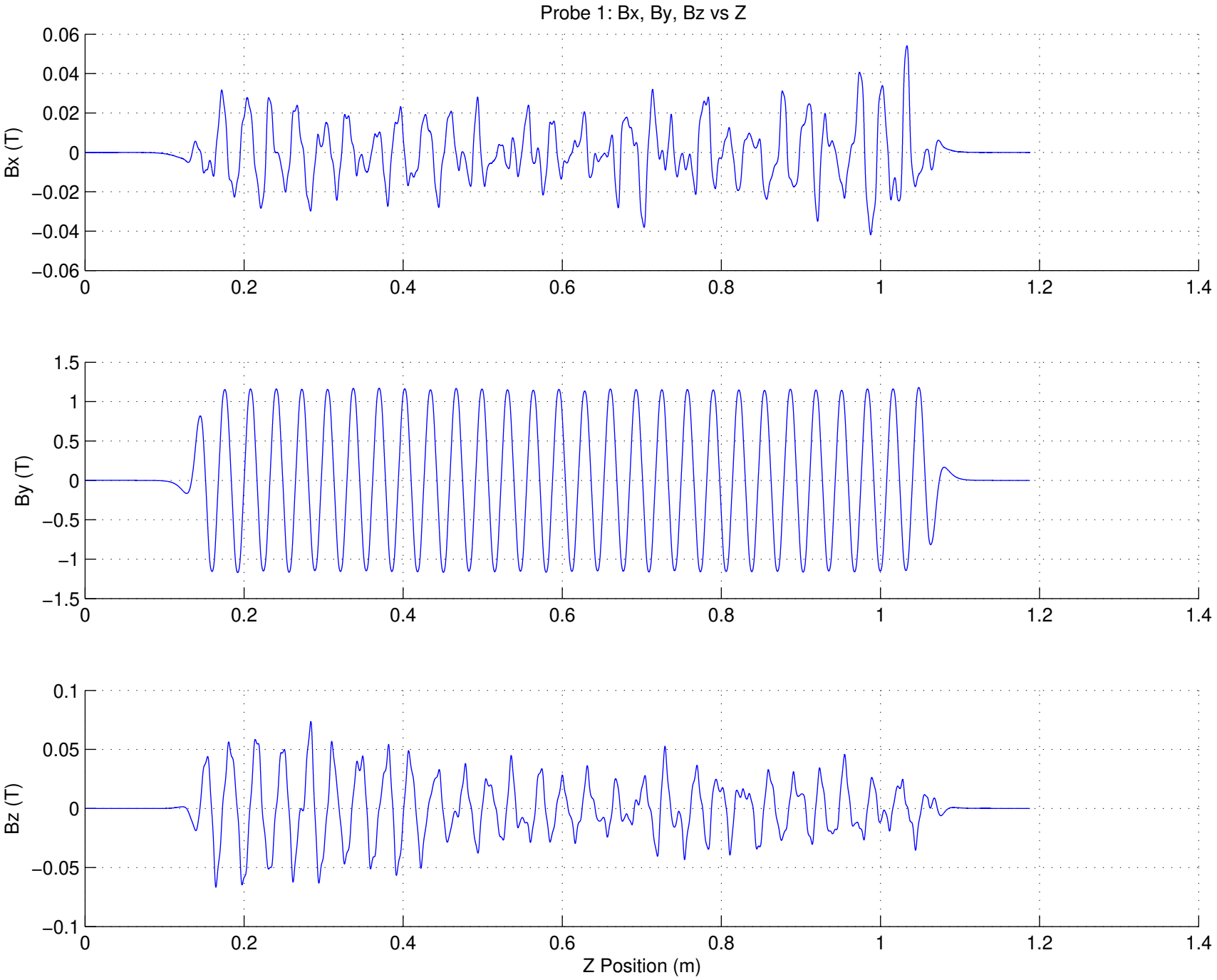
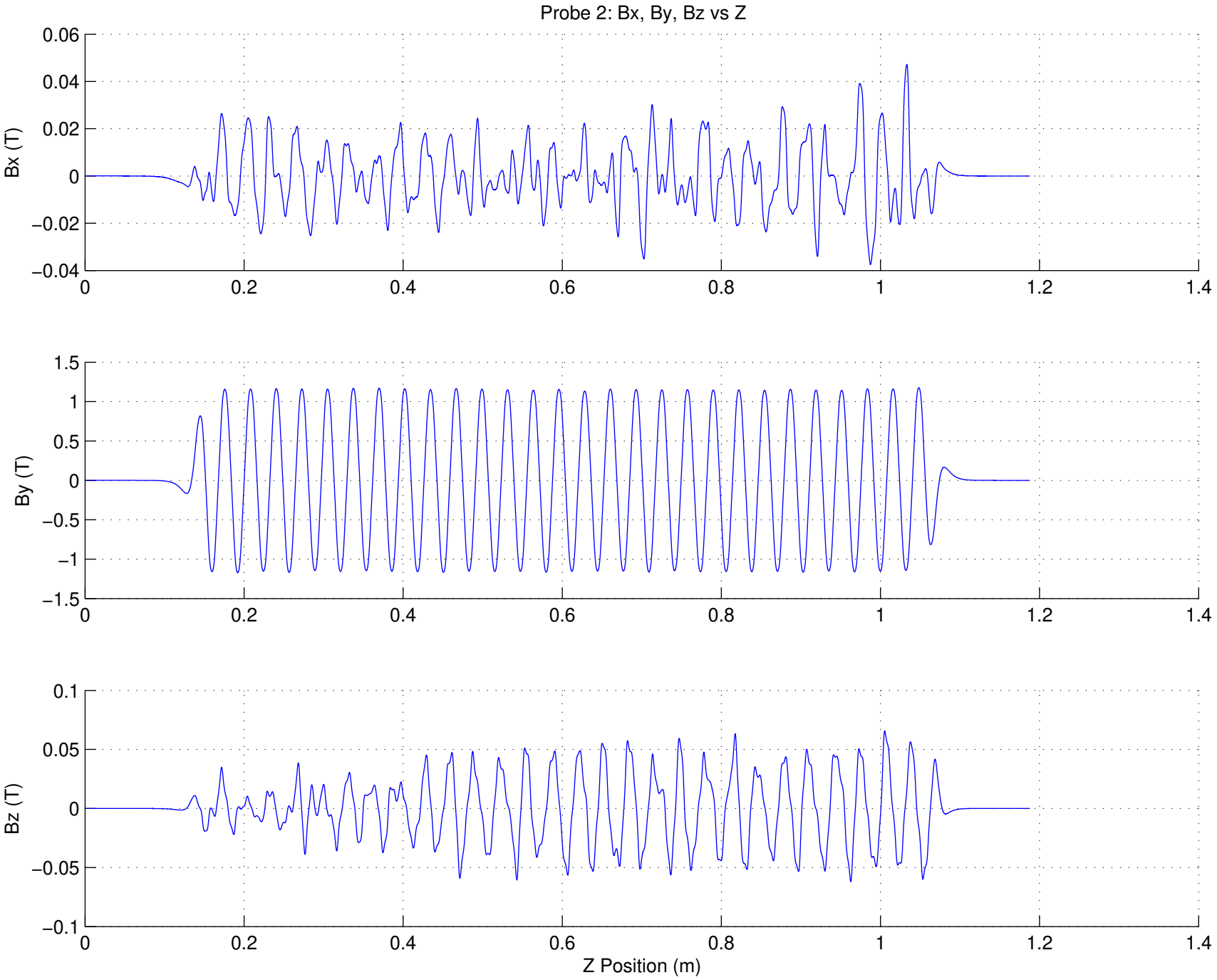
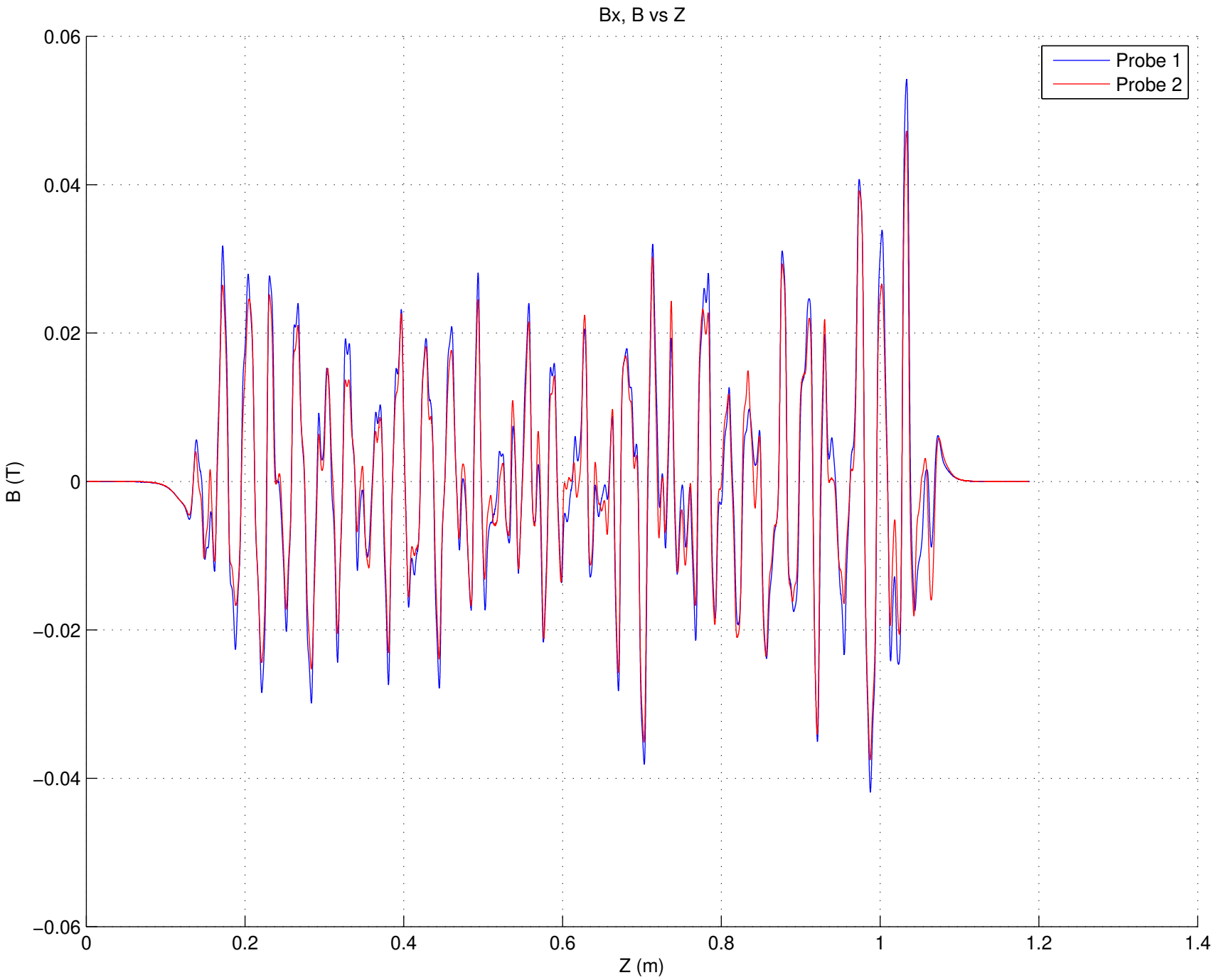
SLAC Magnetic Measurements

