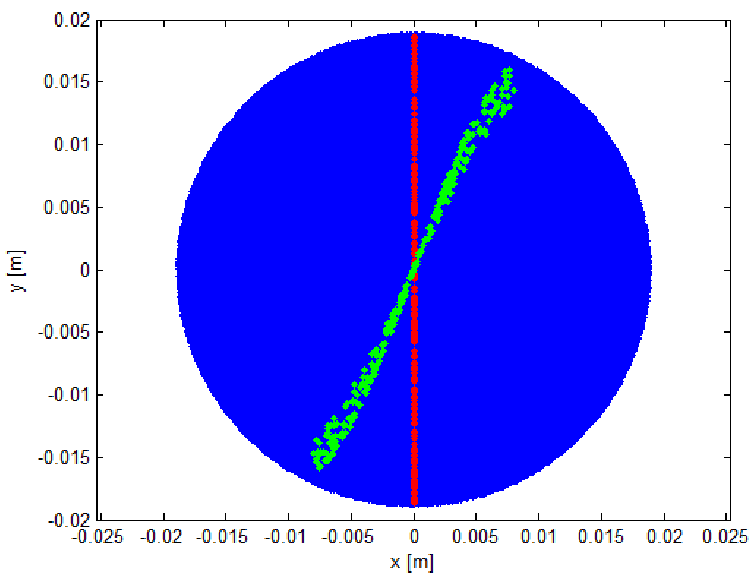
1/19/2016 Fay Hannon

Comparison of cathode fields

Compare

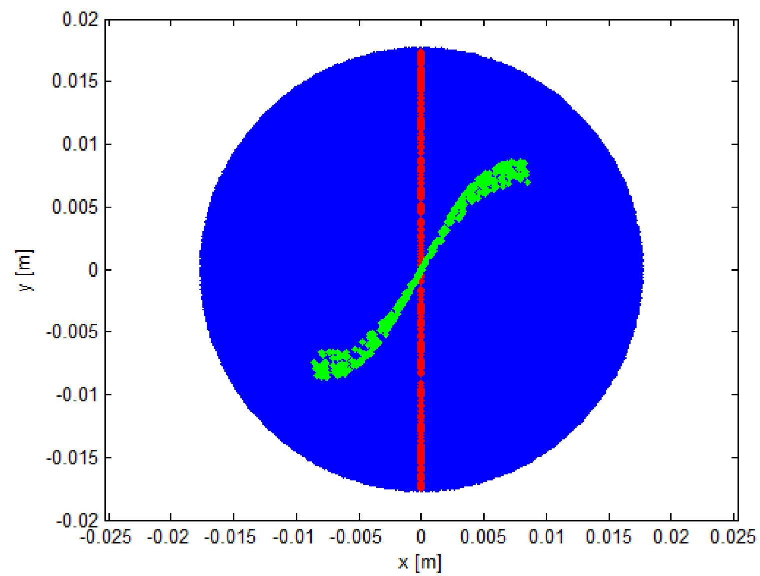
Both 420pC

Helmholtz coil



Ldrd.010.001

