



To PRY or not to PRY

ILLINOIS INSTITUTE
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Motivation

- Arguments for a partial return yoke – PRY
- Last week's MICO meeting, Mike made comments on slide 16 regarding:
 - PRY effect on beam
 - forces on PRY
 - weight considerations
 - access to services
- Additional considerations

Motivation: PRY effect on beam

- present design of MICE hall, field in beam region is non-uniform (small effect)
- reason for no return yoke in original design: reduce cost
- past concern: adding yoke would change linearity of the magnetic fields
- does NOT adversely affect homogeneity
- requires more modeling to get the currents right

- a symmetric return yoke should improve the field in the cooling channel
- as for more modeling, note how much more modeling is now required!

Motivation: forces on PRY

- **non-symmetric arrangement is going to cause non-symmetric forces**
- **additional shielding will result in more forces for which more engineering will be required**
- **reducing returning flux & making arrangement more symmetric with PRY should improve conditions for MICE**

Motivation: weight considerations

- **additional weight will be an issue everywhere**

Motivation: access to services

- **present plan is to move and wrap equipment in shielding material**
- **access will be affected for any plan**
- **problem may be alleviated/reduced with PRY**

Motivation: additional considerations

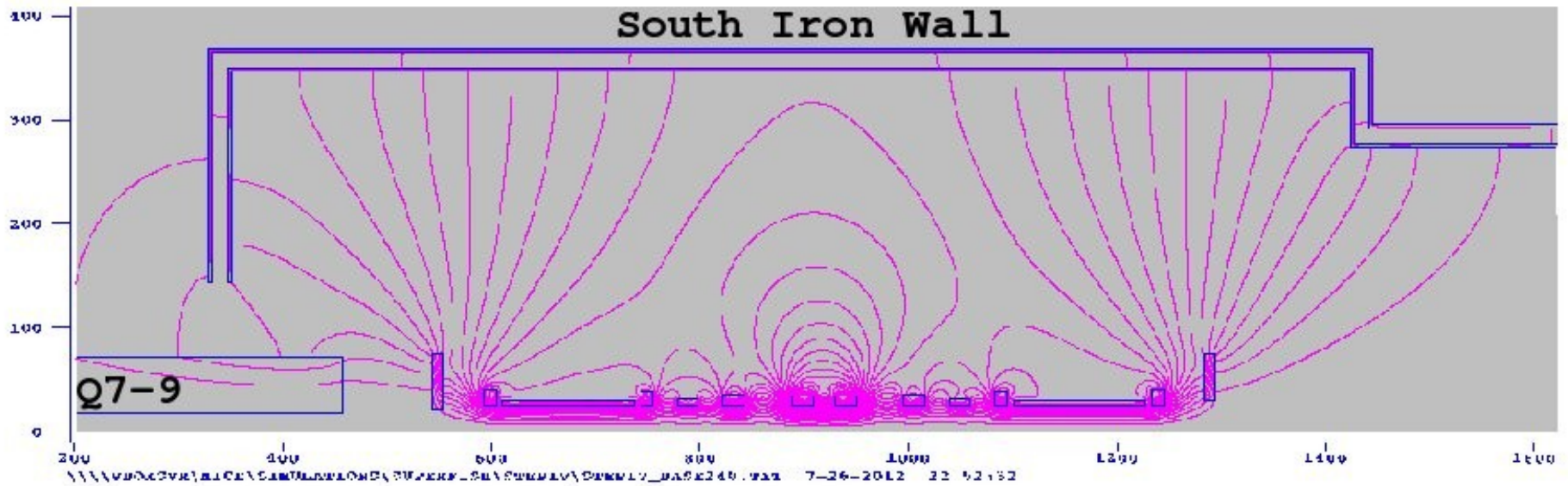
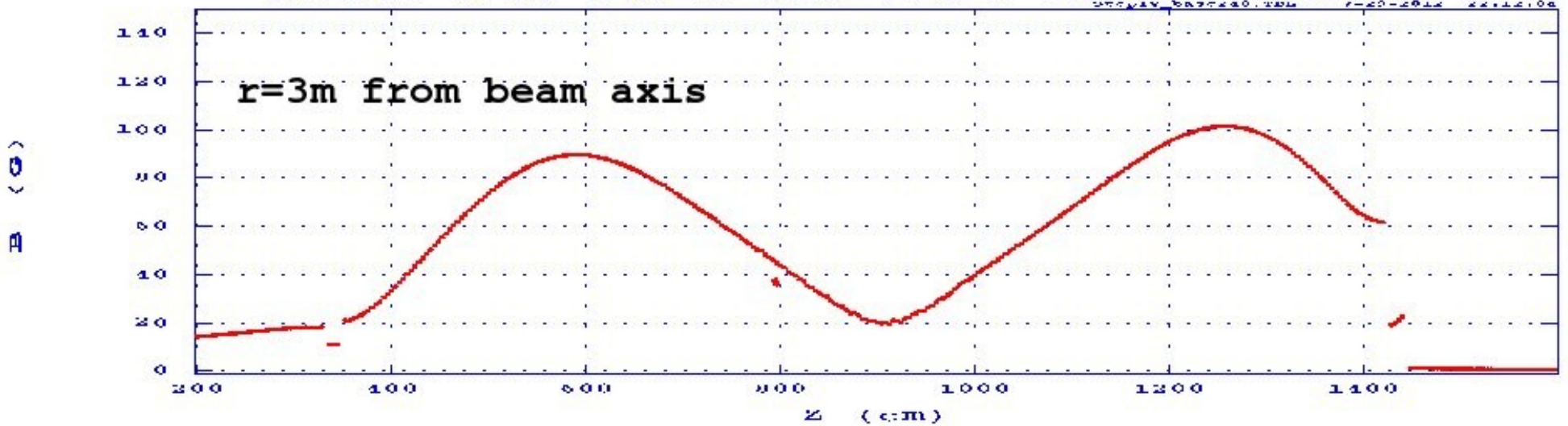
- **don't forget effects of long signal cables**
- **longer cables more susceptible to noise**
- **some monitored signals used in control loops are analog**
- **historically had issues with RS232 lines to beamline magnet power supplies**
- **may spend long time debugging problems associated with longer signal cable runs**

