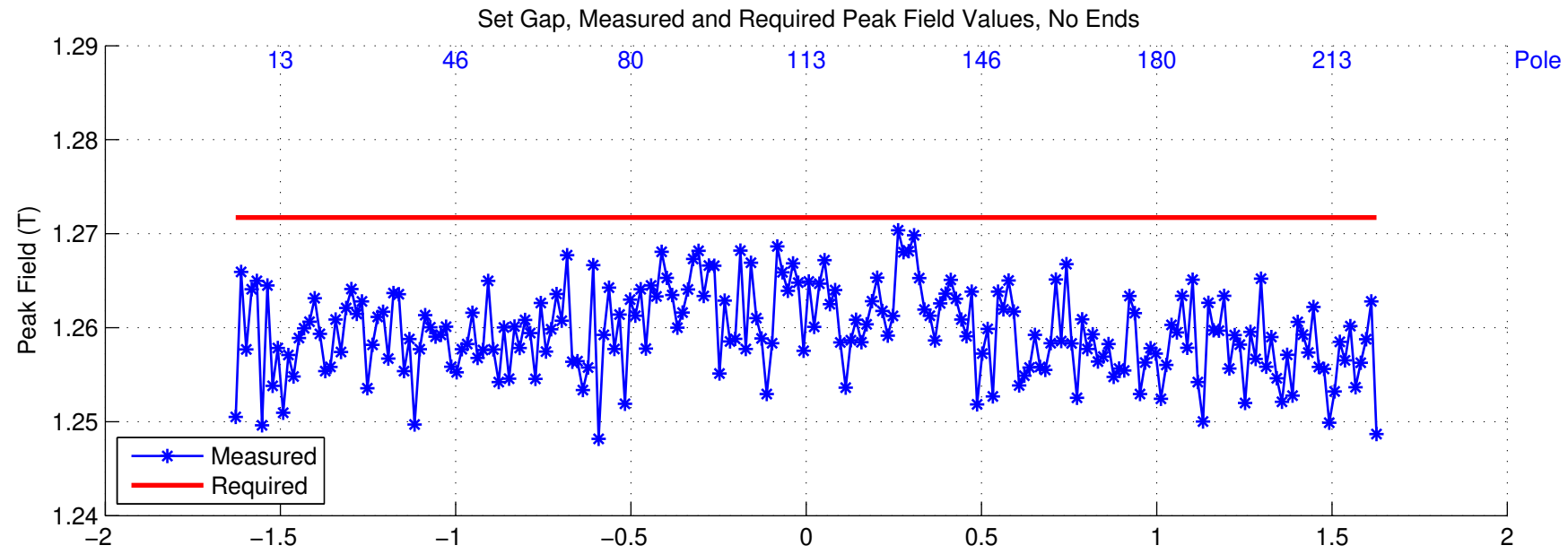
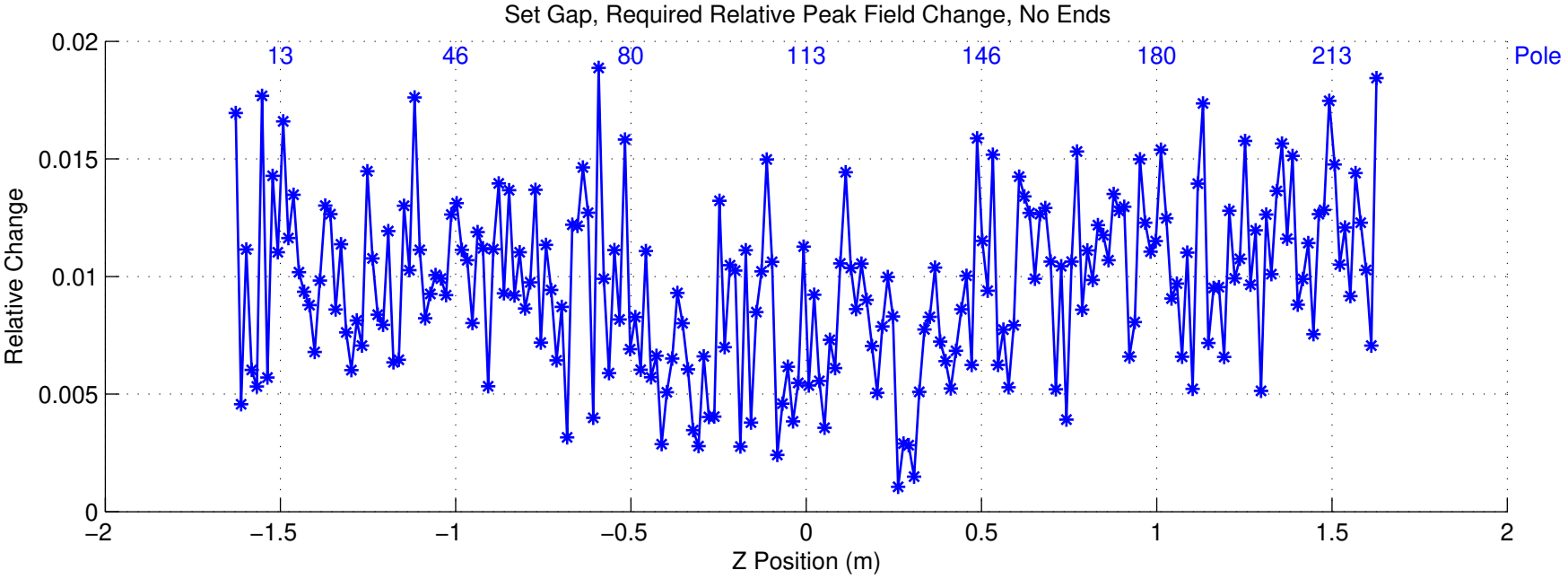
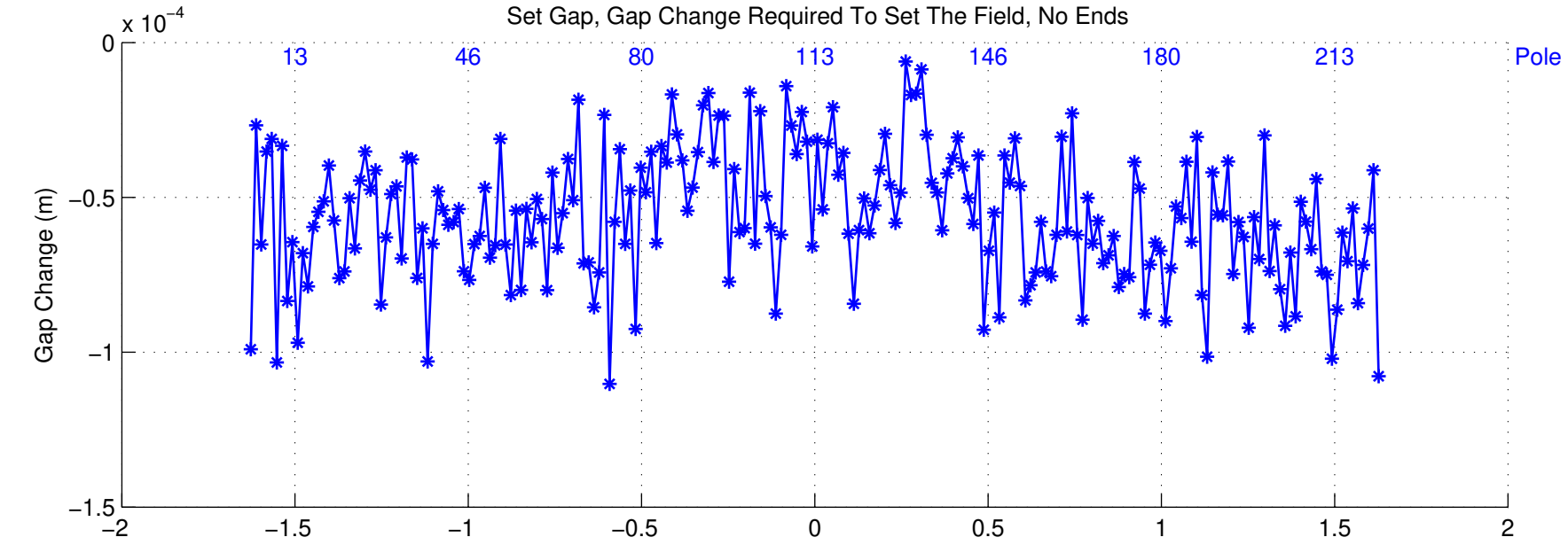
SLAC Magnetic Measurements

