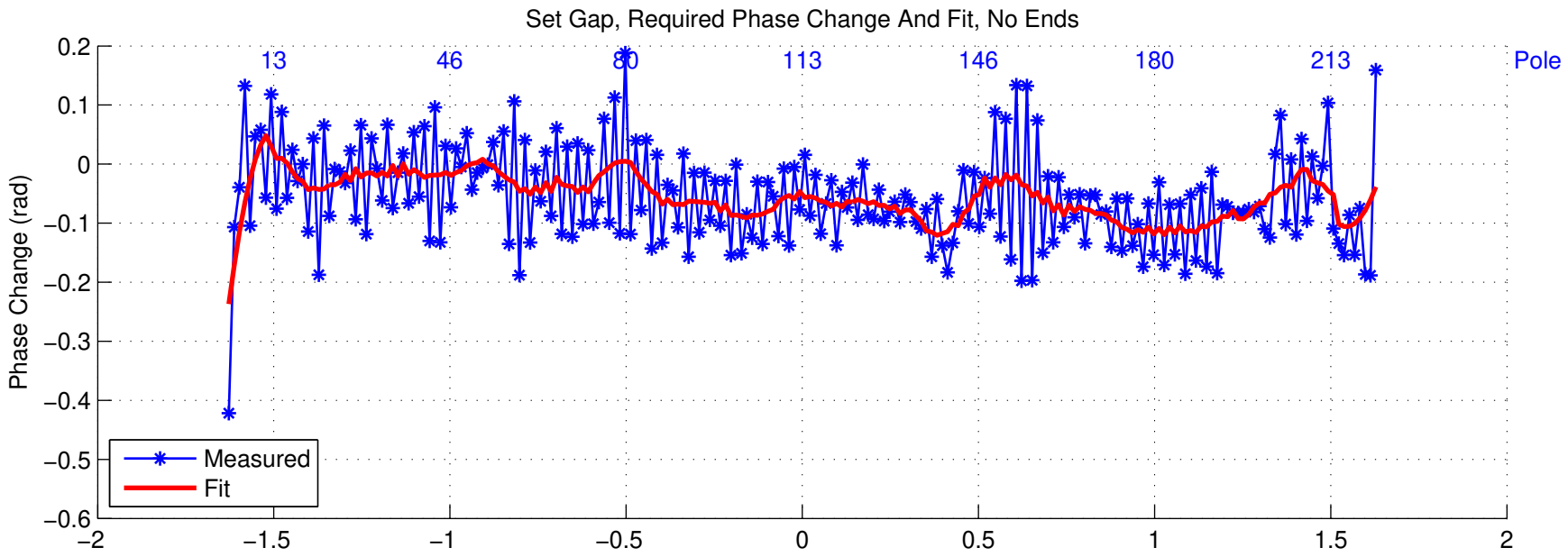
Planar Insertion Device Shim Analysis

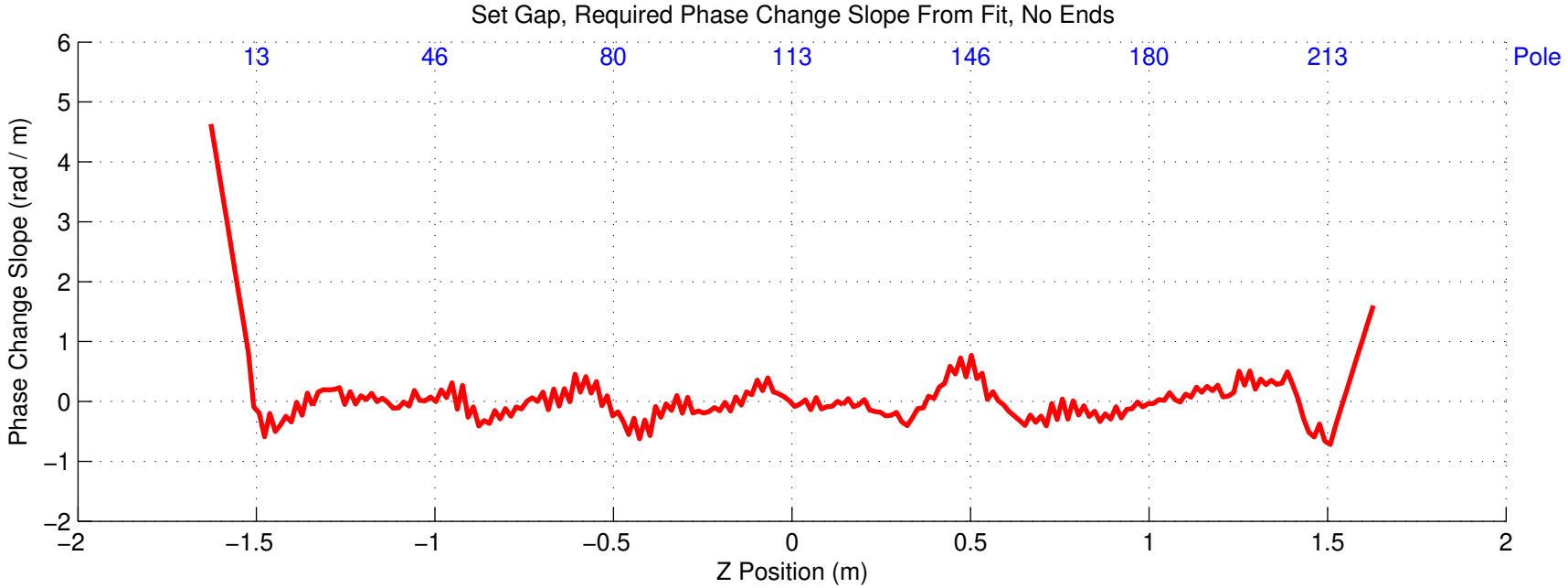
Parameters:
INPUT−FILE−DIR =S:\MagData\LCLS\Undulator\L143−112000−39\DATASET0001\Rough Tuning\Z Scans\Run 076\
INPUT−FILE−NAME =x+00000−y+000−bscanz.dat
INPUT−FILE−TYPE =ZVXYBXYH
CORR−REQUIRED =1
GAMMA =26648.21
NOM−LAMBDA−U =0.03
NOM−K−VALUE =3.4904
NOM−LAMBDA−R =1.4979e−010
NUM−POLES =226
NUM−END−POLES =4
CELL−LENGTH =3.656

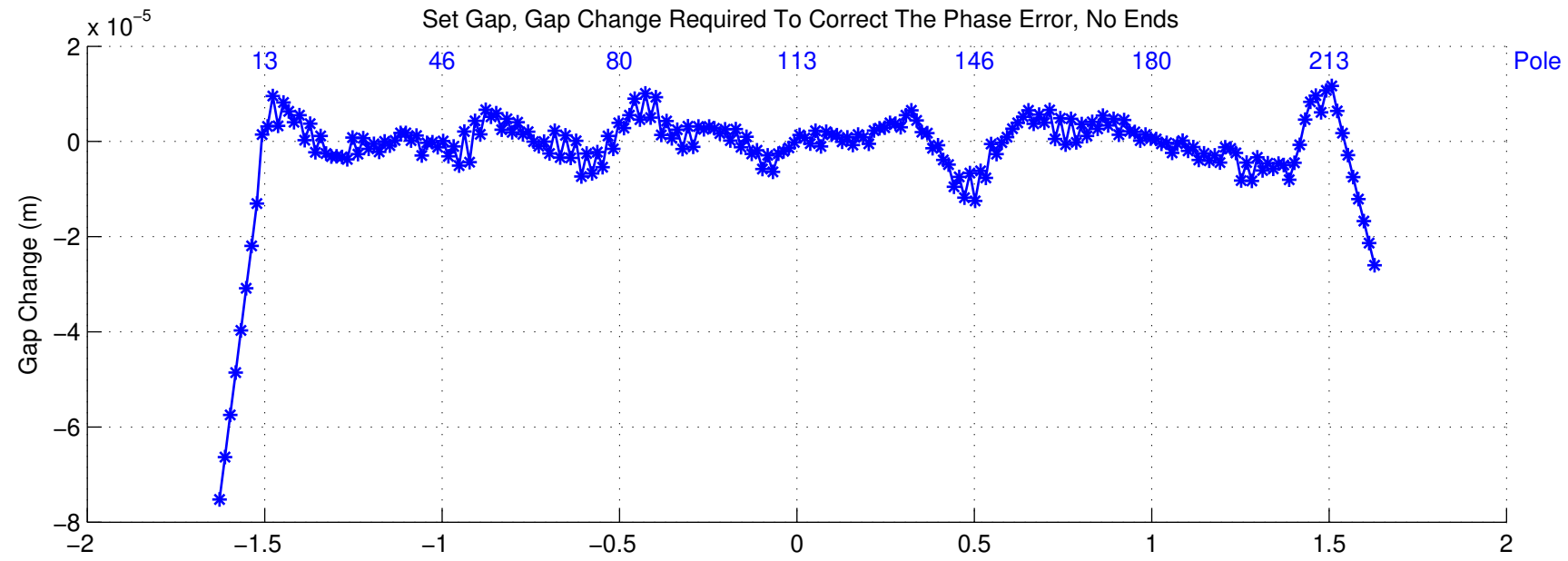

Set Gap, Measured and Required Peak Field Values, No Ends
13
46
80
113
146
180
213
Pole
Peak Field (T)
1.32
1.3
1.28
1.26
1.24
1.22
Measured
Required
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Set Gap, Required Relative Peak Field Change, No Ends
Relative Change
0.04
0.03
0.02
0.01
0
−0.01
Z Position (m)

