

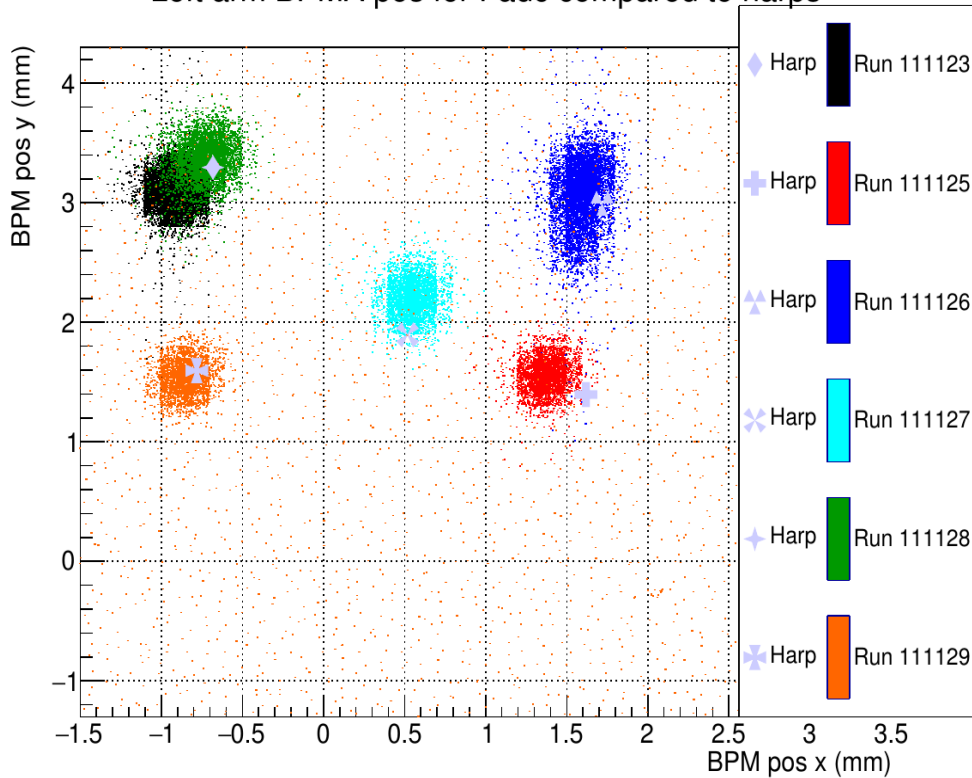
# EMC effect in $A=3$

Overview of work since last Analysis Day

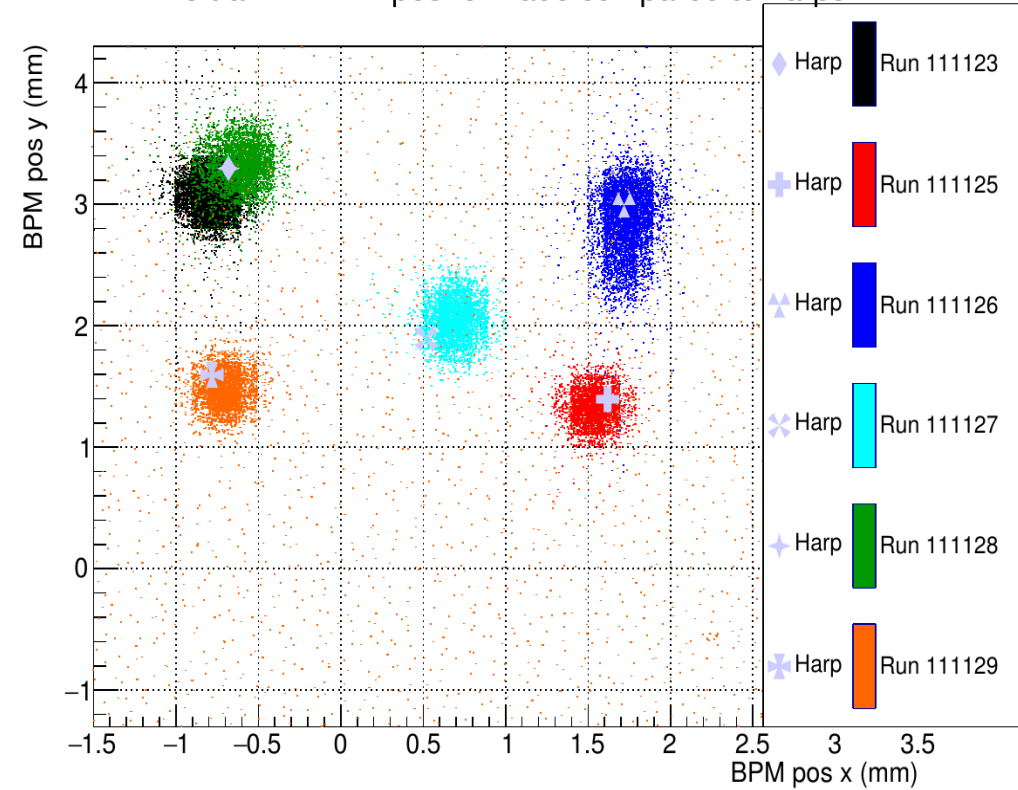
- Preparing for DNP Oct -30th
- Preparing for PhD committee meeting Nov -30<sup>th</sup>
  - Working to defend in the Fall
- Week of RC! And BPM calibration for  $(e, e' k)$
- Monte Carlo tuning
- Detector Efficiency  $\rightarrow$  SQL
- EMC effect Calculation

