aao_gen
deeply virtual pi0 generator

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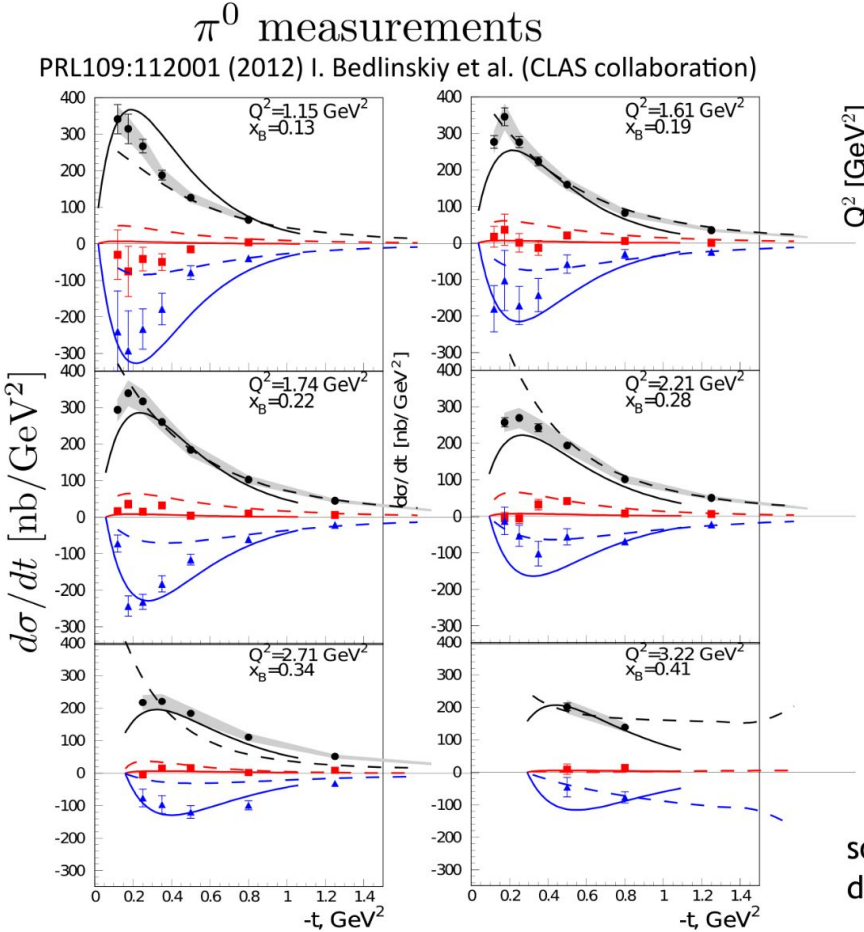
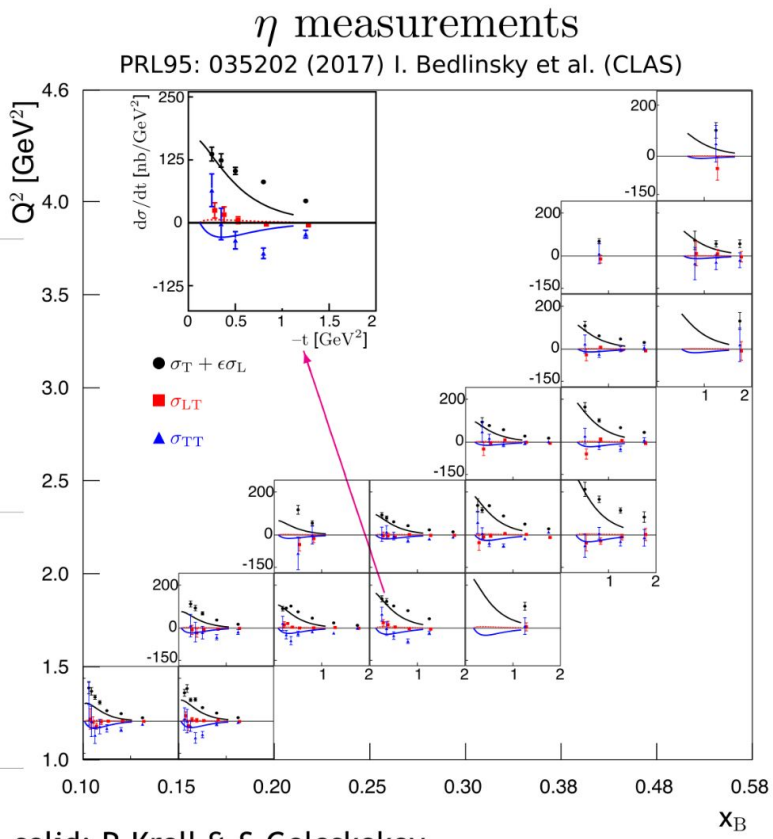
CLAS 6 measurements of pi0 and eta cross sections





