

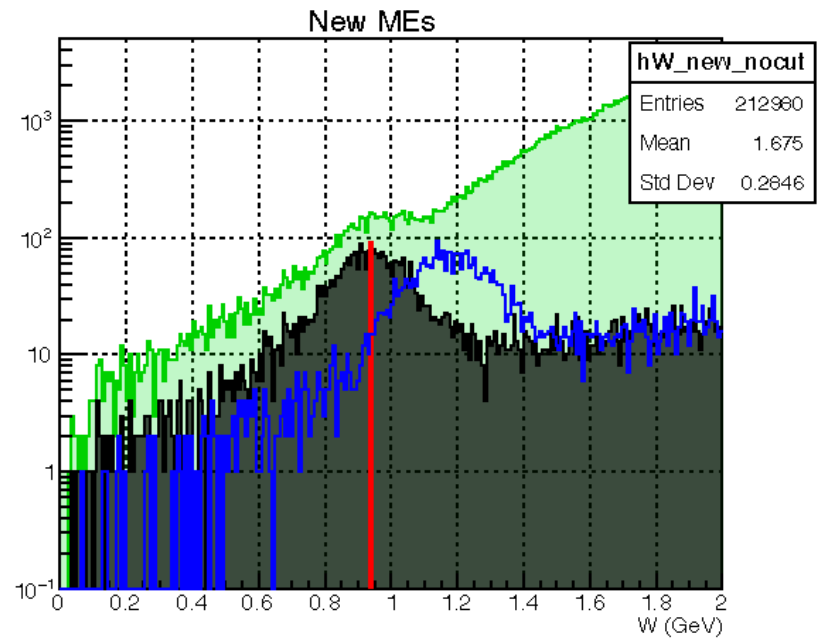
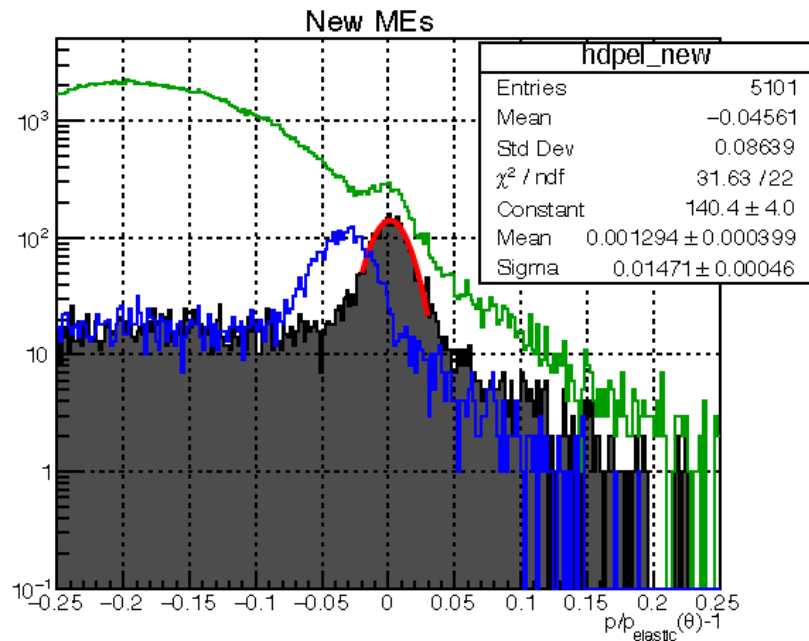
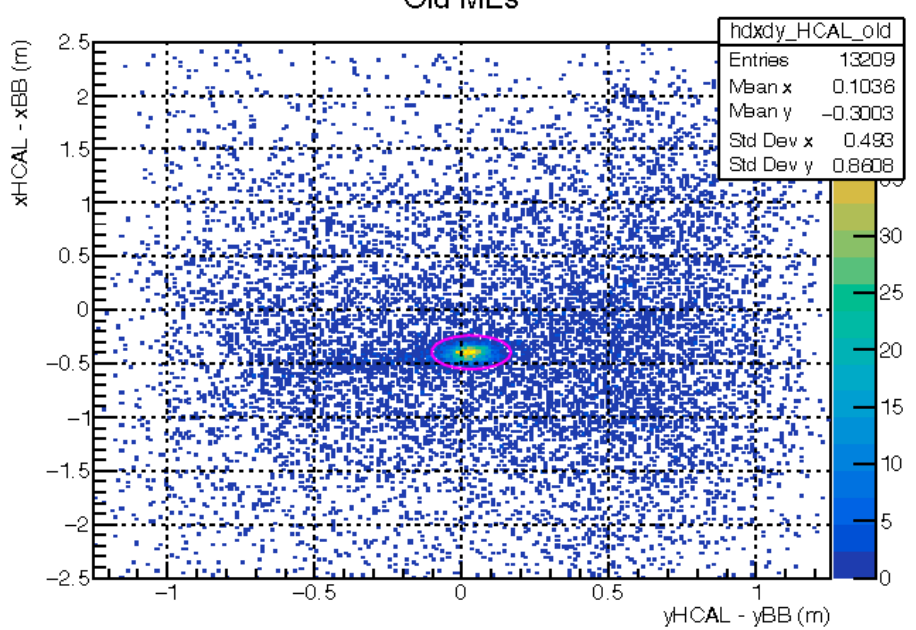
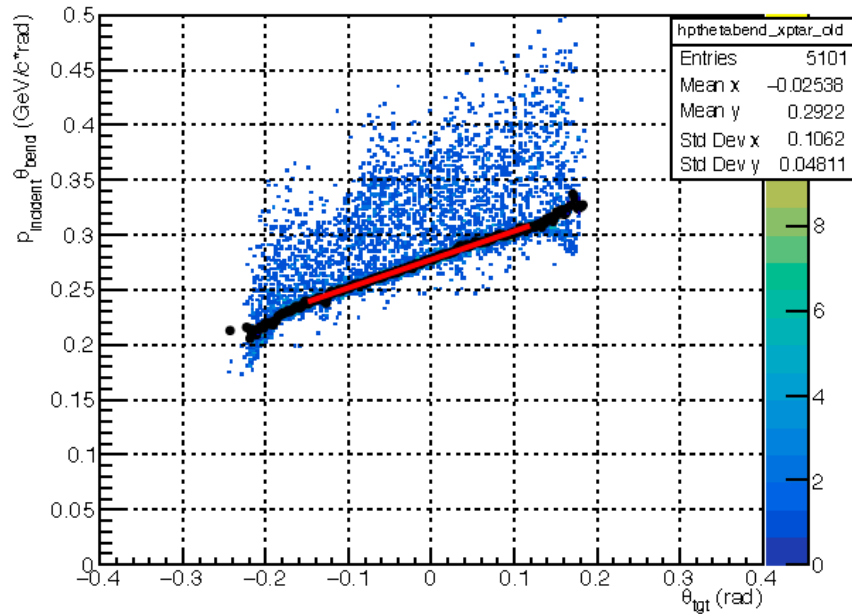
1st-order Momentum Calibration Results, SBS-7 and SBS-11