Motivation: additional considerations

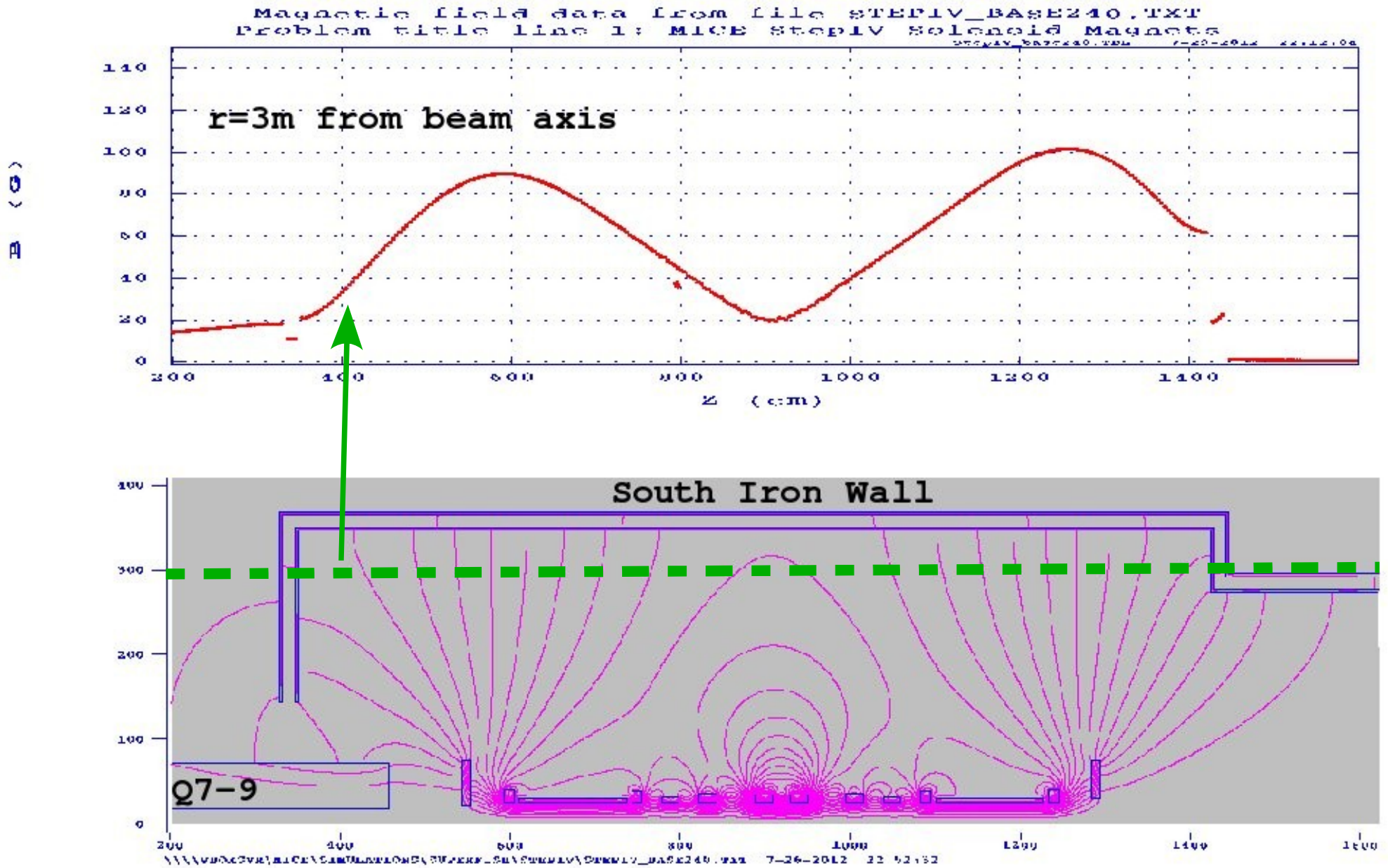
- concerned about all of the little things that we will miss**
- a hurried job of re-engineering so much that was so carefully engineered in the first place will almost surely bite us in the backside**
- even with moving equipment, we will still need more control of the return flux**
- perhaps hybrid plan will be best option**
- argument that it's a new engineering project to put in PRY is not compelling in light many simulation and re-engineering tasks required to move equipment and shield each piece individually**