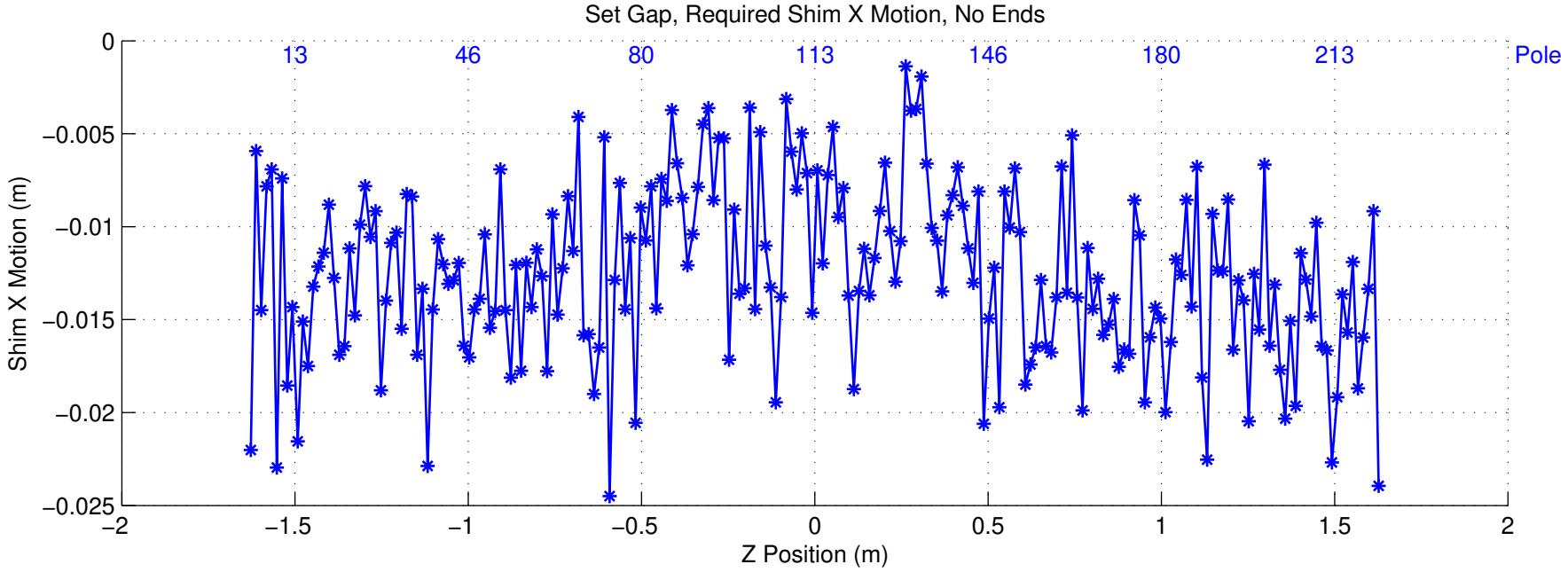
Planar Insertion Device Shim Analysis

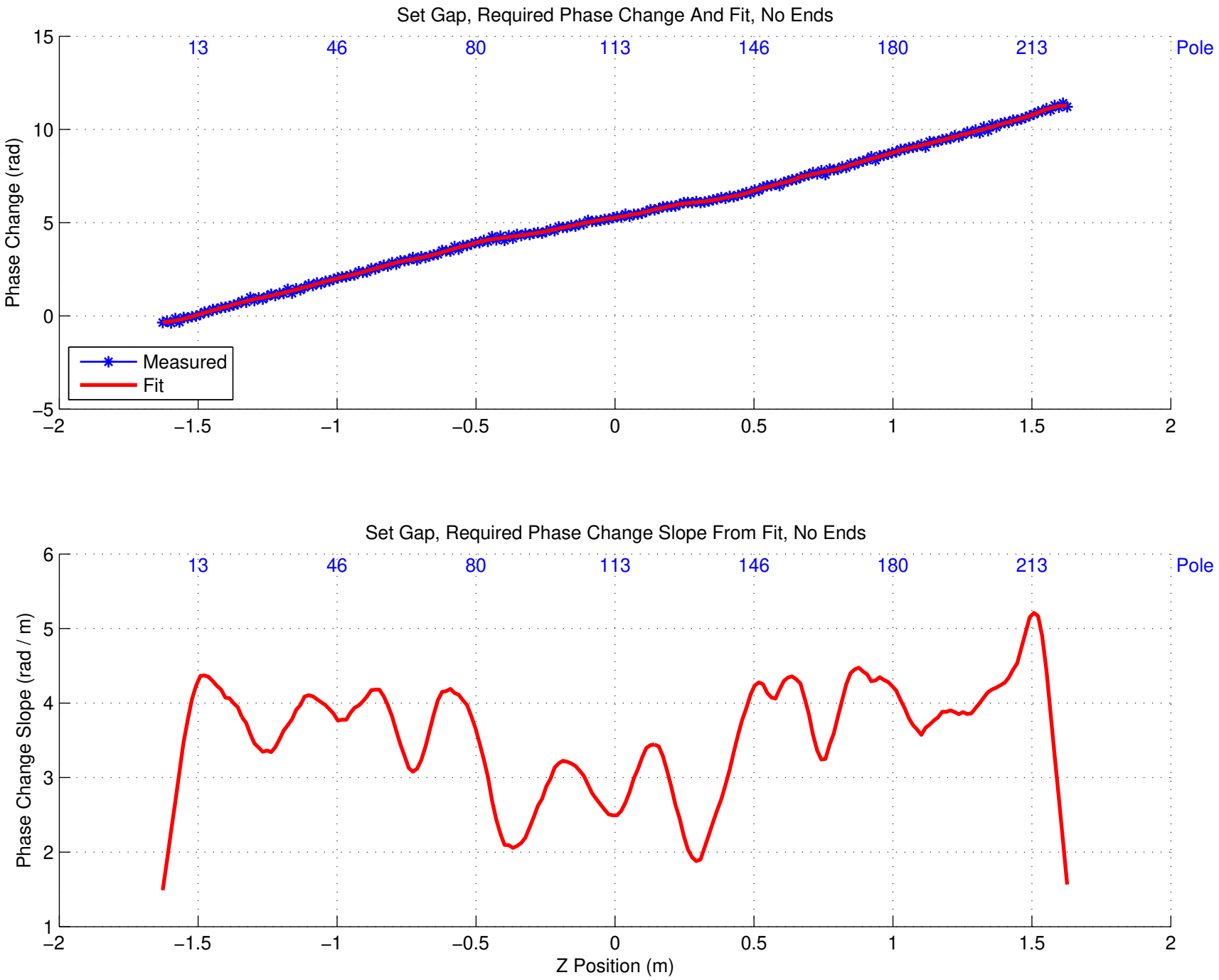
Parameters:
INPUT−FILE−DIR =S:\MagData\LCLS\Undulator\L143−112000−36\DATASET0001\Rough Tuning\Z Scans\Run 019\
INPUT−FILE−NAME =x+00000−y+000−bscanz.dat
INPUT−FILE−TYPE =ZVXYBXYH
CORR−REQUIRED =1
GAMMA =26648.21
NOM−LAMBDA−U =0.03
NOM−K−VALUE =3.4904
NOM−LAMBDA−R =1.4979e−010
NUM−POLES =226
NUM−END−POLES =4
CELL−LENGTH =3.656

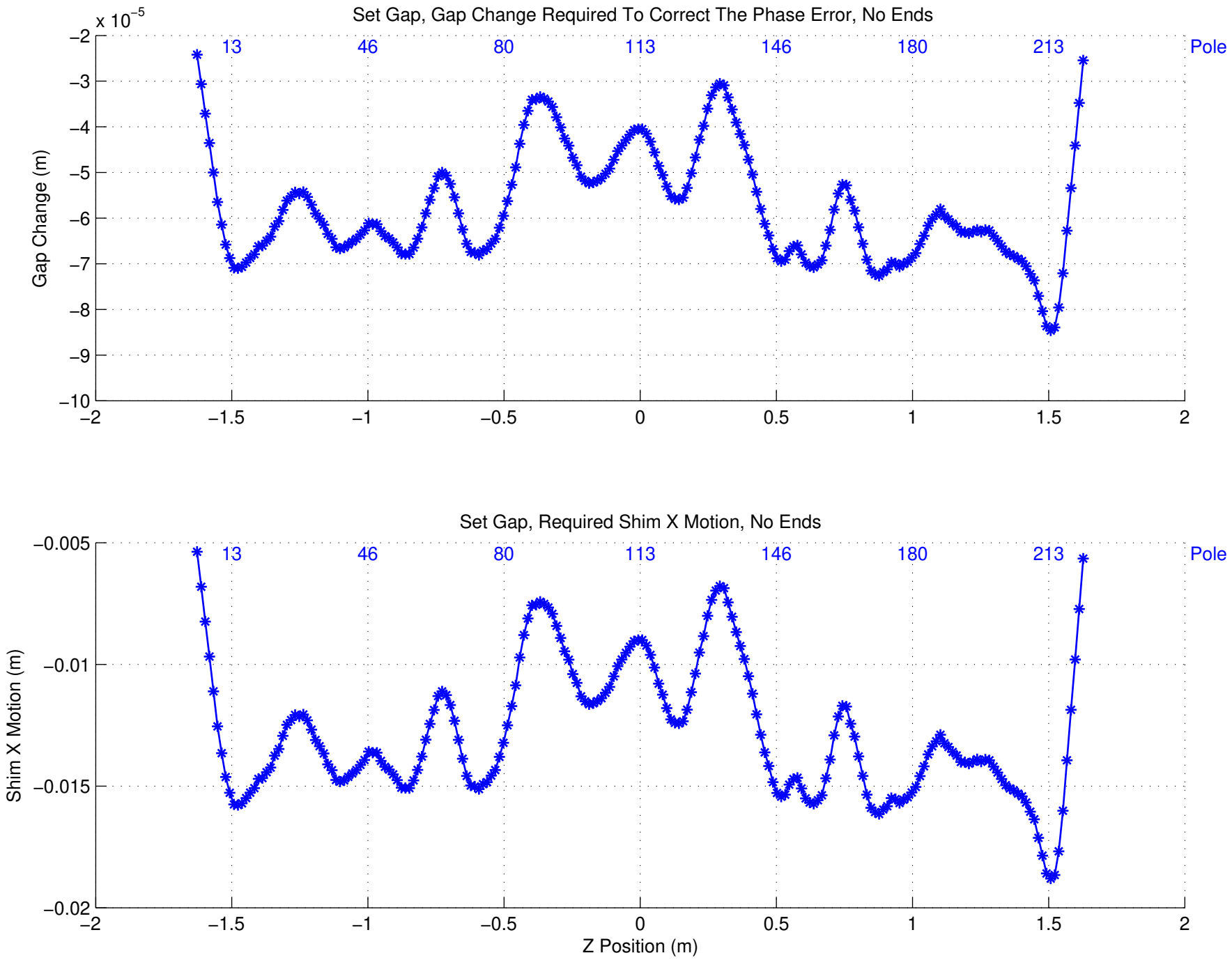

Set Gap, Measured and Required Peak Field Values, No Ends
13
46
80
113
146
180
213
Pole
Peak Field (T)
1.29
1.28
1.27
1.26
1.25
1.24
Measured
Required
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

