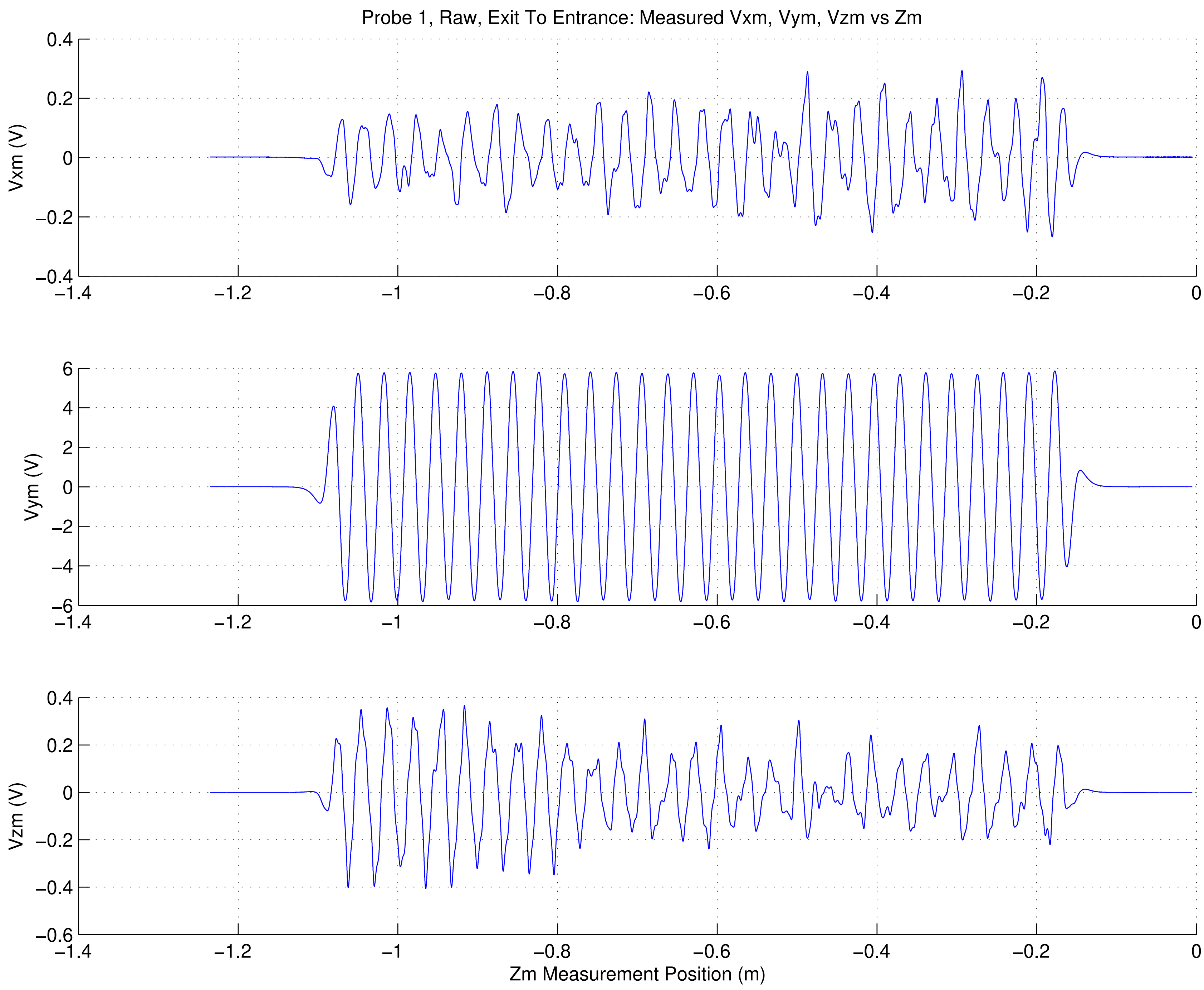
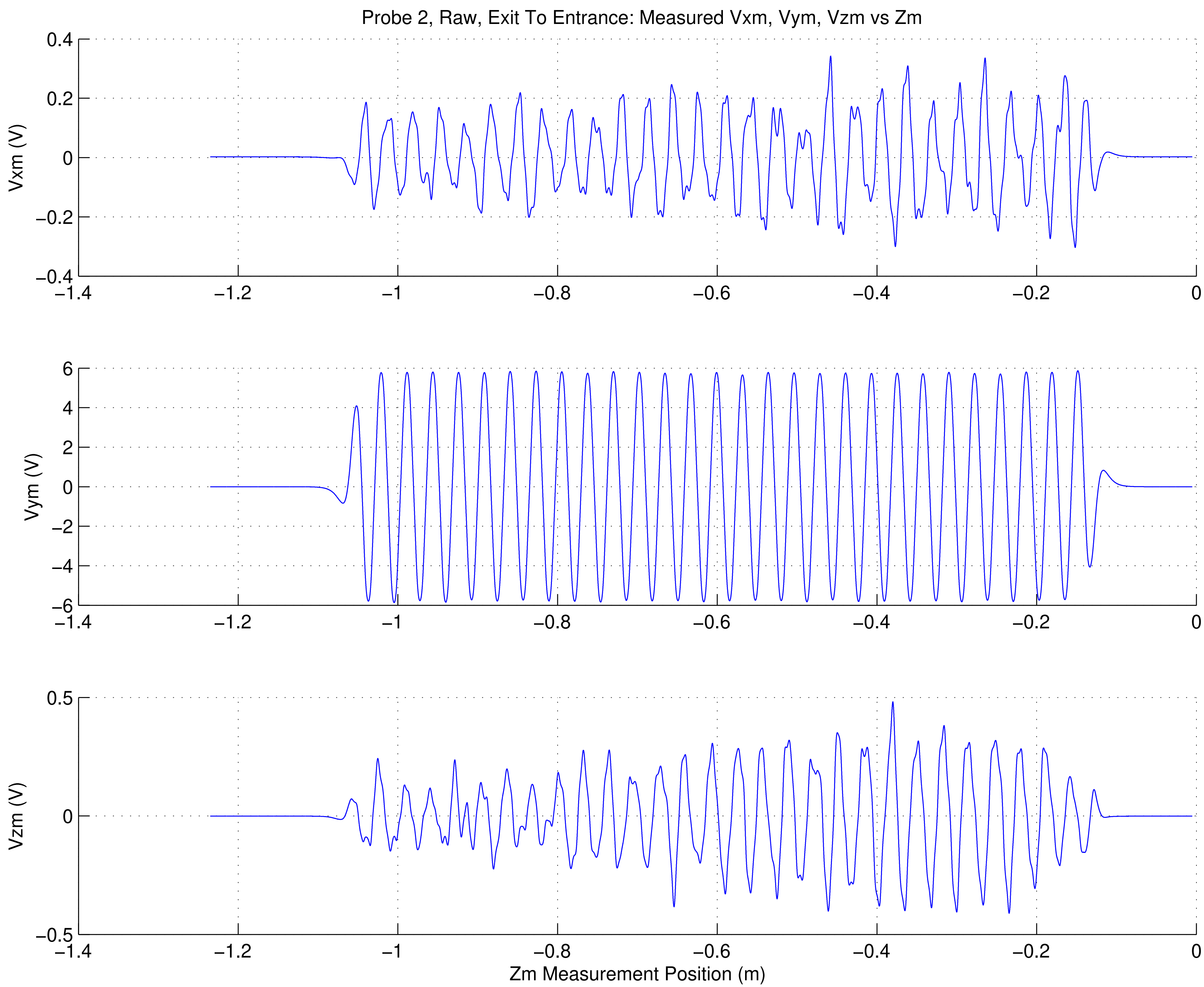
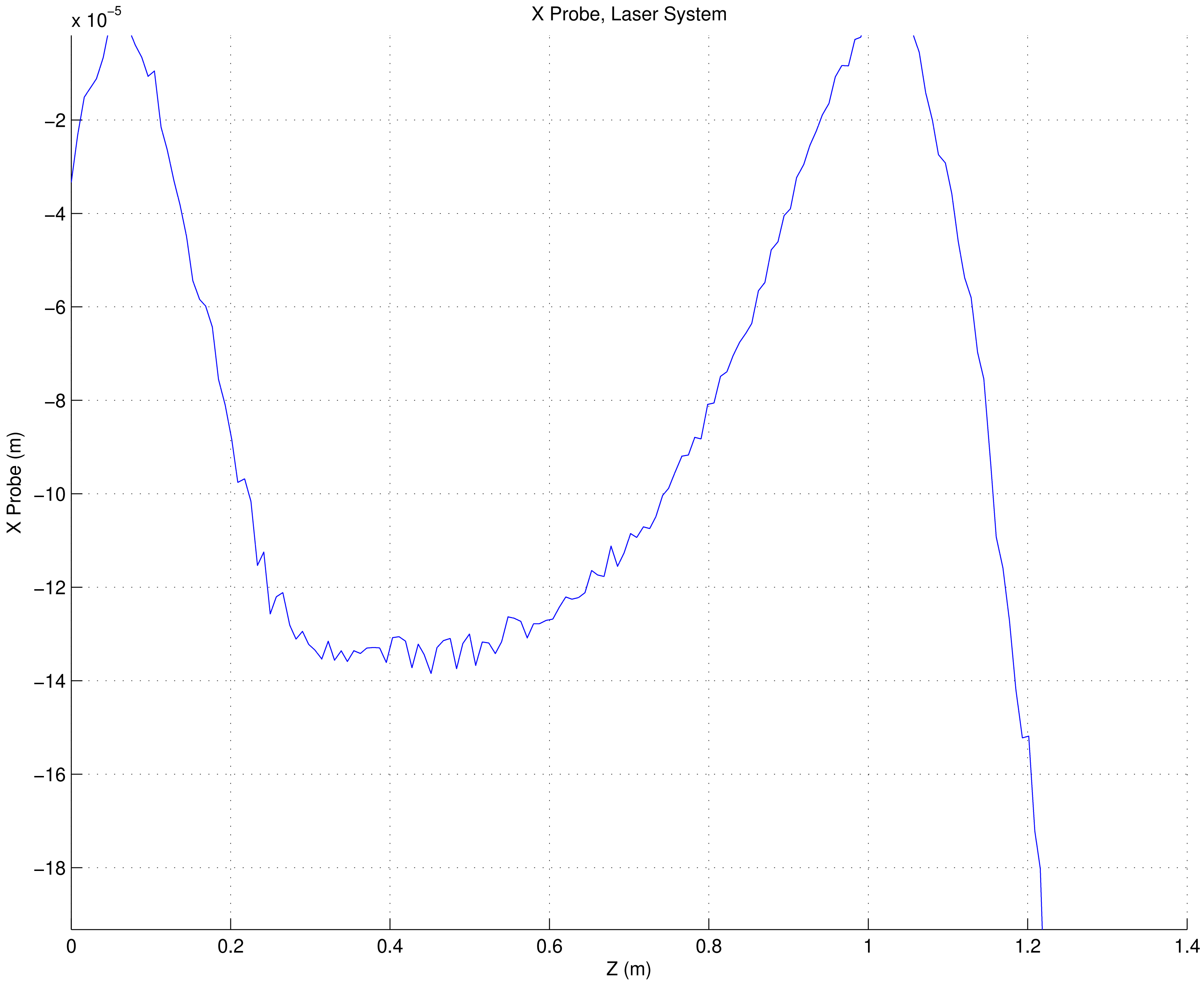
SLAC Magnetic Measurements

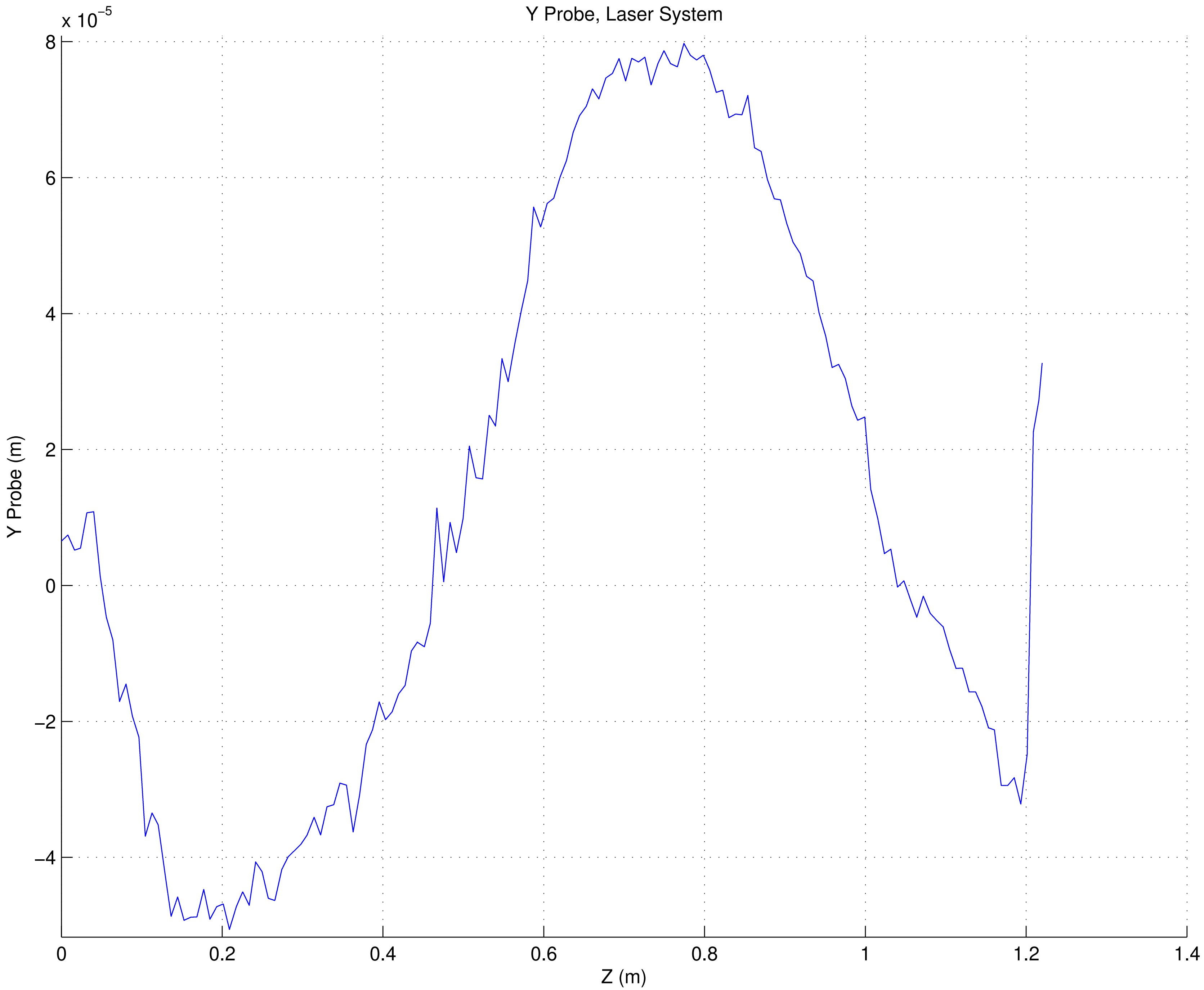
Hall Probe Array Analysis
****

Parameters:
INPUT−FILE−DIR =s:\MagData\LCLS\Undulator\DELTA\Data\Run 494\
INPUT−FILE−NAME =DUTestStep+0.dat
INPUT−FILE−TYPE =ZVXYZVXYZH
UND−POL−MODE =LIN−POL−VERT−FIELD
PROBE1−BX−CALIB−FILE =v:\MET\MagServe\MagData\LCLS\Hall probe\SENIS−119−12\SENIS−119−12−X.ini
PROBE1−BY−CALIB−FILE =v:\MET\MagServe\MagData\LCLS\Hall probe\SENIS−119−12\SENIS−119−12−Y.ini
PROBE2−BX−CALIB−FILE =v:\MET\MagServe\MagData\LCLS\Hall probe\SENIS−120−12\SENIS−120−12−X.ini
PROBE2−BY−CALIB−FILE =v:\MET\MagServe\MagData\LCLS\Hall probe\SENIS−120−12\SENIS−120−12−Y.ini
NUM−ZERO−GAUSS−MEAS =200
PROBE2−OFFSET−DIR =Y

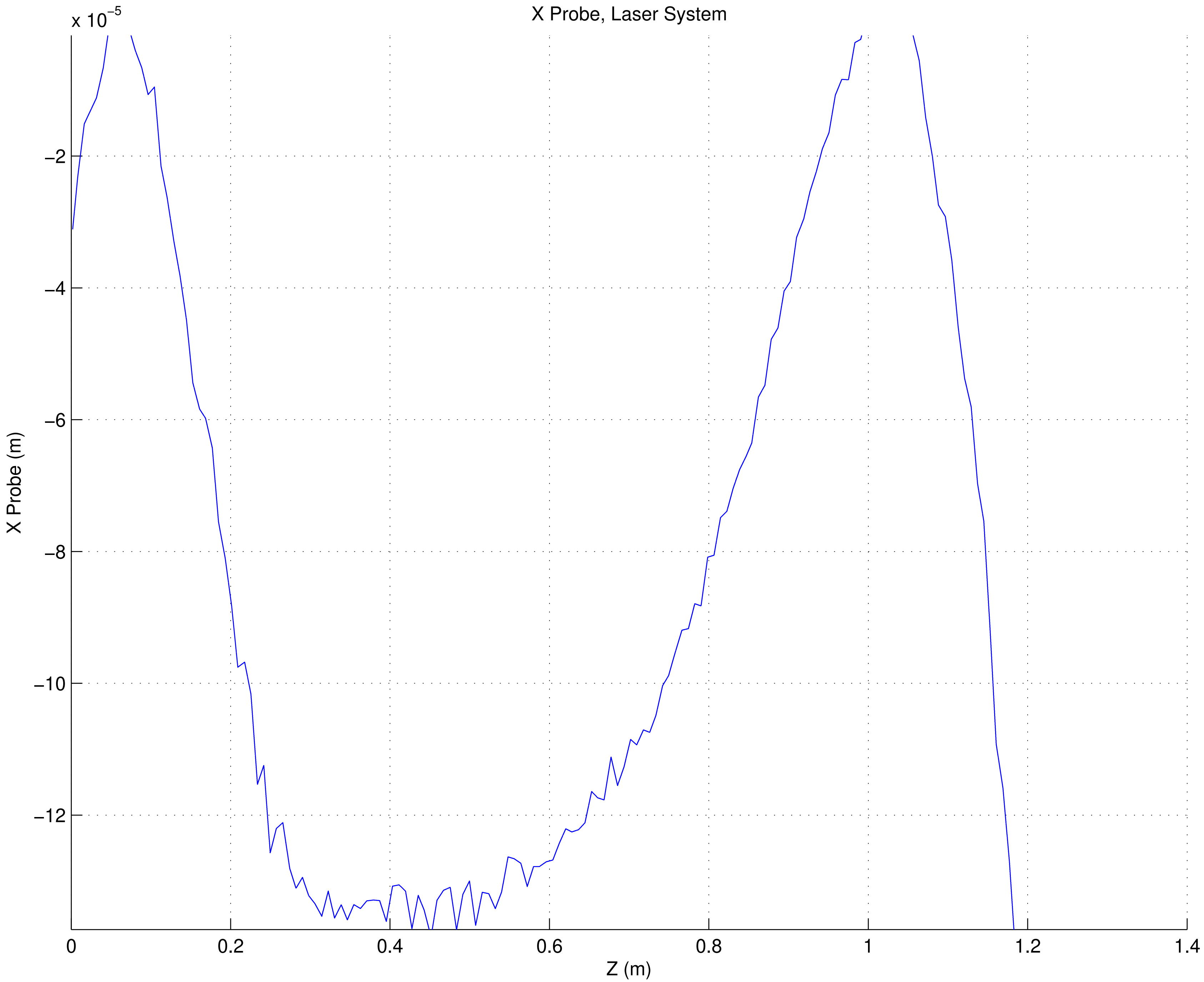

Probe 1, Raw, Exit To Entrance: Measured Vxm, Vym, Vzm vs Zm
Vxm (V)
Vym (V)
Vzm (V)
Zm Measurement Position (m)


Probe 2, Raw, Exit To Entrance: Measured Vxm, Vym, Vzm vs Zm
Vxm (V)
0.4
0.2
0
−0.2
−0.4
−1.4
−1.2
−1
−0.8
−0.6
−0.4
−0.2
0
Vym (V)
6
4
2
0
−2
−4
−6
−1.4
−1.2
−1
−0.8
−0.6
−0.4
−0.2
0
Vzm (V)
0.5
0
−0.5
−1.4
−1.2
−1
−0.8
−0.6
−0.4
−0.2
0
Zm Measurement Position (m)

