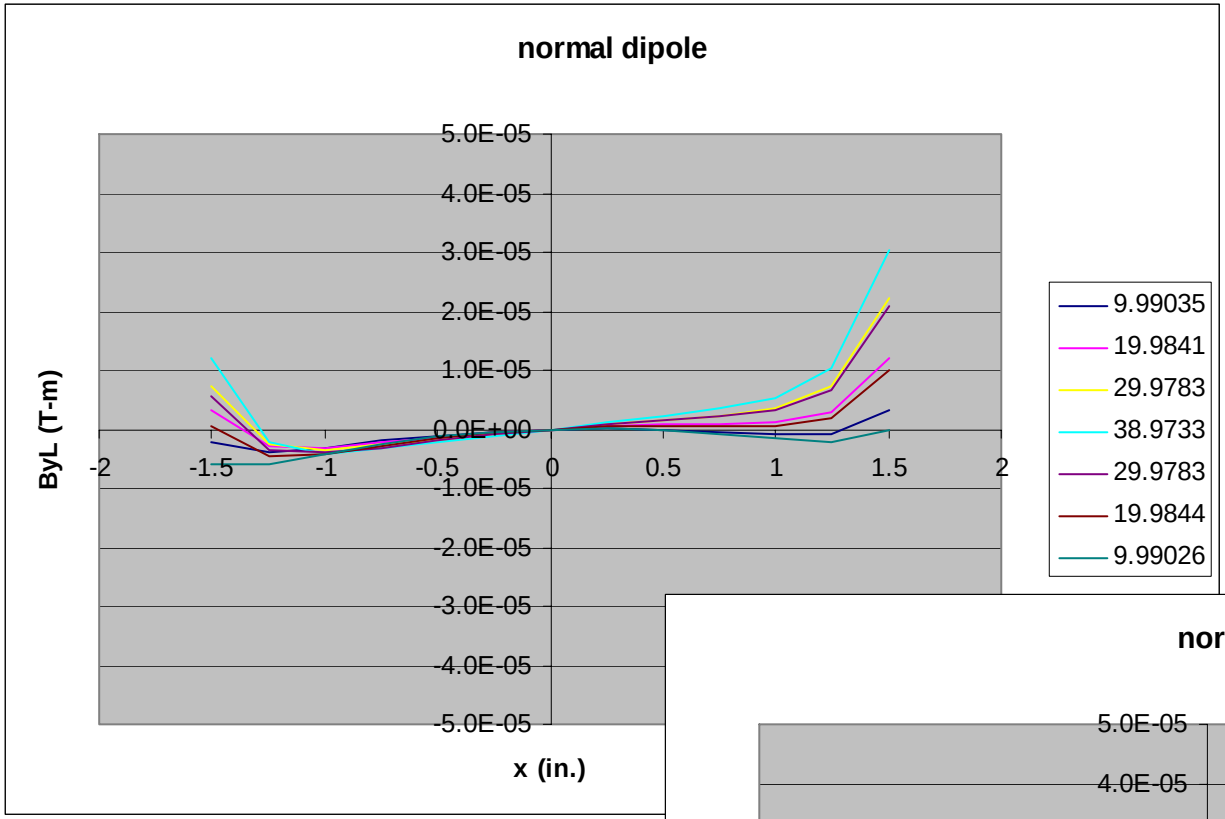
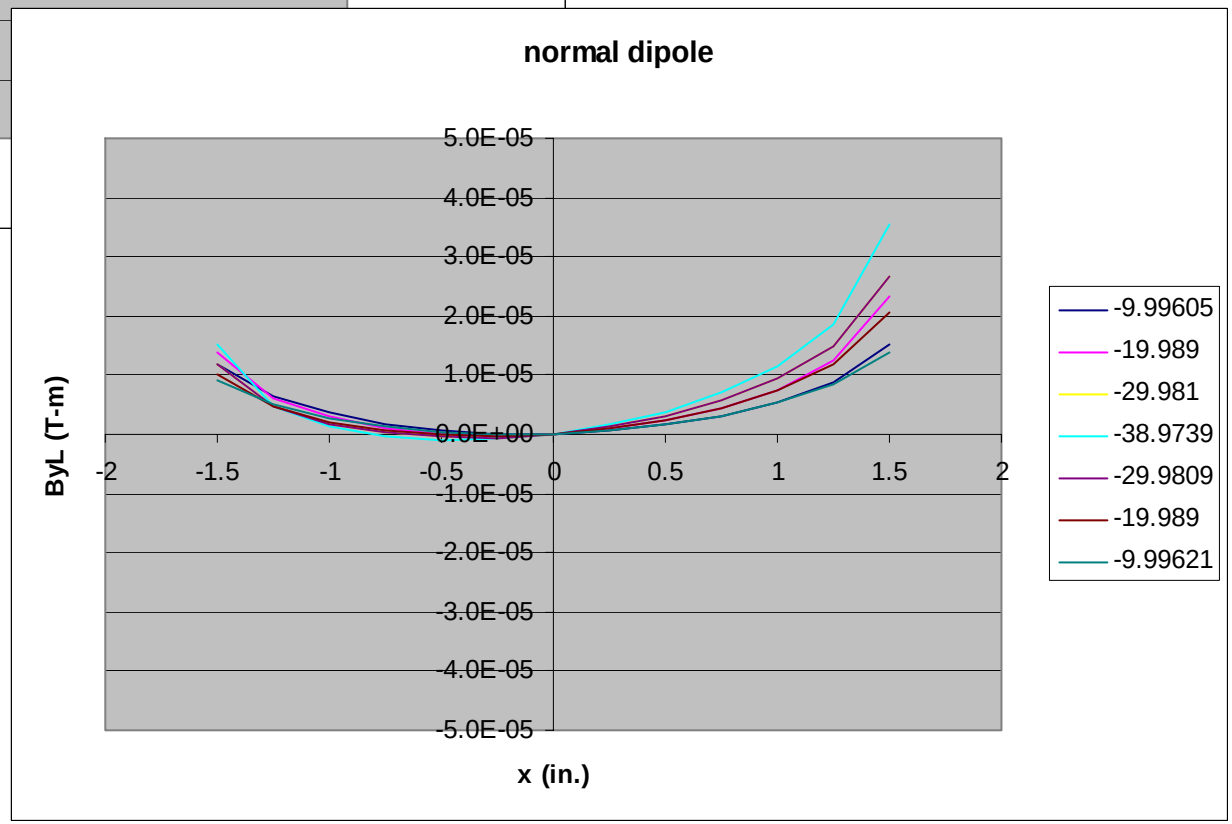
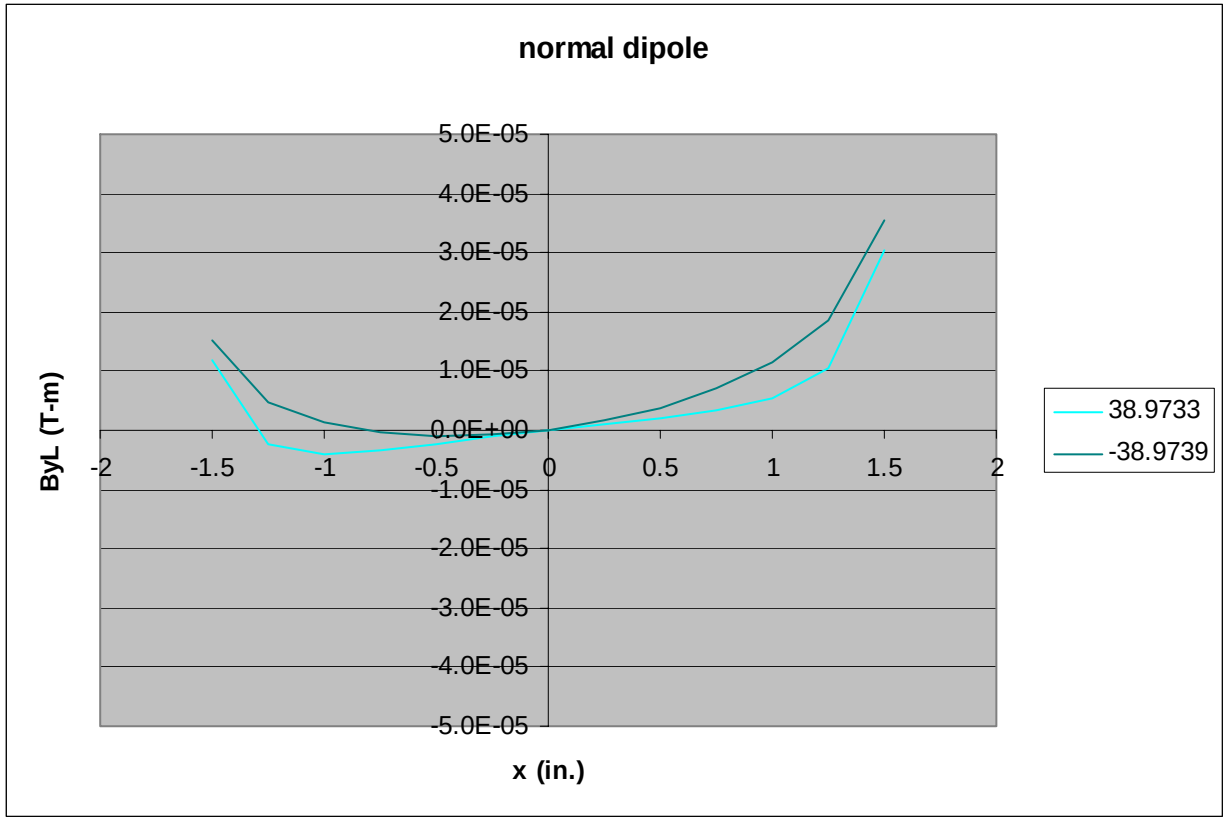
field shape analysis

