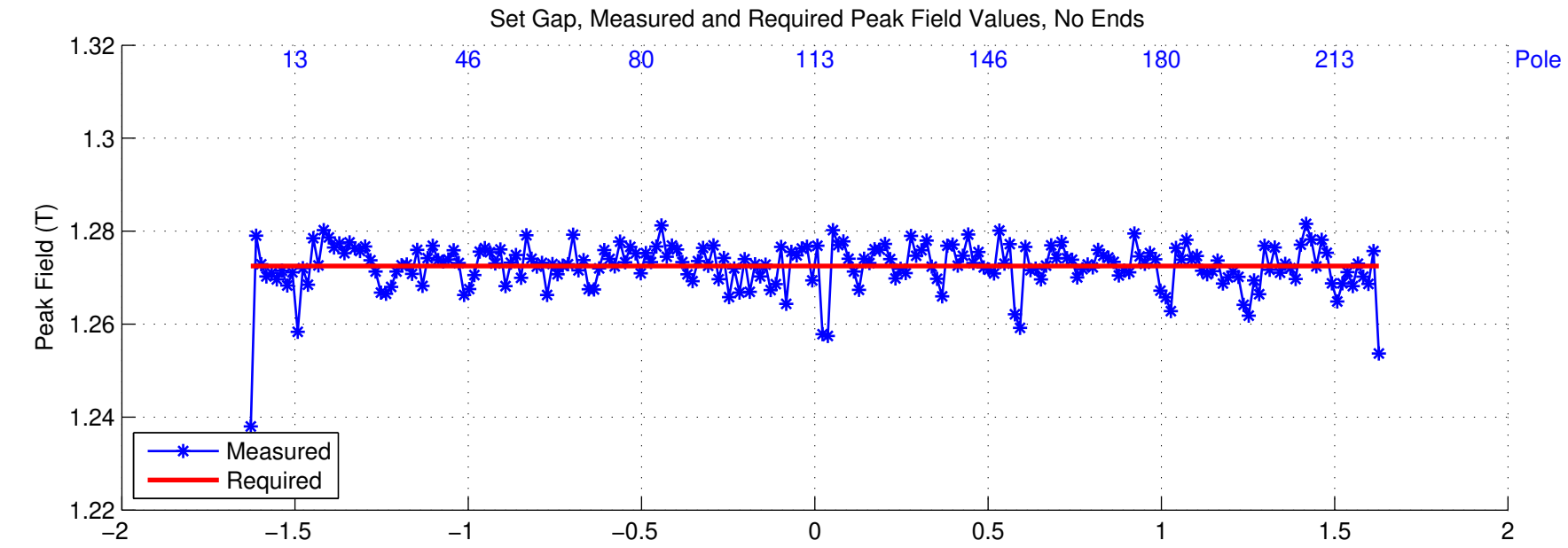
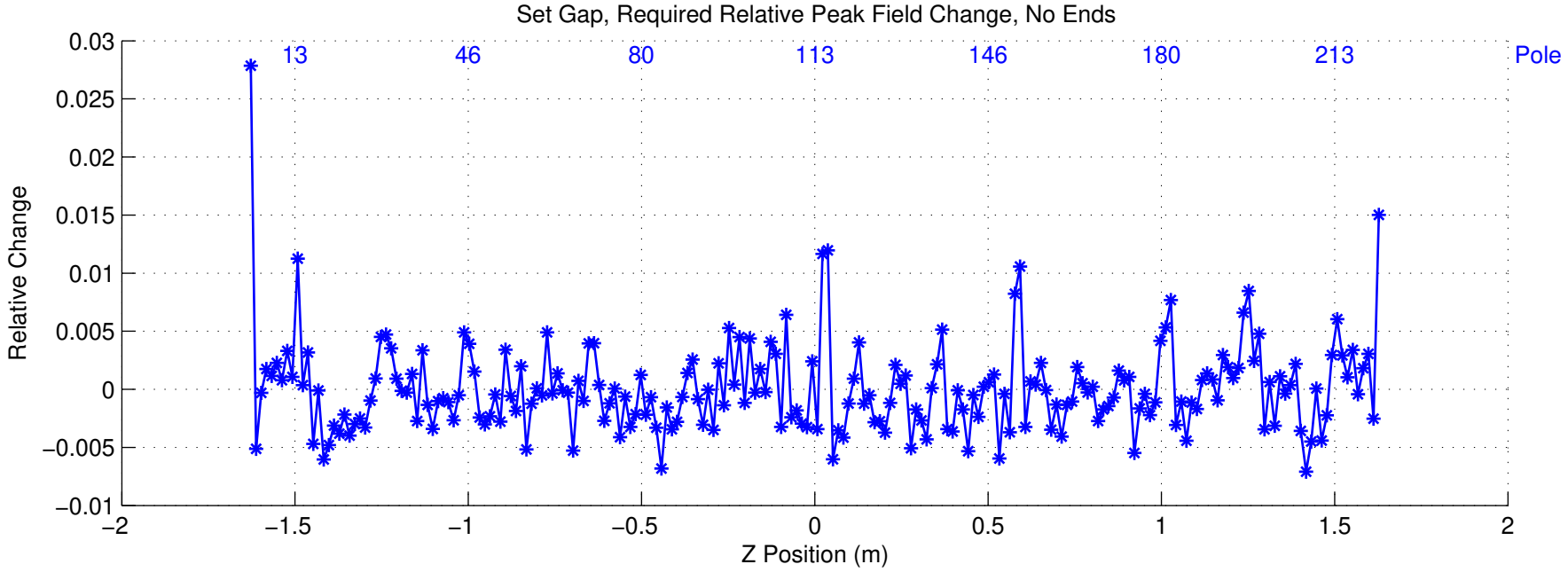
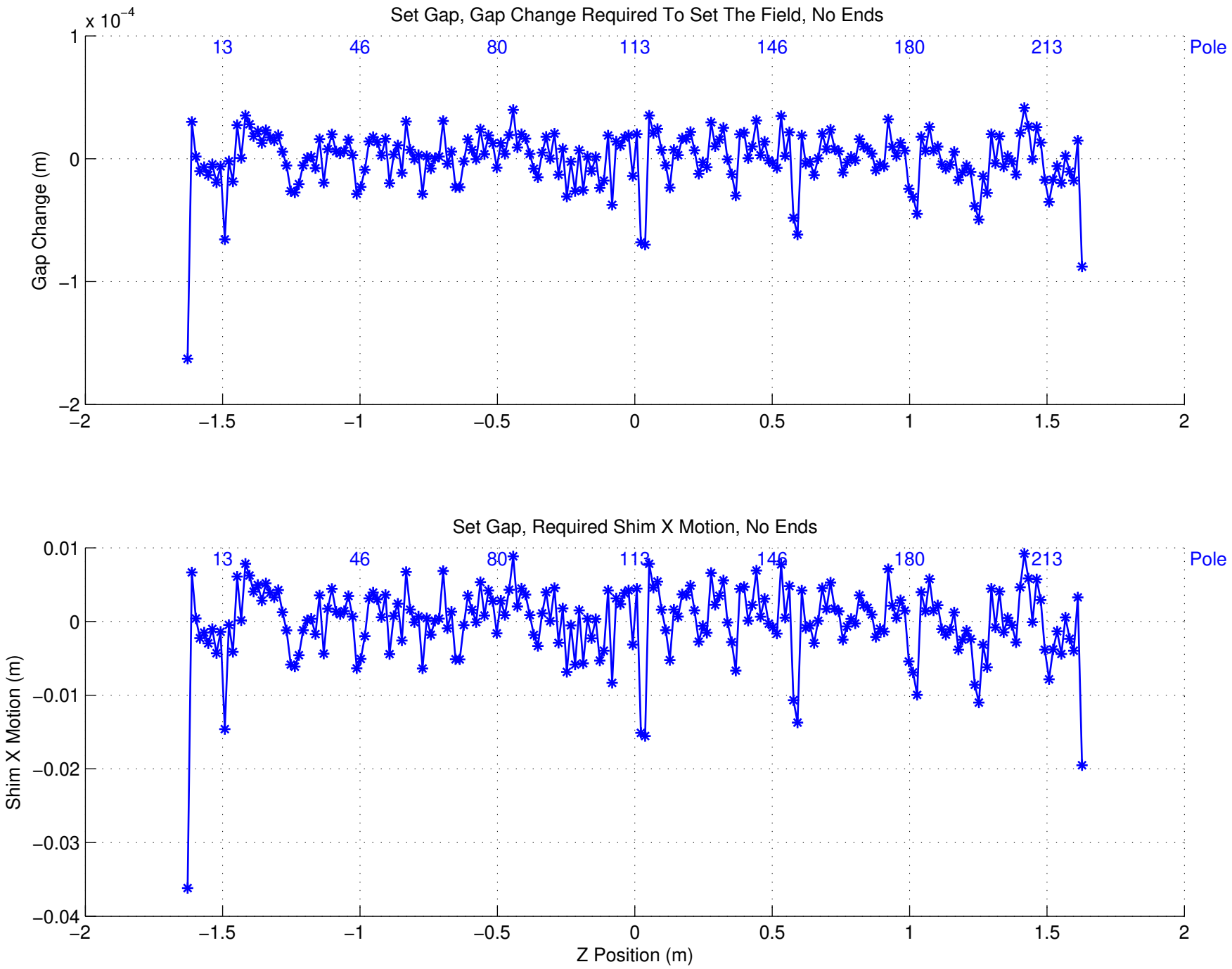
SLAC Magnetic Measurements

