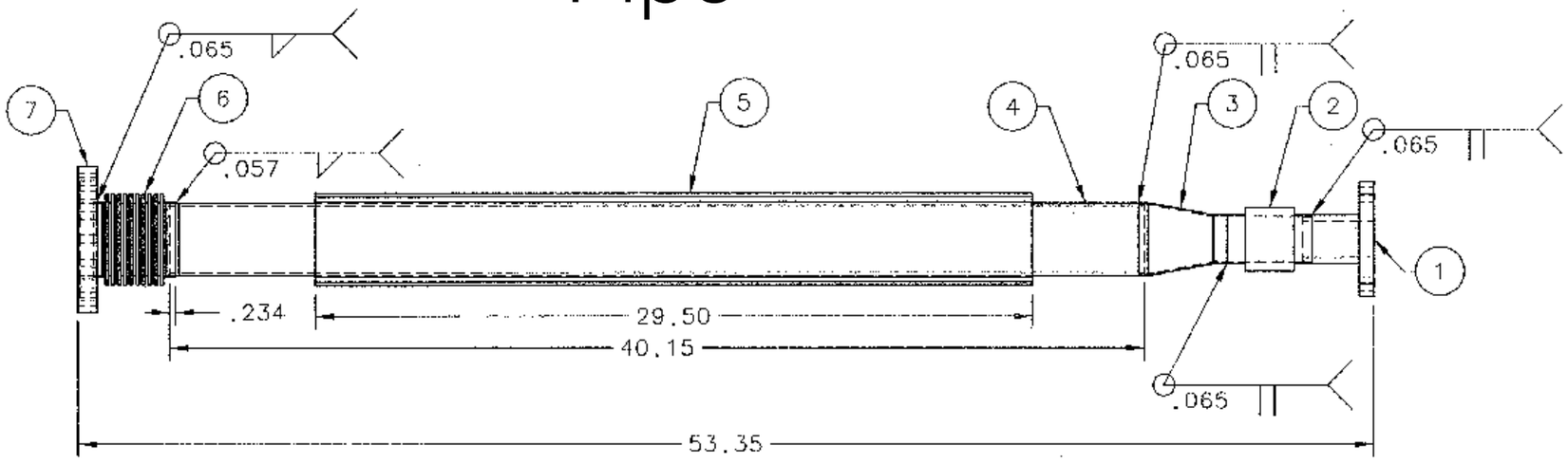
PREX Magnetic Modeling

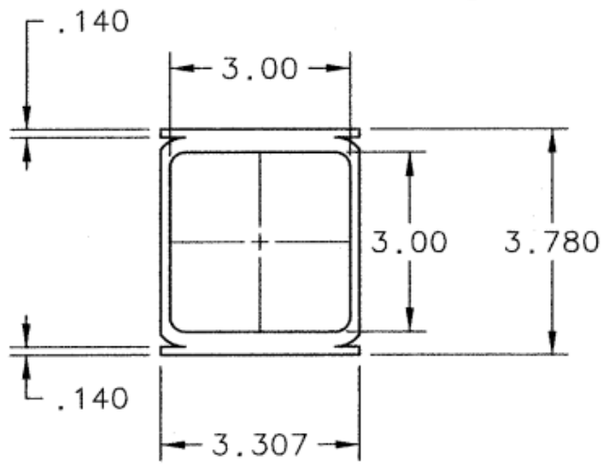
work done by Jay Benesch

Septum beam pipe

Pipe



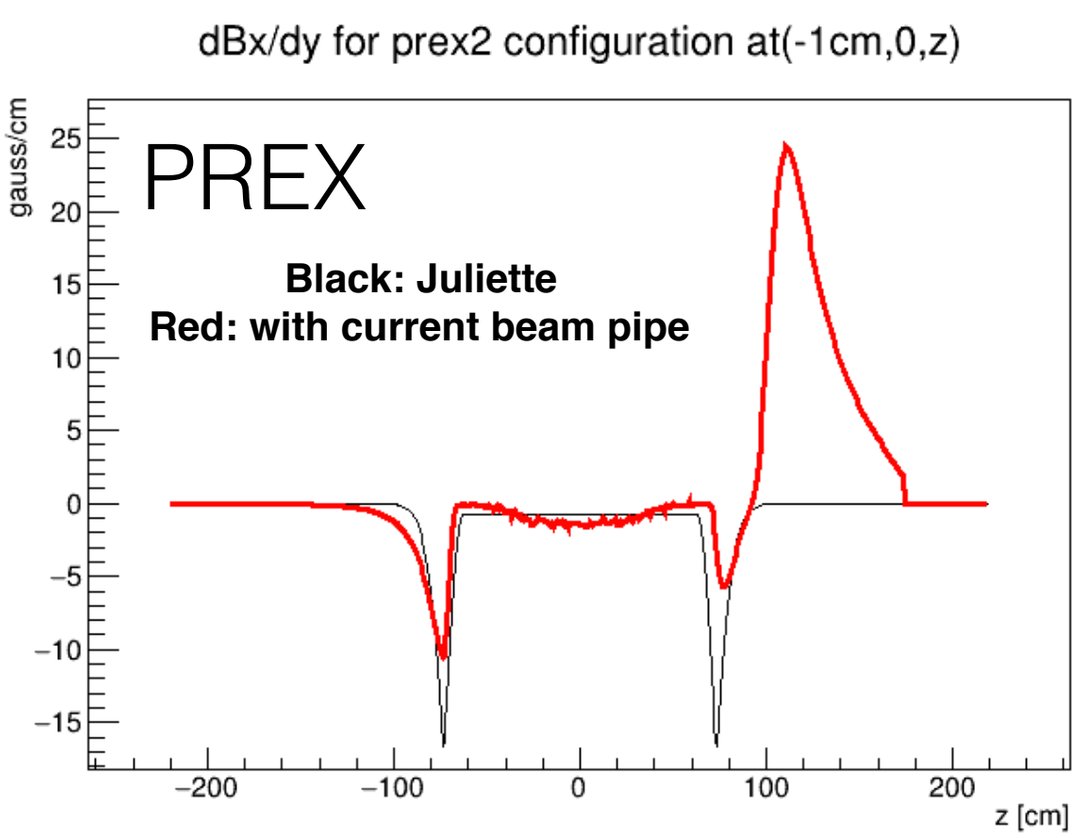
Shielding