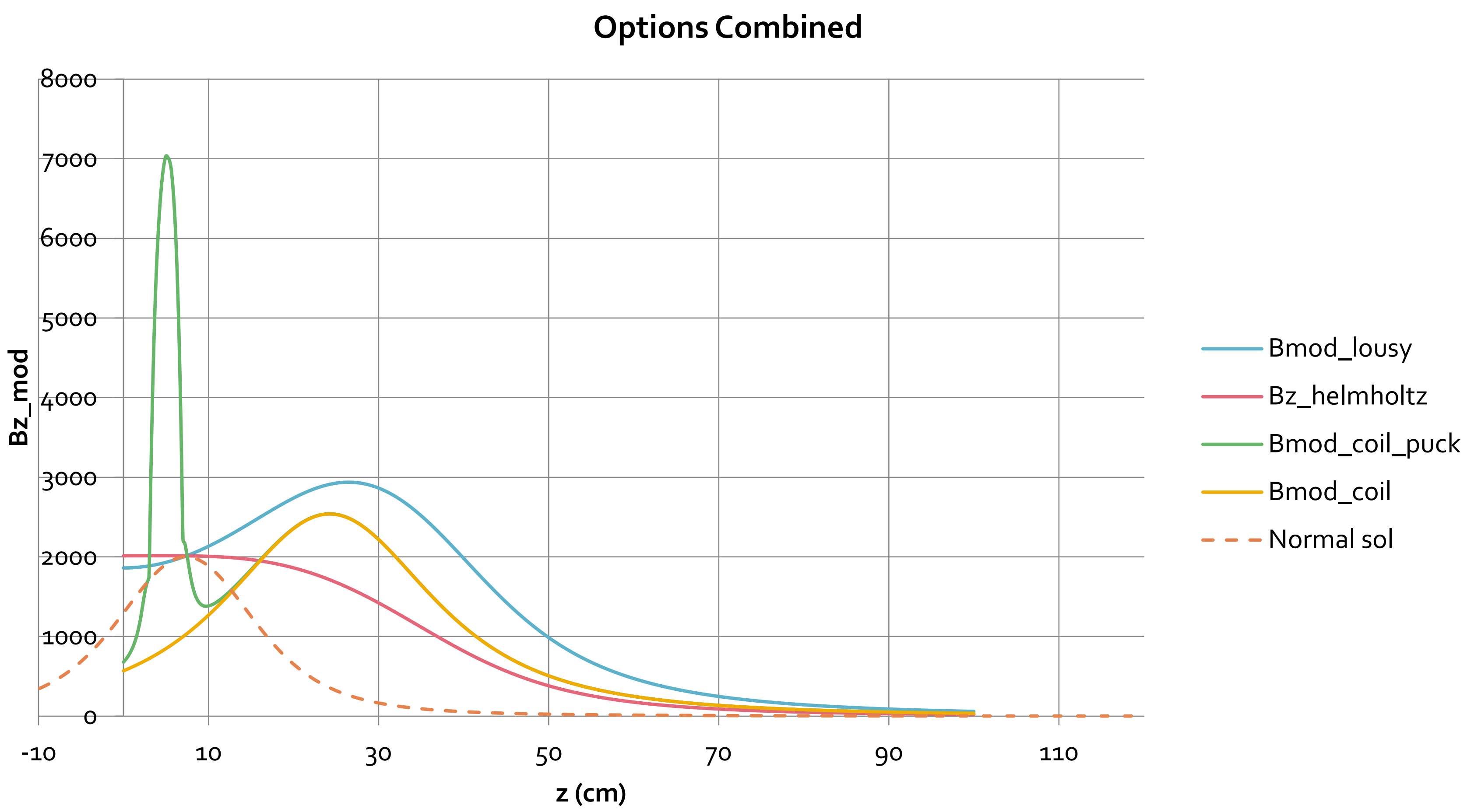
Standard solenoid



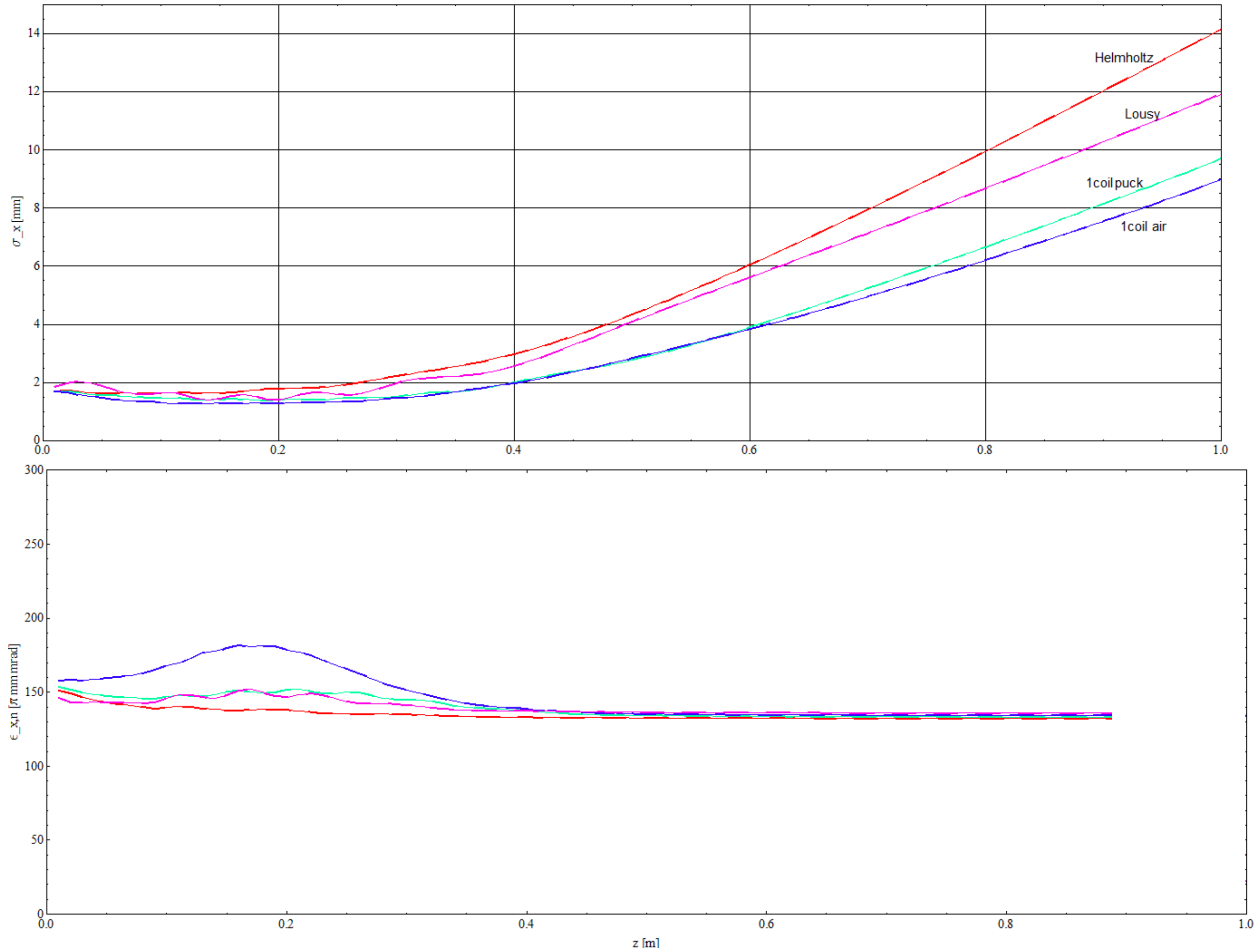
Ldrd.009.001

Nrad 70, Nlong 100

4 field maps, scaled to give ~0.2T