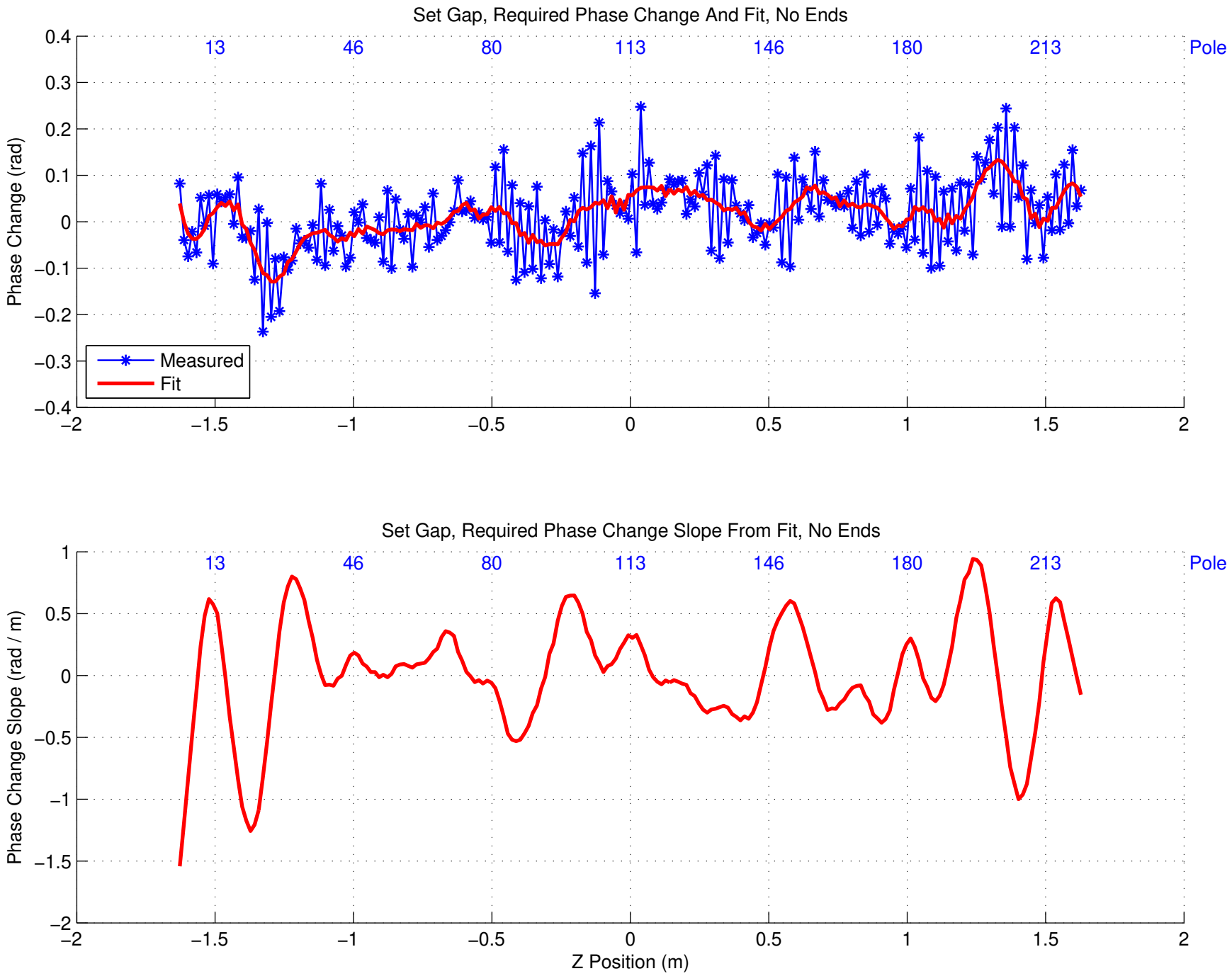
Planar Insertion Device Shim Analysis

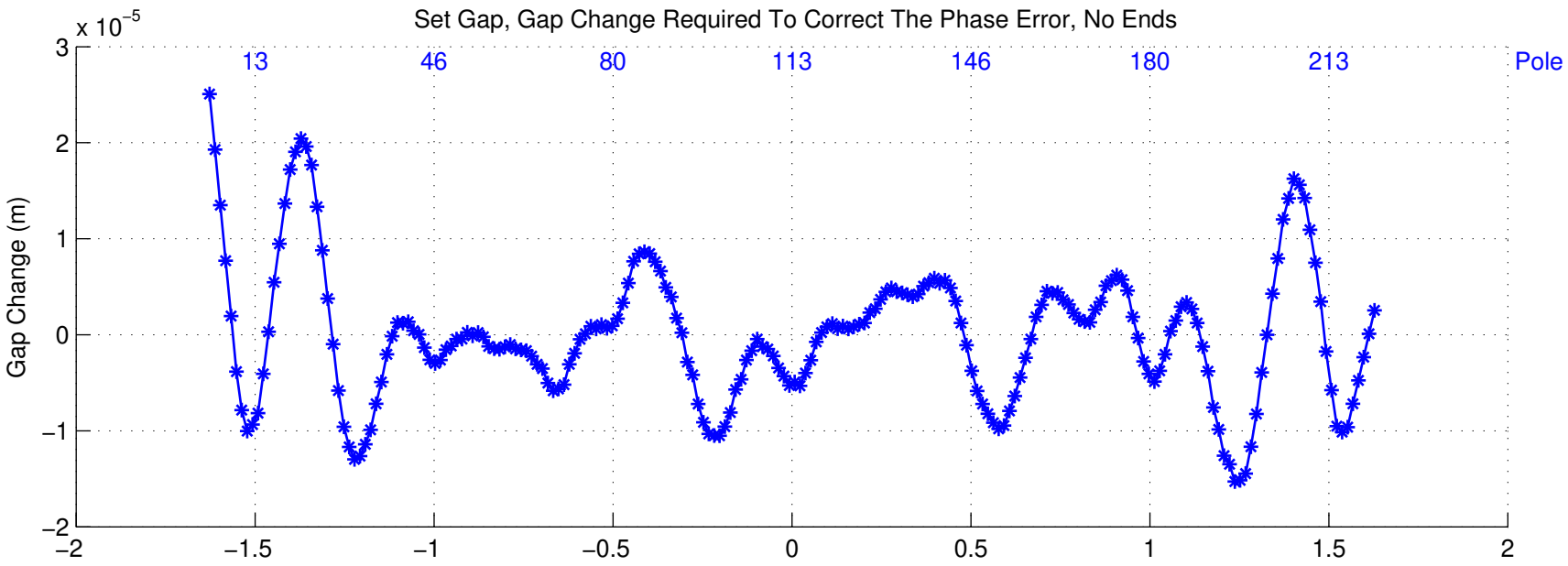
Parameters:
INPUT−FILE−DIR =S:\MagData\LCLS\Undulator\L143−112000−21\DATASET0001\Rough Tuning\Z Scans\Run 043\
INPUT−FILE−NAME =x+00000−y+000−bscanz.dat
INPUT−FILE−TYPE =ZVXYBXYH
CORR−REQUIRED =1
GAMMA =26644.12
NOM−LAMBDA−U =0.03
NOM−K−VALUE =3.4895
NOM−LAMBDA−R =1.4977e−010
NUM−POLES =226
NUM−END−POLES =4
CELL−LENGTH =3.656

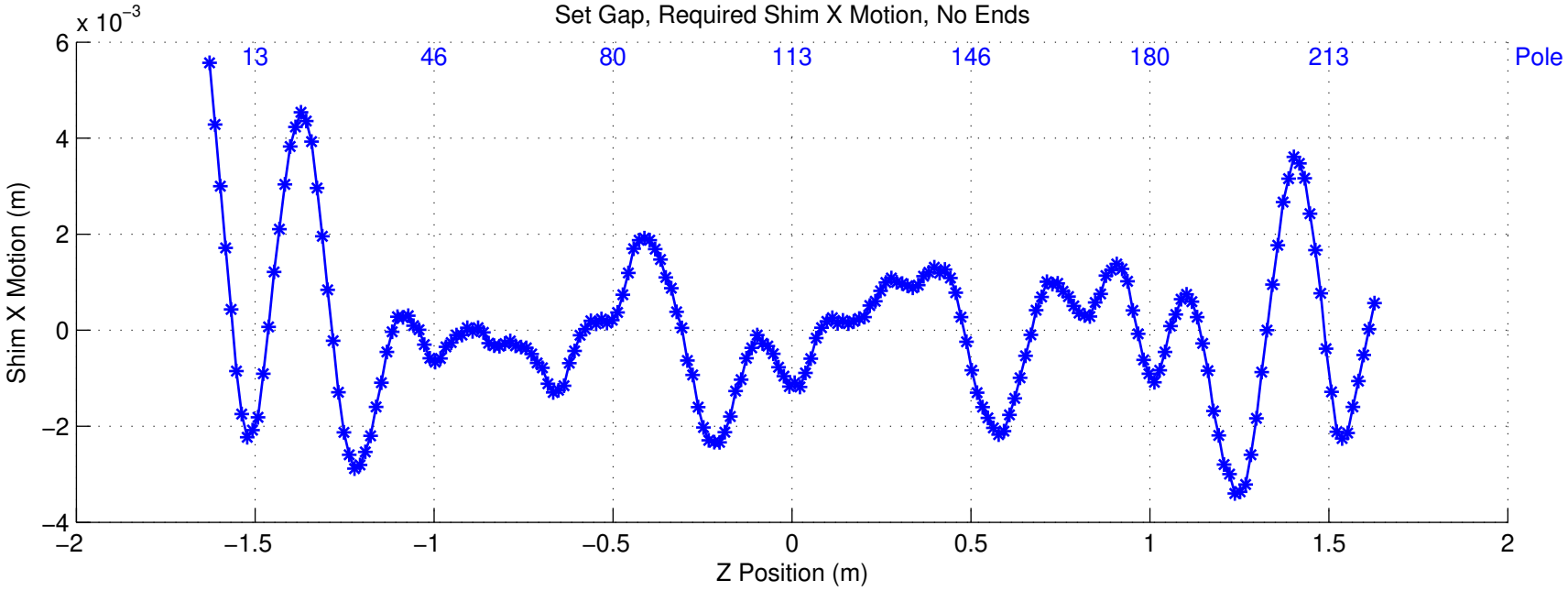

Set Gap, Measured and Required Peak Field Values, No Ends
13
46
80
113
146
180
213
Pole
1.32
1.3
1.28
1.26
1.24
1.22
Peak Field (T)
Measured
Required
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