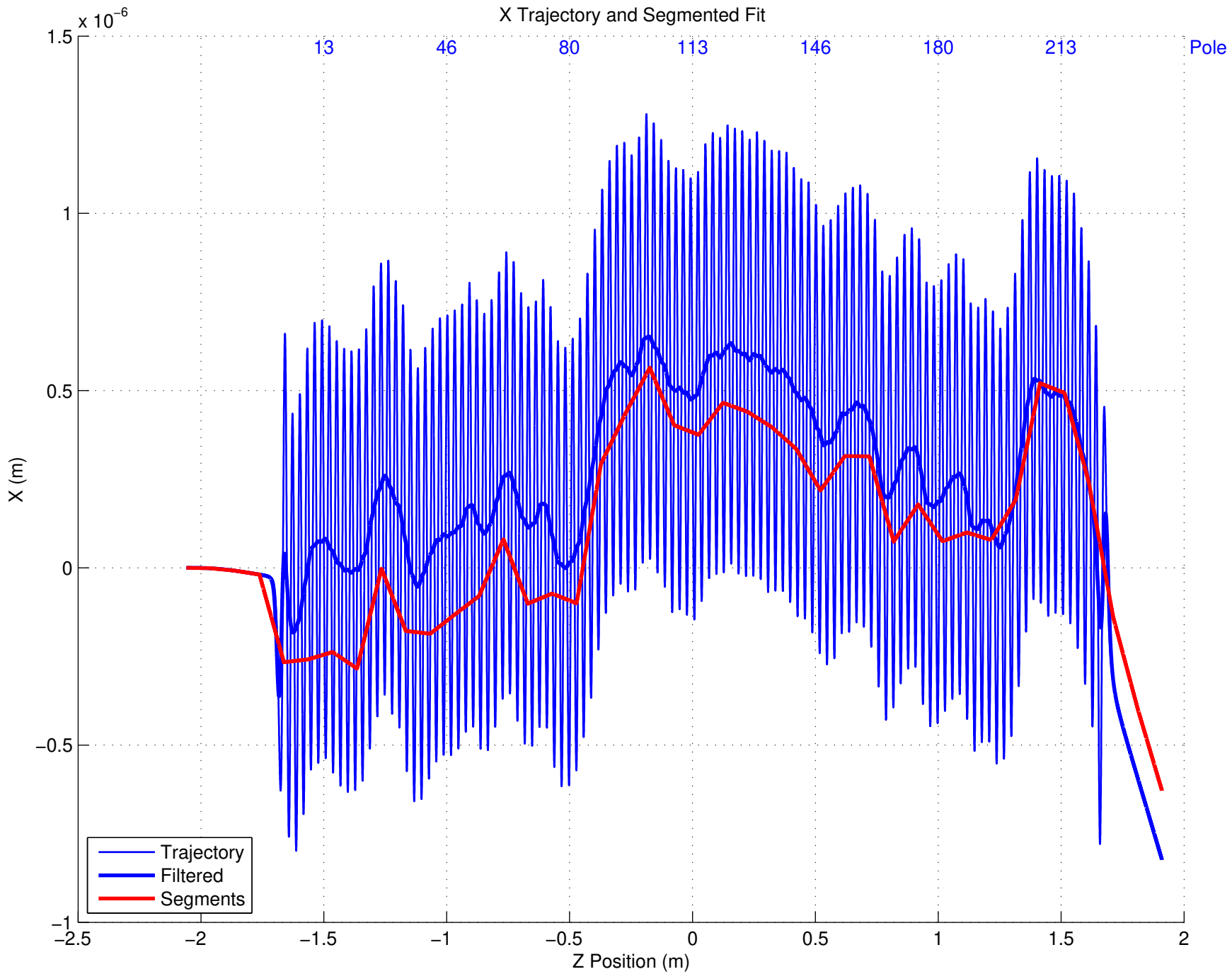

Set Gap, Required Relative Peak Field Change, No Ends
13
46
80
113
146
180
213
Pole
Relative Change
0.02
0.015
0.01
0.005
0
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)

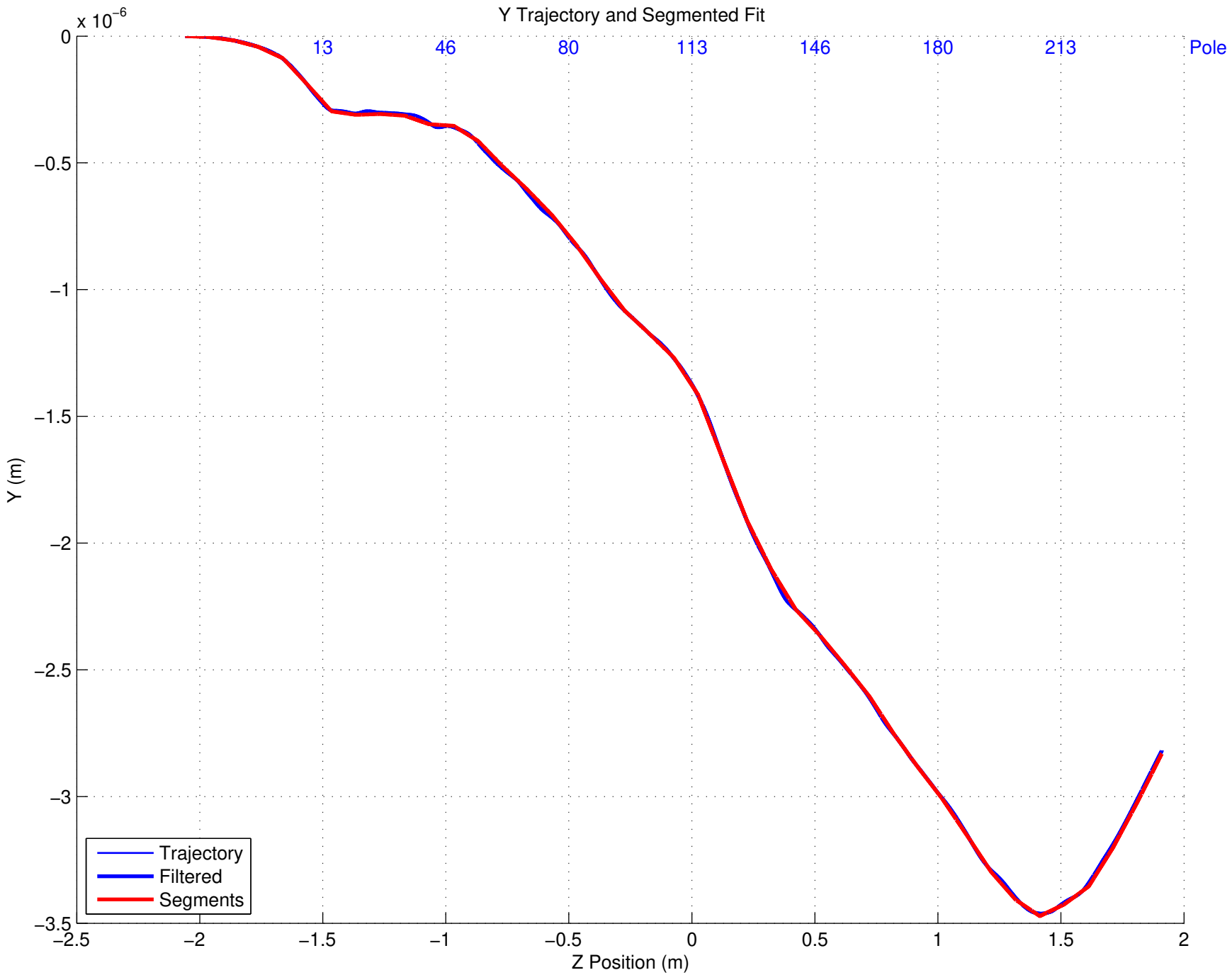

Set Gap, Gap Change Required To Set The Field, No Ends
x 10^-4
Gap Change (m)
0
−0.5
−1
−1.5
13
46
80
113
146
180
213
Pole
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

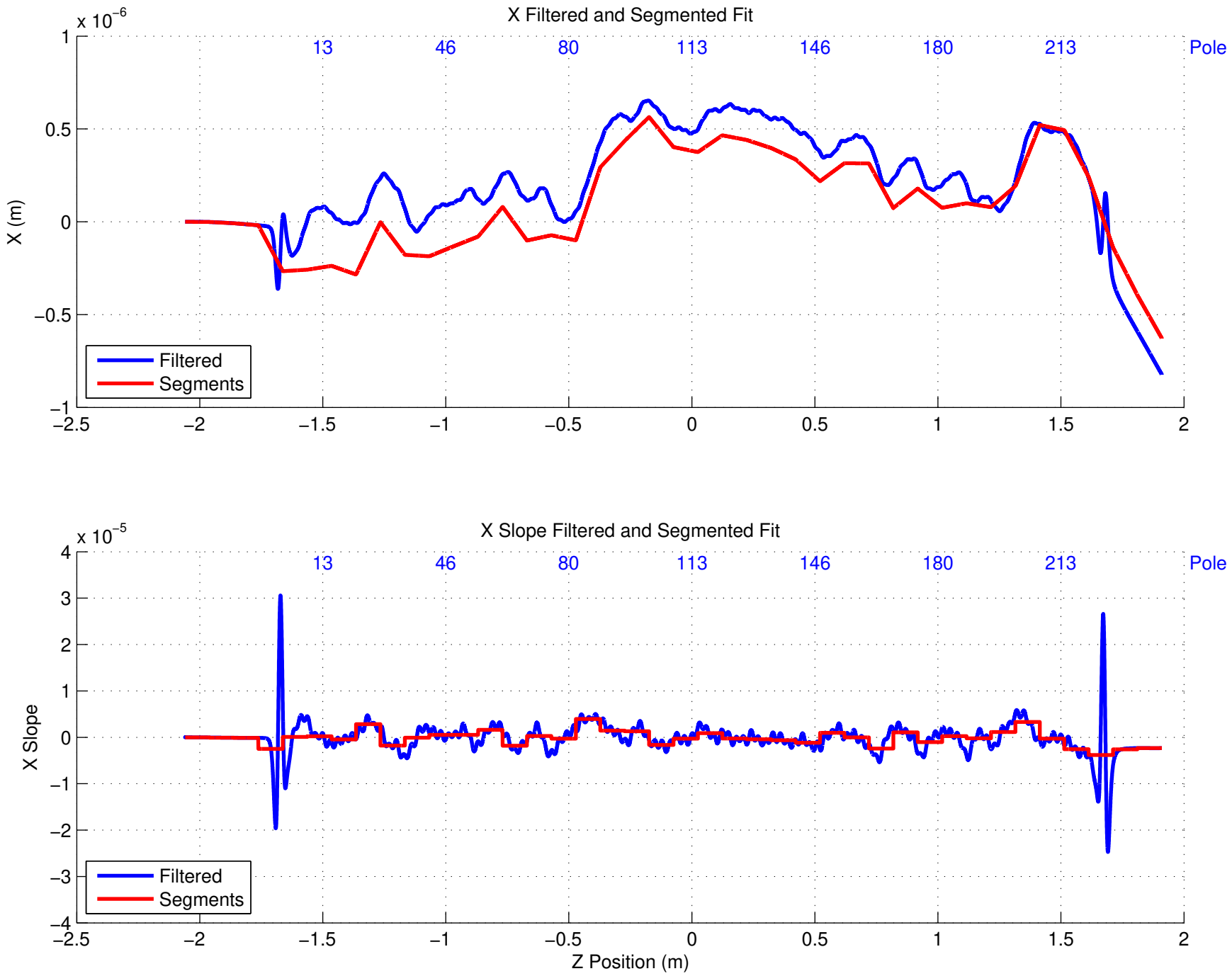

Set Gap, Required Shim X Motion, No Ends
Shim X Motion (m)
0
−0.005
−0.01
−0.015
−0.02
−0.025
13
46
80
113
146
180
213
Pole
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)