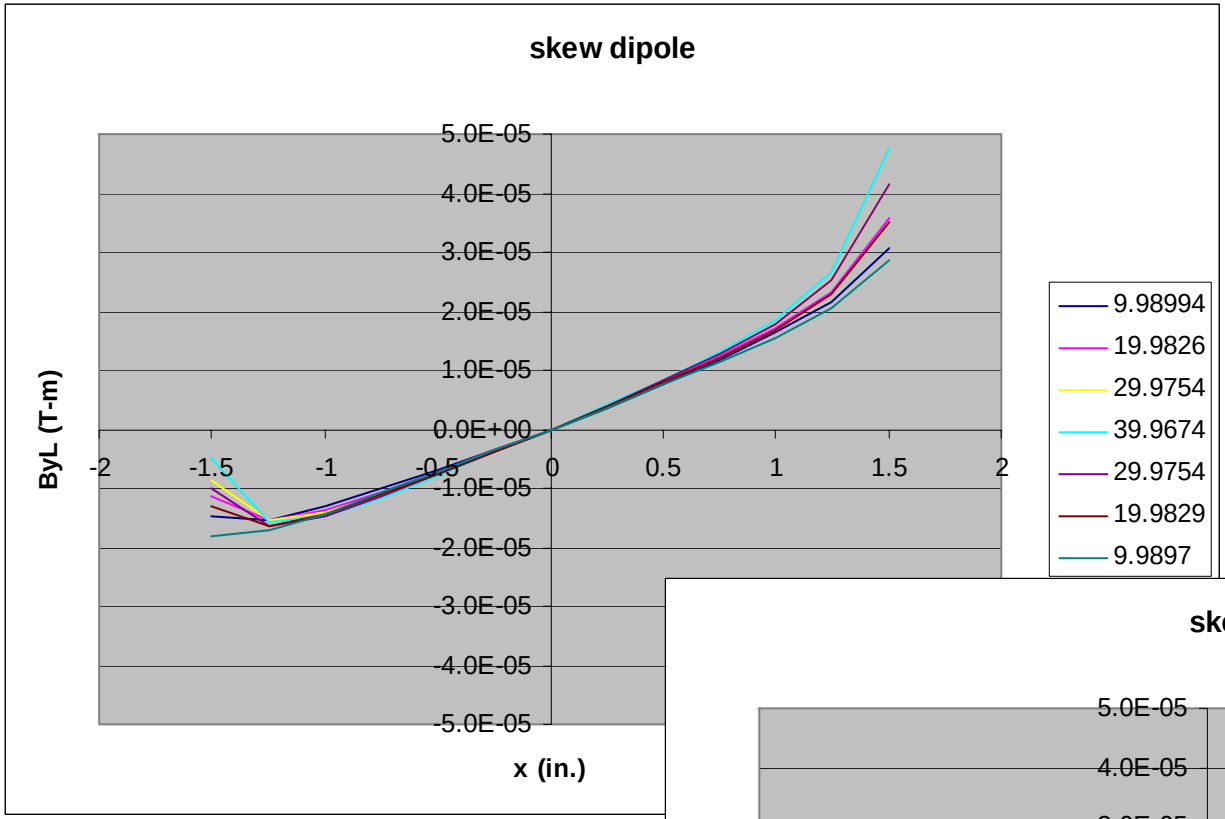
- single element excitation data
- compare different currents
  - rotate by the difference in field angle (from angle measured at highest positive current point)
- to compare negative and positive current data
  - (correct for the field angle – see previous point)
  - negate all terms
- All on the same scale