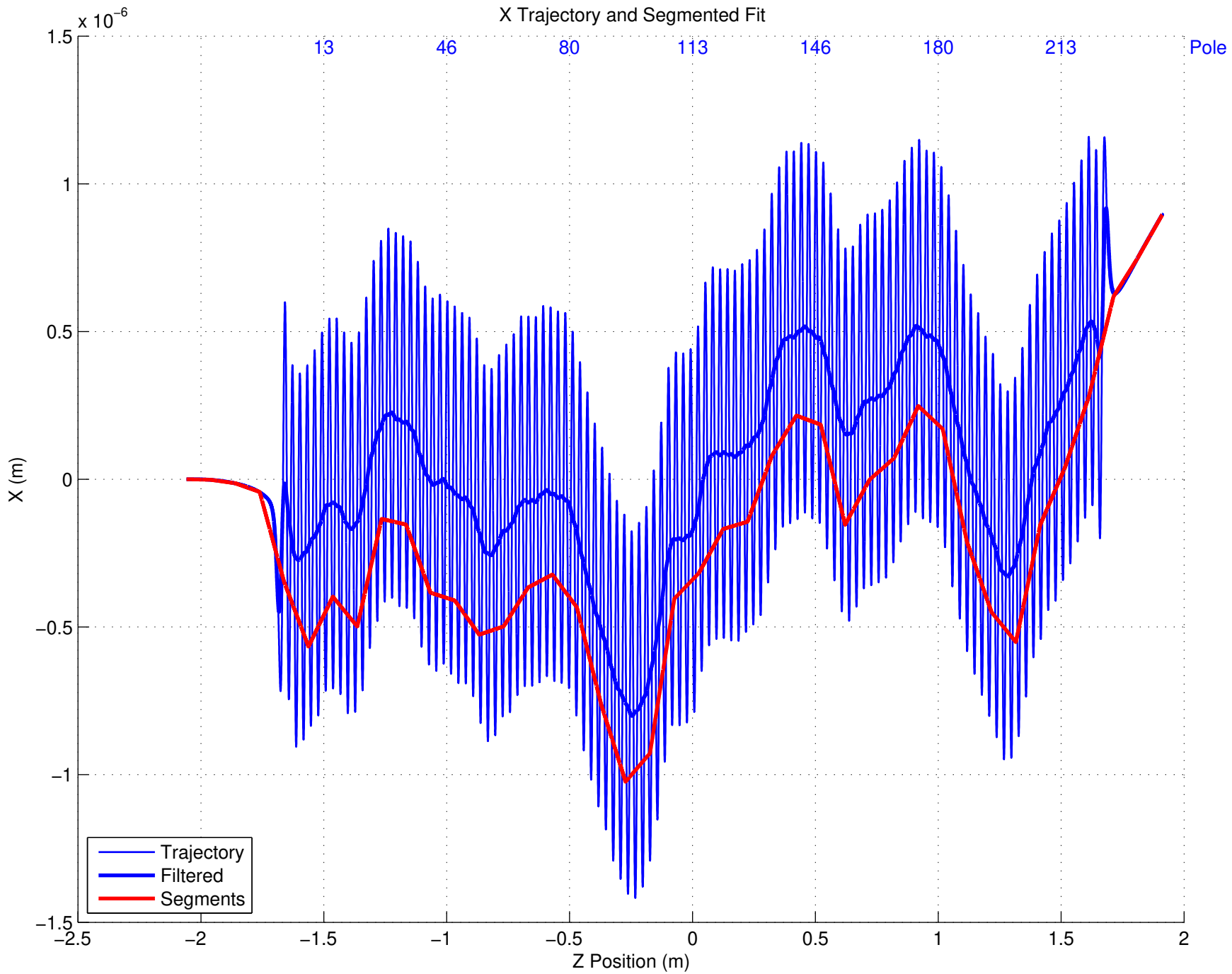

Set Gap, Required Relative Peak Field Change, No Ends
13
46
80
113
146
180
213
Pole
0.03
0.025
0.02
0.015
0.01
0.005
0
−0.005
−0.01
Relative Change
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)

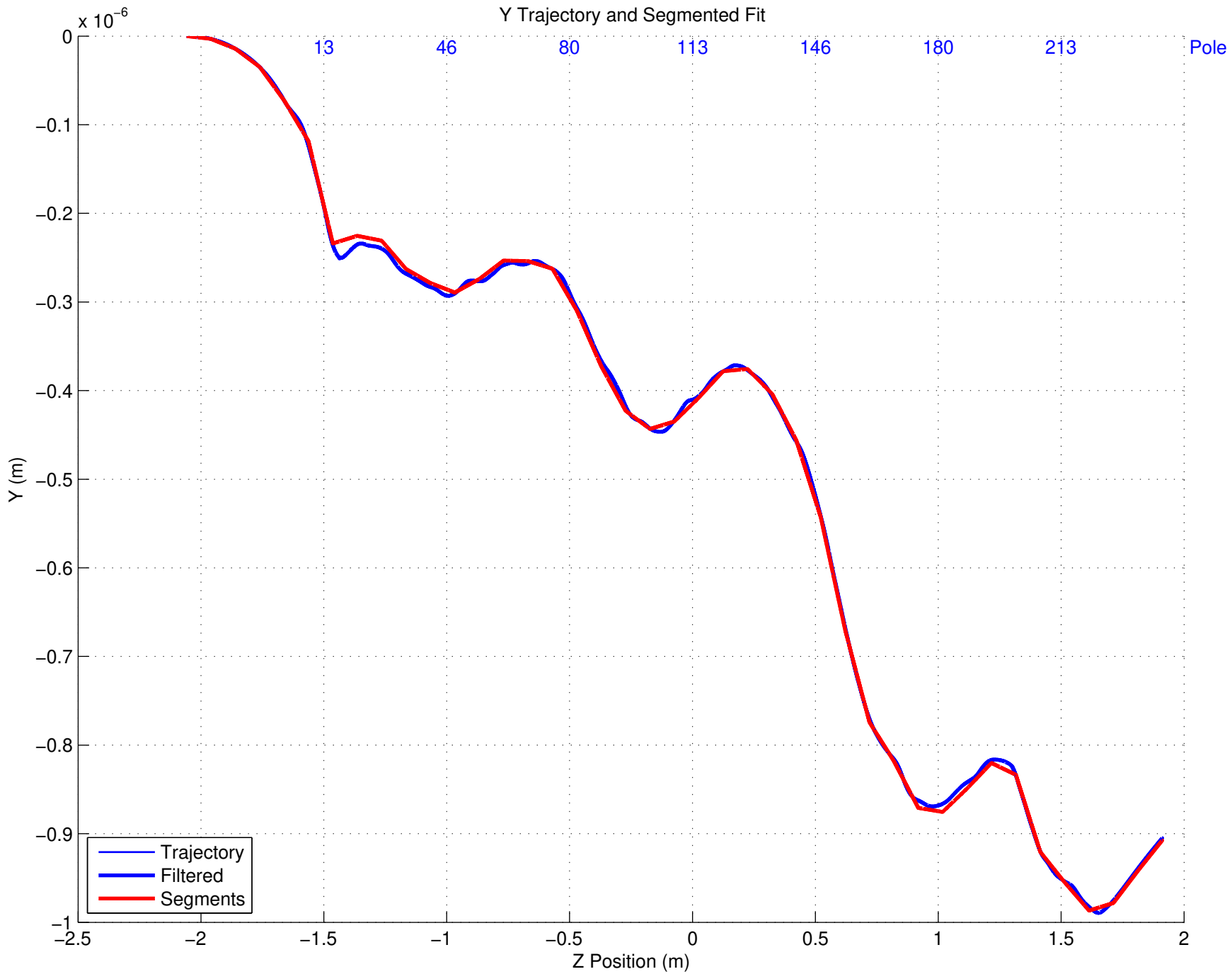

Set Gap, Gap Change Required To Set The Field, No Ends
x 10^-4
Gap Change (m)
13
46
80
113
146
180
213
Pole
Set Gap, Required Shim X Motion, No Ends
Shim X Motion (m)
Z Position (m)

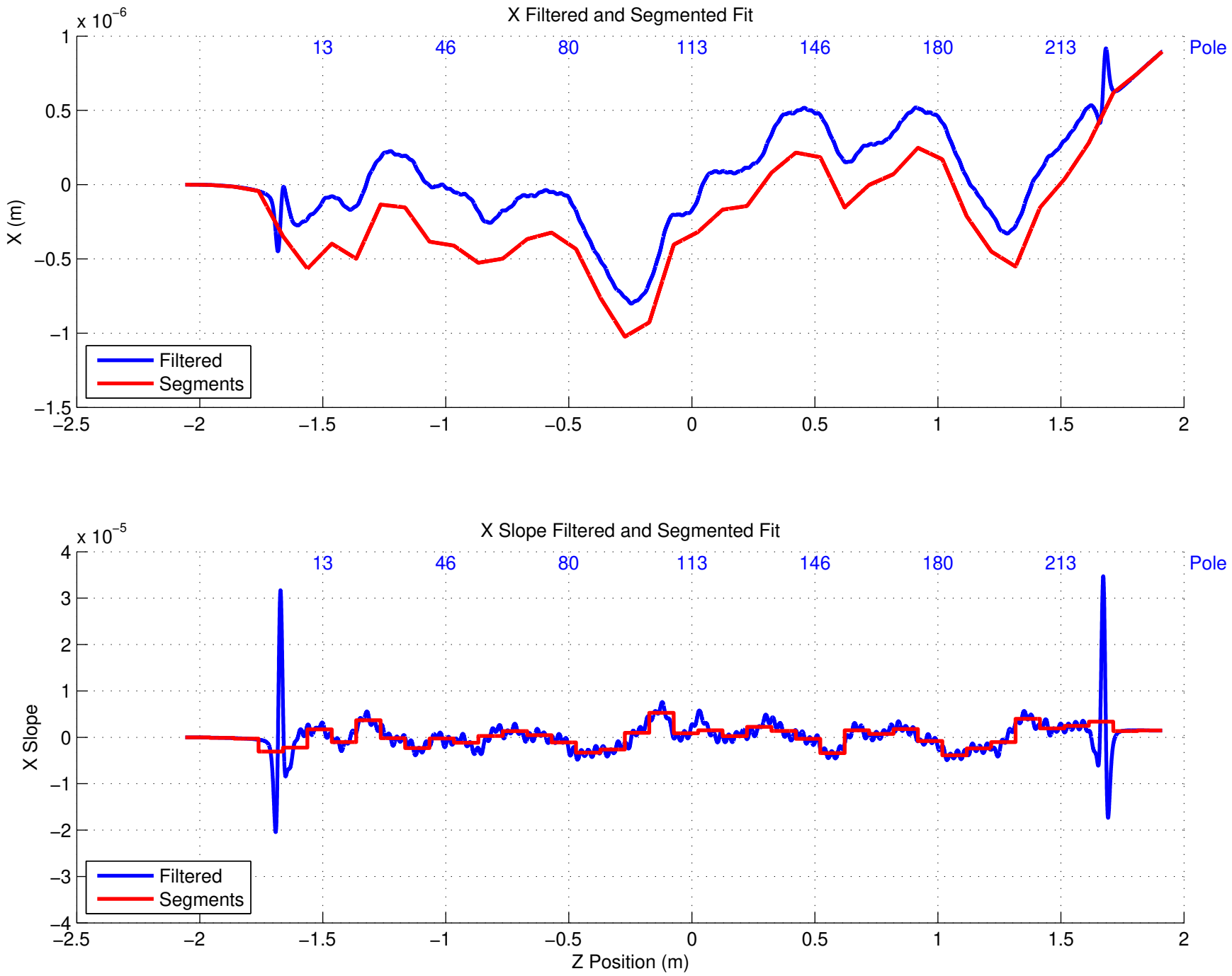

Set Gap, Required Phase Change And Fit, No Ends
13
46
80
113
146
180
213
Pole
Phase Change (rad)
0.4
0.3
0.2
0.1
0
−0.1
−0.2
−0.3
−0.4
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Measured
Fit
Set Gap, Required Phase Change Slope From Fit, No Ends
13
46
80
113
146
180
213
Pole
Phase Change Slope (rad / m)
1
0.5
0
−0.5
−1
−1.5
−2
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)