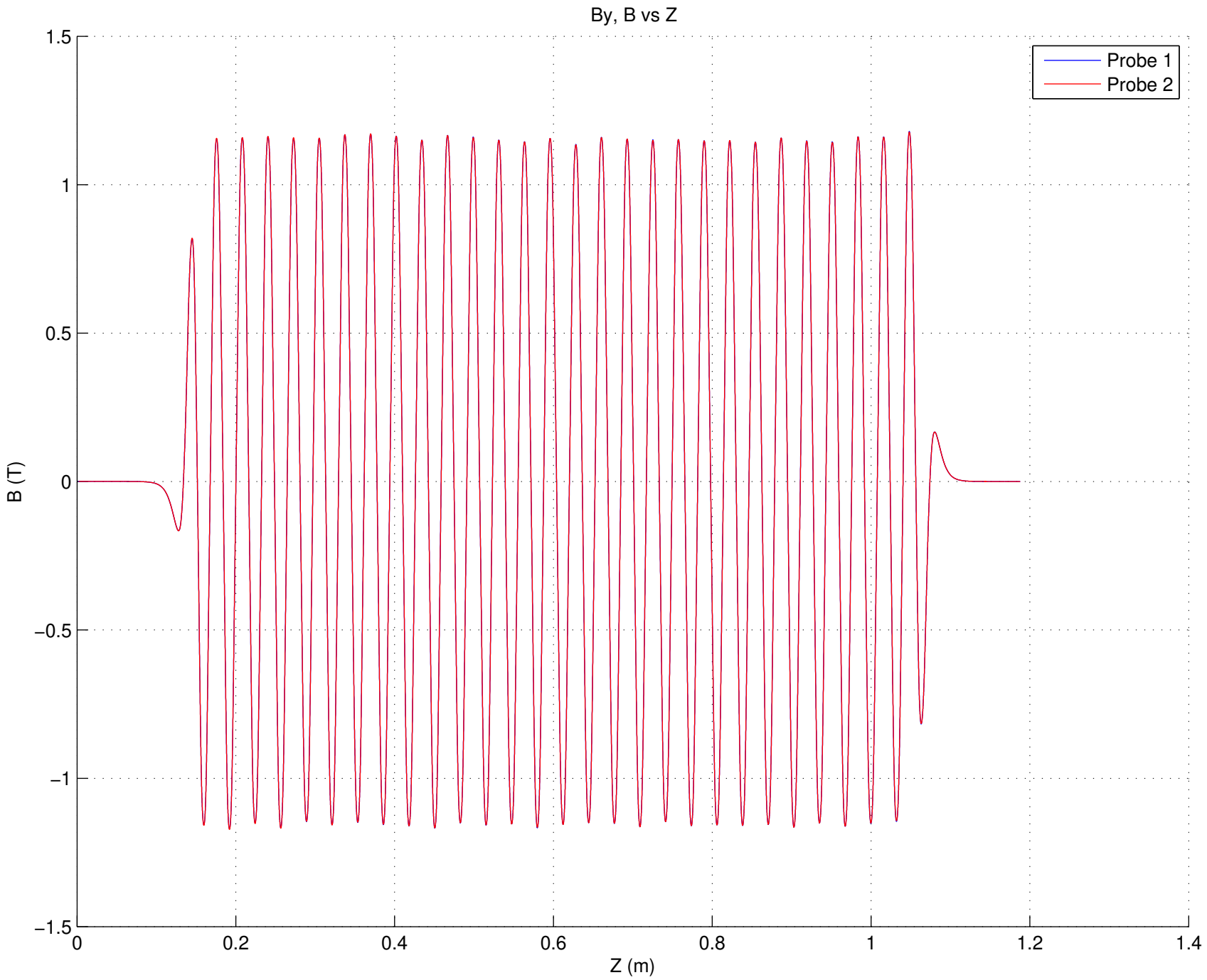
Hall Probe Array Analysis
****

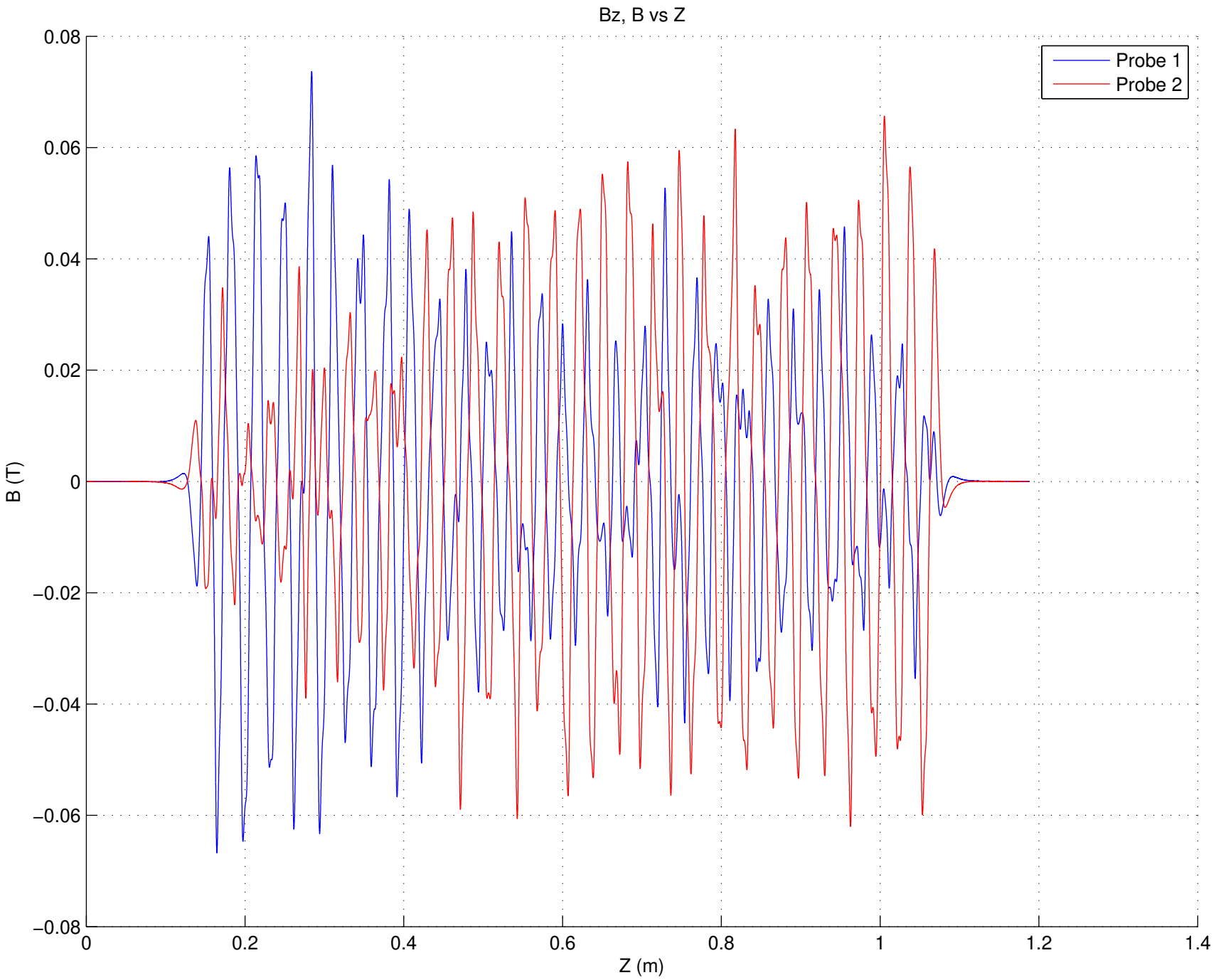
Parameters:
INPUT−FILE−DIR =s:\MagData\LCLS\Undulator\DELTA\Data\Run 531\
INPUT−FILE−NAME =DUTestStep+0.dat
INPUT−FILE−TYPE =ZVXYZVXYZH
UND−POL−MODE =LIN−POL−VERT−FIELD
PROBE1−BX−CALIB−FILE =v:\MET\MagServe\MagData\LCLS\Hall probe\SENIS−119−12\SENIS−119−12−X.ini
PROBE1−BY−CALIB−FILE =v:\MET\MagServe\MagData\LCLS\Hall 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

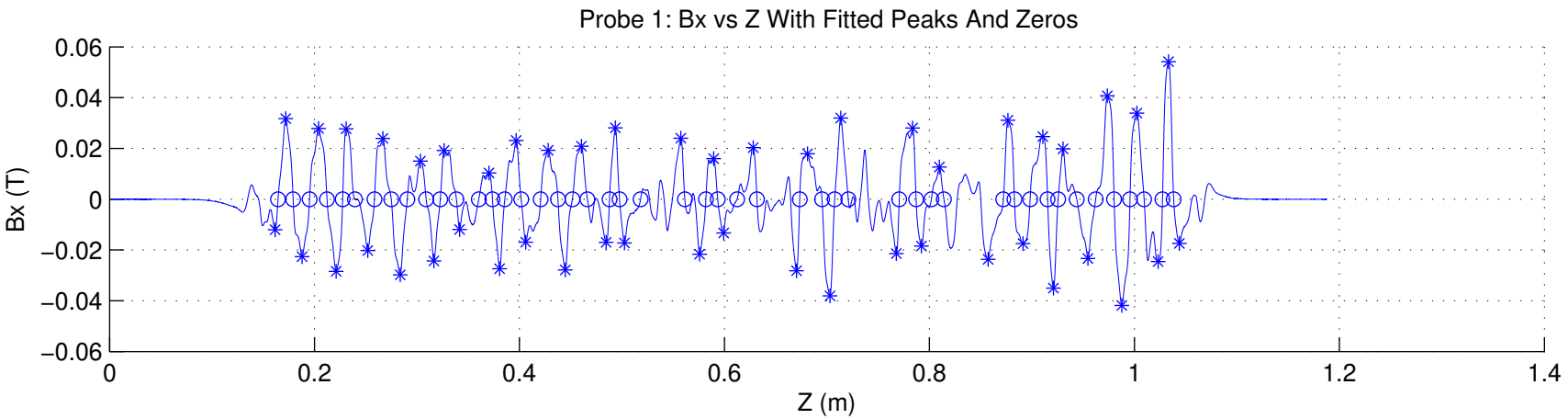

Probe 1: Bx, By, Bz vs Z
Bx (T)
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
By (T)
1.5
1
0.5
0
−0.5
−1
−1.5
Bz (T)
0.1
0.05
0
−0.05
−0.1
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z Position (m)

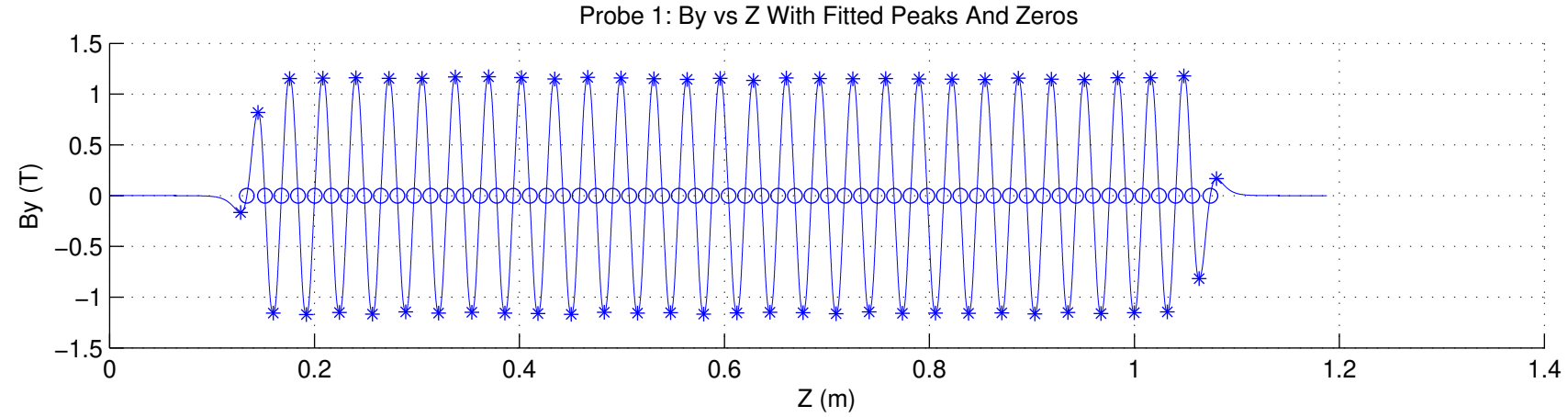

Probe 2: Bx, By, Bz vs Z
Bx (T)
0.06
0.04
0.02
0
−0.02
−0.04
By (T)
1.5
1
0.5
0
−0.5
−1
−1.5
Bz (T)
0.1
0.05
0
−0.05
−0.1
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z Position (m)

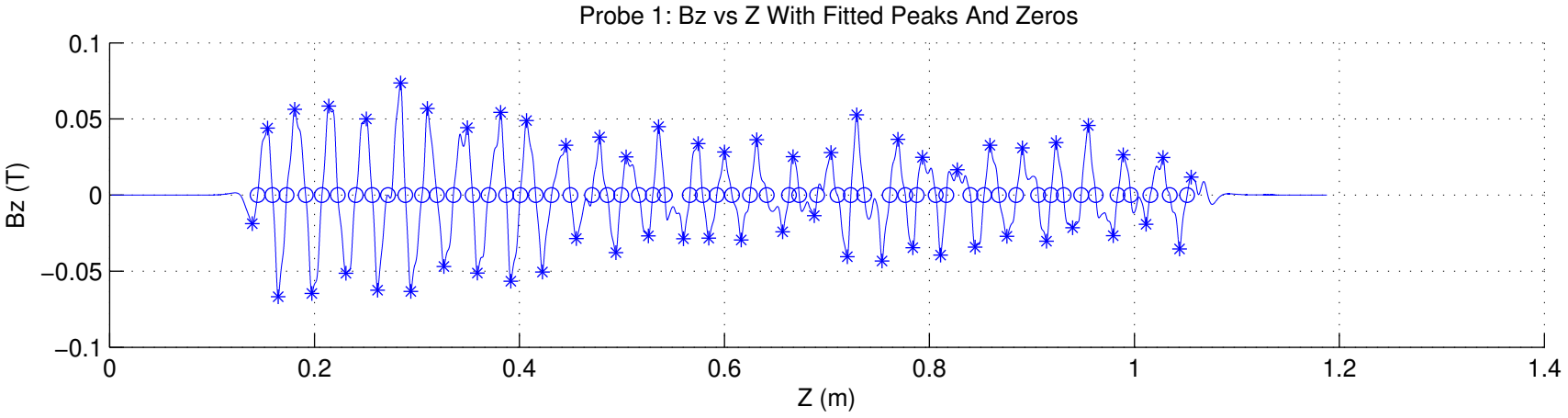

Bx, B vs Z
Probe 1
Probe 2
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
B (T)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)

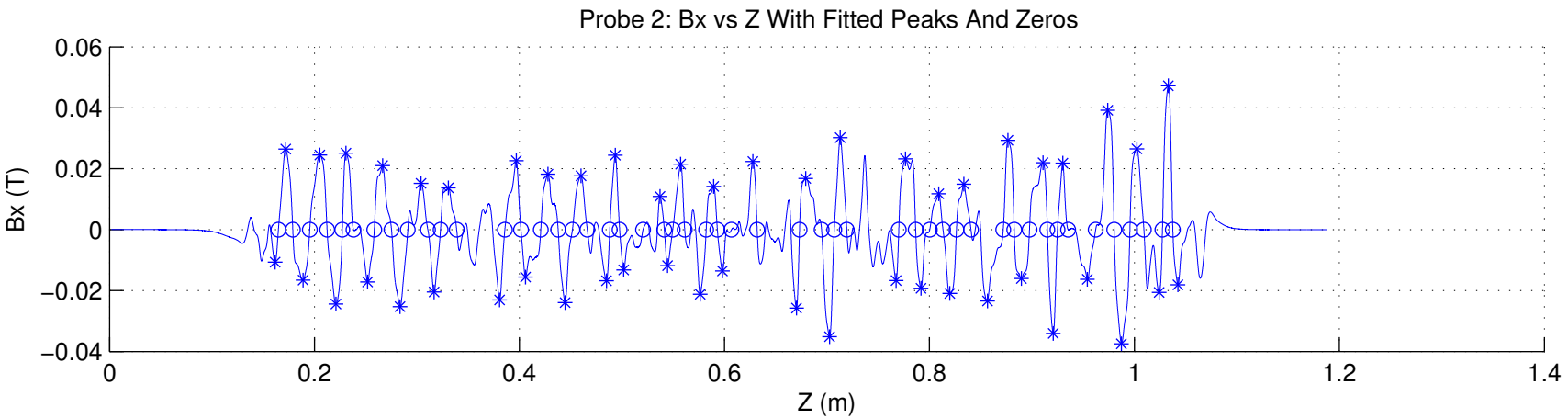

By, B vs Z
Probe 1
Probe 2
B (T)
Z (m)
1.5
1
0.5
0
−0.5
−1
−1.5
0
0.2
0.4
0.6
0.8
1
1.2
1.4

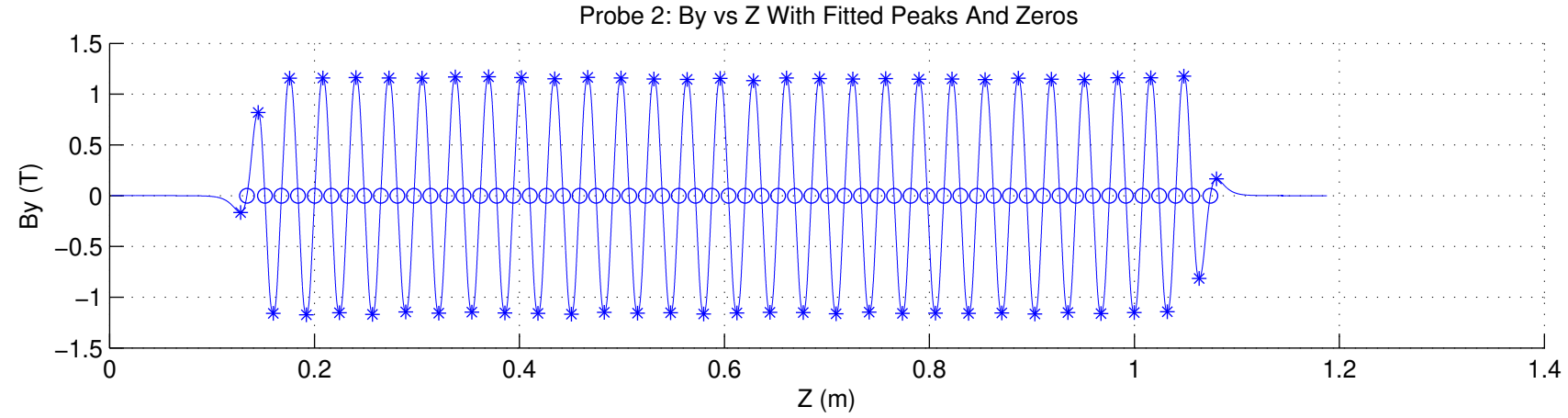

Bz, B vs Z
Probe 1
Probe 2
B (T)
Z (m)
0.08
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
−0.08
0
0.2
0.4
0.6
0.8
1
1.2
1.4

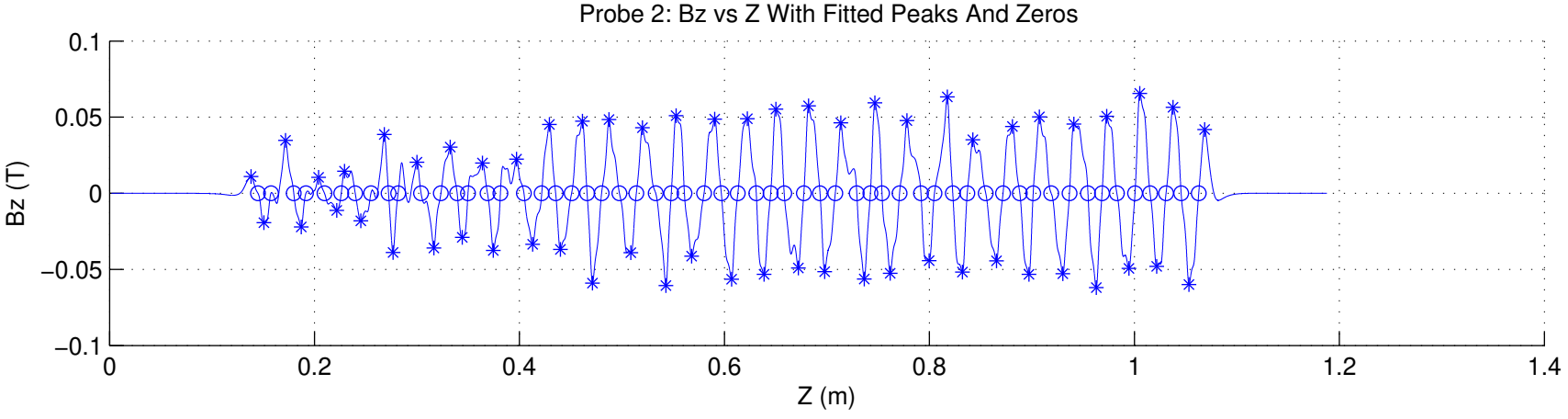

Probe 1: Bx vs Z With Fitted Peaks And Zeros
Bx (T)
Z (m)
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
0
0.2
0.4
0.6
0.8
1
1.2
1.4