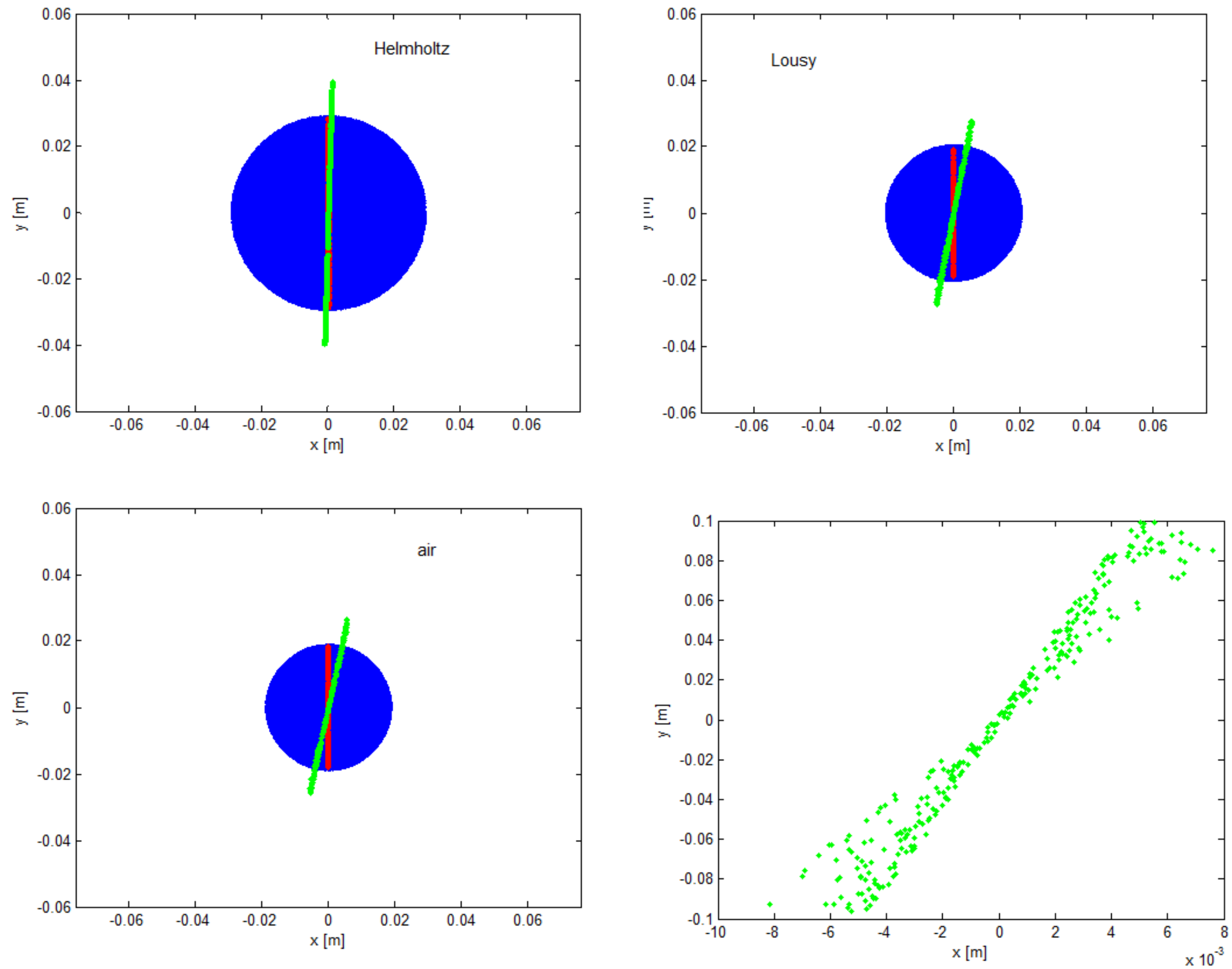


Transverse beam size, emittance



Magnetization virtual experiment

At 1m



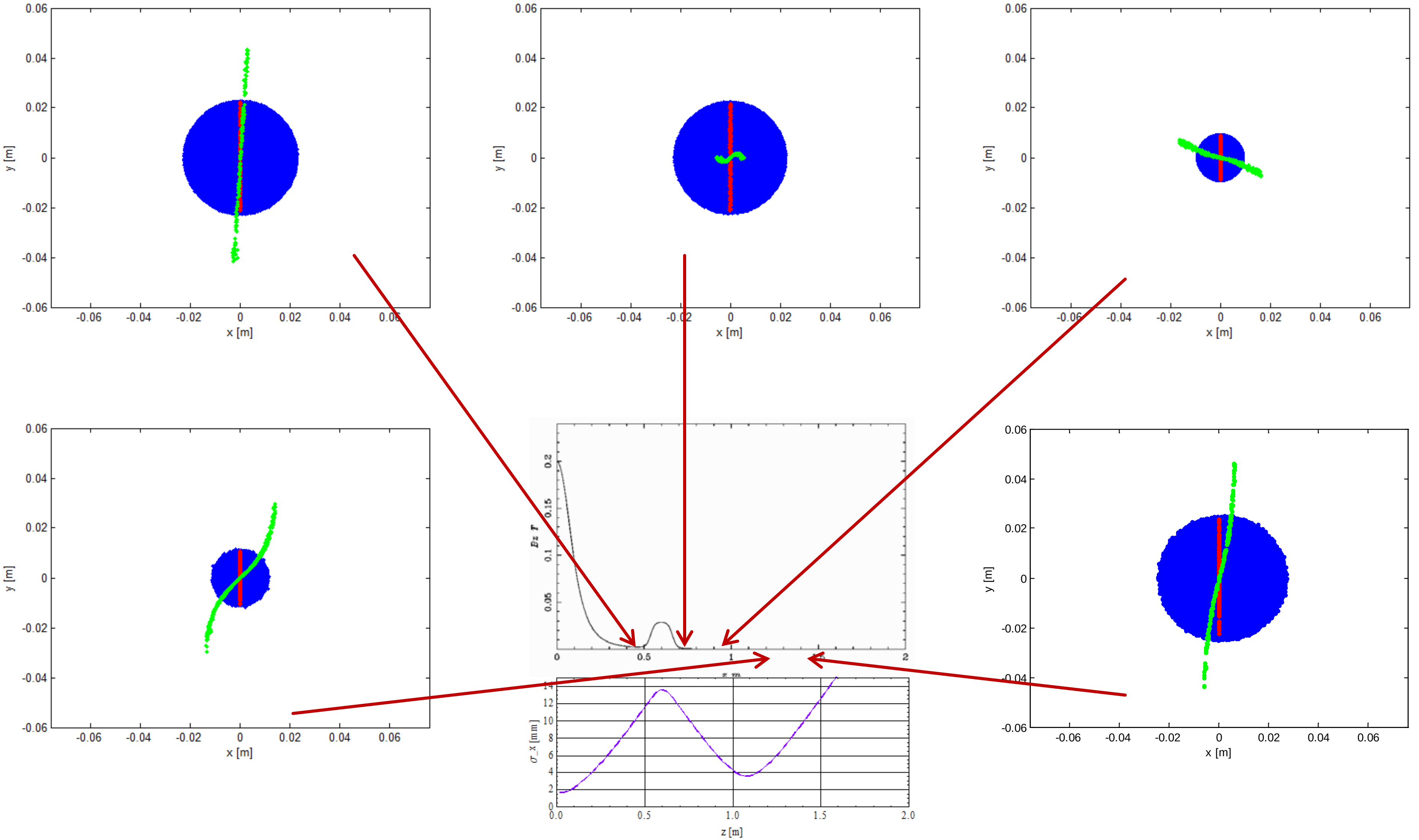
Can't see 'S' – all seem linear… why is this…