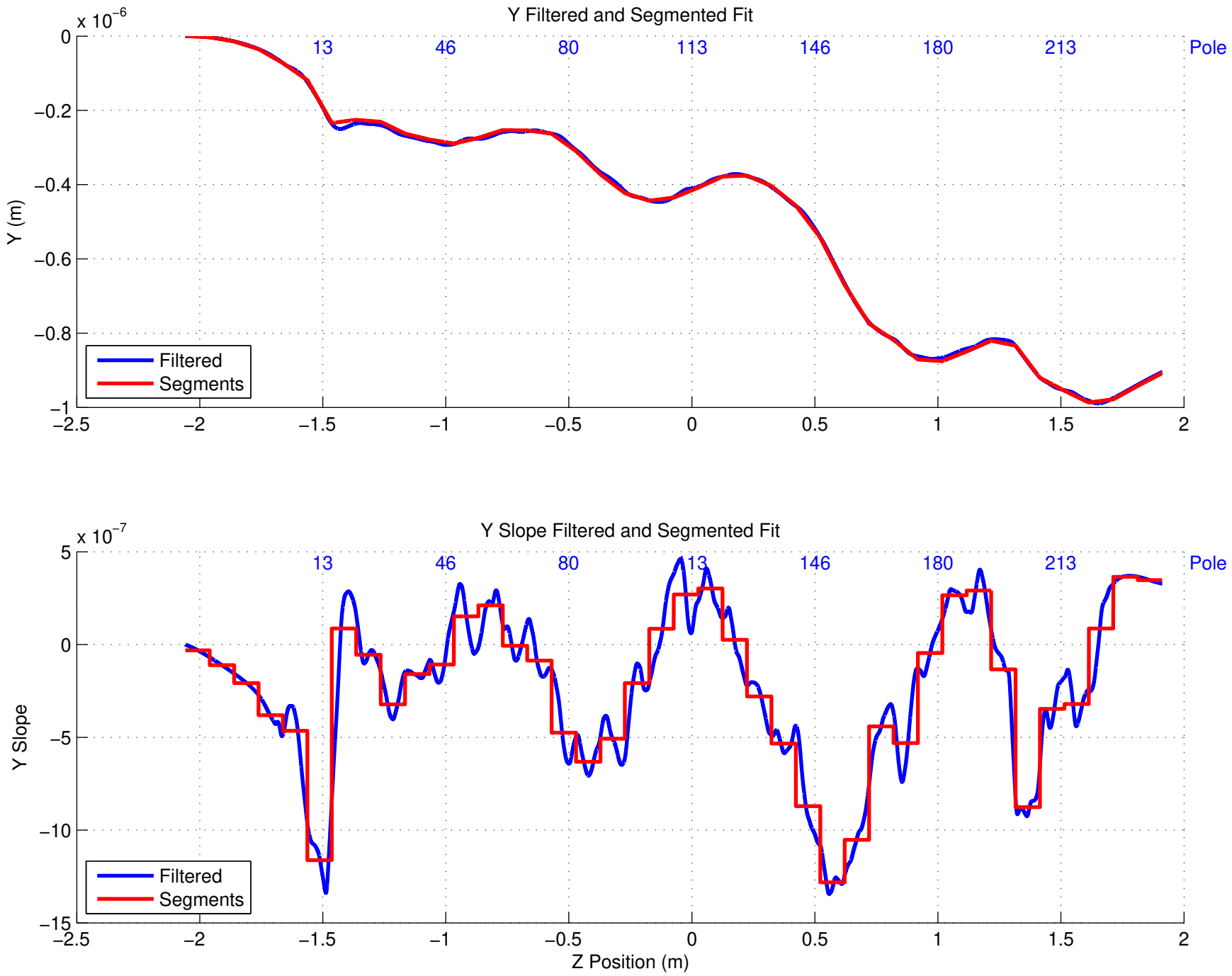

Set Gap, Gap Change Required To Correct The Phase Error, No Ends
x 10^-5
Gap Change (m)
13
46
80
113
146
180
213
Pole
3
2
1
0
−1
−2
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

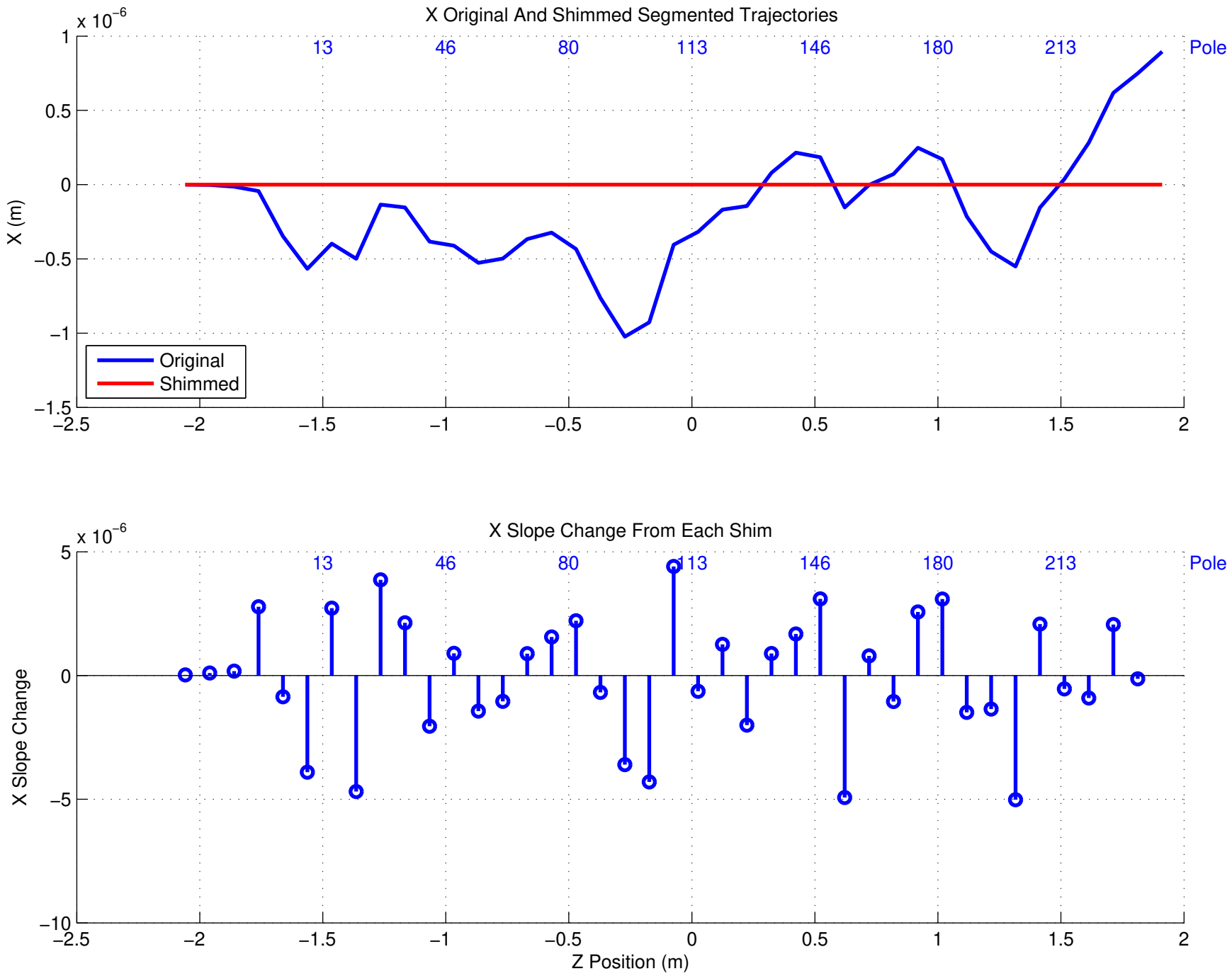

Set Gap, Required Shim X Motion, No Ends
x 10^-3
Shim X Motion (m)
13
46
80
113
146
180
213
Pole
6
4
2
0
−2
−4
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)

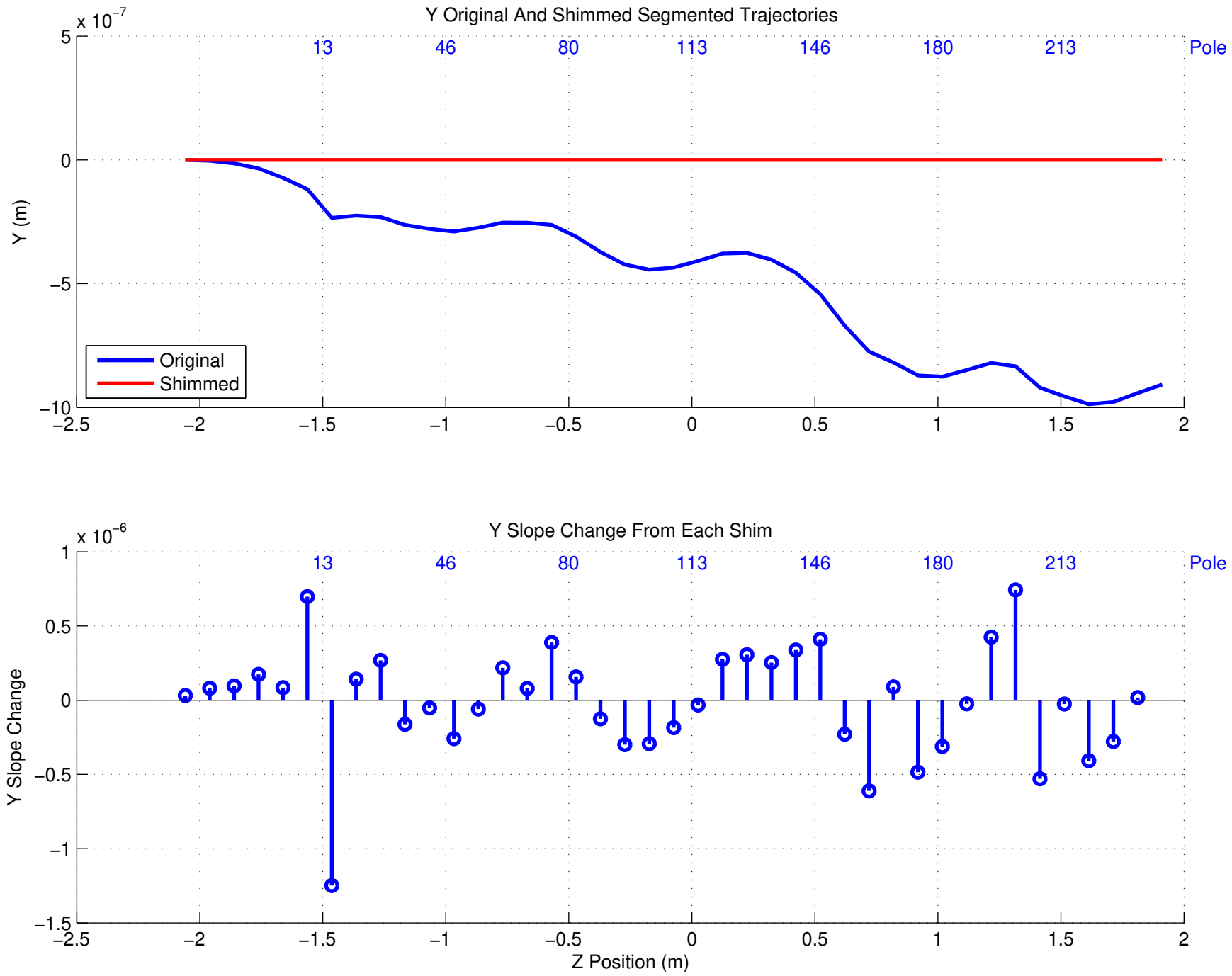

X Trajectory and Segmented Fit
x 10^-6
13
46
80
113
146
180
213
Pole
1.5
1
0.5
0
−0.5
−1
−1.5
X (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)
Trajectory
Filtered
Segments