Base Step IV layout - $p=240\text{MeV}/c$

Magnetic field data from file STEP1V_BASE240.TXT
Problem title line 1: MICE StepIV Solenoid Magnets

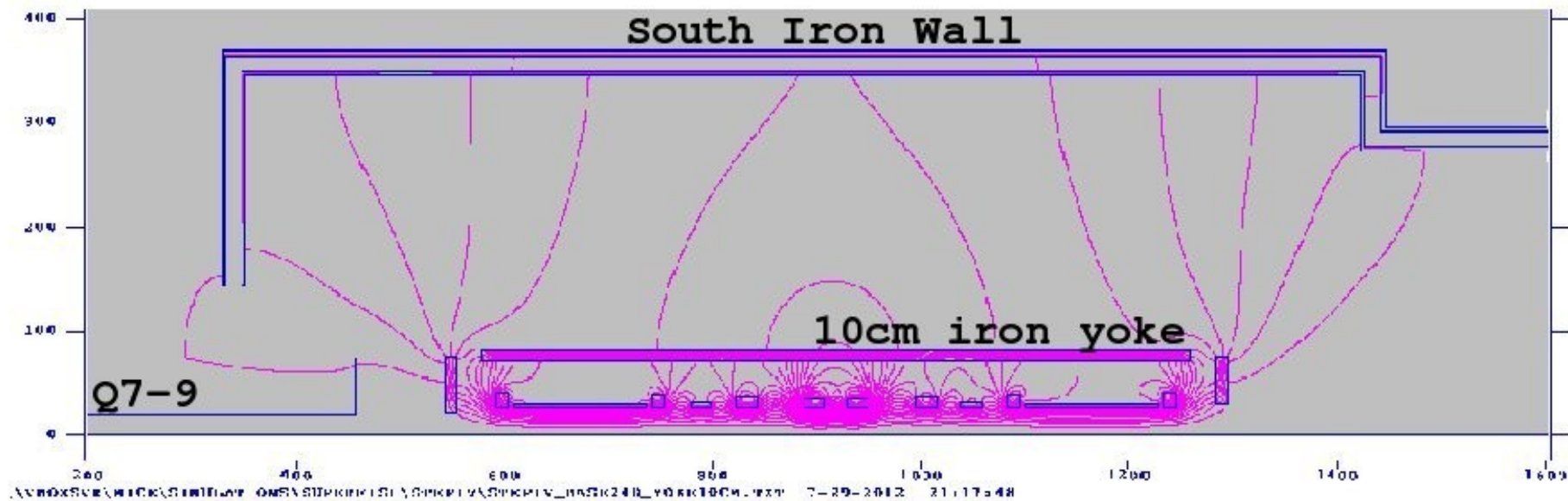
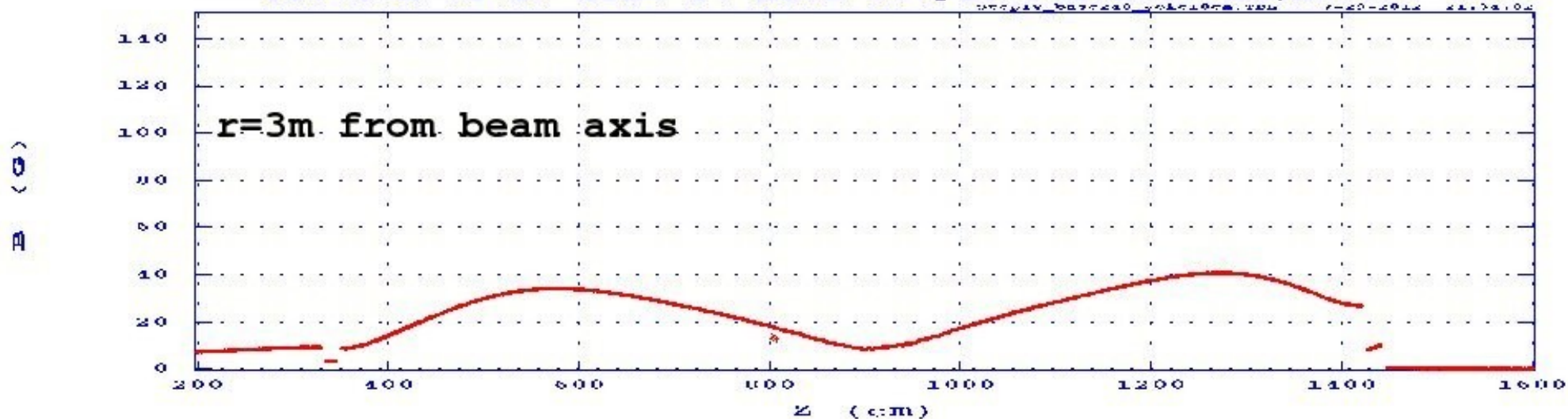


