Generating Observables with EpIC – Update

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Bins

$$Q^2 = [1.0, 1.77828, 3.16228, 5.62341, 10, 17.7828, 31.6228, 56.2341, 100, 177.828, 316.228, 562.341, 1000.0]$$

$$x_{\mathrm{Bj}} = [0.0001, 0.000158489, 0.000251189, 0.000398107, 0.000630957, 0.001, 0.00158489, 0.00251189, 0.00398107, 0.00630957, 0.01, 0.0158489, 0.0251189, 0.0398107, 0.0630957, 0.1, 0.158489, 0.251189, 0.398107, 0.630957]$$

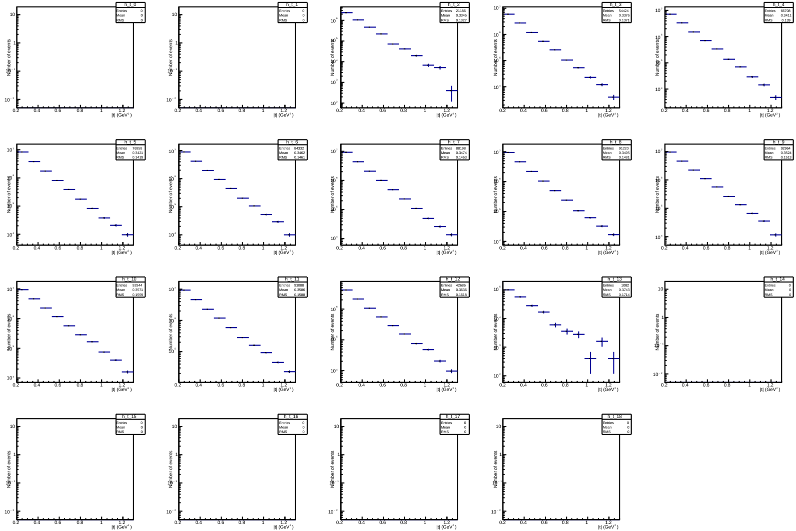
$$t = [0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3]$$

Unpolarized Cross Section

- Only DVCS events
- GK16 model
- 1.2 M Events generated $\approx 8.28\ \text{fb}^{-1}$