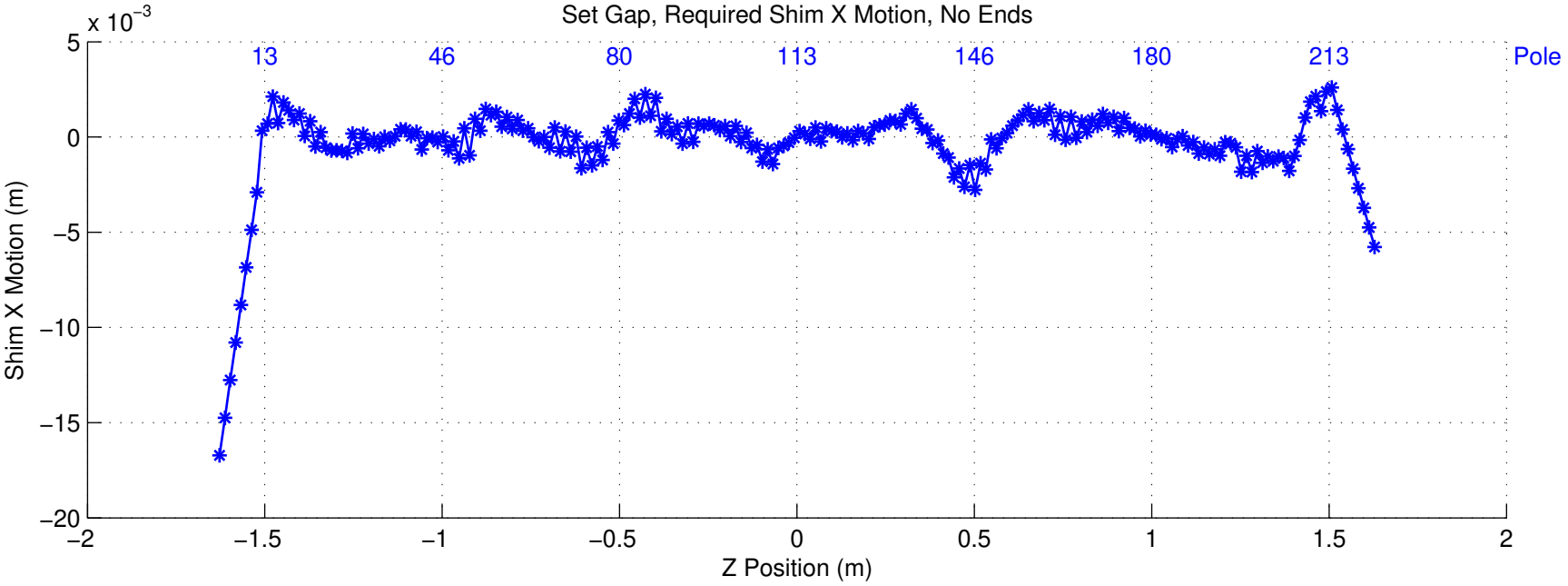

Set Gap, Gap Change Required To Set The Field, No Ends
x 10^-4
Gap Change (m)
13
46
80
113
146
180
213
Pole
2
1
0
−1
−2
−3
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

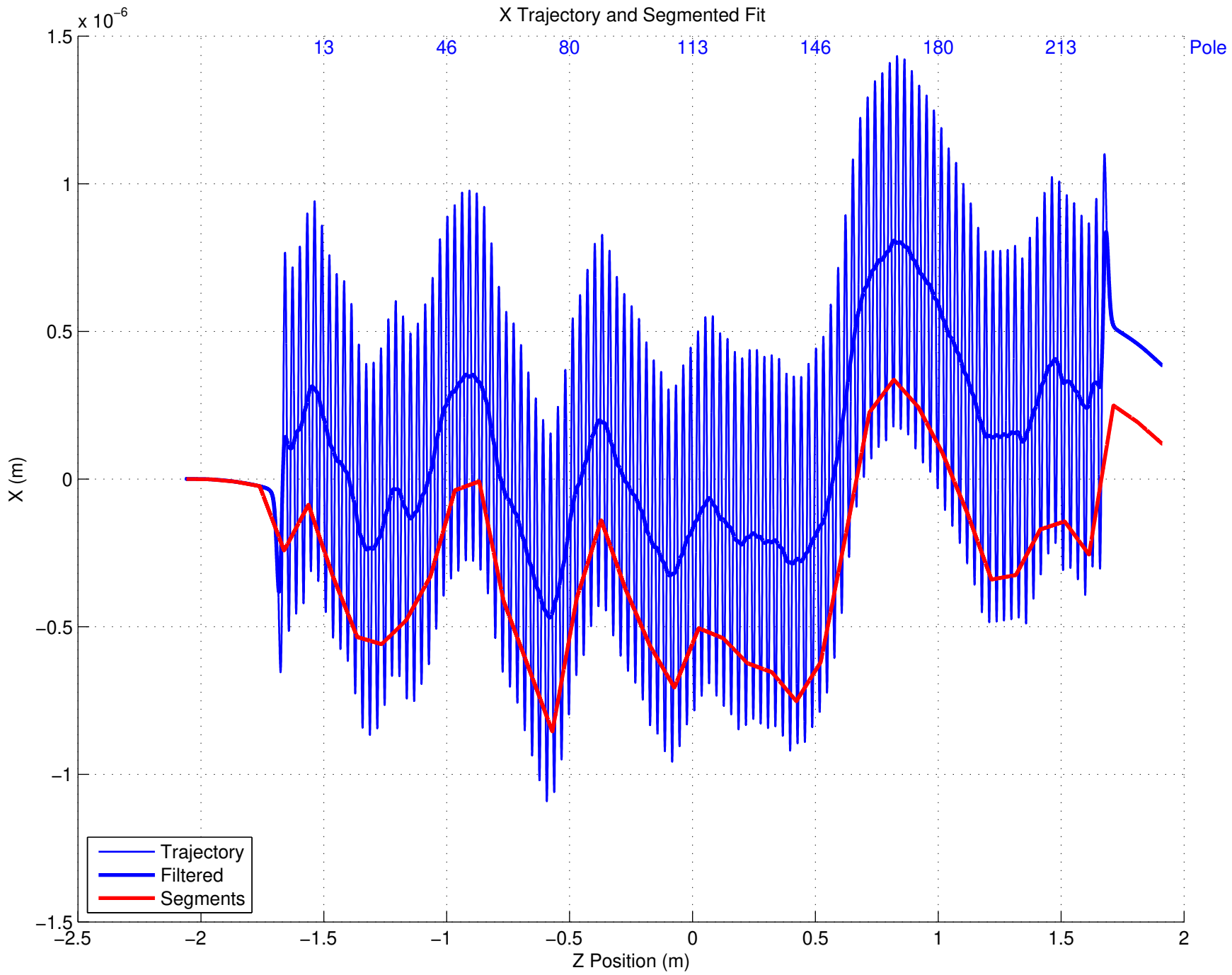

Set Gap, Required Shim X Motion, No Ends
Shim X Motion (m)
13
46
80
113
146
180
213
Pole
0.02
0.01
0
−0.01
−0.02
−0.03
−0.04
−0.05
−0.06
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)

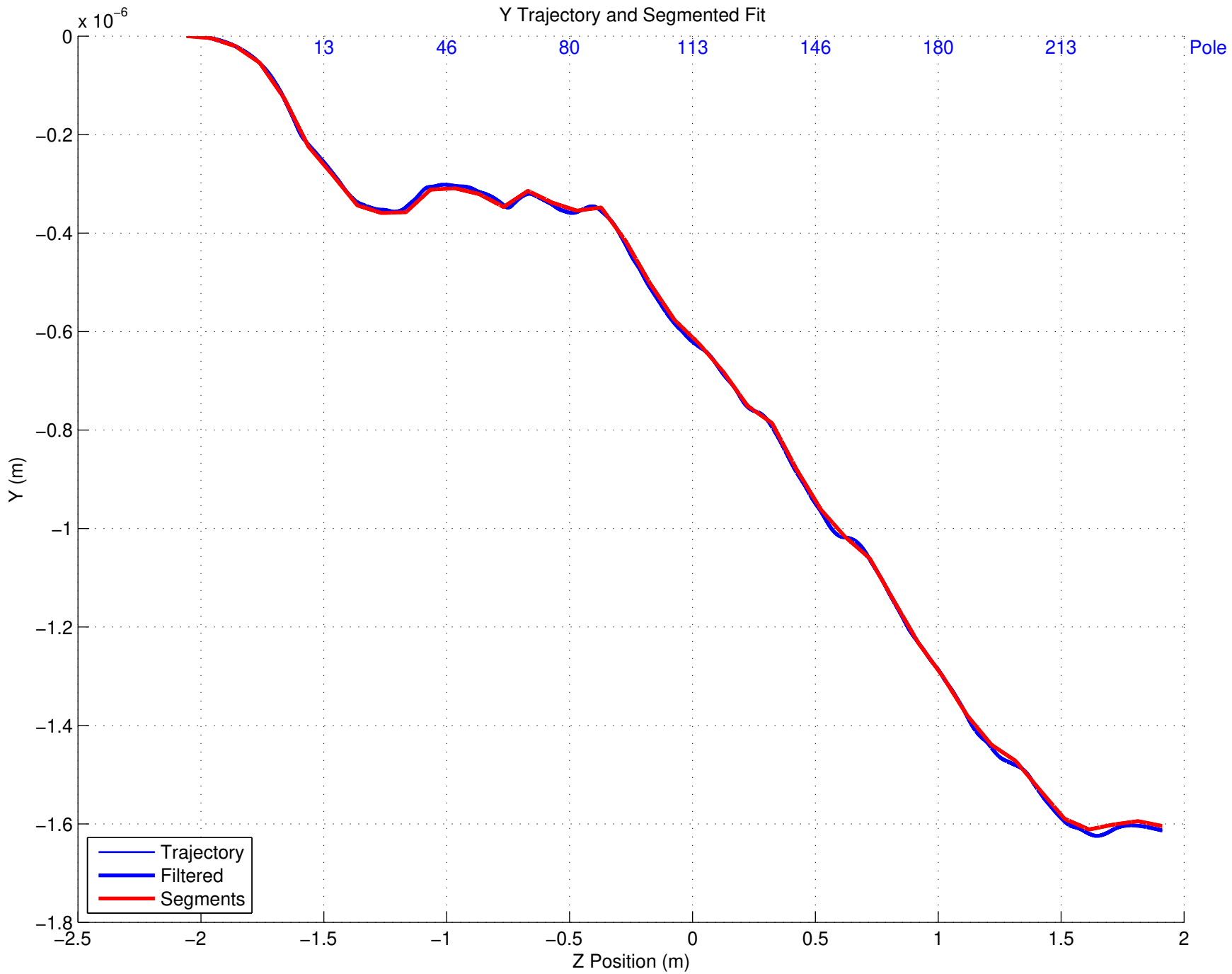

Set Gap, Required Phase Change And Fit, No Ends
Phase Change (rad)
13
46
80
113
146
180
213
Pole
Measured
Fit