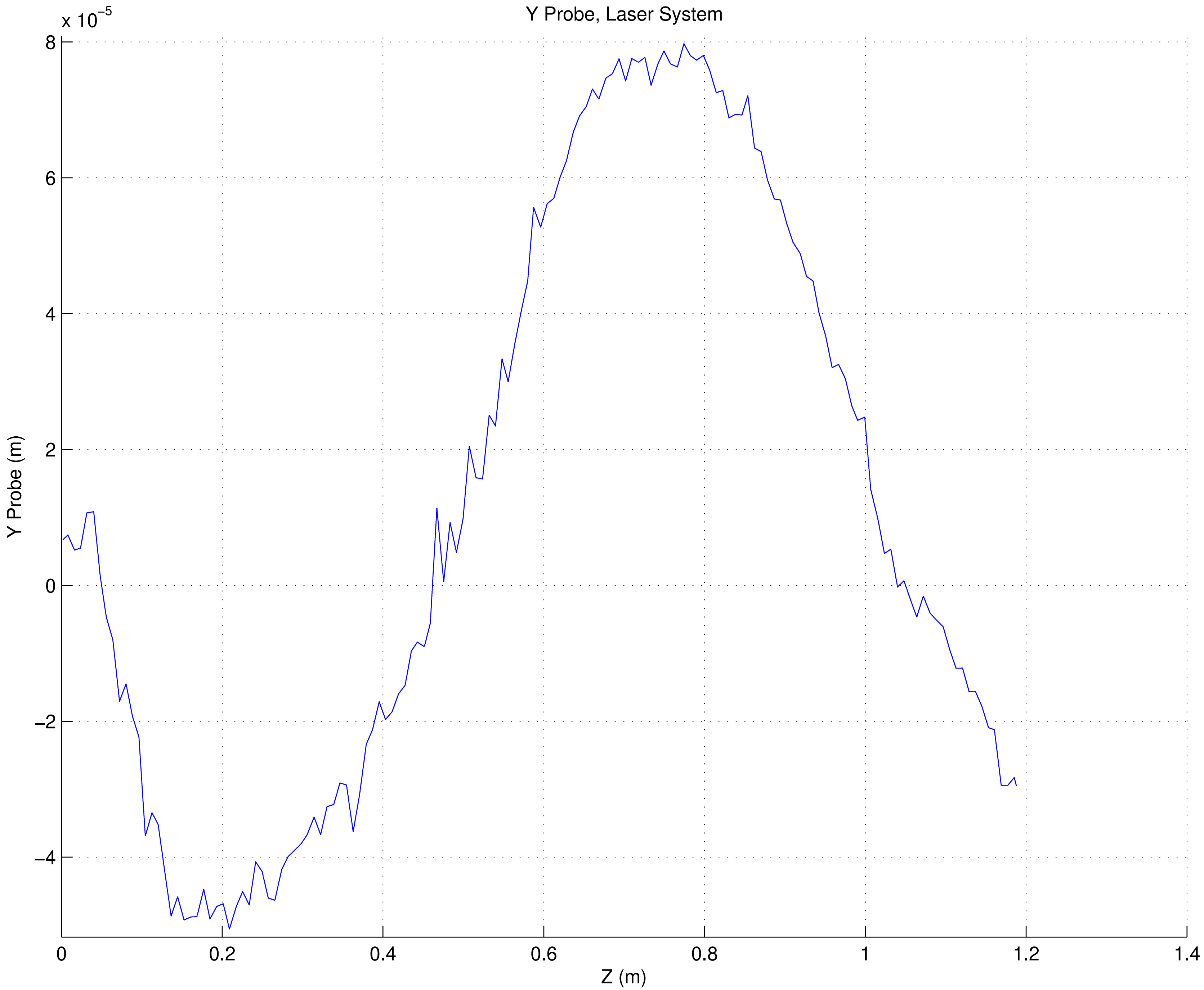

X Probe, Laser System
x 10^−5
X Probe (m)
Z (m)
−2
−4
−6
−8
−10
−12
−14
−16
−18
0
0.2
0.4
0.6
0.8
1
1.2
1.4



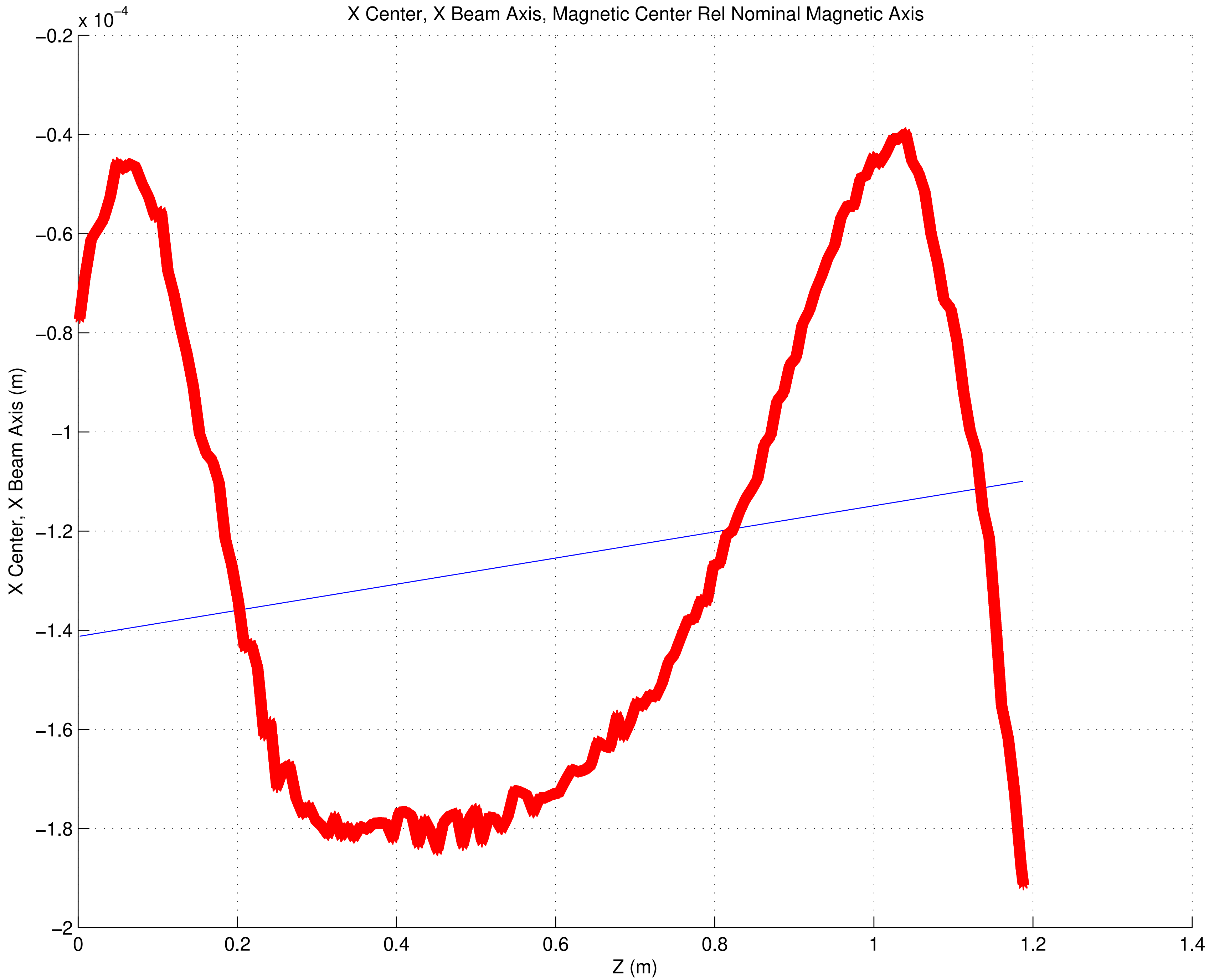
Y Probe, Laser System
x 10^-5
8
6
4
2
0
−2
−4
Y Probe (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)

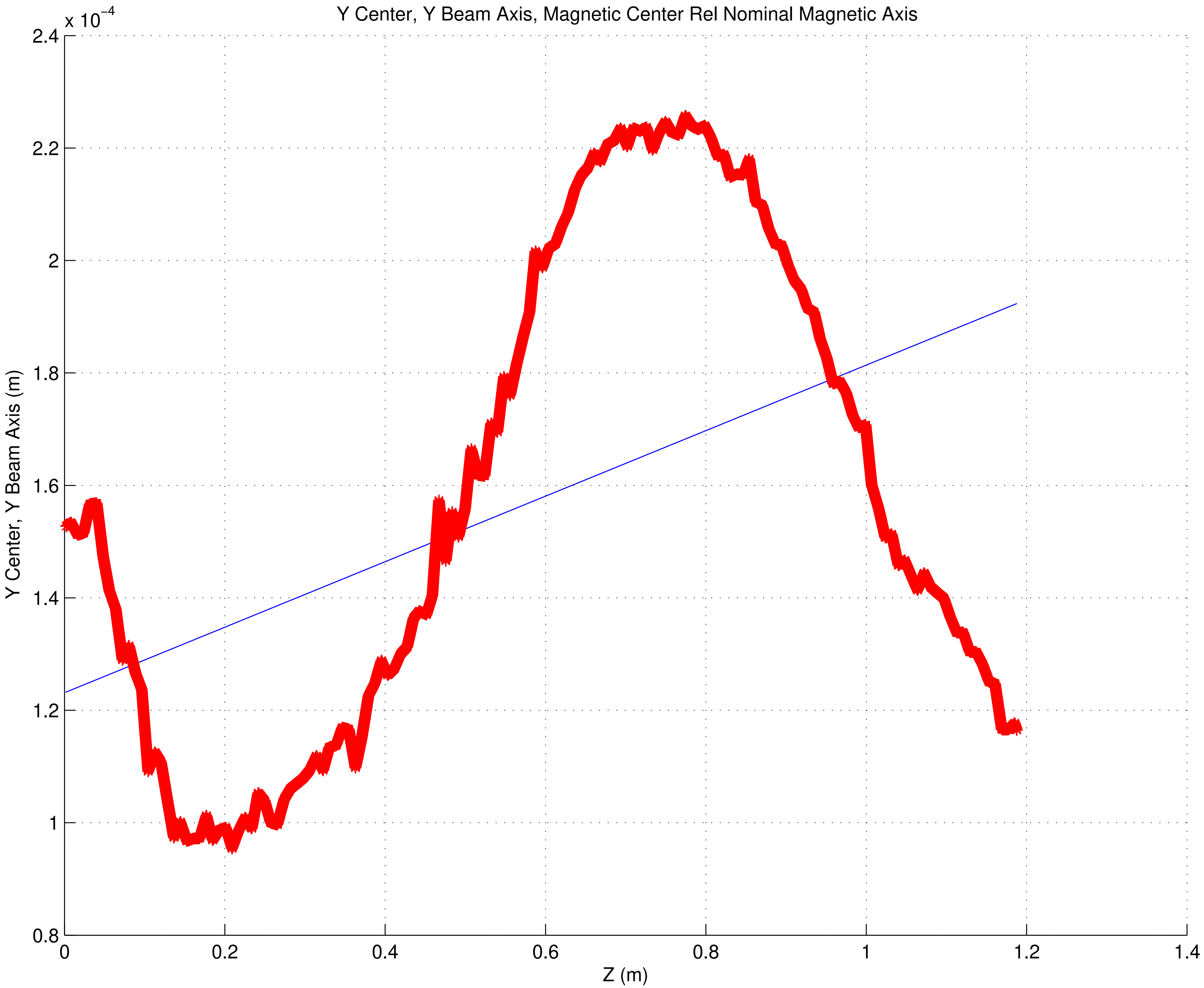


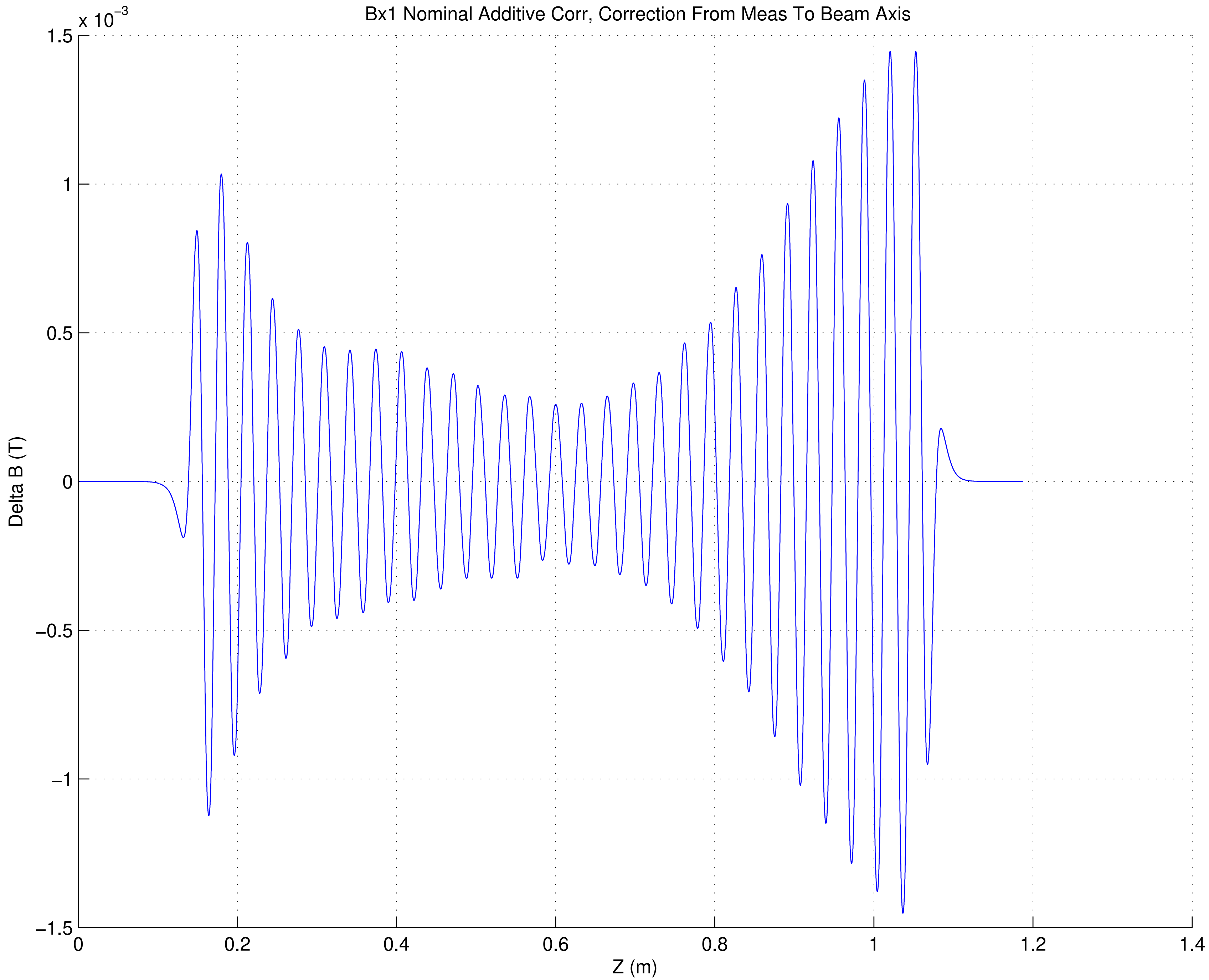
X Probe, Laser System
x 10^-5
X Probe (m)
−2
−4
−6
−8
−10
−12
Z (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4



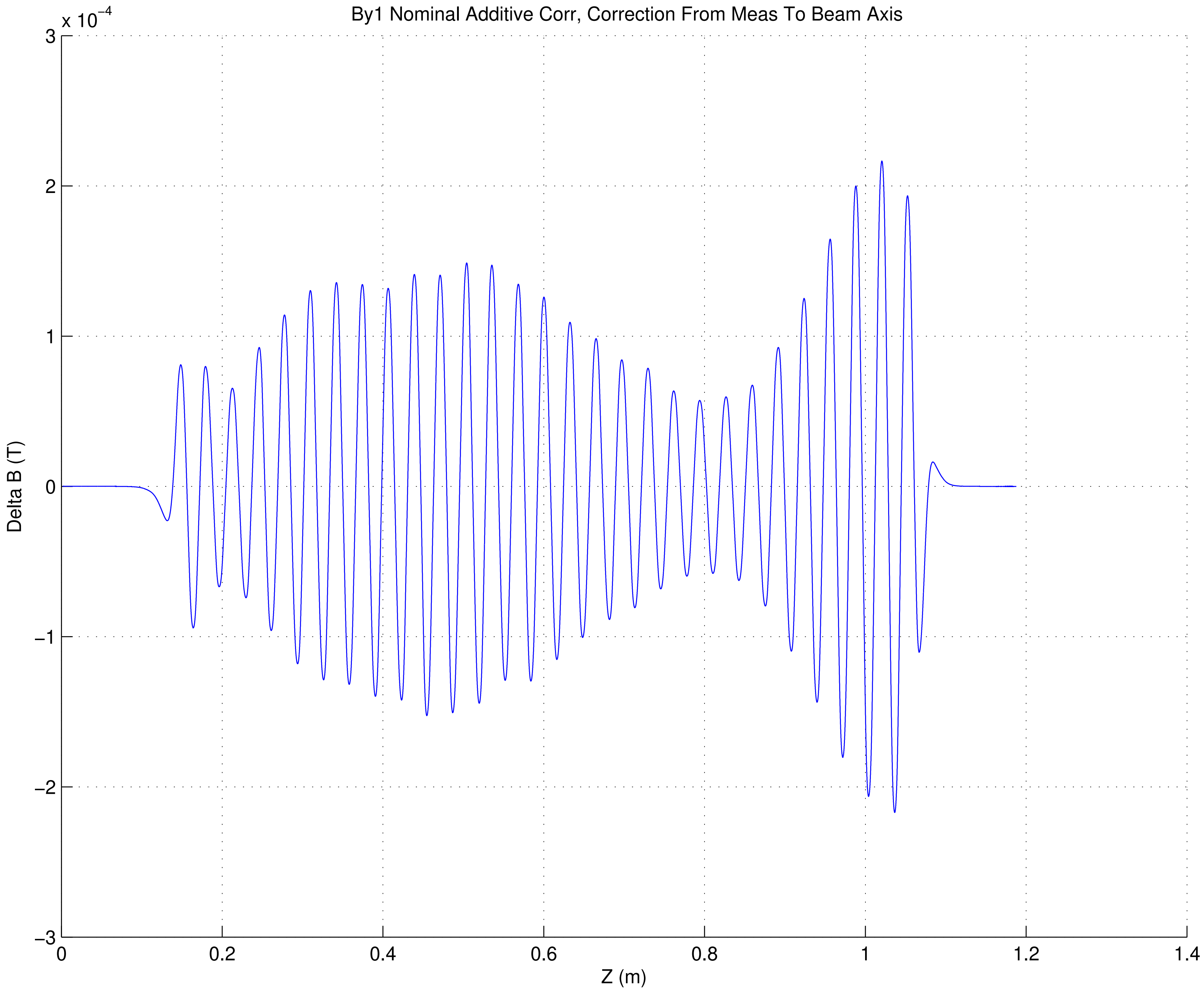
Y Probe, Laser System
x 10^−5
8
6
4
2
0
−2
−4
Y Probe (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)

