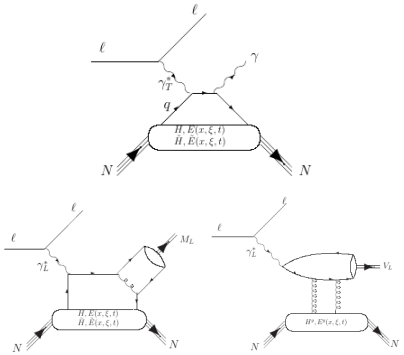
DVMP at ECCE

Stuart Fegan

University of York

August 27th, 2021

DVMP



arXiv:1511.04535

- Complimentary to DVCS, produced meson replacing outgoing photon
- Meson production process allows different flavour combinations to be explored, e.g. gluon GPDs with heavy vector mesons
- Some potential analyses are outlined in the Yellow Report, to my knowledge mainly focussed on π^0
- Priority vector meson channels are ϕ and J/Psi

Available Generators

Two generators; lAger and VT

- lAger - Argonne generic l/A event generator
  - S. Joosten, Argonne l/A-event Generator (2021), GitLab repository, https://eicweb.phy.anl.gov/monte_carlo/lager
  - I use this for J/Ψ studies
- 'VT Generator' - under development by M. Boer (VT)
  - Extension of an existing generator framework for fixed target (i.e. JLab) experiments
  - Applicable to ϕ and J/Ψ reactions

lAger Status

- Small scale event samples available for analysis development (1k-50k events)
- Tuning job cards for EIC kinematics
  - Currently unable to produce J/Ψ samples for eP collisions at higher energies than 1 on 10 GeV - lAger fails to initialise from jobcard
  - Example EIC jobcard was for Υ production, some settings may not be appropriate for J/Ψ
- Outpoot ROOT tree incompatible with EIC format, convert first to LUND

```
I, ievent, nParticles
=============================================
I  K(I,1)  K(I,2)   K(I,3)  K(I,4)  K(I,5)   P(I,1)  P(I,2)  P(I,3)  P(I,4)  P(I,5)  V(I,1)  V(I,2)  V(I,3)
=============================================
0       0      11
=============================================
1    21          11     0     3     5           0           0         -10          10  0.000510999     0     0     0
2    21        2212     0     2     3           0           0       99.9956         100     0.938272     0     0     0
3    21          22     0     5     7   0.00785359  -0.00220345  -2.92493     2.92493           0     0     0     0
4     1          11     0    -1    -1  -0.00785359   0.00220345  -7.07507     7.07507  0.000510999     0     0     0
5    12        2212     1     0     0           0           0       99.9956         100     0.938272     0     0     0
6    22         553     3     7    11    -0.306674  -0.0134966     4.73428     10.5832      9.4603     0     0     0
7    14        2212     3     0     0    0.314527   0.0112932     92.3364     92.3417     0.938272     0     0     0
8    30         -13     5     0     0      2.1074      1.09055  -2.01181     3.11272     0.105658     0     0     0
9    30          13     5     0     0    -2.53948   -0.905427     6.68244     7.20659     0.105658     0     0     0
10    1          22     5     0     0  -0.000353848  -0.00627829  -0.0187697  0.019795           0     0     0     0
11    1          22     5     0     0     0.125756    -0.192339     0.082418  0.244134           0     0     0     0
=============== Event finished ===============
0       1      10
```

Configurations to Study

Settings from Yellow Report wiki π^0 DVMP lising

e^- Energy (GeV)	P Energy (GeV)
5	41
5	100
10	100
18	275

- Detector configuration - Standard ECCE? Testing alternatives? With/without certain subsystems?
- Field settings? Fixed for ECCE?
- Interaction regions? IP6/8

Distributions to Plot ($J/\Psi \rightarrow e^+e^-$ channel)

Standard variables from Yellow Report

- Q^2, t, W, x_B
- 2-D combinations (e.g. Q^2 vs x_B)
- Pseudorapidity

Other stuff we might want to see

- Missing Mass
- Momentum distributions of final state particles
- Opening angles of J/Ψ decay products (e^+e^-)
- Verify J/Ψ reconstruction via e^+e^- invariant mass?