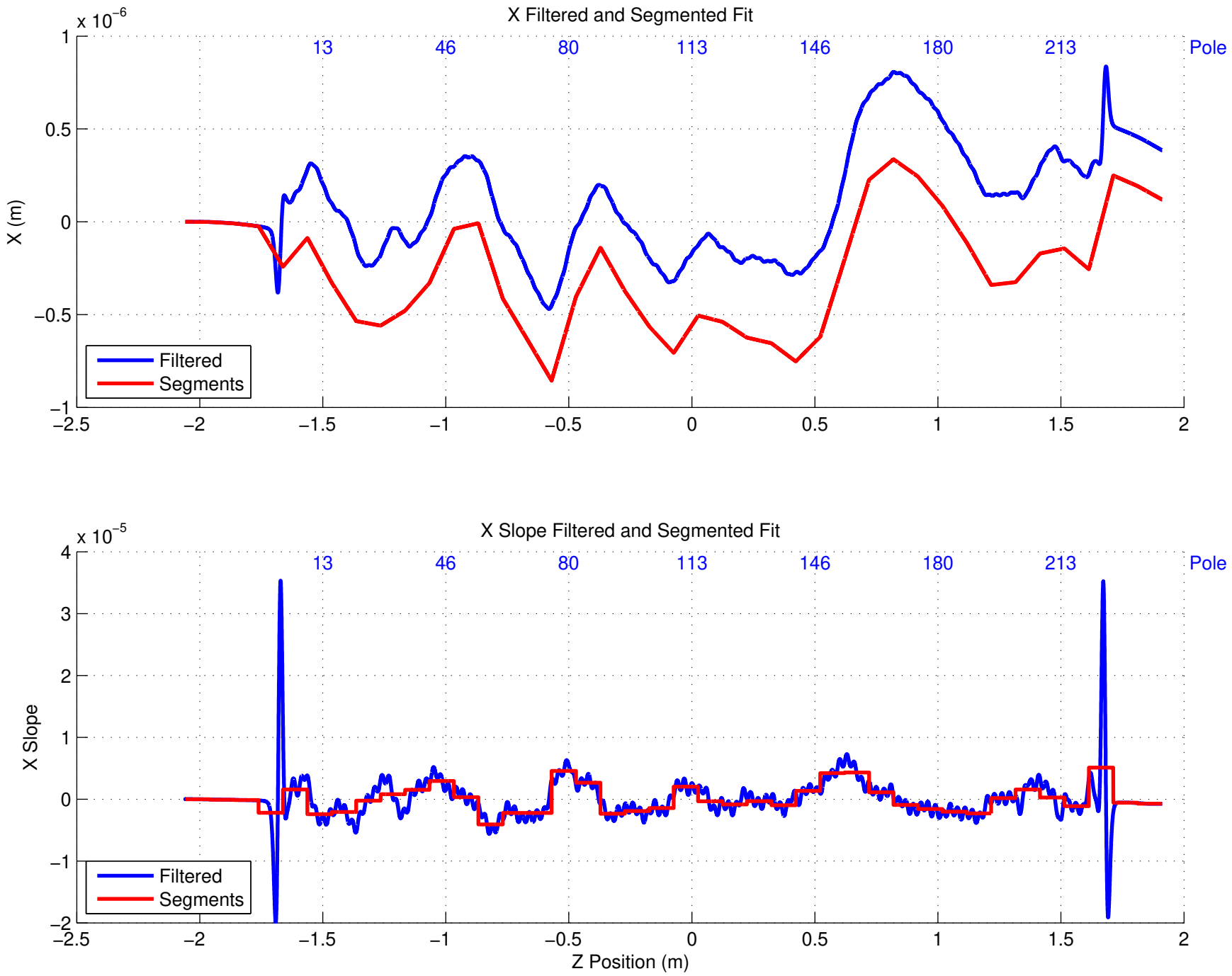

Set Gap, Required Phase Change Slope From Fit, No Ends
Phase Change Slope (rad / m)
13
46
80
113
146
180
213
Pole
Z Position (m)

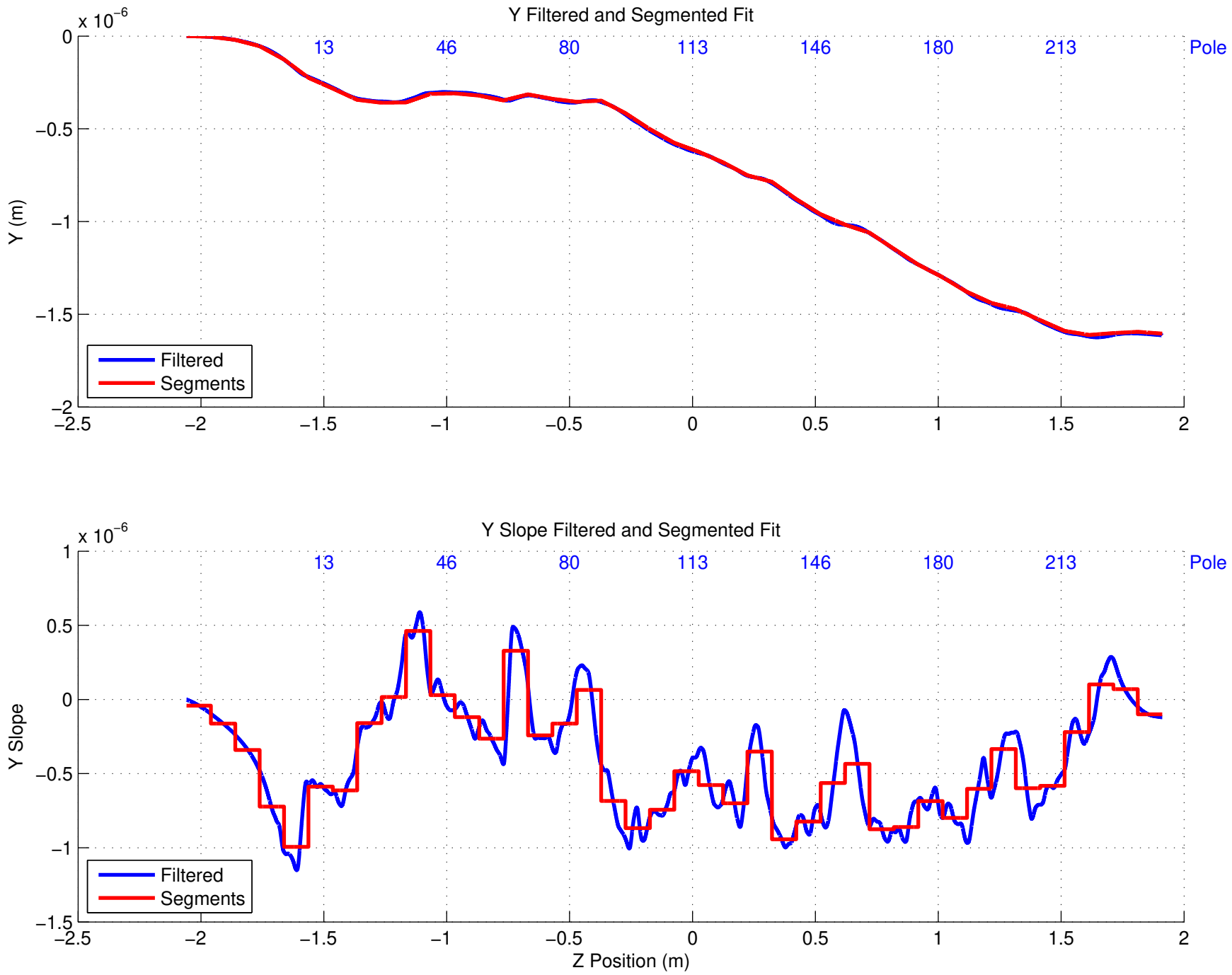

Set Gap, Gap Change Required To Correct The Phase Error, No Ends
x 10^-5
Gap Change (m)
2
0
−2
−4
−6
−8
13
46
80
113
146
180
213
Pole
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