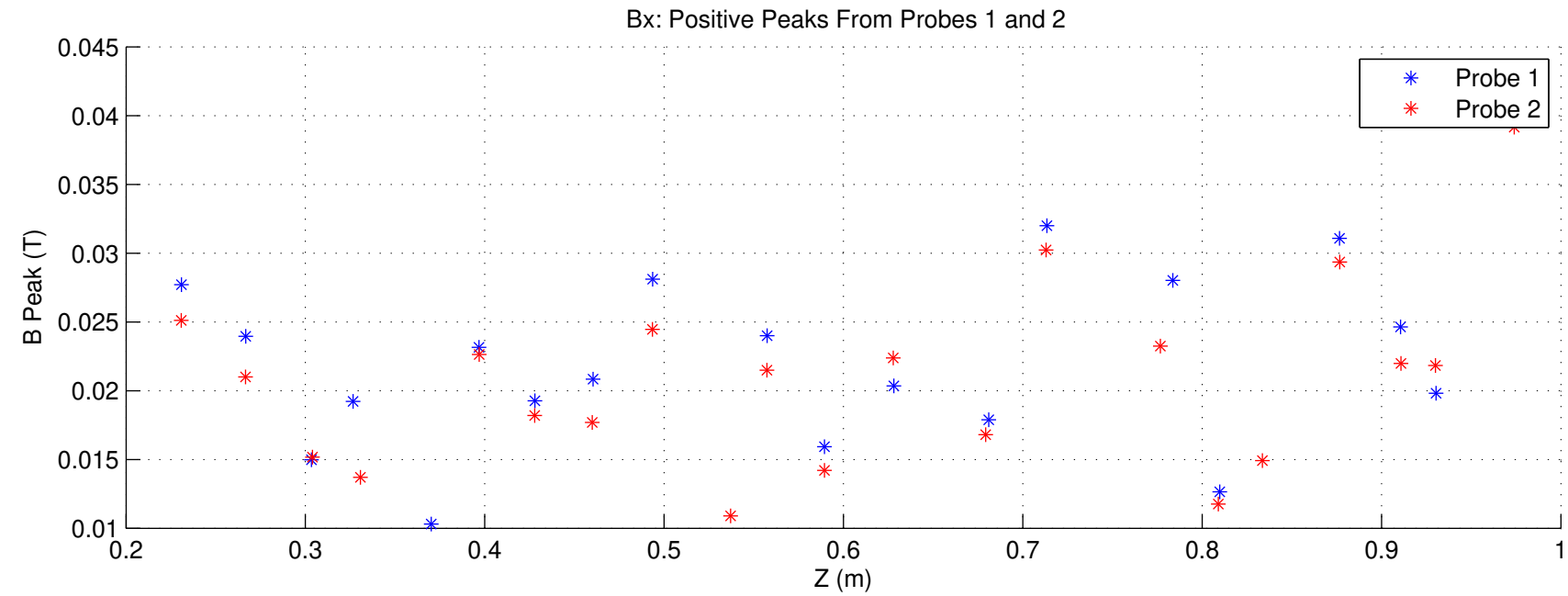

Probe 1: By vs Z With Fitted Peaks And Zeros
By (T)
Z (m)
1.5
1
0.5
0
−0.5
−1
−1.5
0
0.2
0.4
0.6
0.8
1
1.2
1.4

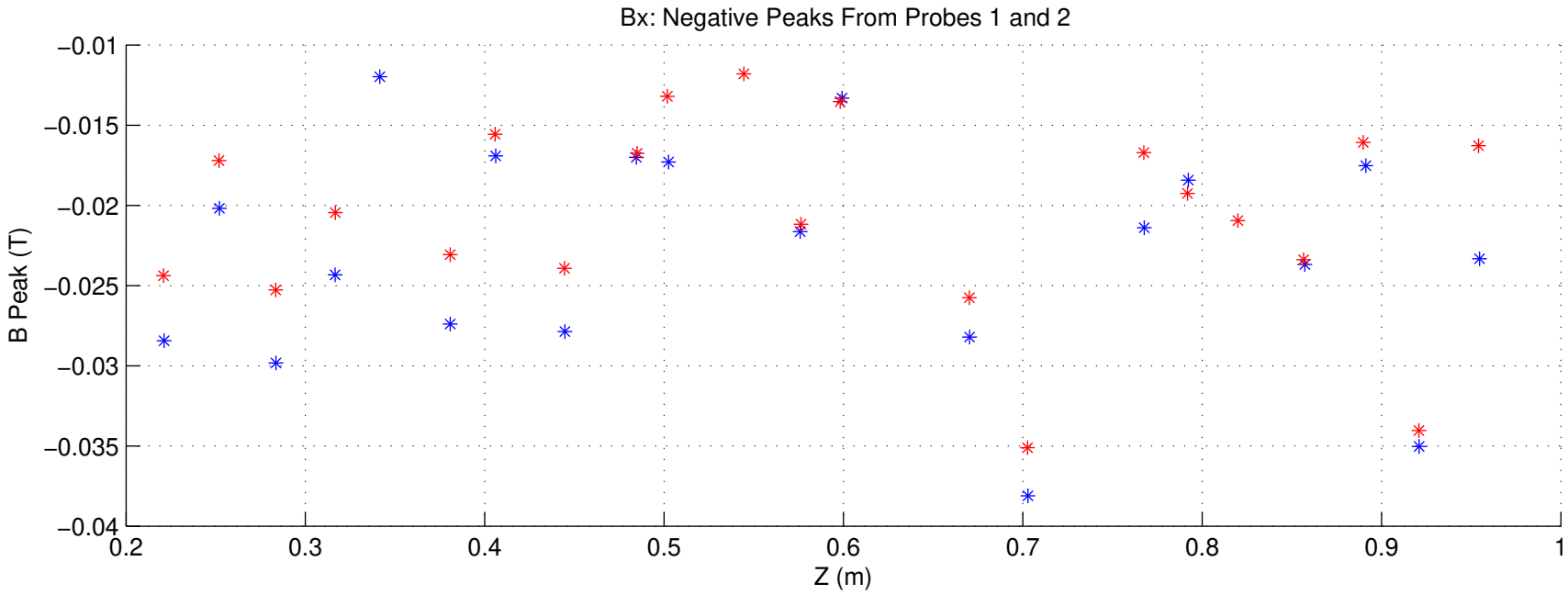

Probe 1: Bz vs Z With Fitted Peaks And Zeros
Bz (T)
Z (m)
0.1
0.05
0
−0.05
−0.1
0
0.2
0.4
0.6
0.8
1
1.2
1.4

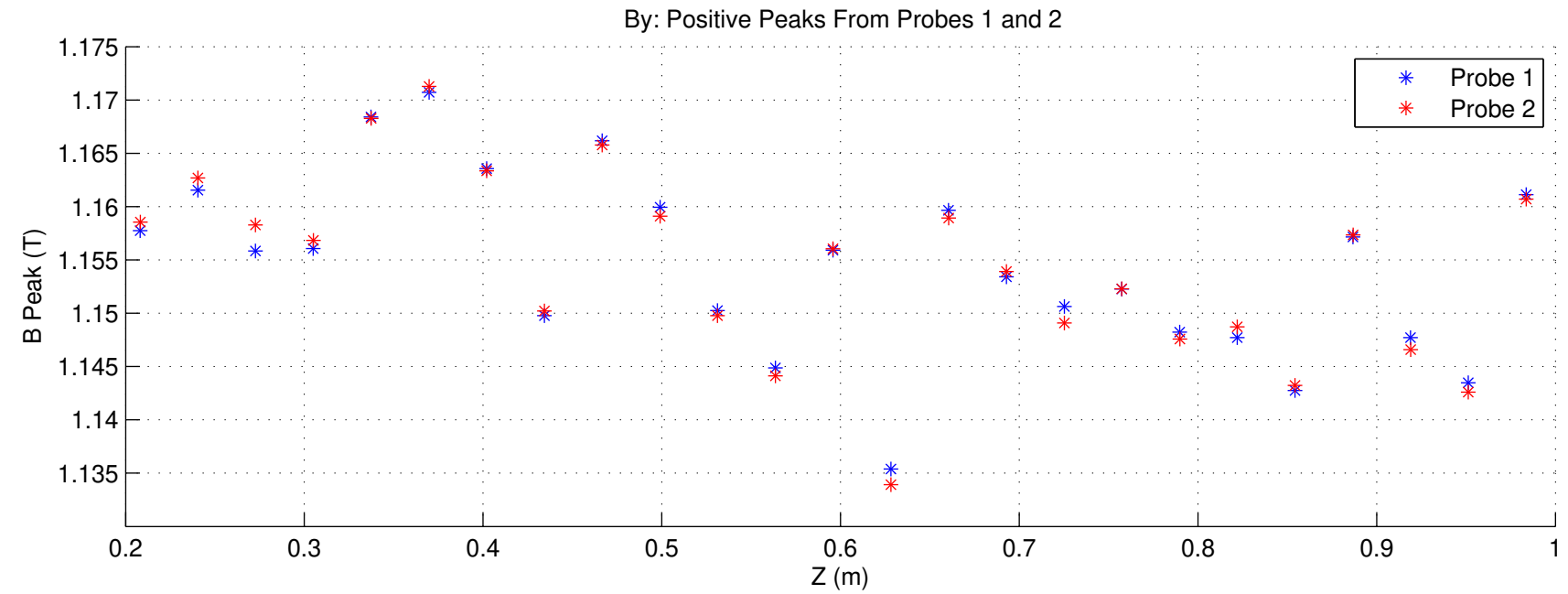

Probe 2: Bx vs Z With Fitted Peaks And Zeros
Bx (T)
Z (m)
0.06
0.04
0.02
0
−0.02
−0.04
0
0.2
0.4
0.6
0.8
1
1.2
1.4

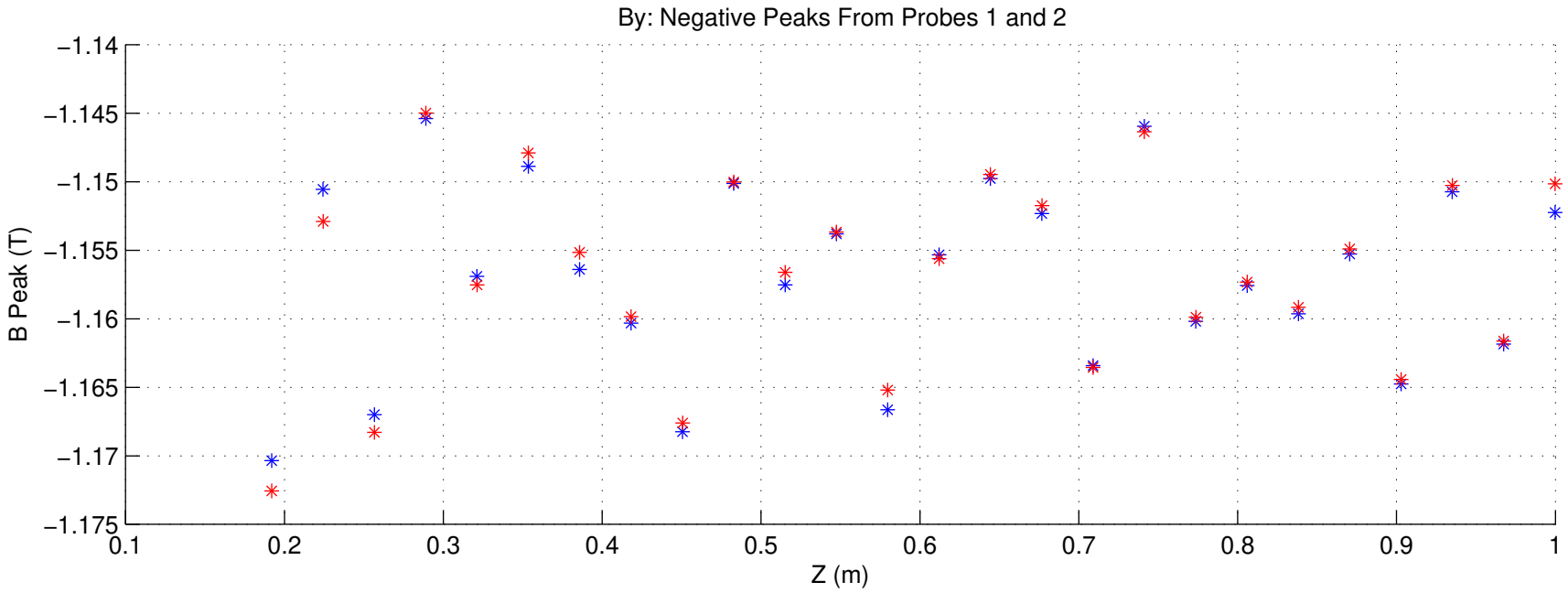

Probe 2: By vs Z With Fitted Peaks And Zeros
By (T)
Z (m)
1.5
1
0.5
0
−0.5
−1
−1.5
0
0.2
0.4
0.6
0.8
1
1.2
1.4

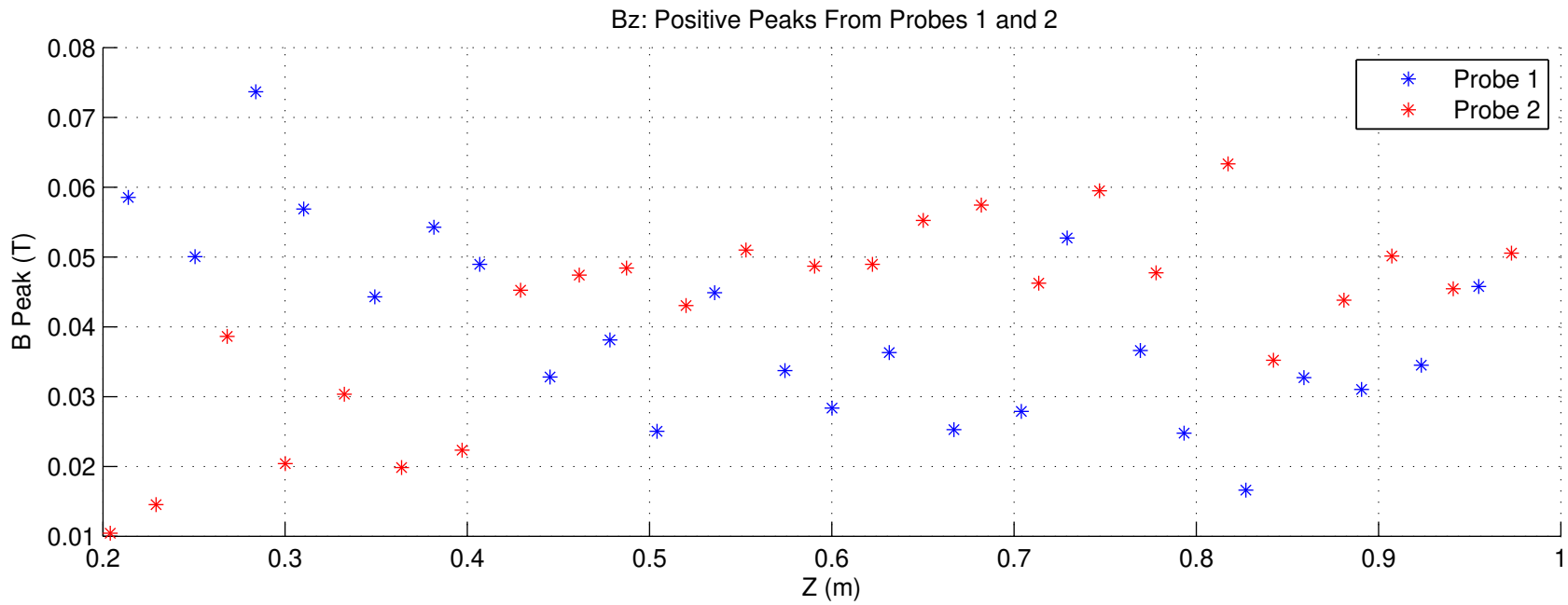

Probe 2: Bz vs Z With Fitted Peaks And Zeros
Bz (T)
Z (m)
0.1
0.05
0
−0.05
−0.1
0
0.2
0.4
0.6
0.8
1
1.2
1.4