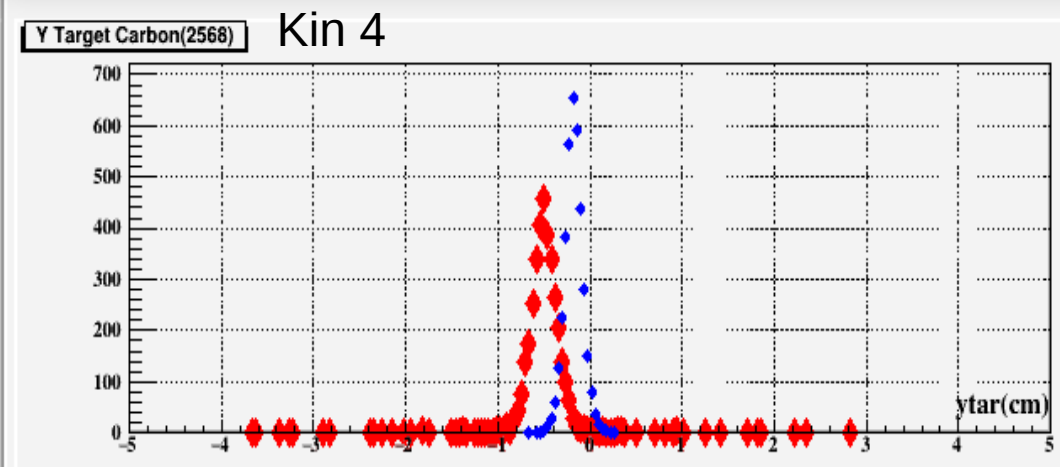
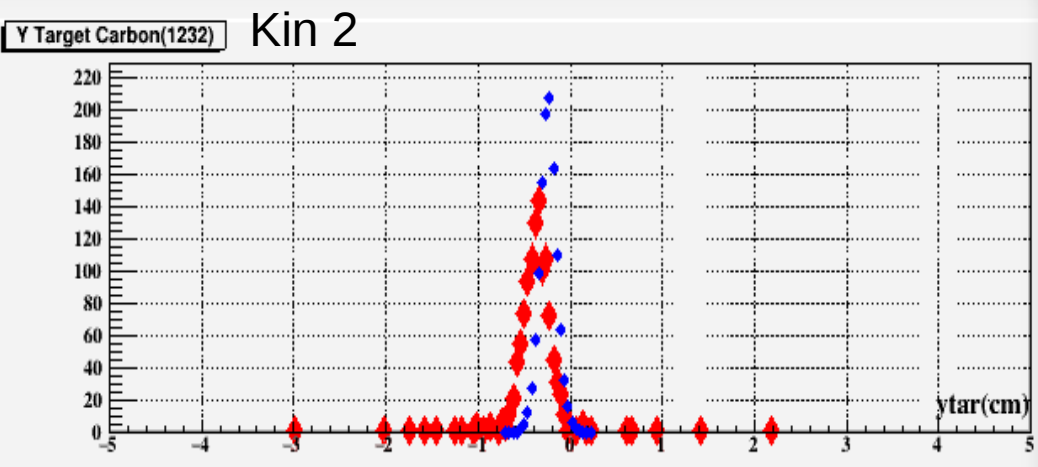
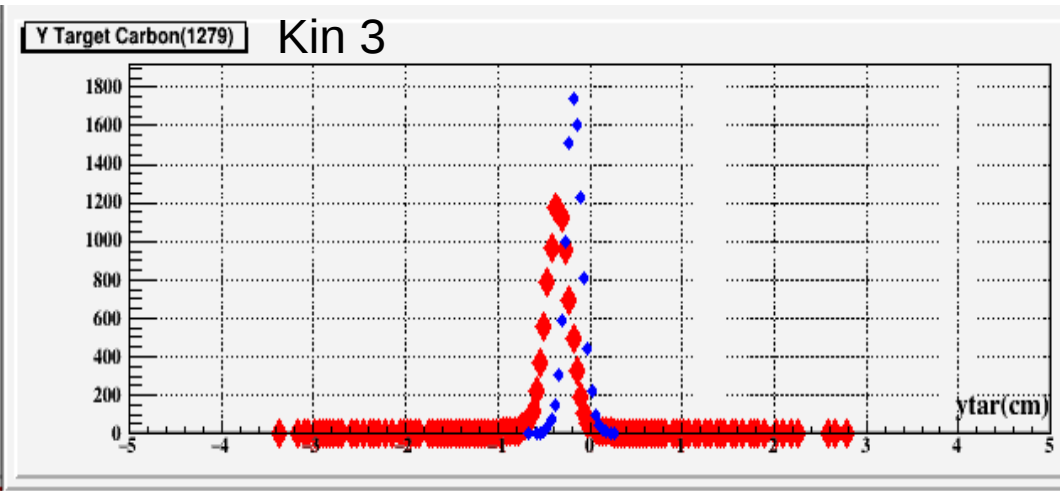
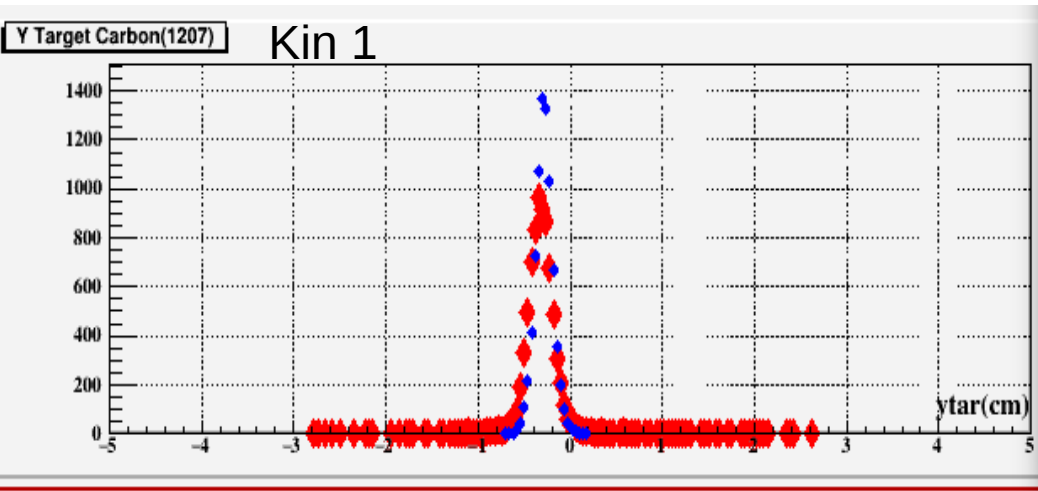
# BPM Before and After