Ldrd.013.001-004

Beam size determines angle

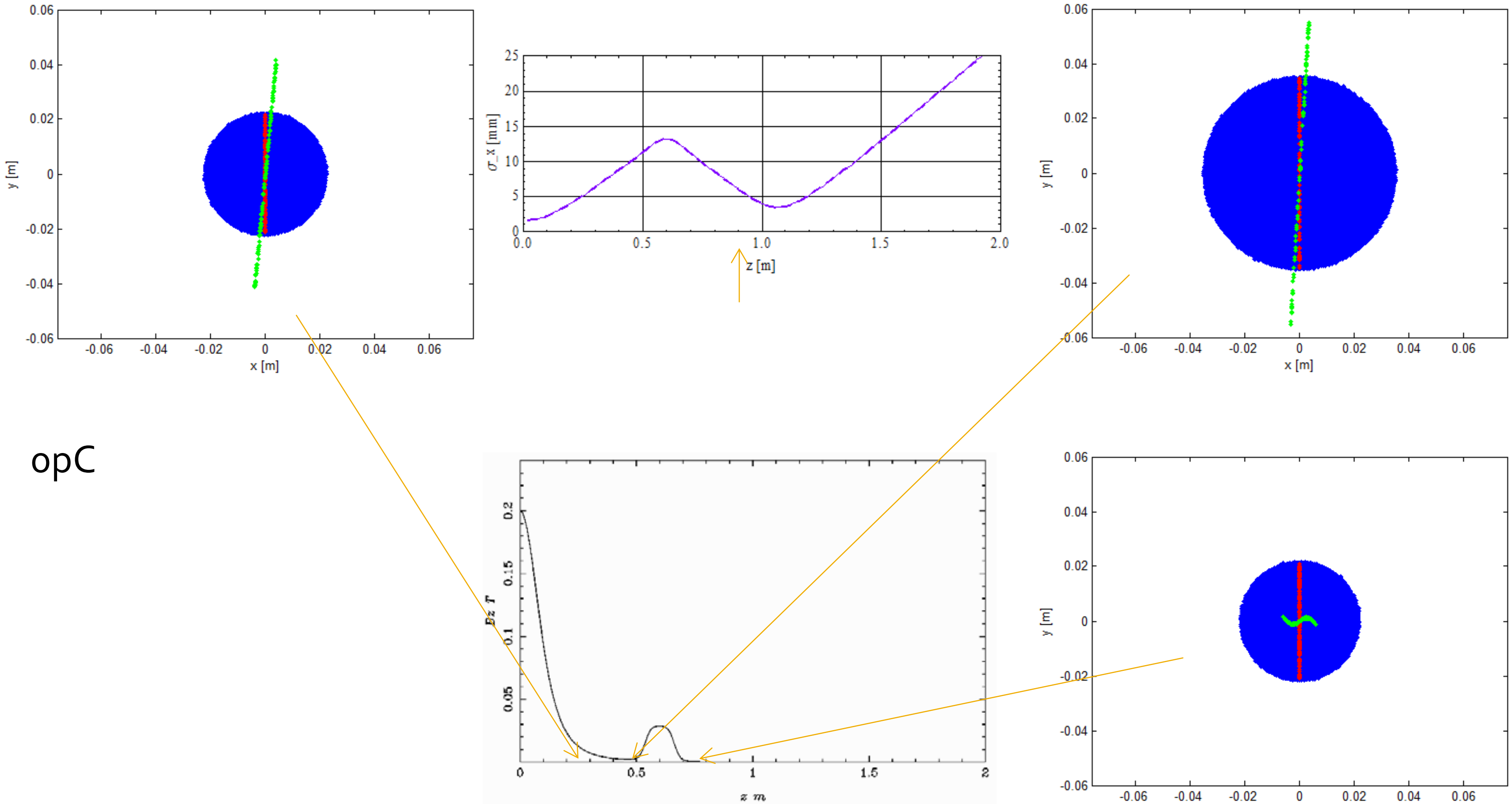
- $< L >= \frac{2 p_z \sigma_1 \sigma_2 \sin\theta}{D} = B_z e {a_0}^2$
- For given magnetization, smaller σ_1, gives bigger $\sin\theta$
- Include beamline solenoid

Normal solenoid



Is this space charge in EC sol?