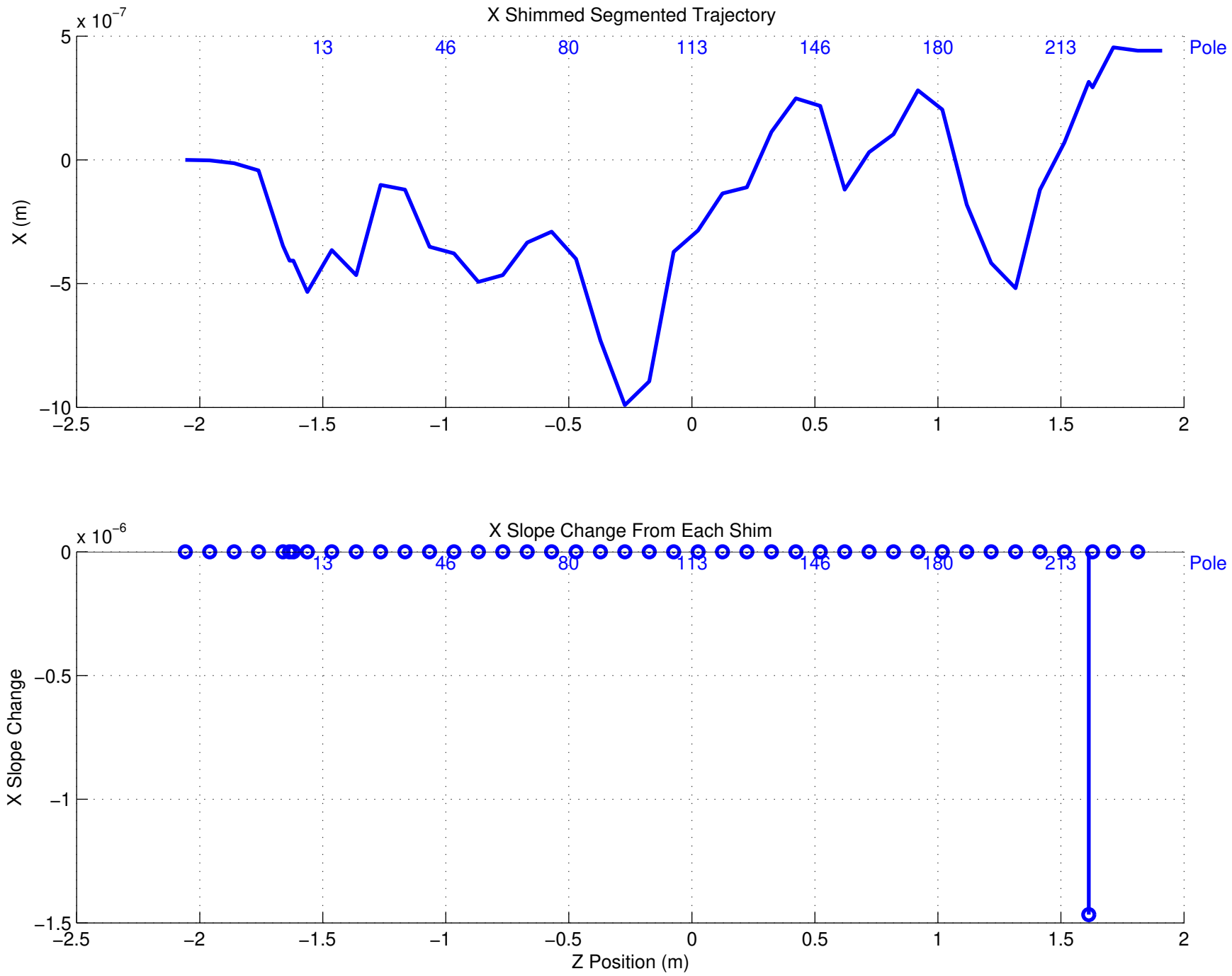

Y Trajectory and Segmented Fit
x 10^-6
13
46
80
113
146
180
213
Pole
0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
−0.7
−0.8
−0.9
−1
Y (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)
Trajectory
Filtered
Segments

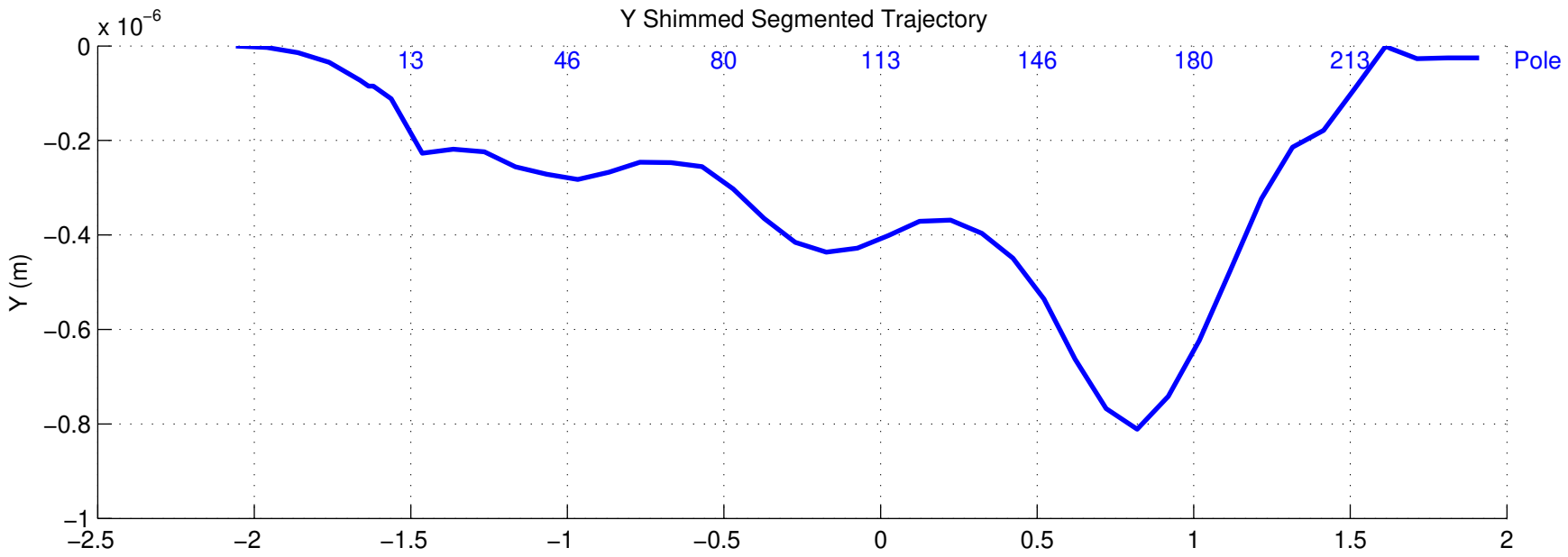

X Filtered and Segmented Fit
x 10^-6
X (m)
13
46
80
113
146
180
213
Pole
Filtered
Segments
X Slope Filtered and Segmented Fit
x 10^-5
X Slope
Z Position (m)

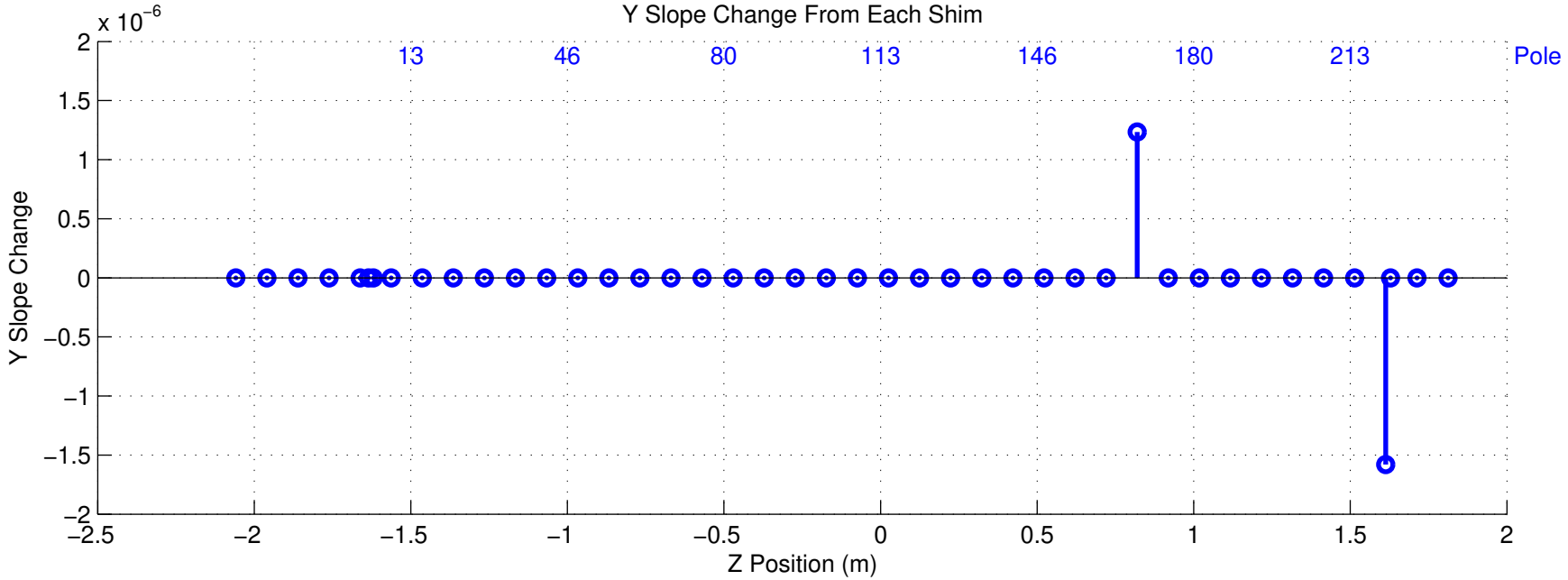

Y Filtered and Segmented Fit
x 10^-6
0
−0.2
−0.4
−0.6
−0.8
−1
Y (m)
13
46
80
113
146
180
213
Pole
Filtered
Segments
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Y Slope Filtered and Segmented Fit
x 10^-7
5
0
−5
−10
−15
Y Slope
Z Position (m)