solid: P.Kroll & S.Goloskokov

dashed: G.R. Goldstein, J.O. Gonzalez & S.Liuti

Generalized form factors contributions to structure functions

$$\frac{d\sigma_L}{dt} = \frac{4\pi\alpha}{k}\frac{1}{Q^2}\left\{(1-\xi^2)\left|\langle\tilde{H}\rangle\right|^2 - 2\xi^2 Re\left[\langle\tilde{H}\rangle^*\langle\tilde{E}\rangle\right] - \frac{t'}{4m^2}\xi^2\left|\langle\tilde{E}\rangle\right|^2\right\}$$

$$\frac{d\sigma_T}{dt} = \frac{4\pi\alpha}{2kQ^4}\left[(1-\xi^2)\left|\langle H_T\rangle\right|^2 - \frac{t'}{8m^2}\left|\langle\bar{E}_T\rangle\right|^2\right]$$

$$\frac{d\sigma_{LT}}{dt} = \frac{4\pi\alpha}{\sqrt{2}kQ^3}\xi\sqrt{1-\xi^2}\frac{\sqrt{-t'}}{2m}Re\left[\langle H_T\rangle^*\langle\tilde{E}\rangle\right]$$

$$\frac{d\sigma_{TT}}{dt} = \frac{4\pi\alpha}{kQ^4}\frac{t'}{16m^2}\left|\langle\bar{E}_T\rangle\right|^2$$