Andrew Puckett

SBS Software Meeting, April 1, 2022

SBS-7

UConn



SBS-7 Fit Results

```
New Open Recent Revert Save Print
1bb.preconflag = 1
2# NOTE on new momentum reconstruction formalism: 1st-order momentum is calculated from
3#  $p \cdot \text{thetabend} = A_{\text{pth1}} \cdot (1.0 + (B_{\text{pth1}} + C_{\text{pth1}} \cdot \text{bb.magdist}) \cdot \text{thtgt})$ 
4# and momentum expansion coefficients are for  $\text{delta} = p(\text{first order}) \cdot (1 + \text{delta})$ 
5# In most of the acceptance we don't need any corrections beyond the first-order model
6
7bb.A_pth1 = 0.27756646
8bb.B_pth1 = 0.928255129
9bb.C_pth1 = 0.0
10
11#NOTE: angle and vertex reconstruction coefficients are from newfit_sbs7.dat
12
13bb.optics_parameters =
14 -0.018501398 -6.7399972e-05 0.00051113736 0 0 0 0 0 0
15 0.43806034 -0.0023926575 0.0045009461 0 1 0 0 0 0
16 -0.020722233 0.0034615225 -0.012662051 0 2 0 0 0 0
17 0.015320724 -0.045600421 1.1058649 0 0 1 0 0 0
18 -0.26764984 0.11312445 -0.22326626 0 1 1 0 0 0
19 0.012835836 -0.044965034 0.049439064 0 0 2 0 0 0
20 -0.32424517 0.0061390671 -0.011105304 0 0 0 1 0 0
21 -0.018702796 -0.0047125082 0.064590279 0 1 0 1 0 0
22 0.16398927 -0.16899269 0.37757206 0 0 1 1 0 0
23 0.067573257 -0.00043834694 -0.087371113 0 0 0 2 0 0
24 -0.039041417 1.0260013 -2.9822304 0 0 0 0 1 0
25 0.7420103 -0.15498262 0.30890089 0 1 0 0 1 0
26 -0.099567929 -0.12153484 0.13542661 0 0 1 0 1 0
27 -0.49758931 0.16939045 -0.78056765 0 0 0 1 1 0
28 0.27744977 0.43693015 -0.69362856 0 0 0 0 2 0
29 -9.6140311e-16 -1.357631e-15 9.2605663e-17 0 0 0 0 0 1
30 -2.1436212e-16 2.1026365e-16 1.9389511e-16 0 1 0 0 0 1
31 2.2572645e-16 1.5761084e-16 -3.5722312e-17 0 0 1 0 0 1
32 -4.6911865e-17 1.5525669e-16 -2.405119e-18 0 0 0 1 0 1
33 3.8674907e-16 1.4831082e-16 8.137218e-17 0 0 0 0 1 1
34 4.5026307e-17 -8.6377048e-17 5.8408047e-17 0 0 0 0 0 2
```