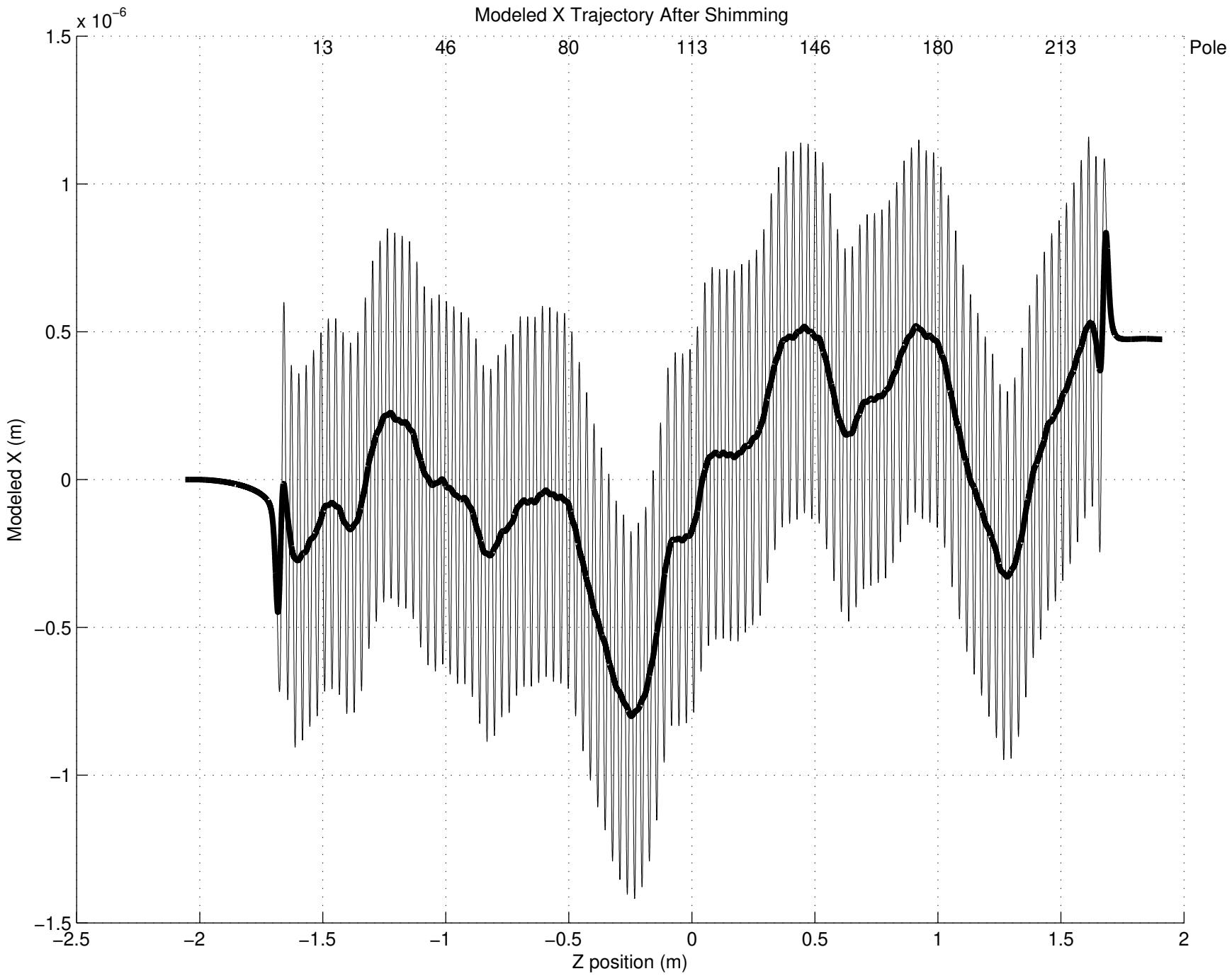

X Original And Shimmed Segmented Trajectories
x 10^-6
13
46
80
113
146
180
213
Pole
X (m)
Original
Shimmed
X Slope Change From Each Shim
X Slope Change
Z Position (m)

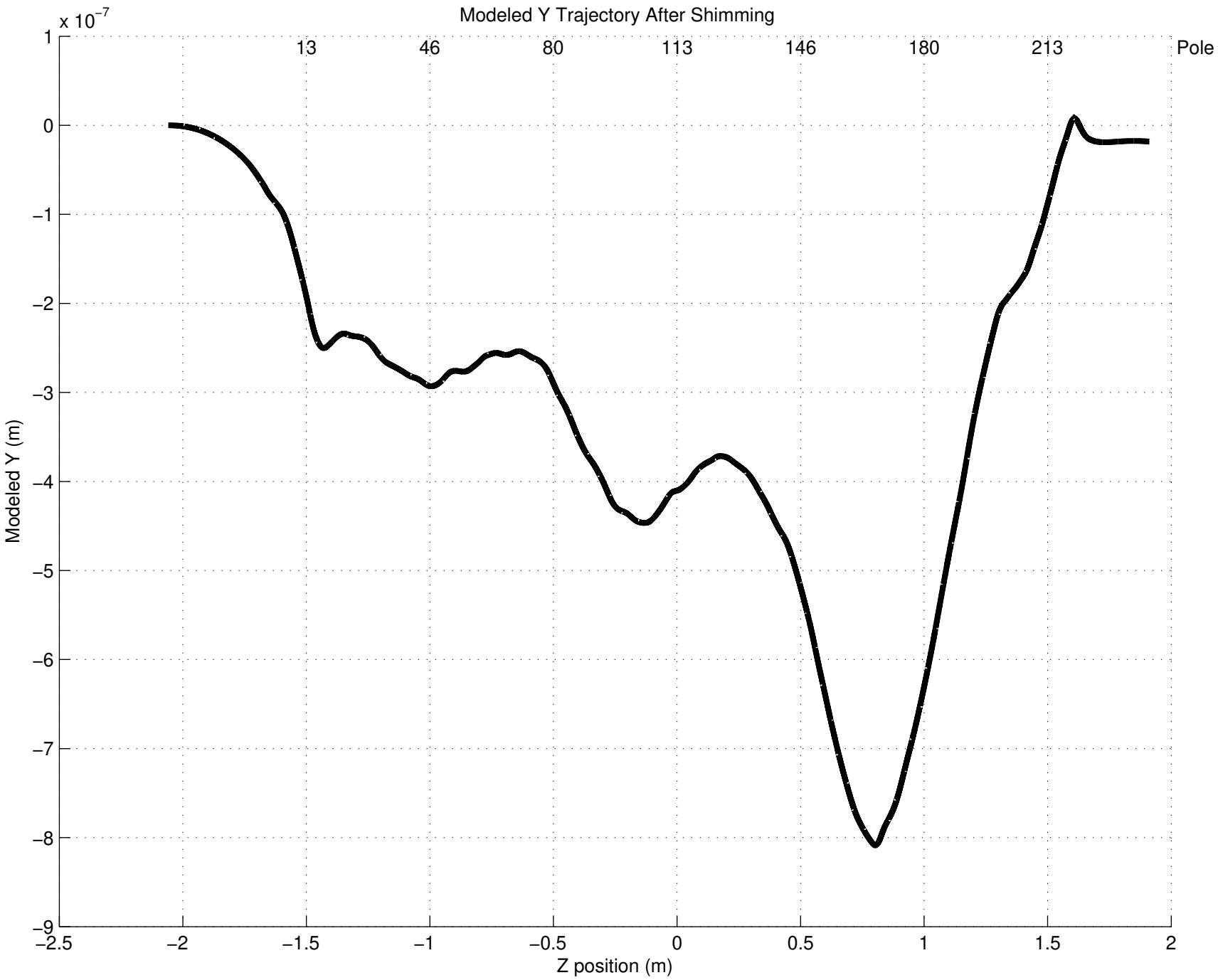

Y Original And Shimmed Segmented Trajectories
x 10^-7
5
0
−5
−10
Y (m)
13
46
80
113
146
180
213
Pole
Original
Shimmed
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Y Slope Change From Each Shim
x 10^-6
1
0.5
0
−0.5
−1
−1.5
Y Slope Change
Z Position (m)

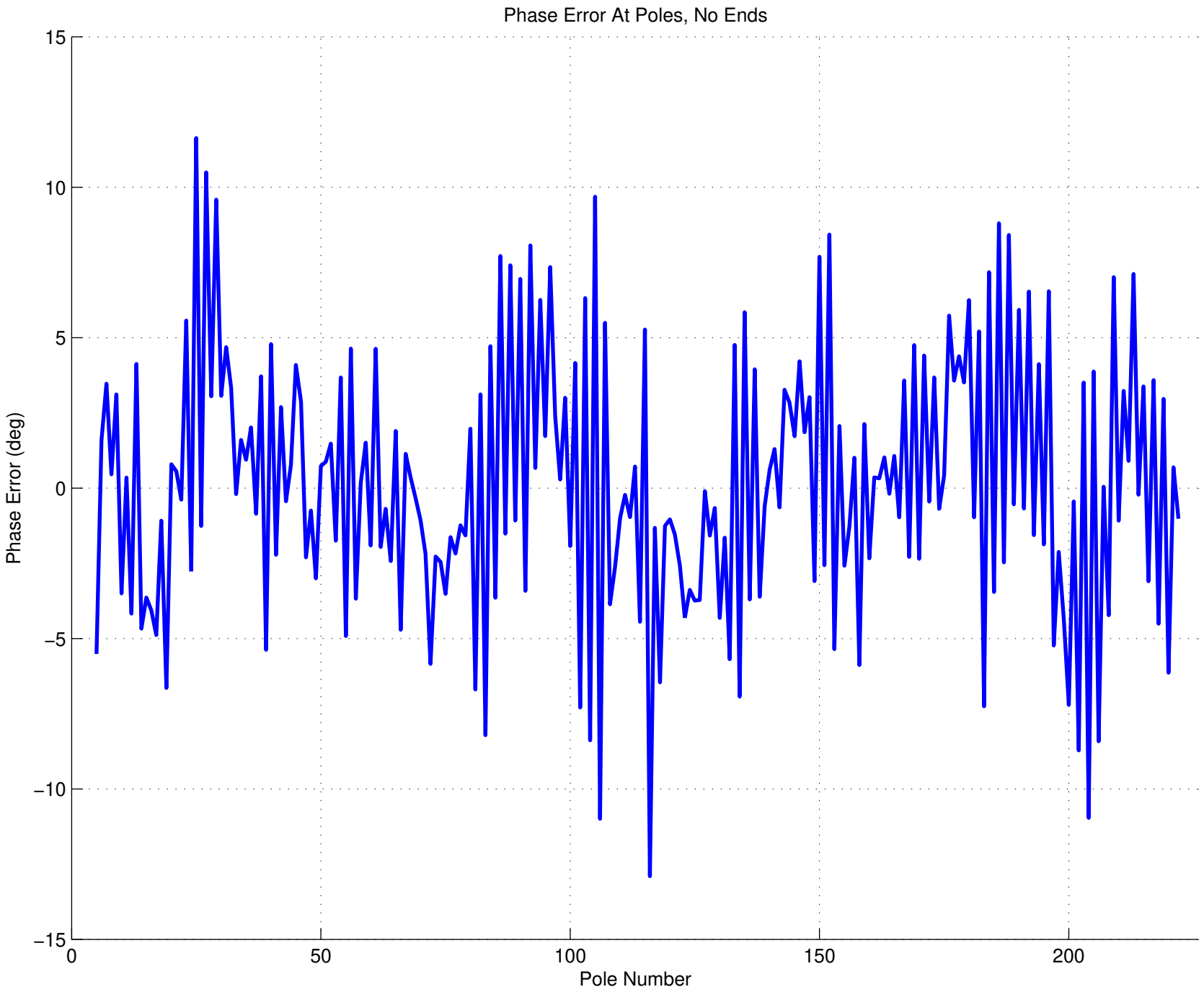

X Shimmed Segmented Trajectory
x 10^-7
X (m)
5
0
−5
−10
13
46
80
113
146
180
213
Pole
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
X Slope Change From Each Shim
x 10^-6
X Slope Change
0
−0.5
−1
−1.5
Z Position (m)