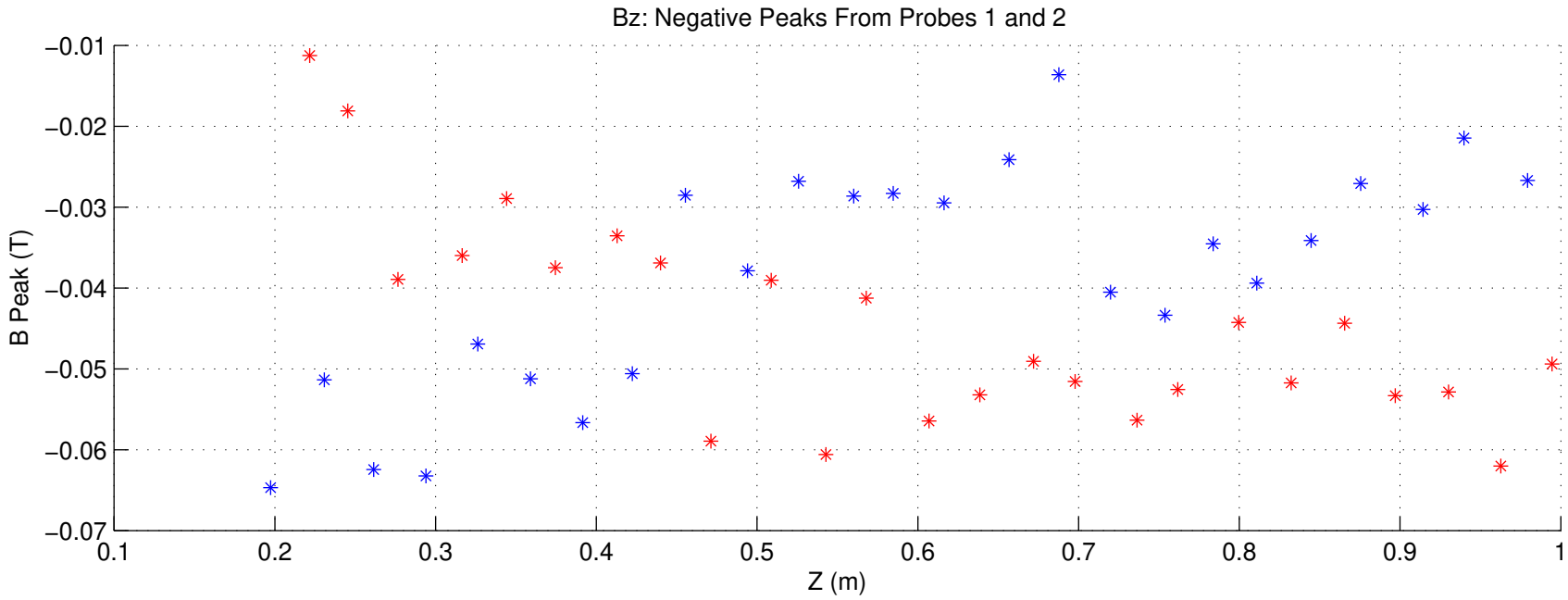

Bx: Positive Peaks From Probes 1 and 2
Probe 1
Probe 2
B Peak (T)
Z (m)
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

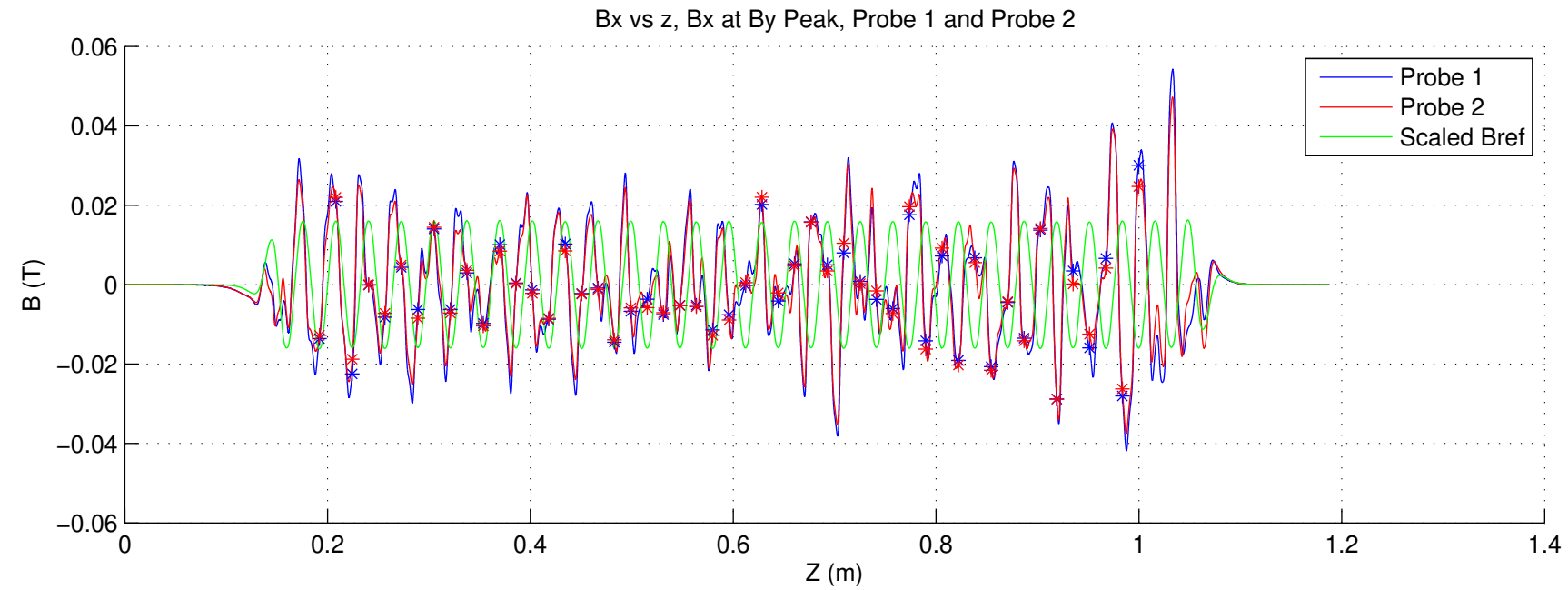

Bx: Negative Peaks From Probes 1 and 2
B Peak (T)
Z (m)
−0.01
−0.015
−0.02
−0.025
−0.03
−0.035
−0.04
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

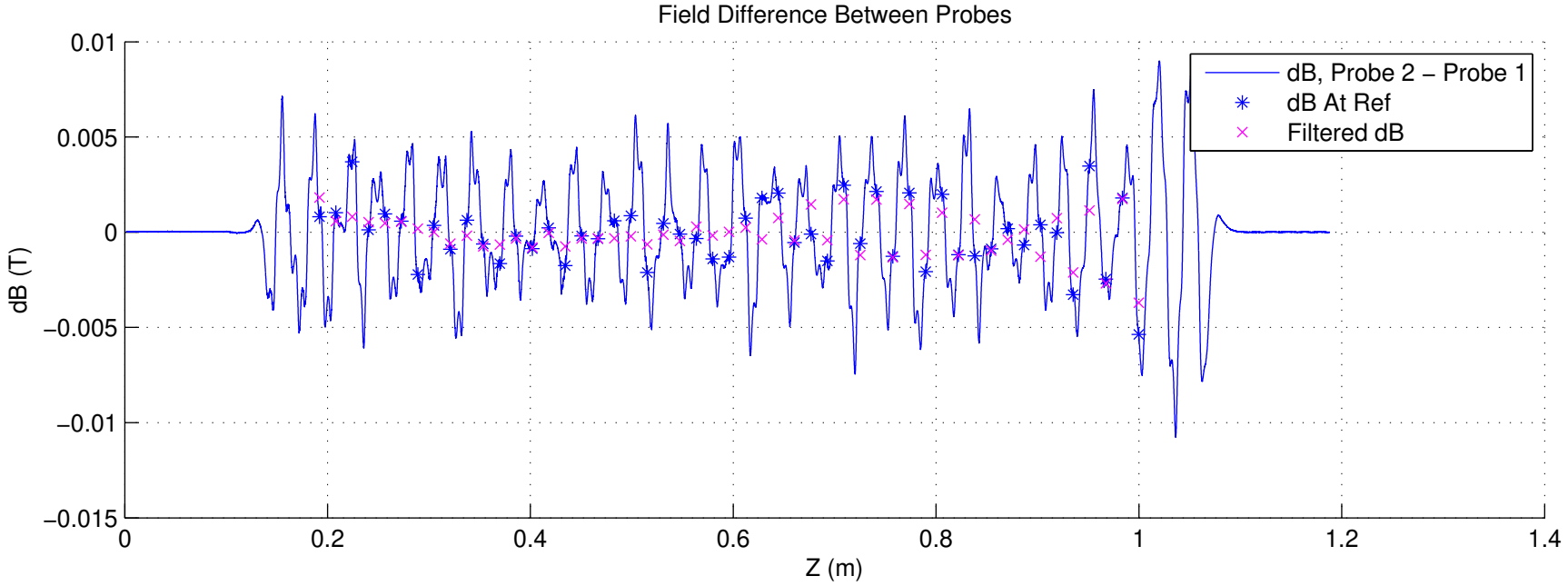

By: Positive Peaks From Probes 1 and 2
Probe 1
Probe 2
B Peak (T)
Z (m)
1.175
1.17
1.165
1.16
1.155
1.15
1.145
1.14
1.135
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

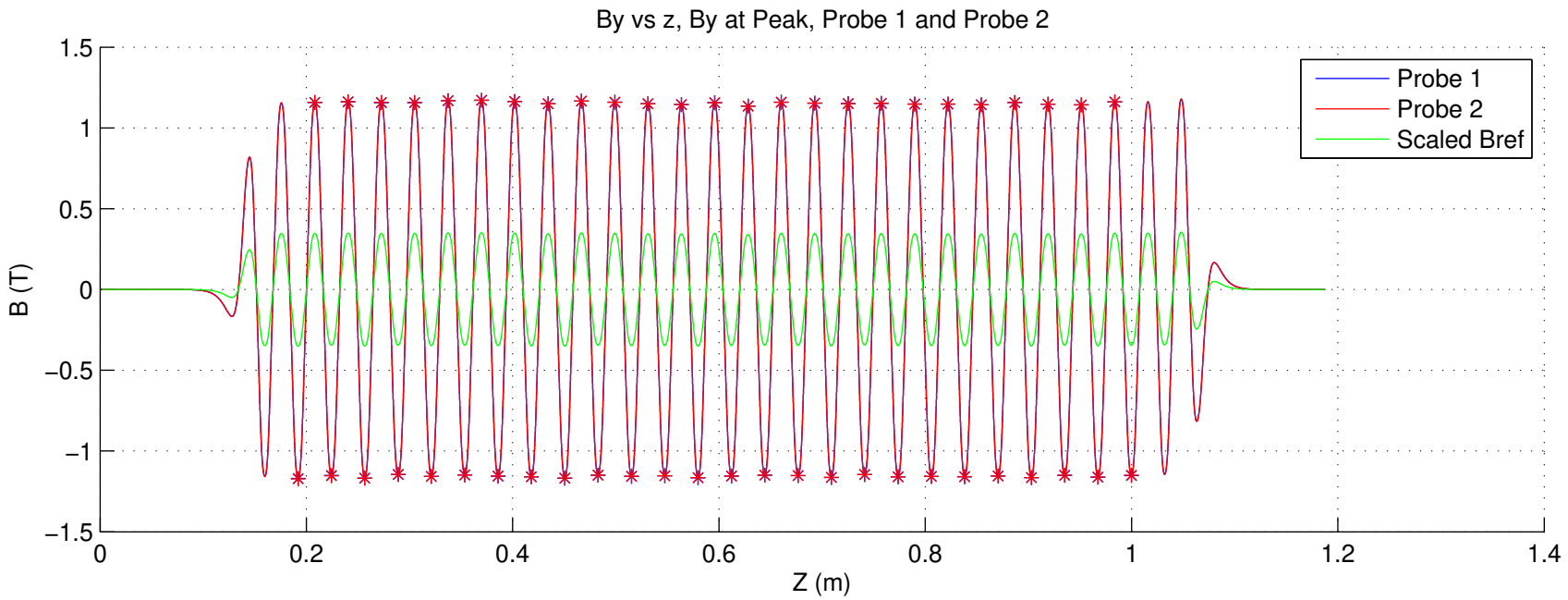

By: Negative Peaks From Probes 1 and 2
B Peak (T)
Z (m)
−1.14
−1.145
−1.15
−1.155
−1.16
−1.165
−1.17
−1.175
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

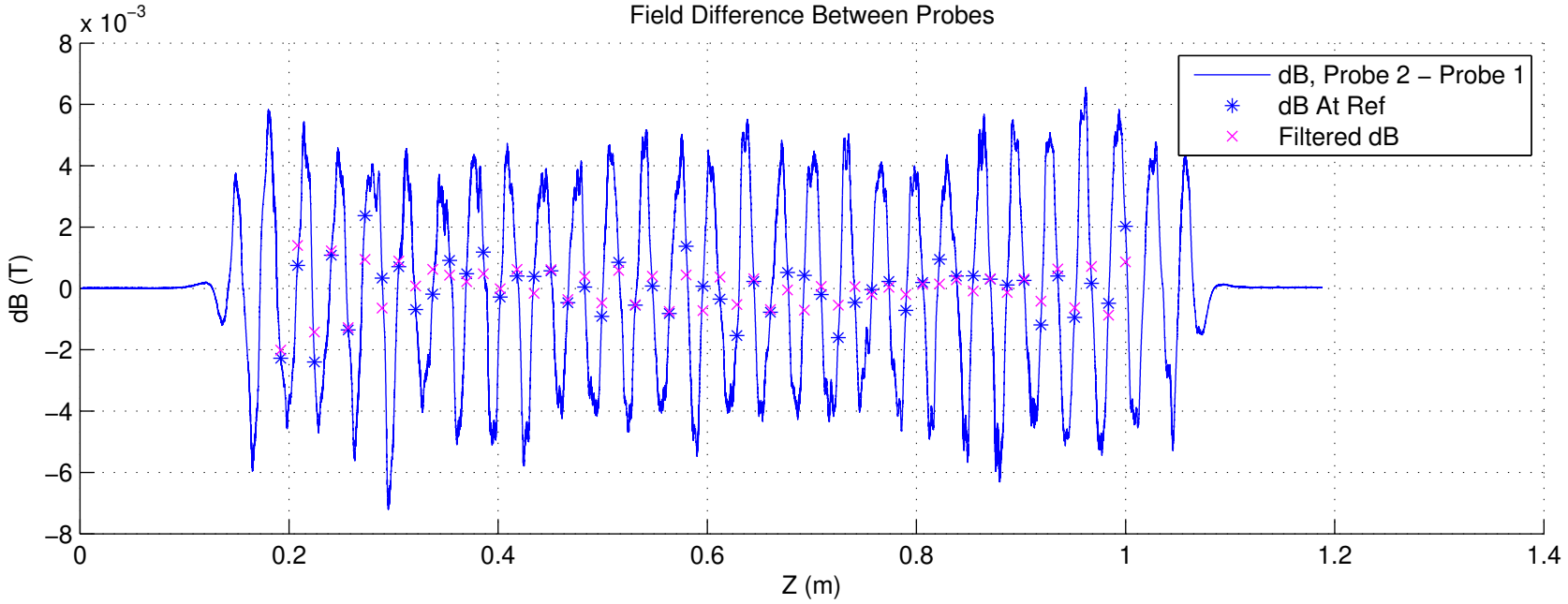

Bz: Positive Peaks From Probes 1 and 2
Probe 1
Probe 2
B Peak (T)
Z (m)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

