# EpIC (ePic) generator - Update

#### Kemal Tezgin

Brookhaven National Lab

kemaltezgin@gmail.com

May 10, 2021

# EpIC generator

- EpIC (ePic): a generator for exclusive reactions
- EpIC is attached to the PARTONS framework: takes advantage of
  - multiple GPD models already exist
  - flexibility for adding new models
- Multiple channels: DVCS, TCS, DVMP
- Written in C++
- Why EpIC? Epicurus, EIC, epic, ...

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- EpIC uses mini FOAM (mFOAM, a compact version of FOAM) to generate events randomly
- Input file: model, model parameters, number of events, kinematic limits, beam and target type, beam helicity, target polarization, beam and target energy
- Output file: 4-vectors of all particles

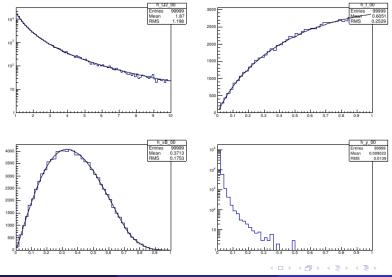
#### the test.xml file under "home/partons/git/epic"

```
<!-- Experimental conditions -->
<experimental conditions>
  <param name="lepton energy" value="5.0" />
  <param name="lepton type" value="e-" />
  <param name="lepton helicity" value="1" />
  <param name="hadron energy" value="41.0" />
  <param name="hadron type" value="p" />
  <param name="hadron polarisation" value="0.|0.|0." />
</experimental conditions>
<!-- Computation scenario -->
<computation configuration>
   <module type="DVCSProcessModule" name="DVCSProcessGV08">
          <module type="DVCSScalesModule" name="DVCSScales02Multiplier">
                  <param name="lambda" value="l." />
          </module>
          <module type="DVCSXiConverterModule" name="DVCSXiConverterXBToXi">
          </module>
          <module type="DVCSConvolCoeffFunctionModule" name="DVCSCFFConstant">
                  <param name="qcd order type" value="L0" />
                  <param name="cff value H Re" value="3." />
                 <param name="cff value H Im" value="4." />
                 <!--param name="cff value E Re" value="0." /-->
                  <!--param name="cff value E Im" value="0," /-->
                 <!--param name="cff value Ht Re" value="0.0" /-->
                  <!--param name="cff value Ht Im" value="0.0" /-->
                  <!--param name="cff value Et Re" value="0.0" /-->
                  <!--param name="cff value Et Im" value="0.0" /-->
          </module>
   </module>
</computation configuration>
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• Compare generated events with theory expectation curves • i.e.  $\int_{\text{bin}} \frac{d\sigma}{dxB} dxB = \int_{\text{bin}} dxB \int dQ2 \int dt \int d\phi \int d\psi \frac{d^5\sigma}{dxB dQ^2 dt d\phi d\psi}$ 

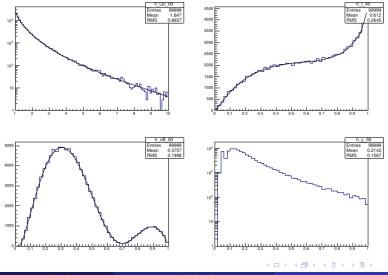
Unpolarized target,  $E_{beam} = 5 \text{ GeV}$ ,  $E_{target} = 41 \text{ GeV}$ 



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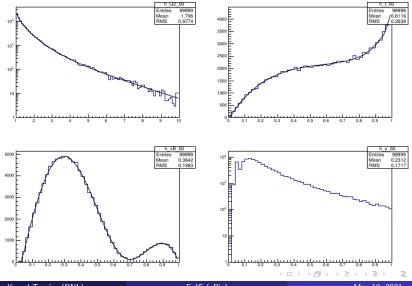