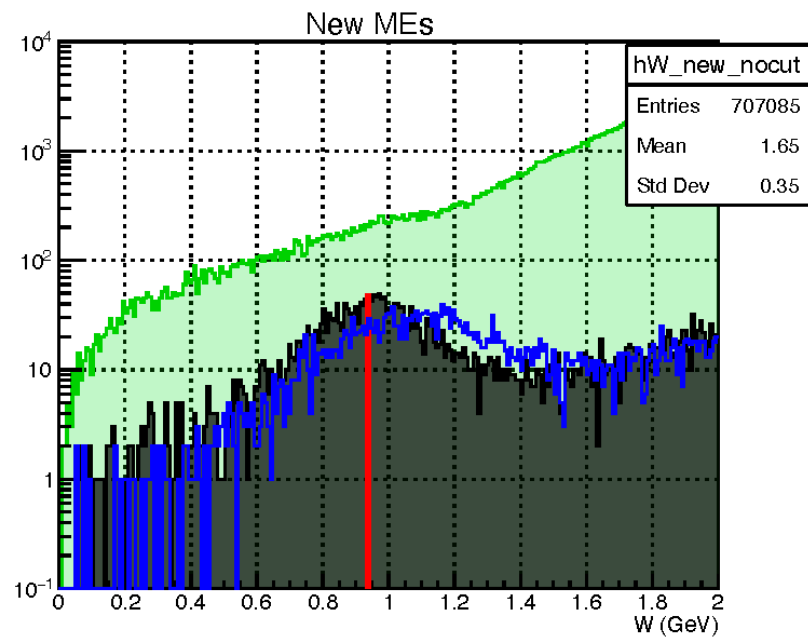
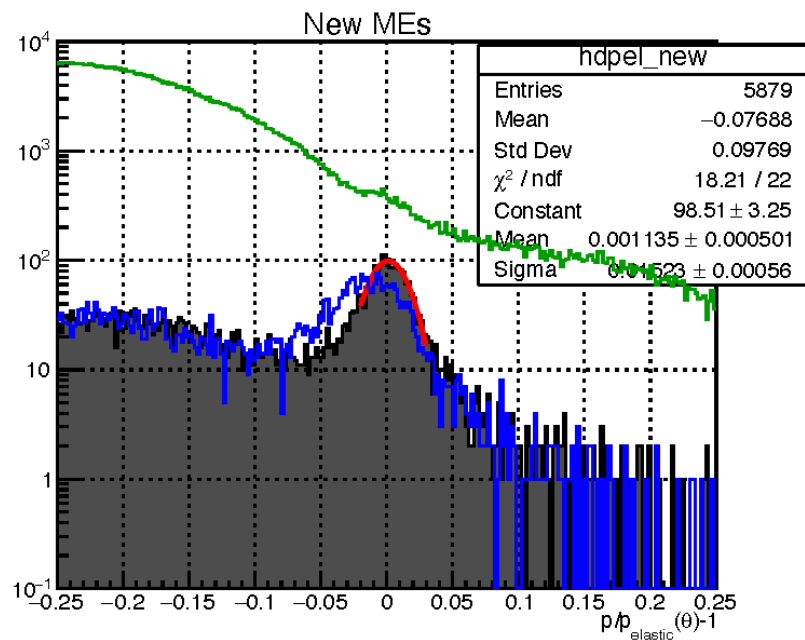
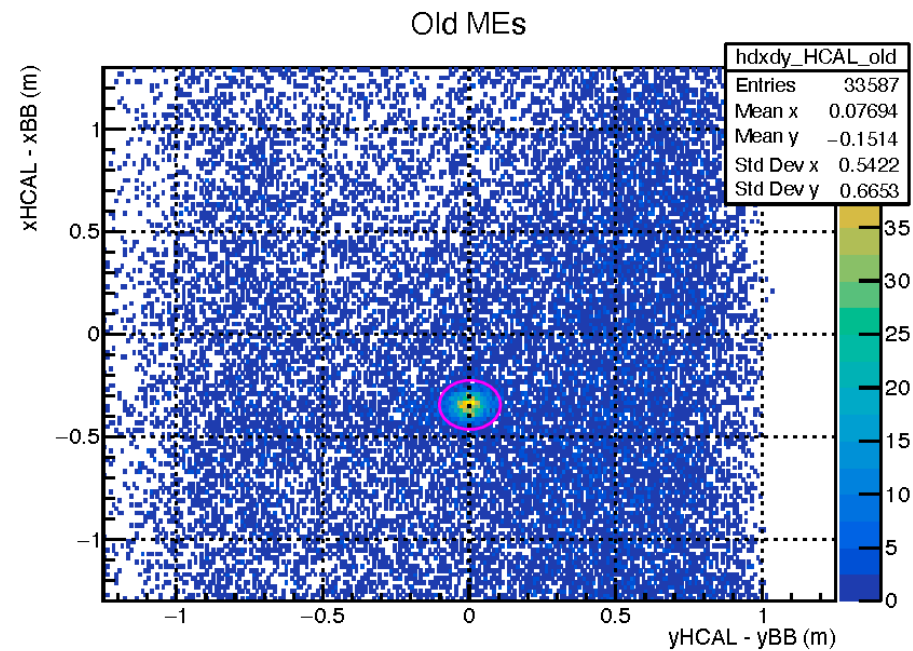
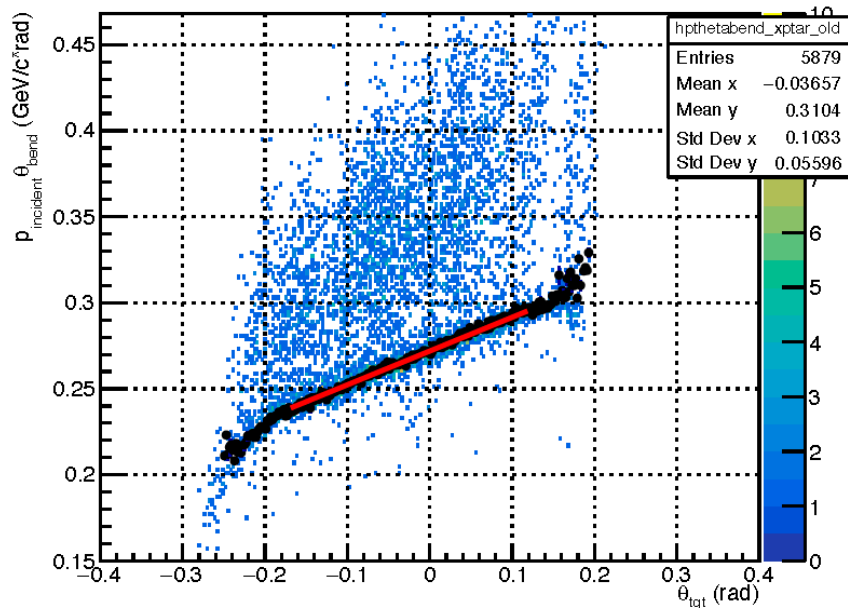
- $A = 0.278$
- $B = 0.928$
- BigBite distance 1.85 m
- BigBite angle 40 degrees
- Elastic electron momentum = 2.67 GeV
- Note: Here the result for “A” is close to the simulation model, while the result for “B” is about 12% low compared to the simulation model.
- Since both SBS-7 and SBS-11 involve large Q2, forward angles of SBS, and high SBS field settings, it is possible that SBS fringe field is affecting the BigBite optics for these settings, as suggested by David H