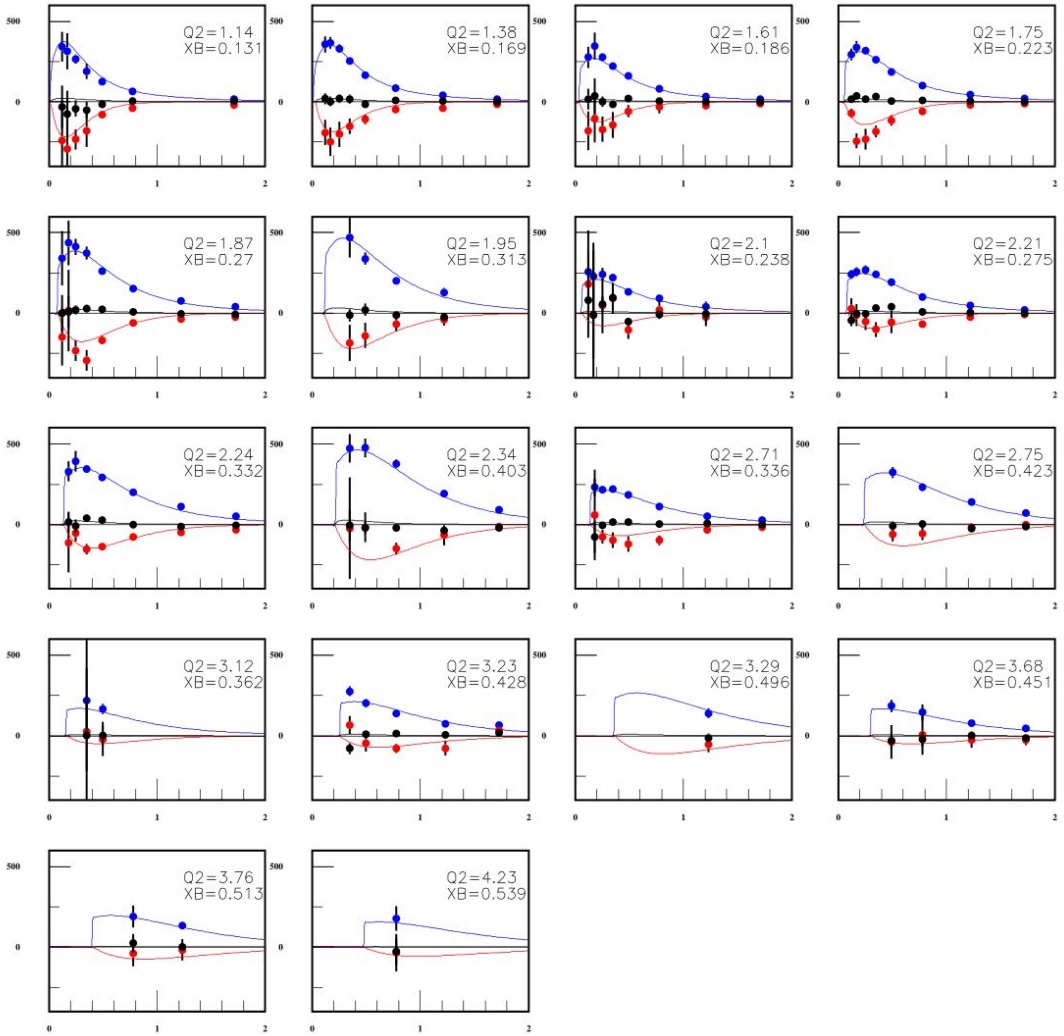
Parameterizations of the generalized form factors

There are 8 parameters used in the model for the $\langle H_T\rangle$ and $\langle\bar{E}_T\rangle$ Generalized form factors in the model:

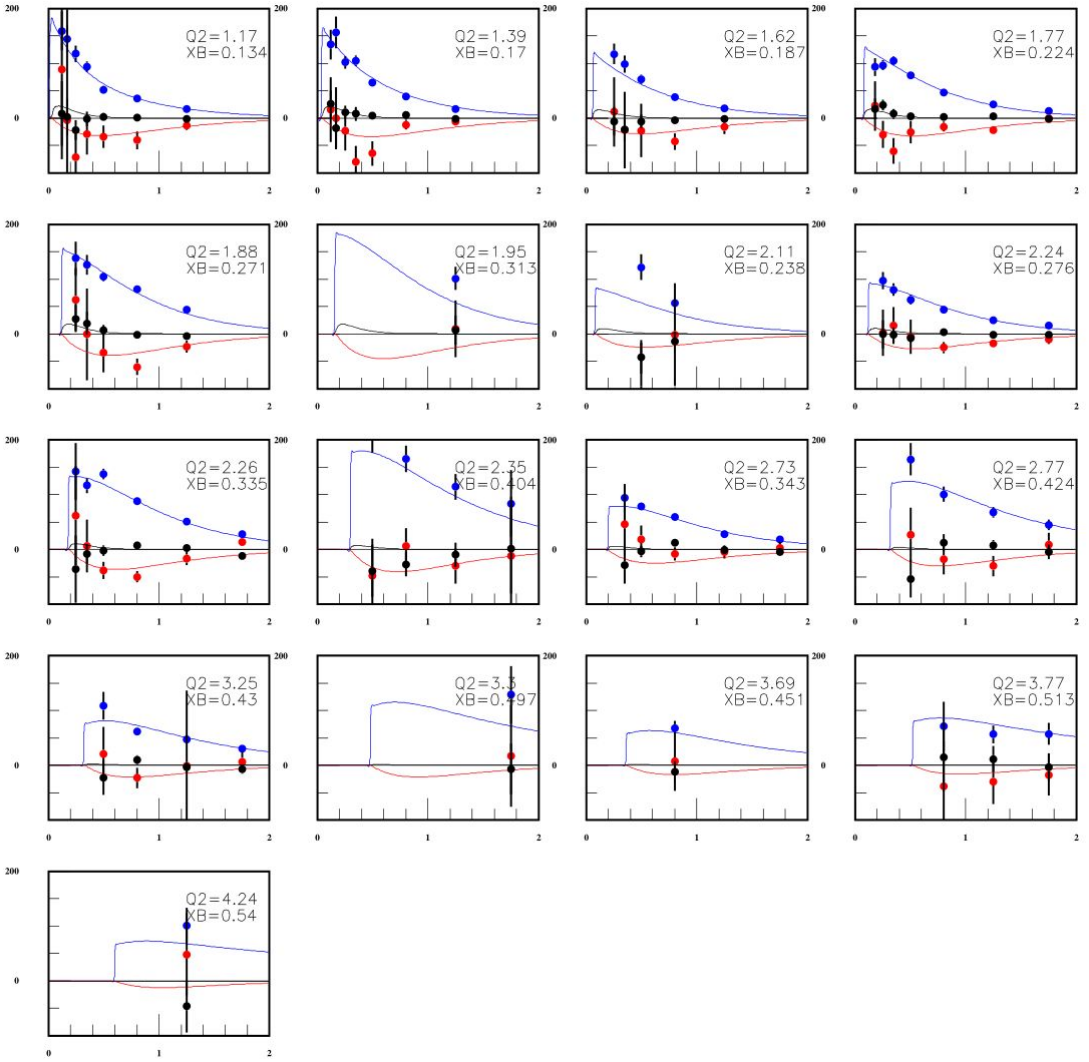
$$\langle H_T\rangle(t, x_B, Q^2) = p_1 \cdot \exp[p_2 + p_3(\ln x_B - \ln 0.15)t] \cdot Q^{p_4} \tag{14}$$

$$\langle\bar{E}_T\rangle(t, x_B, Q^2) = p_6 \cdot \exp[p_7 + p_8(\ln x_B - \ln 0.15)t] \cdot Q^{p_9} \tag{15}$$

- Comparison of parameterizations with **pi0** structure function measurements



- Comparison of parameterizations with **eta** structure function measurements



Github repository

git clone https://github.com/JeffersonLab/aao_gen.git

Example usage to generate 1000 events with minimum xB 0.1 and minimum W2 of 3:

python3 aao_gen.py --xBmin 0.1 --w2min 3 --trig 1000

output datafile is in aao_gen.dat

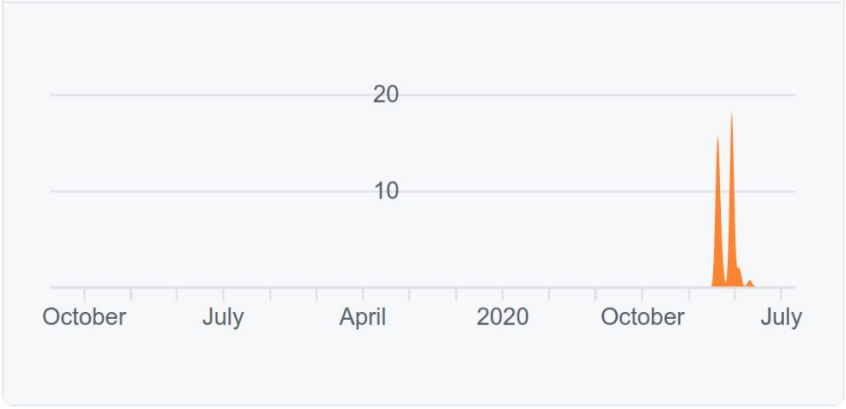
To get command line options: ./aao_gen.py -h

```
optional arguments:
  -h, --help            show this help message and exit
  --rad                 Uses radiative generator instead of nonradiative one,
                        CURRENTLY NOT WORKING (default: False)
  --physics_model PHYSICS_MODEL
                        Physics model: 1=A0, 4=MAID98, 5=MAID2000 (default: 5)
  --flag_ehel FLAG_EHEL
                        0= no polarized electron, 1=polarized electron
                        (default: 1)
  --npart NPART         number of particles in BOS banks: 2=(e-,h+),
                        3=(e-,h+,h0) (default: 3)
```

