COD measurements

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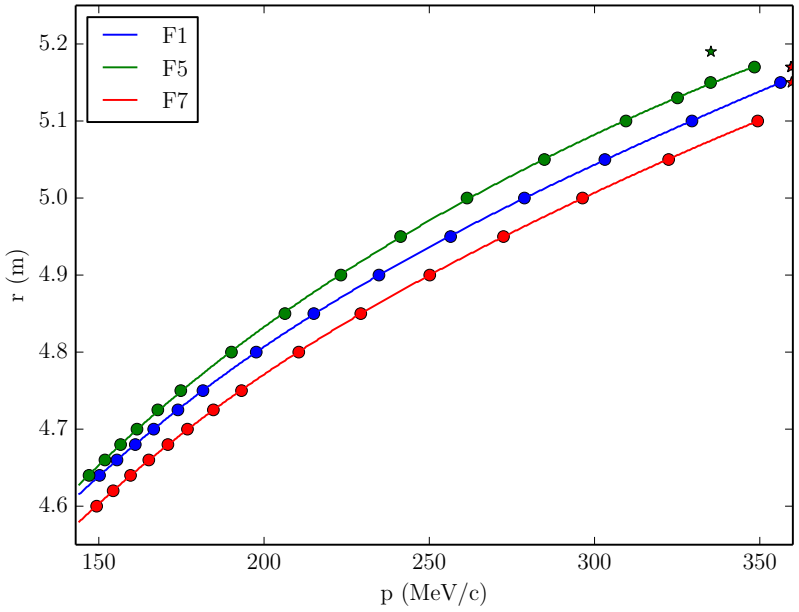
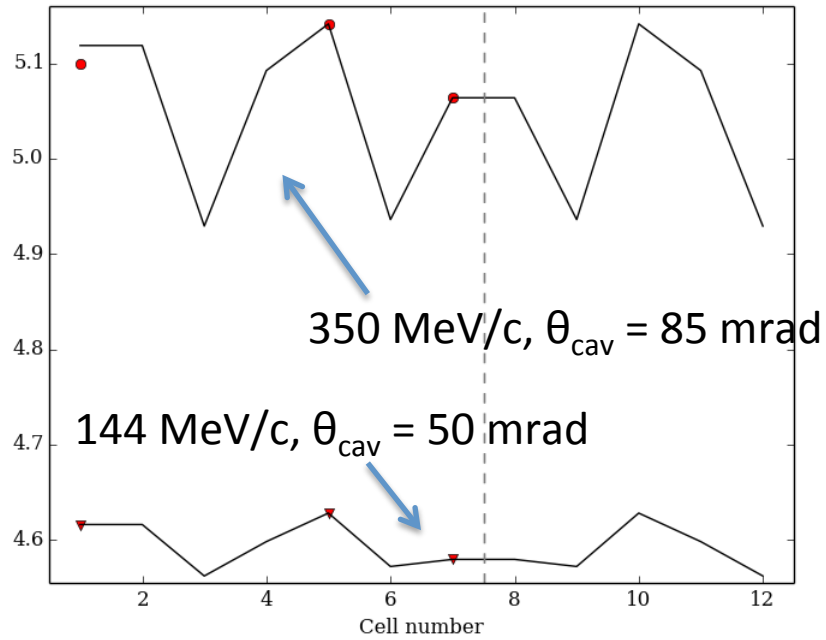
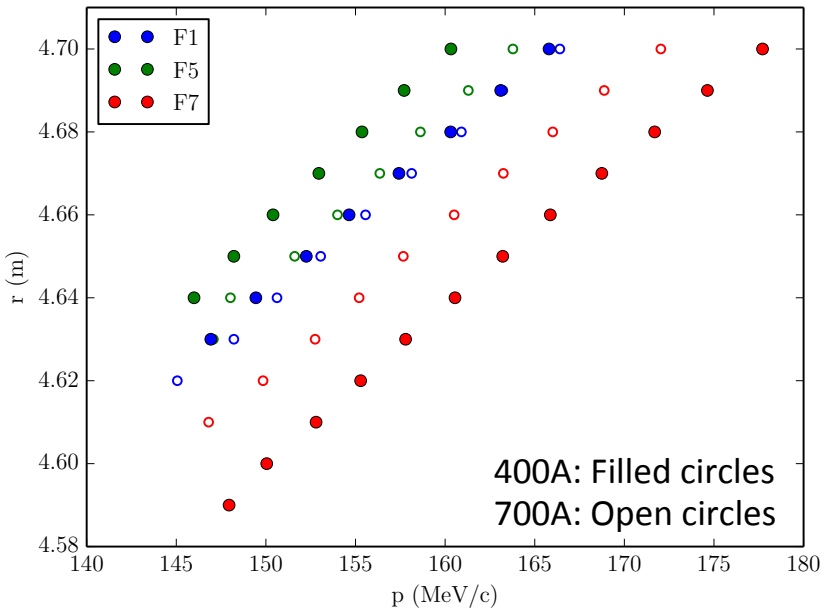
Single error source prediction (2014)