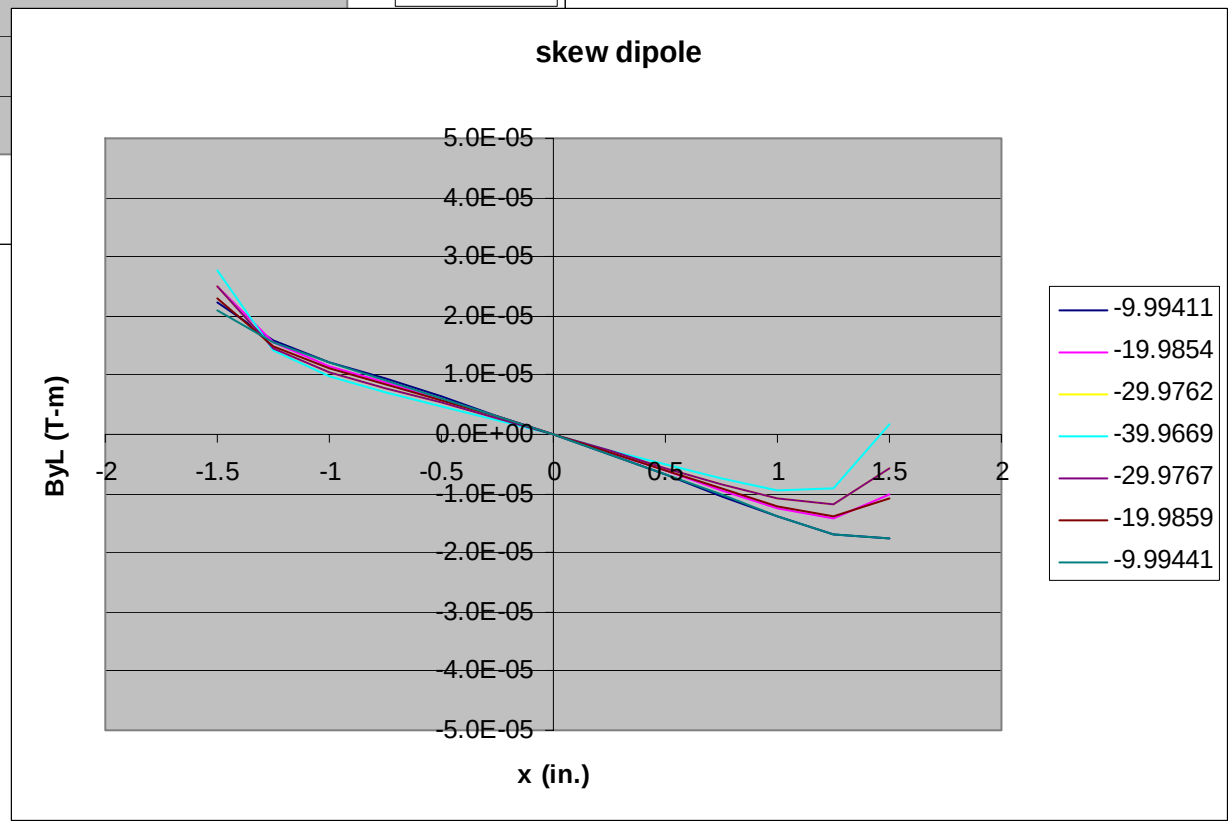
B_1=0.0141 T-m
@ 40A

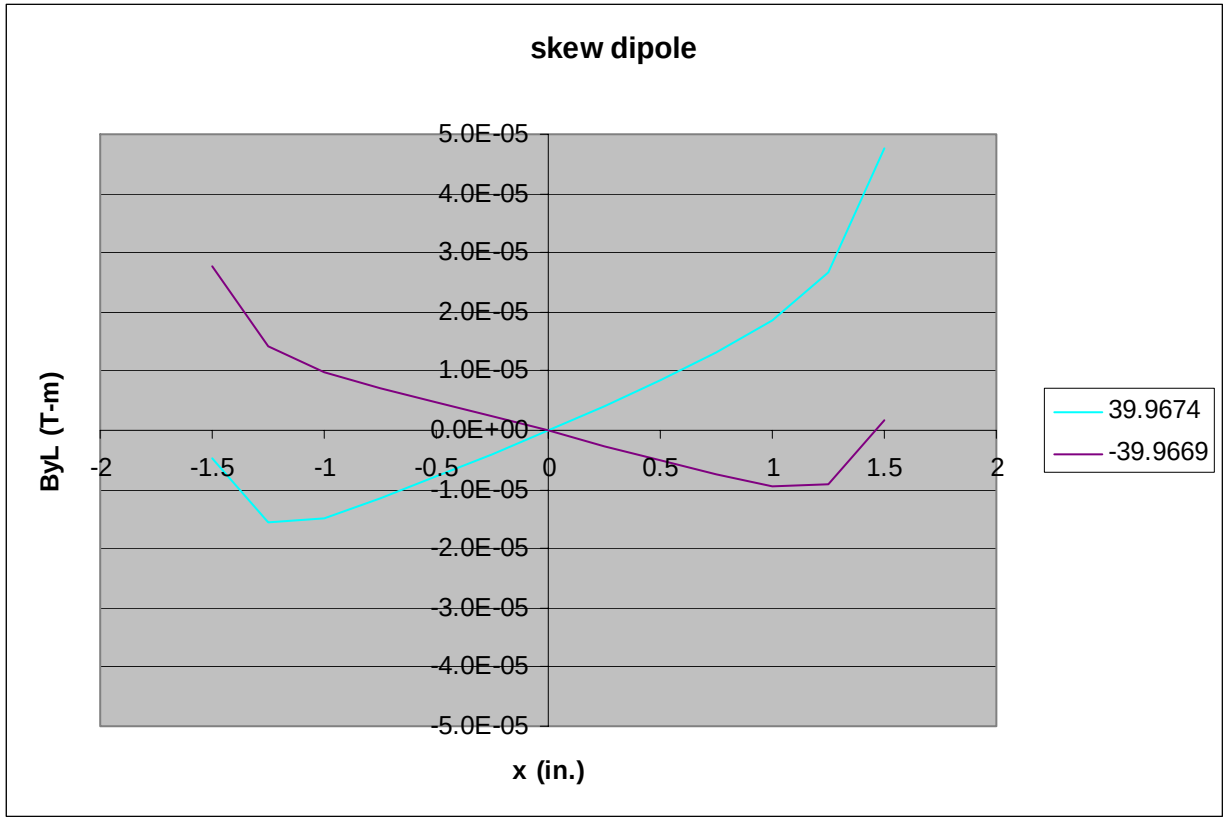


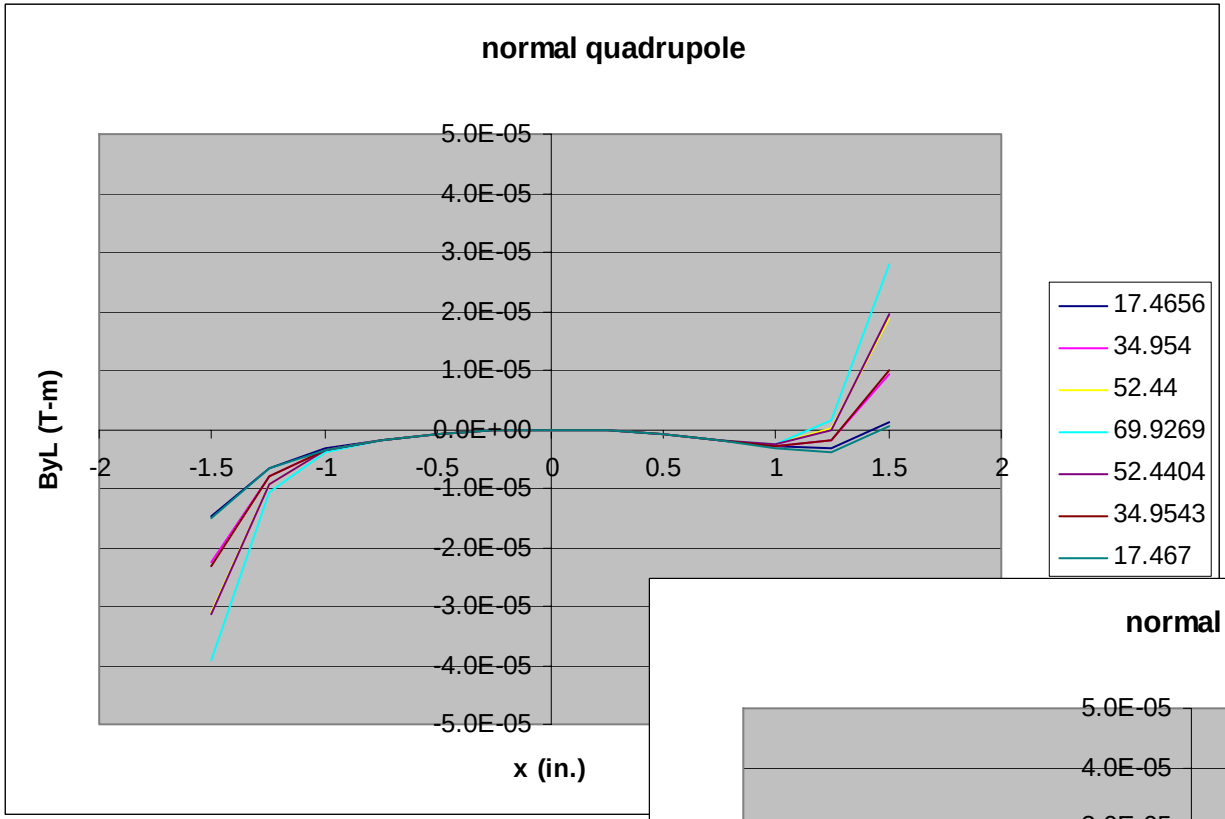

normal dipole
5.0E-05
4.0E-05
3.0E-05
2.0E-05
1.0E-05
0.0E+00
-1.0E-05
-2.0E-05
-3.0E-05
-4.0E-05
-5.0E-05
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
ByL (T-m)
x (in.)
38.9733
-38.9739