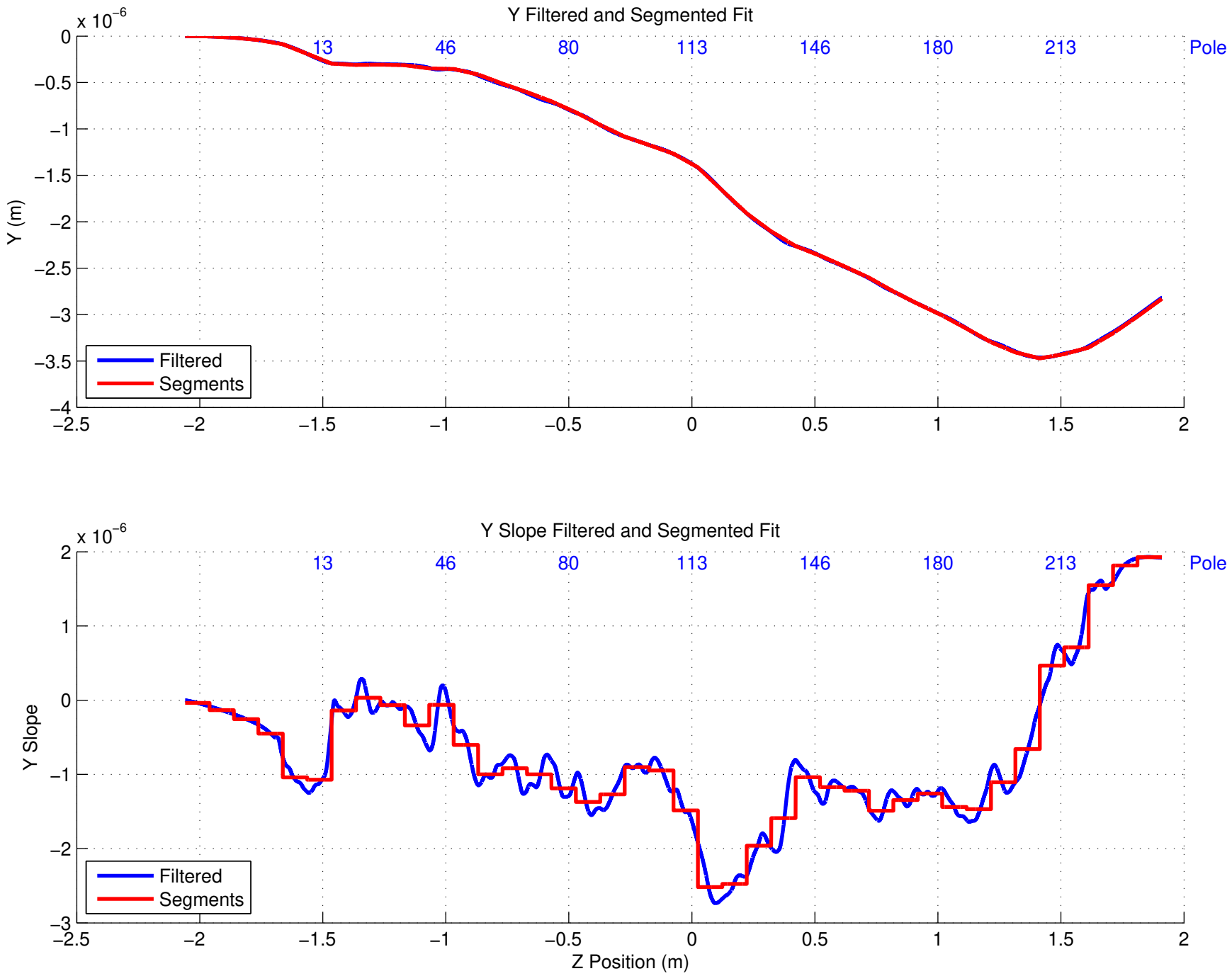

Set Gap, Required Phase Change And Fit, No Ends
Pole
13
46
80
113
146
180
213
Phase Change (rad)
15
10
5
0
−5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Measured
Fit
Set Gap, Required Phase Change Slope From Fit, No Ends
Pole
Phase Change Slope (rad / m)
6
5
4
3
2
1
Z Position (m)

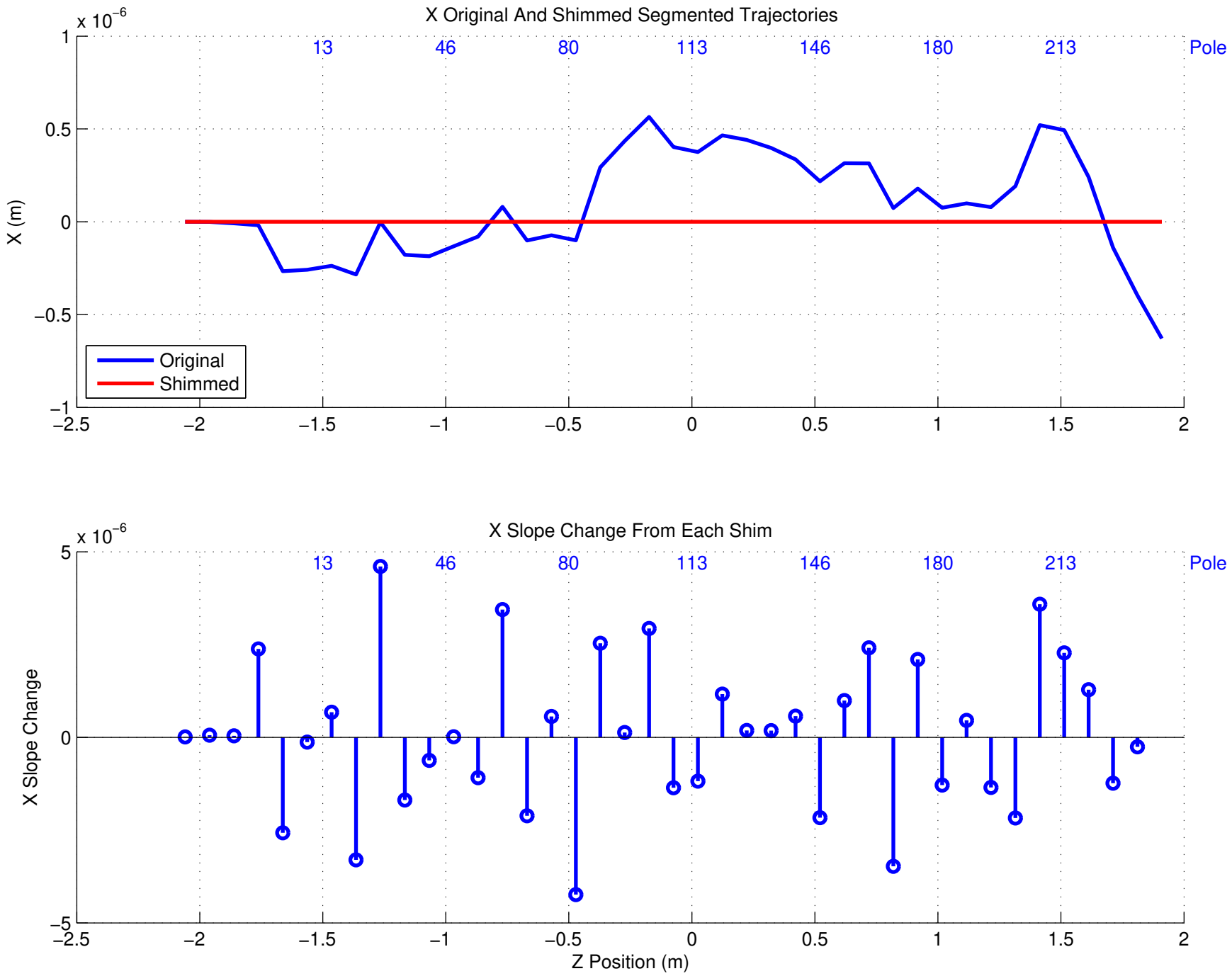

Set Gap, Gap Change Required To Correct The Phase Error, No Ends
x 10^-5
Gap Change (m)
−2
−3
−4
−5
−6
−7
−8
−9
−10
13
46
80
113
146
180
213
Pole
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Set Gap, Required Shim X Motion, No Ends
Shim X Motion (m)
−0.005
−0.01
−0.015
−0.02
13
46
80
113
146
180
213
Pole
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)

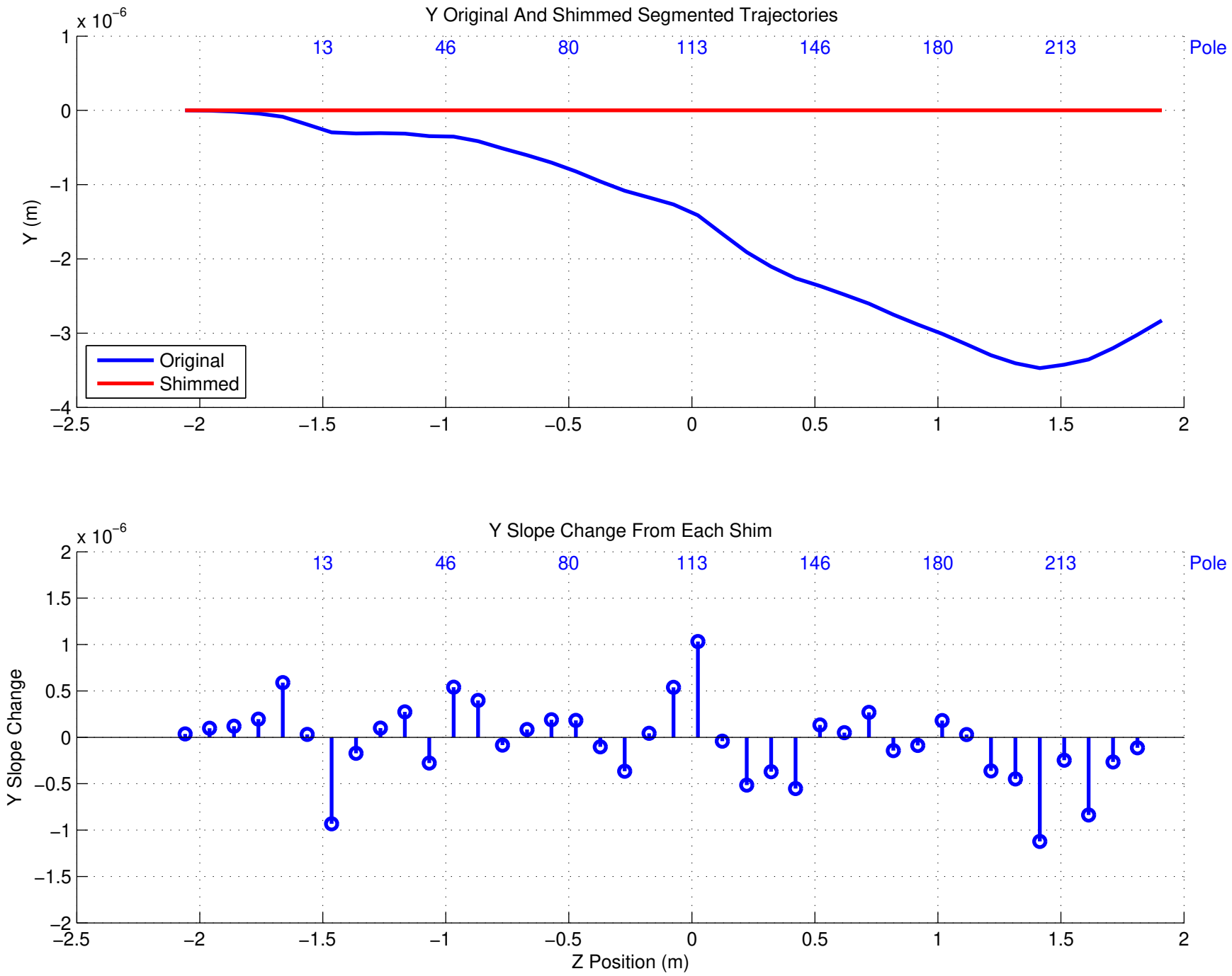

X Trajectory and Segmented Fit
x 10^-6
1.5
1
0.5
0
−0.5
−1
13
46
80
113
146
180
213
Pole
X (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)
Trajectory
Filtered
Segments