Left arm BPMA pos for Fadc compared to harps

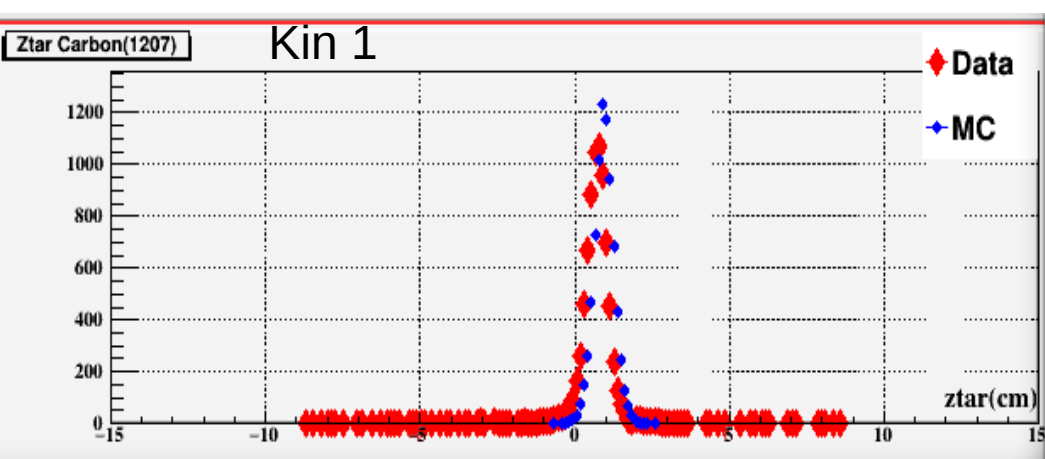


Left arm BPMA pos for Fadc compared to harps

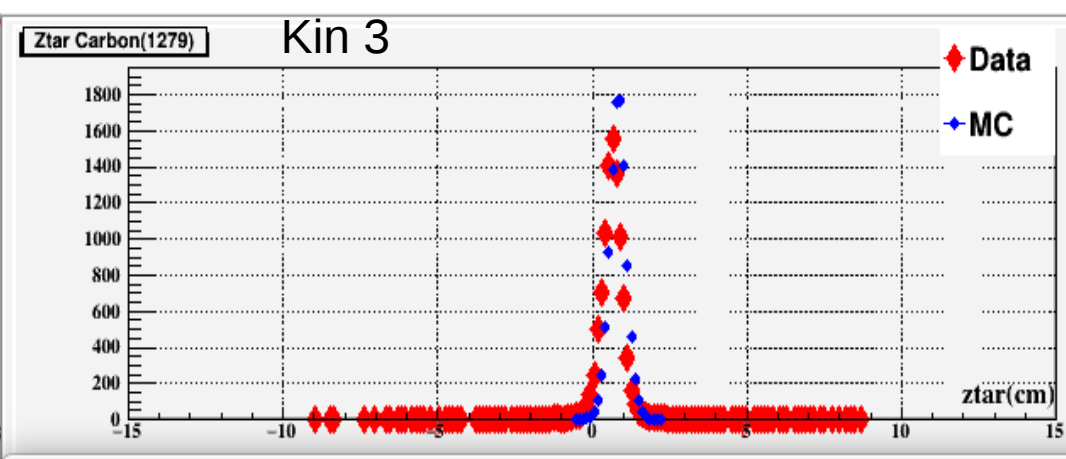




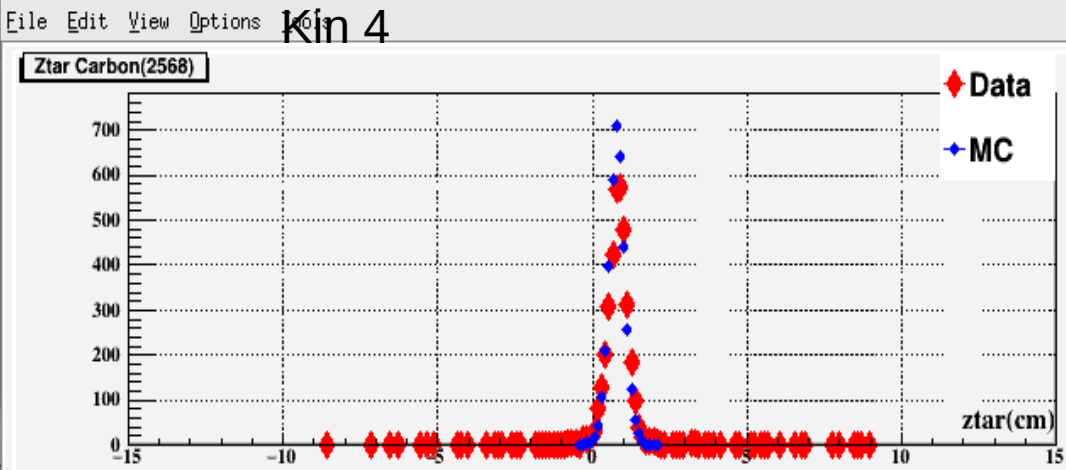
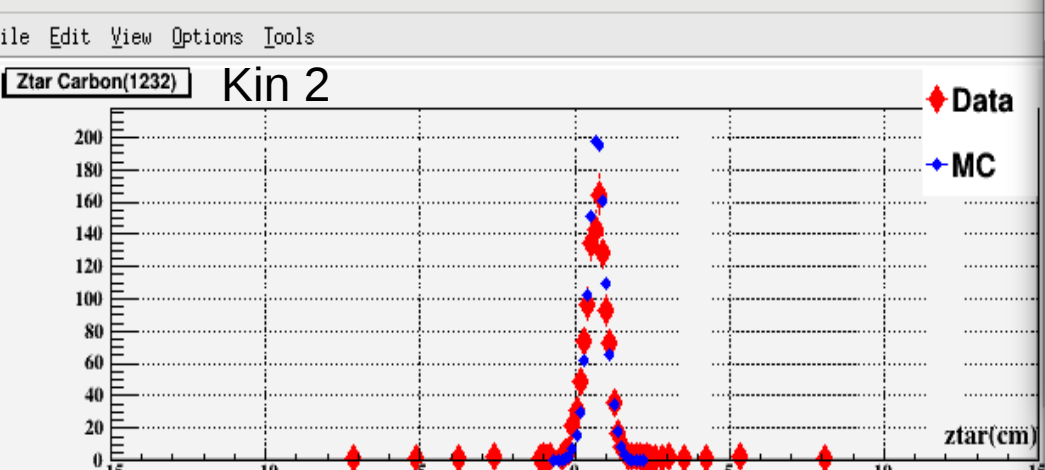
Noticed an offset in Y target between MC and data that differences over kinematic.