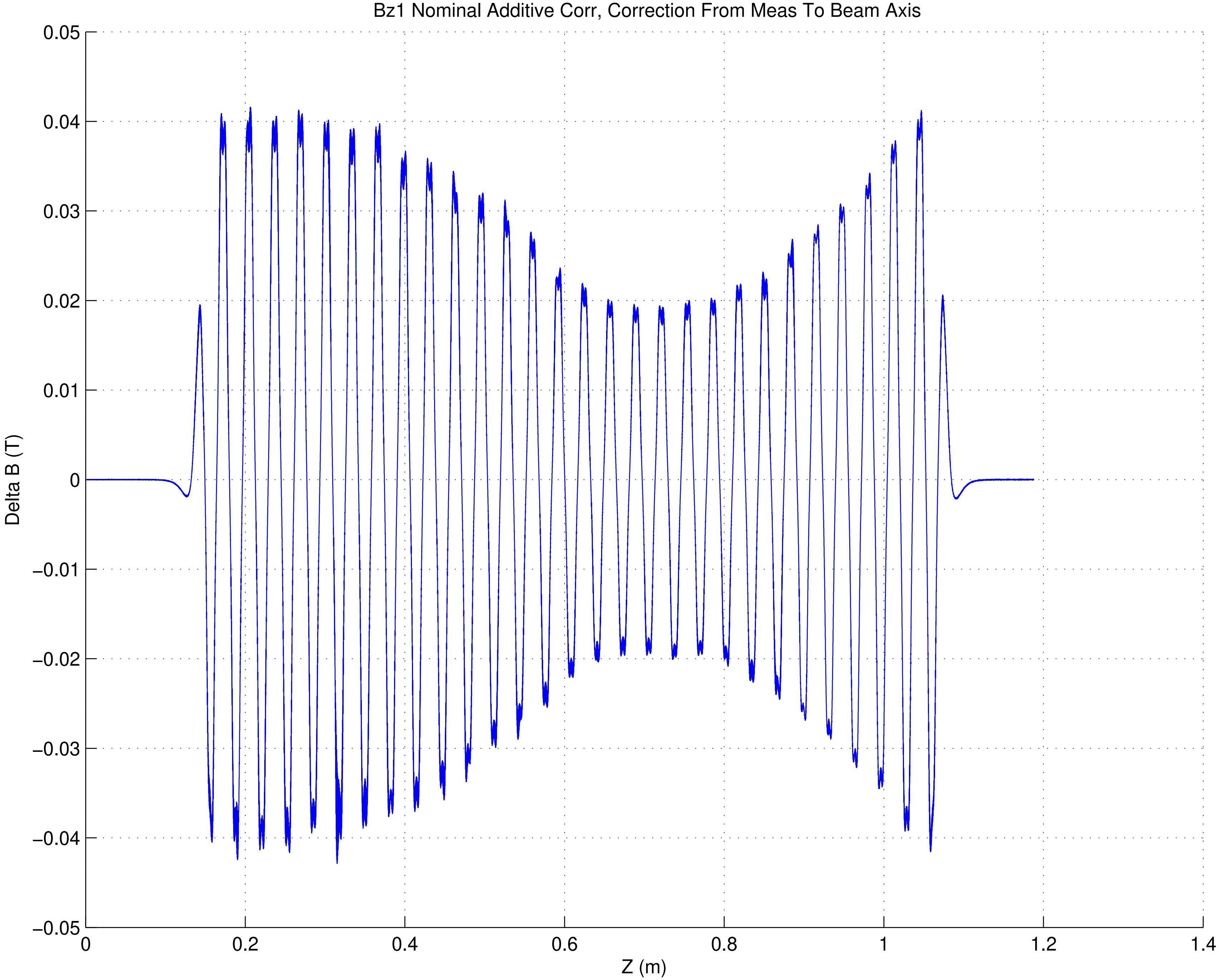

X Center, X Beam Axis, Magnetic Center Rel Nominal Magnetic Axis
x 10^−4
−0.2
−0.4
−0.6
−0.8
−1
−1.2
−1.4
−1.6
−1.8
−2
X Center, X Beam Axis (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)


Y Center, Y Beam Axis, Magnetic Center Rel Nominal Magnetic Axis
x 10^-4
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
Y Center, Y Beam Axis (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)

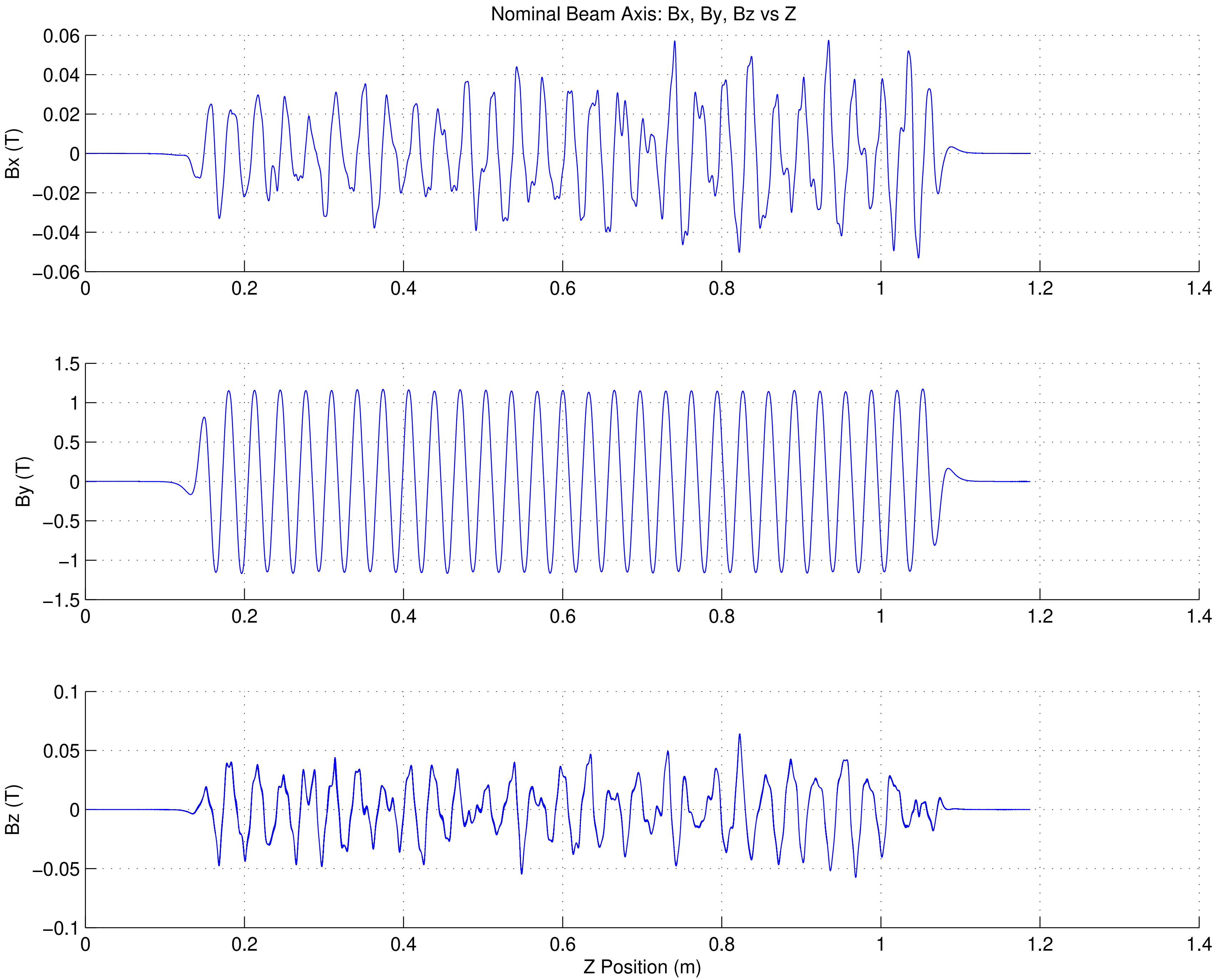


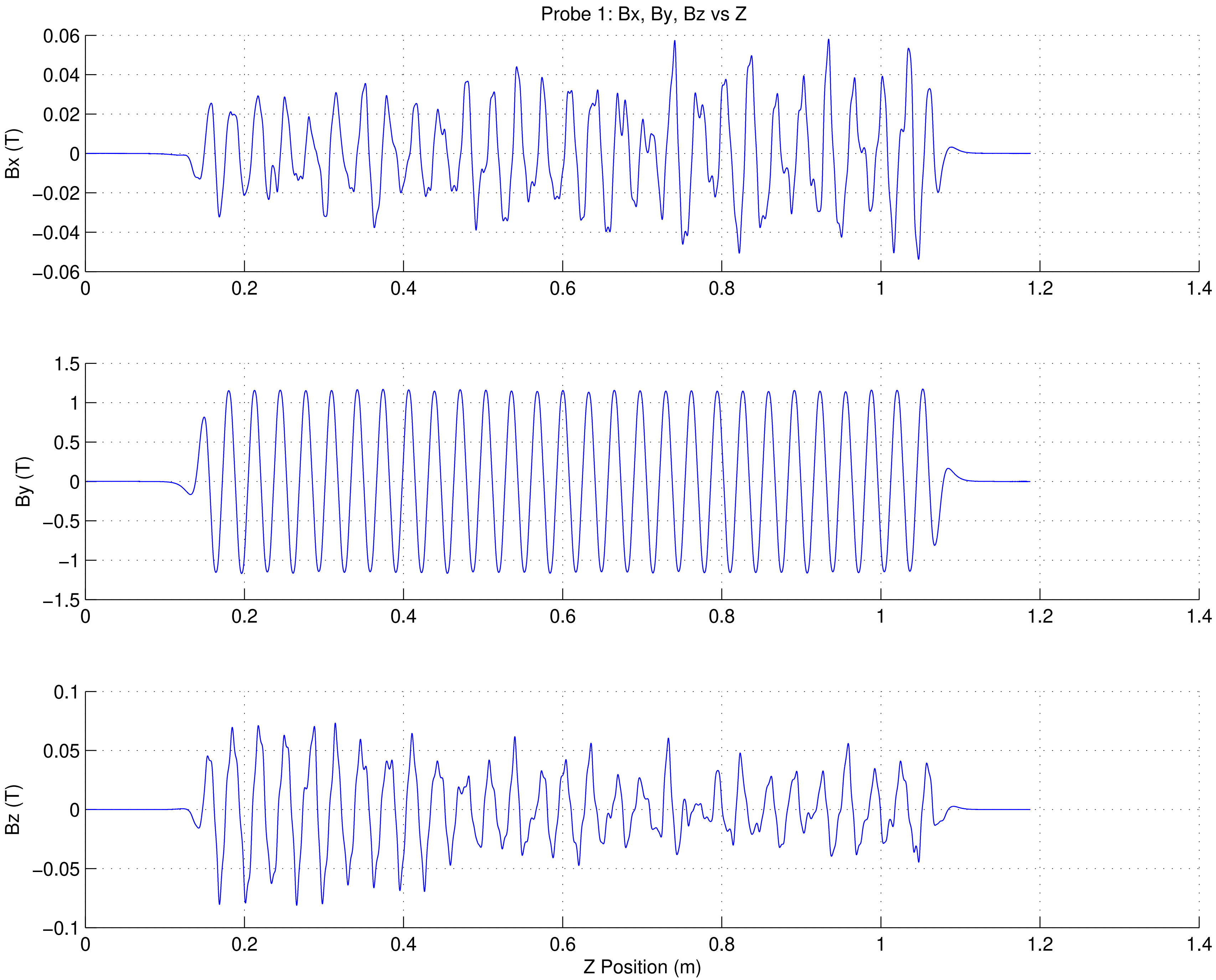
Bx1 Nominal Additive Corr, Correction From Meas To Beam Axis
x 10^-3
1.5
1
0.5
0
−0.5
−1
−1.5
Delta B (T)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)


By1 Nominal Additive Corr, Correction From Meas To Beam Axis
x 10^-4
3
2
1
0
−1
−2
−3
Delta B (T)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)

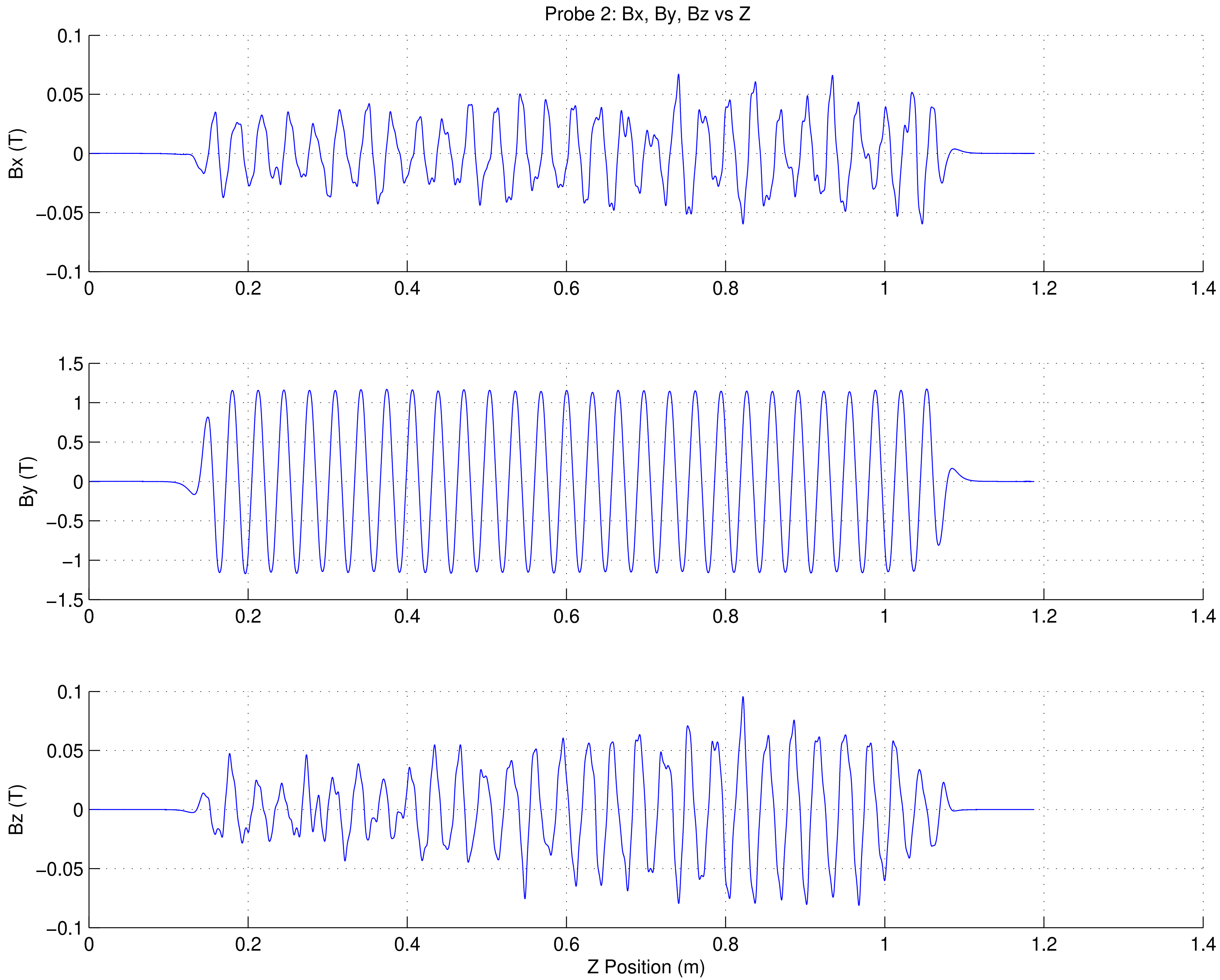


Bz1 Nominal Additive Corr, Correction From Meas To Beam Axis
Delta B (T)
Z (m)
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
−0.03
−0.04
−0.05
0
0.2
0.4
0.6
0.8
1
1.2
1.4

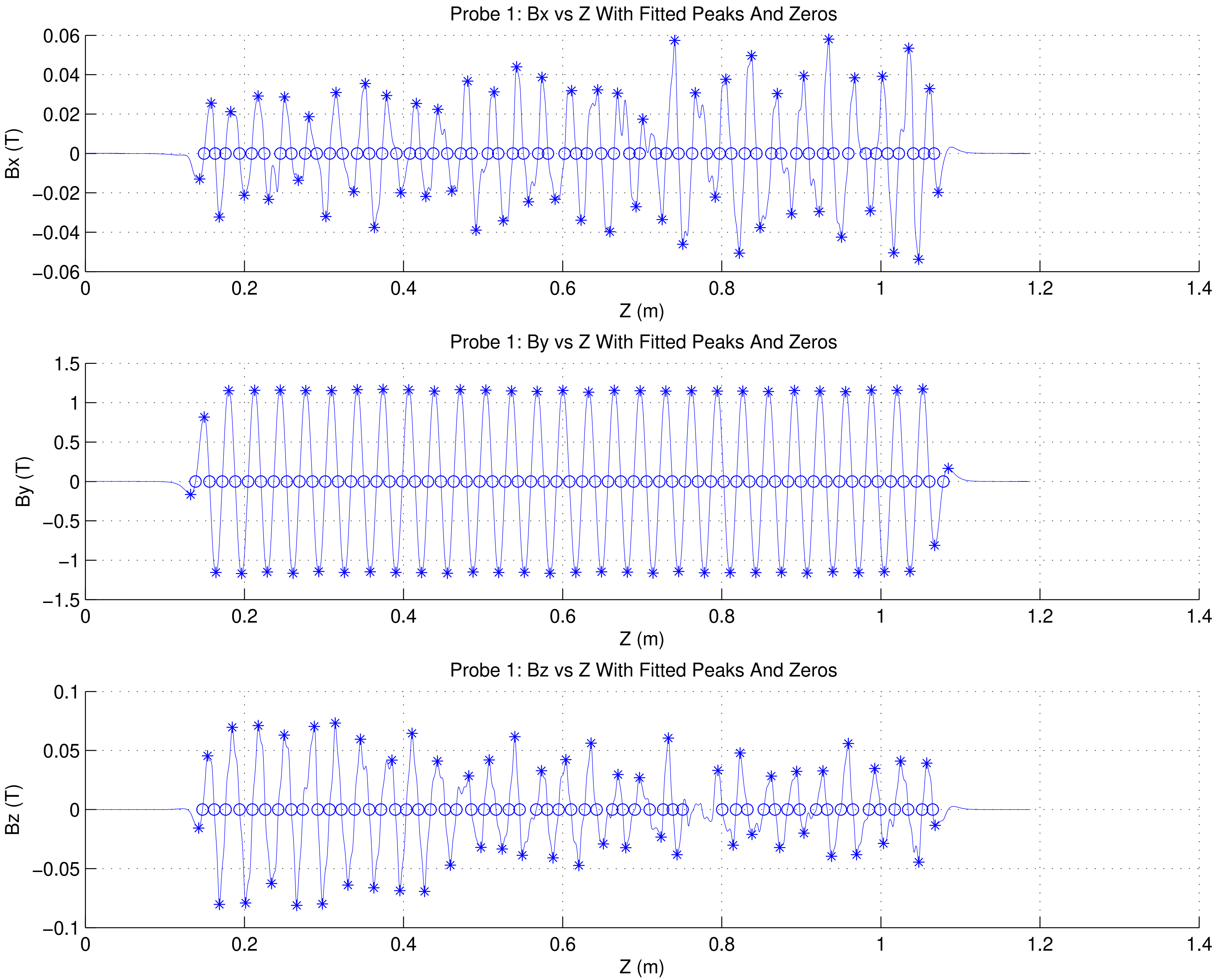

Nominal Beam Axis: Bx, By, Bz vs Z
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
Bx (T)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.5
1
0.5
0
−0.5
−1
−1.5
By (T)
0.1
0.05
0
−0.05
−0.1
Bz (T)
Z Position (m)