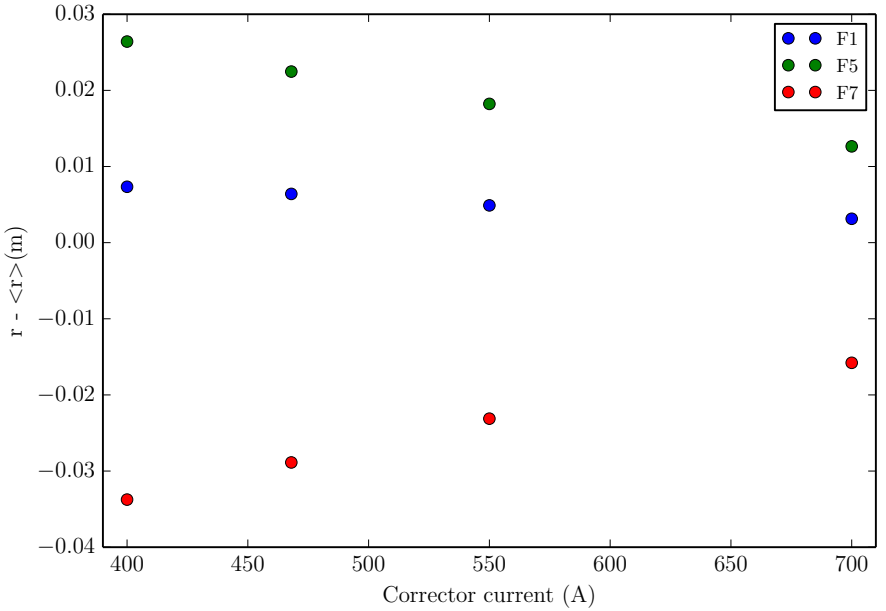




- Assume a single error source at the cavity. Use measured horizontal tunes (3.65 at injection, 3.85 at 350 MeV/c). Set kick angle to match amplitude of data (F5-F7).
- Single error source at cavity is consistent with the data at injection. However, as the momentum increases the measured COD is inconsistent with this single error source.
- Note: Response matrix assumes smoothed beta (<r(p)>/q(p)).

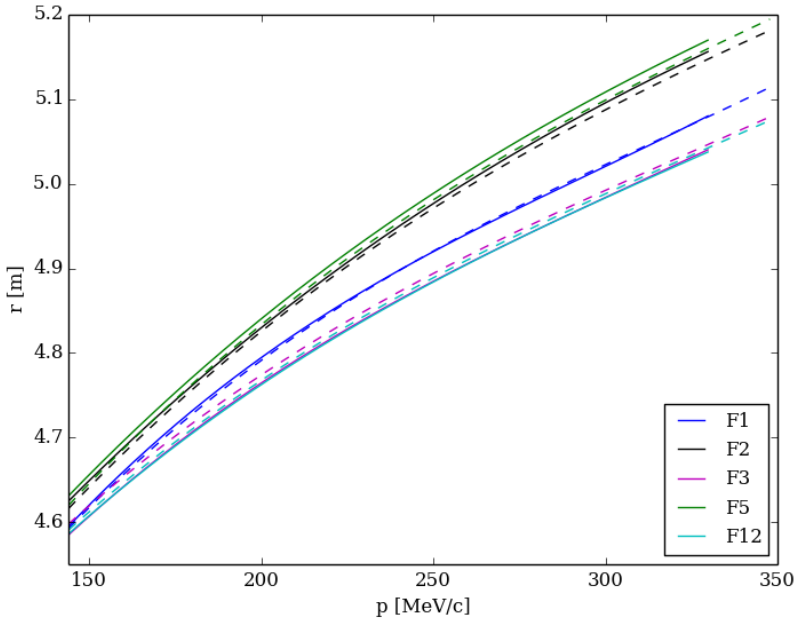
COD correction (2014)

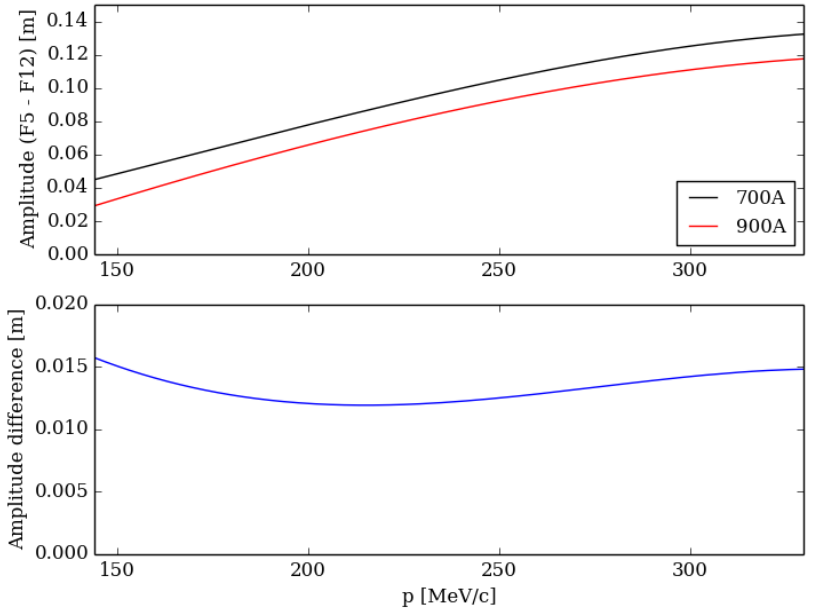




- In 2014, we showed that increasing the corrector coil current decreases the COD.
- However, we only made measurements at the lower end of the momentum range!