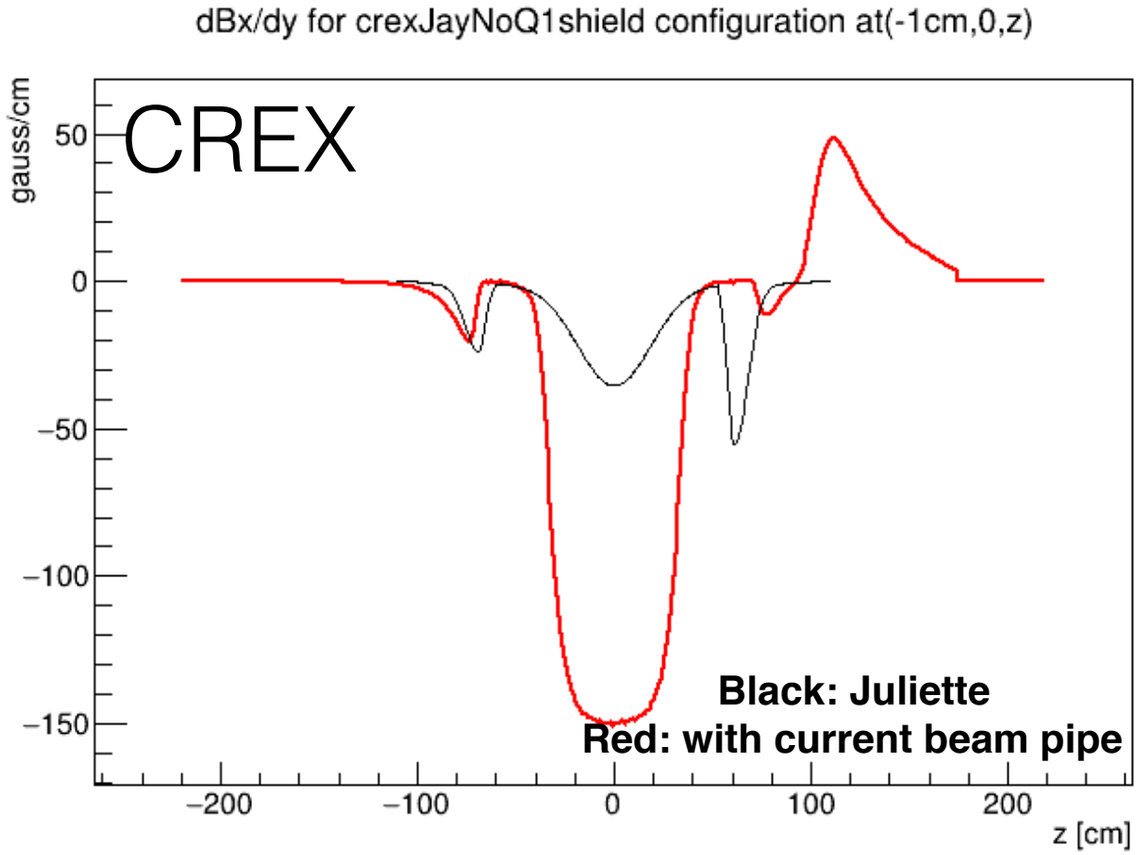


- Jay started working with the model Juliette and Iris provided

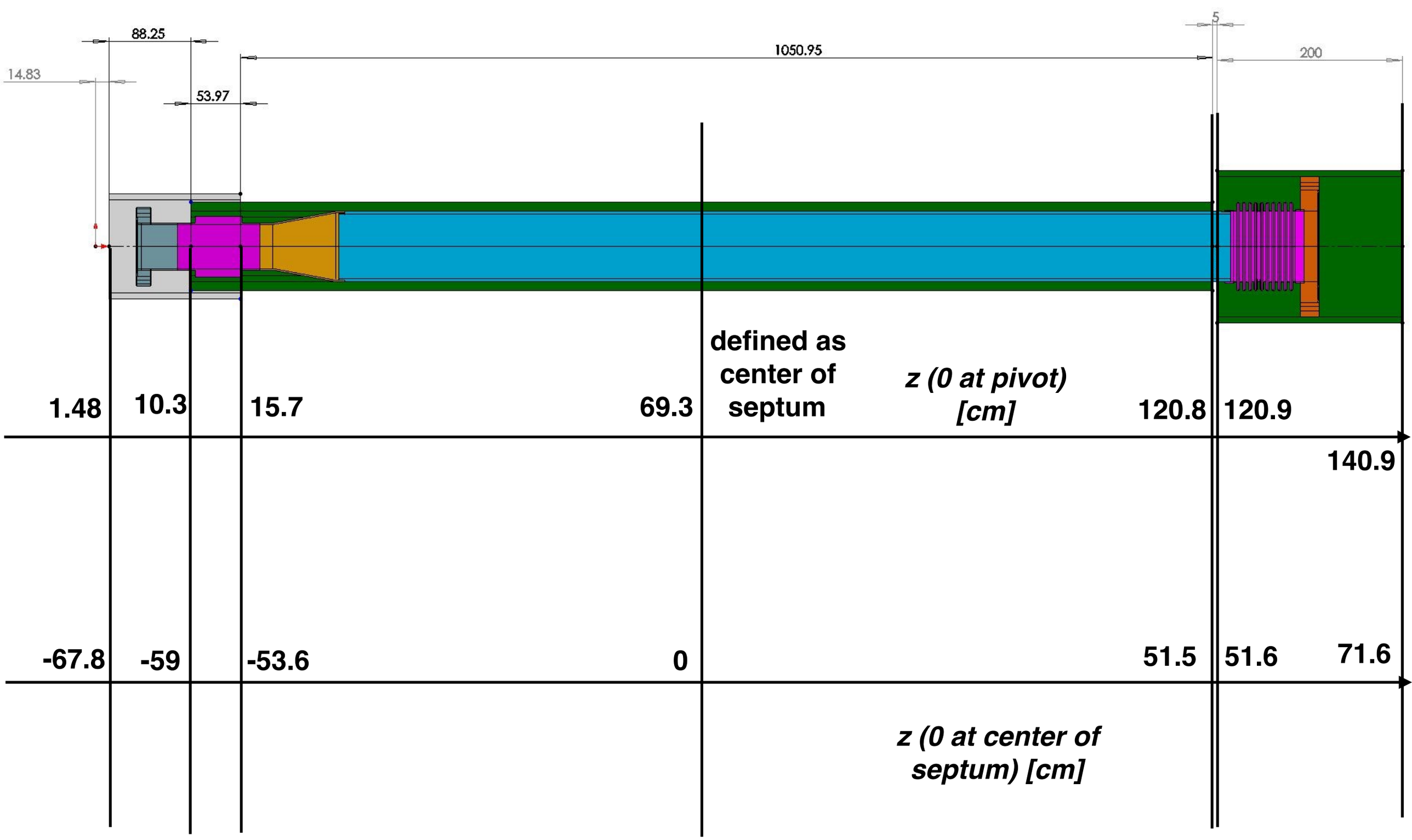
- The beam pipe through the septum in the configuration that ran for PREX1 (and is available now) has:
  - The shielding (# 5) is in actuality longer - 43.5”
  - The shielding box is made out of carbon steel and the openings at the top and bottom are filled in with weld
  - The pipe itself is made out of stainless steel