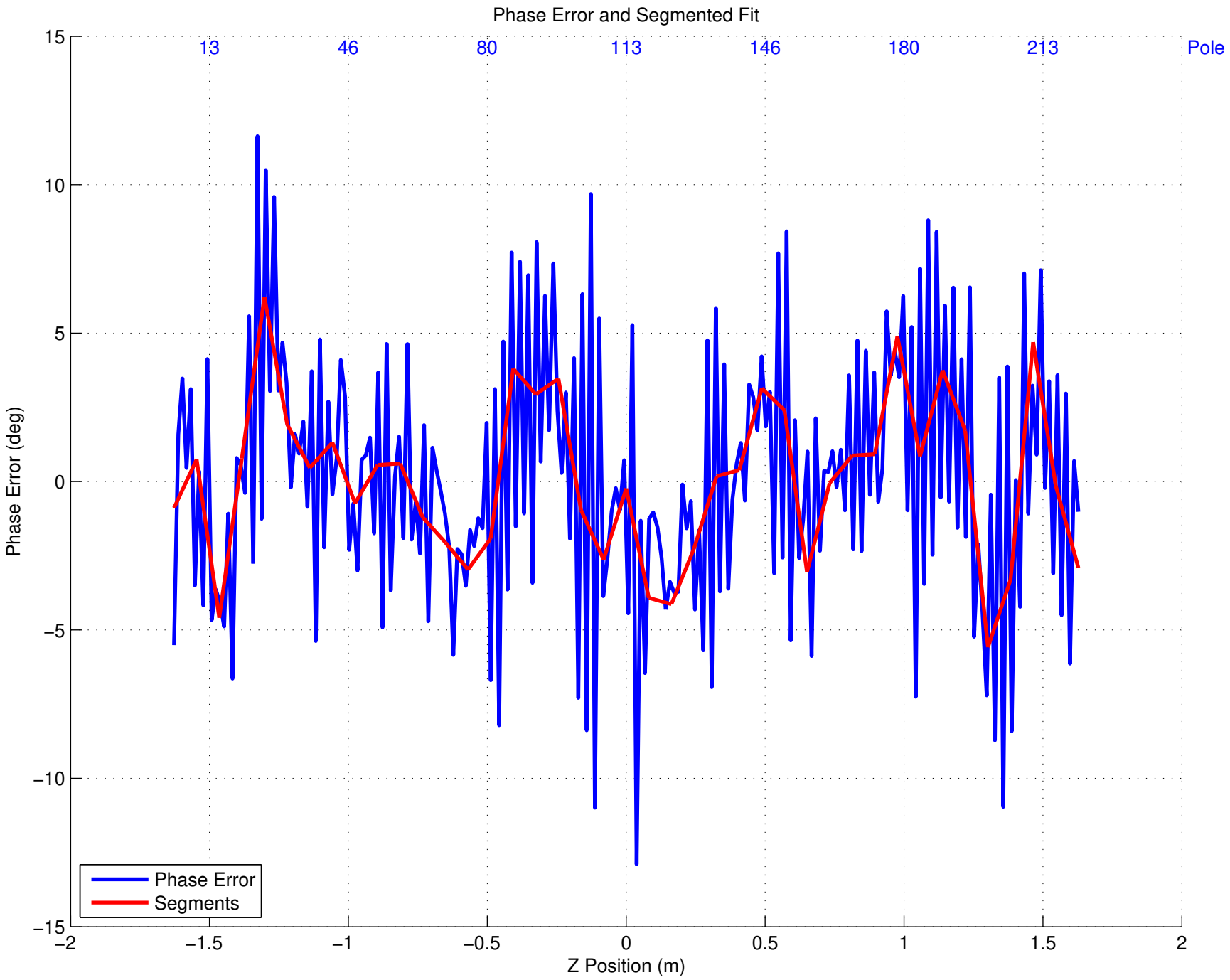

Y Shimmed Segmented Trajectory
x 10^-6
0
−0.2
−0.4
−0.6
−0.8
−1
Y (m)
13
46
80
113
146
180
213
Pole
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

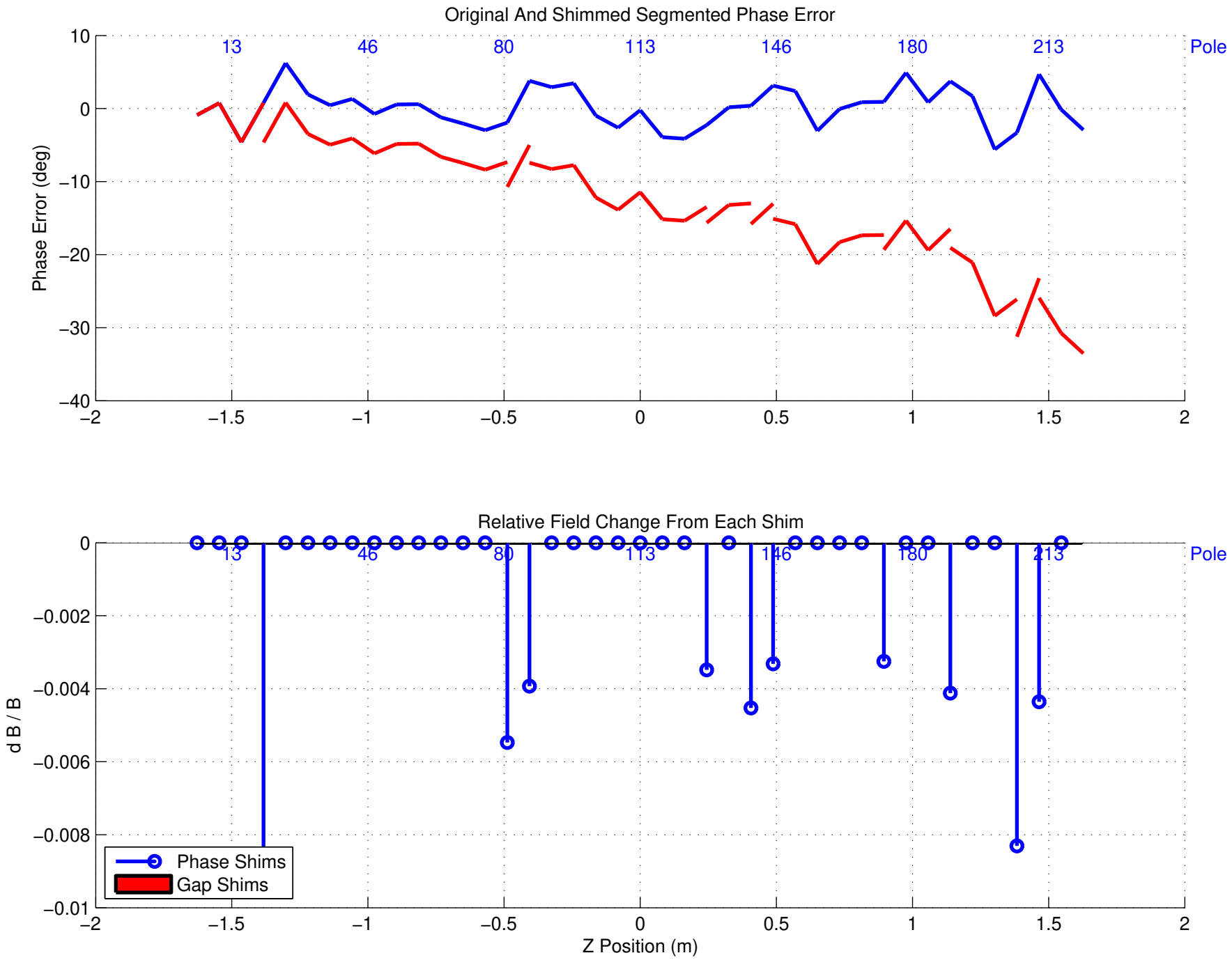

Y Slope Change From Each Shim
x 10^-6
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2
Y Slope Change
13
46
80
113
146
180
213
Pole
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)