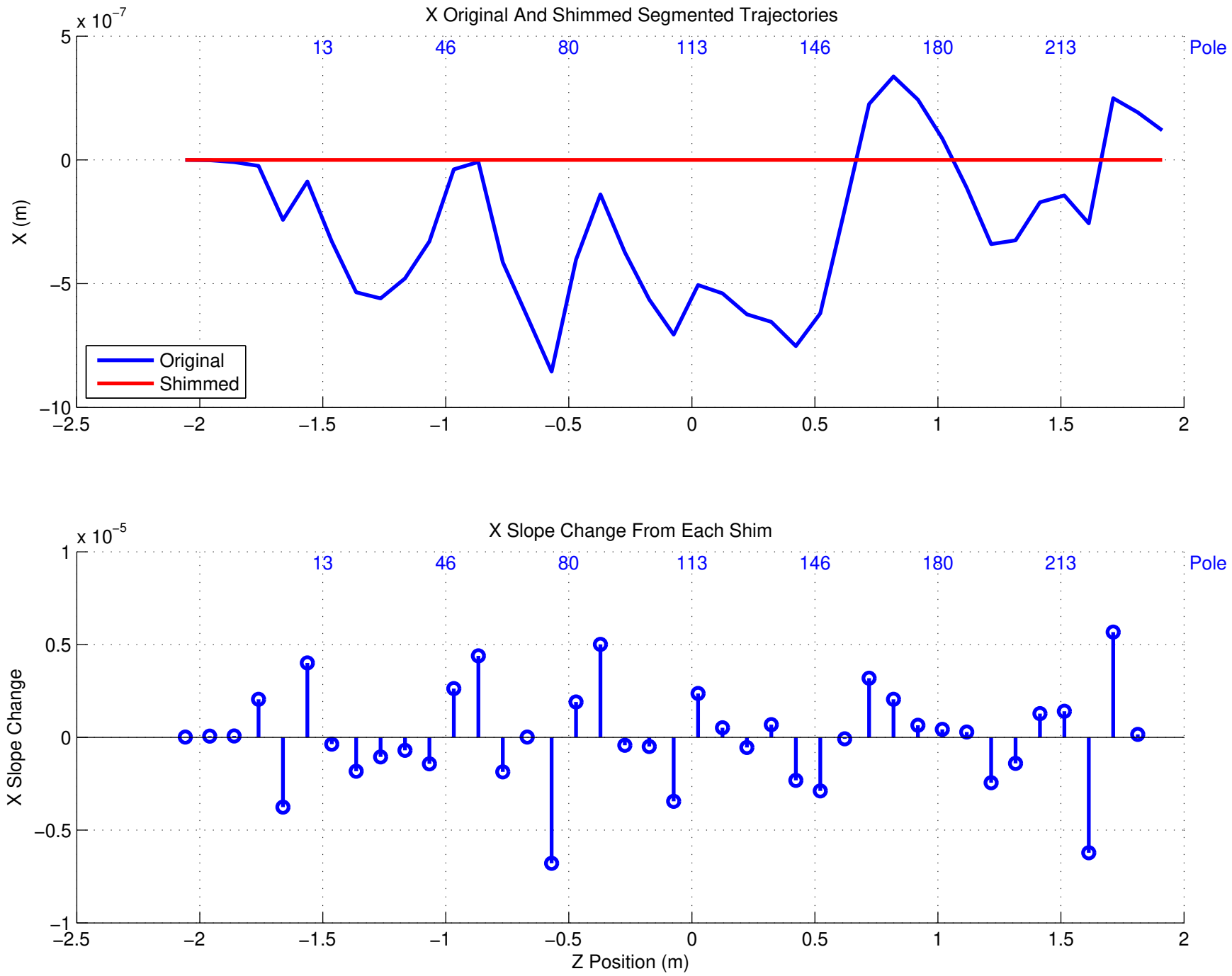

Set Gap, Required Shim X Motion, No Ends
x 10^-3
Shim X Motion (m)
5
0
−5
−10
−15
−20
13
46
80
113
146
180
213
Pole
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)

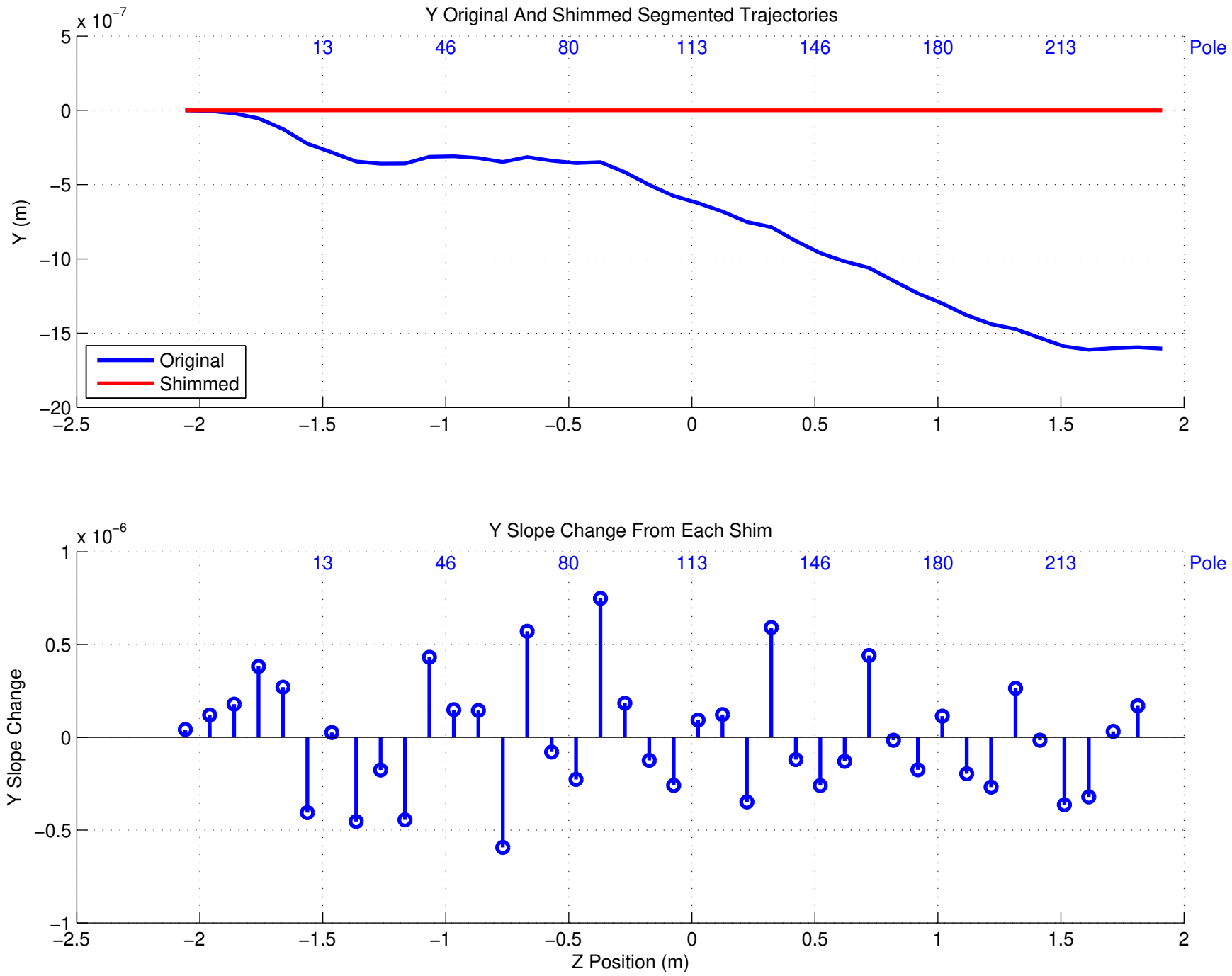

X Trajectory and Segmented Fit
x 10^-6
13
46
80
113
146
180
213
Pole
1.5
1
0.5
0
−0.5
−1
−1.5
X (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)
Trajectory
Filtered
Segments