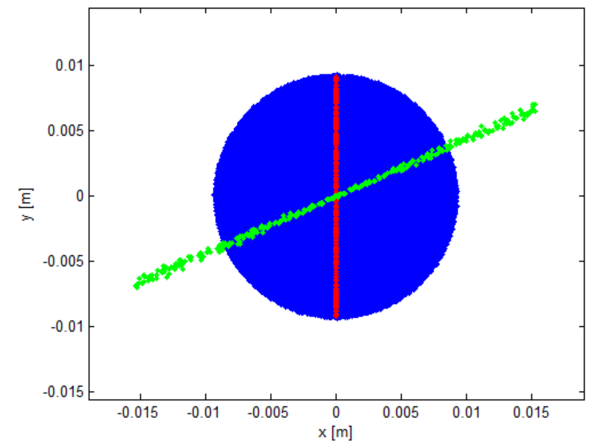
opC

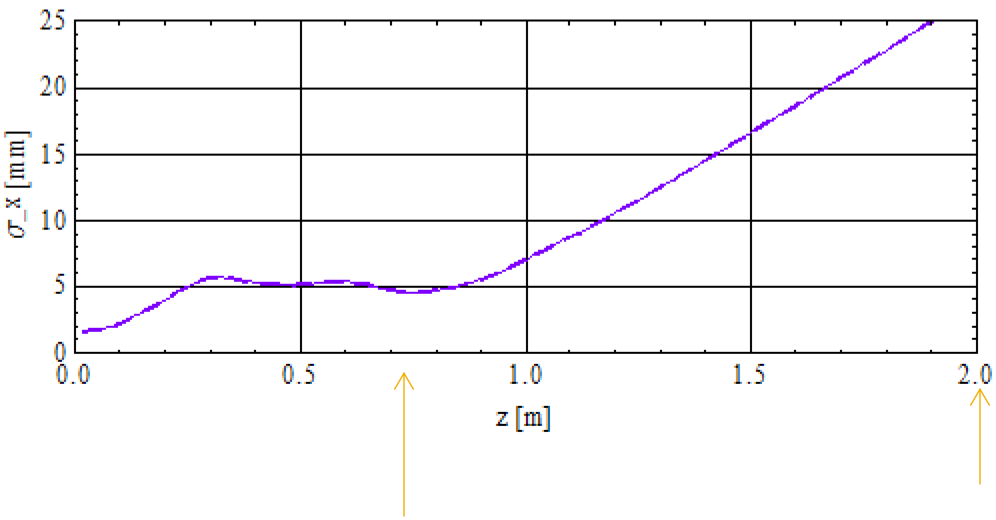


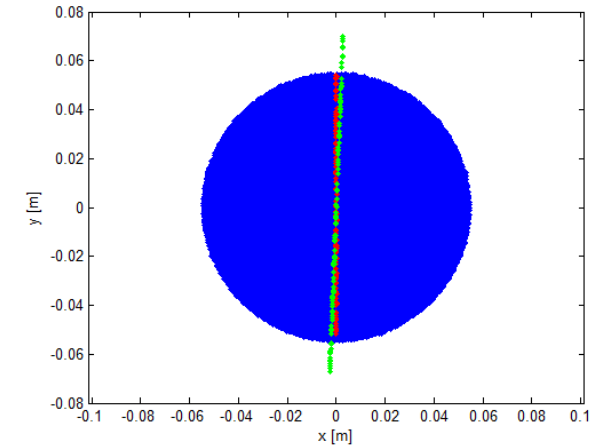
ldrd.016.0072.002

Is the trick to keep beam small in beamline solenoids?

- Trying not to have different B.dl over transverse direction.