#### Longitudinally polarized target, $E_{beam} = 10 \text{ GeV}$ , $E_{target} = 1 \text{ GeV}$



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Transversely polarized target,  $E_{beam} = 10 \text{ GeV}$ ,  $E_{target} = 1 \text{ GeV}$ 



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<computation\_configuration>

<module type="DVCSObservableModule" name="DVCSCrossSectionTotal">

cparam name=DUCSCrossSectionTotal\_rangeXb" valuem"0.0[1." />
cparam name=DUCSCrossSectionTotal\_rangeT" valuem"0.1 |-0.0" />
cparam name=DUCSCrossSectionTotal\_rangeD1" valuem"1.110." />
cparam name=DUCSCrossSectionTotal\_rangeD1" valuem"0.16.2831853" />
cparam name=DUCSCrossSectionTotal\_rangeP1" valuem0.11."

cparam name="DVCSCrossSectionTotal\_beamHelicity" value="1." />
cparam name="DVCSCrossSectionTotal\_targetPolarization" value="0.|0.|1." />

<param name="DVCSCrossSectionTotal\_subprocessesTypes" value="DVCS" />

cyparam name="DVCSCrossSectionTotal\_rangeN0" value="5000" />
cyparam name="DVCSCrossSectionTotal rangeN1" value="1" />

<param name="DVCSCrossSectionTotal\_xB\_over\_y" value="0" />

<module type="DVCSProcessModule" name="DVCSProcessGV08">

<module type="DVCSScalesModule" name="DVCSScalesQ2Multiplier"> <param name="lambda" value="1." /> </module>

<module type="DVCSXiConverterModule" name="DVCSXiConverterXBToXi"> </module>

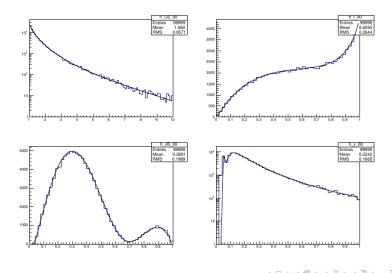
<module type="DVCSConvolCoeffFunctionModule" name="DVCSCFFConstant">

<param name="qcd\_order\_type" value="LO" />

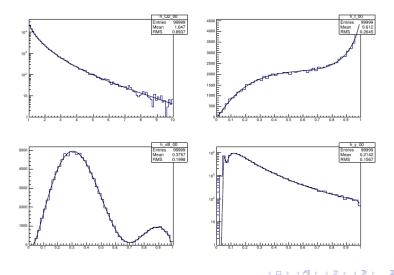
cprram name="eff\_value\_H.Re' value="1.\*/>
cprram name="eff\_value\_H.Re' value="2.\*/>
cprram name="eff\_value\_E.Re' value="3.\*/>
cprram name="eff\_value\_E.Re' value="3.\*/>
cprram name="eff\_value\_H.Re' value="3.\*/>
cprram name="eff\_value\_H.Re' value="3.\*/>
cprram name="eff\_value\_E.Re' value="3.\*/>
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cprram name="eff\_value\_E.Re' value="3.\*/>

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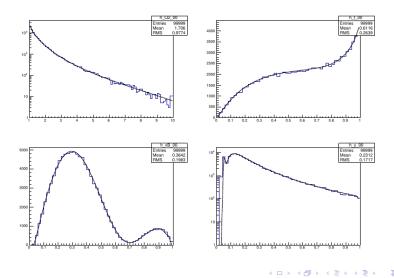
Unpolarized target,  $E_{beam} = 10 \text{ GeV}$ ,  $E_{target} = 1 \text{ GeV}$ 



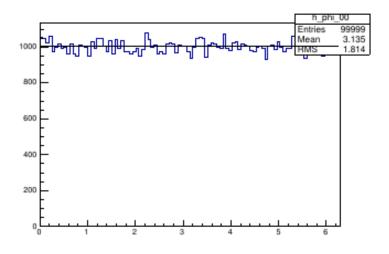
Longitudinally polarized target,  $E_{beam} = 10 \text{ GeV}$ ,  $E_{target} = 1 \text{ GeV}$ 



Transversely polarized target,  $E_{beam} = 10 \text{ GeV}$ ,  $E_{target} = 1 \text{ GeV}$ 



Transversely polarized target,  $E_{beam} = 10 \text{ GeV}$ ,  $E_{target} = 1 \text{ GeV}$ 

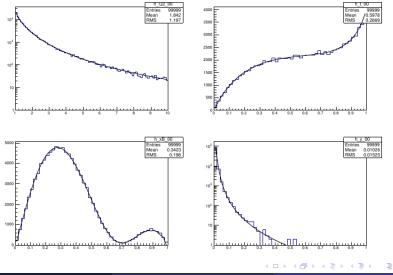


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Longitudinally polarized target,  $E_{beam} = 5 \,\text{GeV}$ ,  $E_{target} = 41 \,\text{GeV}$ 



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- Pure DVCS seems to be working
- BH process involves singularities
- Radiative corrections