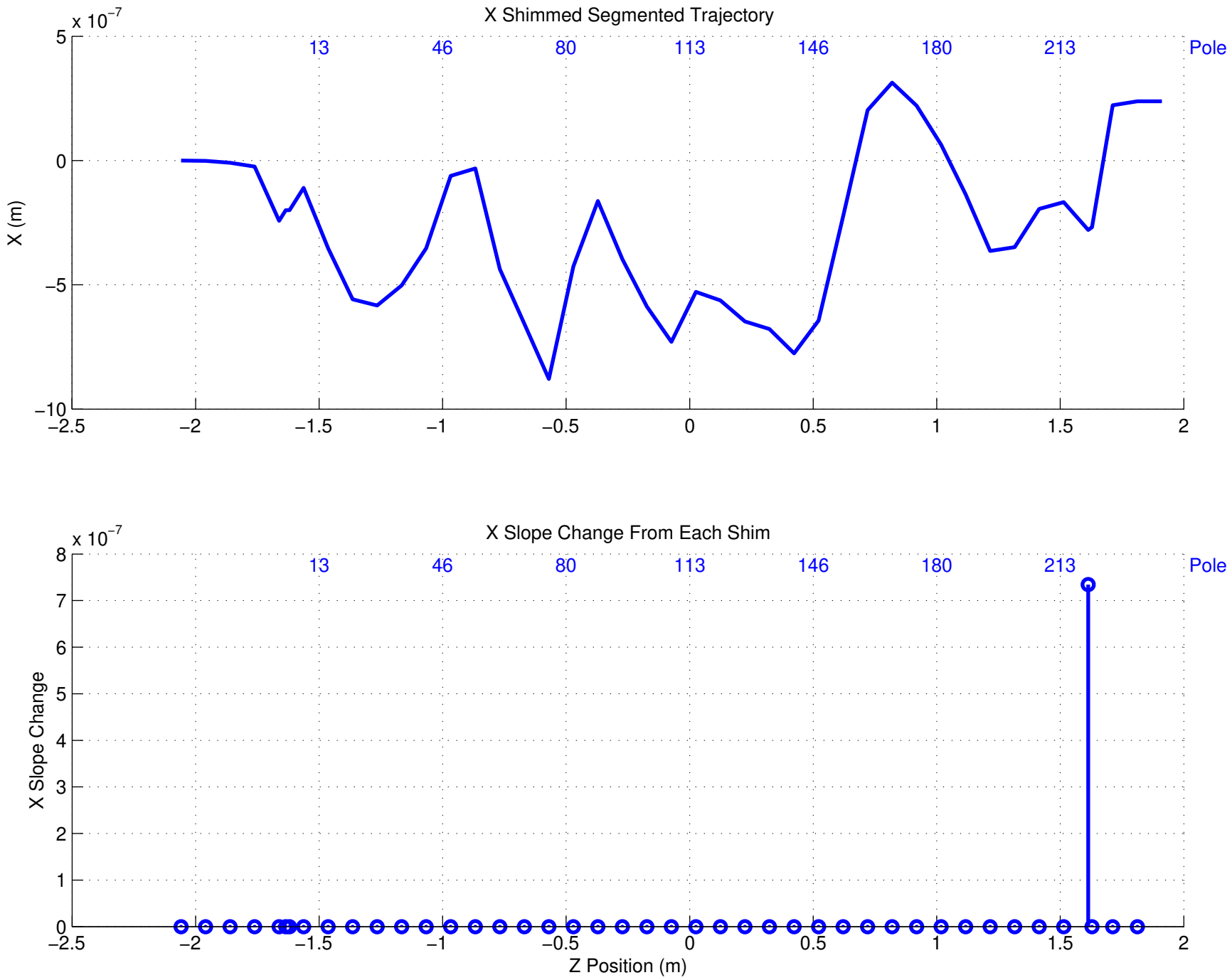

Y Trajectory and Segmented Fit
x 10^-6
0
−0.2
−0.4
−0.6
−0.8
−1
−1.2
−1.4
−1.6
−1.8
Y (m)
13
46
80
113
146
180
213
Pole
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)
Trajectory
Filtered
Segments

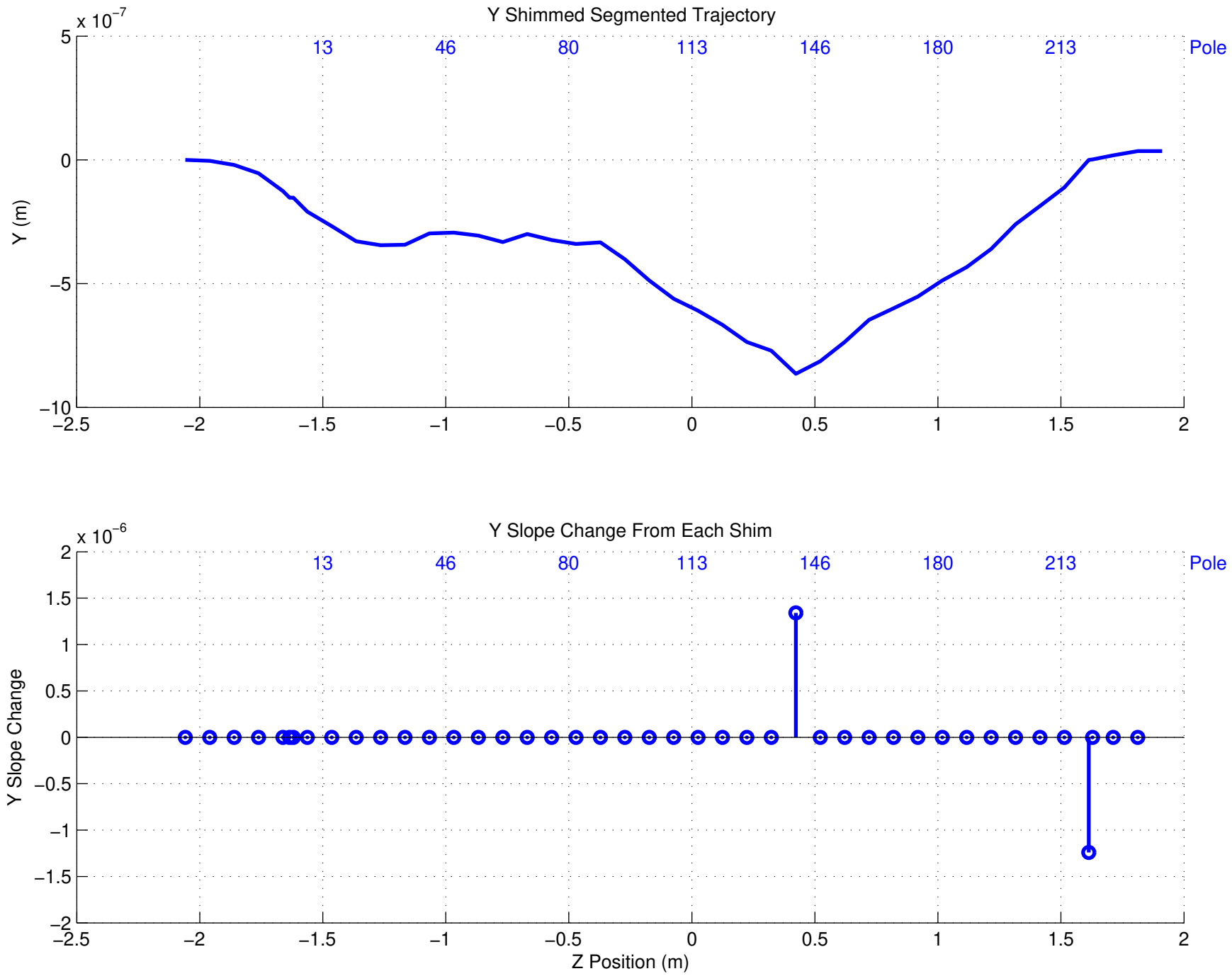

X Filtered and Segmented Fit
x 10^-6
X (m)
13
46
80
113
146
180
213
Pole
Filtered
Segments
X Slope Filtered and Segmented Fit
x 10^-5
X Slope
Z Position (m)

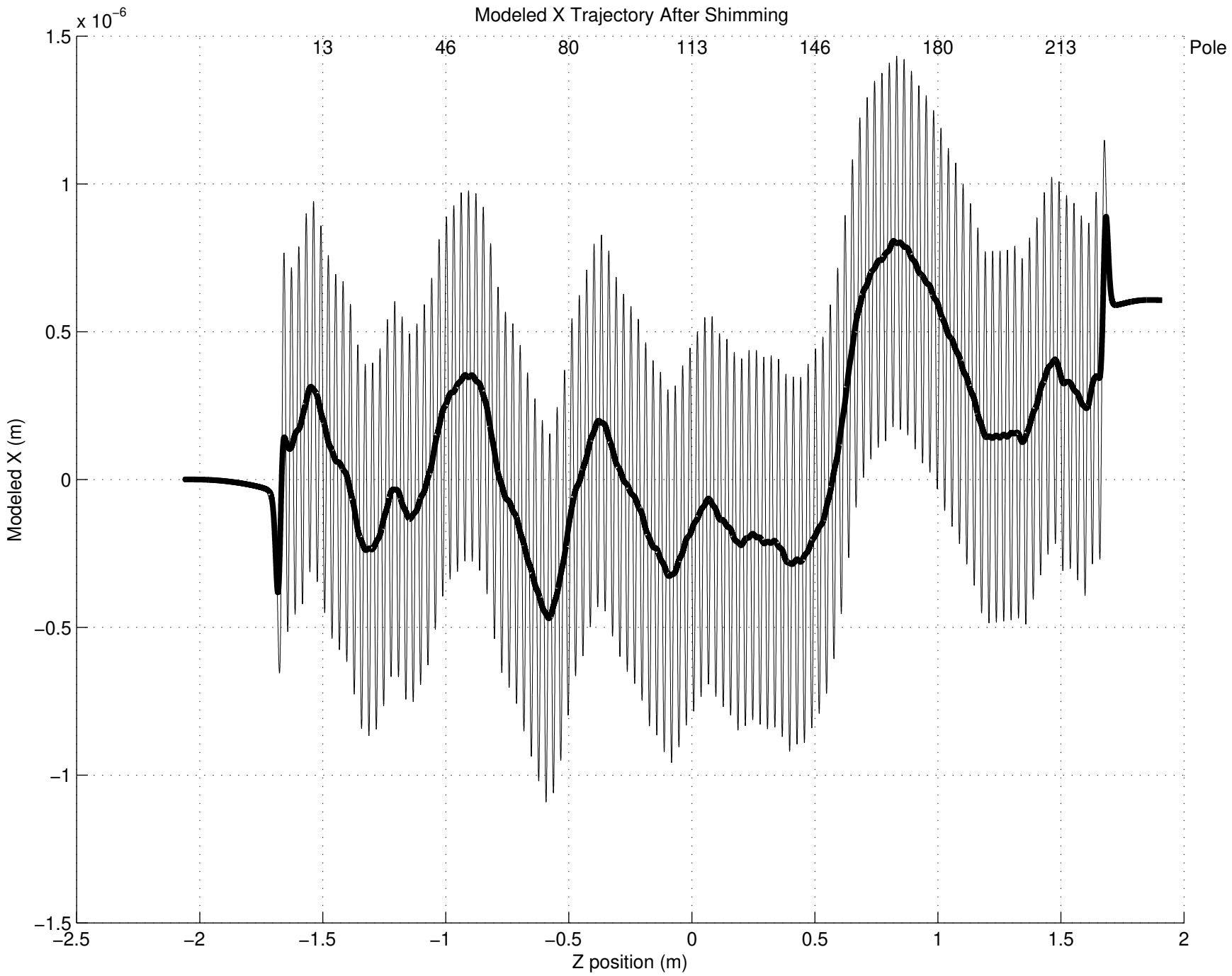

Y Filtered and Segmented Fit
x 10^-6
0
−0.5
−1
−1.5
−2
Y (m)
13
46
80
113
146
180
213
Pole
Filtered
Segments
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Y Slope Filtered and Segmented Fit
x 10^-6
1
0.5
0
−0.5
−1
−1.5
Y Slope
Z Position (m)