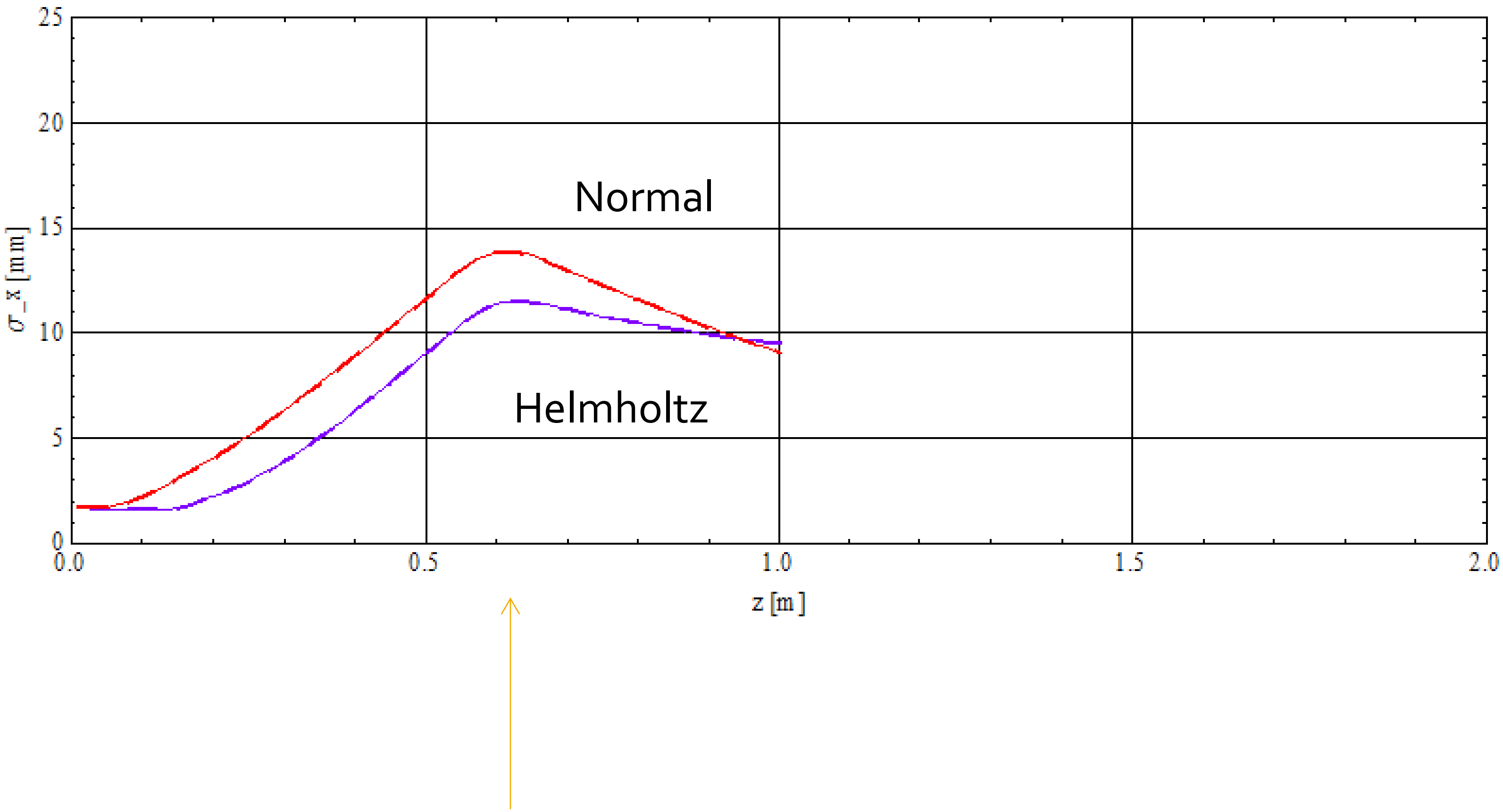






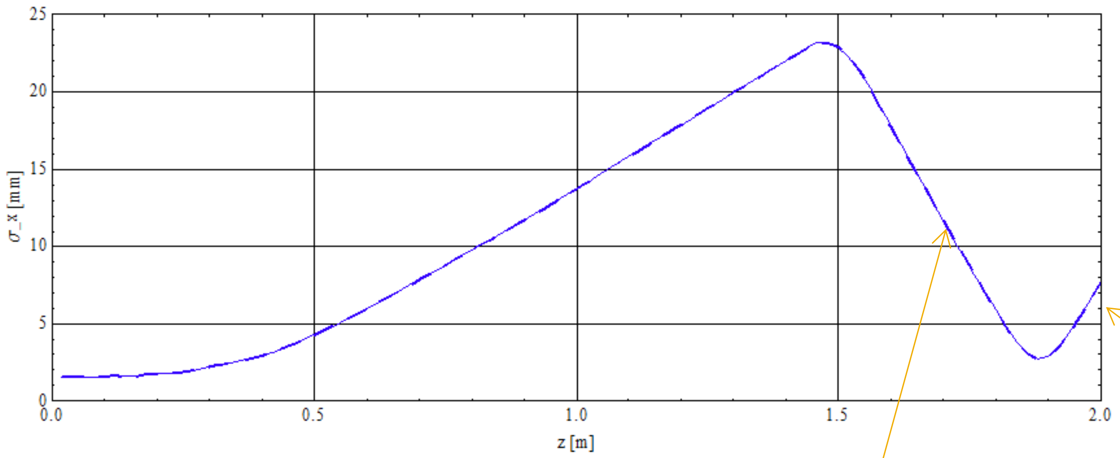
Ldrd.017.0072.004

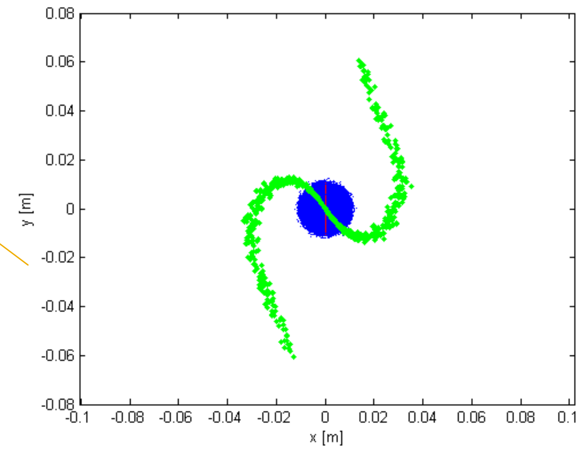
Could this explain difference between helmholtz and normal sol