Base Step IV layout - $p=240\text{MeV}/c$

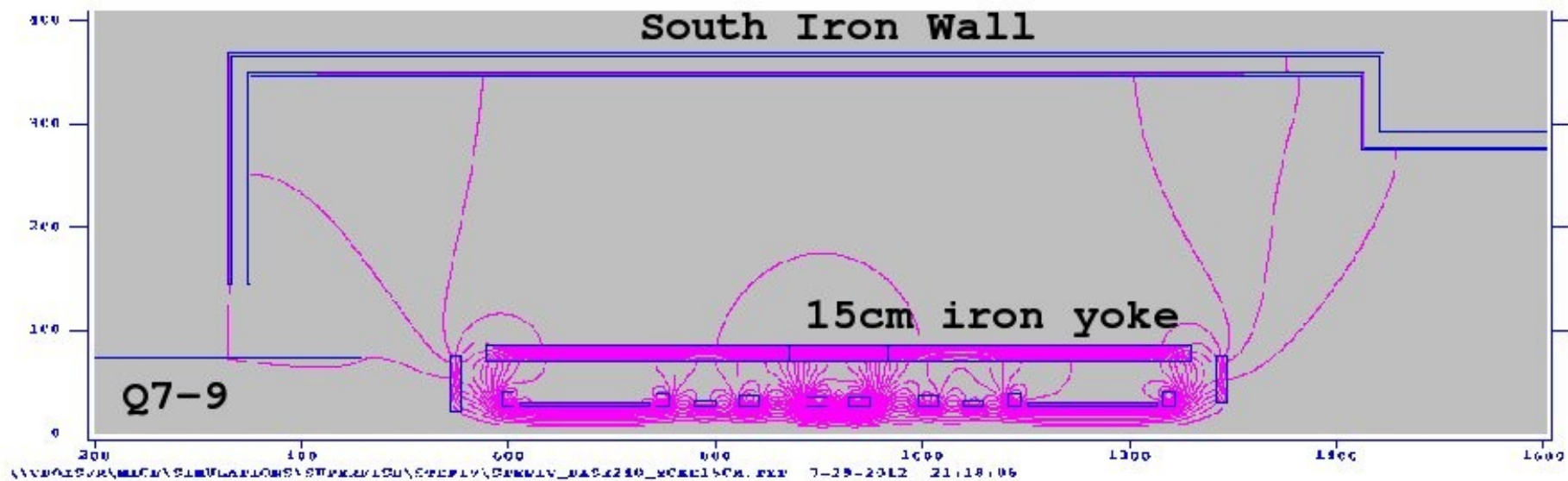
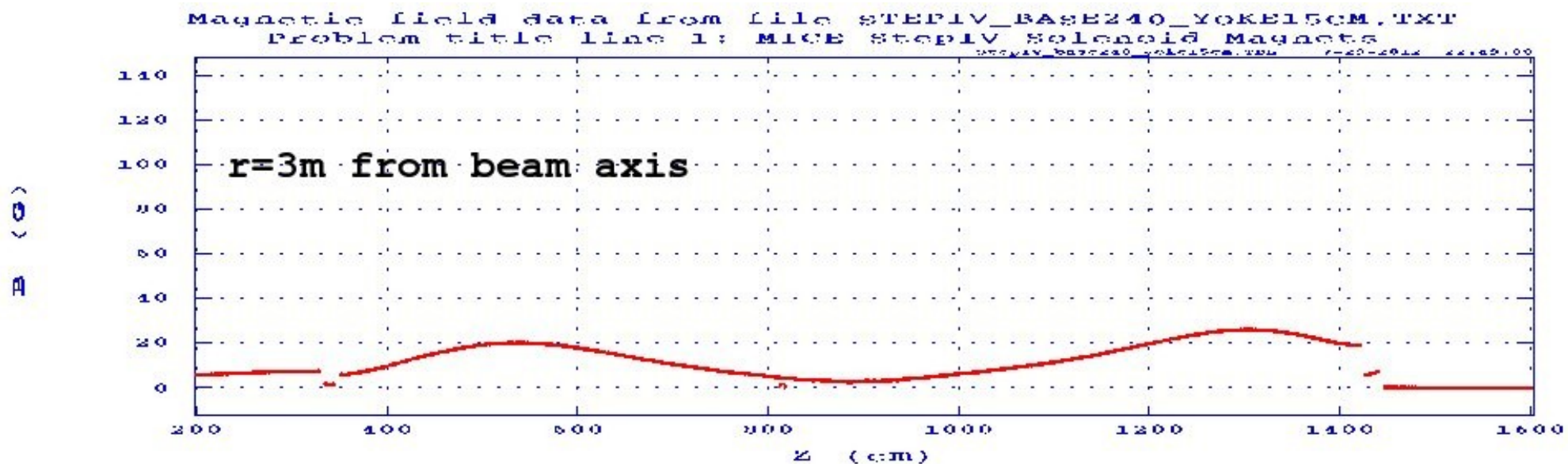