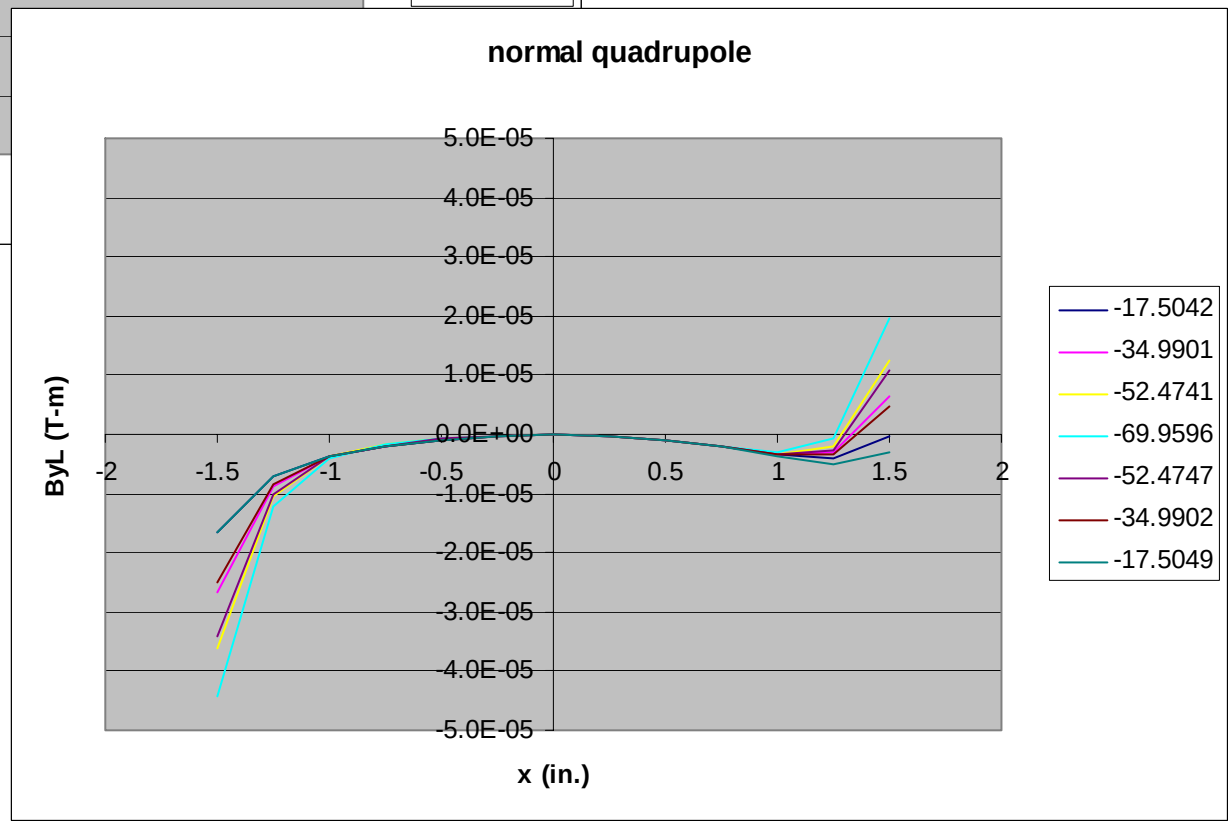
A_1=0.0145 T-m
@ 40A

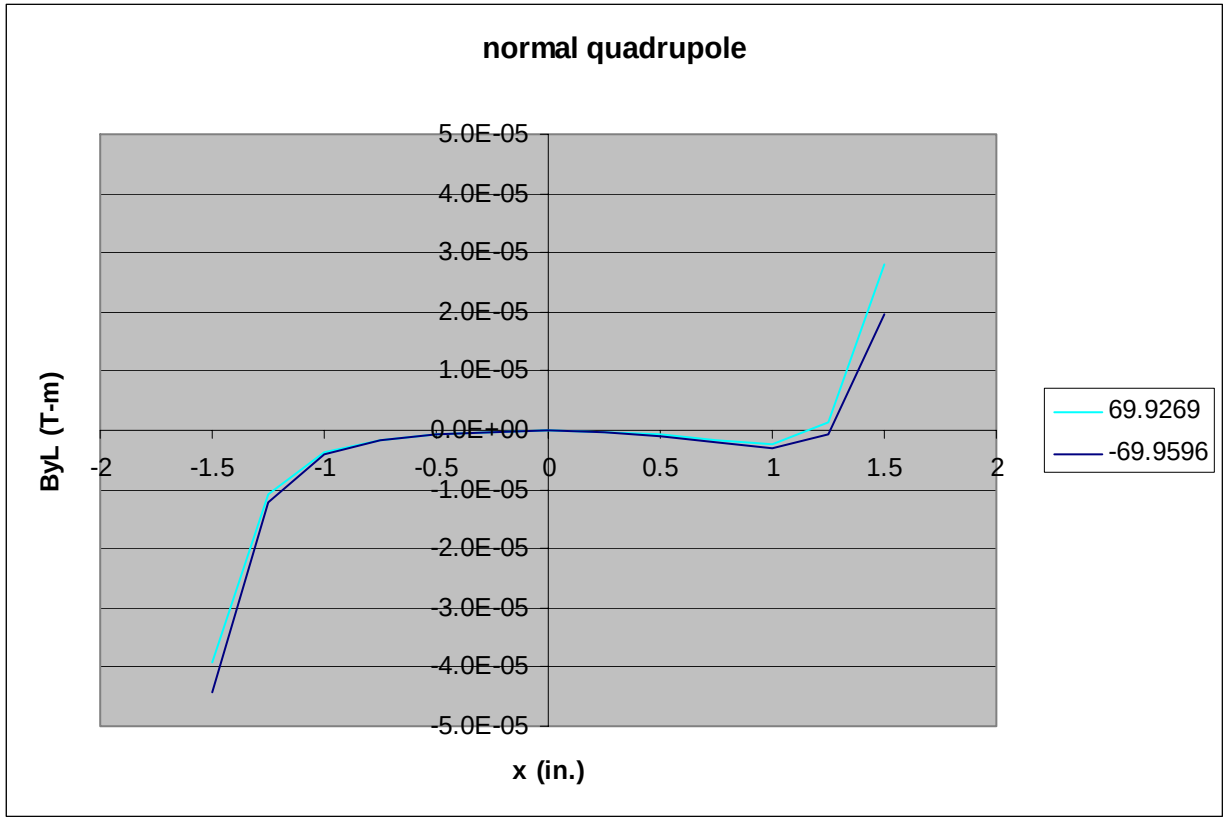


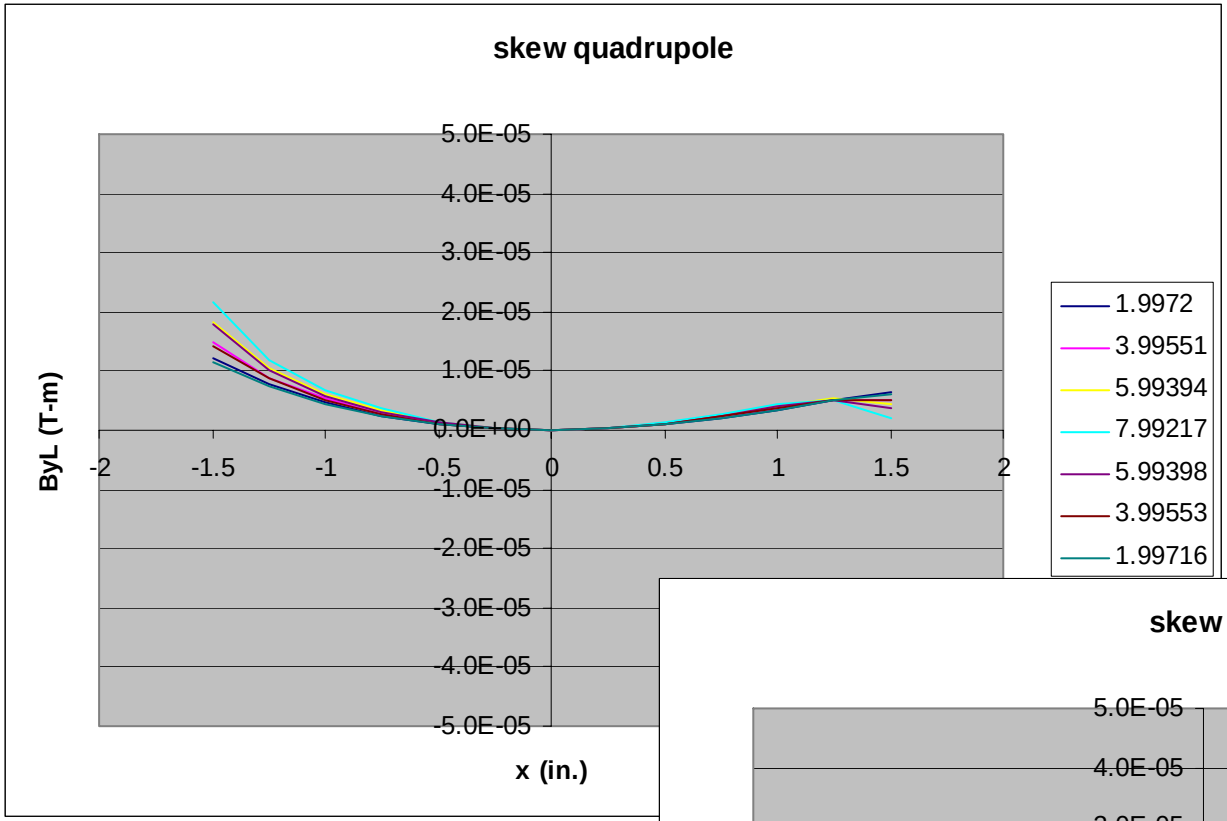

skew dipole
5.0E-05
4.0E-05
3.0E-05
2.0E-05
1.0E-05
0.0E+00
-1.0E-05
-2.0E-05
-3.0E-05
-4.0E-05
-5.0E-05
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
ByL (T-m)
x (in.)
39.9674
-39.9669