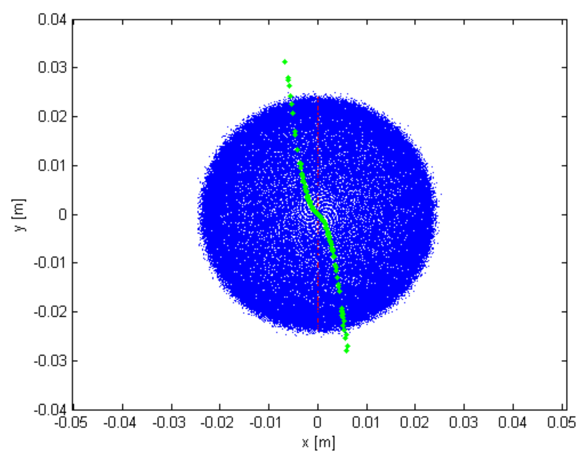


Focusing solenoid here

Let beam get big and then focus







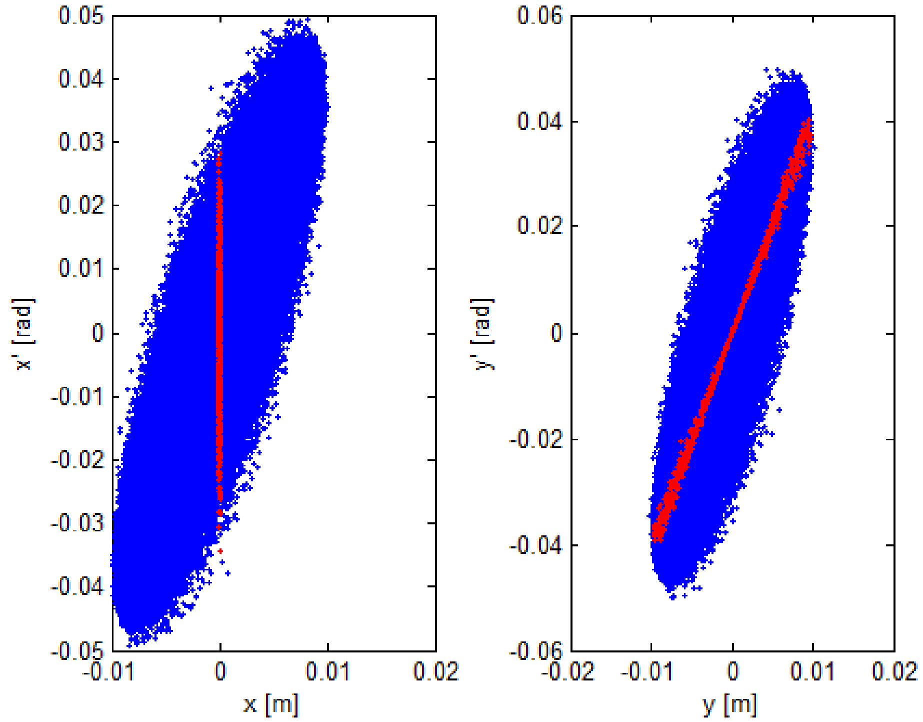
So even with good helmholtz field I can mess it up!

Conclusion

- Don’t need a fancy magnetizing magnet for LDRD
- We can characterize what we have
- Need to really understand this with MEIC

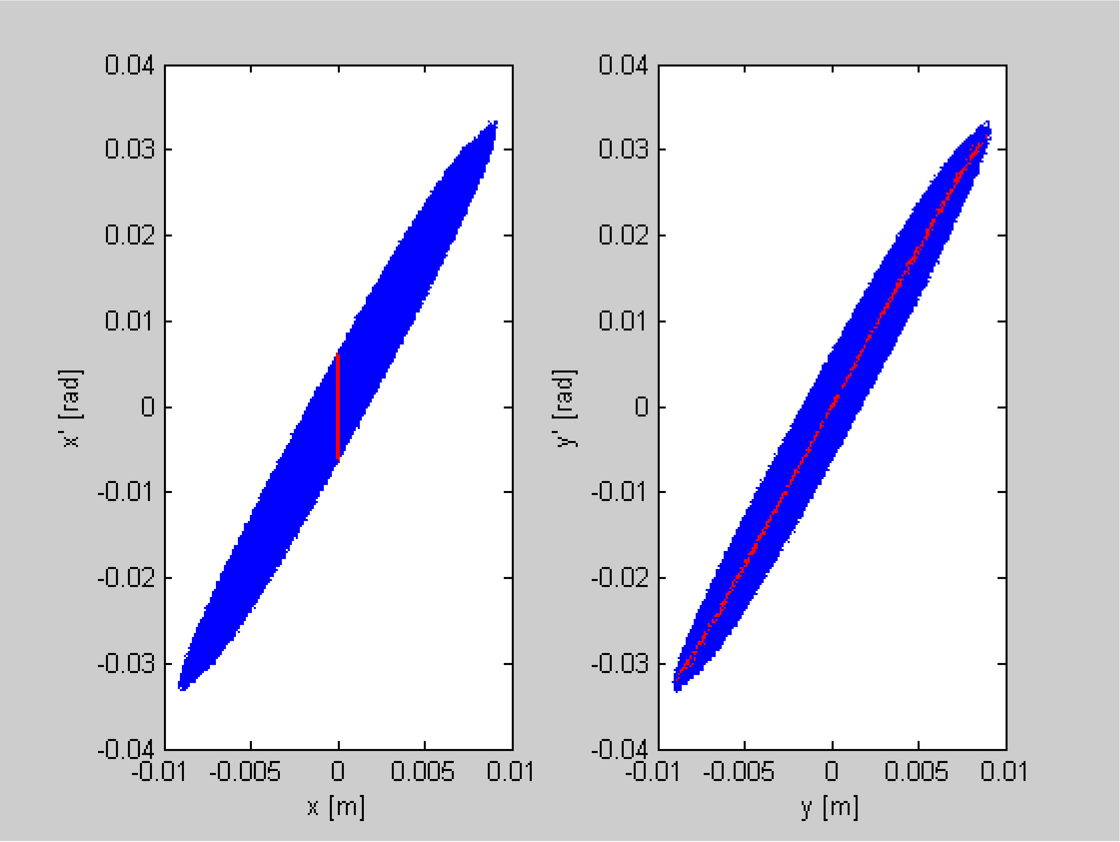
A measure of magnetization?