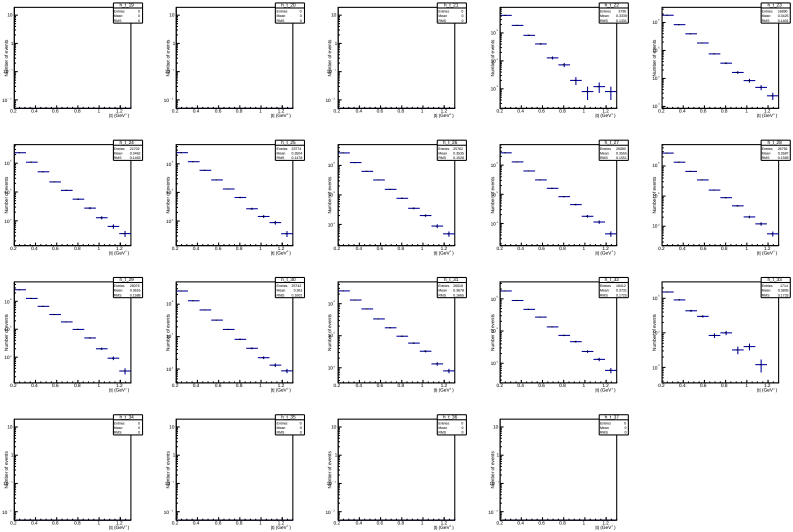
Unpolarized Cross Section

First Q^2-bin



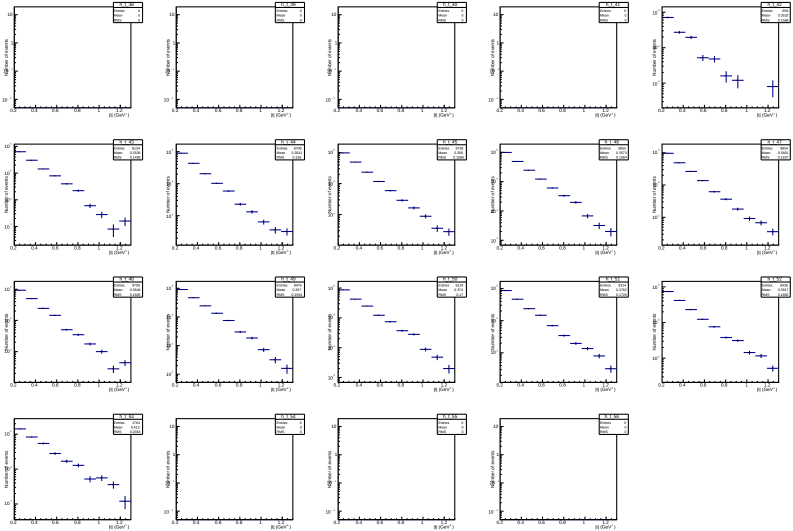
Unpolarized Cross Section

Second Q^2-bin



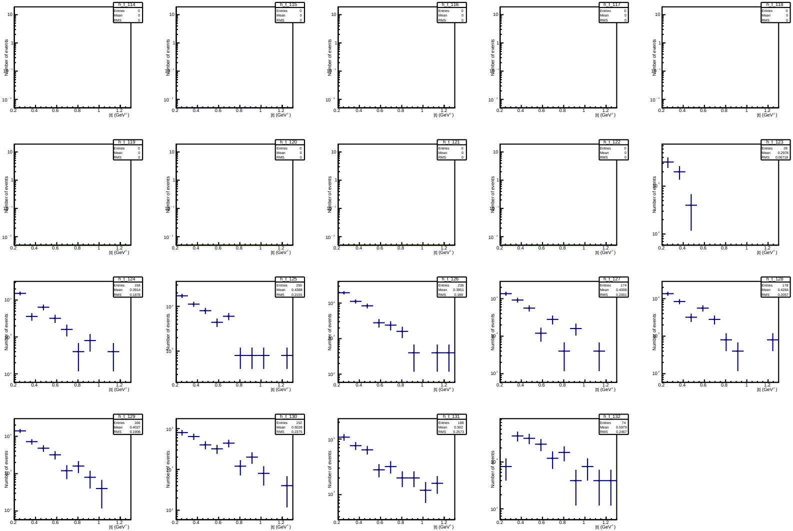
Unpolarized Cross Section

Third Q^2-bin



Unpolarized Cross Section

Seventh Q^2-bin



BSA

- DVCS + BH + INT
- GK16 model
- 2.4 M Events generated $\approx 0.534\ \text{fb}^{-1}$

- Bethe-Heitler amplitude includes singularities

$$|\mathcal{T}_{\rm BH}|^2 = \frac{1}{x_B y^2 (1+\epsilon^2) t \mathcal{P}_1(\phi)\mathcal{P}_2(\phi)} \left\{ c_0^{\rm BH} + \sum_{n=1}^{2} c_n^{\rm BH} cos(n\phi) + s_1^{\rm BH} sin(\phi) \right\}$$

with

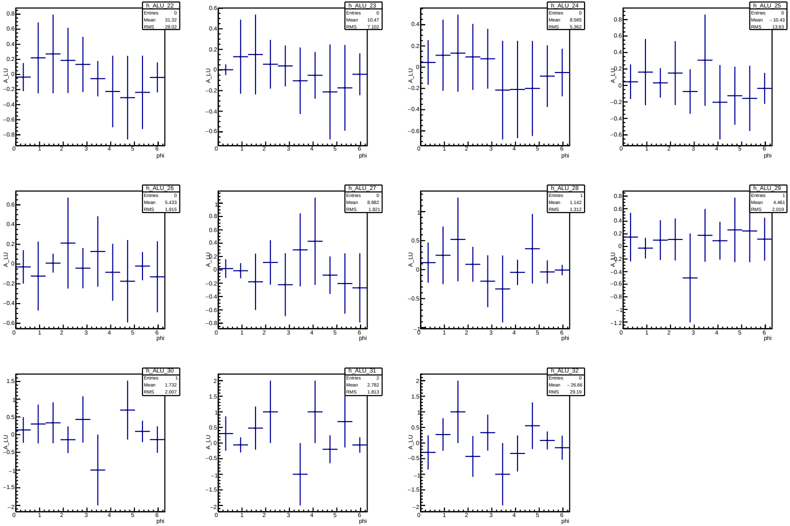
$$\mathcal{P}_1(\phi) = 1 + \frac{2k\cdot\Delta}{Q^2} \qquad \mathcal{P}_2(\phi) = \frac{t - 2k\cdot\Delta}{Q^2}\,, \quad \text{where}$$

$$k\cdot\Delta = -\frac{Q^2}{2y(1+\epsilon^2)}\left\{1 + 2Kcos\phi - \frac{t}{Q^2}(1 - x_B(2-y) + \frac{y\epsilon^2}{2}) + \frac{y\epsilon^2}{2}\right\}$$

$$K^2 = -\frac{t}{Q^2}(1-x_B)(1 - y - \frac{y^2\epsilon^2}{4})(1 - \frac{t_{\rm min}}{t^2})\left\{\sqrt{1+\epsilon^2} + \frac{4x_B(1-x_B)+\epsilon^2}{4(1-x_B)}\frac{t - t_{\rm min}}{Q^2}\right\}$$