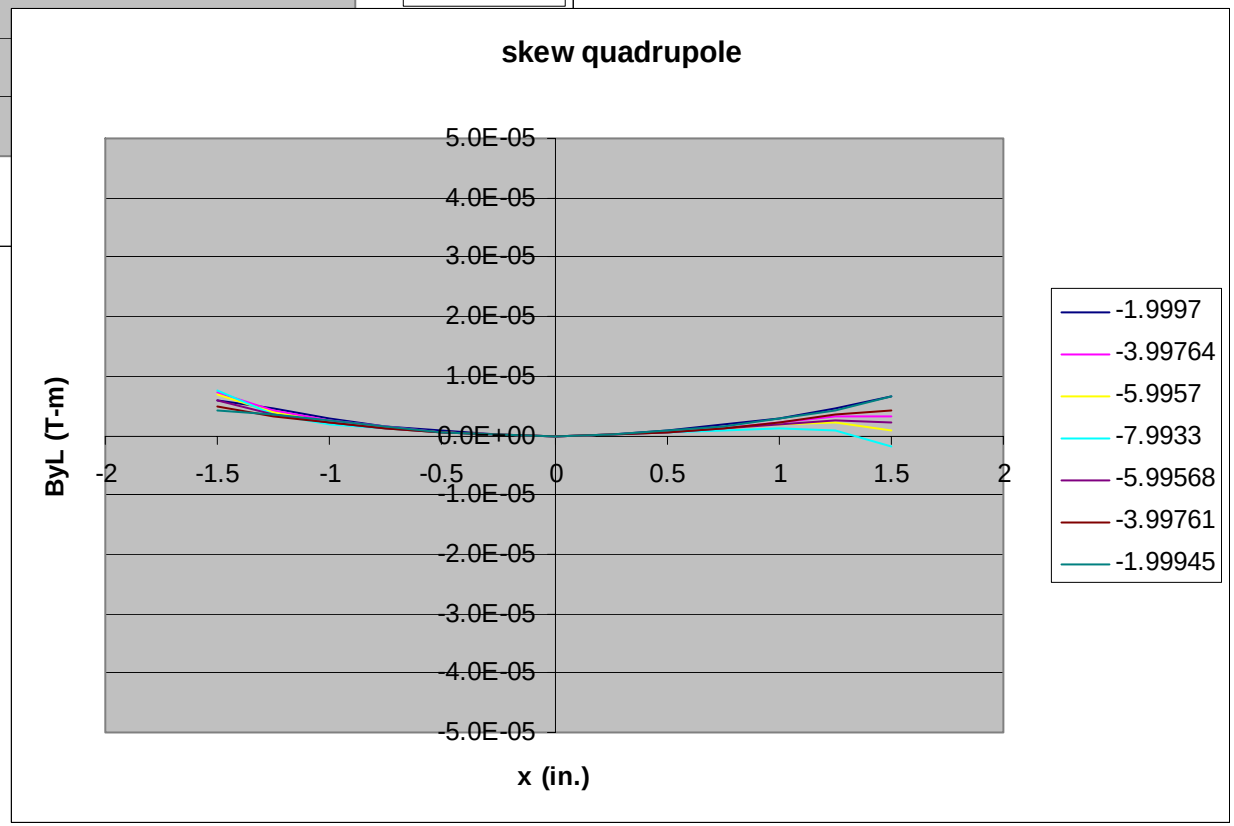
B_2=0.00440 T-m
@ 70A

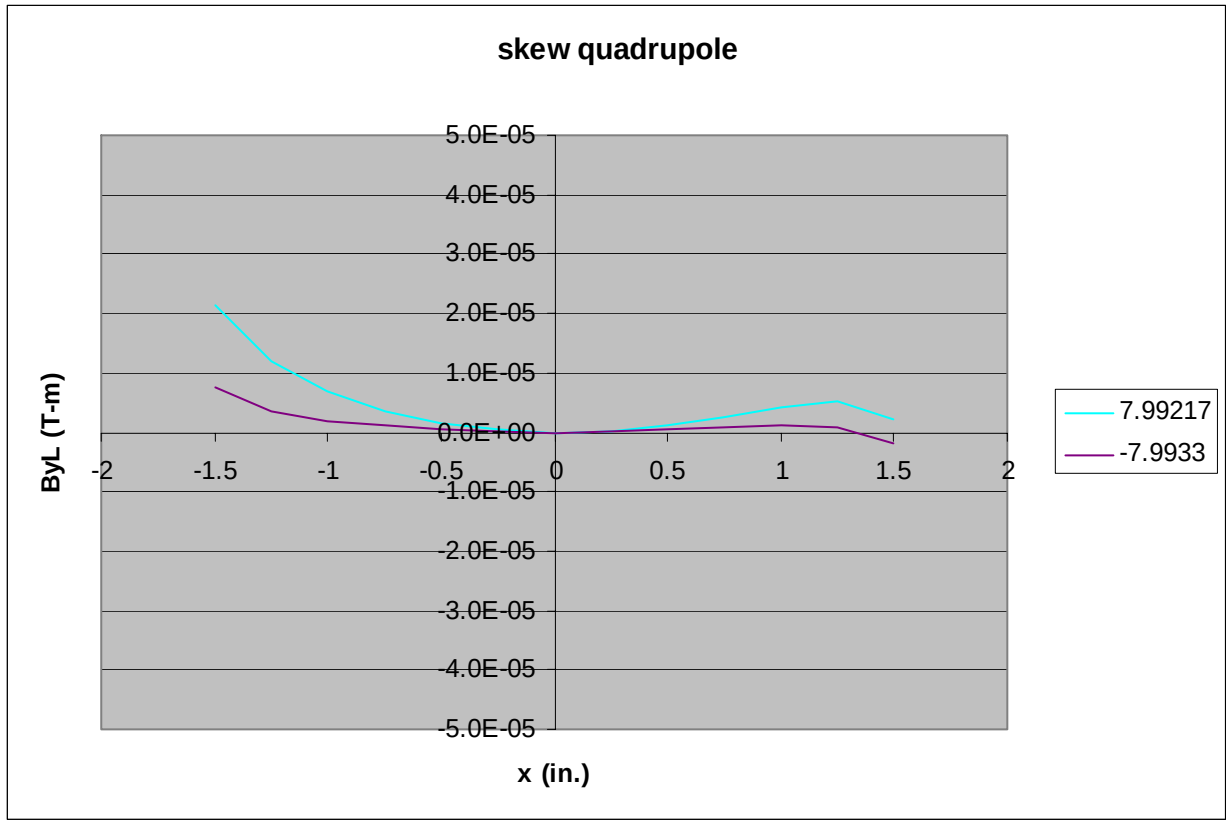


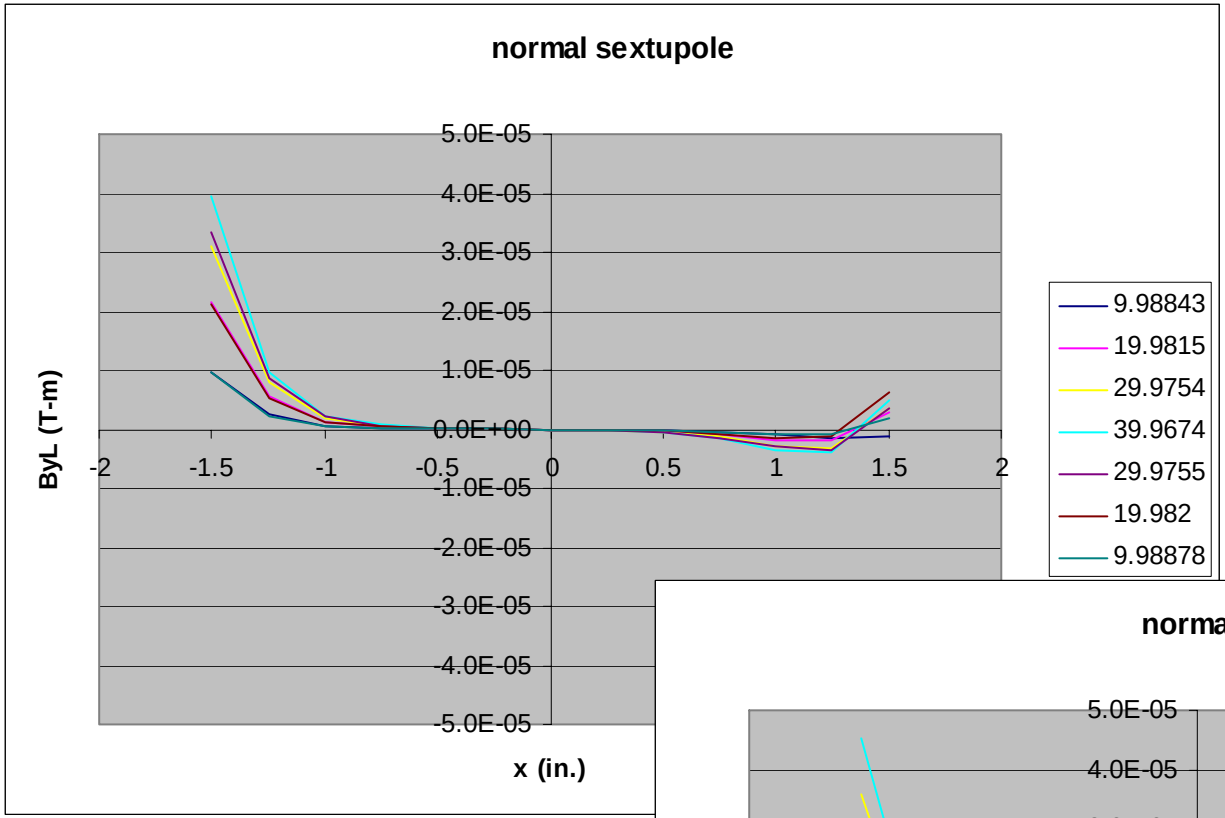

normal quadrupole
5.0E-05
4.0E-05
3.0E-05
2.0E-05
1.0E-05
0.0E+00
-1.0E-05
-2.0E-05
-3.0E-05
-4.0E-05
-5.0E-05
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
ByL (T-m)
x (in.)
69.9269
-69.9596