Canvas 4 for run 1232

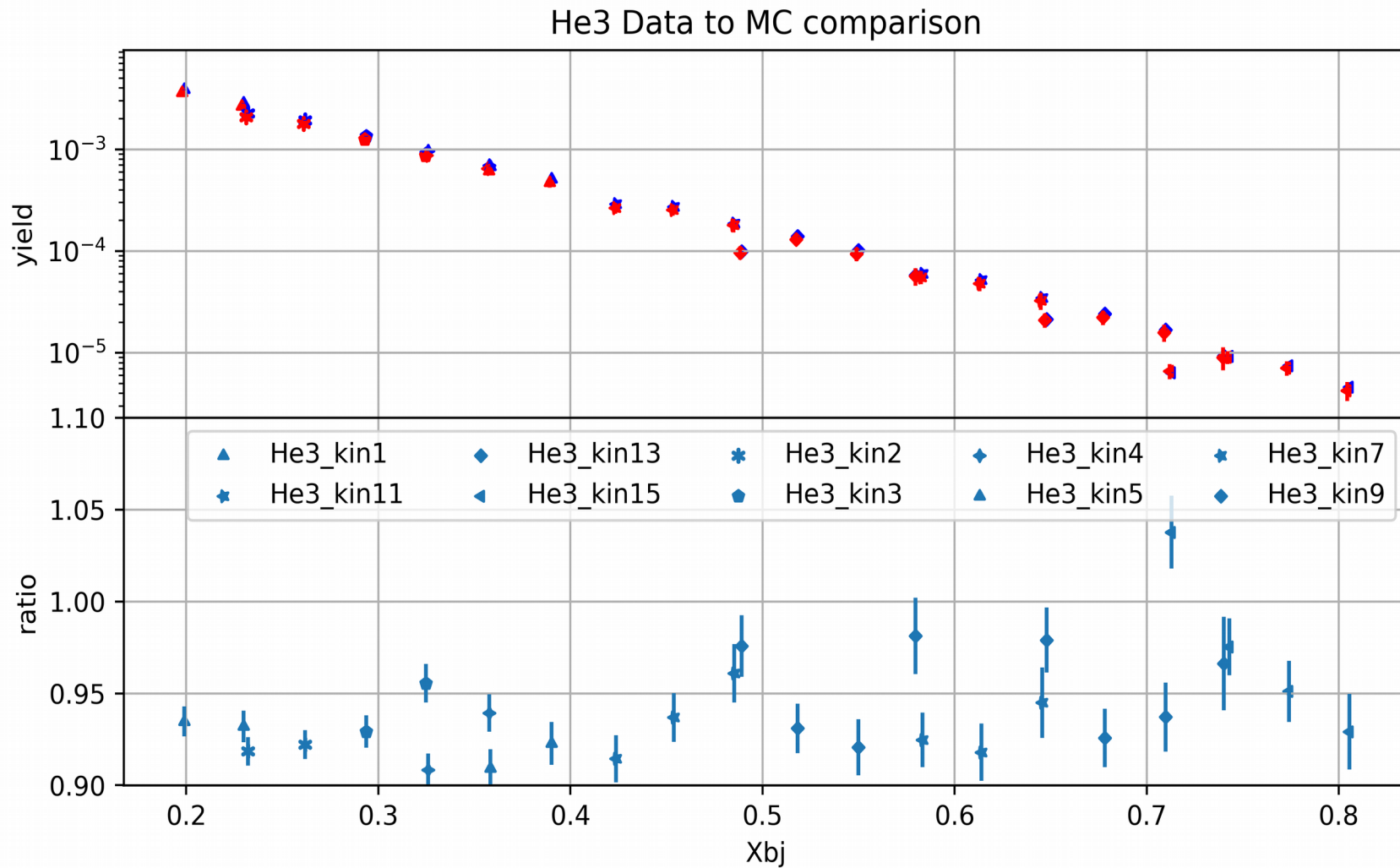


Canvas 4 for run 2568