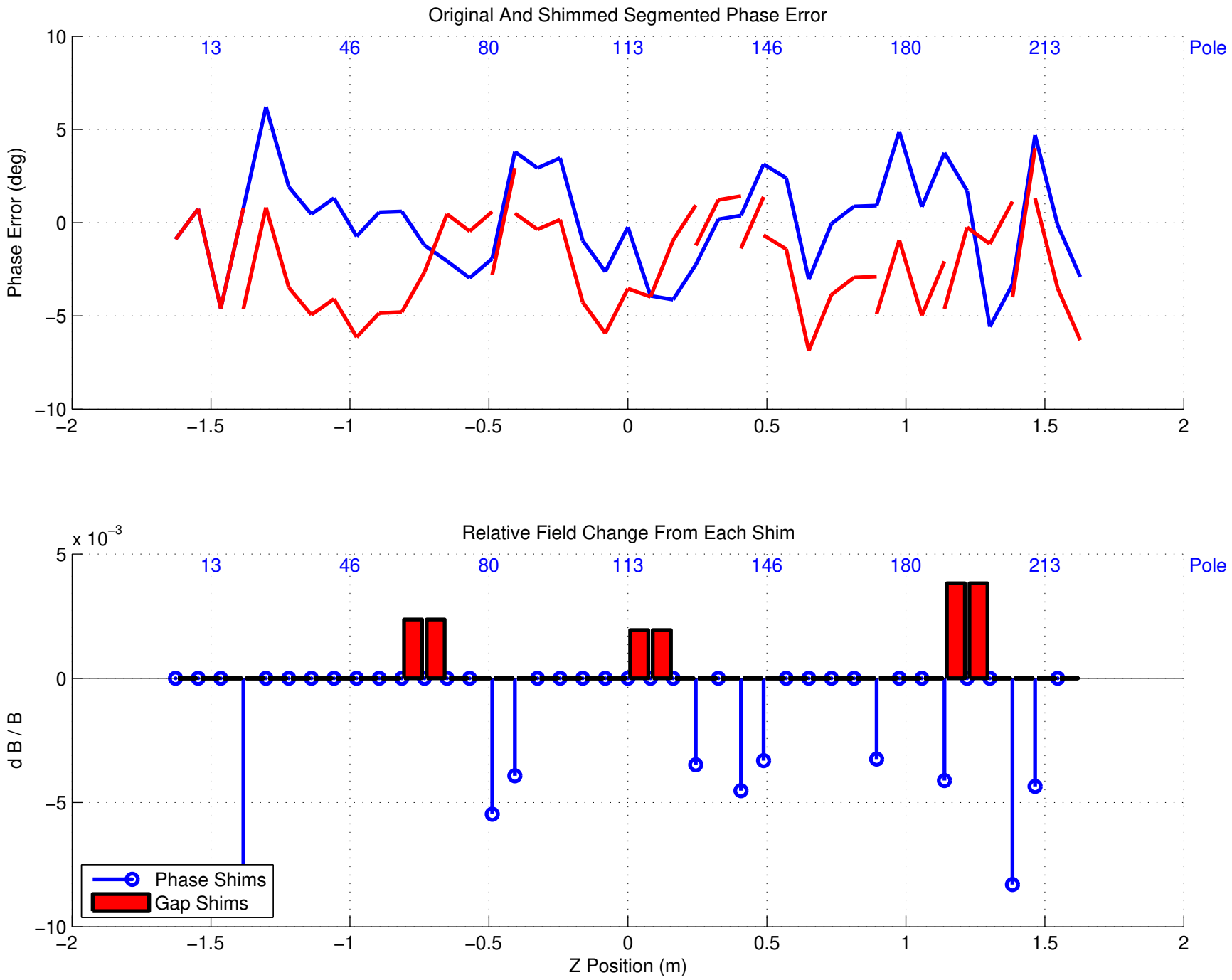

Modeled X Trajectory After Shimming
x 10^-6
1.5
1
0.5
0
−0.5
−1
−1.5
13
46
80
113
146
180
213
Pole
Modeled X (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z position (m)

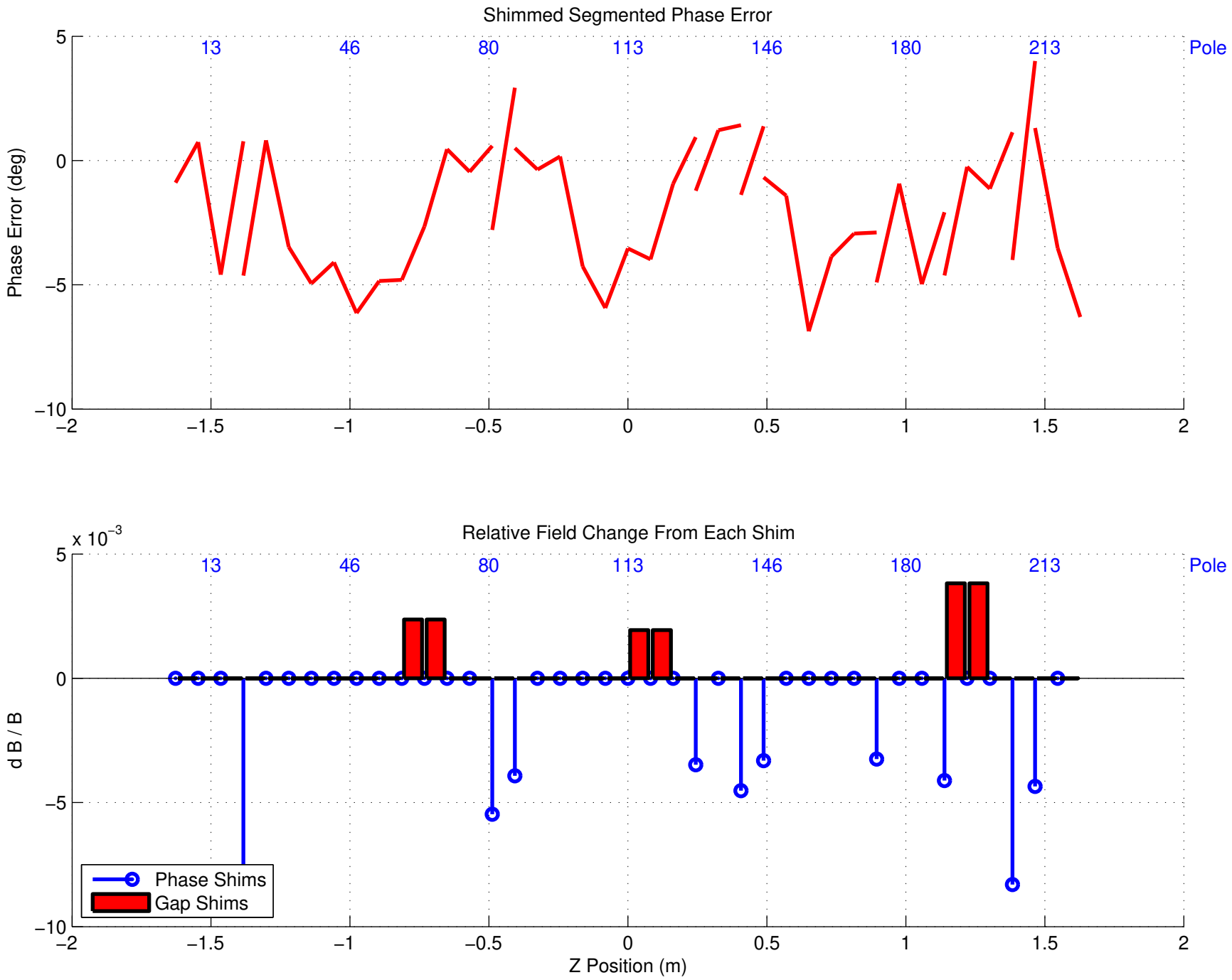

Modeled Y Trajectory After Shimming
x 10^-7
13
46
80
113
146
180
213
Pole
1
0
−1
−2
−3
−4
−5
−6
−7
−8
−9
Modeled Y (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z position (m)

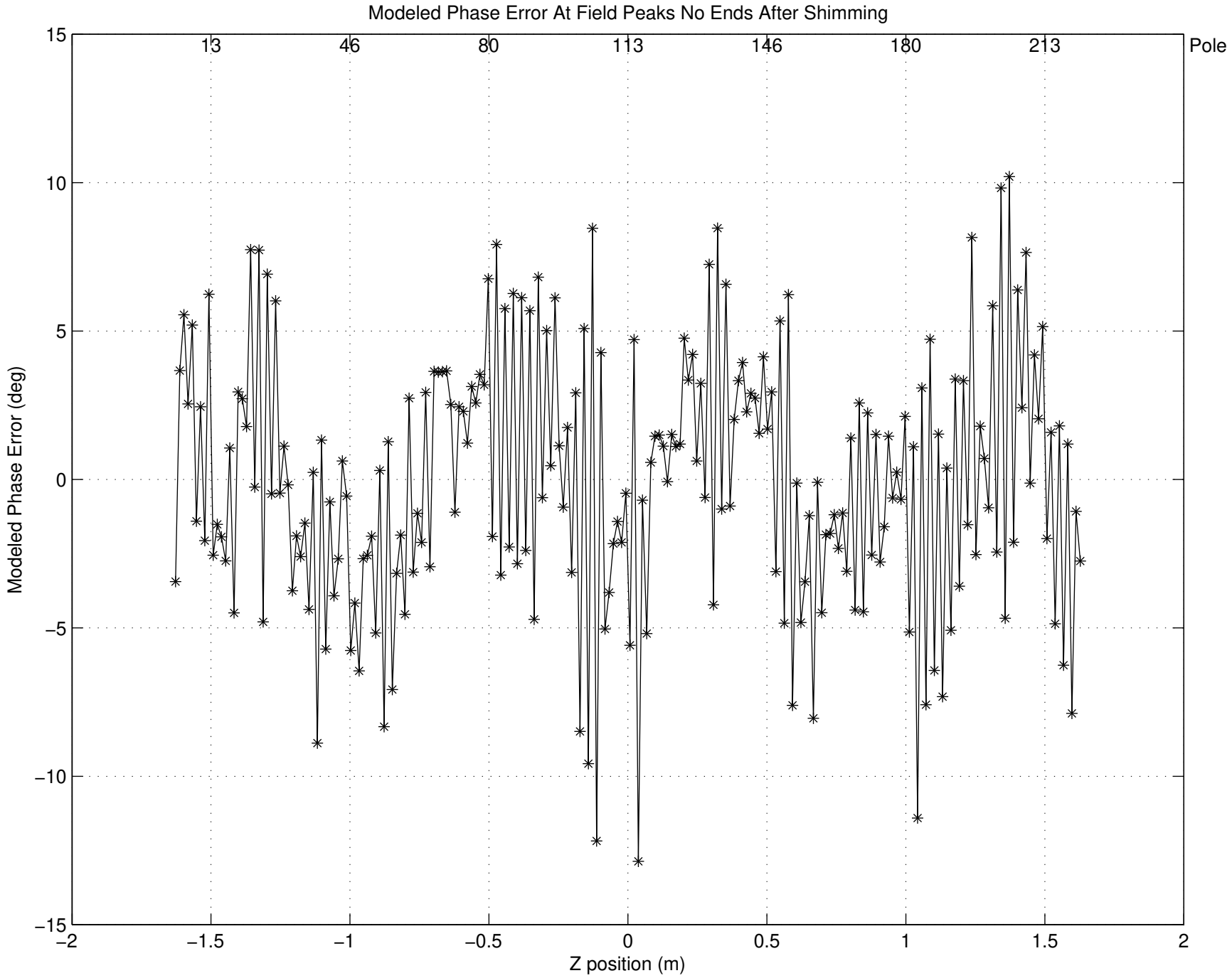

Phase Error At Poles, No Ends
Phase Error (deg)
Pole Number
15
10
5
0
−5
−10
−15
0
50
100
150
200


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


Original And Shimmed Segmented Phase Error
Phase Error (deg)
10
0
−10
−20
−30
−40
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
d B / B
0
−0.002
−0.004
−0.006
−0.008
−0.01
Phase Shims
Gap Shims
Z Position (m)


Original And Shimmed Segmented Phase Error
Phase Error (deg)
Pole
13
46
80
113
146
180
213
10
5
0
−5
−10
−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
Z Position (m)
Phase Shims
Gap Shims


Shimmed Segmented Phase Error
Phase Error (deg)
13
46
80
113
146
180
213
Pole
5
0
−5
−10
−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 = 4.293159 deg