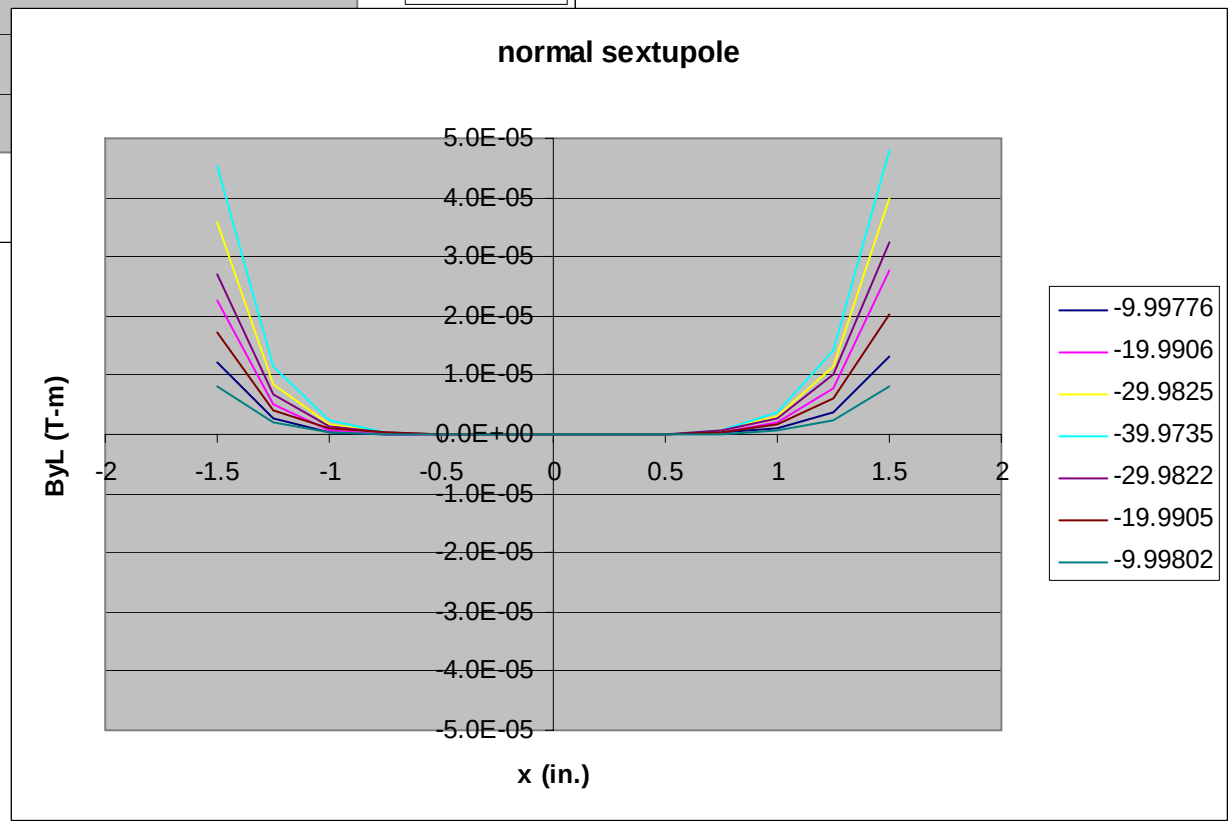
A_2=0.0008 T-m
@ 8A

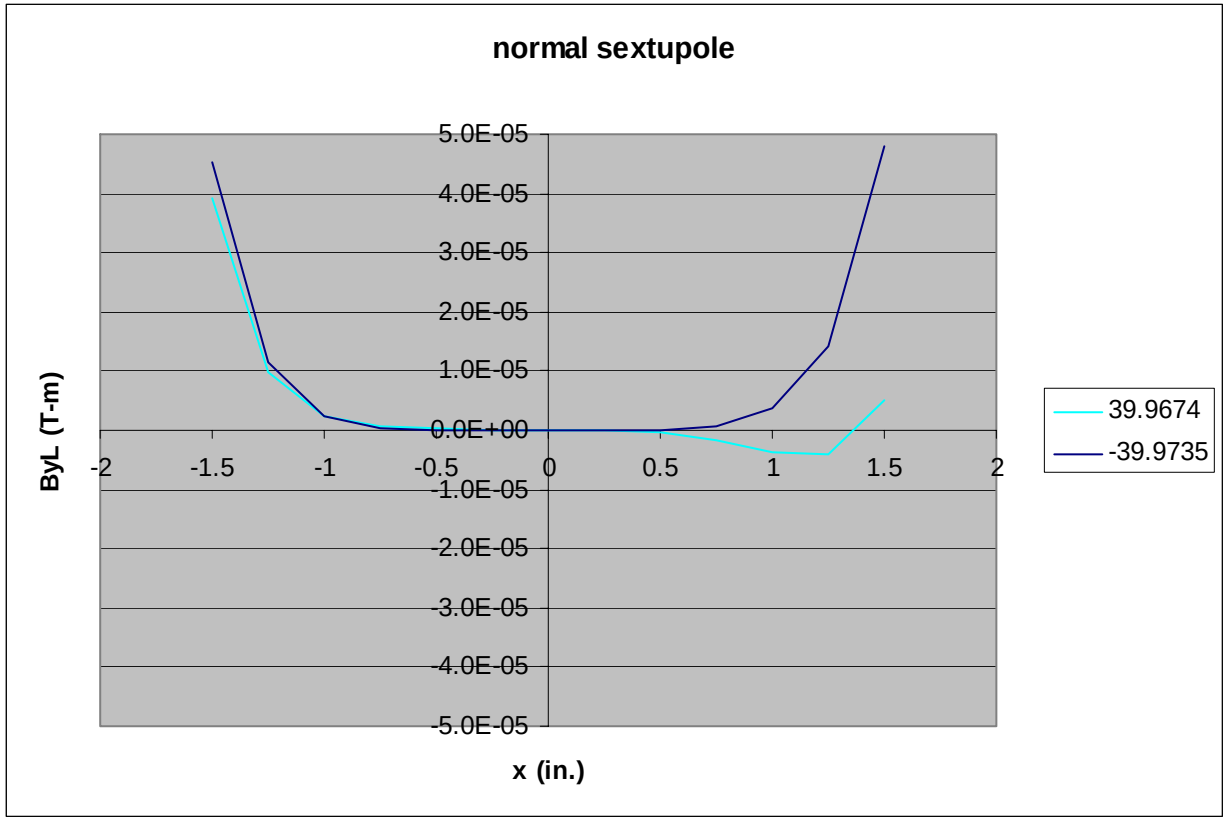


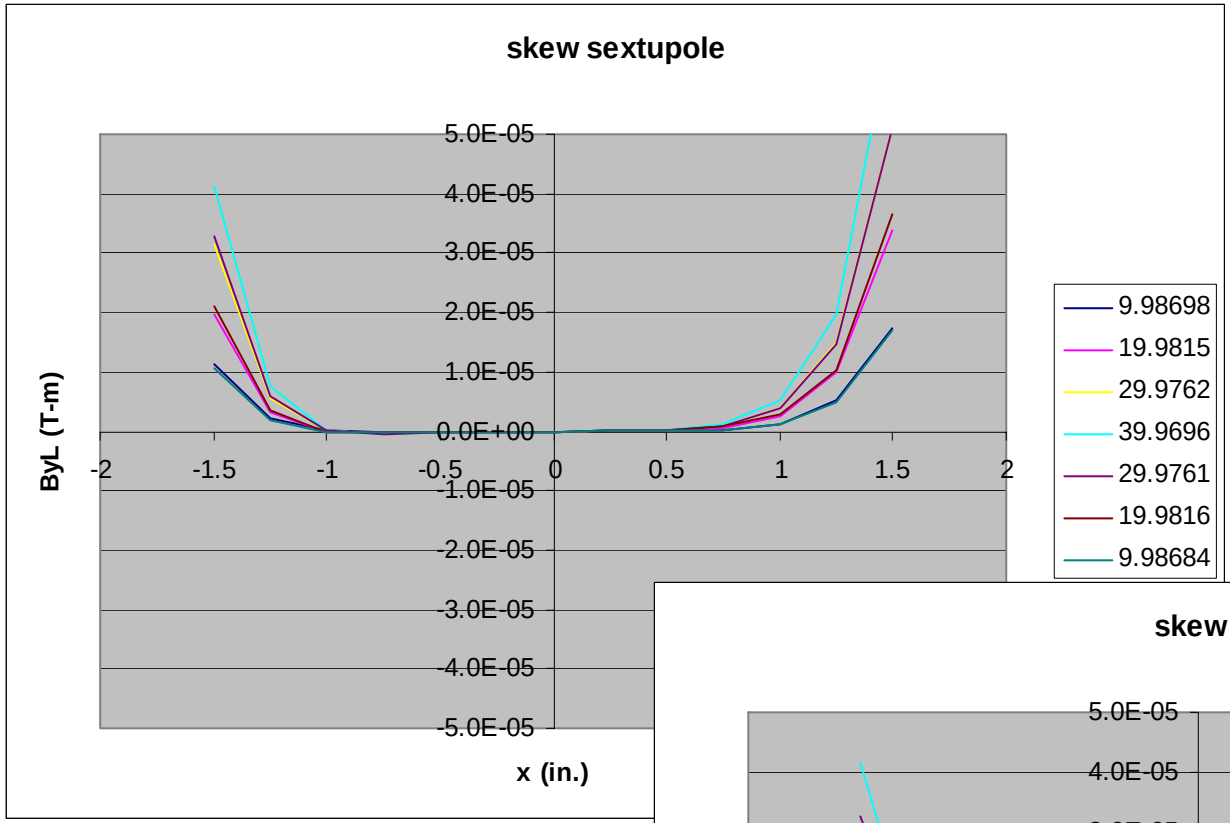

skew quadrupole
5.0E-05
4.0E-05
3.0E-05
2.0E-05
1.0E-05
0.0E+00
-1.0E-05
-2.0E-05
-3.0E-05
-4.0E-05
-5.0E-05
ByL (T-m)
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
x (in.)
7.99217
-7.9933