Step IV layout - $p=240\text{MeV}/c$: 10cm iron yoke

Magnetic field data from file STEP4V_BASE240_YOKE10CM.TXT
Problem title line 1: MICE StepIV Solenoid Magnets

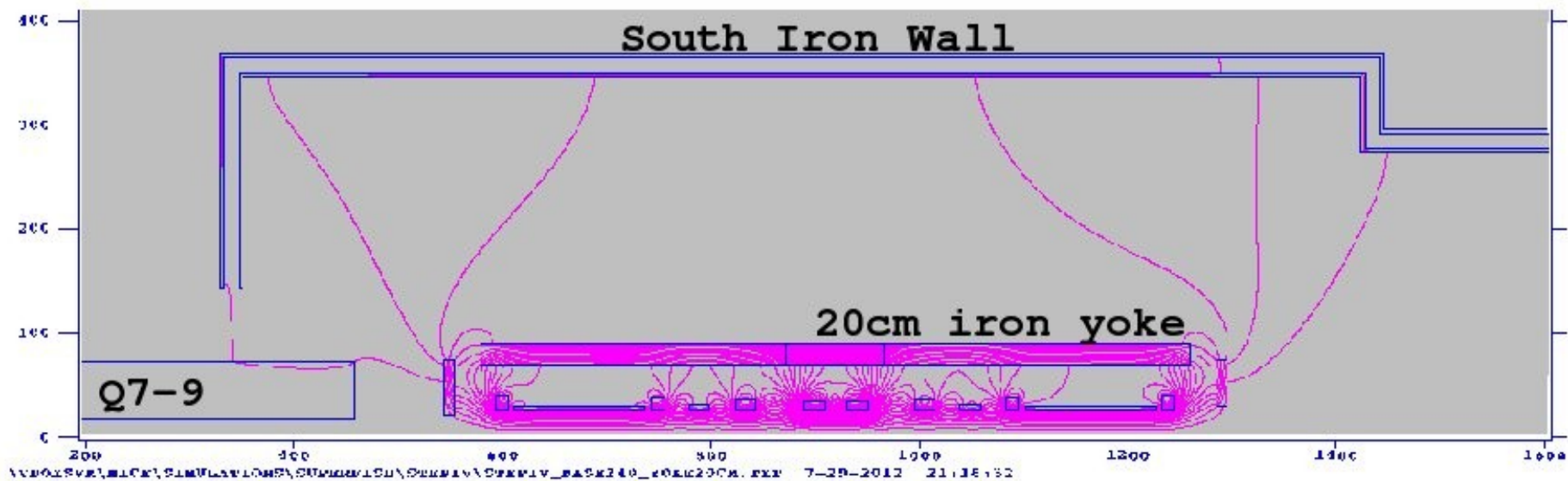
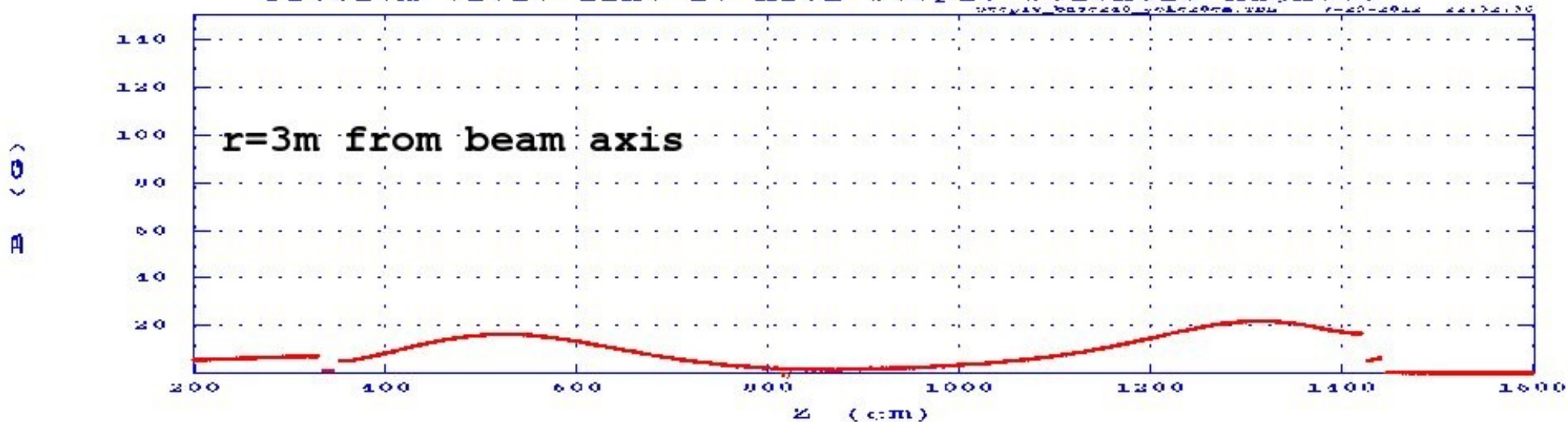