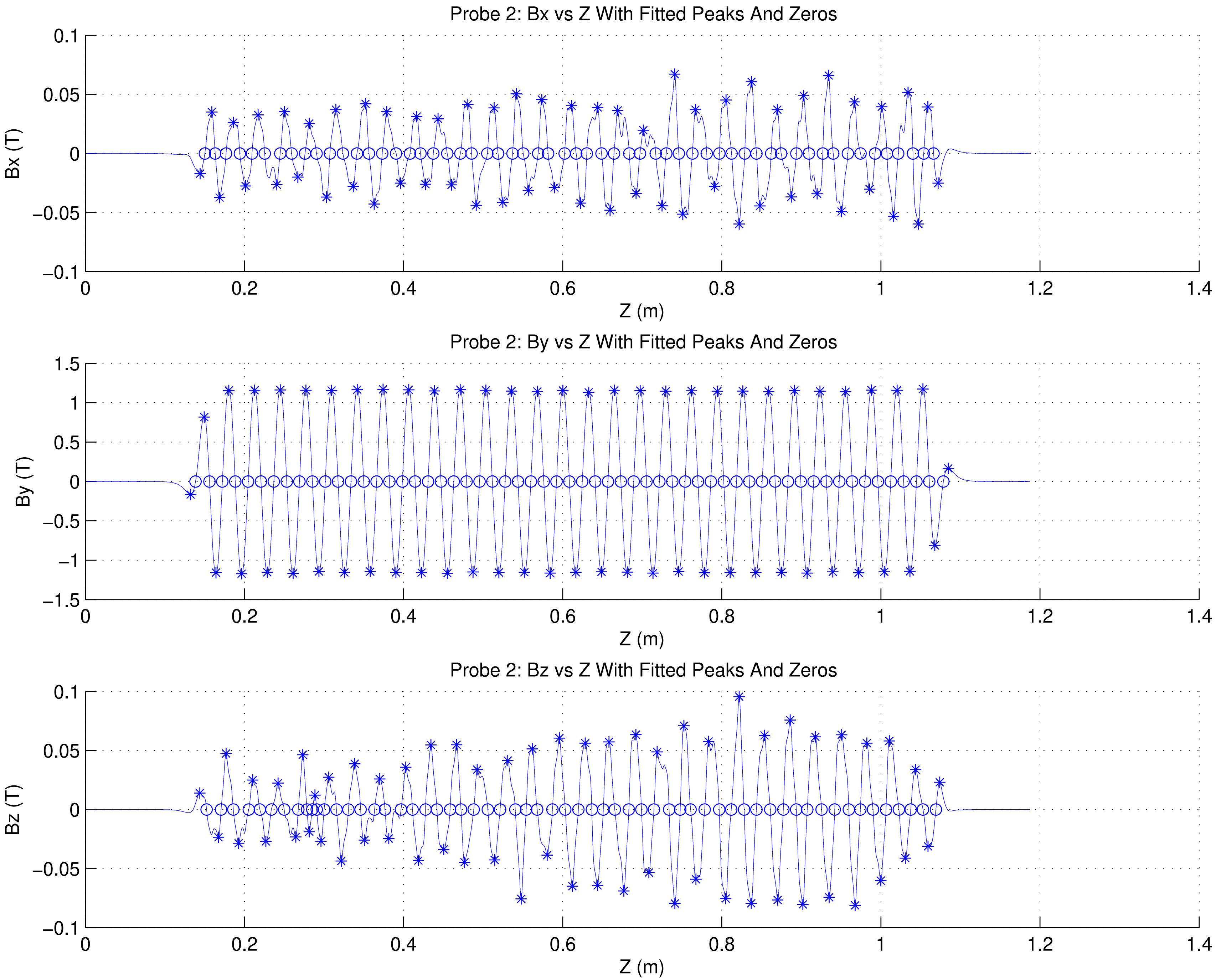


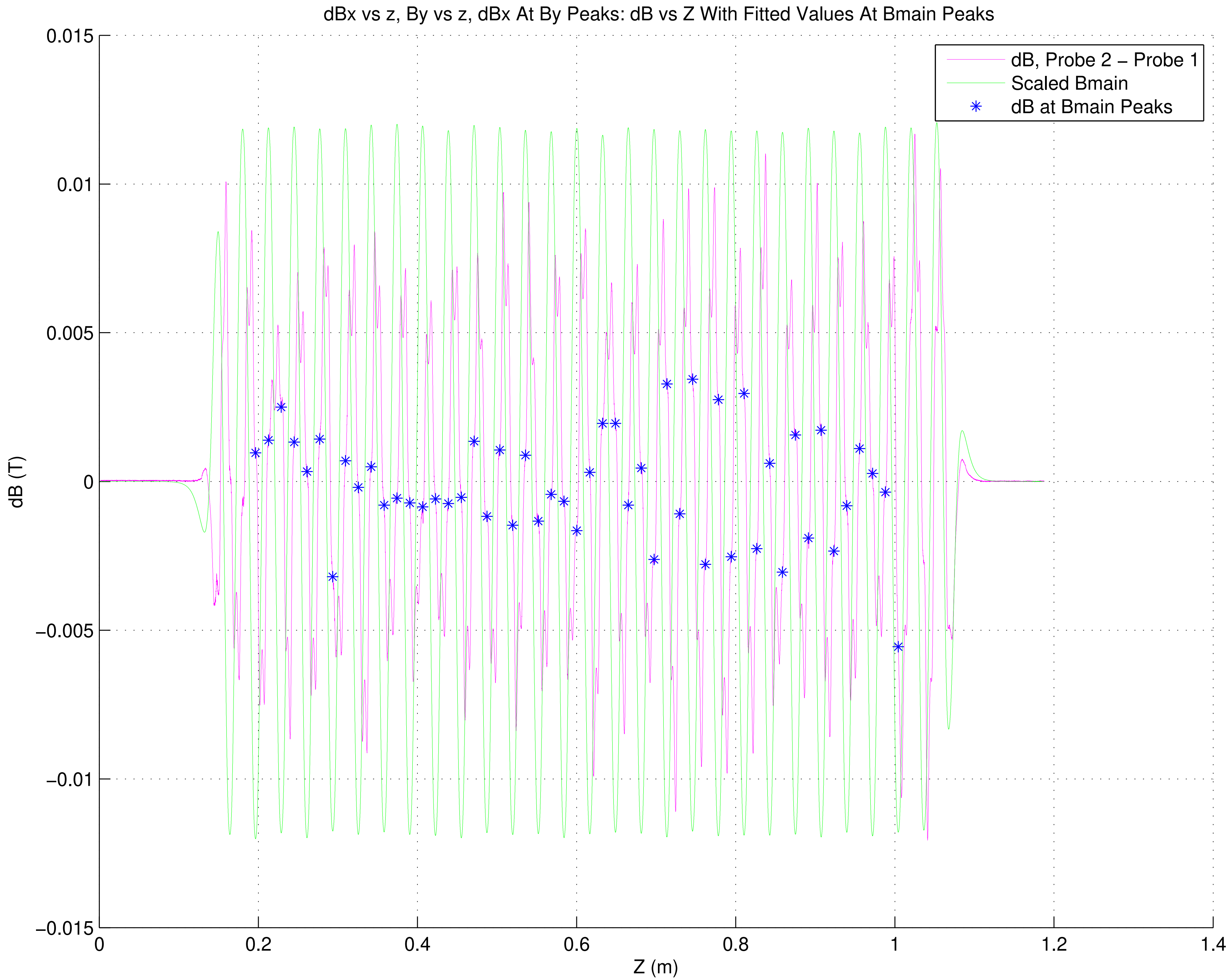
Probe 1: Bx, By, Bz vs Z
Bx (T)
By (T)
Bz (T)
Z Position (m)

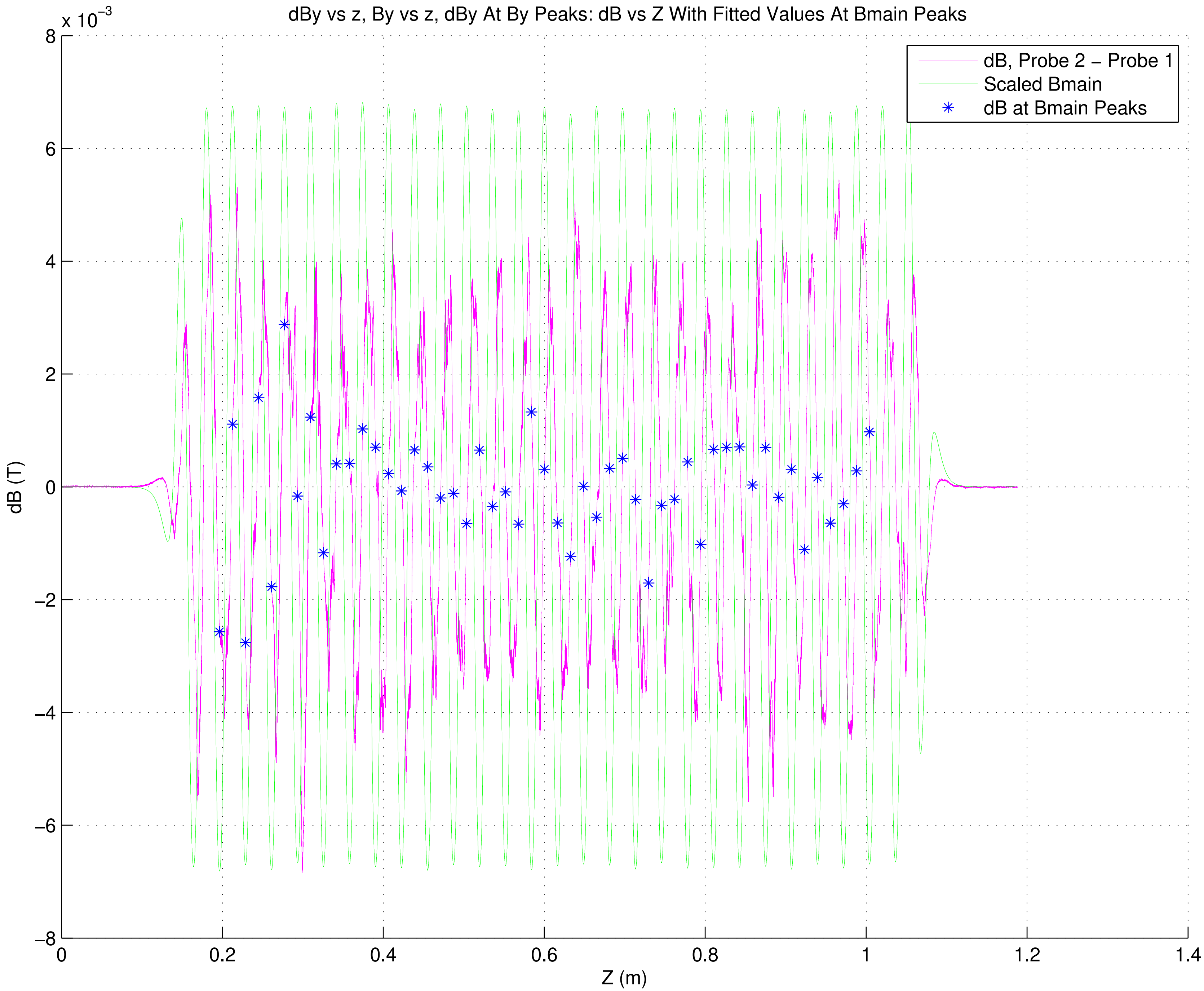


Probe 2: Bx, By, Bz vs Z
Bx (T)
By (T)
Bz (T)
0.1
0.05
0
−0.05
−0.1
1.5
1
0.5
0
−0.5
−1
−1.5
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z Position (m)

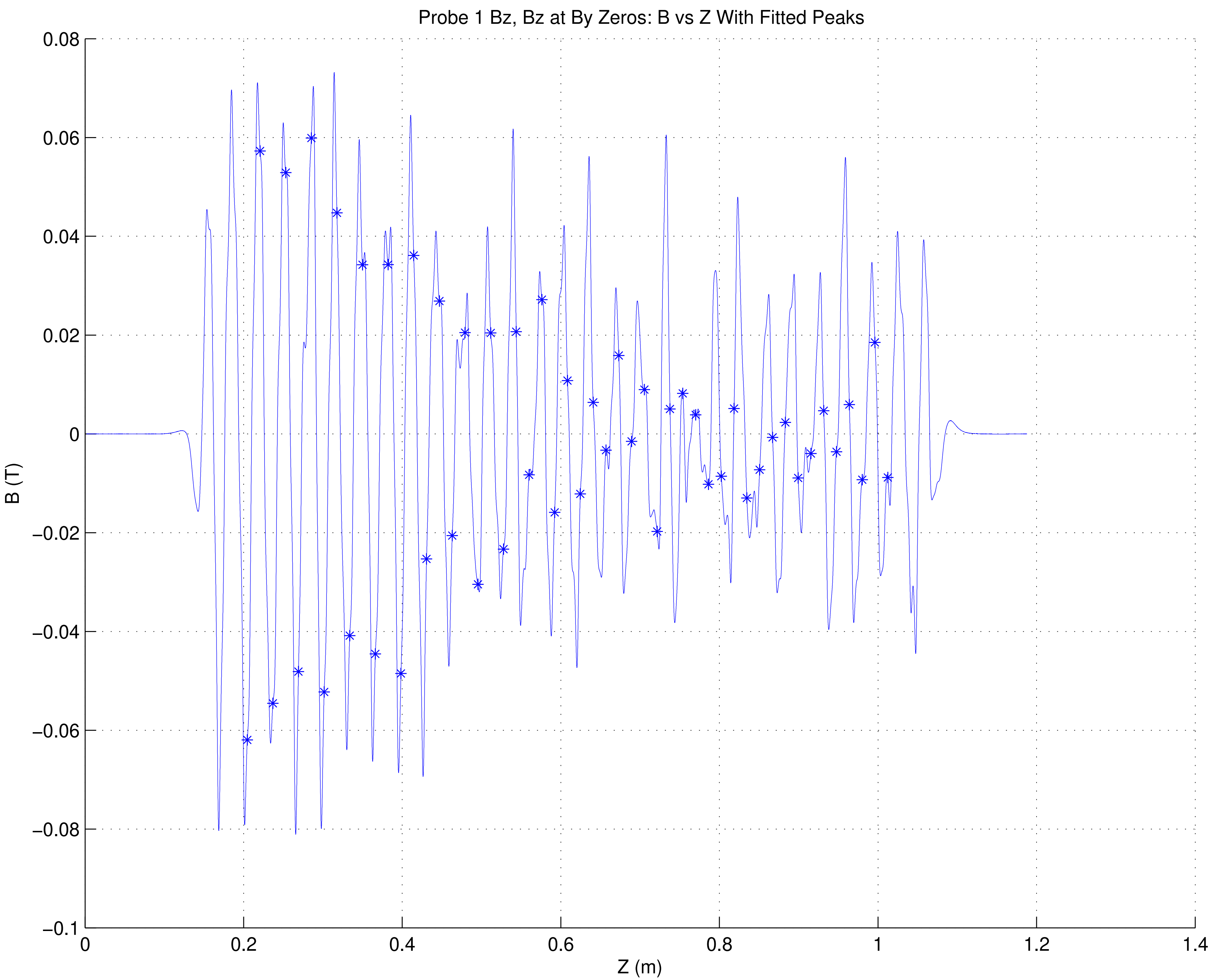

Probe 1: Bx vs Z With Fitted Peaks And Zeros
Bx (T)
Z (m)
Probe 1: By vs Z With Fitted Peaks And Zeros
By (T)
Z (m)
Probe 1: Bz vs Z With Fitted Peaks And Zeros
Bz (T)
Z (m)


Probe 2: Bx vs Z With Fitted Peaks And Zeros
Bx (T)
Z (m)
Probe 2: By vs Z With Fitted Peaks And Zeros
By (T)
Z (m)
Probe 2: Bz vs Z With Fitted Peaks And Zeros
Bz (T)
Z (m)

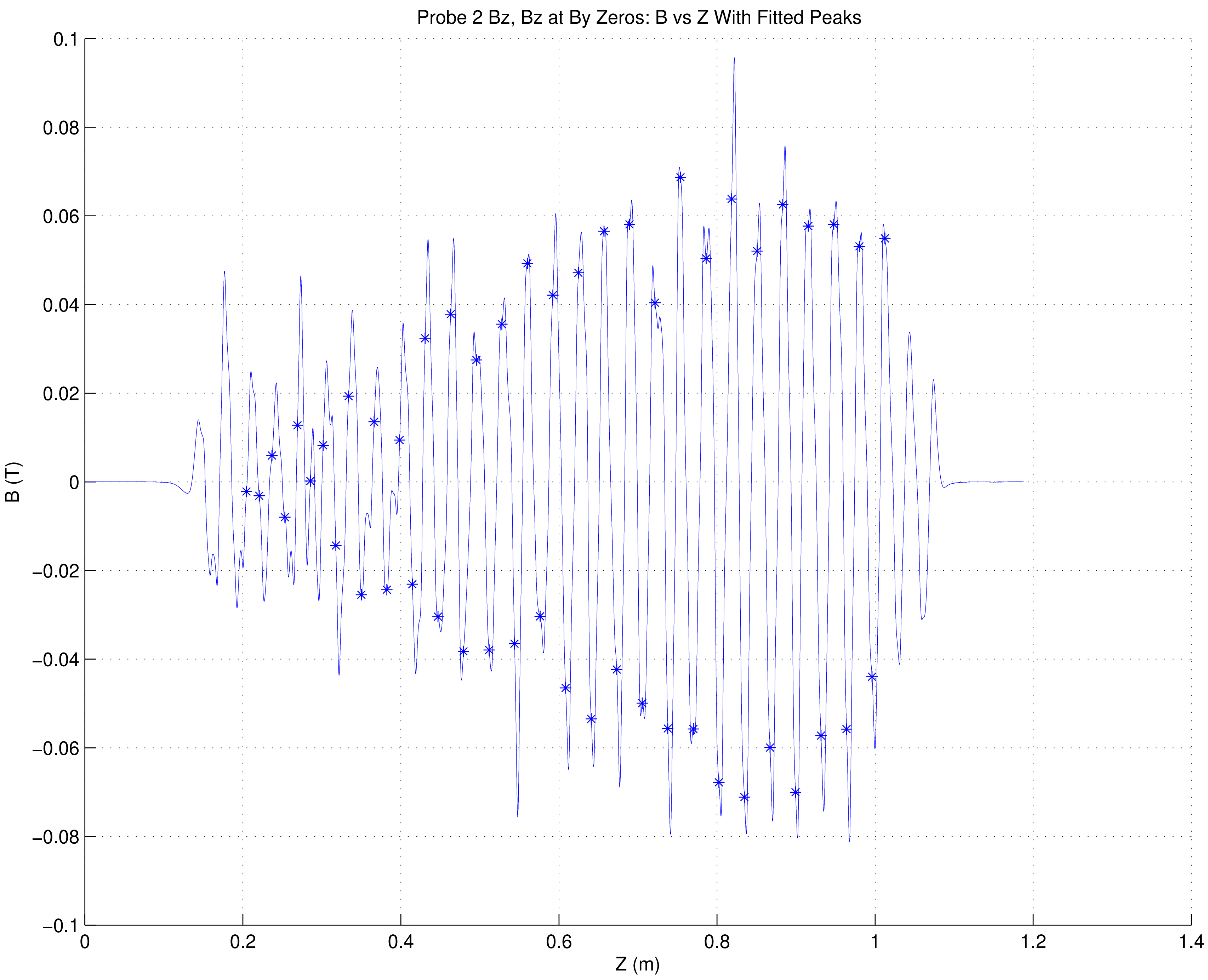

dBx vs z, By vs z, dBx At By Peaks: dB vs Z With Fitted Values At Bmain Peaks
dB, Probe 2 – Probe 1
Scaled Bmain
dB at Bmain Peaks
dB (T)
Z (m)
0.015
0.01
0.005
0
–0.005
–0.01
–0.015
0
0.2
0.4
0.6
0.8
1
1.2
1.4