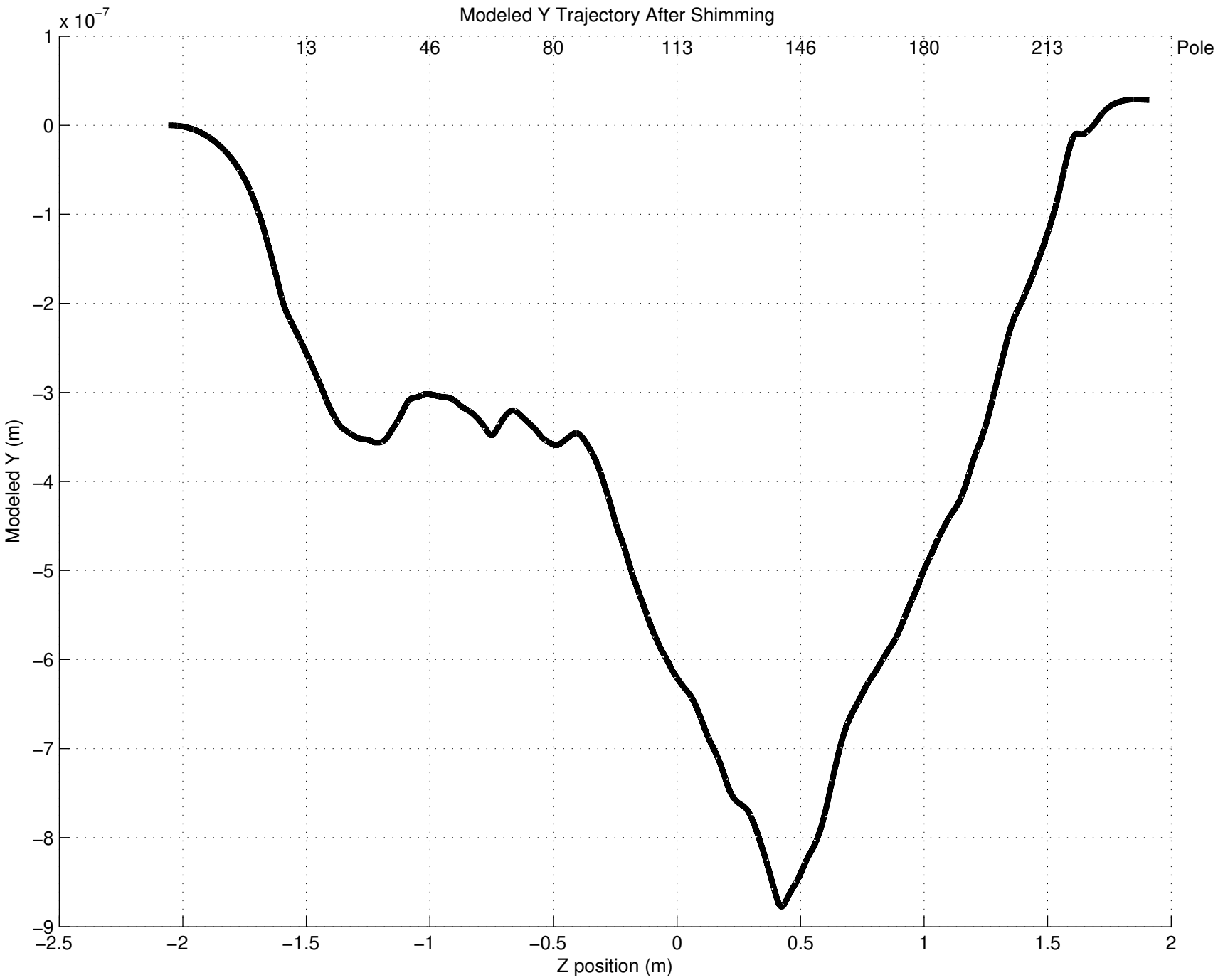

X Original And Shimmed Segmented Trajectories
x 10^-7
5
0
−5
−10
X (m)
13
46
80
113
146
180
213
Pole
Original
Shimmed
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
X Slope Change From Each Shim
x 10^-5
1
0.5
0
−0.5
−1
X Slope Change
Z Position (m)

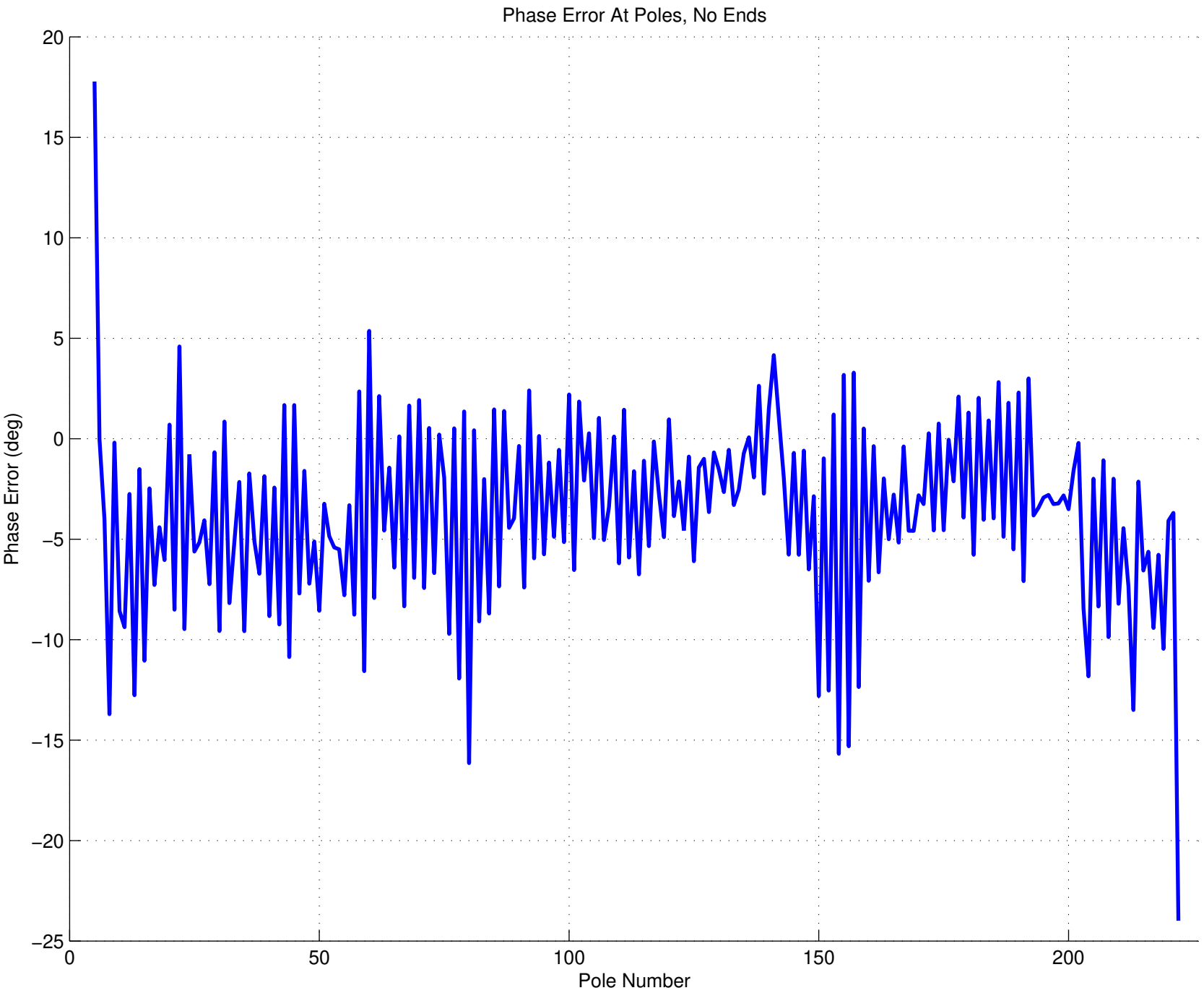

Y Original And Shimmed Segmented Trajectories
x 10^-7
13
46
80
113
146
180
213
Pole
Y (m)
Original
Shimmed
Y Slope Change From Each Shim
x 10^-6
Y Slope Change
Z Position (m)

