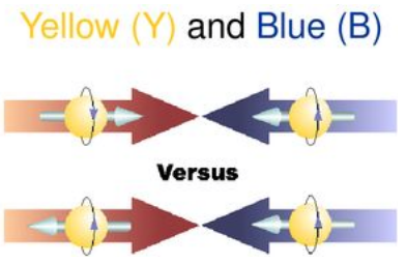
Run 13 direct photon ALL

Zhongling Ji

Stony Brook University

August 3, 2020

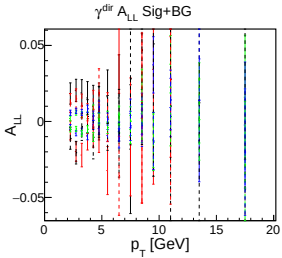
Direct photon ALL

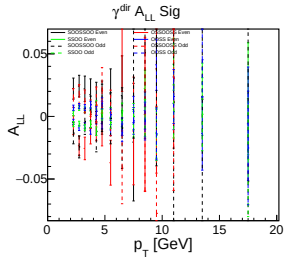


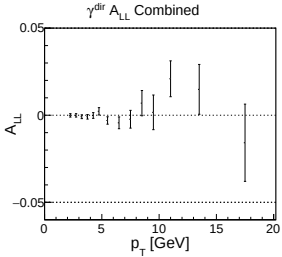
$$A_{LL} = \frac{\Delta\sigma}{\sigma} = \frac{\sigma_{++} + \sigma_{--} - \sigma_{+-} - \sigma_{-+}}{\sigma_{++} + \sigma_{--} + \sigma_{+-} + \sigma_{-+}} = \frac{1}{P_B P_Y} \frac{N_{++} - RN_{+-}}{N_{++} + RN_{+-}}$$

- Different runs have different polarization P_B and P_Y, so measured in a run-by-run basis.
- Even and odd crossings have difference electric circuits, so measured separately.
- There are also four spin patterns, so total eight groups.
- For particles in isolation cone:
  - Loose cut: ToF $<$ 50 ns, E $>$ 0.15 GeV
  - Tight cut: ToF $<$ 10 ns, E $>$ 0.5 GeV

Discrepancies in loose cuts

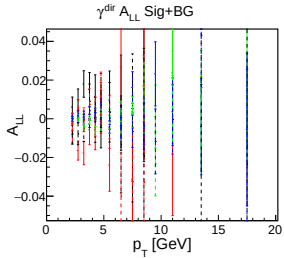


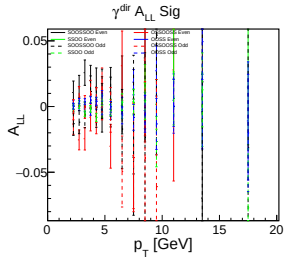


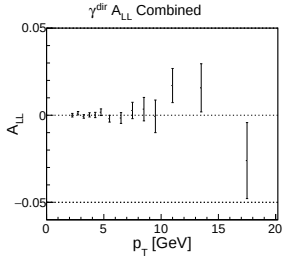


p_T [GeV]	F	p
2-2.5	5.901	8.709e-07
2.5-3	12.4	1.554e-15
3-3.5	8.116	9.932e-10
3.5-4	5.853	1.009e-06
4-4.5	3.334	0.00157
4.5-5	1.223	0.2864
5-6	1.704	0.104
6-7	1.256	0.2686
7-8	0.7887	0.5968
8-9	0.5234	0.8174
9-10	1.299	0.2471
10-12	0.697	0.6747
12-15	0.9198	0.4899
15-20	0.6332	0.7287