Step IV layout - $p=240\text{MeV}/c$: 15cm iron yoke



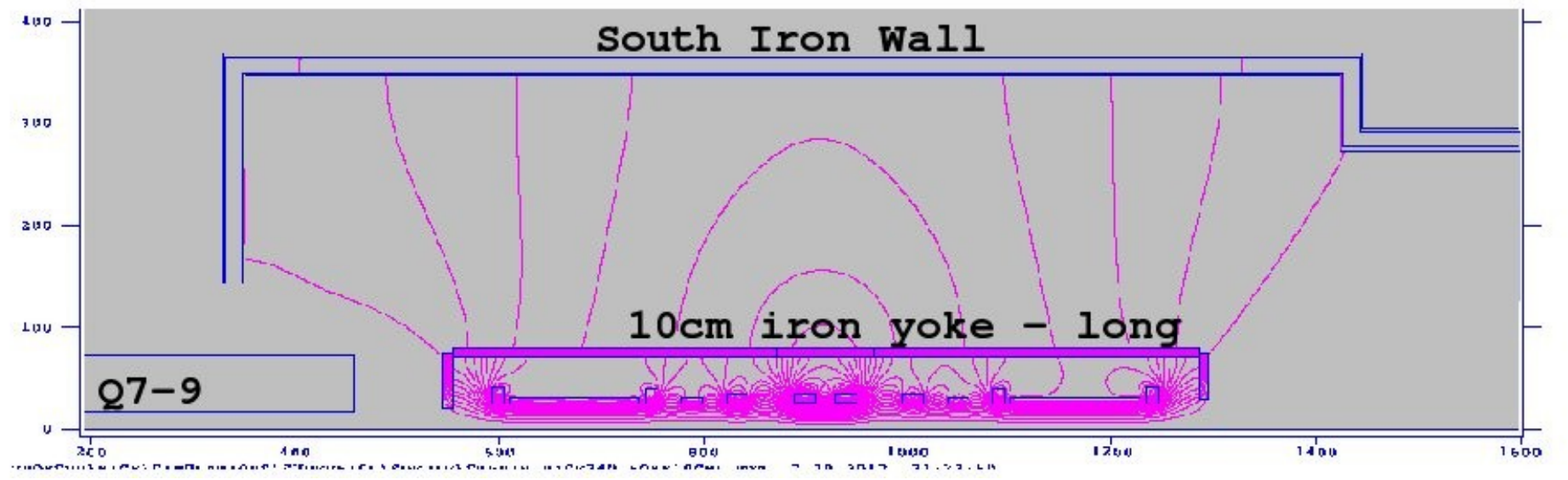
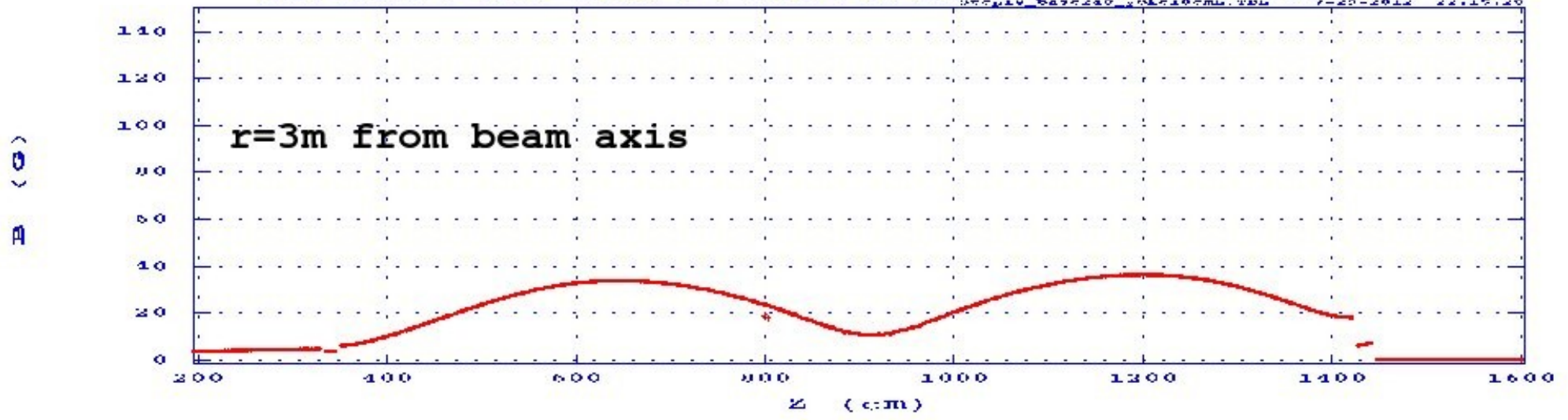
Step IV layout - $p=240\text{MeV}/c$: 20cm iron yoke

Magnetic field data from file STEP4V_BASE240_YOKE20CM.TXT
Problem title line 1: MICE StepIV Solenoid Magnets