B fringe field from current setup





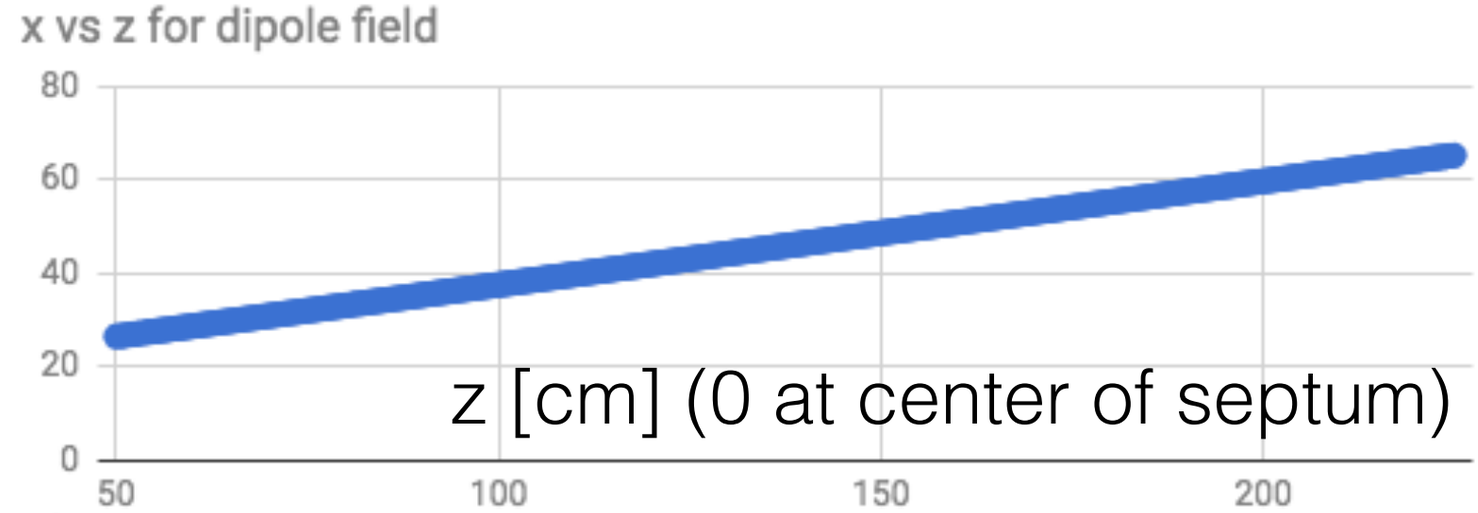
- Note that Juliette never got a fringe field for the Q1s
- The fringe field in the CREX case is probably unmanageable (radiation wise) if we keep the current setup
- Juliette must have already replaced the stainless steel pipe in her simulation with carbon-steel
- Jay has models running now with updated configuration