Better agreement in tight cuts

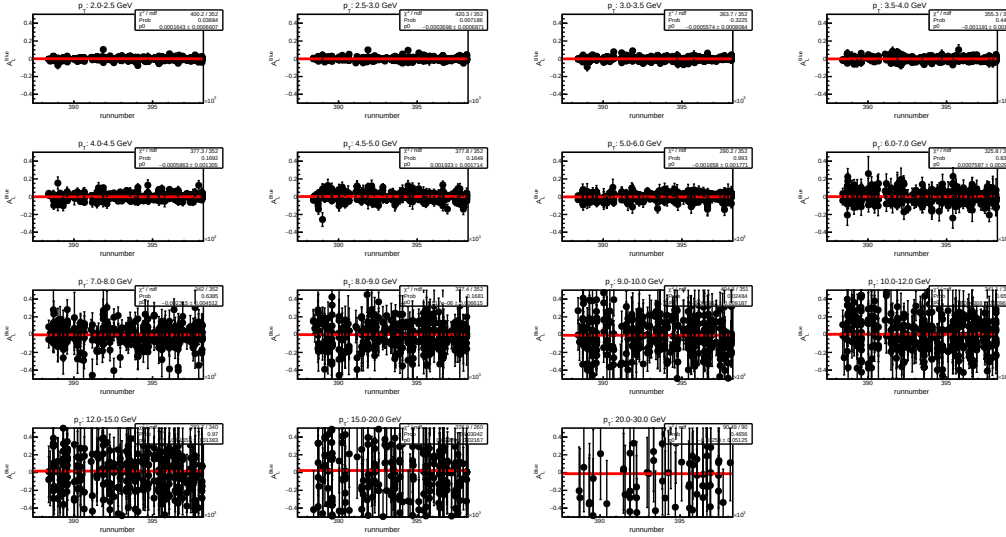




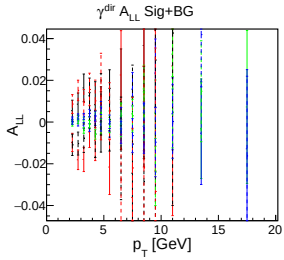


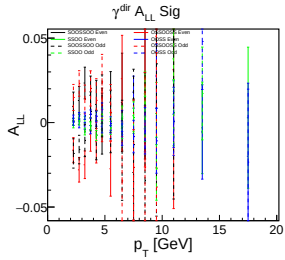
p_T [GeV]	F	p
2-2.5	1.254	0.2697
2.5-3	3.282	0.001815
3-3.5	3.933	0.0002903
3.5-4	1.777	0.08792
4-4.5	1.724	0.09921
4.5-5	1.125	0.3442
5-6	0.8223	0.5686
6-7	0.9596	0.4593
7-8	1.065	0.3837
8-9	0.4716	0.8556
9-10	0.9886	0.4377
10-12	0.9743	0.4482
12-15	0.6964	0.6752
15-20	0.8313	0.5613

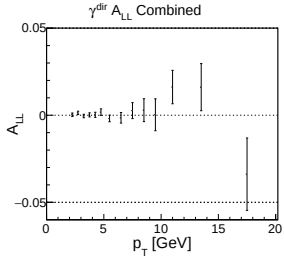
Run-by-run fitting



Cross check in fill-by-fill analysis

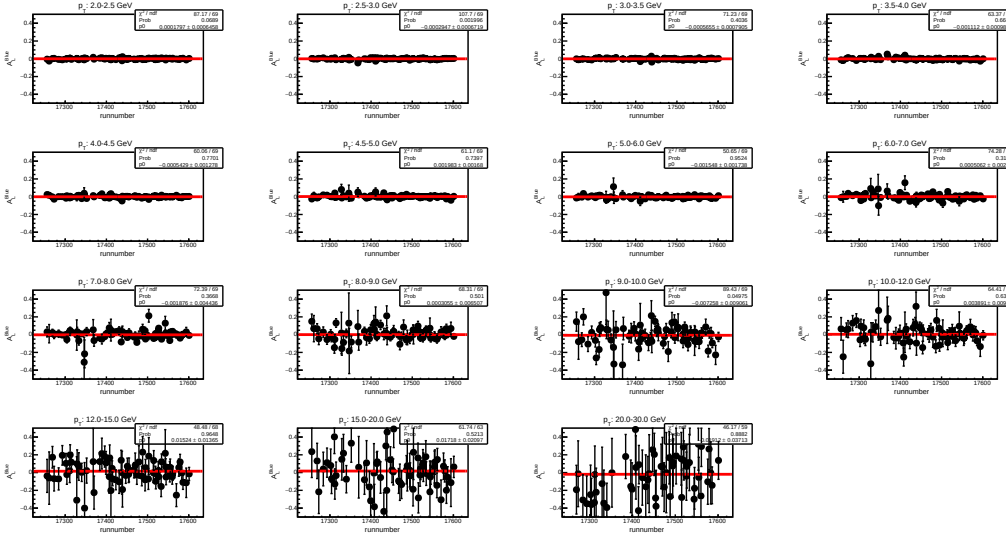




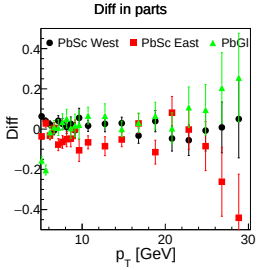


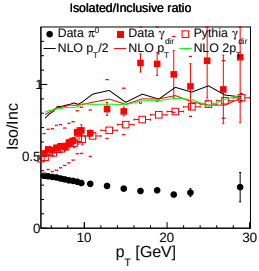
p_T [GeV]	F	p
2-2.5	1.824	0.08209
2.5-3	4.494	8.618e-05
3-3.5	3.533	0.001139
3.5-4	2.027	0.05136
4-4.5	1.883	0.07174
4.5-5	1.326	0.2373
5-6	0.8033	0.5851
6-7	0.6962	0.6753
7-8	1.029	0.4103
8-9	0.5332	0.8092
9-10	0.7743	0.6092
10-12	0.8879	0.5162
12-15	0.8807	0.5219
15-20	1.345	0.2288
20-30	0.6968	0.6748

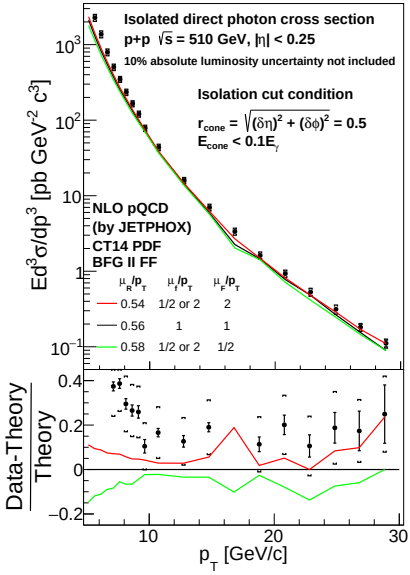
Fill-by-fill fitting



Cross section in tight cuts







Conclusions

- Discrepancies from spin patterns come from previous ghost events and can be removed by using tight cuts.
- Agreement with partonic NLO calculations in isolated cross section needs loose cut.
- Will use loose cut for cross section and tight cut for ALL.