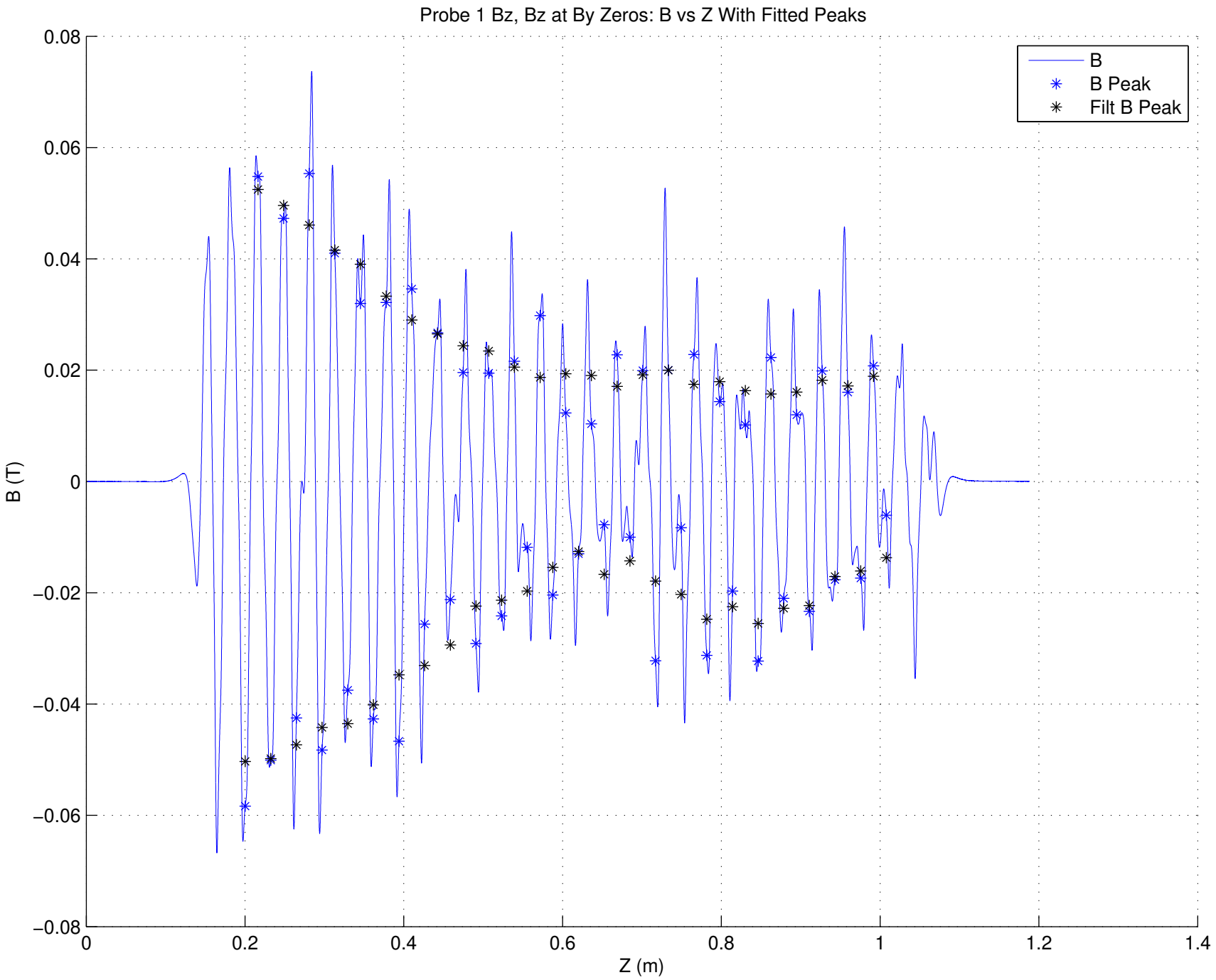

Bz: Negative Peaks From Probes 1 and 2
B Peak (T)
Z (m)
−0.01
−0.02
−0.03
−0.04
−0.05
−0.06
−0.07
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

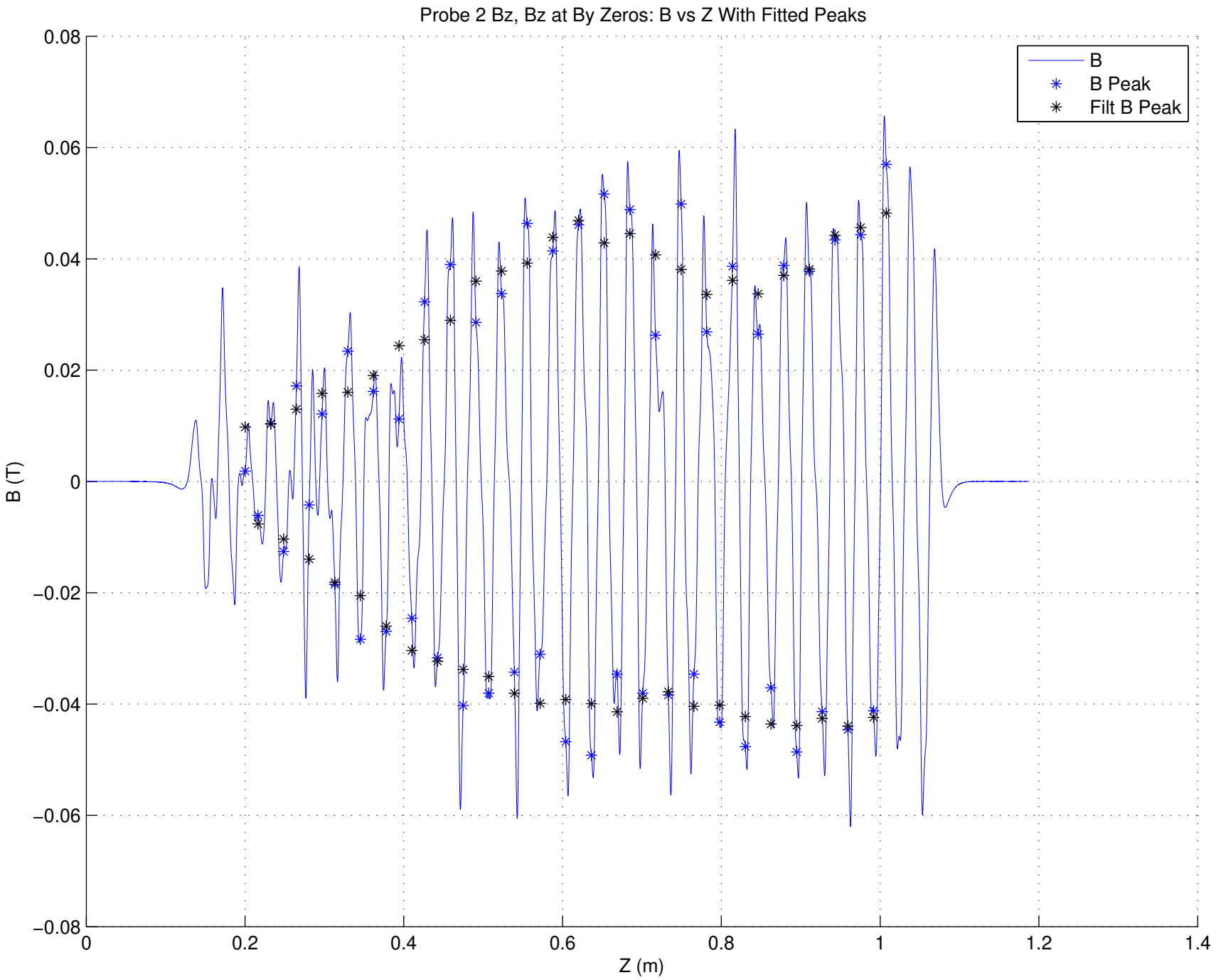

Bx vs z, Bx at By Peak, Probe 1 and Probe 2
Probe 1
Probe 2
Scaled Bref
B (T)
Z (m)
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
0
0.2
0.4
0.6
0.8
1
1.2
1.4

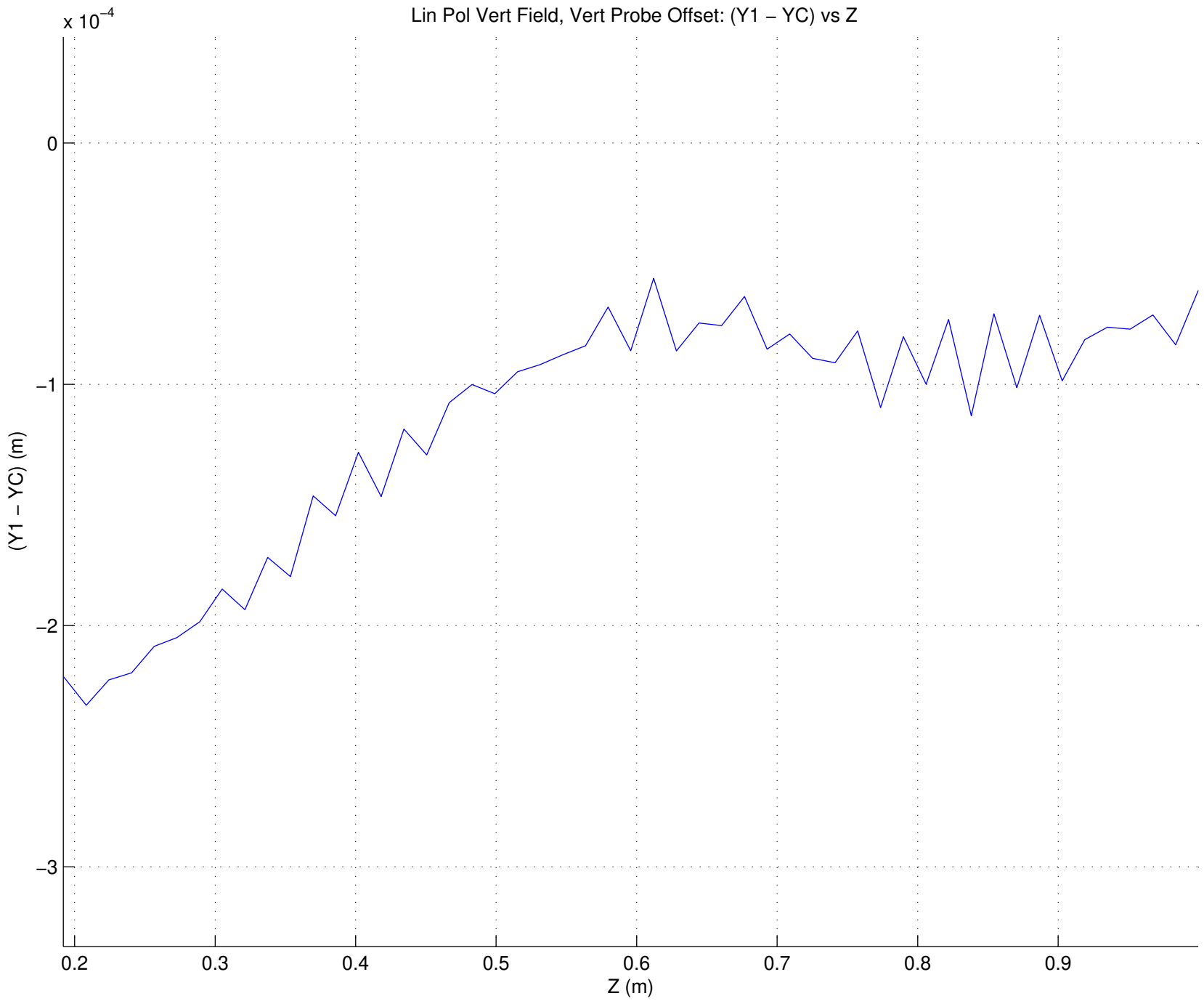

Field Difference Between Probes
dB, Probe 2 – Probe 1
dB At Ref
Filtered dB
dB (T)
Z (m)
0.01
0.005
0
−0.005
−0.01
−0.015
0
0.2
0.4
0.6
0.8
1
1.2
1.4

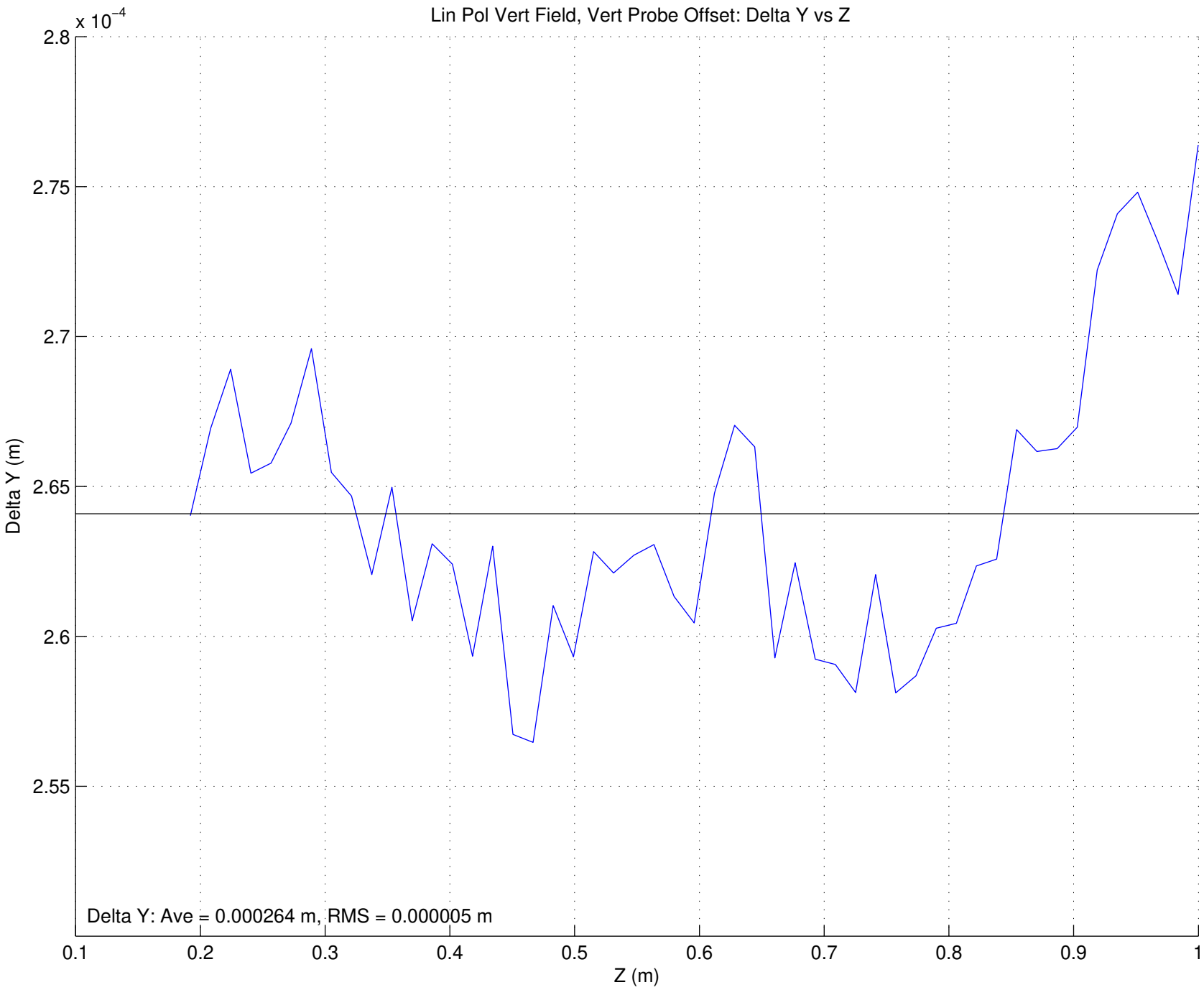

By vs z, By at Peak, Probe 1 and Probe 2
Probe 1
Probe 2
Scaled Bref
B (T)
Z (m)
1.5
1
0.5
0
−0.5
−1
−1.5
0
0.2
0.4
0.6
0.8
1
1.2
1.4