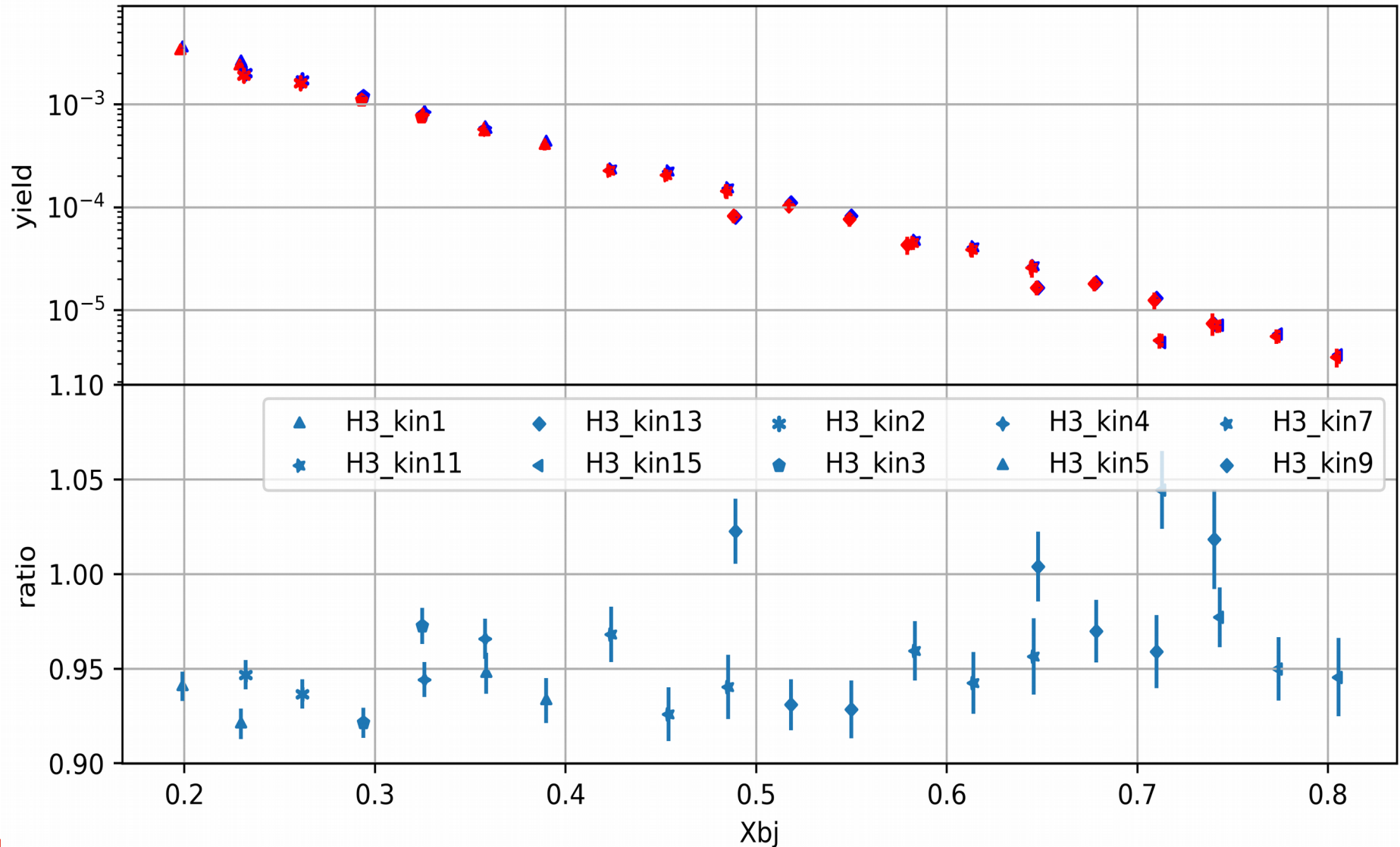
The offset is not present in the z target. Could still be a beam offset issue (WIP).

