

ECCE Physics Benchmarks Team IB Meeting Report

April 12th, 2021

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Outline

- Review of the Physics Team Charge
- Team Organization
- Simulation workshop
- Getting Started
- Initial Steps
- Timeline
- Conclusions/Outlook

Charge

From the steering committee:

- The Physics Benchmarks Team is responsible for the **realistic simulation** of **key physics observables** for the proposal and evaluation of ECCE performance through the Physics Working Groups

Physics Working Groups:

- Inclusive reactions
- Electroweak and BSM/Exclusive Reactions
- Semi-inclusive reactions
- Jets and Heavy Flavor
- Exclusive reactions
- Diffractive & Tagging
- Simulation

Team organization

- Team Structure: ECCE Team Structure
- Mailing list: ecce-eic-phys-l@lists.bnl.gov
- Mattermost channel: <https://chat.sdcc.bnl.gov/eic/channels/fun4all-ecce>
- Conveners:
 - Simulations: Jin Huang (BNL), Cameron Dean (LANL)
 - Inclusive Processes: TBD, TBD
 - Semi-Inclusive Processes: Ralf Seidl (RIKEN), Charlotte Van Hulse (Orsay)
 - Diffractive and Tagging: Wenliang Li (W&M), TBD
 - Exclusive Processes: Rachel Montgomery (Glasgow), TBD
 - Jets and Heavy Flavor: Xuan Li (LANL), TBD
 - BSM and Precision Electroweak: Xiaochao Zheng (UVa), Sonny Mantry (UNG)

Simulation workshop (April 2)

- Simulation workshop was the kick-off event for simulations tasks necessary for the proposal
 - 77 Registered Participants!
- Slides and recordings available
 - <https://indico.bnl.gov/event/11112/>
 - Introduction to ECCE and call for proposals: John Lajoie
 - Fun4All Fundamentals: Chris Pinkenburg
 - Tutorial: From Simulation to Reconstruction to Analysis: Joe Osborn
 - Simulation towards ECCE proposal: Cameron Dean, Jin Huang
 - EIC Smear to Fun4All: Kolja Kauder
 - Detector Configurations in Simulations: Friederike Bock, Nicolas Schmidt
 - Far-Forward region in Simulations: Ciprian Gal
- Ideas of future dedicated workshops welcome

Getting Started

- Simulation framework will utilize fun4all
 - Development started in 2002 used by PHENIX from 2003 on
 - Designed for agile development in interactive and batch use
 - Modularity is key!
 - ECCE has a fork for EIC-specific configurations ([ECCE Fun4All git](#))
- Day 1 Checklist at: https://ecce-eic.github.io/tutorials_day1.html
 - Links to sign up for mailing lists, Mattermost Channels, other useful information
 - Will be updated based on input from the community
 - 2 Options to get started:
 - Mount EIC CVMFS
 - Download the EIC Fun4All build via HTTPS archive
- ECCE Wiki (under construction) is now at: [Wiki](#)

Getting Help

- Dedicated Mattermost Channel for Help
 - Mattermost-fun4all-ecce
 - If you do not have a BNL account email Jin Huang (jhuang@bnl.gov) for a direct invitation
- ECCE Simulation Office Hours
 - For direct help with experts!
 - First session will be on **Tuesday April 13 at 2PM EDT (Tomorrow)**
 - Zoom link will appear at: <https://indico.bnl.gov/event/11268/>
 - Other times will appear at: <https://indico.bnl.gov/category/346/>
- Time is short, jump in now!

Initial Steps

- Yellow report simulation samples are being collected:
 - Generator used
 - Steering cards
 - MC files (when available)
- Initial ECCE configuration available at: [github](#)
[Fun4All_G4_EICDetector.C](#)
 - Based on BABAR magnet and YR reference detector to be optimized
- Each PWG will select a few (1-2) key processes
- April Tasks
 - Setup the simulation + analysis chain to evaluate the performance of the initial ECCE configuration
 - Reproduce one WP/YR plot per PWG with low statistics

Simulation TODO's: volunteers needed

From Cameron and Jin's talk at Simulation Meeting

Detector	Status / link to code	Help needed
Silicon trackers	Full model for ALPIDE , fast model for ITS3 , FST	Update ECCE setup
TPC	Full model , fast model	EIC setup, dE/dx
MPGD tracker	Fast model	Update ECCE setup
Barrel Calorimeter	Full model for SPACAL , sPHENIX HCals , fast model for Shashlyke	Update ECCE setup
Forward calorimeter	Full model for Shashlyke , PbScifi , fast model for crystal calorimeter	Light collection uniformity
PID / TOF	Full model for MRPC and Fast model for LGAD	Update ECCE setup
PID / RICH	Full model for mRICH , Gas RICH ; missing DIRC and dual RICH (material placeholder)	dRICH, RICH reco
Far forward	Fast model [Talk: Ciprian]	Beamline material

▶ Tracking:

- Use [GenFit2 for fast prototyping \(PHG4TrackFastSim\)](#), widely used in YR tracking studies
- sPHENIX switched to ACTS: fast to fit but long development time for adopting new tracker set **Not** suited for ECCE at this stage [help needed: pattern reco. with ACTS]

▶ Calo reco:

- [Clusterizers](#), [FastJet](#), Particle flow jet ([prototype](#), need volunteer)

▶ PID reco:

- GenFit2 for TOF, e.g. track length and timing smearing
- RICH has to rely on fast smearing (help needed: full reco of RICH need major development)

Timeline

- First Simulation Campaign (April 1st - May 15th)
 - Initial simulation runs using existing implementation
 - Finish implementing ECCE setup
 - Agree on technology, main physics observable and arrange required event generators
- First Analysis Campaign (May – June 15th)
 - Determine statistics
 - Iterate: simulation \leftrightarrow analysis
- Final Production (June 15th – August)
- Second Simulation Campaign (July 15th – September 1st)
 - Analysis of simulation data to demonstrate physics extraction
 - Drafts of physics plots
- Proposal Writing (September 1st – October 15th)
 - All physics 'plots' are done
 - Compose narrative around simulation results and selected technologies
- Proposal Deadline – **December 1st**



Conclusions/Outlook

- Physics Working Groups are coalescing
 - Everyone should join working group(s) of interest
 - Contact convener or Carlos/Rosi (munoz@jlab.org rosijreed@lehigh.edu)
- Simulation Framework is fun4all
 - ECCE has its own branch
 - Need volunteers to improve ECCE configuration
 - Contact Simulation Conveners (jhuang@bnl.gov cameron.dean@cern.ch)
- Documentation to get started is in place
 - Looking for post-docs and students!
 - Day 1 checklist: https://ecce-eic.github.io/tutorials_day1.html
 - Mattermost Channel: <https://chat.sdcc.bnl.gov/eic/channels/fun4all-ecce>
- Detector and Physics Decisions need to be reached soon
 - Prepare for production in mid-June!