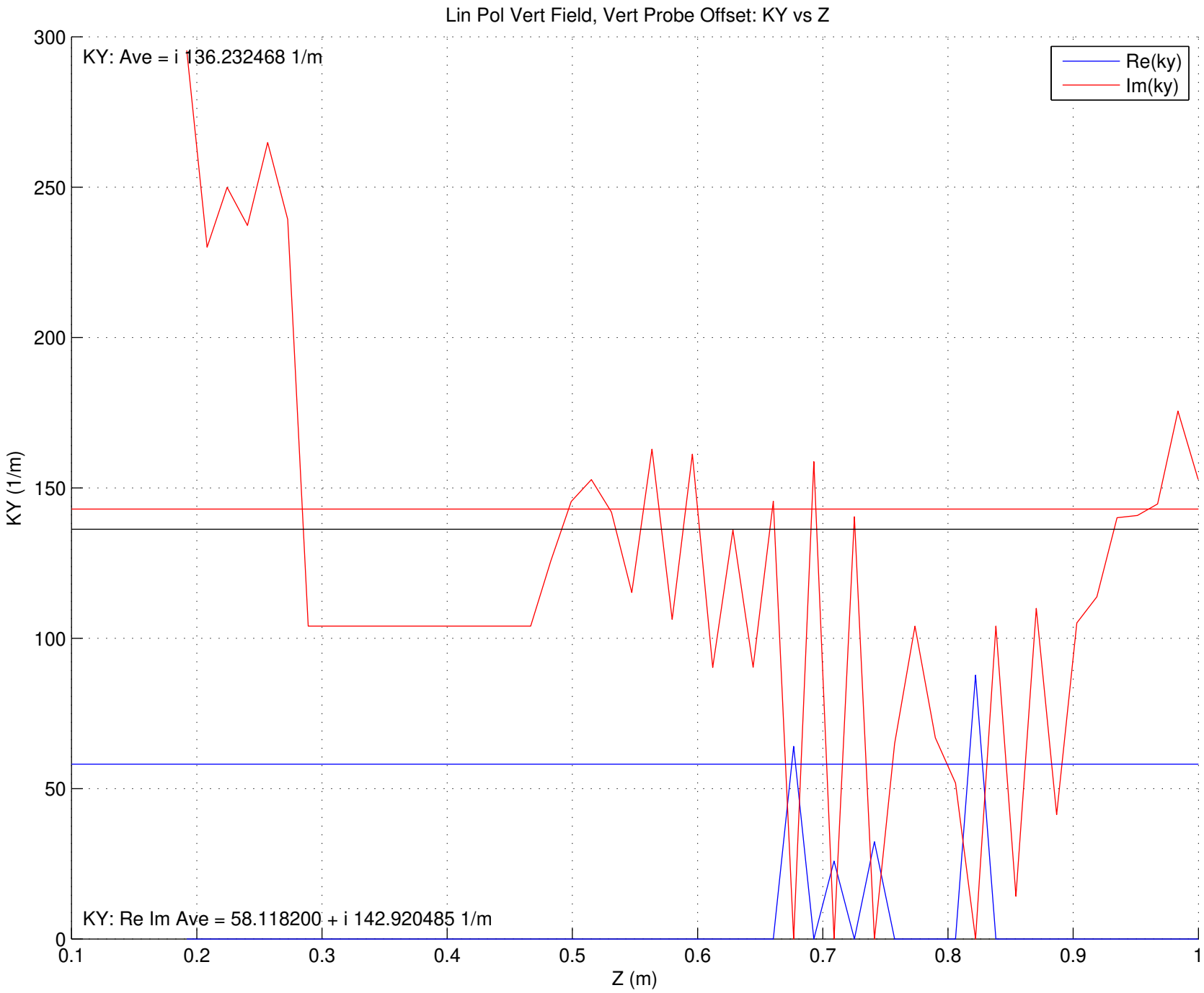

Field Difference Between Probes
x 10^-3
dB, Probe 2 – Probe 1
dB At Ref
Filtered dB
dB (T)
Z (m)
8
6
4
2
0
−2
−4
−6
−8
0
0.2
0.4
0.6
0.8
1
1.2
1.4

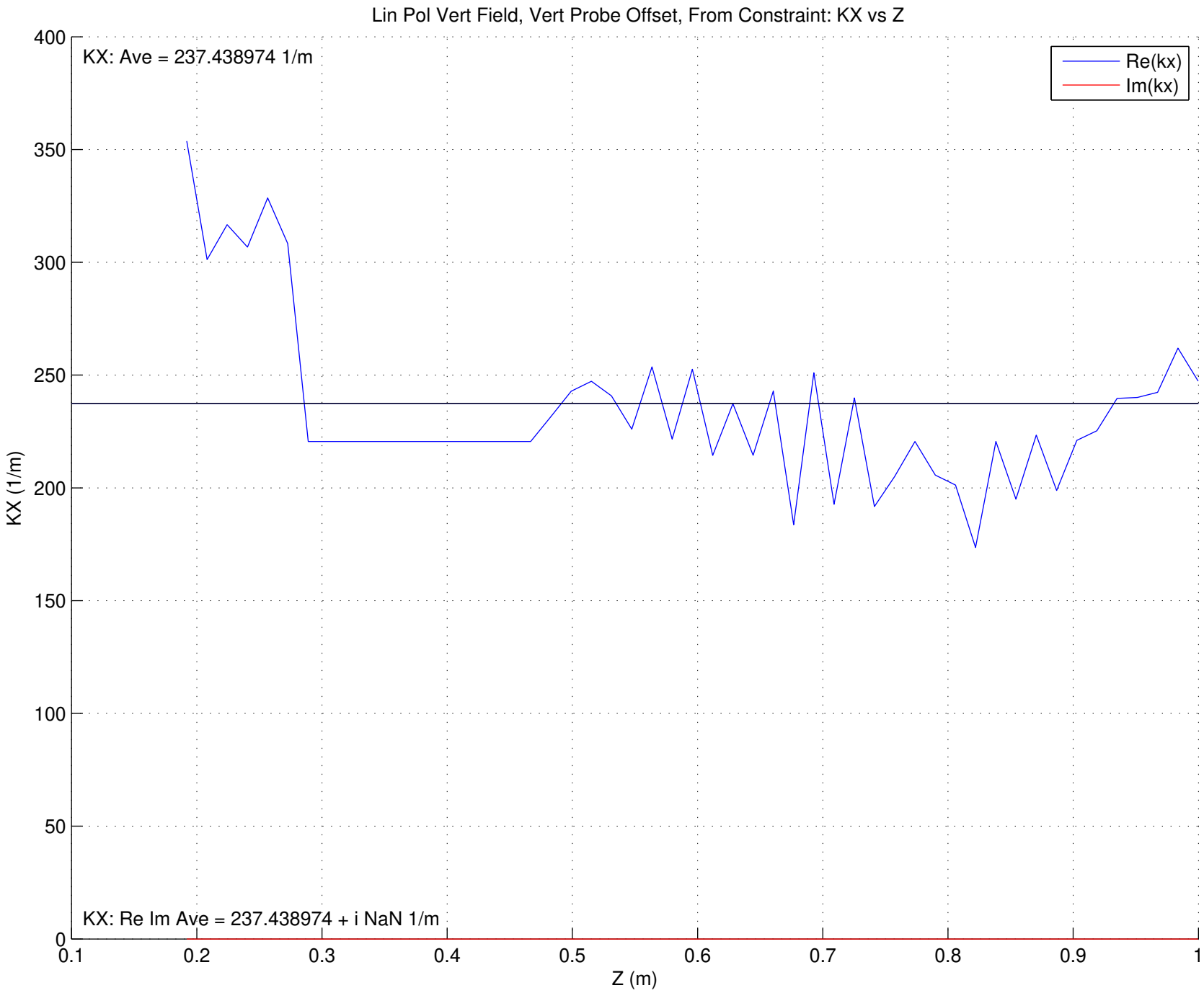

Probe 1 Bz, Bz at By Zeros: B vs Z With Fitted Peaks
B
B Peak
Filt B Peak
B (T)
Z (m)
0.08
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
−0.08
0
0.2
0.4
0.6
0.8
1
1.2
1.4

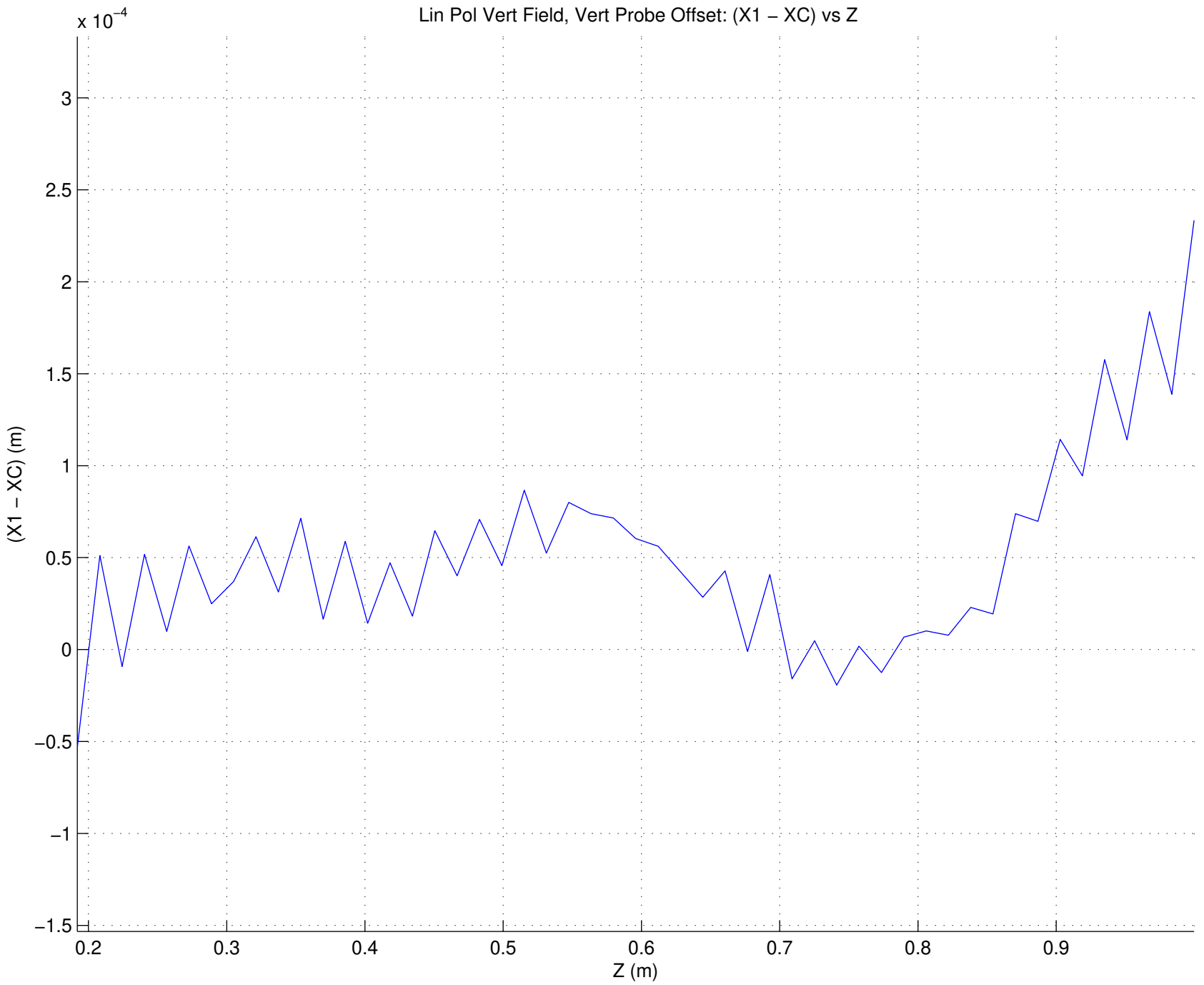

Probe 2 Bz, Bz at By Zeros: B vs Z With Fitted Peaks
B
B Peak
Filt B Peak
B (T)
Z (m)
0.08
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
−0.08
0
0.2
0.4
0.6
0.8
1
1.2
1.4

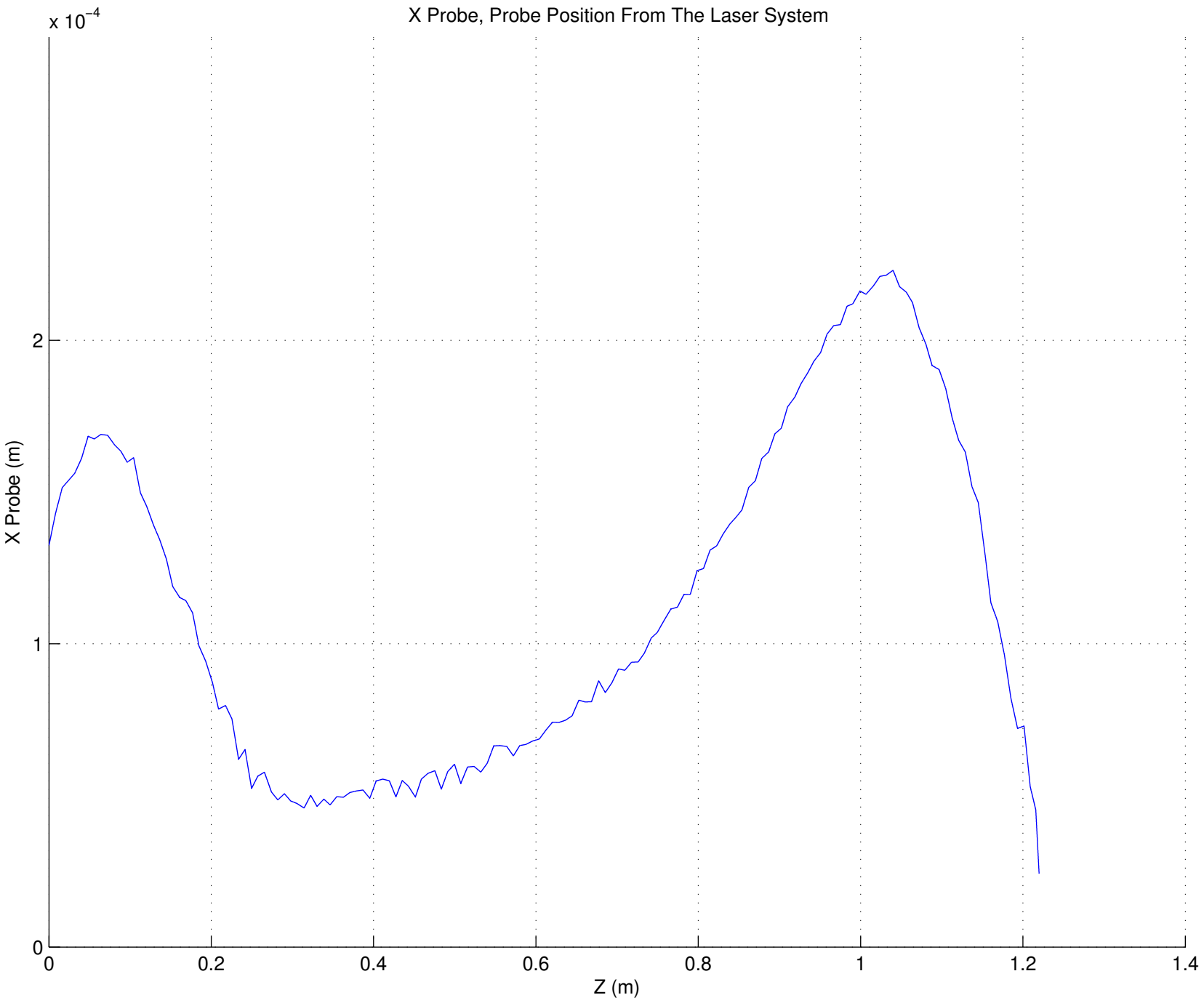

Lin Pol Vert Field, Vert Probe Offset: (Y1 – YC) vs Z
x 10^-4
0
–1
–2
–3
(Y1 – YC) (m)
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Z (m)