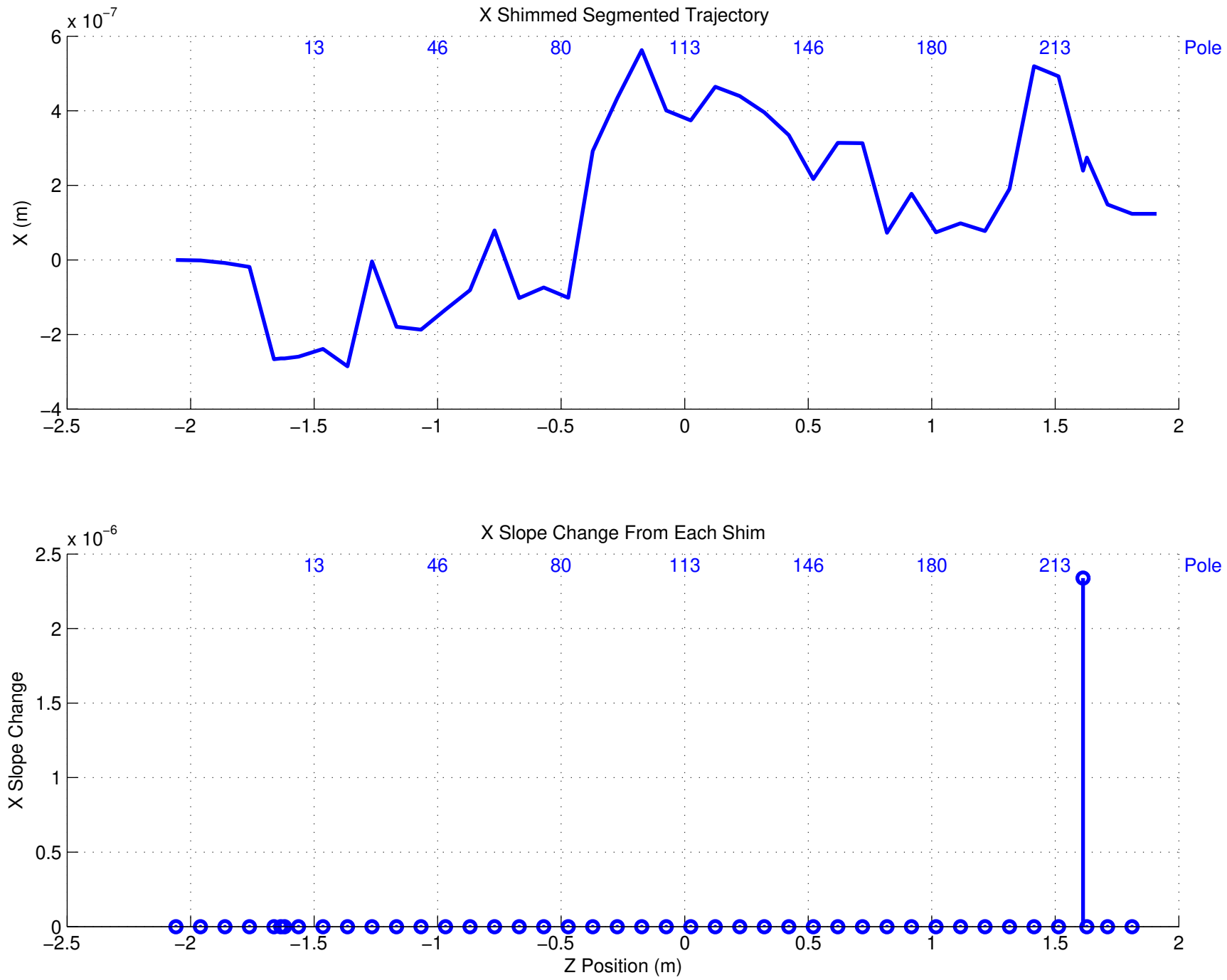

Y Trajectory and Segmented Fit
x 10^-6
0
−0.5
−1
−1.5
−2
−2.5
−3
−3.5
13
46
80
113
146
180
213
Pole
Y (m)
Z Position (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Trajectory
Filtered
Segments

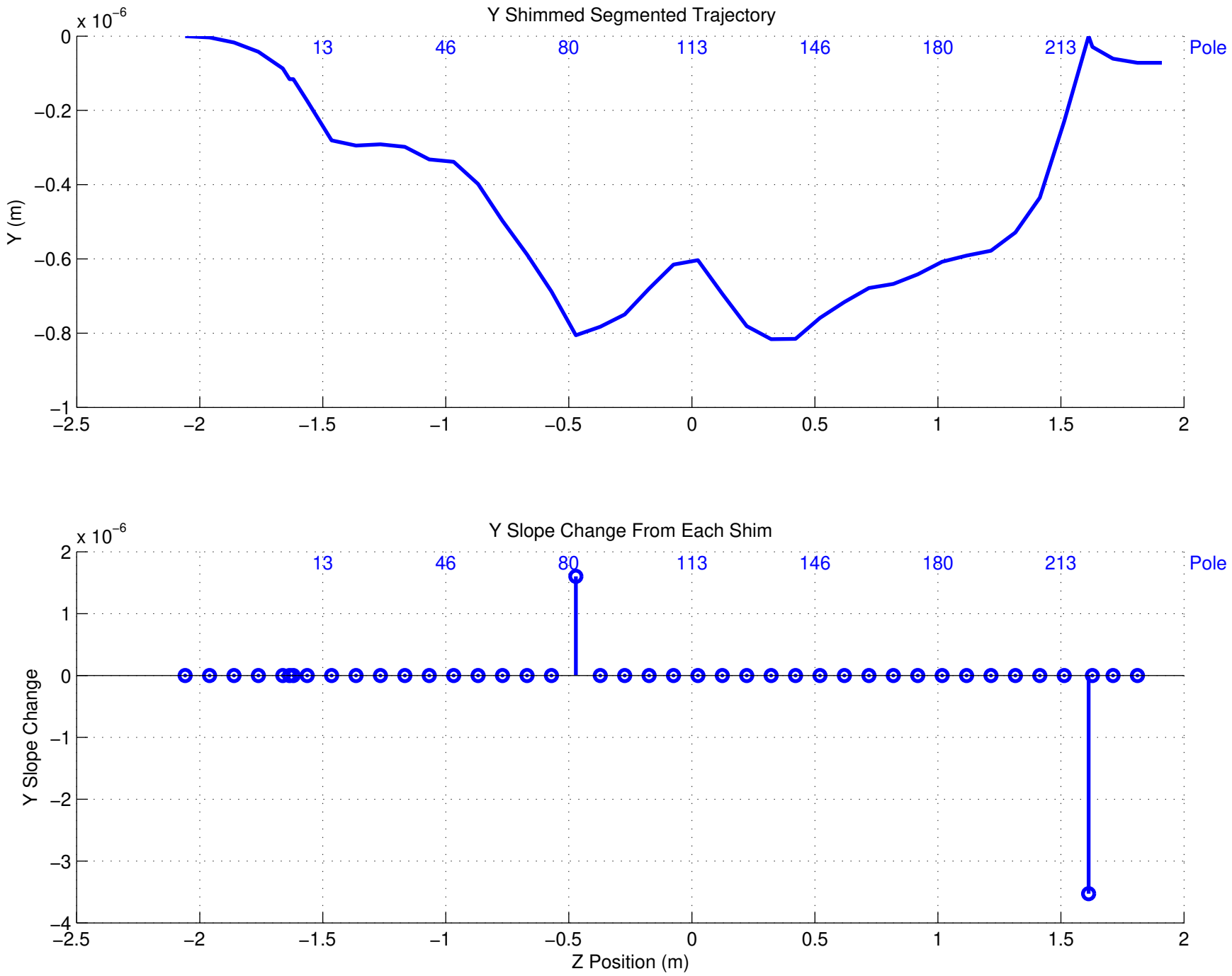

X Filtered and Segmented Fit
x 10^-6
X (m)
13
46
80
113
146
180
213
Pole
Filtered
Segments
X Slope Filtered and Segmented Fit
x 10^-5
X Slope
Z Position (m)