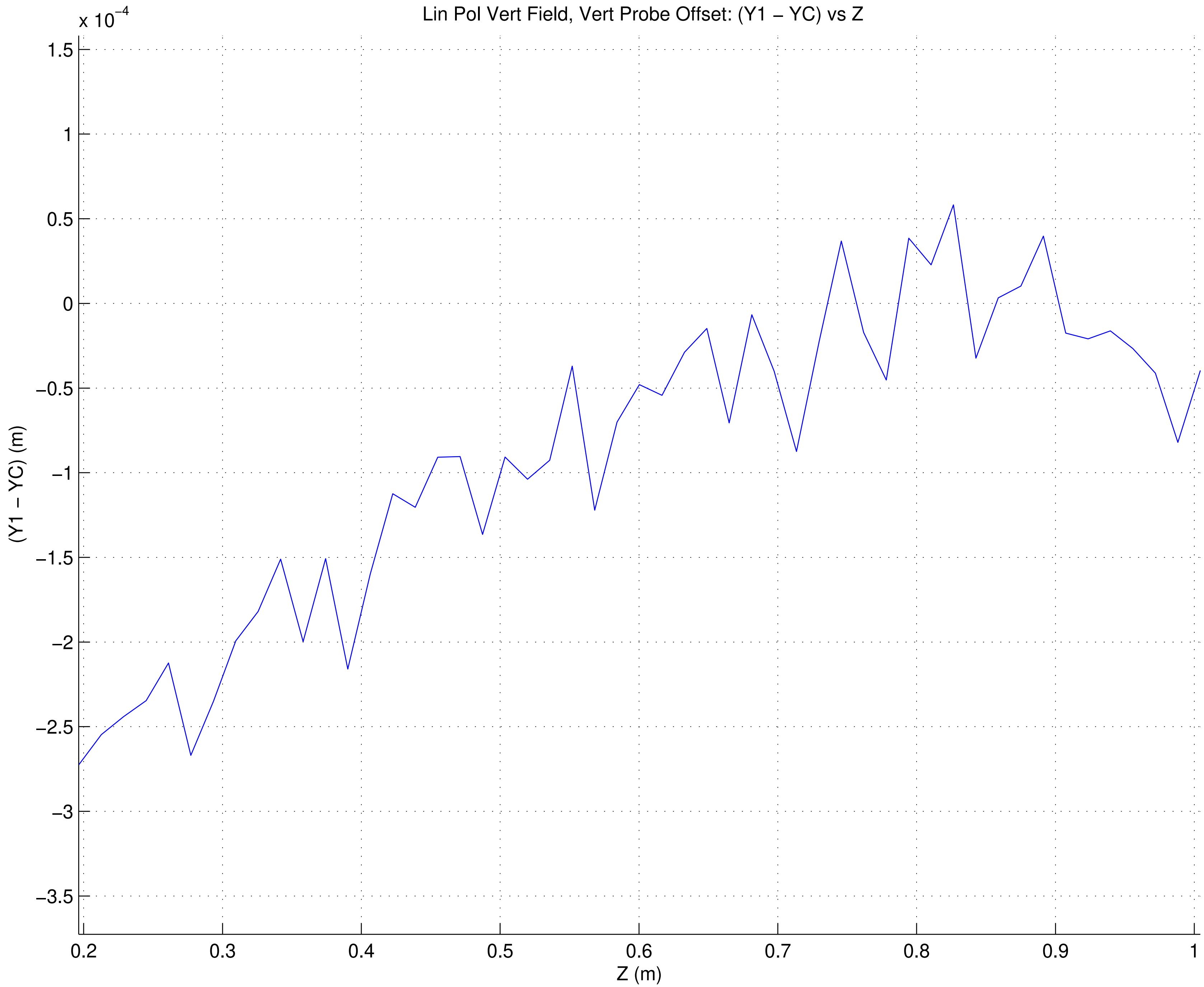


dBy vs z, By vs z, dBy At By Peaks: dB vs Z With Fitted Values At Bmain Peaks
x 10^-3
8
6
4
2
0
−2
−4
−6
−8
dB (T)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)
dB, Probe 2 – Probe 1
Scaled Bmain
dB at Bmain Peaks

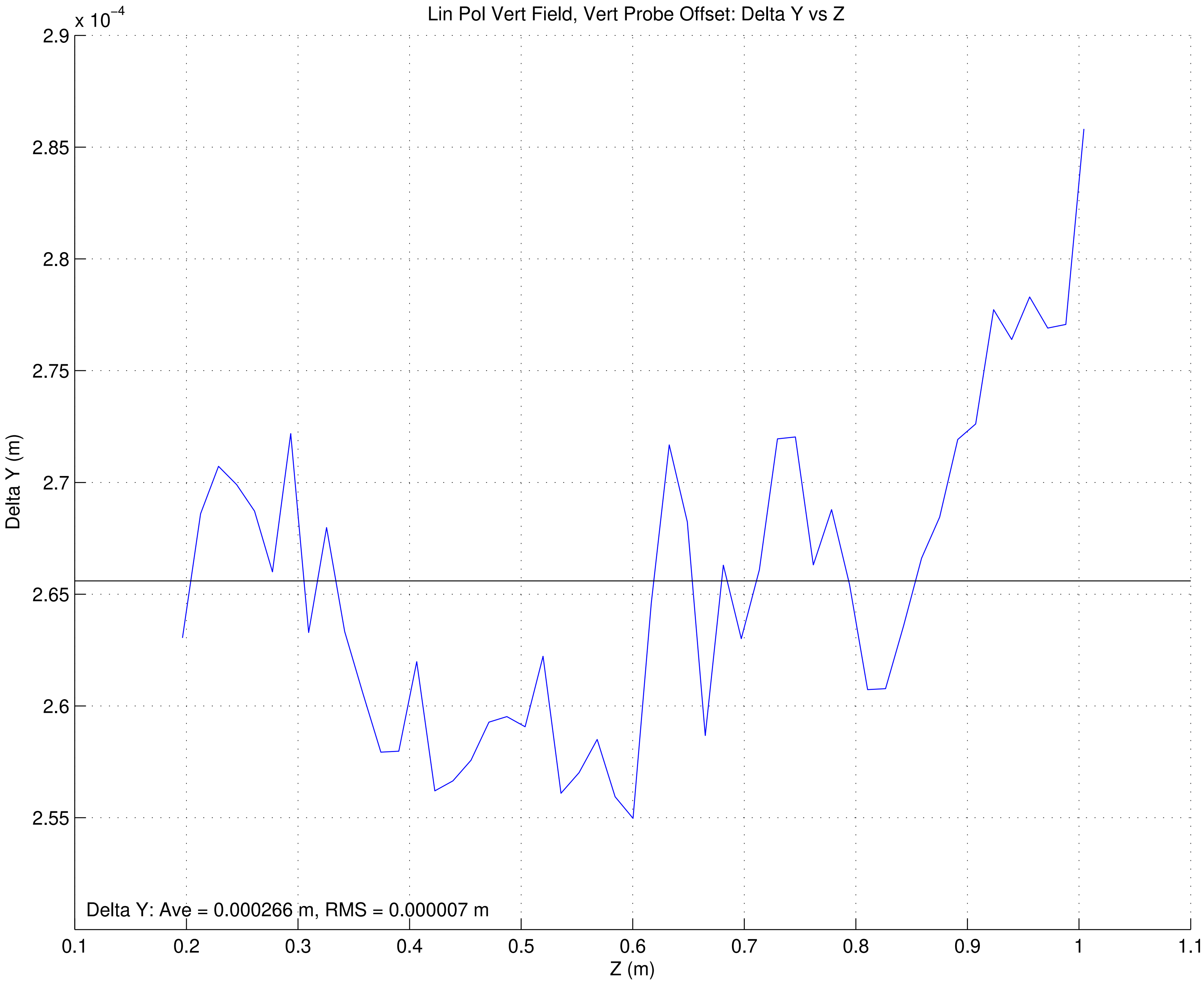


Probe 1 Bz, Bz at By Zeros: B vs Z With Fitted Peaks
0.08
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
−0.08
−0.1
B (T)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)

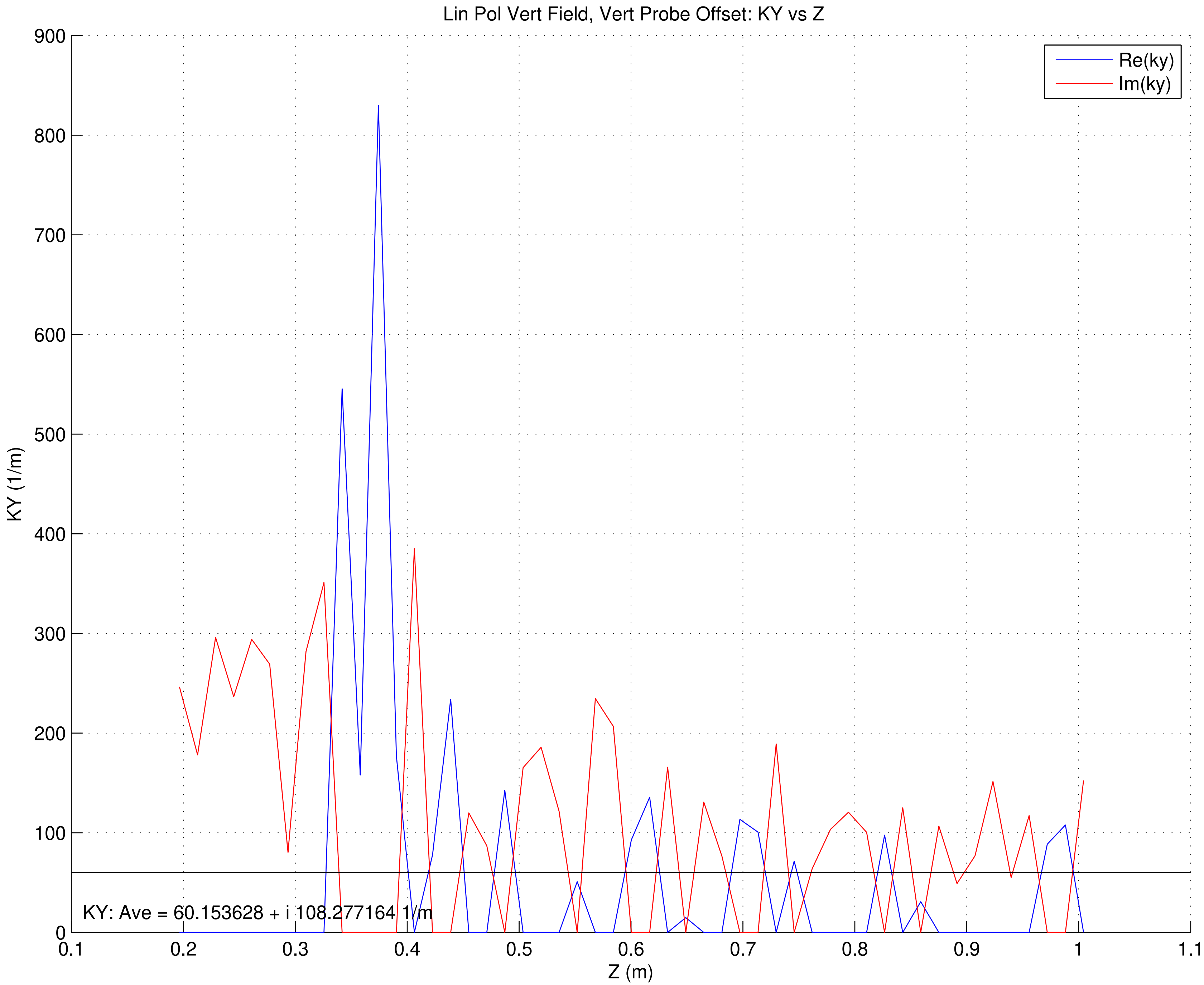

Probe 2 Bz, Bz at By Zeros: B vs Z With Fitted Peaks
B (T)
Z (m)
0.1
0.08
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
−0.08
−0.1
0
0.2
0.4
0.6
0.8
1
1.2
1.4



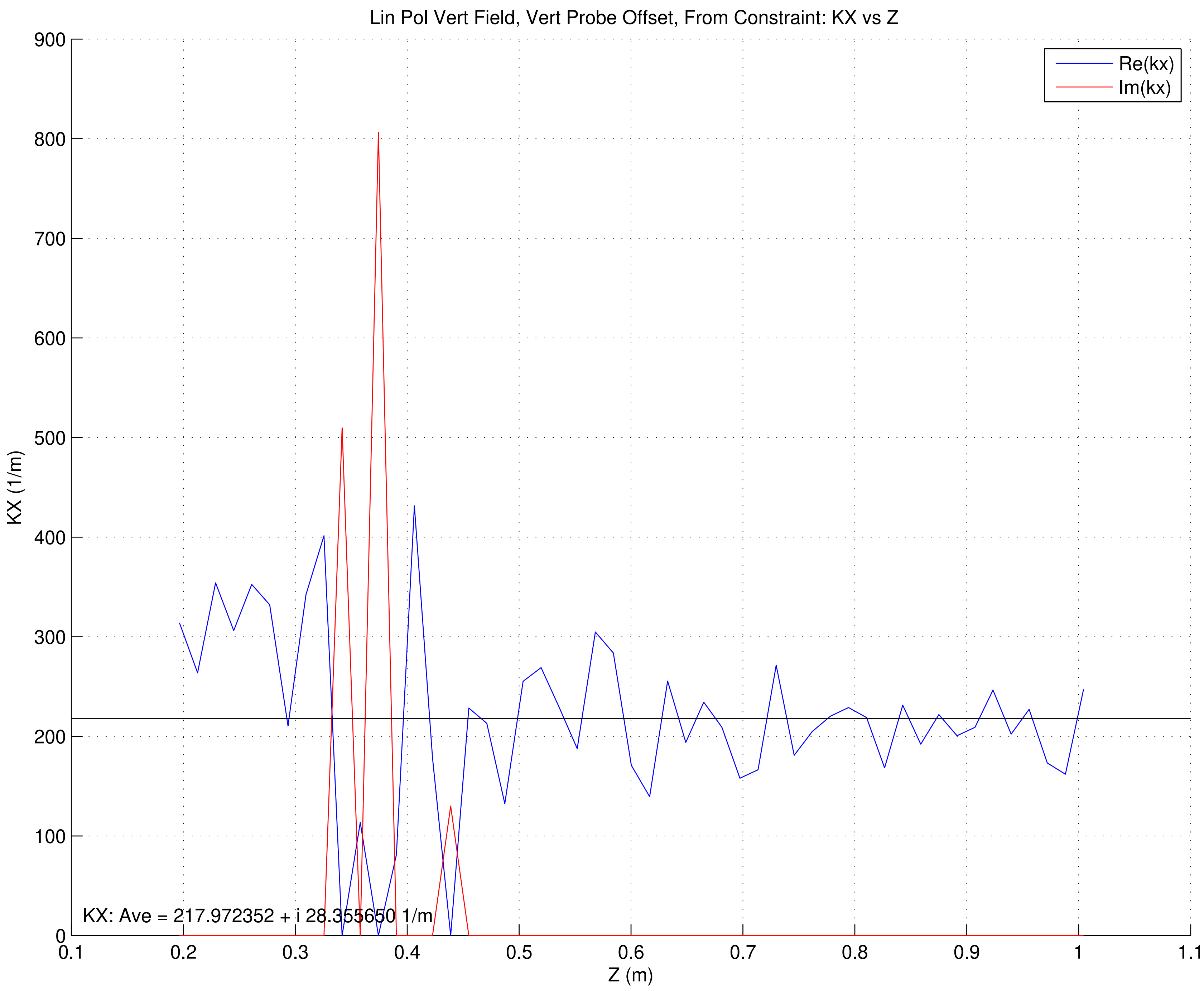
Lin Pol Vert Field, Vert Probe Offset: (Y1 − YC) vs Z
x 10^−4
1.5
1
0.5
0
−0.5
−1
−1.5
−2
−2.5
−3
−3.5
(Y1 − YC) (m)
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Z (m)



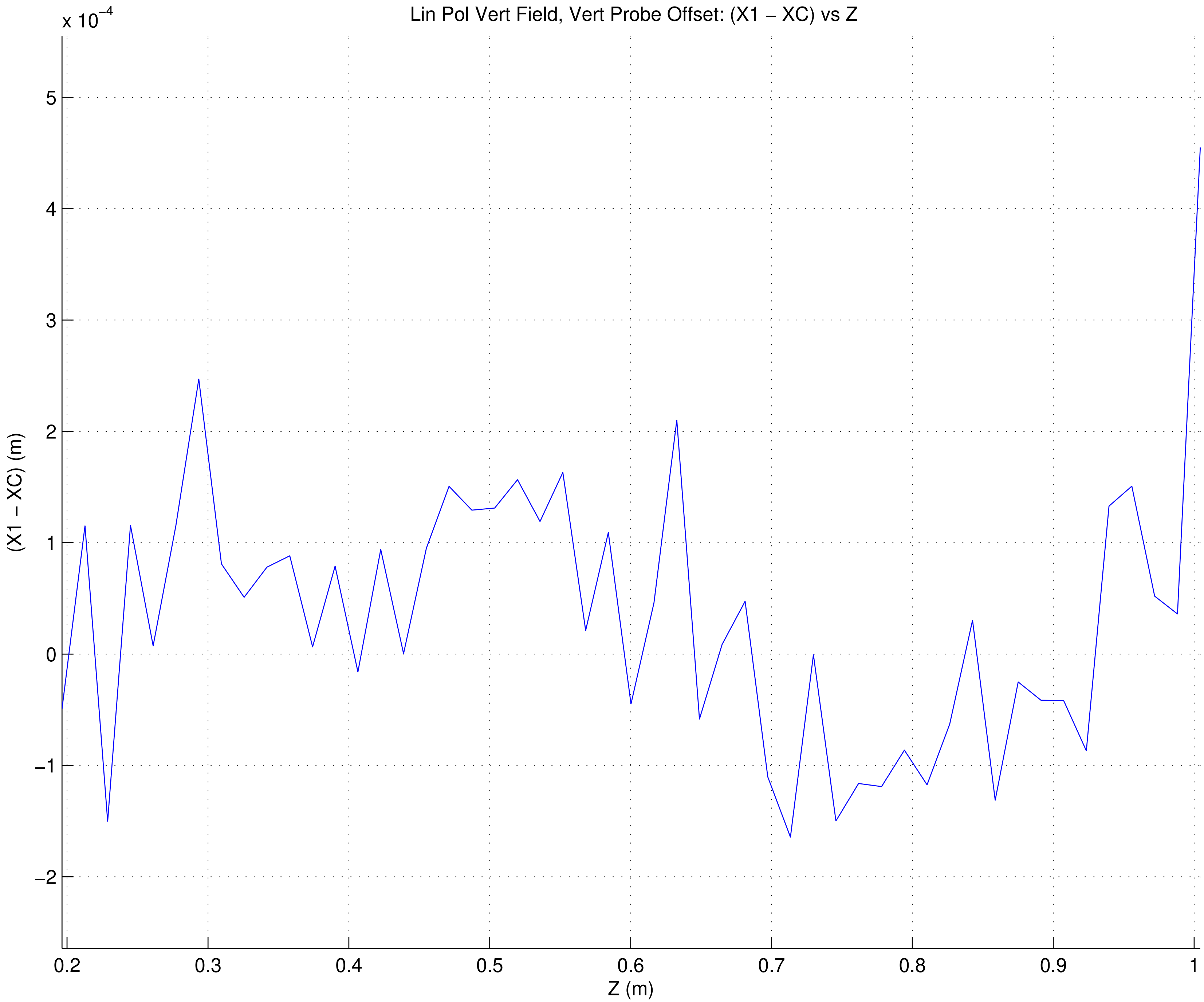
Lin Pol Vert Field, Vert Probe Offset: Delta Y vs Z
x 10^-4
2.9
2.85
2.8
2.75
2.7
2.65
2.6
2.55
Delta Y (m)
Delta Y: Ave = 0.000266 m, RMS = 0.000007 m
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
Z (m)

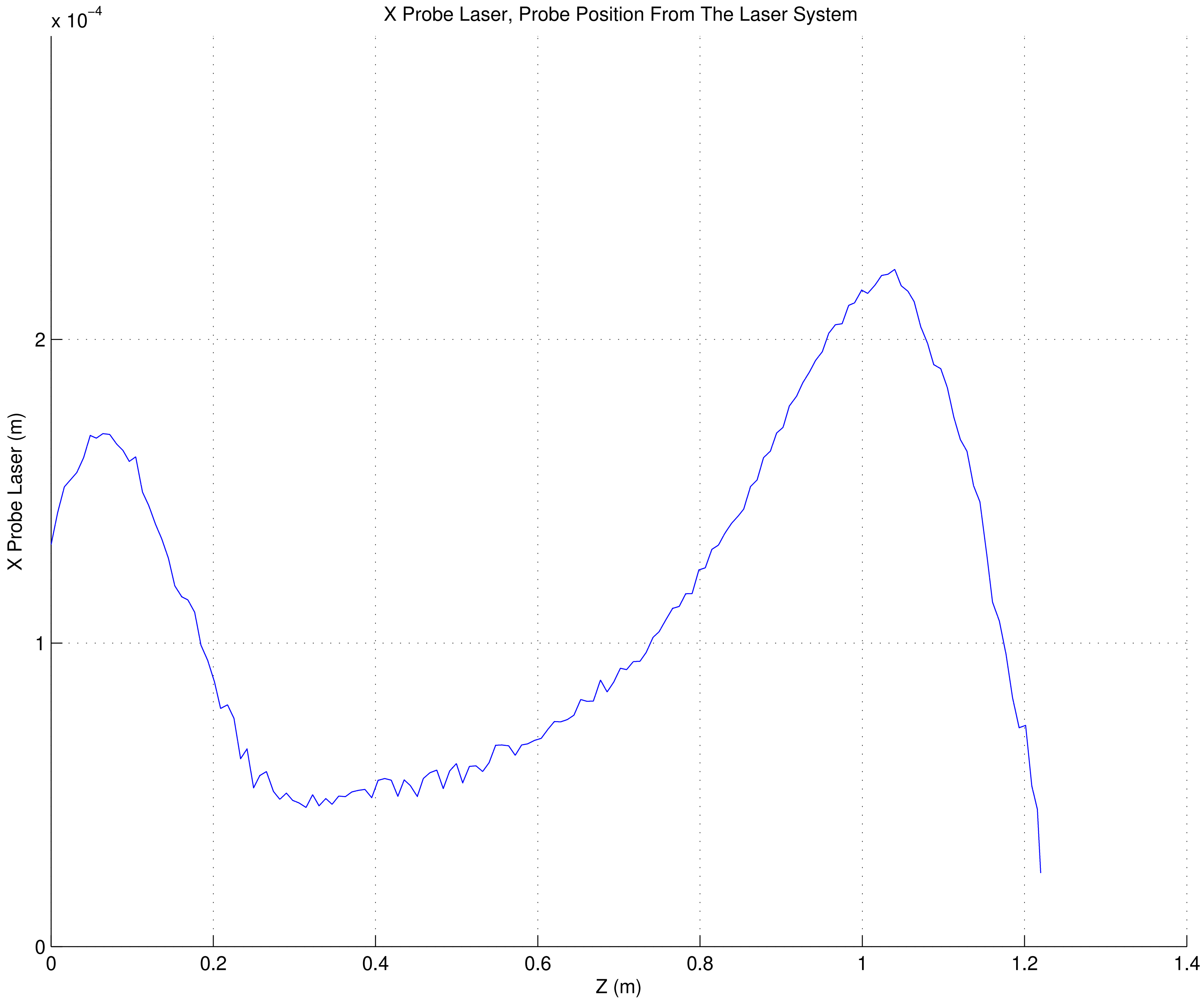


Lin Pol Vert Field, Vert Probe Offset: KY vs Z
Re(ky)
Im(ky)
KY (1/m)
Z (m)
KY: Ave = 60.153628 + i 108.277164 1/m
0
100
200
300
400
500
600
700
800
900
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1