- Phase space after the cathode should be ideally perfectly linear



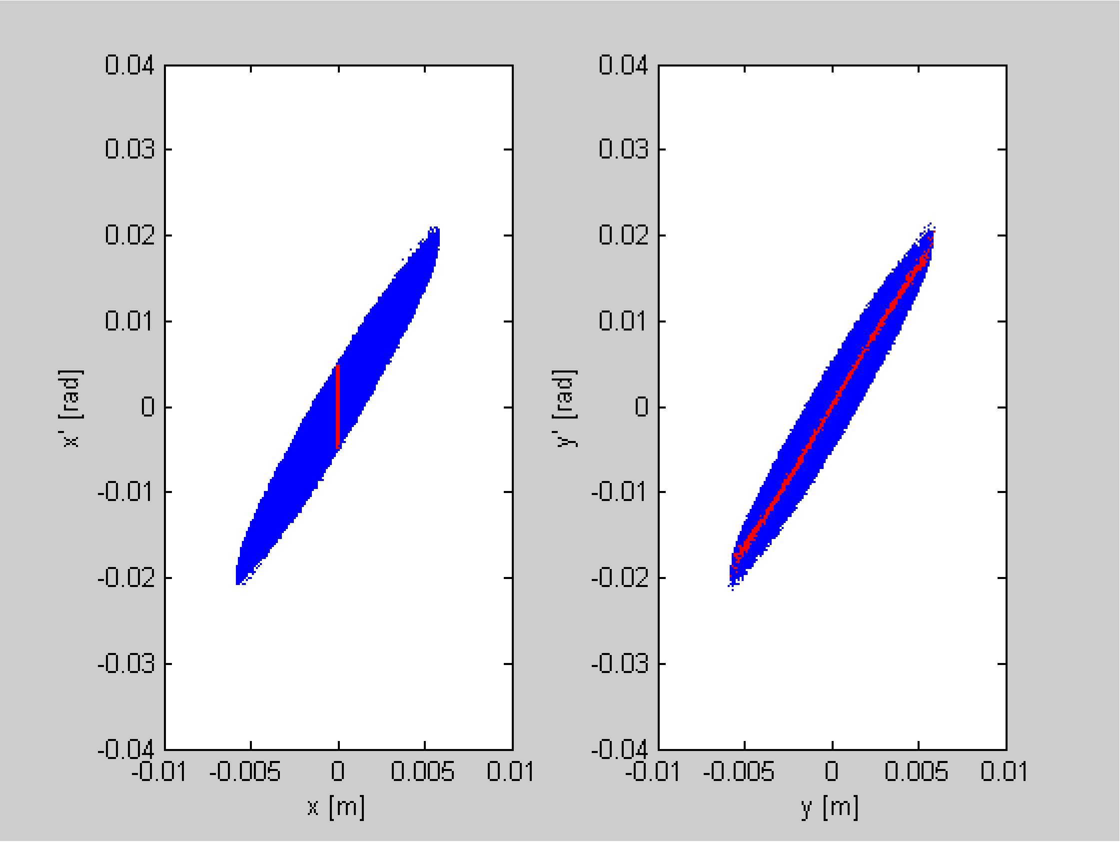
Ldrd.017.0024.004 mag_sol

Helmholtz

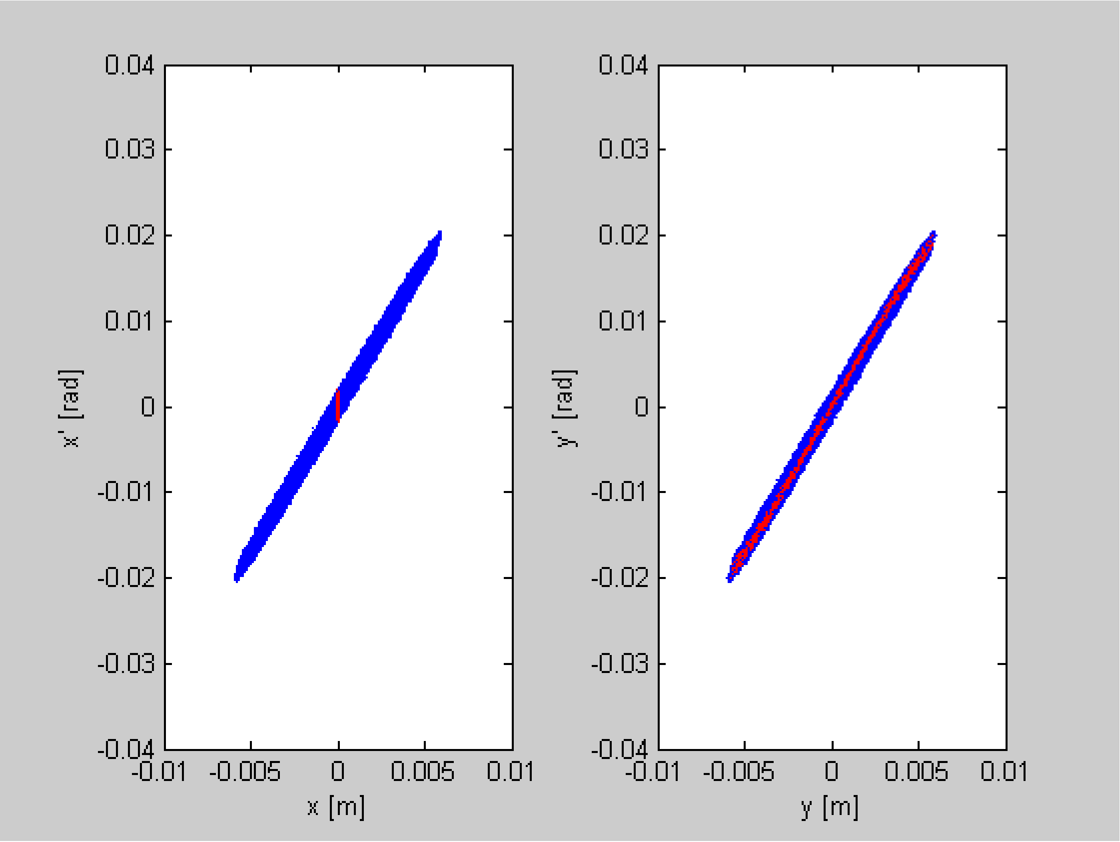


0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
x' [rad]
-0.01
-0.005
0
0.005
0.01
x [m]
y' [rad]
y [m]

Lousy helmholtz



One coil - air



0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
x' [rad]
-0.01
-0.005
0
0.005
0.01
x [m]
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
y' [rad]
-0.01
-0.005
0
0.005
0.01
y [m]

One coil - puck