# Monte Carlo to Data



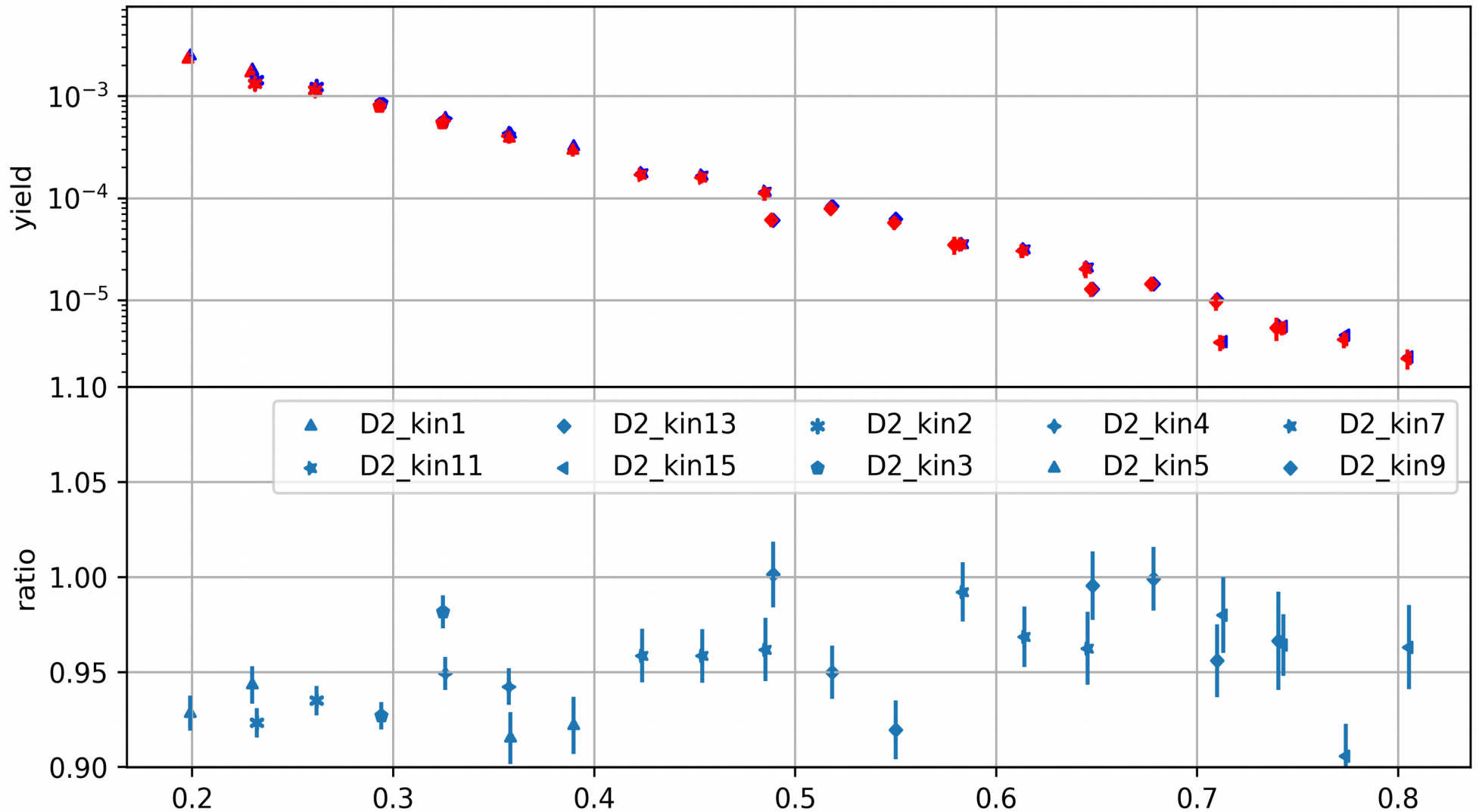
# Monte Carlo to Data

H3 Data to MC comparison



# Monte Carlo to Data

D2 Data to MC comparison





# Cross section

$$N_e = L * \left( \frac{d\sigma}{d\Omega dE'} \right) * (\Delta E' \Delta \Omega) \epsilon * A(E' \theta) + \text{BackGround}$$