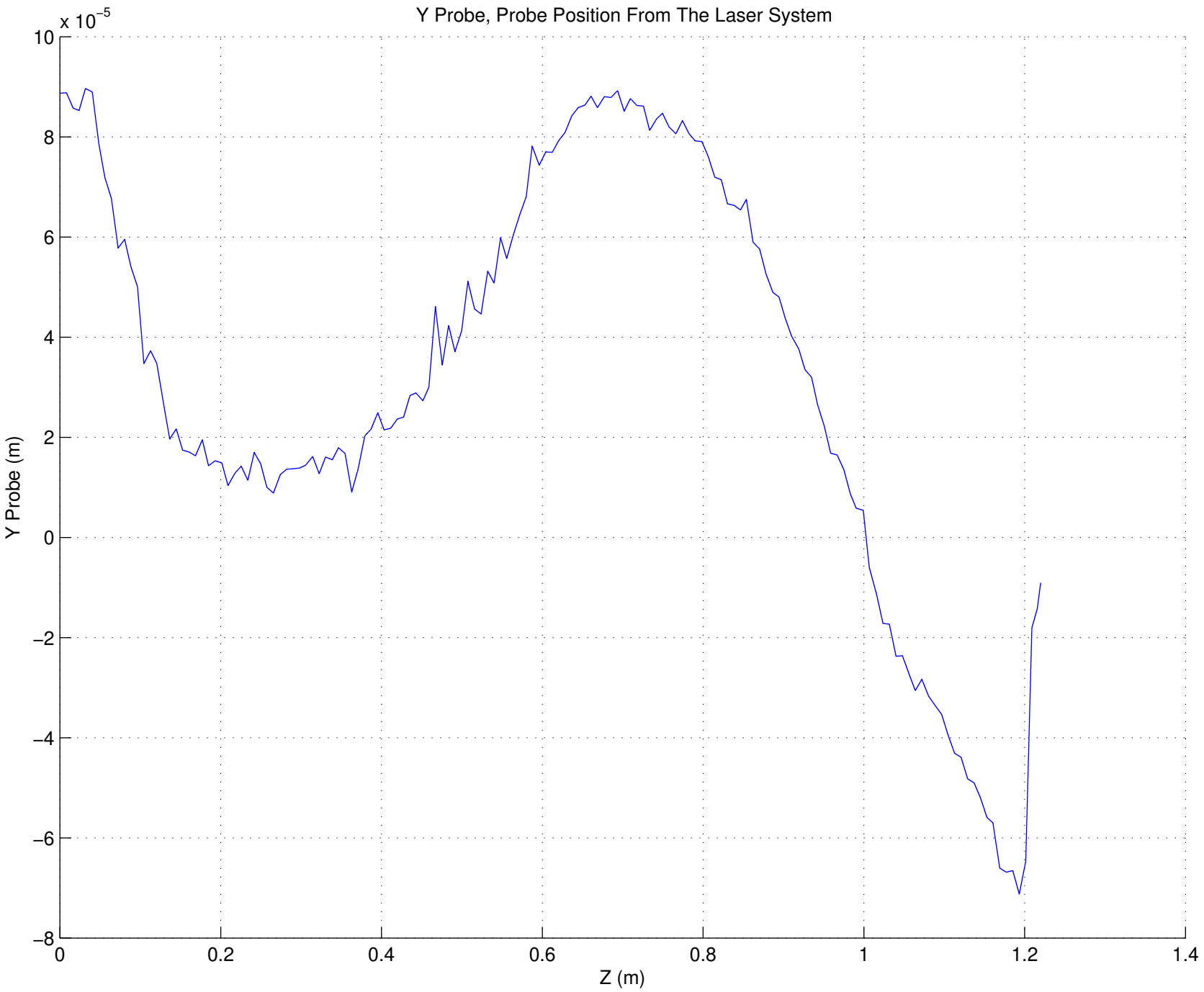

Lin Pol Vert Field, Vert Probe Offset: Delta Y vs Z
x 10^-4
2.8
2.75
2.7
2.65
2.6
2.55
Delta Y (m)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Z (m)
Delta Y: Ave = 0.000264 m, RMS = 0.000005 m

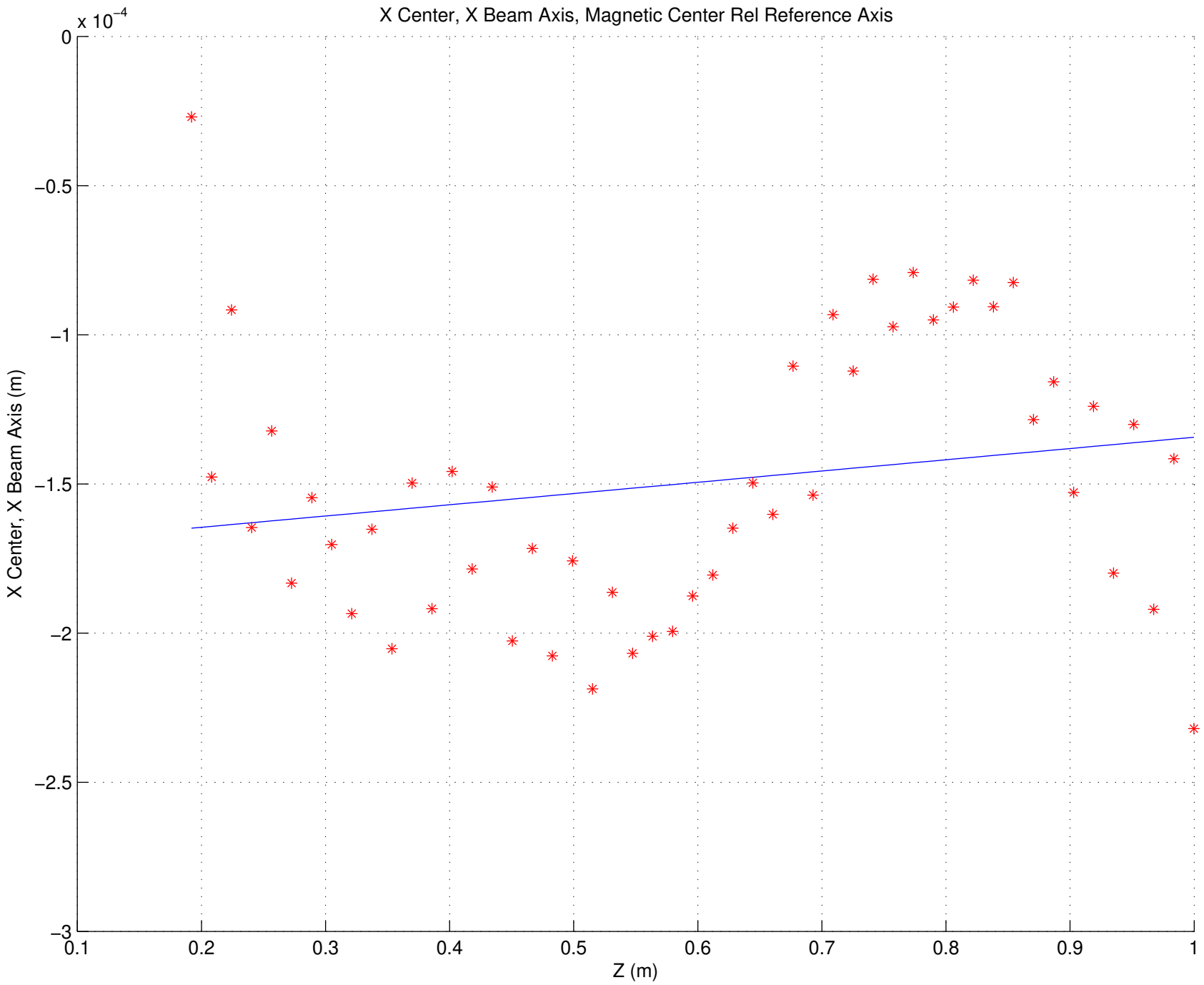

Lin Pol Vert Field, Vert Probe Offset: KY vs Z
KY: Ave = i 136.232468 1/m
KY: Re Im Ave = 58.118200 + i 142.920485 1/m
Re(ky)
Im(ky)
KY (1/m)
Z (m)
300
250
200
150
100
50
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

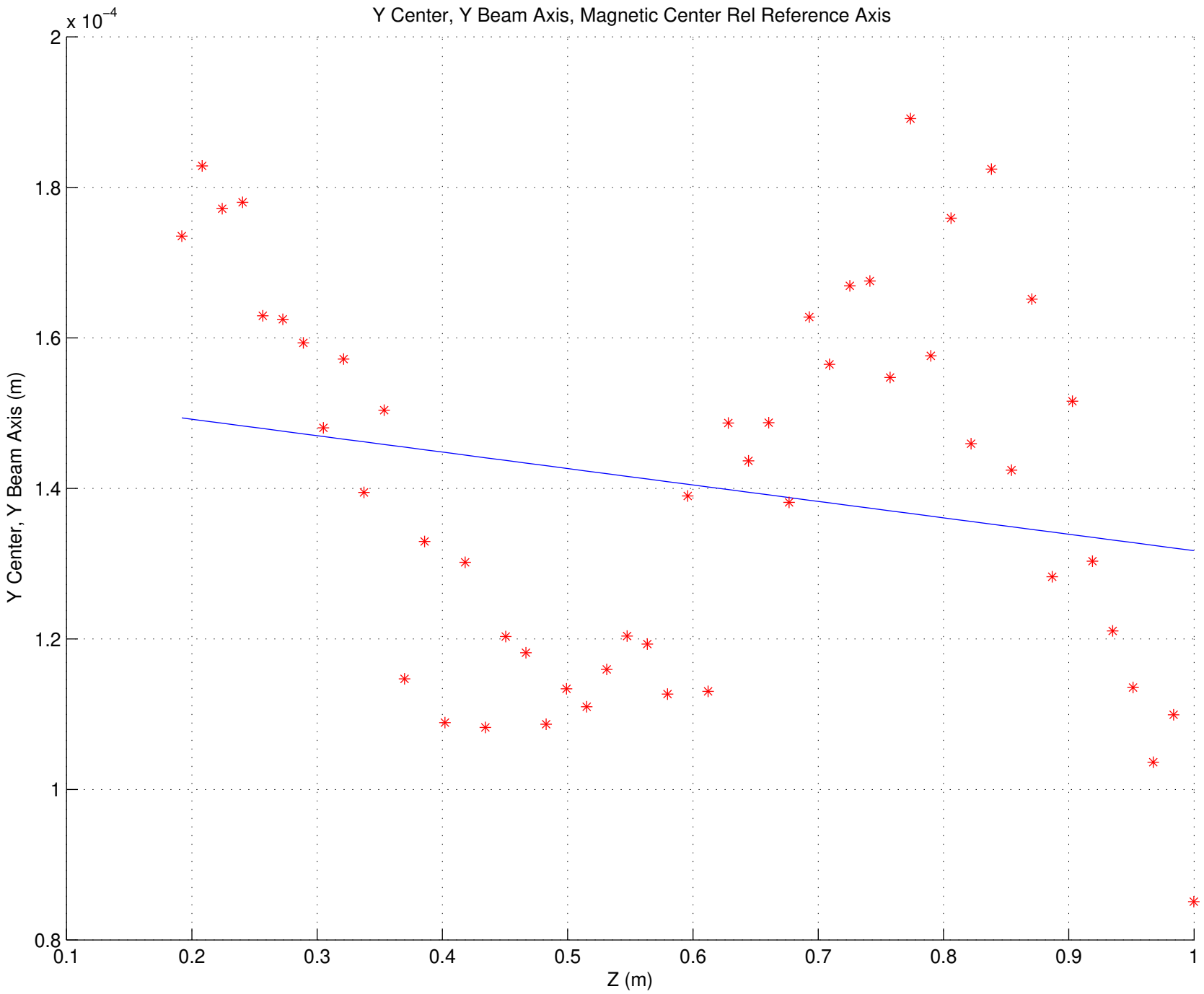

Lin Pol Vert Field, Vert Probe Offset, From Constraint: KX vs Z
KX: Ave = 237.438974 1/m
Re(kx)
Im(kx)
KX: Re Im Ave = 237.438974 + i NaN 1/m
KX (1/m)
Z (m)
400
350
300
250
200
150
100
50
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

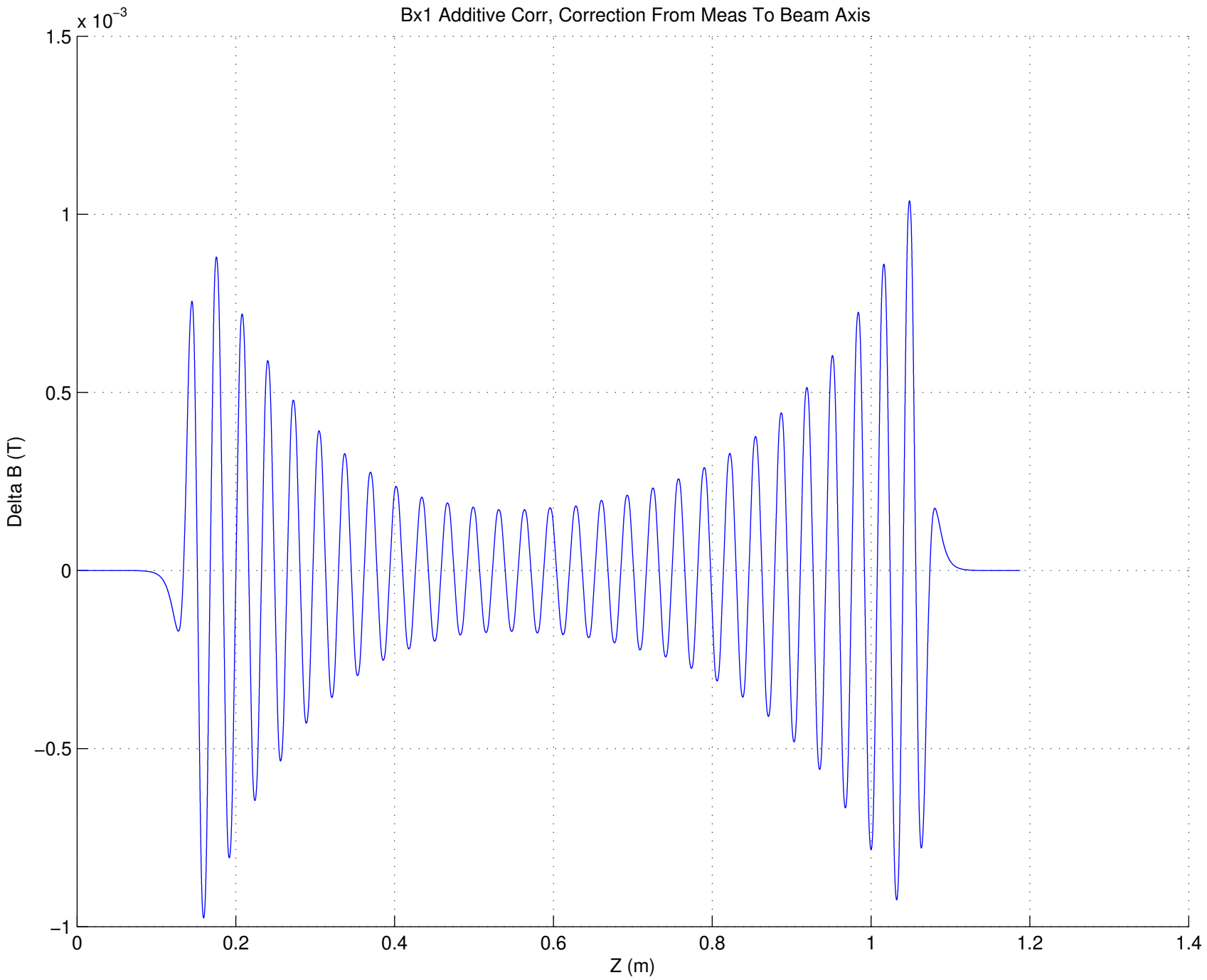

Lin Pol Vert Field, Vert Probe Offset: (X1 – XC) vs Z
x 10^-4
3
2.5
2
1.5
1
0.5
0
−0.5
−1
−1.5
(X1 – XC) (m)
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Z (m)