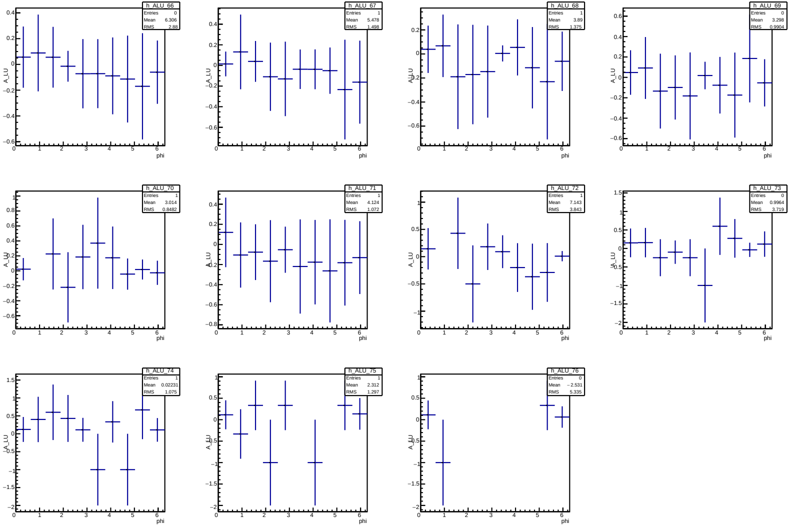
BSA

First Q^2-bin, Third x_B



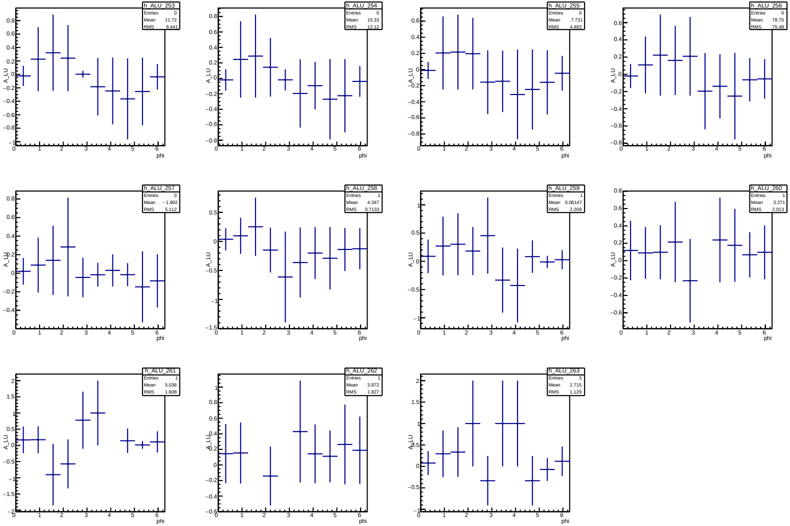
BSA

First Q^2-bin, Seventh x_B



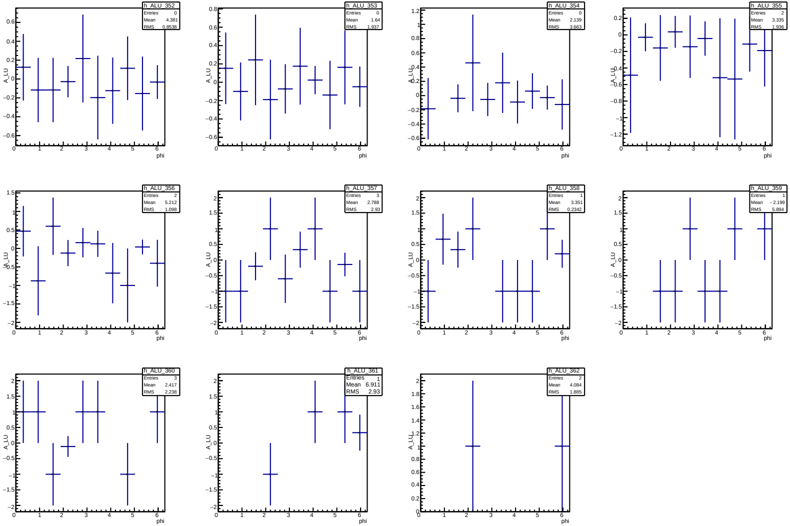
BSA

Second Q^2-bin, Fifth x_B



BSA

Second Q^2-bin, Fourteenth x_B



EpIC – Bethe-Heitler

- Bethe-Heitler amplitude includes singularities

$$|\mathcal{T}_{\mathrm{BH}}|^2 = \frac{1}{x_B y^2 (1+\epsilon^2) t \mathcal{P}_1(\phi)\mathcal{P}_2(\phi)} \left\{ c_0^{\mathrm{BH}} + \sum_{n=1}^{2} c_n^{\mathrm{BH}} cos(n\phi) + s_1^{\mathrm{BH}} sin(\phi) \right\}$$

with

$$\mathcal{P}_1(\phi) = 1 + \frac{2k\cdot\Delta}{Q^2} \qquad \mathcal{P}_2(\phi) = \frac{t - 2k\cdot\Delta}{Q^2}, \quad \text{where}$$

$$k\cdot\Delta = -\frac{Q^2}{2y(1+\epsilon^2)} \left\{ 1 + 2K cos\phi - \frac{t}{Q^2}(1 - x_B(2-y) + \frac{y\epsilon^2}{2}) + \frac{y\epsilon^2}{2} \right\}$$

$$K^2 = -\frac{t}{Q^2}(1-x_B)(1 - y - \frac{y^2\epsilon^2}{4})(1 - \frac{t_{\mathrm{min}}}{t^2}) \left\{ \sqrt{1+\epsilon^2} + \frac{4x_B(1-x_B)+\epsilon^2}{4(1-x_B)} \frac{t - t_{\mathrm{min}}}{Q^2} \right\}$$