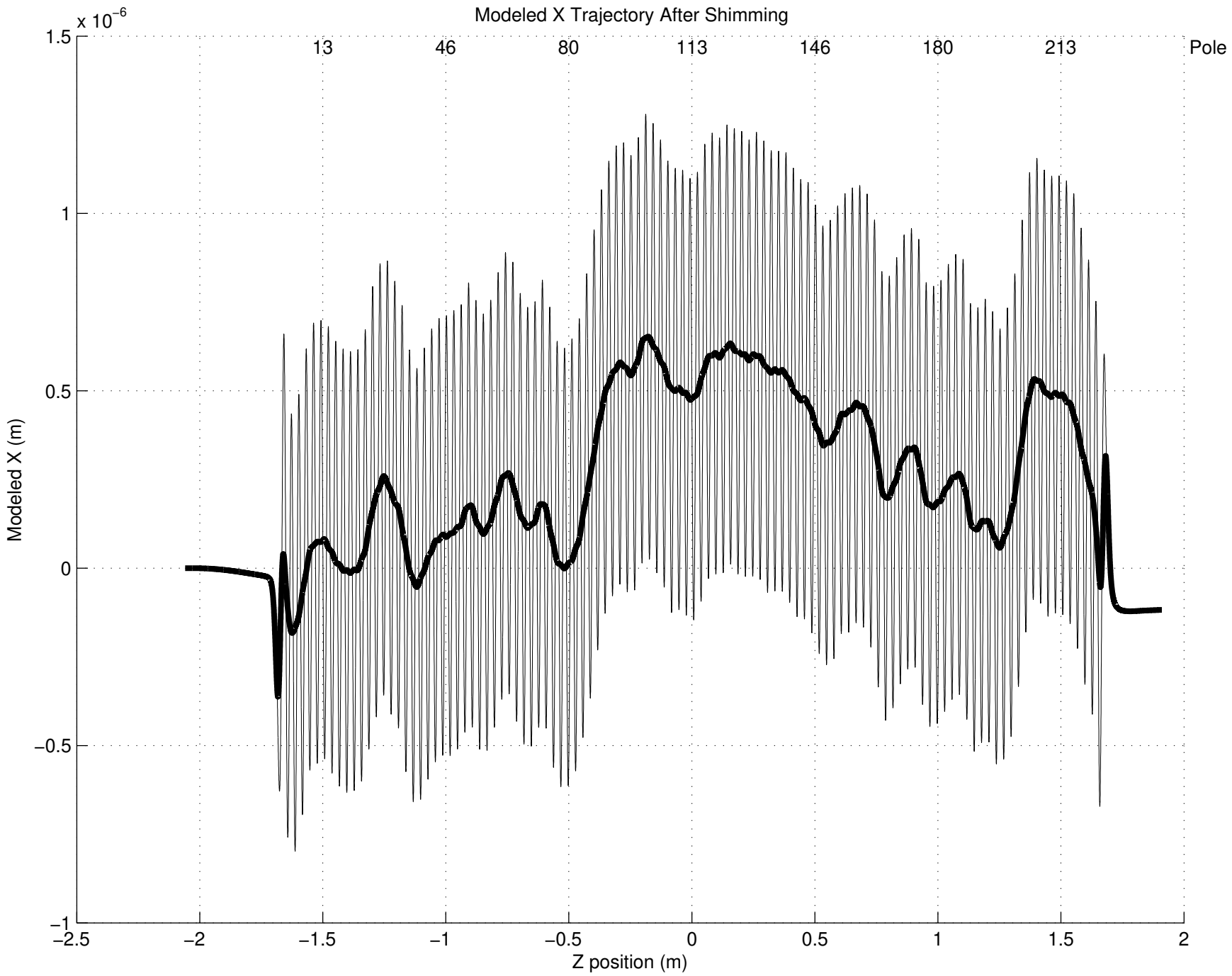

Y Filtered and Segmented Fit
x 10^-6
0
−0.5
−1
−1.5
−2
−2.5
−3
−3.5
−4
Y (m)
13
46
80
113
146
180
213
Pole
Filtered
Segments
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Y Slope Filtered and Segmented Fit
x 10^-6
2
1
0
−1
−2
−3
Y Slope
13
46
80
113
146
180
213
Pole
Filtered
Segments
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z Position (m)

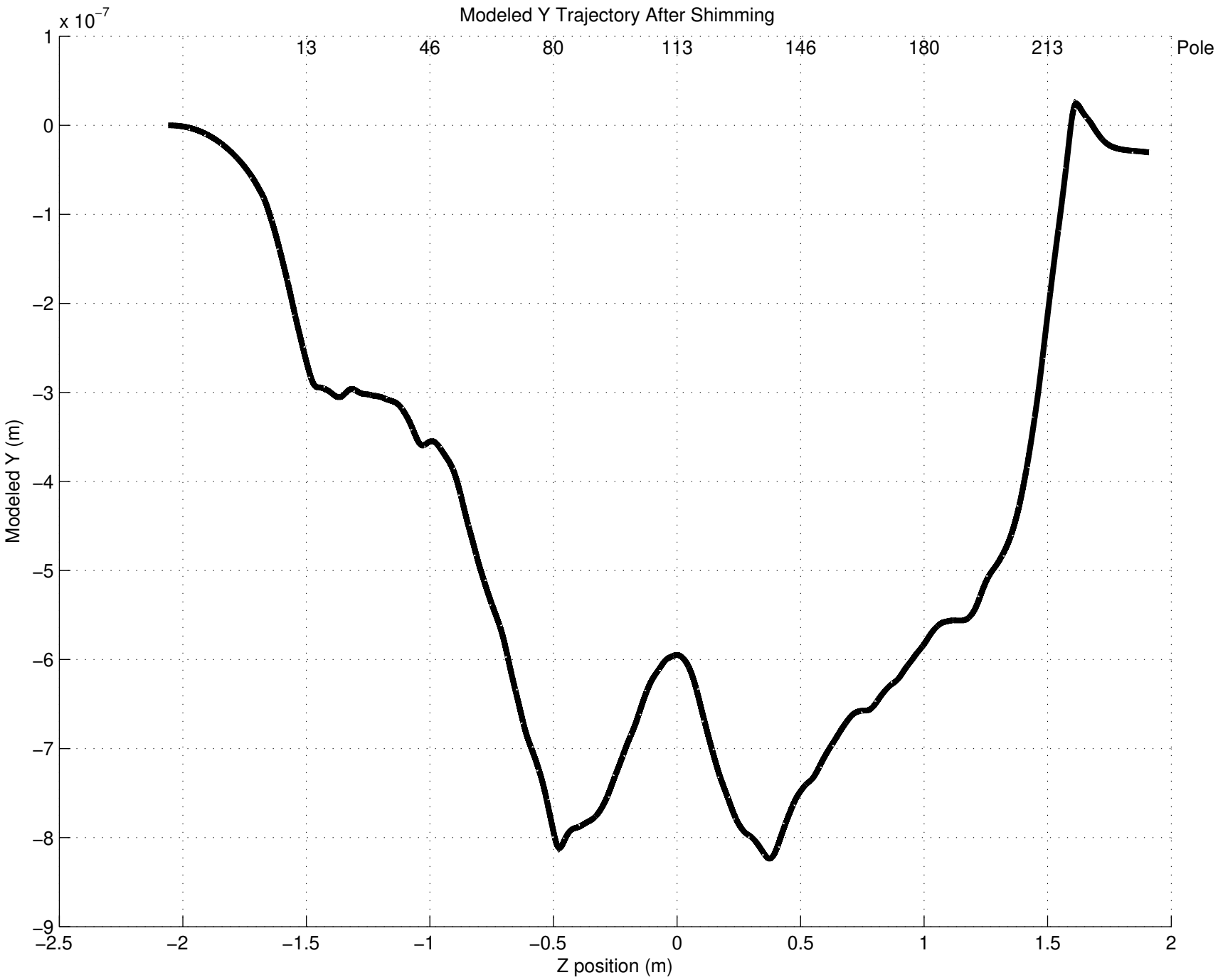

X Original And Shimmed Segmented Trajectories
x 10^-6
X (m)
13
46
80
113
146
180
213
Pole
Original
Shimmed
X Slope Change From Each Shim
X Slope Change
Z Position (m)

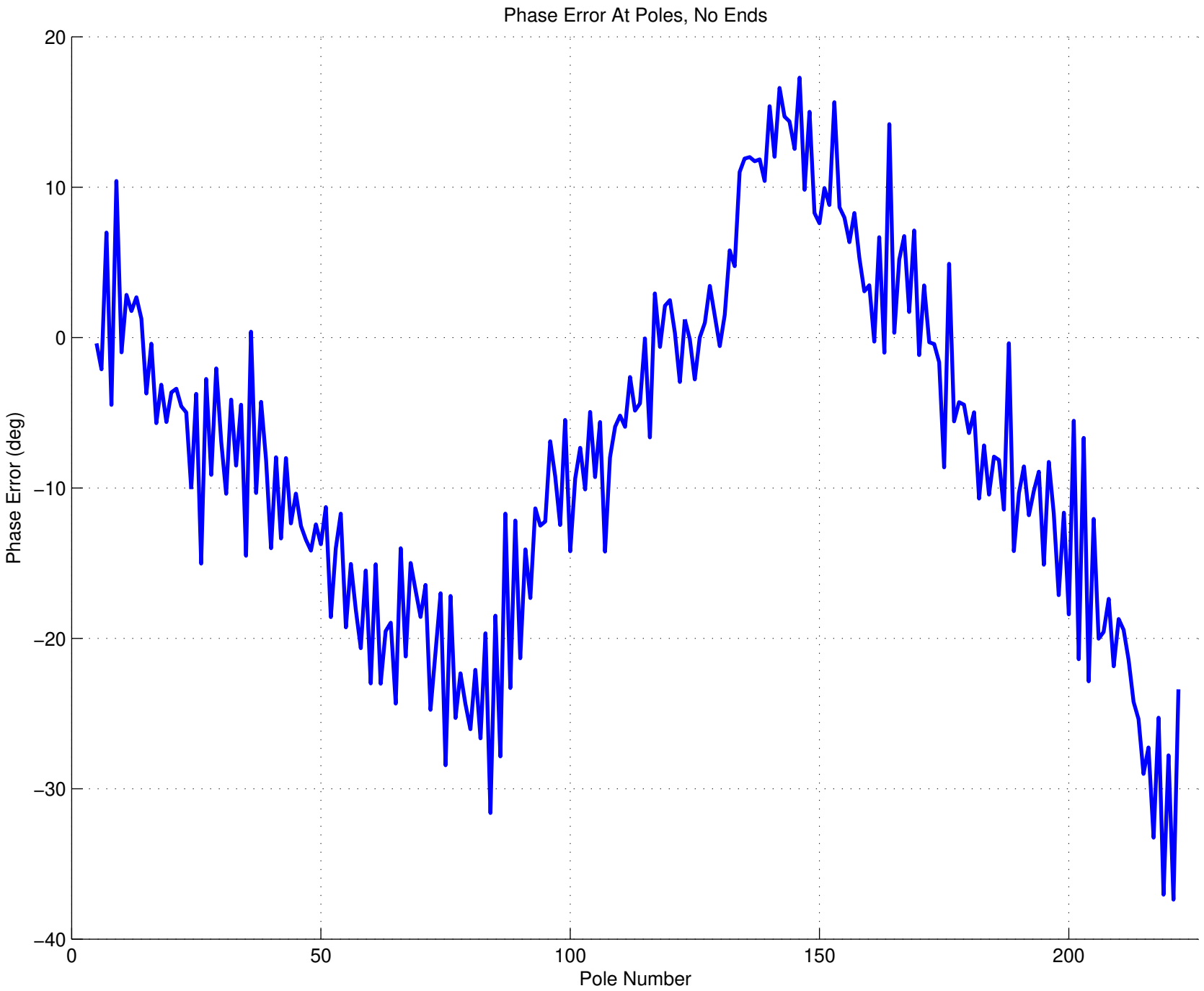

Y Original And Shimmed Segmented Trajectories
x 10^-6
13
46
80
113
146
180
213
Pole
Y (m)
Original
Shimmed
Y Slope Change From Each Shim
Y Slope Change
Z Position (m)