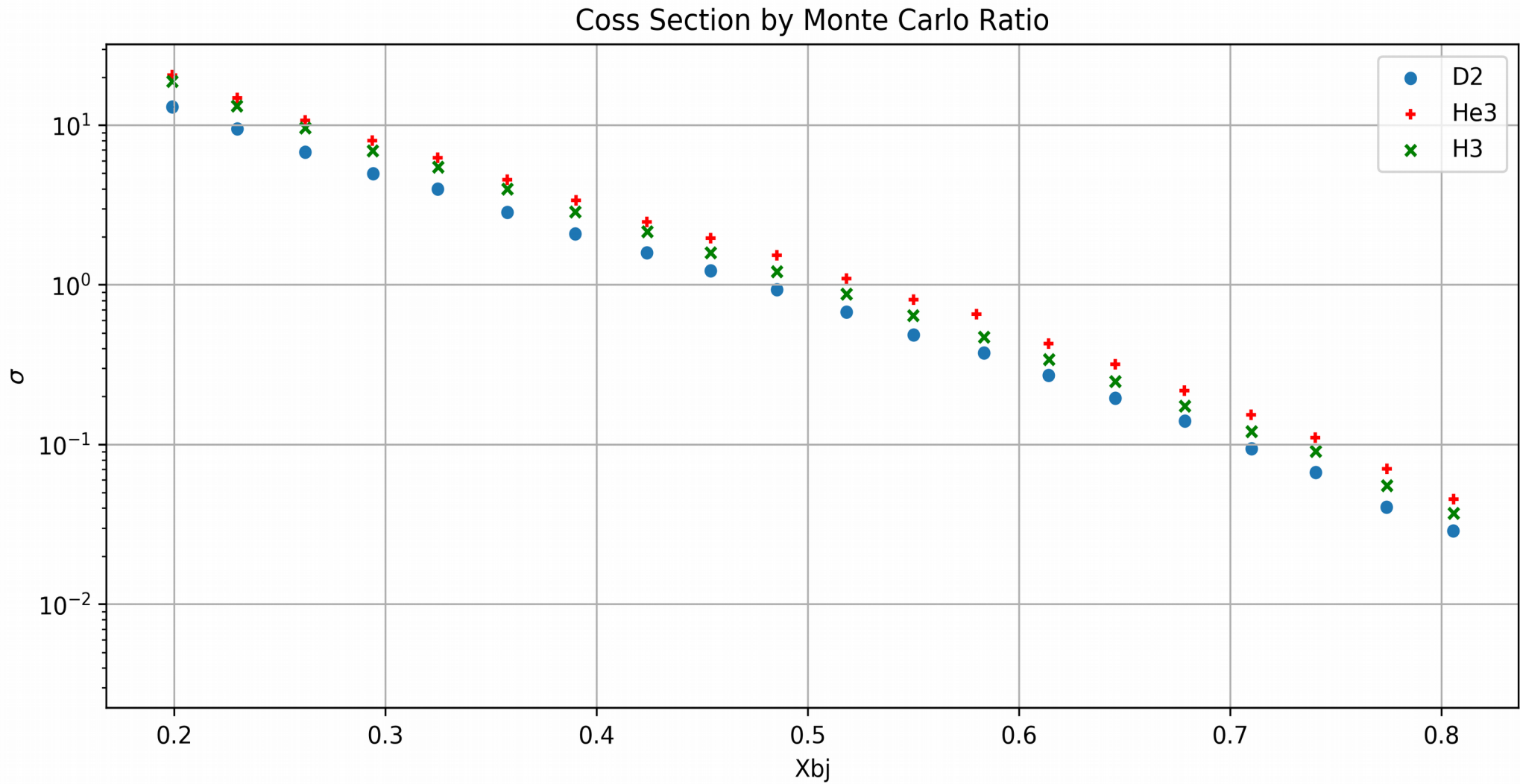
- $L$  Luminosity  $\equiv$  # of electrons per scattering centers
- $(\Delta E' \Delta \Omega)$  = size of bin
- $\epsilon$  = efficiencies
- $A(E' \theta)$  = Acceptance

$$\text{Yield}_{data} = \frac{(N_e - \text{BackGround})}{\text{Efficiency}} = L * \sigma^{data} * (\Delta E' \Delta \Omega) * A(E' \theta)$$
$$\text{Yield}_{MC} = L * \sigma^{mod} * (\Delta E' \Delta \Omega) * A(E' \theta)$$

Cross section by Monte carlo ratio method:  $\frac{d\sigma}{d\Omega dE'} = \sigma^{mod} * \left[ \frac{\text{Yield}_{data}(E', \theta)}{\text{Yield}_{MC}(E', \theta)} \right]$



# Cross section

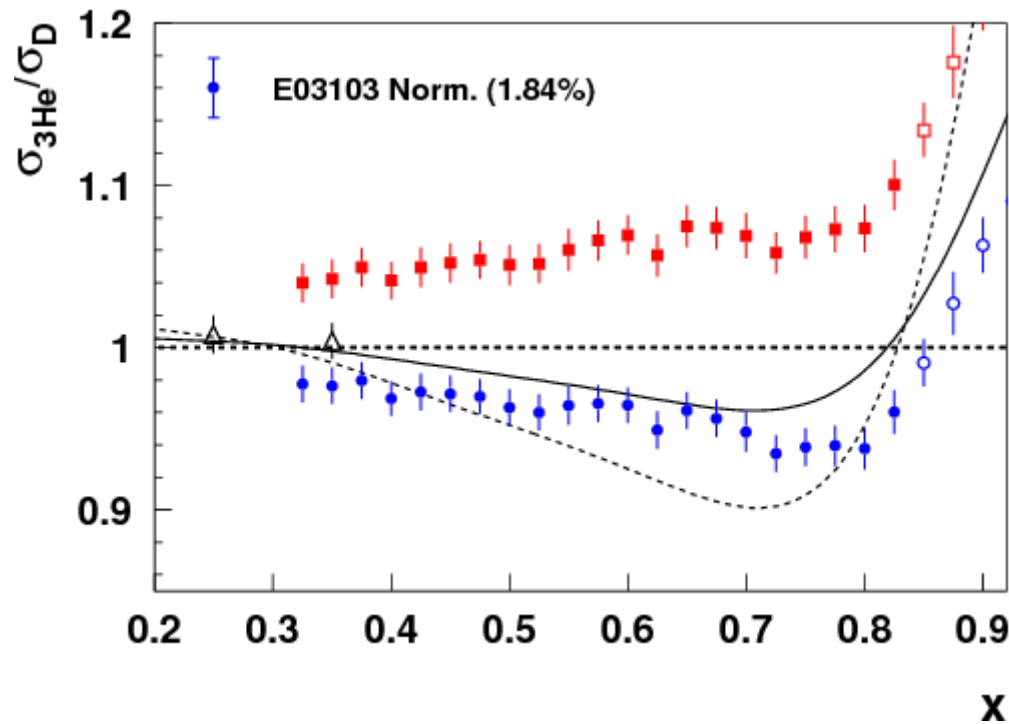


# Isoscalar correction

Using  $F_2^n/F_2^p$  data from Nuclear Physics B 371 (1992) 3–31 Nuclear Physics B 371 (1992) 3–31 by the NMC- limit in X from 0.3 -0.7