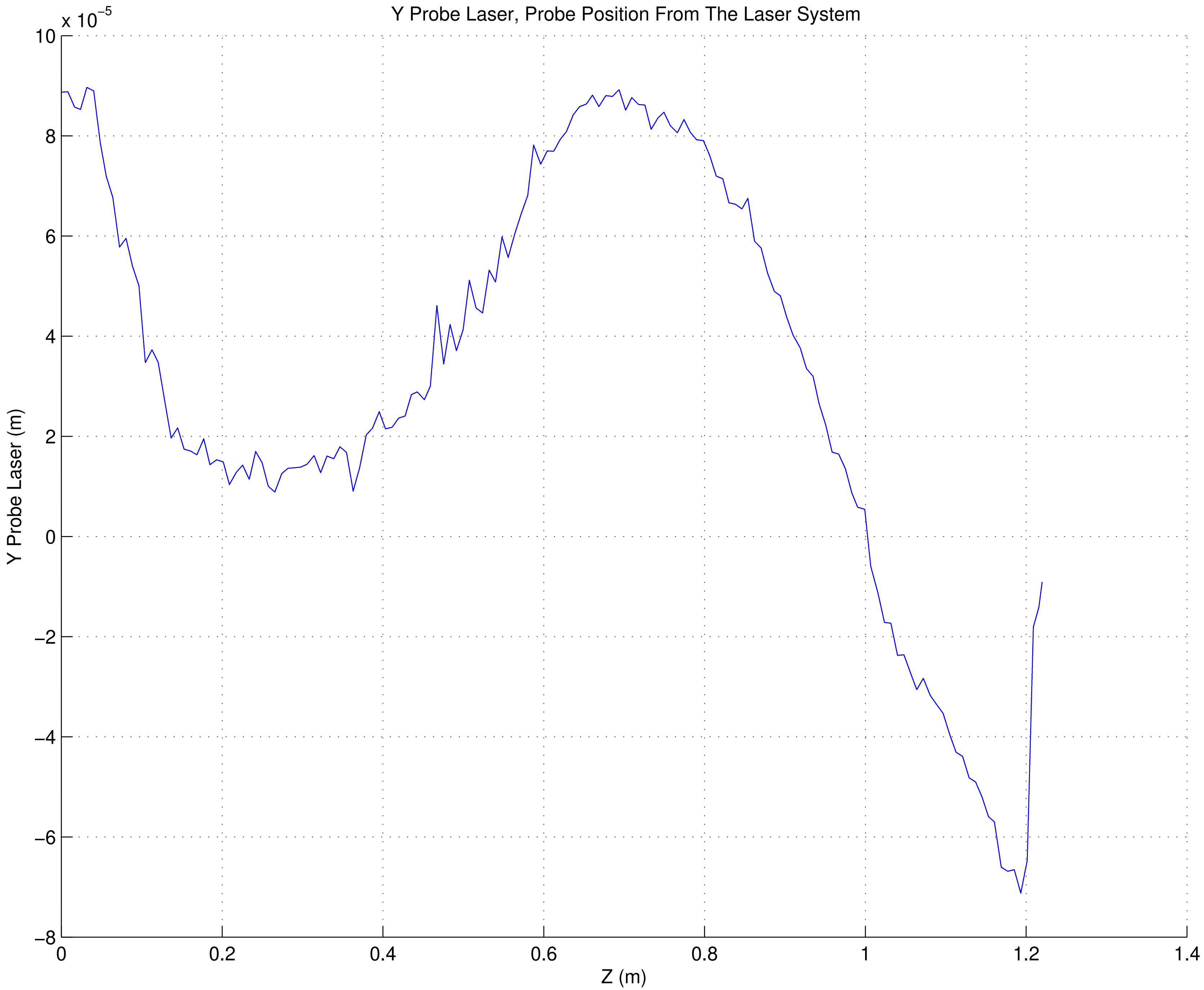


Lin Pol Vert Field, Vert Probe Offset, From Constraint: KX vs Z
Re(kx)
Im(kx)
KX (1/m)
Z (m)
KX: Ave = 217.972352 + i 28.355650 1/m
0
100
200
300
400
500
600
700
800
900
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1

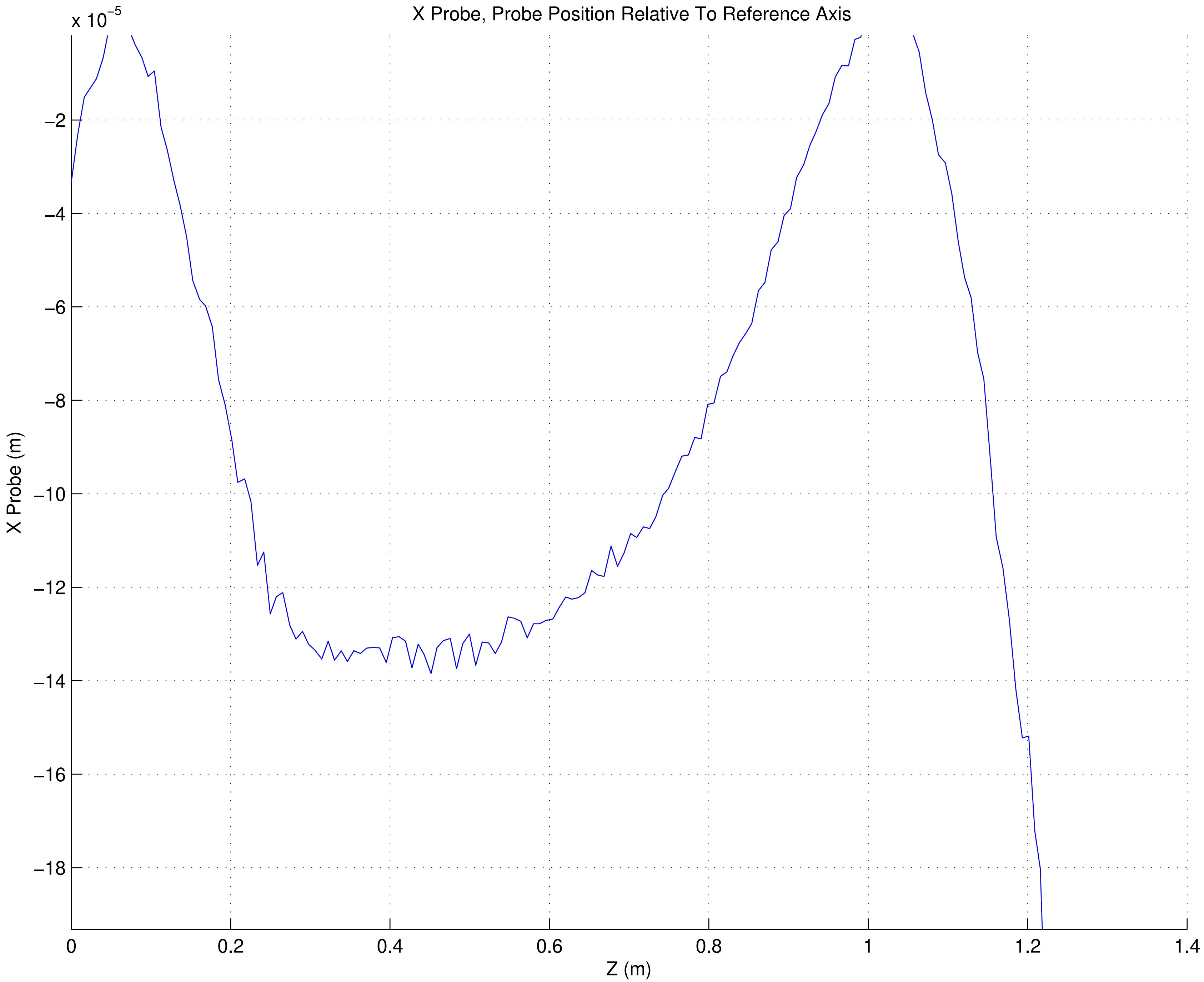

Lin Pol Vert Field, Vert Probe Offset: (X1 − XC) vs Z
x 10^−4
5
4
3
2
1
0
−1
−2
(X1 − XC) (m)
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Z (m)



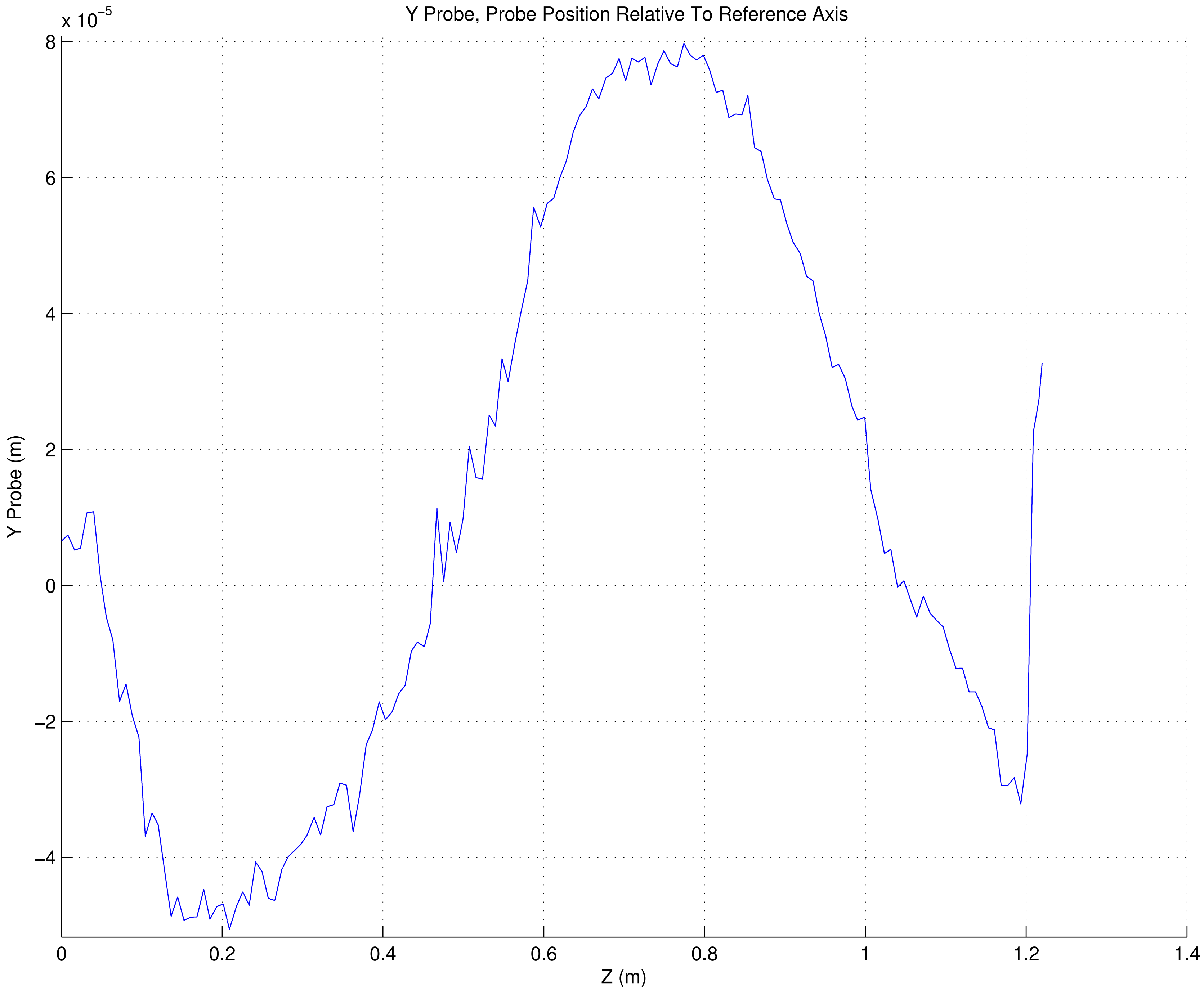
X Probe Laser, Probe Position From The Laser System
x 10^−4
2
1
0
X Probe Laser (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)



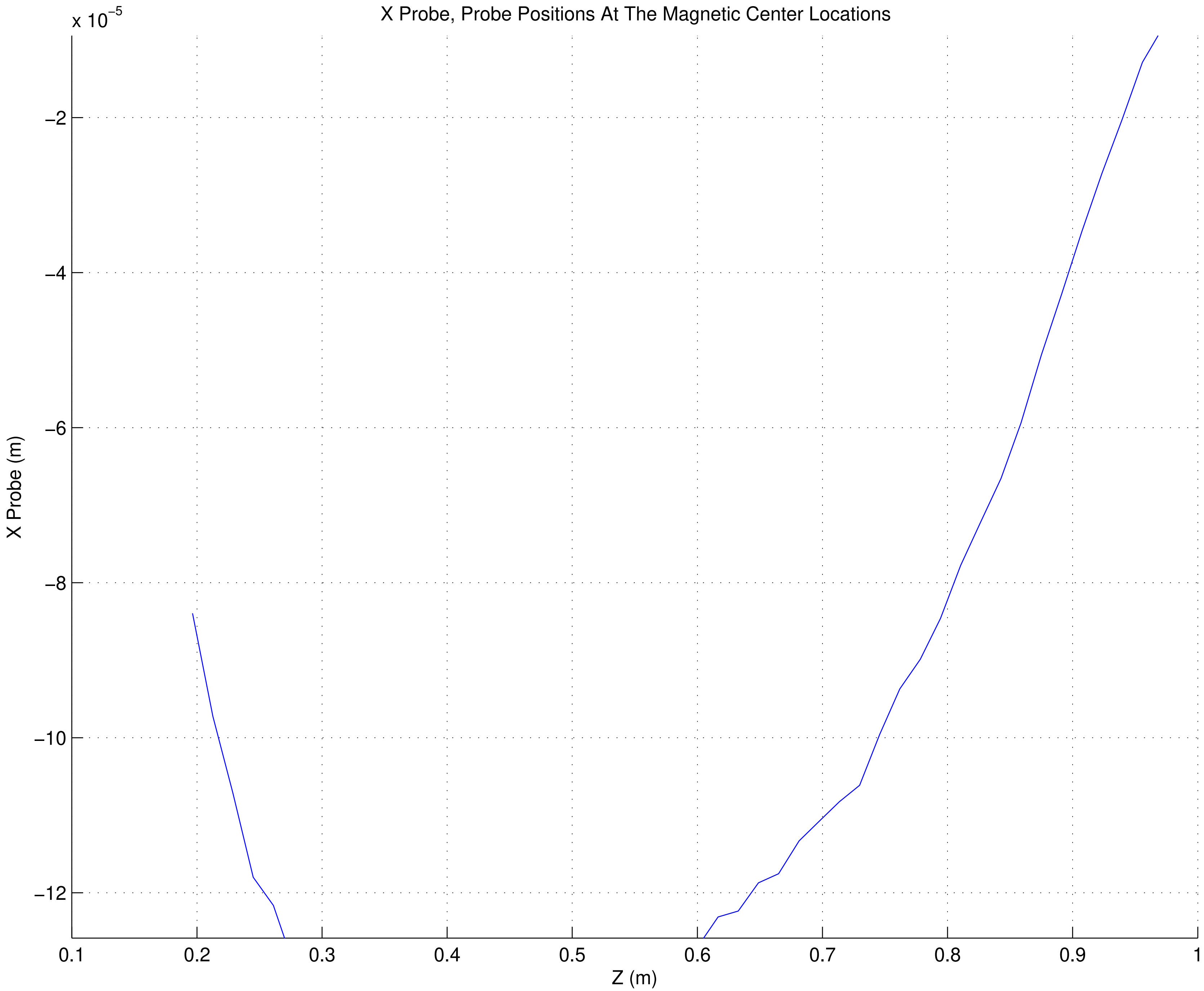
Y Probe Laser, Probe Position From The Laser System
x 10^-5
10
8
6
4
2
0
−2
−4
−6
−8
Y Probe Laser (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)