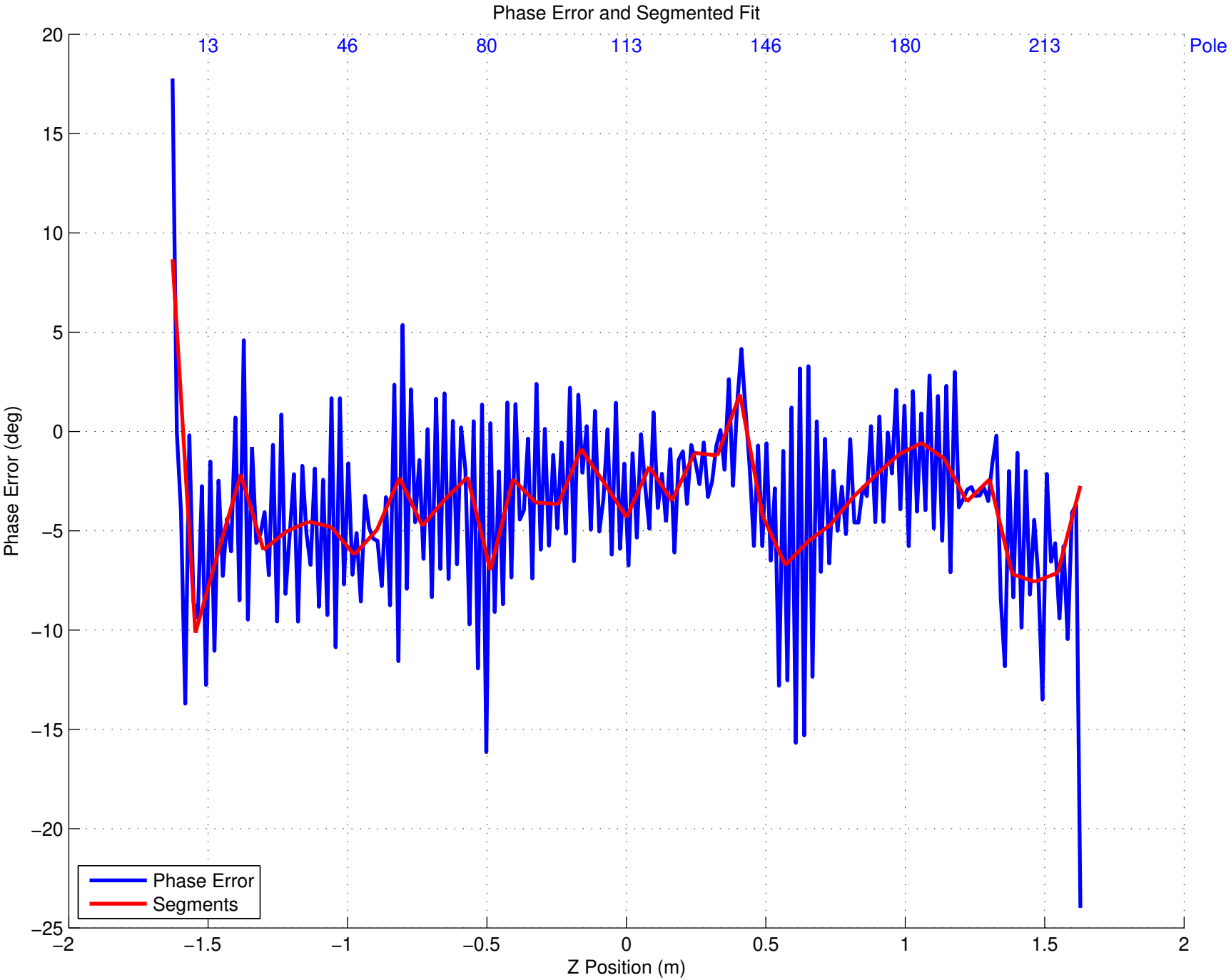

X Shimmed Segmented Trajectory
x 10^-7
X (m)
13
46
80
113
146
180
213
Pole
5
0
−5
−10
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
X Slope Change From Each Shim
x 10^-7
X Slope Change
Z Position (m)
8
7
6
5
4
3
2
1
0

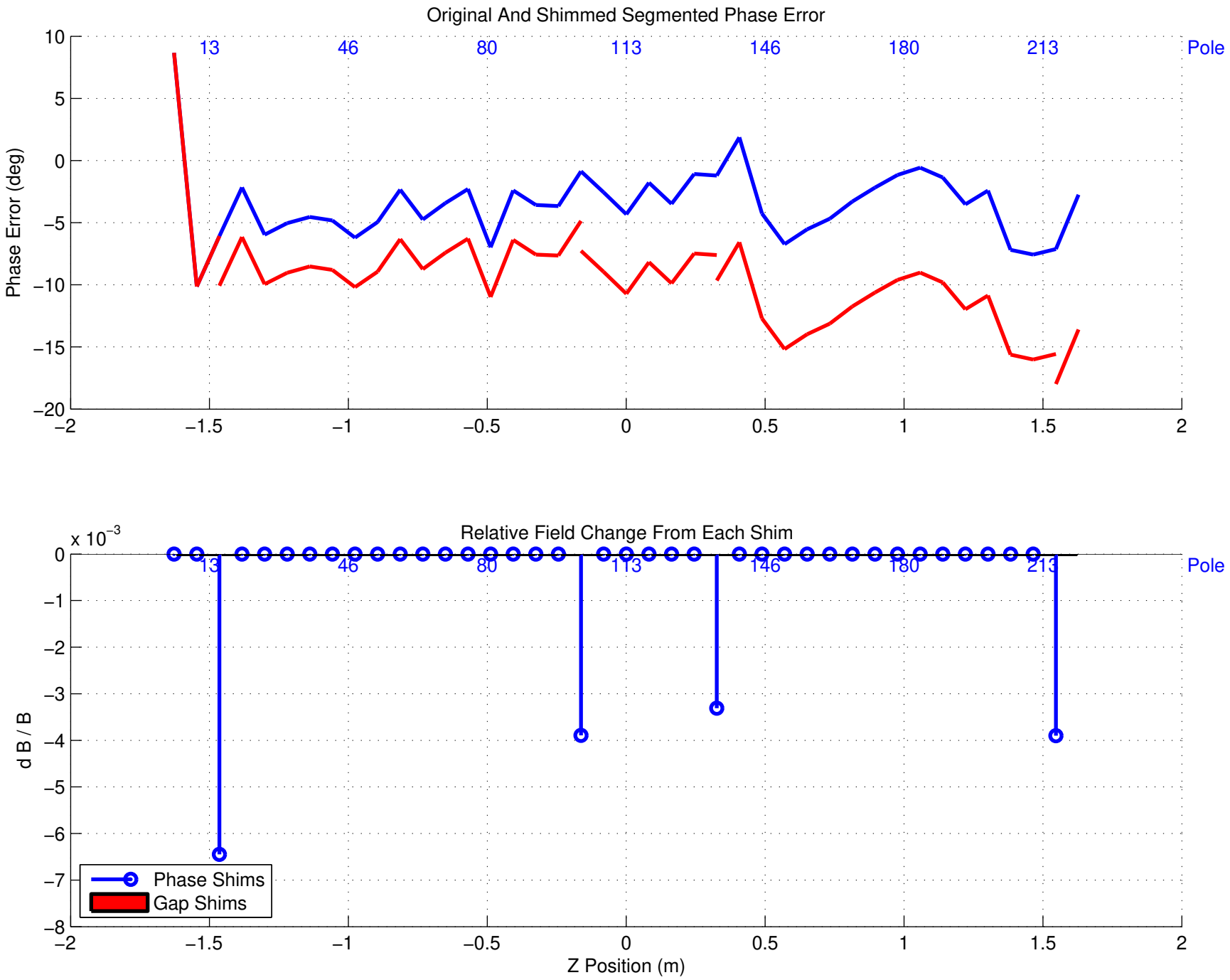

Y Shimmed Segmented Trajectory
x 10^-7
Y (m)
13
46
80
113
146
180
213
Pole
Y Slope Change From Each Shim
x 10^-6
Y Slope Change
Z Position (m)

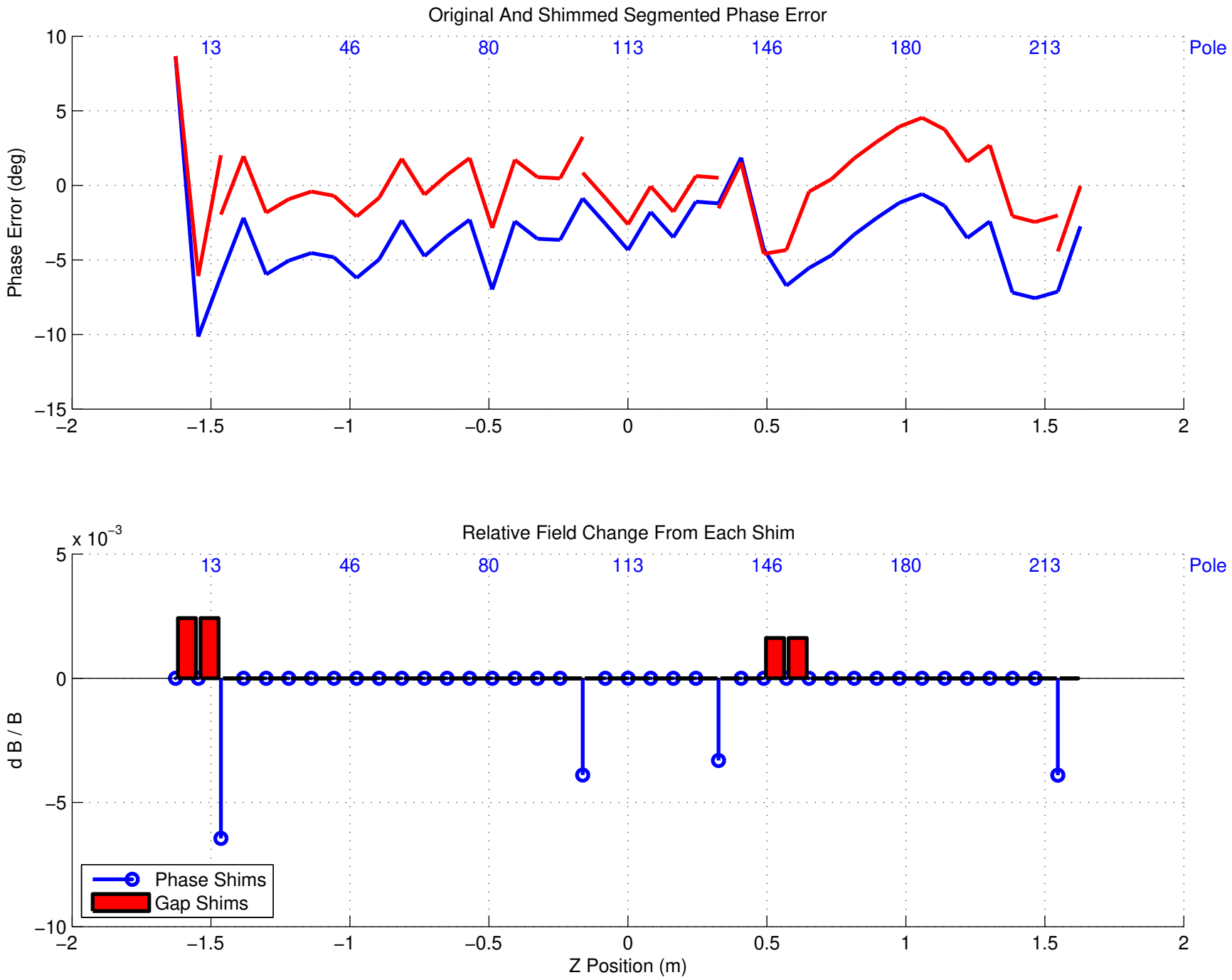

Modeled X Trajectory After Shimming
x 10^-6
13
46
80
113
146
180
213
Pole
1.5
1
0.5
0
−0.5
−1
−1.5
Modeled X (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z position (m)