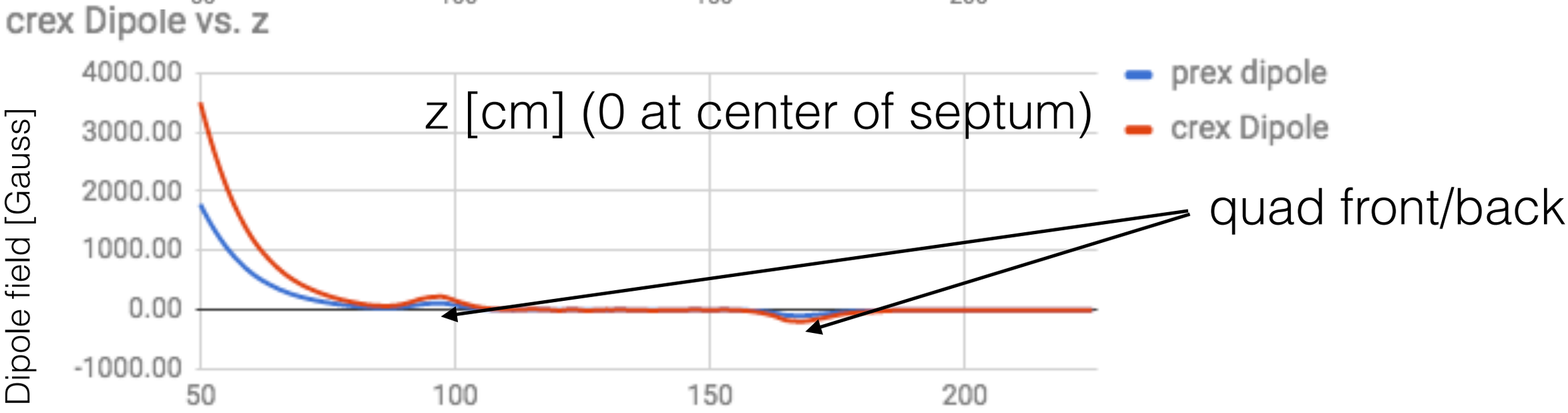

88.25
14.83
53.97
1050.95
5
200
1.48
10.3
15.7
69.3
defined as center of septum
z (0 at pivot) [cm]
120.8
120.9
140.9
-67.8
-59
-53.6
0
51.5
51.6
71.6
z (0 at center of septum) [cm]

Changes needed to the beam pipe

- Minimal changes:
  - the beampipe 3''OD 0.124'' thickness should be **carbon-steel** Z[-53.6, 51.6]. The rest should be left out because that is where we will have stainless steel bellows.
  - the rectangular carbon-steel box around the beampipe should extends Z[-59, 51.6] — already in place
  - the US carbon-steel plates with 0.25'' thickness should extend between Z[-67.8, -53.6] **— have to be designed and manufactured**
  - the DS carbon-steel plates with 0.25'' thickness should extend between Z[51.6, 71.6]**— have to be designed and manufactured**
- Alternative solution:
  - Take two carbon steel rectangular cross section beams (of the correct size) and drill a semi-circular cavity
  - Weld the two pieces together and connect to bellows at either end

Dipole field along signal particle path





- Jay's calculations show that there is a significant dipole field along the path of the particles being scattered into the HRS

- These are calculations made by Jay and provided to us in a spreadsheet of multipoles (the large

- These are with the updated septum beam pipe (the field around 50 is due to the fringe of the septum interacting with the iron in the Q1)s