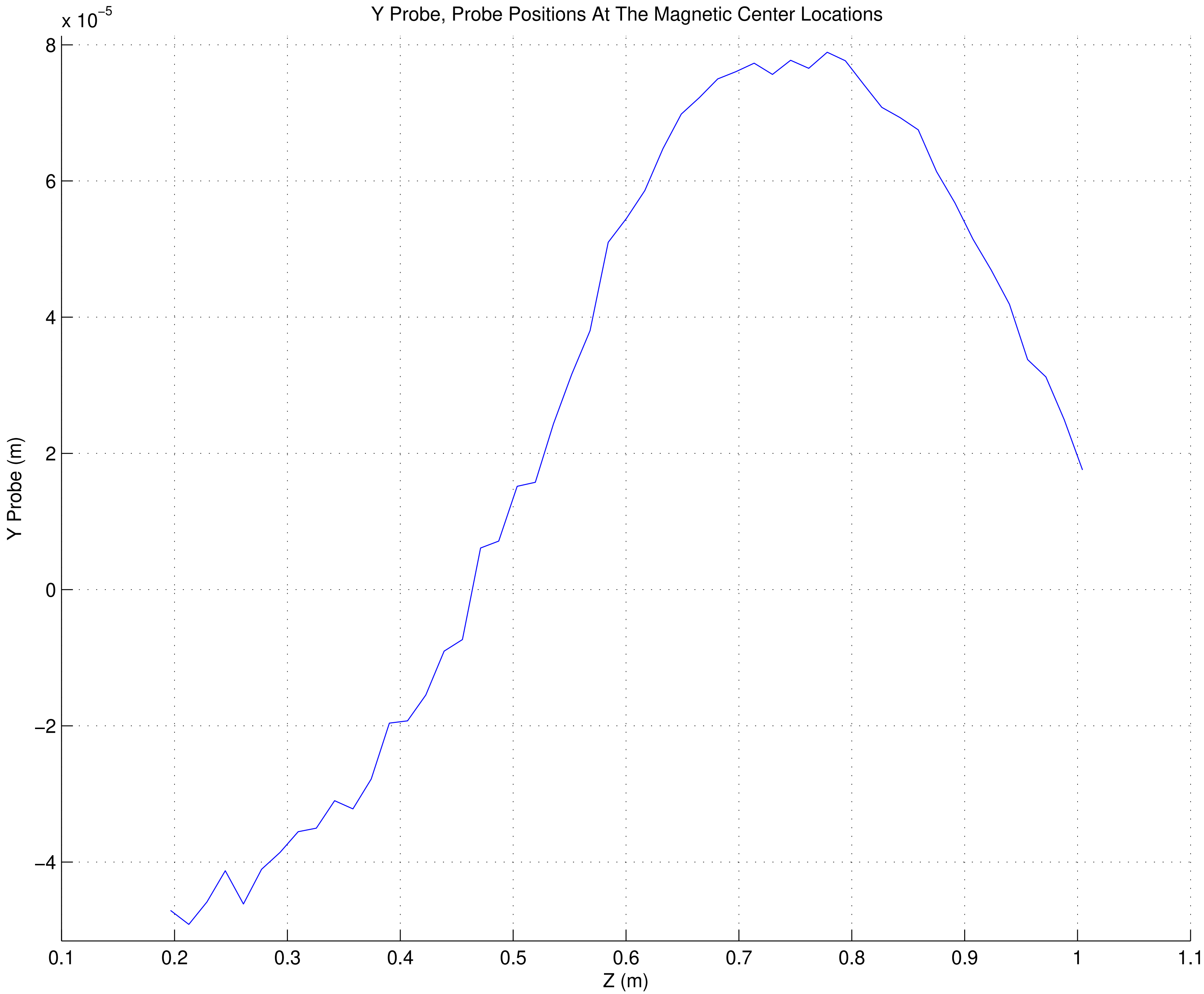


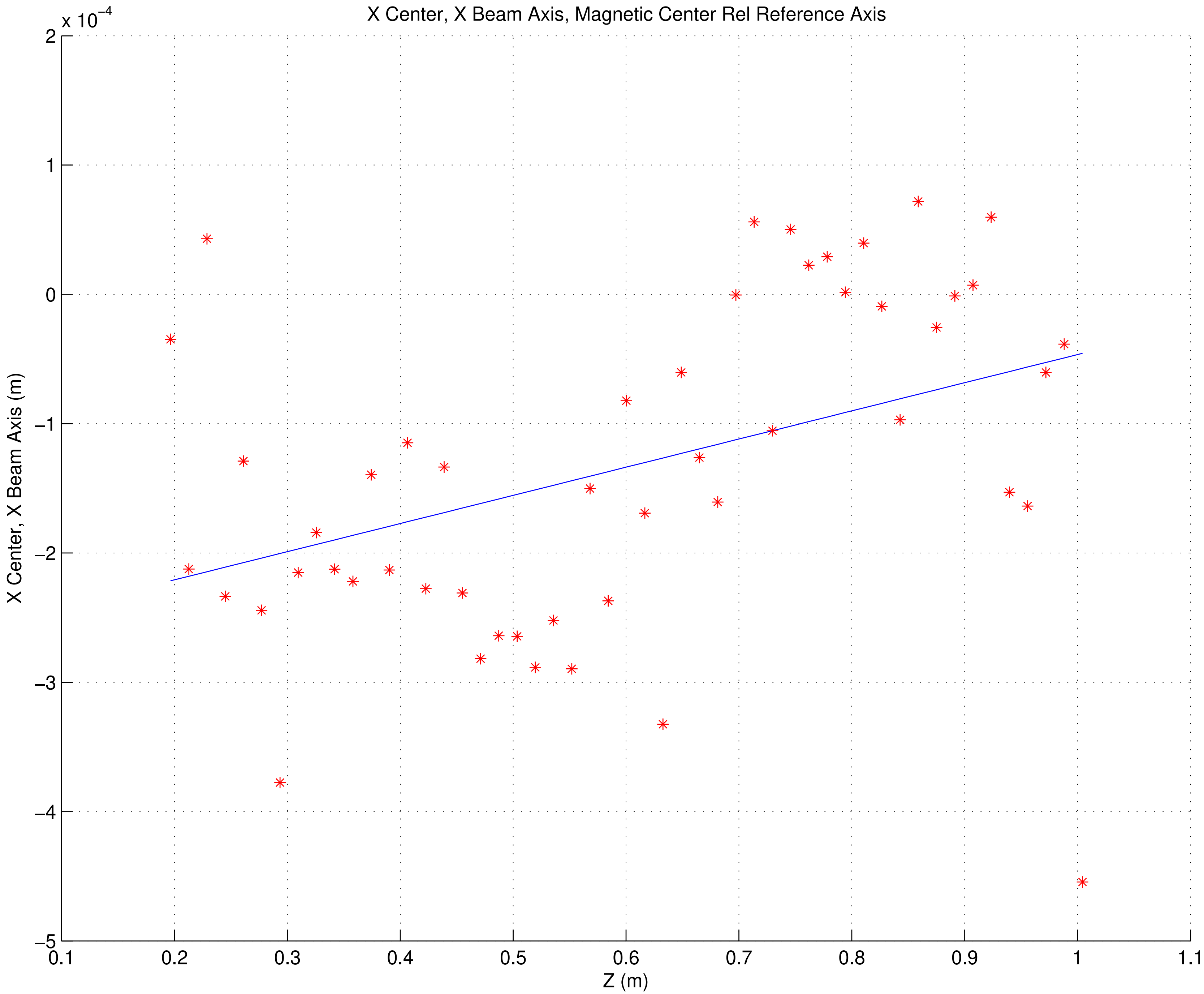
X Probe, Probe Position Relative To Reference Axis
x 10^−5
−2
−4
−6
−8
−10
−12
−14
−16
−18
X Probe (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)

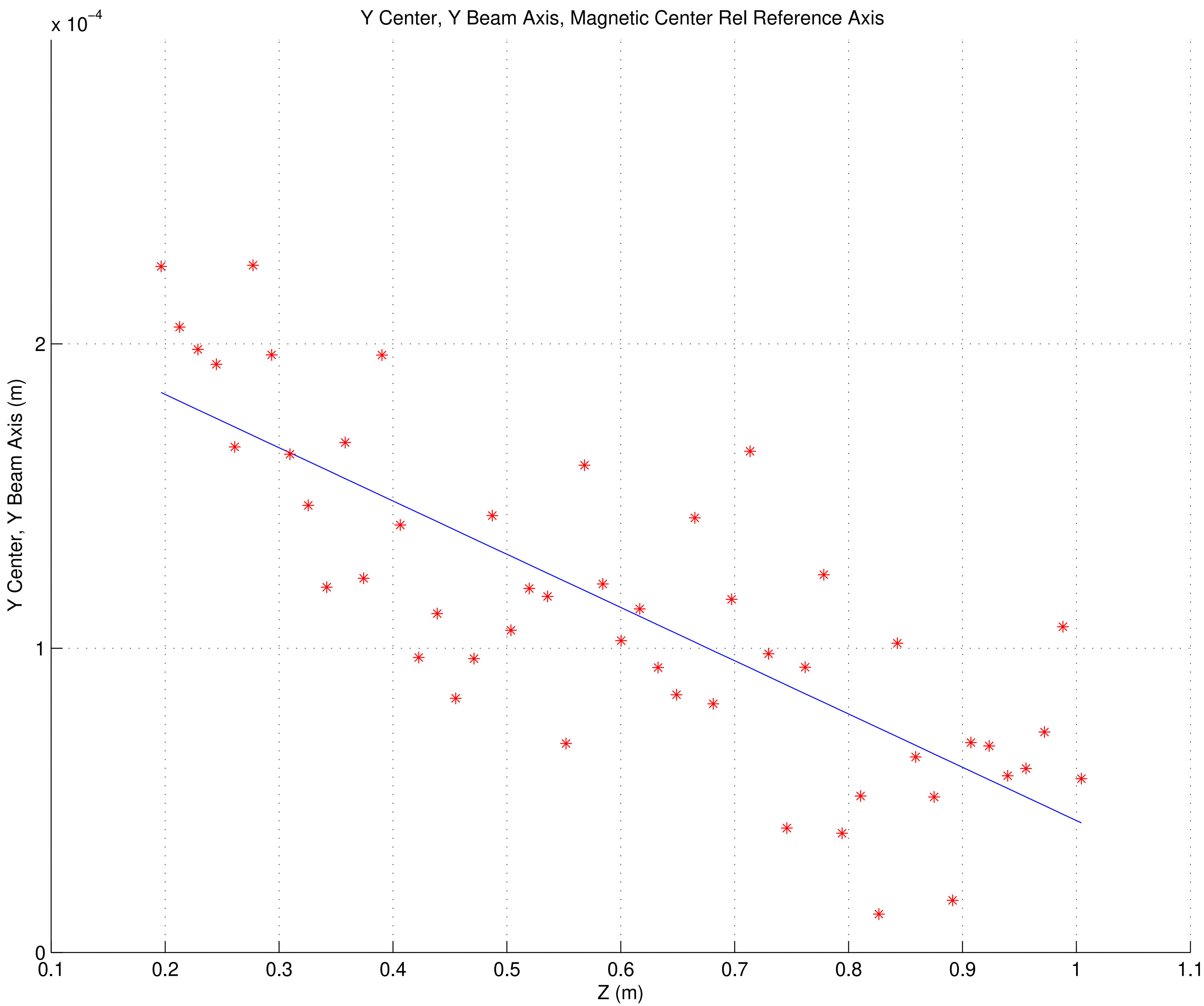


Y Probe, Probe Position Relative To Reference Axis
x 10^−5
8
6
4
2
0
−2
−4
Y Probe (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)

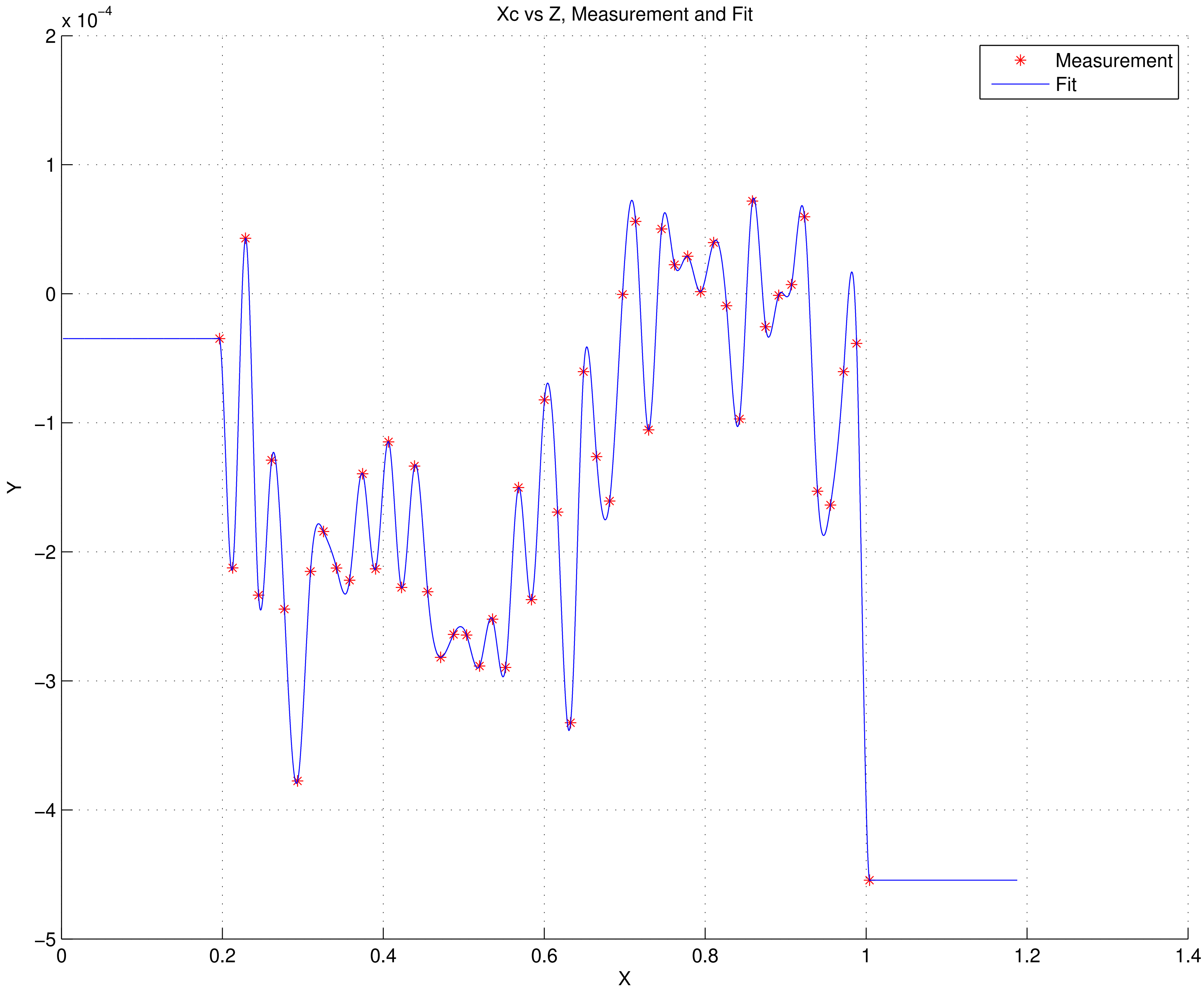

X Probe, Probe Positions At The Magnetic Center Locations
x 10^-5
-2
-4
-6
-8
-10
-12
X Probe (m)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Z (m)


Y Probe, Probe Positions At The Magnetic Center Locations
x 10^-5
8
6
4
2
0
−2
−4
Y Probe (m)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
Z (m)

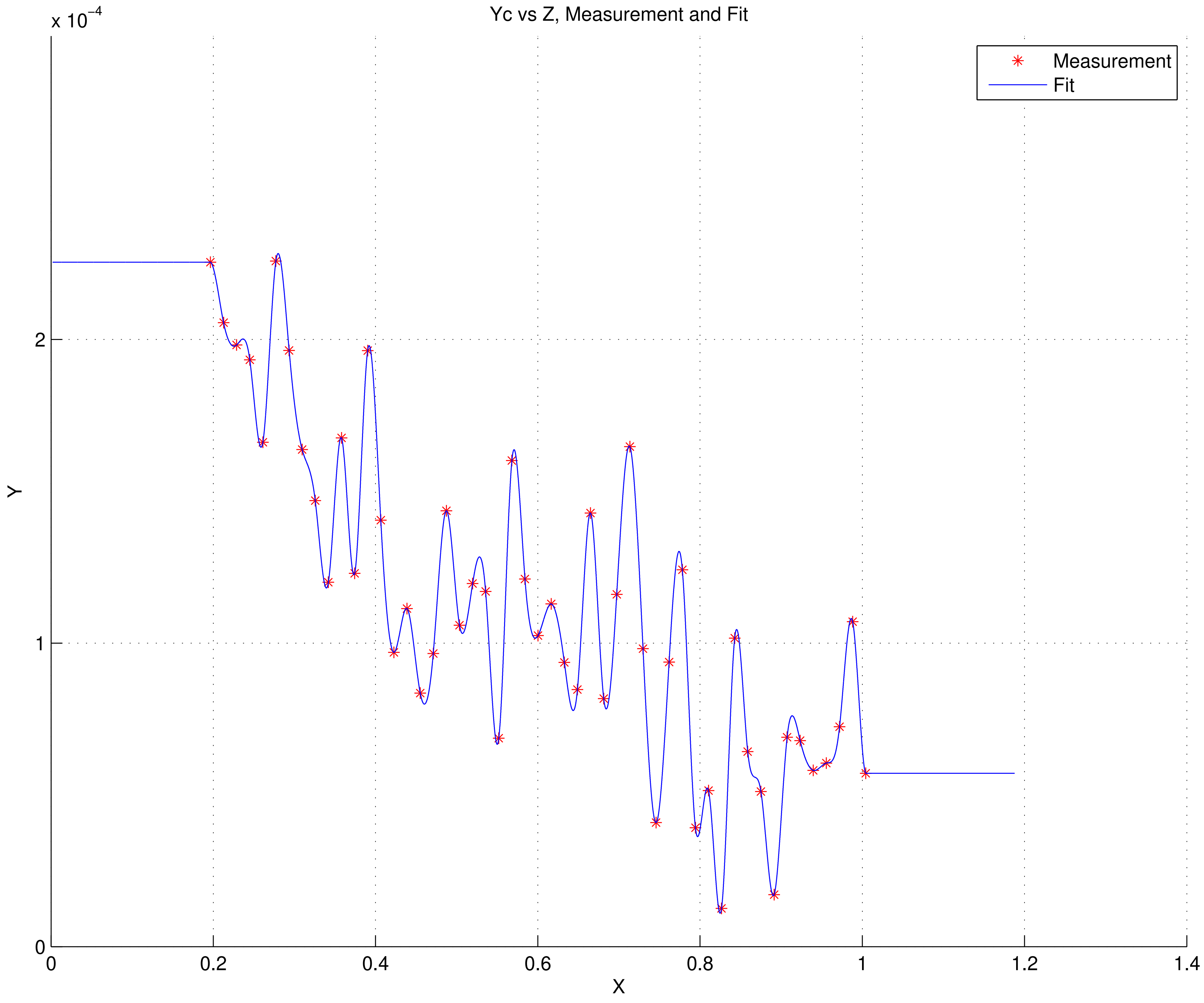

X Center, X Beam Axis, Magnetic Center Rel Reference Axis
x 10^-4
2
1
0
−1
−2
−3
−4
−5
X Center, X Beam Axis (m)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
Z (m)



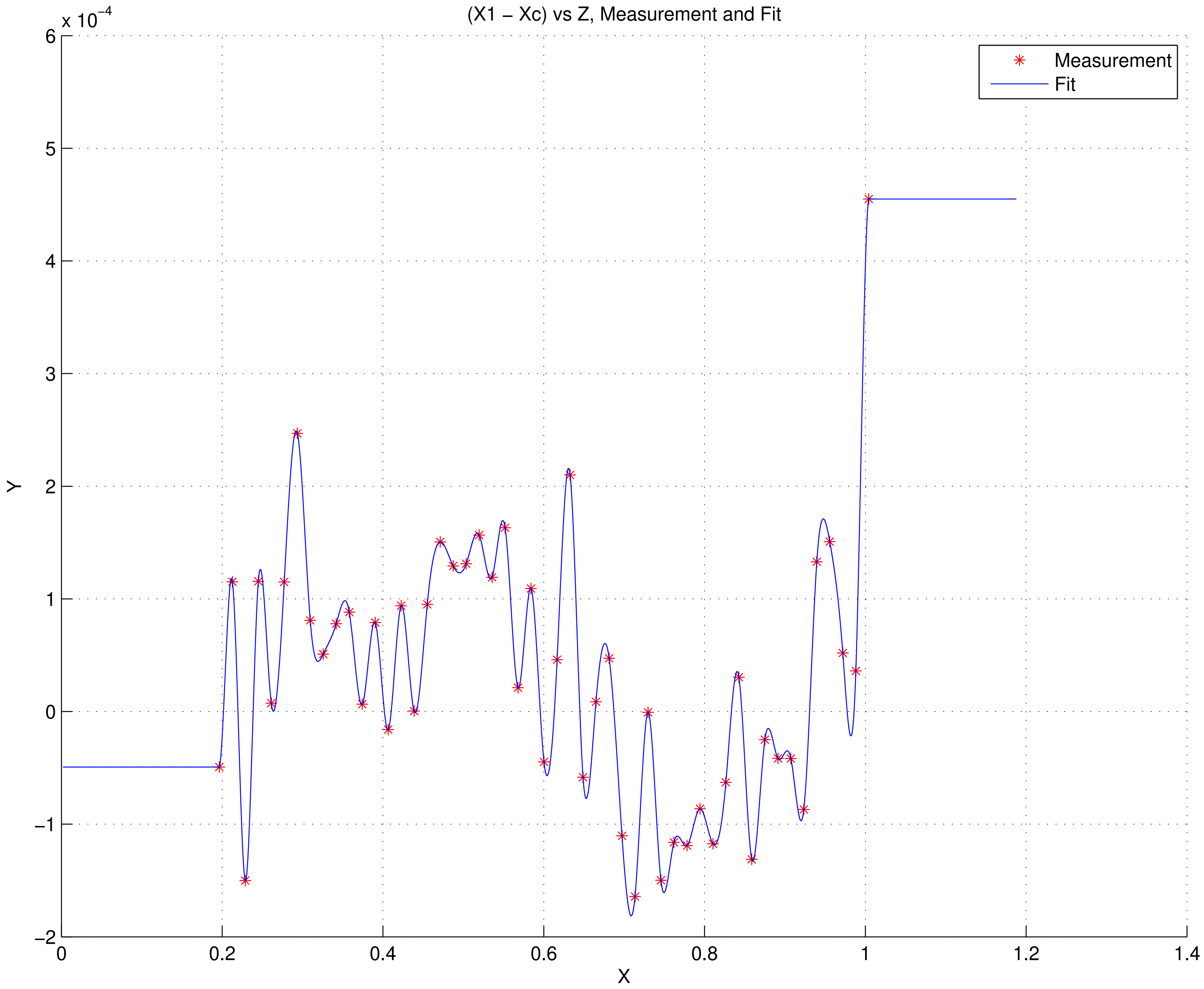
Y Center, Y Beam Axis, Magnetic Center Rel Reference Axis
x 10^-4
2
1
0
Y Center, Y Beam Axis (m)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
Z (m)