Results from Tong on  $F_2^n/F_2^p$  from MARATHON data

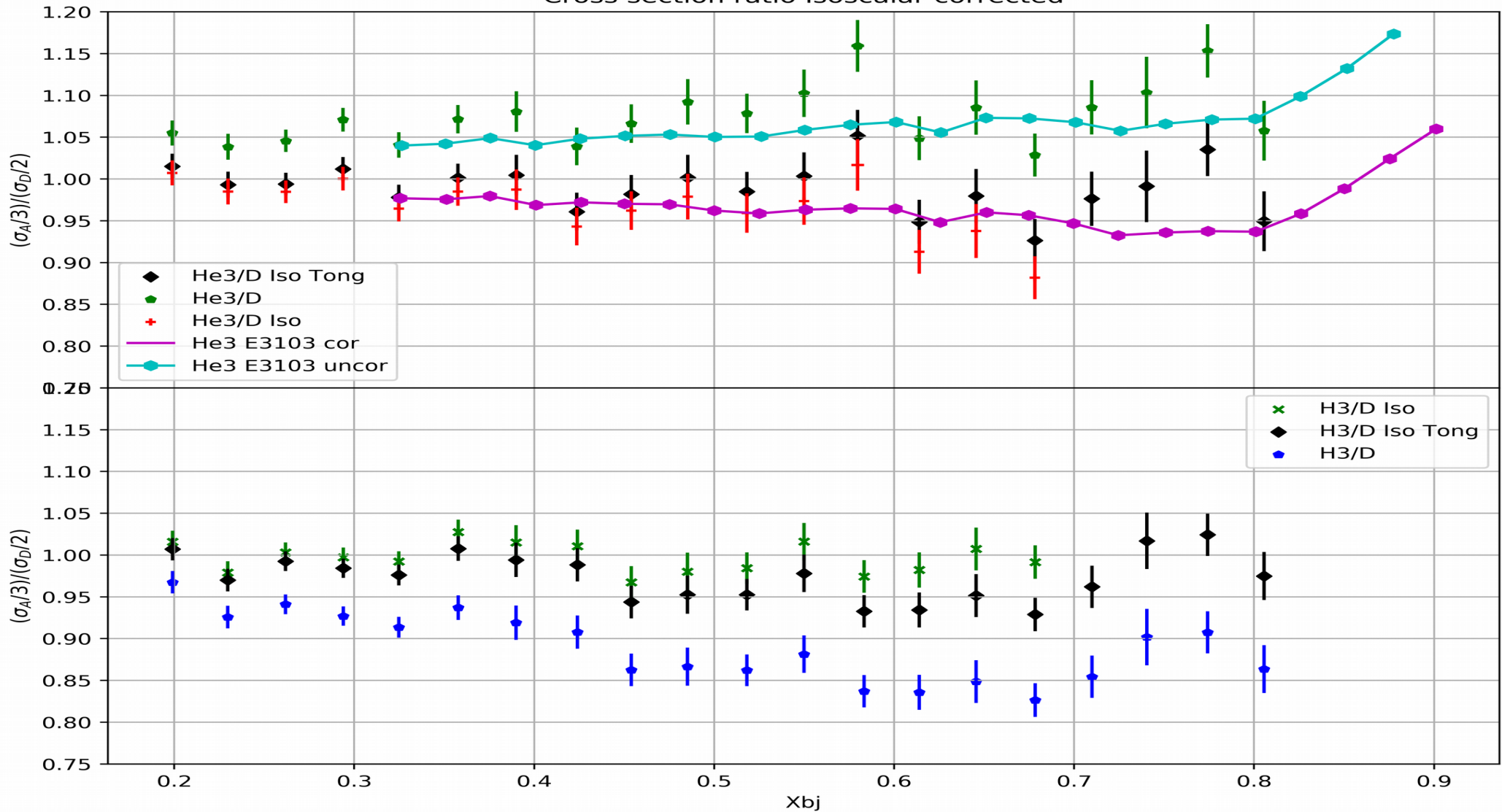
Comparing to results from E03103



$$f_{ISO}^A = \frac{\frac{1}{2} \left( 1 + \frac{F_2^n}{F_2^p} \right)}{\frac{1}{A} \left[ Z + (A - Z) \frac{F_2^n}{F_2^p} \right]}$$

# EMC effect

Cross section ratio Isoscalar corrected



# Efficiency of the PID detectors

- How efficient is it at detected the wanted particles (electrons)?
- How many electrons are we missing out on?
- $Cer_{ele+} = N_E^{Cer} / N_E^{Cal} \rightarrow$  ele saw/ele should of seen from a sample
- Using binomial error to estimate the error on the efficiency calculation because, dealing with ratio of sub samples.
- Hanjie made similar efficiency calculations on other detectors, posted in the analysis wiki page, [Link](#)

```
mysql> select cal_eff, cal_eff_err, cer_eff, cer_eff_err from MARATHONanalysis where
run_number = 1350;
+-----+-----+-----+-----+
| cal_eff | cal_eff_err | cer_eff | cer_eff_err |
+-----+-----+-----+-----+
| 0.983028 | 0.000835 | 0.986672 | 0.000705 |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

# Next!

- Short term!
  - Figure out the y target offset
  - Add detector and analysis efficiency into SQL
- A little further out
  - Complete more in-depth acceptance study focusing on the effect of acceptance in  $x_{bj}$ .