#1

robertej19

58 commits 3,445 ++ 2,254 --



#2

drewkenjo

16 commits 20,030 ++ 8,620 --

#3

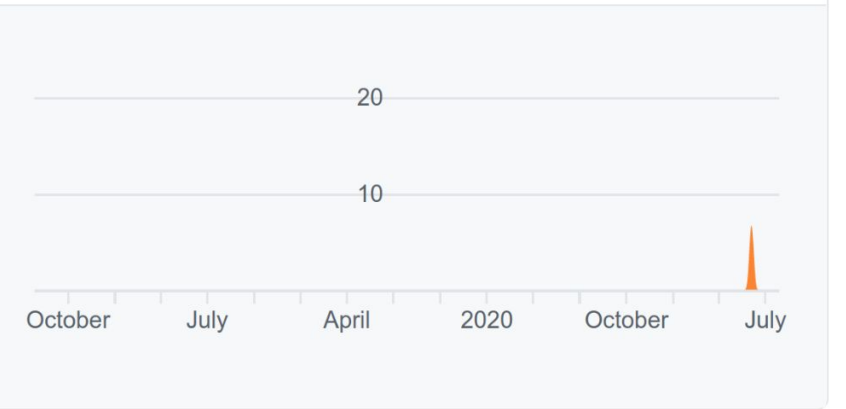
baltzell

12 commits 280 ++ 259 --

#4

forcar

10 commits 167 ++ 27 --



Plans

- Finish a wrapper to adopt this generator for EIC purposes (head-on collision)
- Convert from LUND to HepMC format (Jin's afterburner? Beam crossing?)
- Start working with fun4all software:
  - Based on Yellow Report, DVMP yield is expected to be small for low xB region

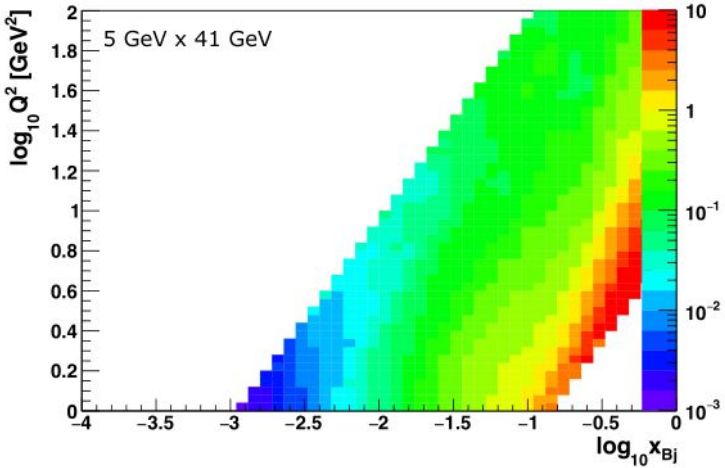


Figure 8.64: Ratio of DVMP π^0 to DVCS event yields in phase-space of (x_B, Q^2) for 5 GeV $\times$ 41 GeV beam energies. For more details see the text.