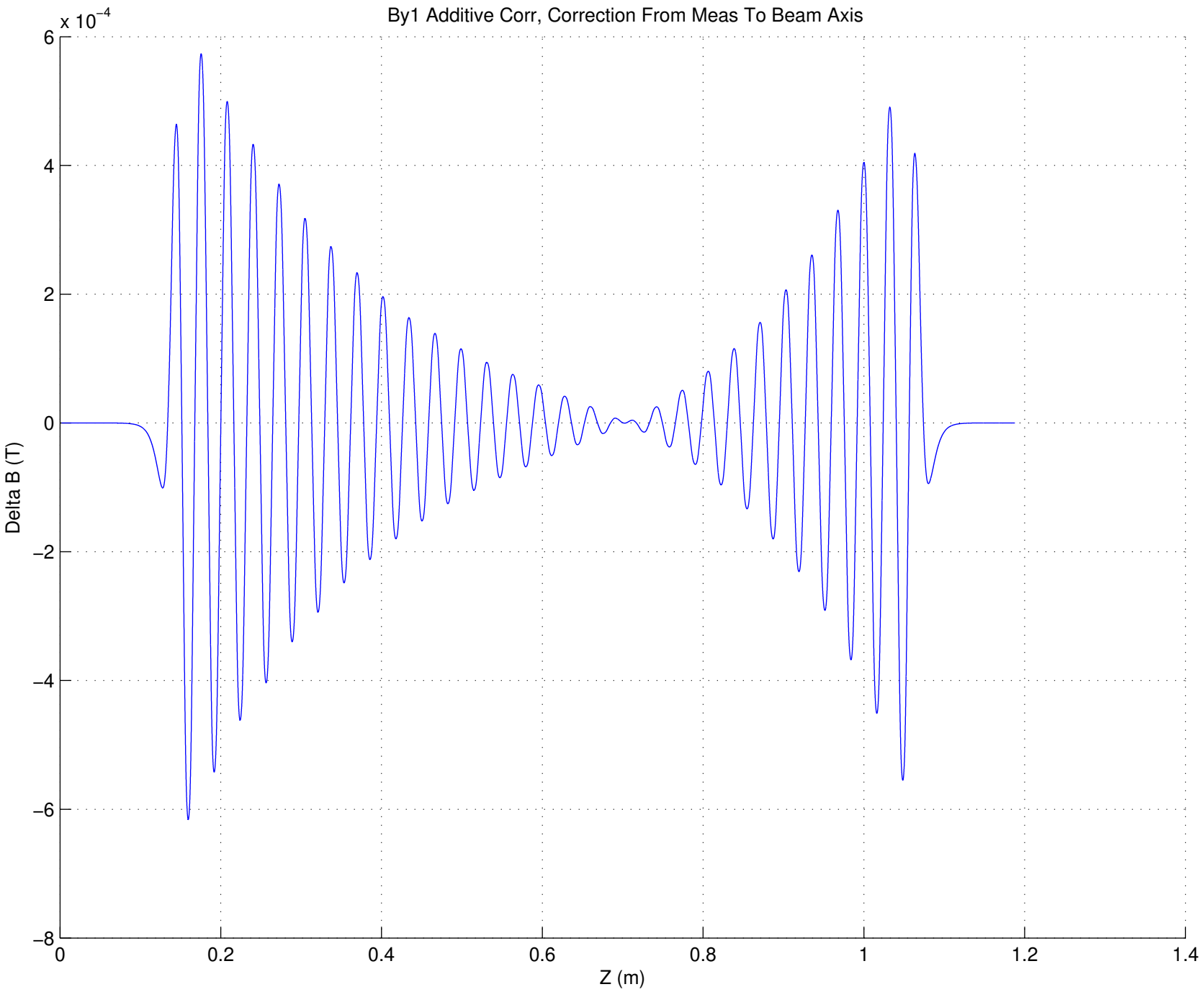

X Probe, Probe Position From The Laser System
x 10^-4
X Probe (m)
Z (m)
0
1
2
0
0.2
0.4
0.6
0.8
1
1.2
1.4

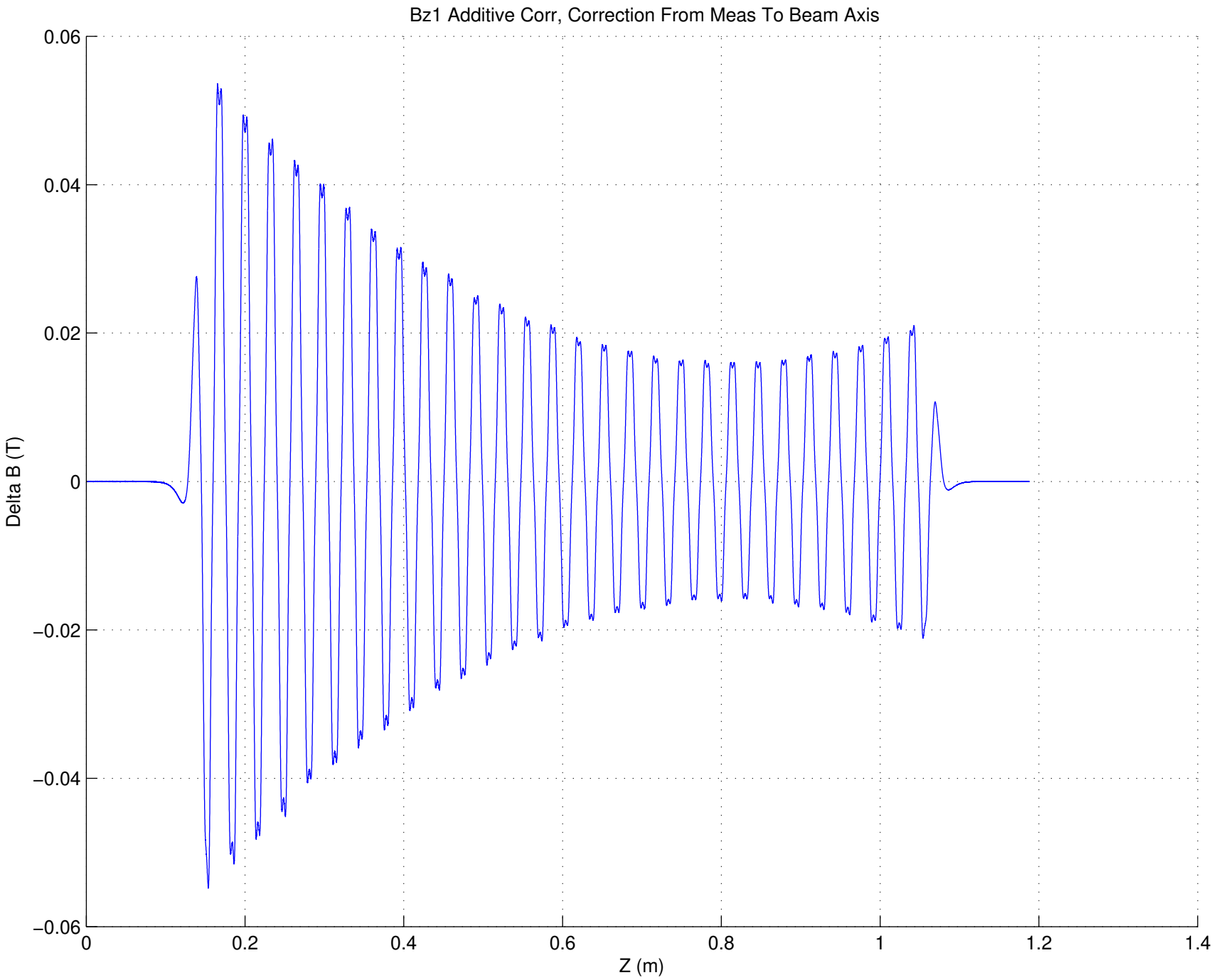

Y Probe, Probe Position From The Laser System
x 10^-5
10
8
6
4
2
0
−2
−4
−6
−8
Y Probe (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Z (m)

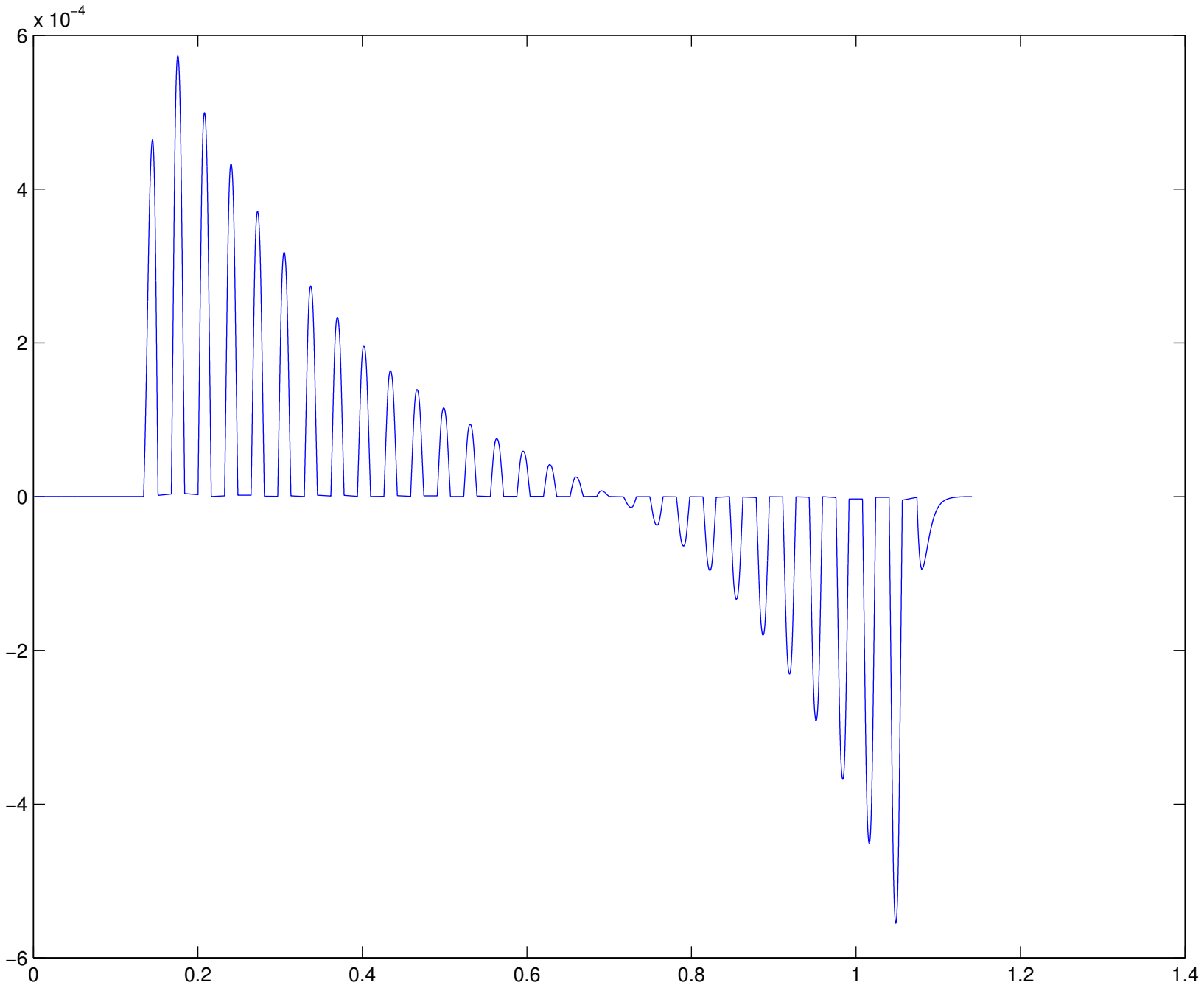

X Center, X Beam Axis, Magnetic Center Rel Reference Axis
x 10^-4
0
−0.5
−1
−1.5
−2
−2.5
−3
X Center, X Beam Axis (m)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Z (m)

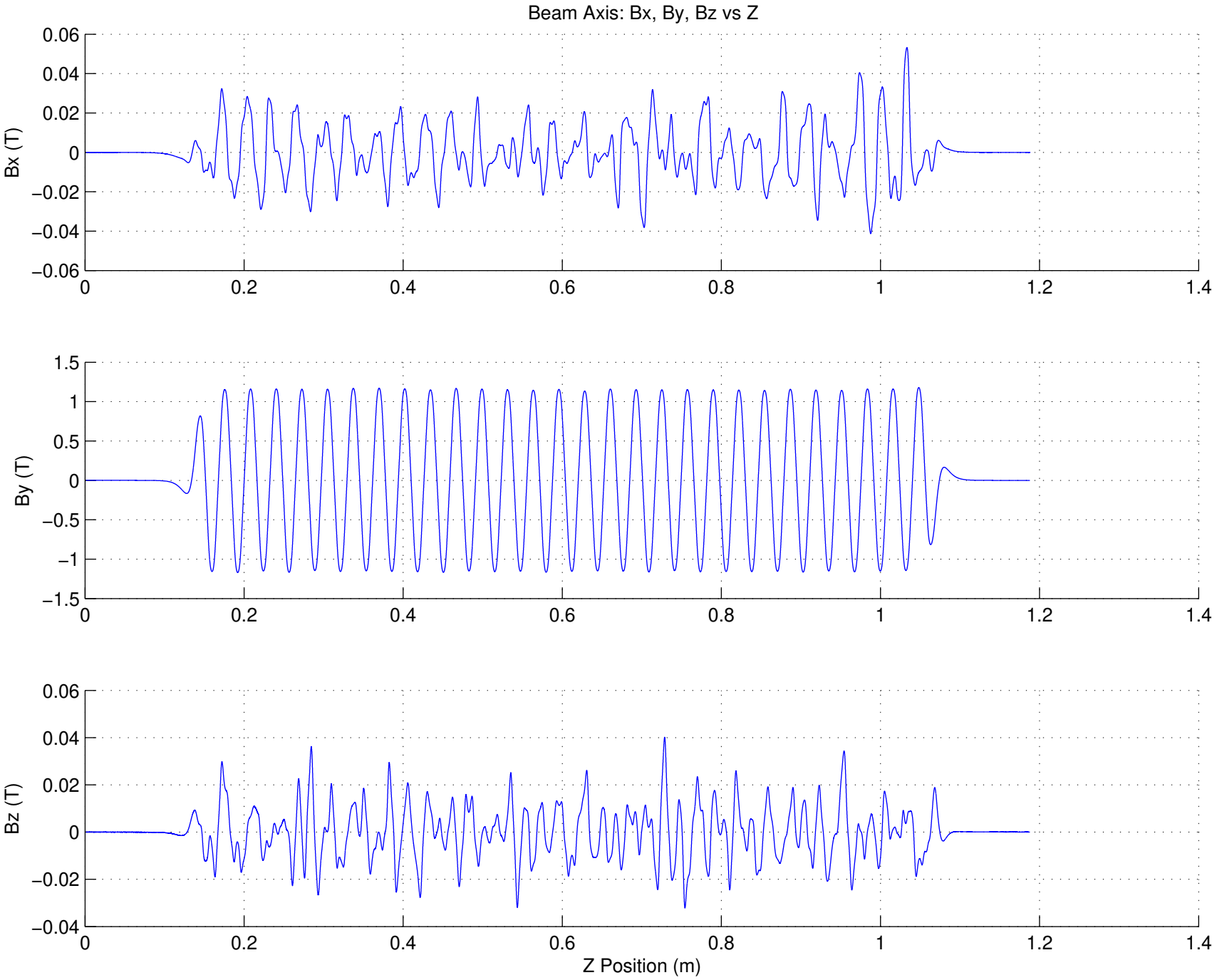

Y Center, Y Beam Axis, Magnetic Center Rel Reference Axis
x 10^-4
2
1.8
1.6
1.4
1.2
1
0.8
Y Center, Y Beam Axis (m)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Z (m)


Bx1 Additive Corr, Correction From Meas To Beam Axis
x 10^-3
1.5
1
0.5
0
−0.5
−1
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^-4
6
4
2
0
−2
−4
−6
−8
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)


x 10^-4
6
4
2
0
−2
−4
−6
0
0.2
0.4
0.6
0.8
1
1.2
1.4


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