SBS-11

UConn

LH2 runs replayed:

- 12308, 12312, 12313, 12320, 12345, 12355, 12358, 12363, 12380, 12382, 12400, 12401, 12414, 12415, 12704, 12973, 12974, 13027, 13028, 13041, 13042, 13043, 13056, 13057
- **Approximately 50% of all LH2 triggers taken at SBS-11**



First-order fit results:

$$A = 0.27192 \pm 0.00007$$

$$B = 0.722 \pm 0.003$$

```
new Open Recent Revert Save Print Undo Redo Cut Copy Paste S
*scratch* 1 GEM_GainMatch.C 2 setup_Pcalib_SBS11.txt 3 PcalibSBS11.dat
1bb.preconflag = 1
2# NOTE on new momentum reconstruction formalism: 1st-order momentum is calculated from
3# p*thetabend = A_pth1*(1.0 + (B_pth1+C_pth1*bb.magdist)*thtgt)
4# and momentum expansion coefficients are for delta = p(first order) * (1+delta)
5# In most of the acceptance we don't need any corrections beyond the first-order model
6
7bb.A_pth1 = 0.271919025
8bb.B_pth1 = 0.721807628
9bb.C_pth1 = 0.0
10
11#NOTE: angle and vertex reconstruction coefficients are from newfit_sbs11.dat
12
13bb.optics_parameters =
14 -0.021445814 5.6483129e-05 0.0001748138 0 0 0 0 0
15 0.50718497 -0.0033045368 0.0034522215 0 1 0 0 0
16 -0.052706028 -0.0017925724 -0.00074193991 0 2 0 0 0
17 0.024046755 -0.049402607 1.0995769 0 0 1 0 0
18 -0.33813093 0.062742511 -0.13182694 0 1 1 0 0
19 -0.017474794 -0.16929464 0.10216957 0 0 2 0 0
20 -0.38891569 0.0068978181 -0.0007431868 0 0 0 1 0
21 0.13995738 -0.014271192 0.006813449 0 1 0 1 0
22 0.28632707 -0.012067602 0.15722113 0 0 1 1 0
23 -0.19851938 0.053847488 -0.023291848 0 0 0 2 0
24 -0.05272633 1.0320823 -2.7095261 0 0 0 0 1
25 0.81545877 -0.1423075 0.2591647 0 1 0 0 1
26 0.11162811 0.48540486 -0.21239857 0 0 1 0 1
27 -0.69088033 0.11867846 -0.6093847 0 0 0 1 1
28 -0.048904399 -0.38581048 -0.057911773 0 0 0 0 2
29 -1.3296127e-15 1.6327616e-15 -3.0916307e-16 0 0 0 0 1
30 2.9936009e-16 5.4460988e-16 2.1787721e-16 0 1 0 0 1
31 -2.4158595e-16 -1.2146423e-16 8.9872129e-17 0 0 1 0 1
32 -1.4567222e-17 1.2541327e-16 -6.0125217e-17 0 0 0 1 0
33 -1.4130748e-16 1.0382918e-16 -1.6620708e-17 0 0 0 1 1
34 -1.2615664e-16 -5.1558342e-17 2.0467856e-16 0 0 0 0 2
```

- SBS-11 has $p(\text{elastic}) = 2.67$ GeV, BigBite distance = 1.55 m, BigBite theta = 42 deg
- Compare to SBS-9 results at same magnet distance, but 1.6 GeV momentum and 49 degrees:
 - $A = 0.270$
 - $B = 0.893$
- Both results are close to the simulation model result for “A”.
- For “B”, the SBS-9 result is about 2% above the simulation model, but SBS-11 result is 17% below the model expectation.
- Note: possibility that “B” is affected by SBS fringe field for SBS-7 and SBS-11 needs to be taken seriously