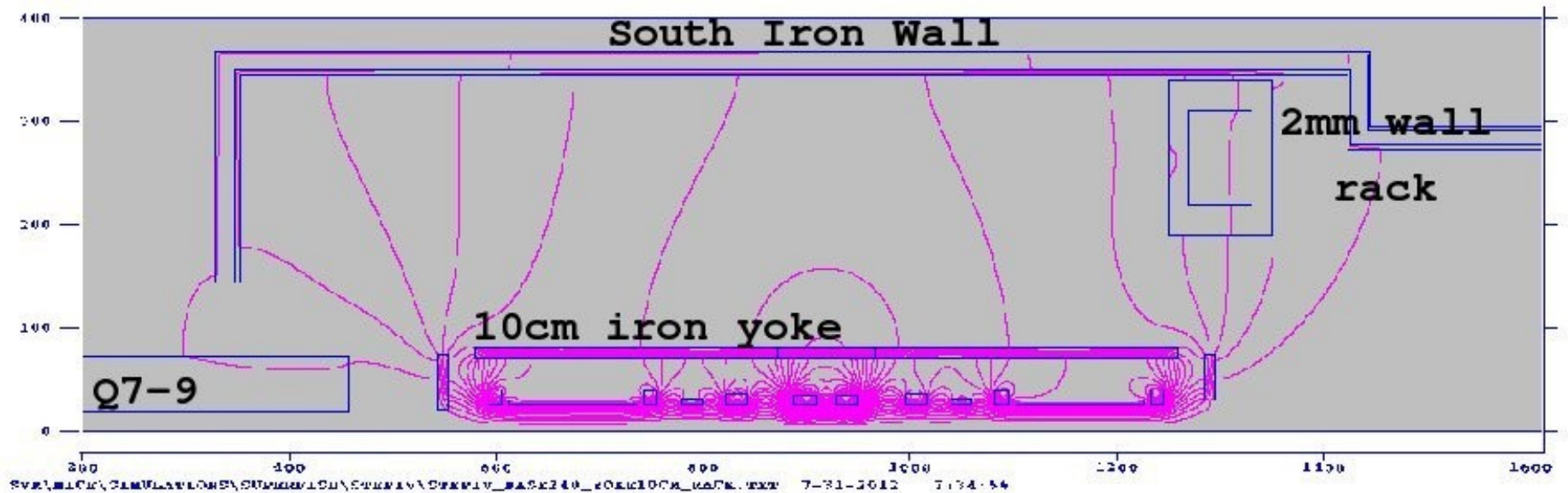
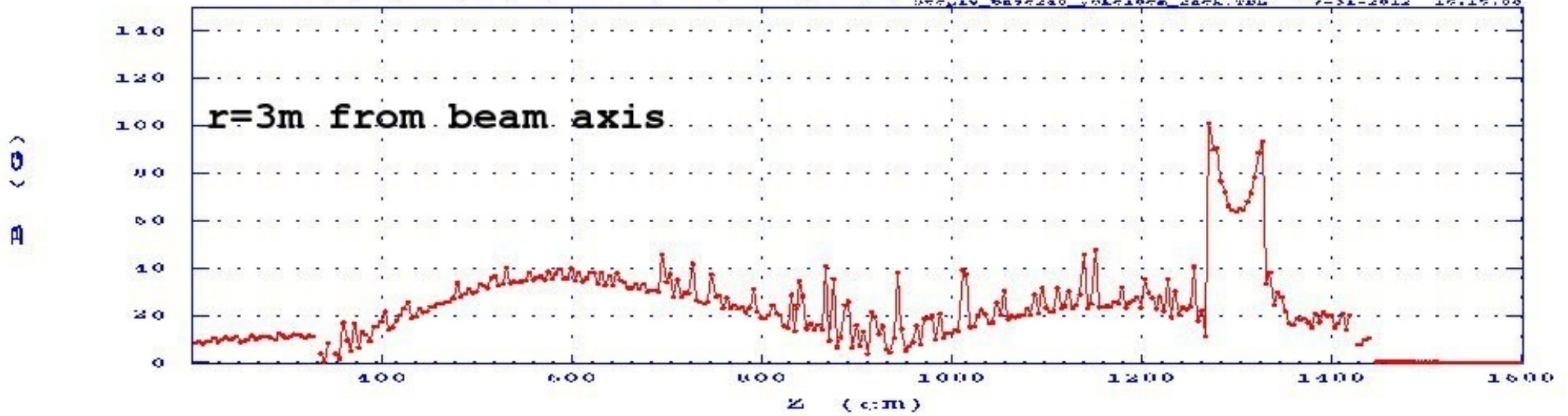
Step IV layout - $p=240\text{MeV}/c$: 10cm "long" yoke

Magnetic field data from file STEP4V_BASE240_YOKE10CML.TXT
Problem title line 1: MICE StepIV Solenoid Magnets