Orbit data – June 2015



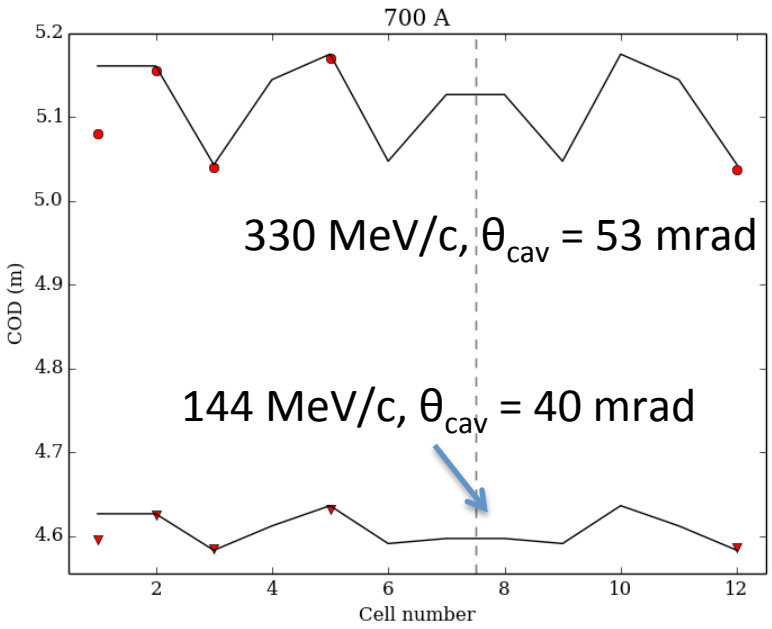


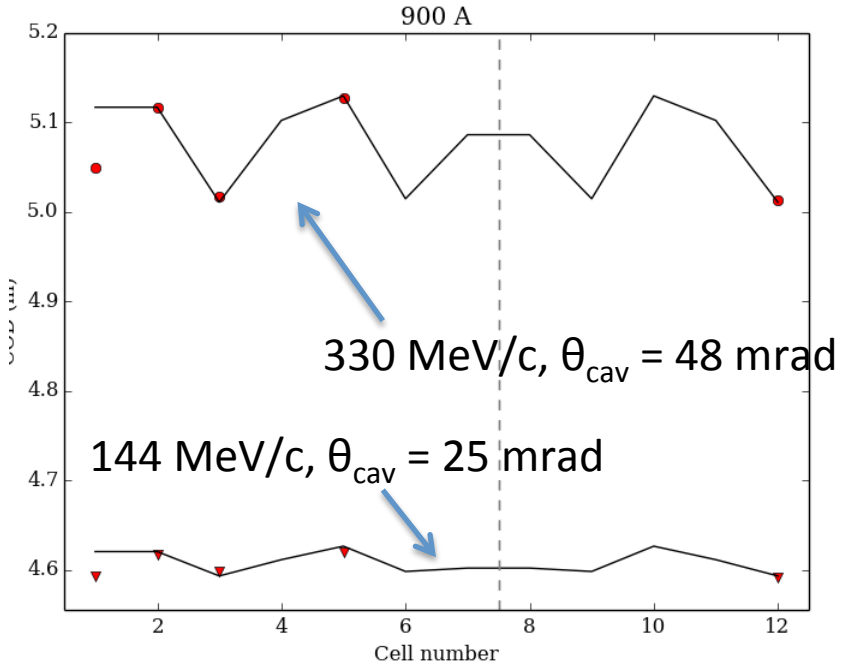
- In June 2015 we measured the orbit at a corrector current of 700A and 900A over a much larger momentum range (144 MeV/c – ~350 MeV/c)
- The COD amplitude (F5-F12) is reduced by 13 mm (averaged over momentum range).
- The increase in COD from injection to 330 MeV/c is in both cases about 90mm.

Estimate of change in “corrector COD”

- Response amplitude $=(\beta_p\beta_k)^{1/2}/(\sin(\pi q)$
- Using smooth approximation $<r>/(q*\sin(\pi q)$
- Kick decreases with p
- Injection p = 144, q = 3.65. Upper momentum measured, p = 330, q = 3.85.
- This estimate finds that COD caused by corrector at the upper momentum is about 90% that at injection.

Single error source prediction (2015)





- Again F1 data doesn't fit in with pattern produced by single error at cavity. In the case of the 2015 data this is apparent even at injection.
- As in 2014, the increase in COD implies the single dipole kick increases with momentum (even after taking into account the increase caused by the tune approaching integer).

To do

- Find the source of the COD by combining data at different times during the acceleration cycle (i.e. different tunes).
- Check effect of corrector coil in more detail.