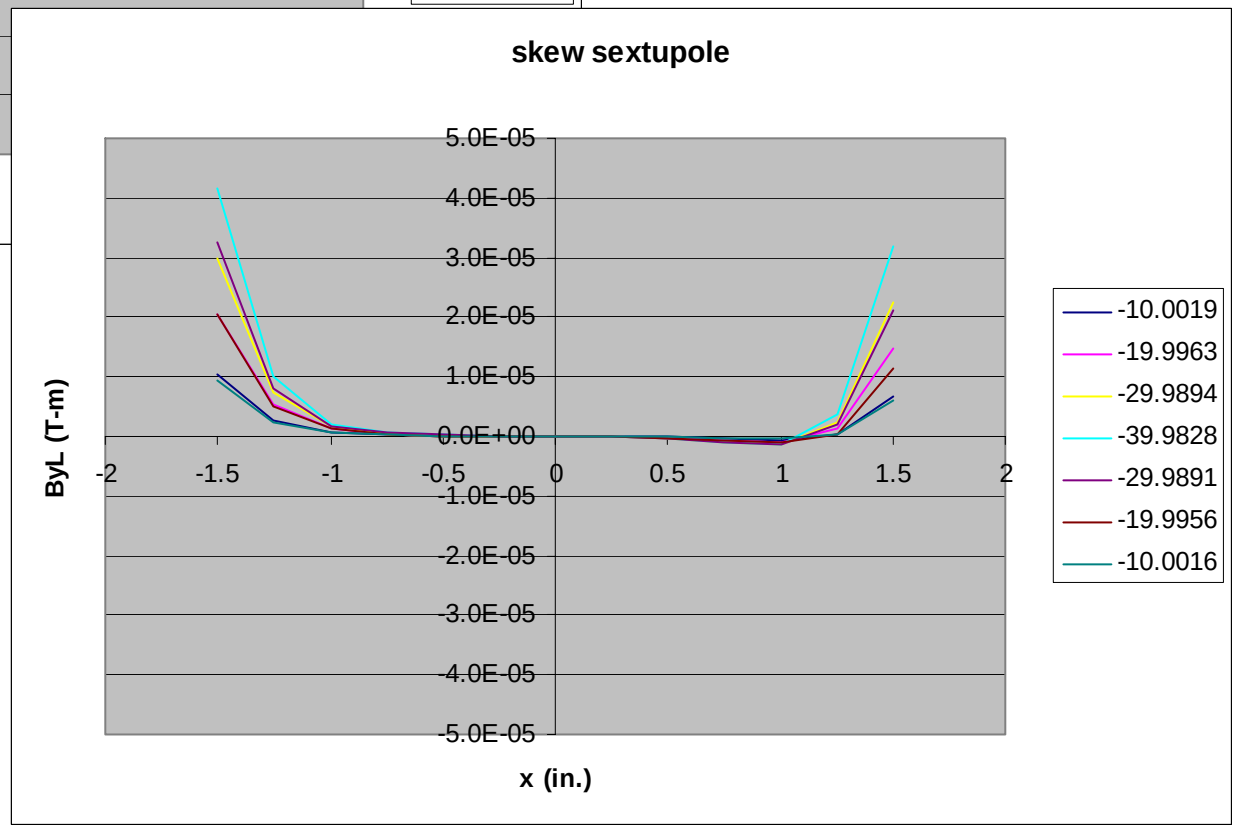
B_3=0.00115 T-m
@ 40A

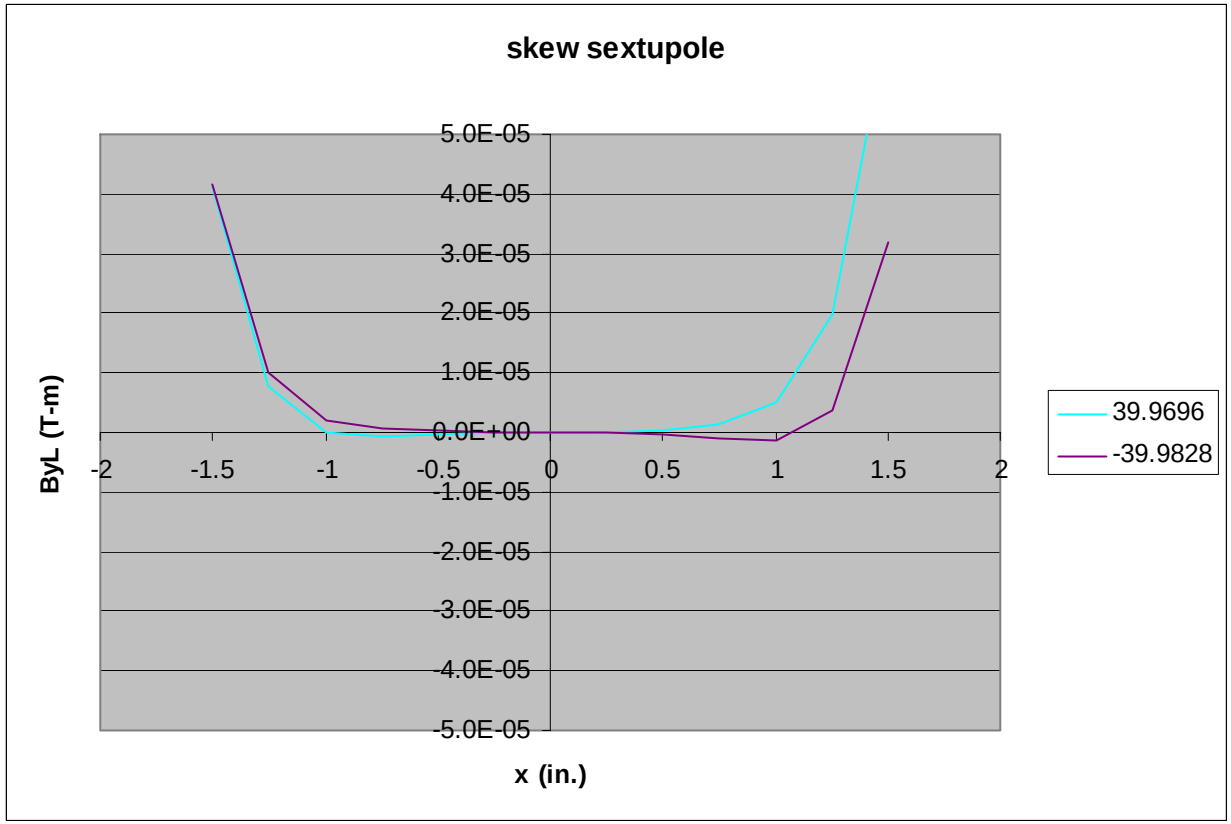



normal sextupole
5.0E-05
4.0E-05
3.0E-05
2.0E-05
1.0E-05
0.0E+00
-1.0E-05
-2.0E-05
-3.0E-05
-4.0E-05
-5.0E-05
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
ByL (T-m)
x (in.)
39.9674
-39.9735



A_3=0.00115 T-m
@ 40A



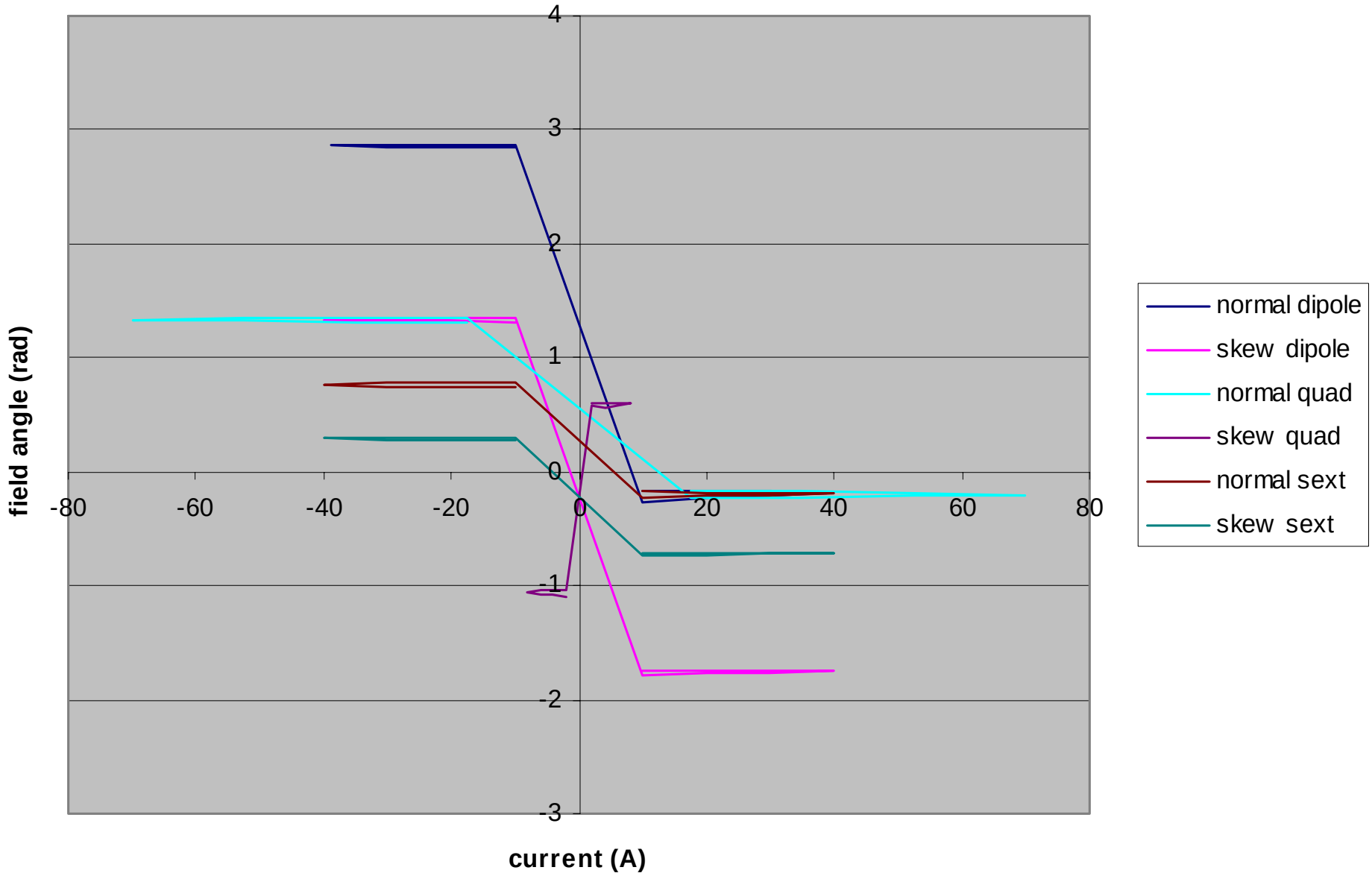

skew sextupole
5.0E-05
4.0E-05
3.0E-05
2.0E-05
1.0E-05
0.0E+00
-1.0E-05
-2.0E-05
-3.0E-05
-4.0E-05
-5.0E-05
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
ByL (T-m)
x (in.)
39.9696
-39.9828

field shape summary

- field error less than but on the order of 5e-5 T-m out to 1.5 in.
- shapes for ± currents similar in most cases but not exactly the same pointing to some field distortion not following the current
- there were a couple of odd things about the field angle I noticed during the exercise
  - field angle changes ±currents
  - hysteresis in the field angle
  - both I think again point to some field not following the current

field angle changes between positvie and negative current

Element	<+I angle>-<-I angle>
Normal dipole	-175 deg.
Skew dipole	-176 deg.
Normal quad	-88 deg.
Skew quad	+94 deg.
Normal sextupole	-55 deg.
Skew sextupole	-58 deg.


field angle (rad)
current (A)
4
3
2
1
0
-1
-2
-3
-80
-60
-40
-20
0
20
40
60
80
normal dipole
skew dipole
normal quad
skew quad
normal sext
skew sext