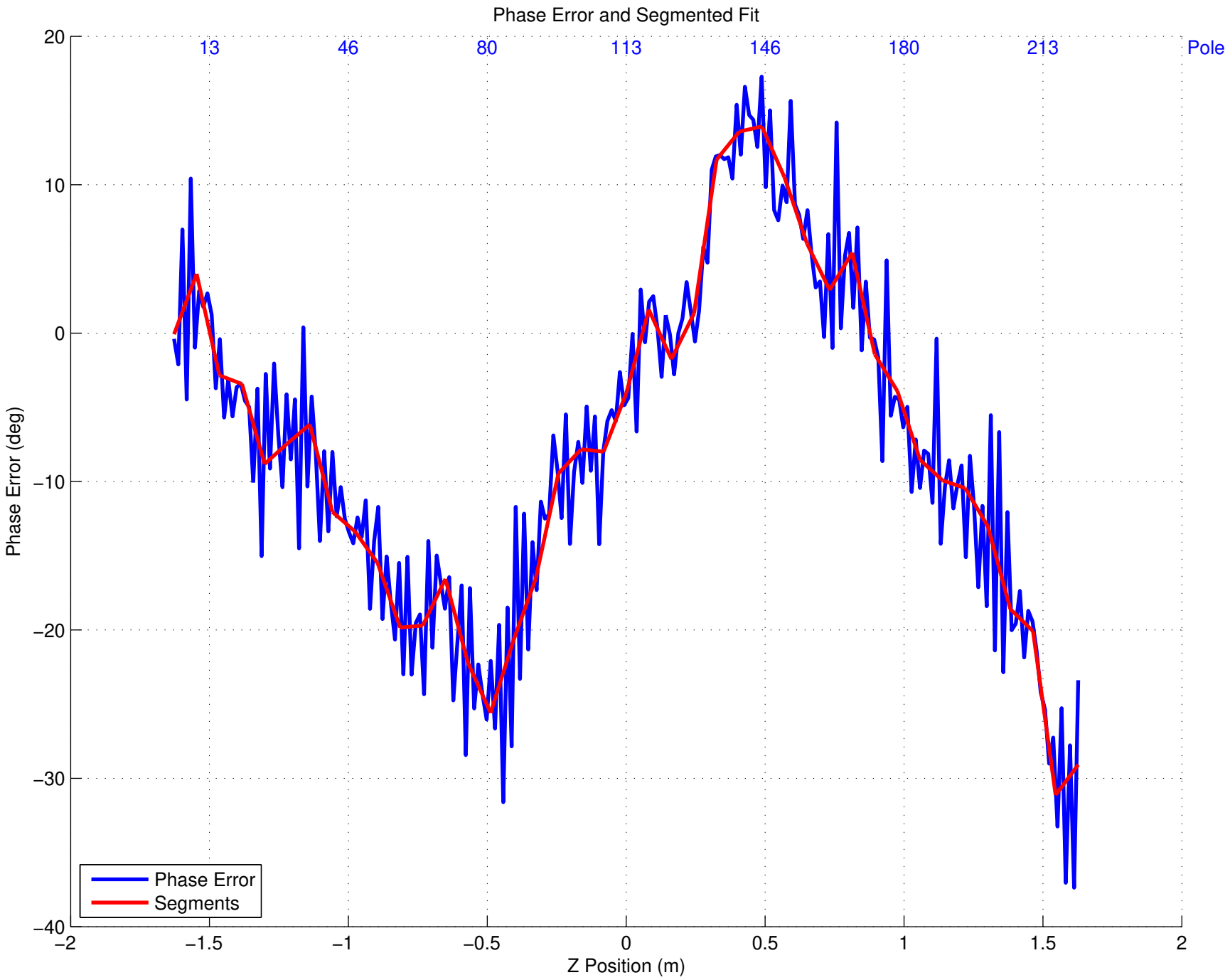

X Shimmed Segmented Trajectory
x 10^-7
X (m)
13
46
80
113
146
180
213
Pole
6
4
2
0
−2
−4
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
X Slope Change From Each Shim
x 10^-6
X Slope Change
2.5
2
1.5
1
0.5
0
Z Position (m)

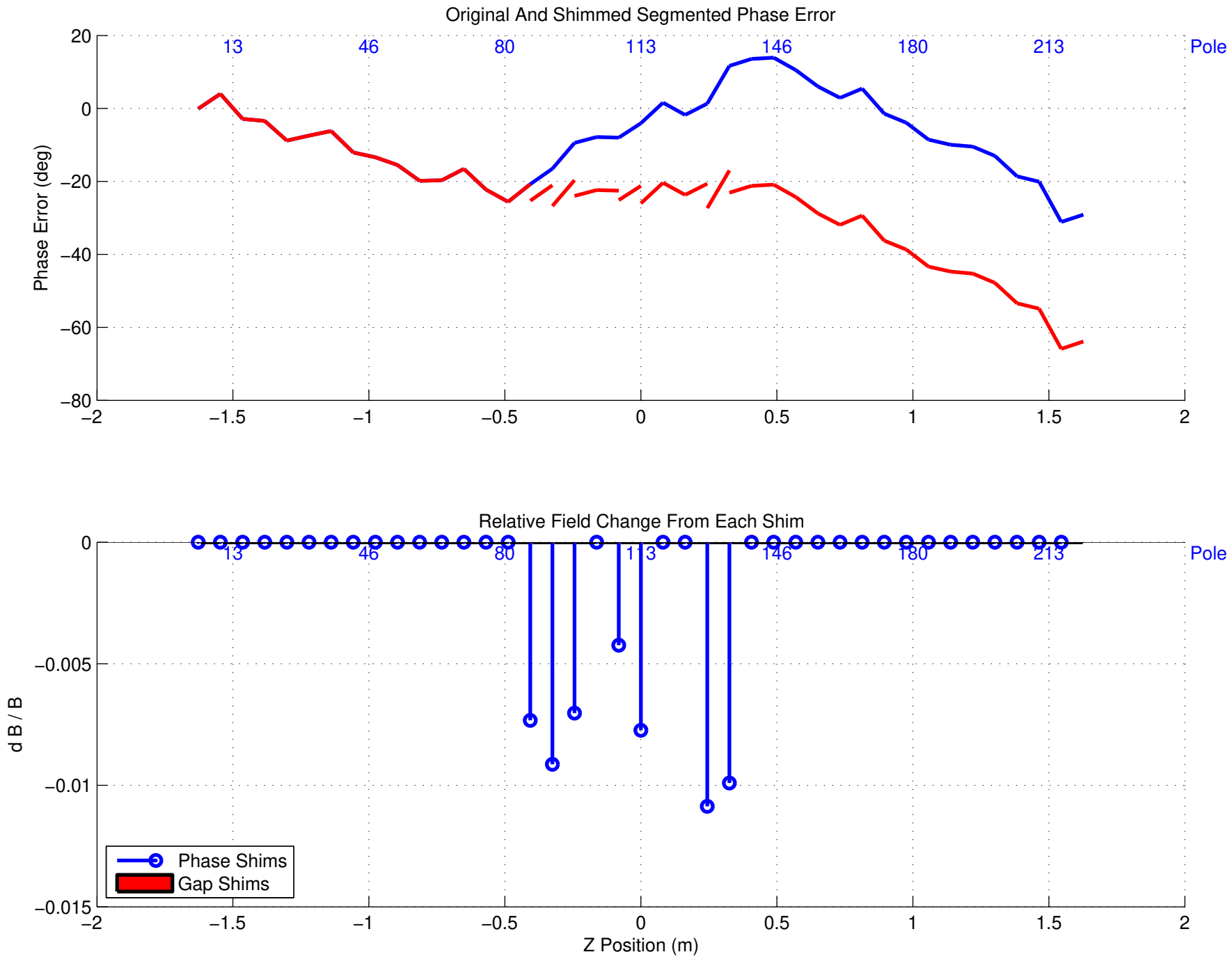

Y Shimmed Segmented Trajectory
x 10^-6
0
−0.2
−0.4
−0.6
−0.8
−1
Y (m)
13
46
80
113
146
180
213
Pole
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Y Slope Change From Each Shim
x 10^-6
2
1
0
−1
−2
−3
−4
Y Slope Change
Z Position (m)