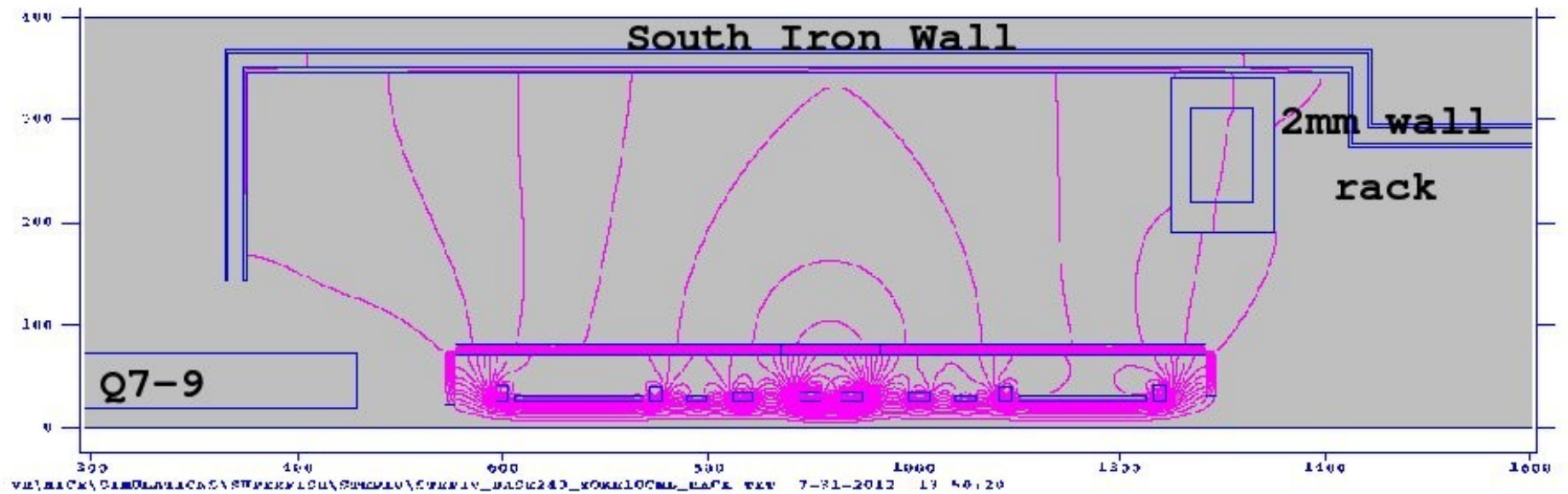
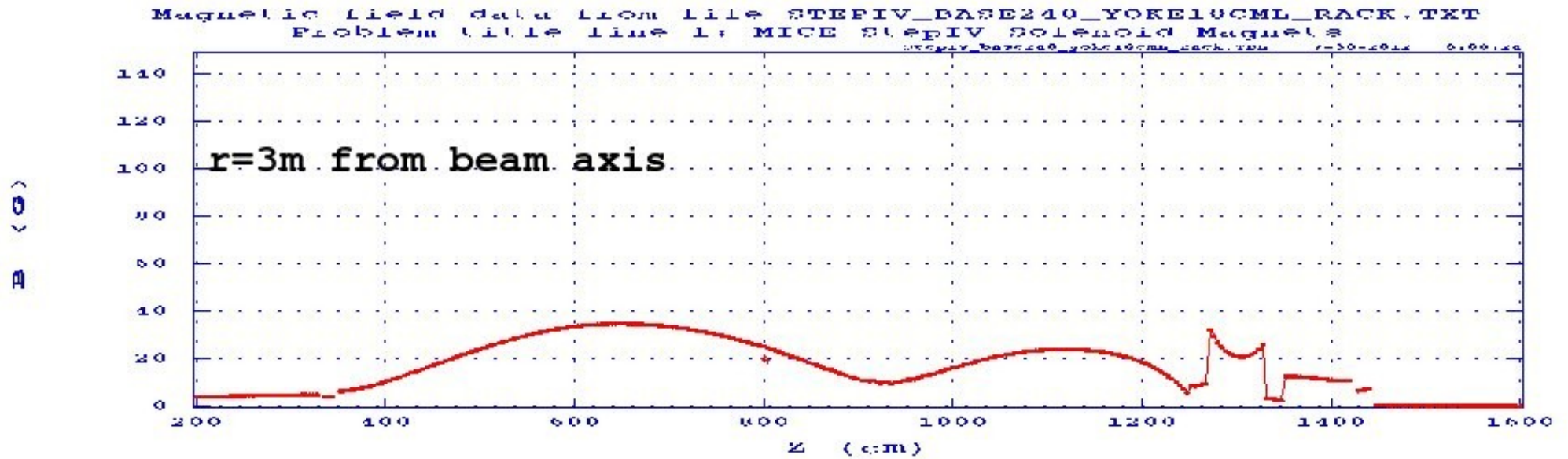


Step IV layout - $p=240\text{MeV}/c$: 10cm yoke + rack

Magnetic field data from file STEP4V_BASE240_YOKE10CM_RACK.TXT
Problem title line 1: MICE StepIV Solenoid Magnets



Step IV layout - $p=240\text{MeV}/c$: 10cm "long" yoke + rack



Proposed Course of Action

- **Create 3D model**
- **Verify:**
 - **compare magnitudes with 3D model**
 - **fields in beam region are not ill perturbed**
 - **return flux reduction in 3D model**
- **Study forces with PRY**
- **Study engineering feasibility**