

ECCE Exclusive Reactions


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April 30th 2021

Charges From Physics Working Group Convenors and Simulation Team

- Select/aim for 1/2 key physics processes or plots from yellow report (YR), white paper (WP) and NAS report
- Think about what simulation stages we need to go through to get there
- Start to set up simulation plus analysis chain to evaluate performance of current ECCE configuration

Simulation coordination towards proposal

- ▶ Time is short
 - ▶ Full G4 simulation can be time-consuming. Simulation team plan to help WGs plot most direct path for delivering plots in the proposal
 - ▶ Simulation campaign will be planned around major plot deliverables for the proposal
 - ▶ Parallelize detector definition and exercise of reco. tools using existing configurations
 - ▶ For large sample, we will organize coordinated simulation production, making result DST files available to analyzers
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- ▶ Dec 1st : proposal submission
 - ▶ Nov 1st: final proposal for editing
 - ▶ Sept 1st : all major simulation plot done. After this date, we just do polishing, composing narratives around the figures in the performance chapter of the proposal.
 - ▶ Aug 1st : Final simulation production done
 - ▶ July 1st : Final simulation production start
 - ▶ May 1st: First simulation campaign, followed by first round of analysis. From May – July, many studies probably need another iteration of simulation-analysis to advance detector design.
 - ▶ Entire Apr: develop simulation setup to run.
 - ▶ Today: 1st simulation workshop

- Time line from Jin Huang and Cameron Dean (simulation team)
- First simulation campaign starting May
- Once we have initial event samples can pass to Jin and Cameron

Ideas

Topics in YR Exclusive Measurements:

- DVCS and exclusive production of π^0 in $e+p$
- Neutron DVCS
- DVCS off helium
- Timelike Compton Scattering
- Exclusive vector meson. Production in $e+p$
- Exclusive vector meson production in $e+A$
- U-channel exclusive electroproduction of π^0
- Exclusive meson production by charged currents
- Diffractive di-jets

NAS report:

- How does mass of nucleon arise?
- How does **spin** of nucleon arise?
- What are emerging properties of dense systems of gluons?

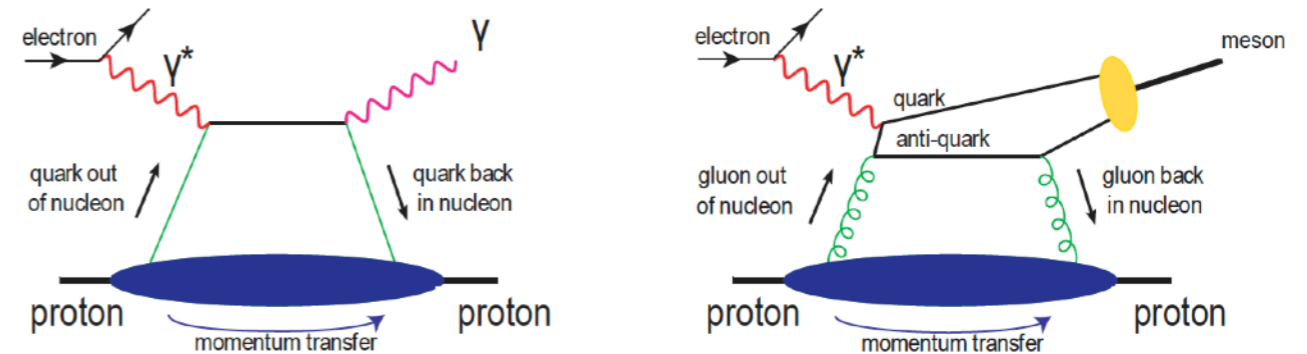


FIGURE 2.2 Real photon production (*left*) and real meson production (*right*). The virtual photon γ^* is emitted by the incoming electron. The final state photon and meson are real particles that can be observed in the detector. For the two-gluon process to dominate real meson production, the produced state should be heavy, like the J/ψ (a charm-anticharm quark bound state) or the Upsilon (Υ) particle (a bottom-antibottom quark bound state). In both processes, the nucleon remains intact but is deflected by a nonzero angle. SOURCE: Z.-E. Meziani.