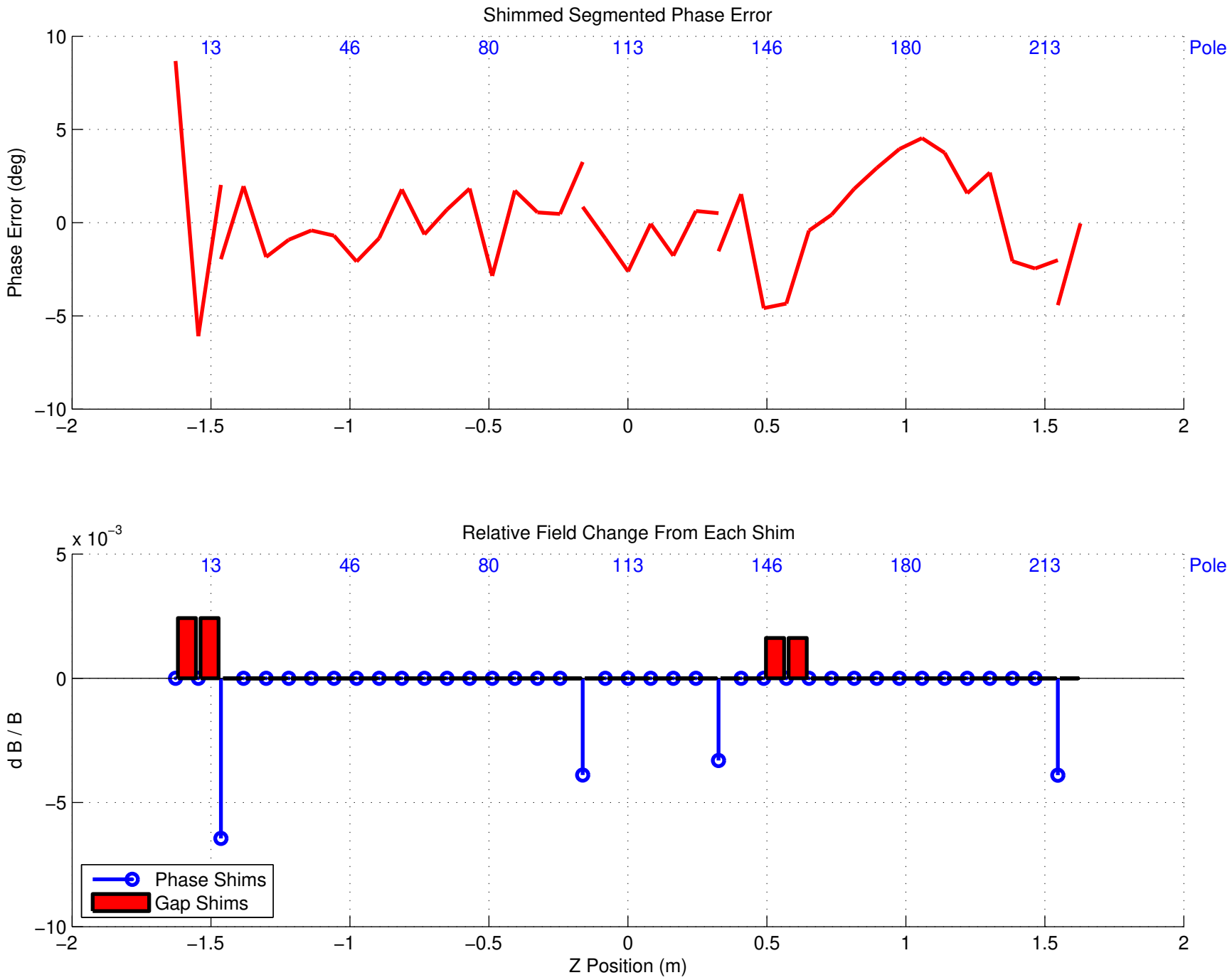

Modeled Y Trajectory After Shimming
x 10^-7
13
46
80
113
146
180
213
Pole
1
0
−1
−2
−3
−4
−5
−6
−7
−8
−9
Modeled Y (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z position (m)

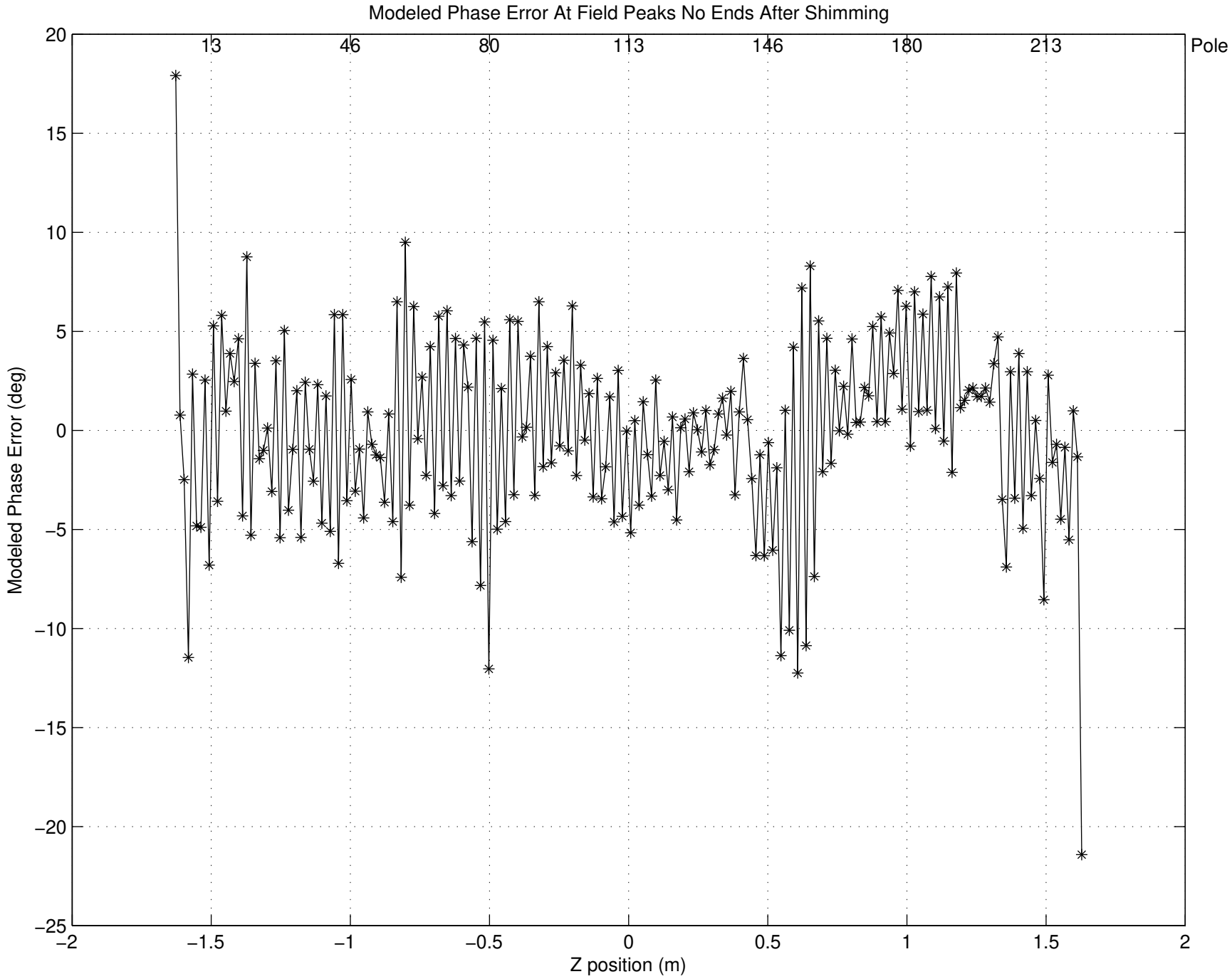

Phase Error At Poles, No Ends
Phase Error (deg)
Pole Number
20
15
10
5
0
−5
−10
−15
−20
−25
0
50
100
150
200


Phase Error and Segmented Fit
13
46
80
113
146
180
213
Pole
20
15
10
5
0
−5
−10
−15
−20
−25
Phase Error (deg)
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)
Phase Error
Segments


Original And Shimmed Segmented Phase Error
Phase Error (deg)
10
5
0
−5
−10
−15
−20
13
46
80
113
146
180
213
Pole
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Relative Field Change From Each Shim
x 10^−3
d B / B
0
−1
−2
−3
−4
−5
−6
−7
−8
Phase Shims
Gap Shims
Z Position (m)


Original And Shimmed Segmented Phase Error
Phase Error (deg)
10
5
0
−5
−10
−15
13
46
80
113
146
180
213
Pole
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Relative Field Change From Each Shim
x 10^−3
d B / B
5
0
−5
−10
Phase Shims
Gap Shims
Z Position (m)


Shimmed Segmented Phase Error
Phase Error (deg)
10
5
0
−5
−10
13
46
80
113
146
180
213
Pole
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Relative Field Change From Each Shim
x 10^−3
d B / B
Phase Shims
Gap Shims
Z Position (m)



Phase Error: Ave = 0.000000 deg, RMS = 4.654726 deg