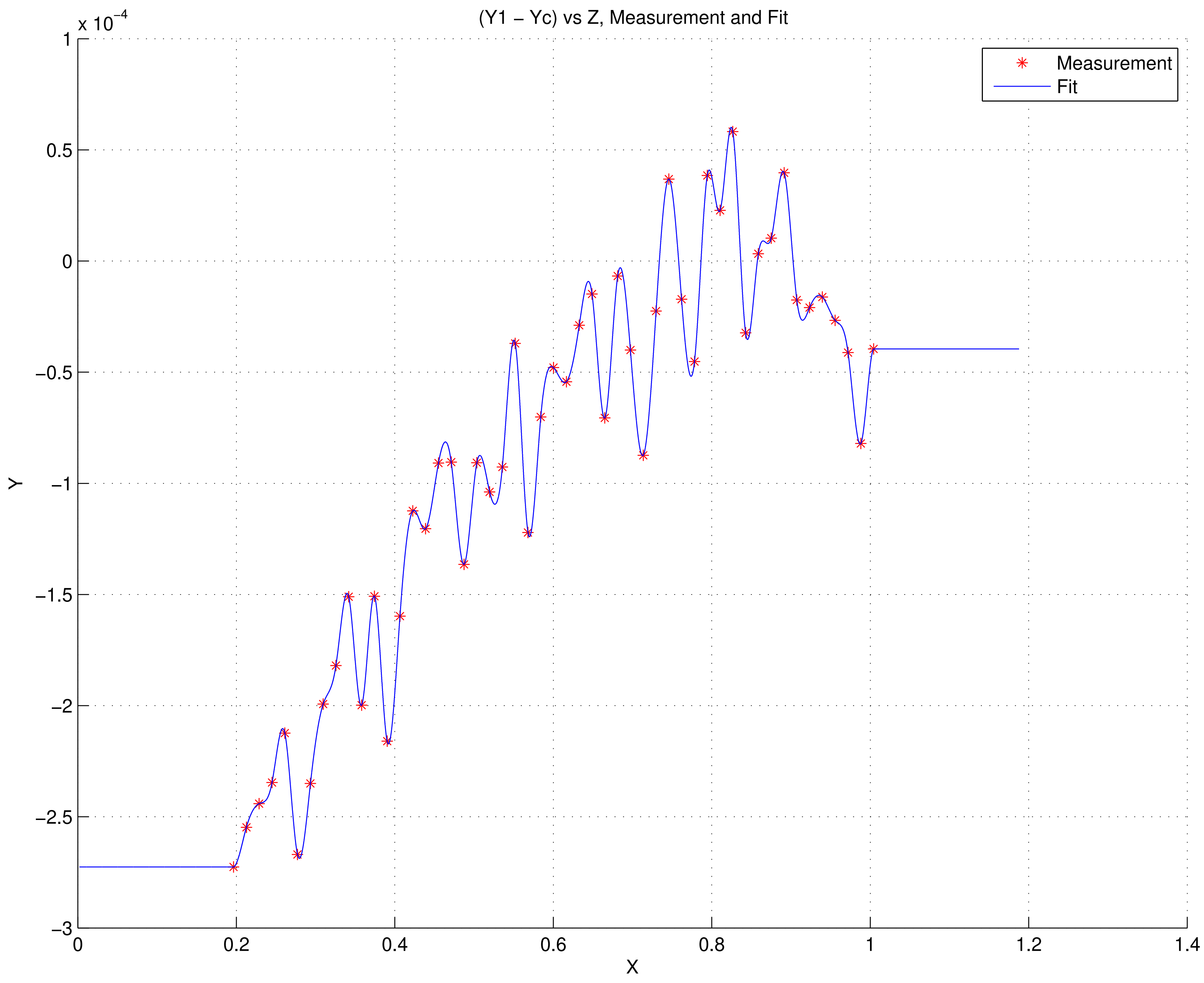
Xc vs Z, Measurement and Fit
x 10^−4
2
1
0
−1
−2
−3
−4
−5
Y
0
0.2
0.4
0.6
0.8
1
1.2
1.4
X
Measurement
Fit

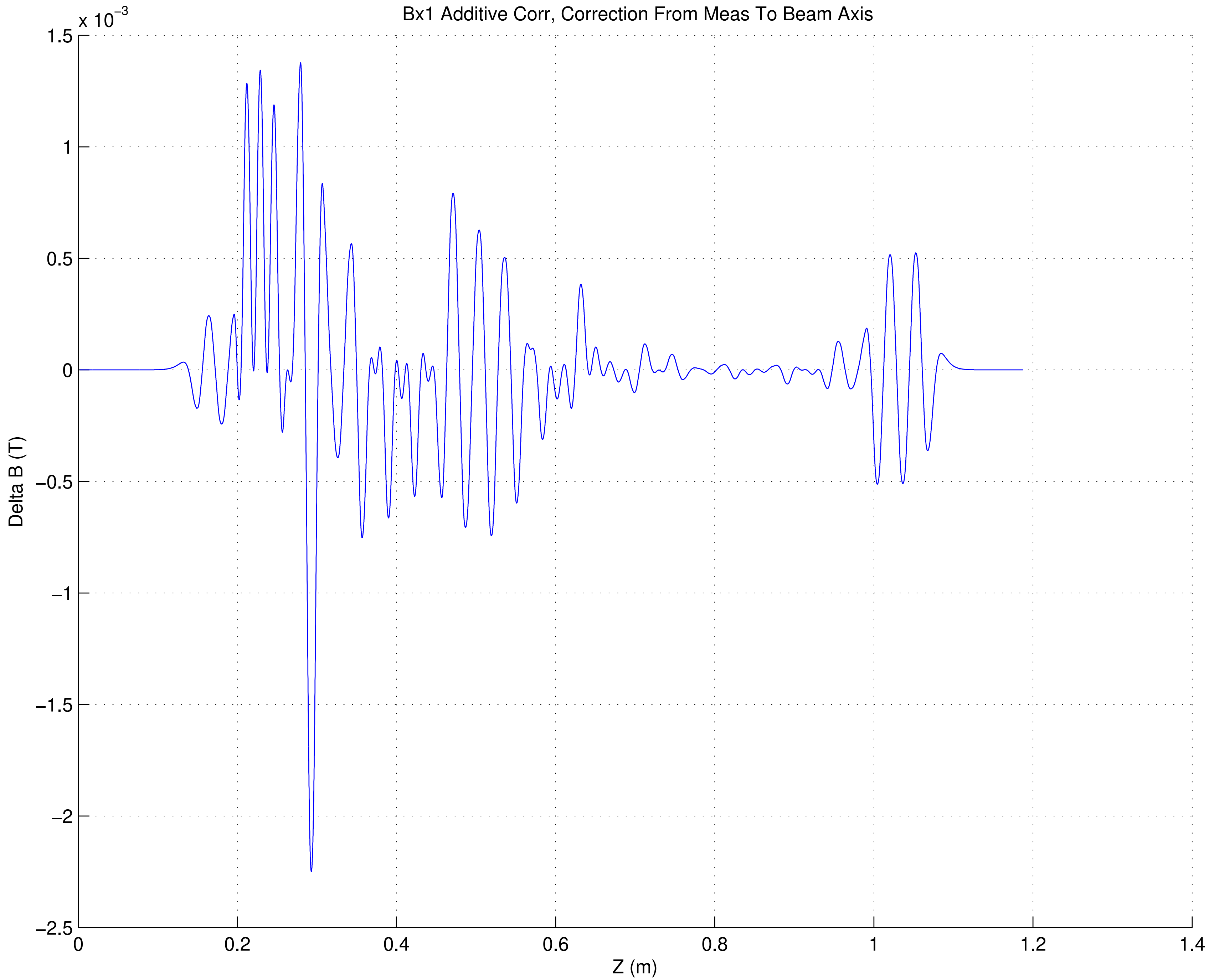


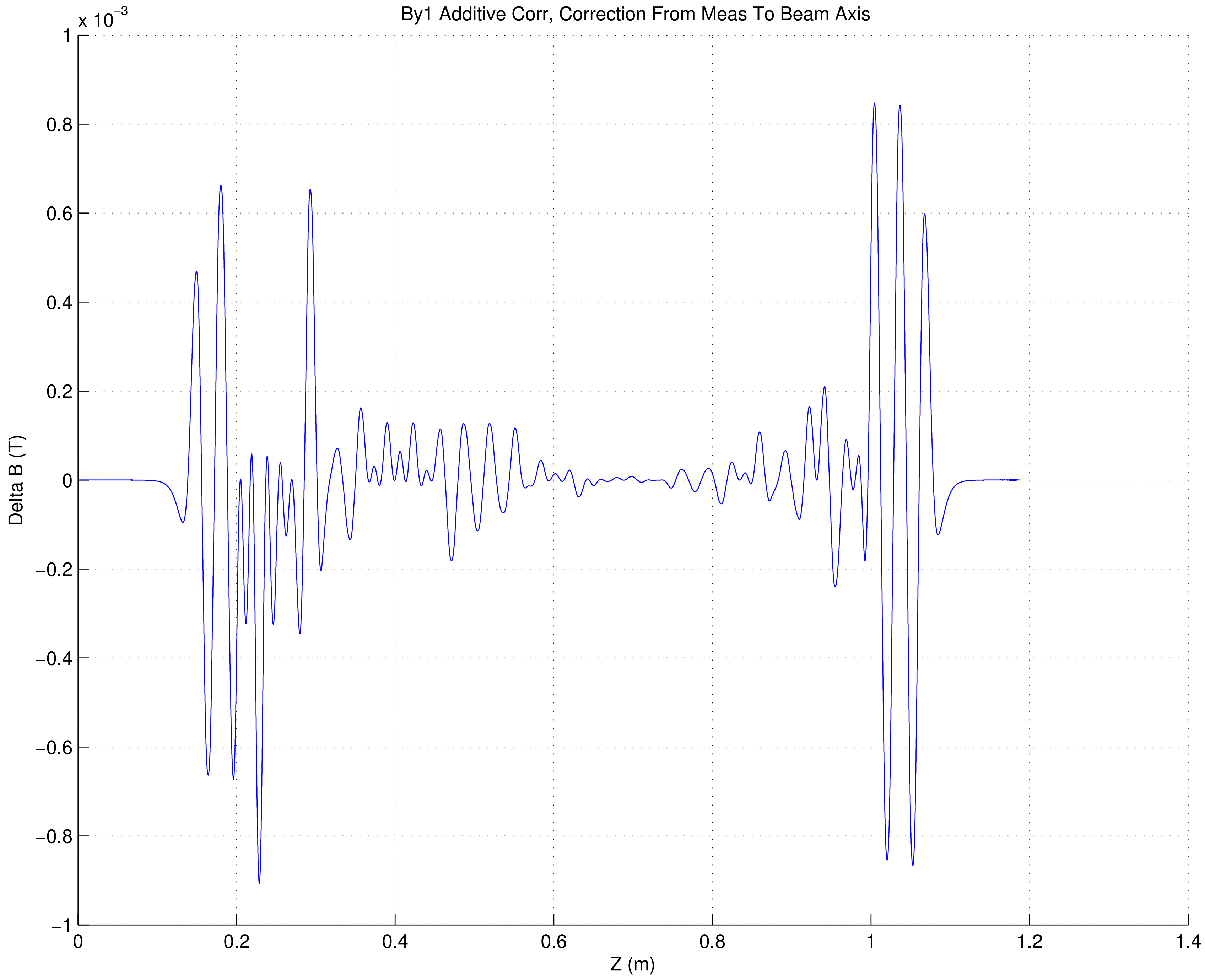
Yc vs Z, Measurement and Fit
x 10^-4
Measurement
Fit
Y
X
0
1
2
0
0.2
0.4
0.6
0.8
1
1.2
1.4



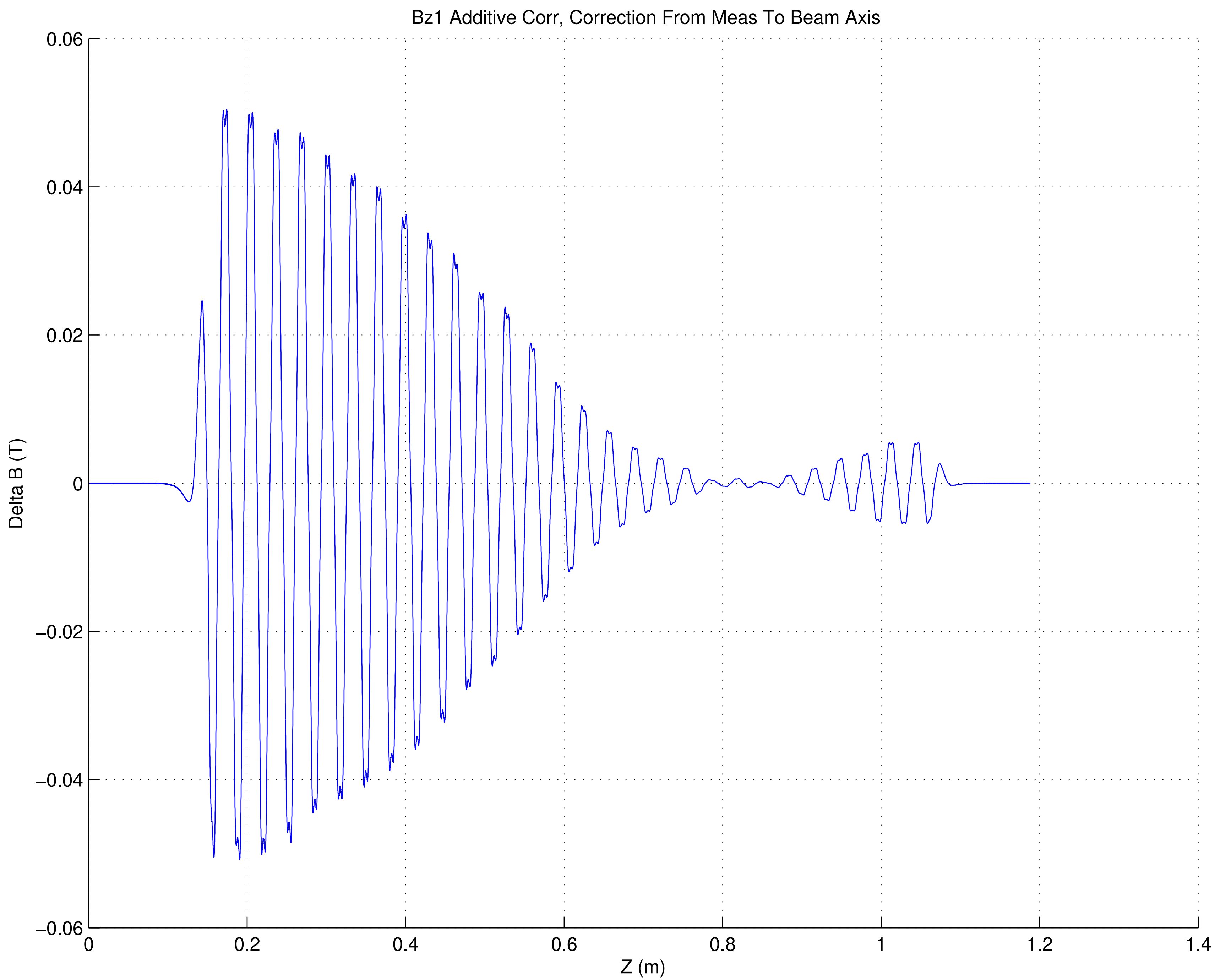
(X1 – Xc) vs Z, Measurement and Fit
x 10^-4
Measurement
Fit
Y
X
6
5
4
3
2
1
0
–1
–2
0
0.2
0.4
0.6
0.8
1
1.2
1.4

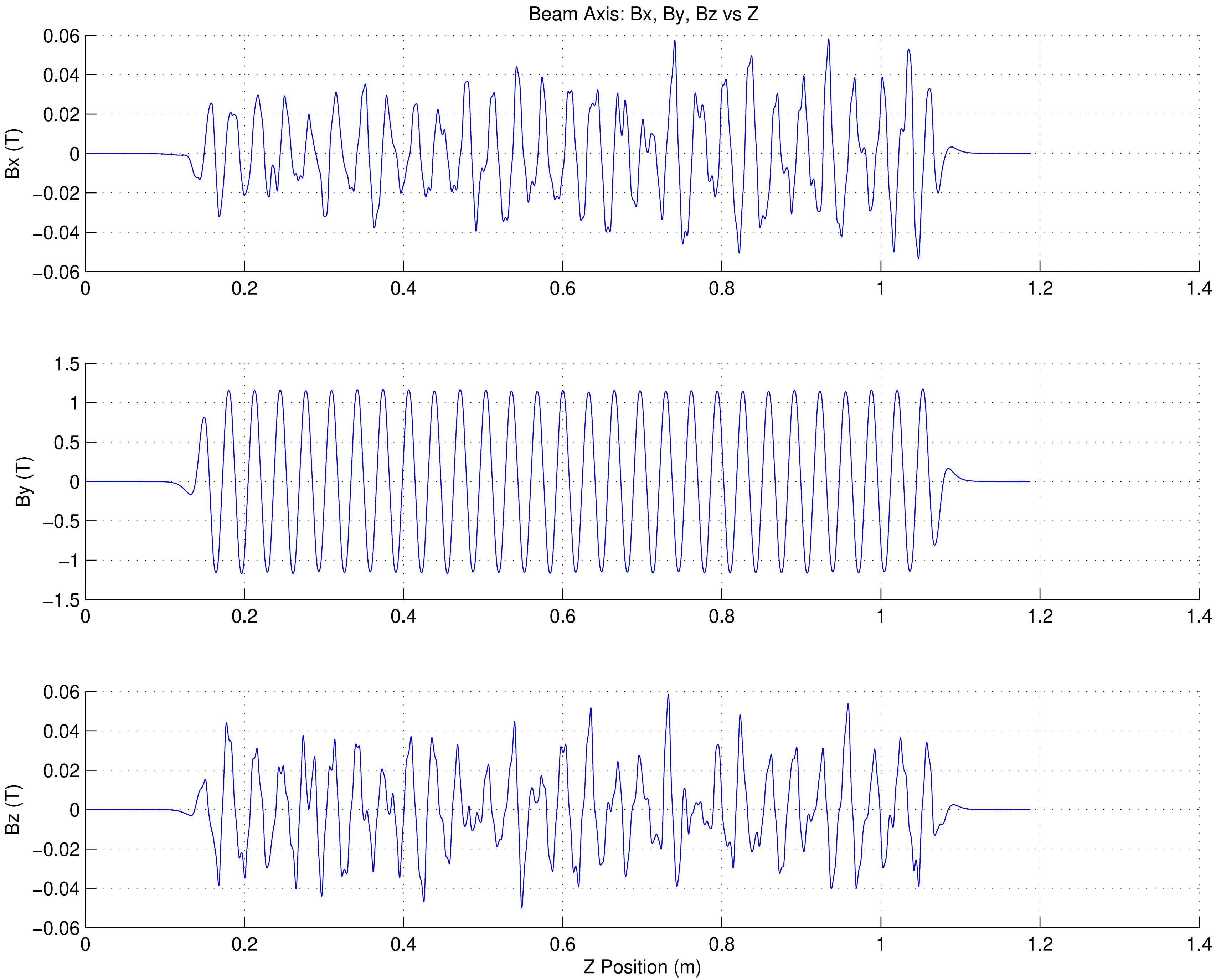

(Y1 − Yc) vs Z, Measurement and Fit
x 10^−4
1
0.5
0
−0.5
−1
−1.5
−2
−2.5
−3
Y
0
0.2
0.4
0.6
0.8
1
1.2
1.4
X
Measurement
Fit


Bx1 Additive Corr, Correction From Meas To Beam Axis
x 10^-3
1.5
1
0.5
0
−0.5
−1
−1.5
−2
−2.5
Delta B (T)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)



By1 Additive Corr, Correction From Meas To Beam Axis
x 10^-3
1
0.8
0.6
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
−1
Delta B (T)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)


Bz1 Additive Corr, Correction From Meas To Beam Axis
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
Delta B (T)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)


Beam Axis: Bx, By, Bz vs Z
Bx (T)
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
By (T)
1.5
1
0.5
0
−0.5
−1
−1.5
Bz (T)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z Position (m)