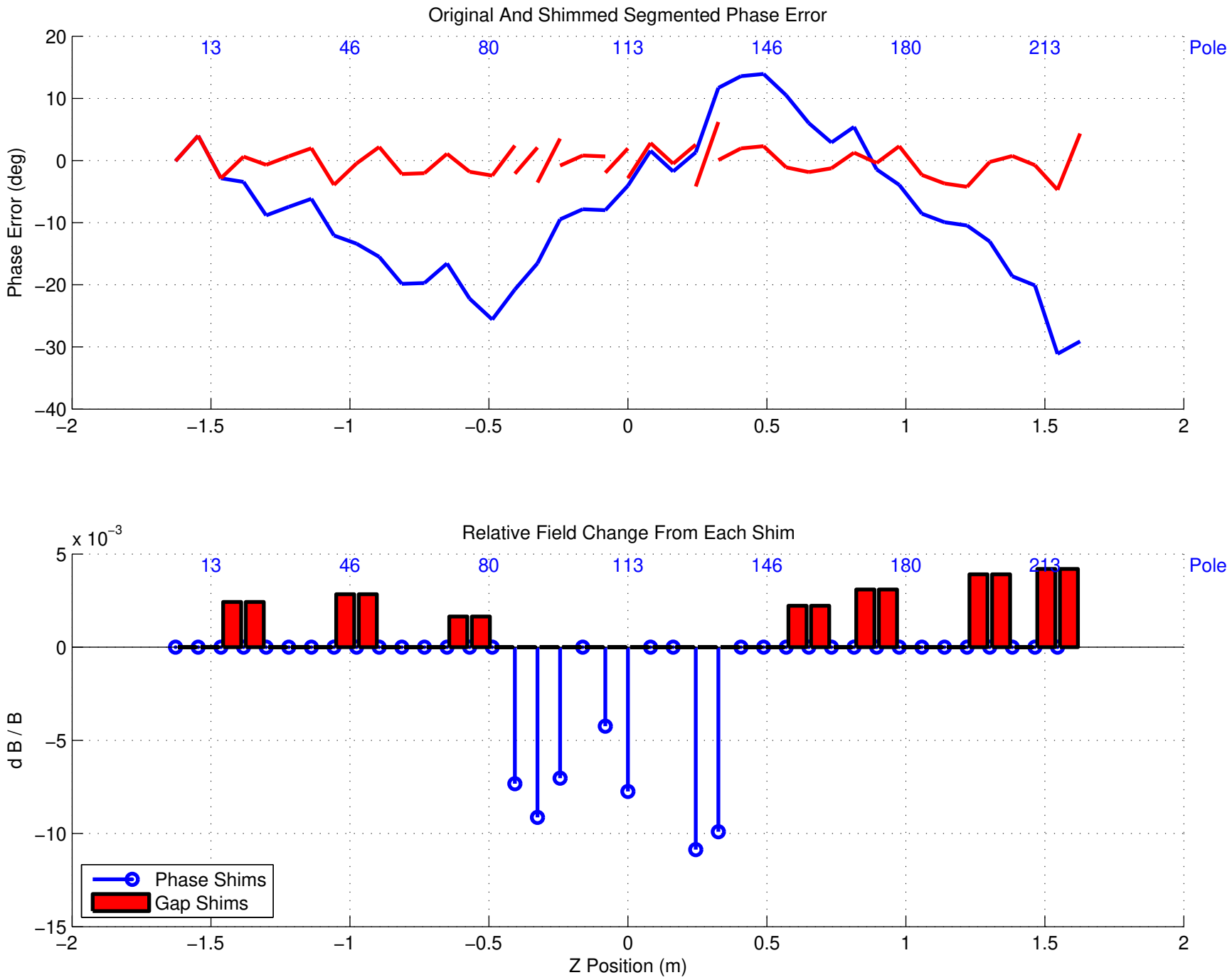

Modeled X Trajectory After Shimming
x 10^-6
1.5
1
0.5
0
−0.5
−1
13
46
80
113
146
180
213
Pole
Modeled X (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z position (m)

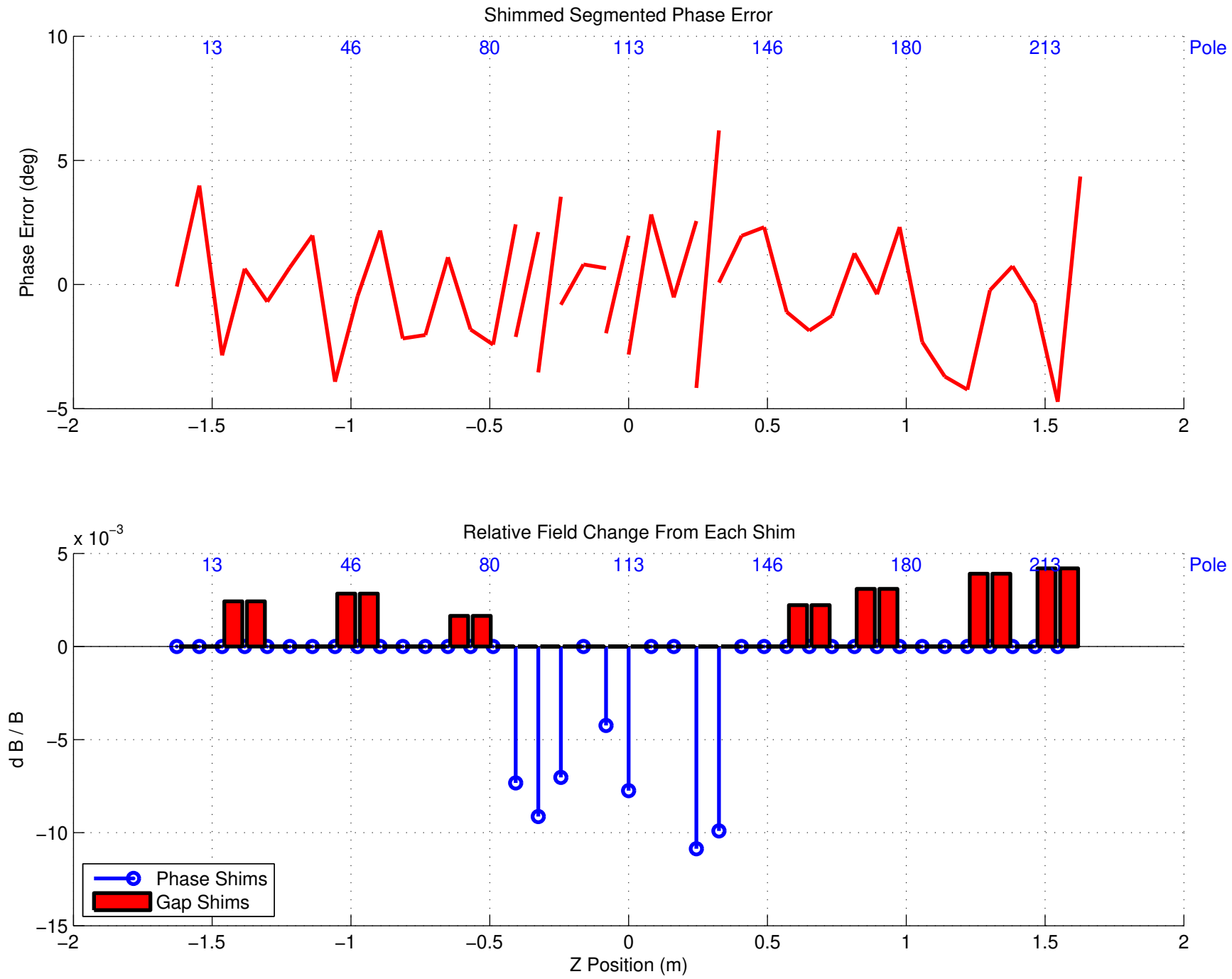

Modeled Y Trajectory After Shimming
x 10^-7
13
46
80
113
146
180
213
Pole
1
0
−1
−2
−3
−4
−5
−6
−7
−8
−9
Modeled Y (m)
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
Z position (m)

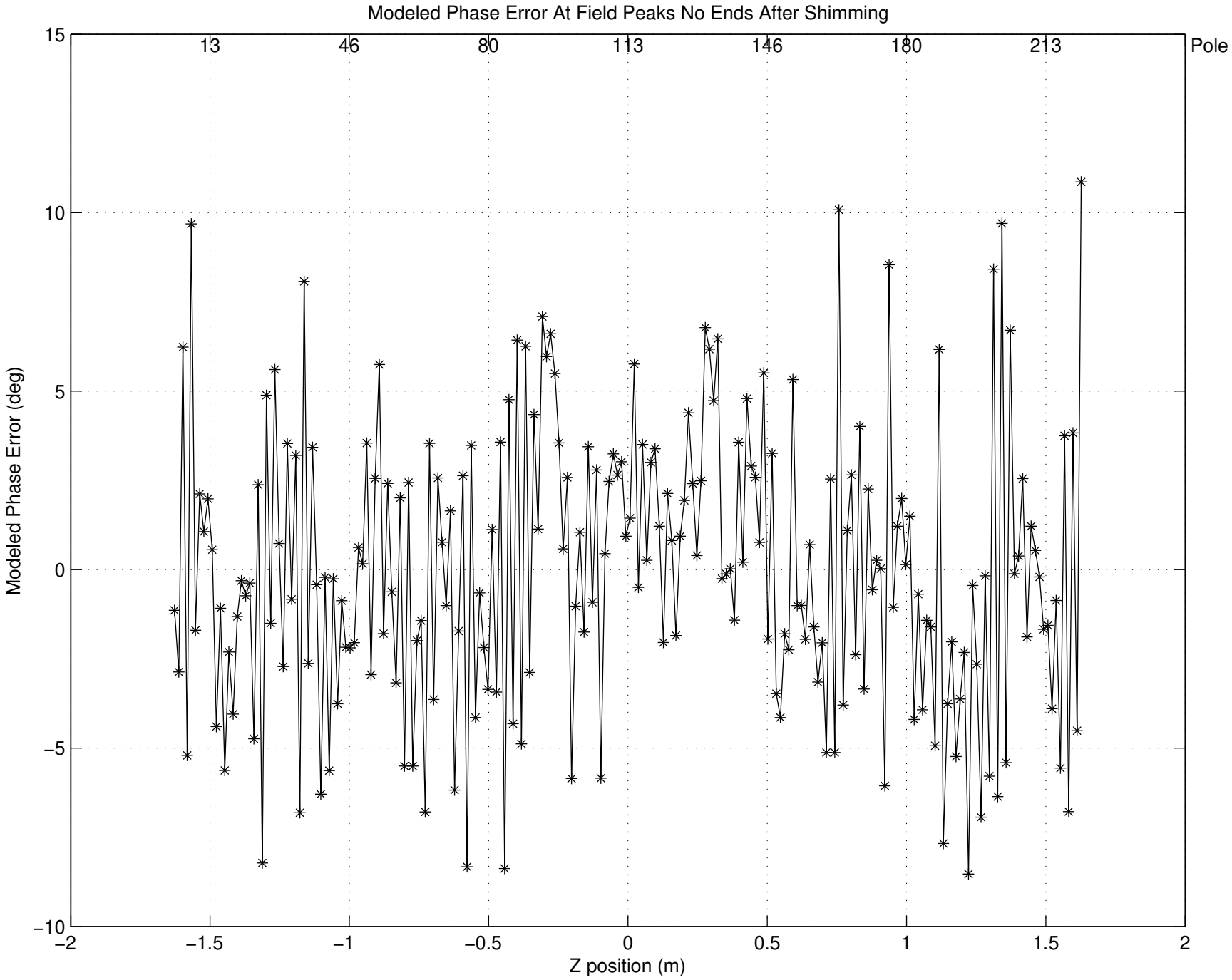

Phase Error At Poles, No Ends
Phase Error (deg)
Pole Number
20
10
0
−10
−20
−30
−40
0
50
100
150
200


Phase Error and Segmented Fit
13
46
80
113
146
180
213
Pole
20
10
0
−10
−20
−30
−40
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)
20
0
−20
−40
−60
−80
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
−0.005
−0.01
−0.015
Phase Shims
Gap Shims
Z Position (m)


Original And Shimmed Segmented Phase Error
Phase Error (deg)
13
46
80
113
146
180
213
Pole
20
10
0
−10
−20
−30
−40
−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
−15
Phase Shims
Gap Shims
Z Position (m)


Shimmed Segmented Phase Error
Phase Error (deg)
10
5
0
−5
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
−15
Phase Shims
Gap Shims
Z Position (m)



Phase Error: Ave = 0.000000 deg, RMS = 3.952455 deg