DVCS and DVMP frequently highlighted for multi-dimensional imaging of quarks/gluons in nucleons/nuclei/mesons in YR and NAS report

Possible routes/ideas (which are open for discussion):

- DVCS and vector meson production - both with ep and eA
- Have two groups - one DVCS, one DVMP, both groups trying to make sense of feasibility to look at ep plus eA
- (DVMP with eA may require collaboration/cross-over with diffractive group?)
- Plus other topics of interest from community...extra ideas and studies certainly welcome

Today's Goal - Discussions and Kick Off

Topics to guide discussion:

- Any particular **interests**/topics or statuses from working group - all are welcome
- Any opinions on processes to aim for
- Available **workforce** - who is willing to contribute to setting up/running simulations etc and when can they start
- Note: if our workforce is short - we can compile **list of tasks** to put on ECCE wiki for groups interested in getting involved to start looking at (https://wiki.bnl.gov/eicug/index.php/Open_Tasks)

Extra for list of resources...

Relevant Info

First ECCE Software workshop

- <https://indico.bnl.gov/event/11112/>
- Recordings, chat transcripts, slides available
- Instructions for joining lattermost channel
- Links to tutorials on running EIC simulations and running via singularity container etc

ECCE Github, including day one tutorial for Fun4All framework (detector and sim set up macros)

<https://ecce-eic.github.io/>

https://ecce-eic.github.io/tutorials_day1.html#get-started-with-ecce-software

First ECCE configuration:

https://github.com/ECCE-EIC/macros/blob/master/detectors/EICDetector/Fun4All_G4_EICDetector.C

ECCE Wiki

- Main page: <https://wiki.bnl.gov/eicug/index.php/ECCE>
- Physics group: https://wiki.bnl.gov/eicug/index.php/ECCE_Physics
- We will start to create/expand exclusive wiki page soon

Physics Benchmark Team Meetings

- Every Monday at 9:30 am and 9 pm both in US Eastern Time Zone. Announced via ecce physics list
- To sign up to mailing lists: <https://www.ecce-eic.org/contact> (and check your spam for confirmation e-mail)

Simulation Office Hours

- Simulation experts online (see links right). Alternating weeks: <https://indico.bnl.gov/category/346/>
Tuesdays 2-4pm ET, Mondays 8-10pm ET <https://ijclab.zoom.us/j/94840187278>
- Announcements go to ecce physics list

Yellow Report Exclusive Reactions Wiki

- https://wiki.bnl.gov/eicug/index.php/Yellow_Report_Physics_Exclusive_Reactions

Event Generators

List of event generators for YR studies found in YR text or on YR wiki:

- https://wiki.bnl.gov/eicug/index.php/Yellow_Report_Physics_Exclusive_Reactions

Also on ECCE physics wiki

- https://wiki.bnl.gov/eicug/index.php/ECCE_Physics#Exclusive_reactions

See too summary table below

1	2	3	4
Contact person	Study	Generator's name	Smearer/detector-simulator
Salvatore Fazio	DVCS	Milou / Milou3D	eic-smear
Salvatore Fazio	pi0	PYTHIA	none
Sylvester Joosten	DVMP	IAger (https://eicweb.phy.anl.gov/monte_carlo/lager)	eic-smear
Raphael Dupre	DVCS on He	TOPEG (newly developed)	eic-smear
Latiful Kabir	Diffractione dijets	Pythia8	Delphes
Wenliang Li	u-channel pi0	DEMPgen	g4e through escalate
Garth Huber, Stephen Kay	Pion and Kaon Form Factors via DEMP	DEMPgen - Latest version - https://github.com/sjdkay/DEMPgen	Ad-hoc smearing
Spencer Klein	VM photoproduction	STARLIGHT	ZDC
Thomas Ullrich	VMP in e+A	SARTRE	eic-smear
Zhoudunming Tu and Alex Jentsch	DVCS/VMP on neutron	BEAGLE	eic-smear and EIC-Root

Info from Cameron during meeting:

- If anyone is looking to produce anything locally and would like someone from simulations to have access - send Jin and Cameron an email so they can set up access to your computer system
- Jin and Cameron have 3M locally produced events at BNL that can interface with Fun4All if people want to get started with analysis macros/modules. Location:
 - /sphenix/user/cdean/ECCE/DST_files
- You need a BNL account to access above at the moment - they are located on RCF. Working on access options (S3) to give people access to files from different accounts but request currently pending
- To get an account: <https://www.sdcc.bnl.gov/users/getting-started/new-user-account>