

ecce-eic-prop update

Tom Cormier, Richard Milner, Peter Steinberg / ECCE team convener meeting / 8 April 2021

ECCE proposal team

- **Proposal team are de facto editors of the proposal documents with members**
 - Tom Cormier - ORNL
 - Richard Milner - MIT
 - Peter Steinberg - BNL
- **Our job is to help organize the information produced by the other teams, and represent it in an effective way in the proposal to be submitted to BNL/JLab in December**
 - Key point: We expect a lot more information to be generated by the other groups than can possibly make it into a 60 page doc (40 on detector/physics, 20 on collaboration)
 - We feel that a set of accompanying internal notes will be good for the groups (to show their hard work to the community) and for the selection process (to give the BNL/JLab committees more material than can fit)
 - We expect that other collaborations will follow suit
- **This involves document...**
 - ...writing: where material needs to be added to make coherent arguments throughout the proposal
 - ...editing: to propose cuts (sometimes drastic) and reorganize material
 - ...organizing: to help manage the production and review of the main proposal document AND supporting material

Call for Collaborations

Detector 1 Collaboration Proposals: Experiments must address the EIC White Paper and NAS Report science case. The collaboration should propose a system that meets the performance requirements described in the EIC CDR and EICUG YR. The design should be compatible with that of the accelerator and interaction region layout of the CDR. Completion of detector construction must be achieved by Critical Decision **(CD)-4A**, the start of EIC accelerator operations.

Detector 2 Collaboration Proposals: Experiments should address science goals described in the EIC White Paper and possibly science beyond that and enable some complementarity to Detector 1. The Detector 2 interaction region design should be consistent with the accelerator design as detailed in the CDR, with perhaps some interaction region optimization. The detector design should allow for an estimated construction schedule compatible with achieving detector completion by **CD-4** (which follows CD-4A). Note: Currently, the EIC project scope does not include the construction of Detector 2 or the accelerator components needed for the second interaction region.

The Proposals should include two parts:

1. A description of the science addressed and performance estimated through simulation including, but not limited to, e/γ , jets, $\pi/K/p$ separation, vertex, and tracking, and how the simulated performance compares to the requirements detailed in the YR. The realization of the conceptual detector design given the technology choices, the R&D needs, risks, and, if applicable, adoption of emerging new technologies.
2. A collaboration roster and structure, timescale and cost (including potential sources of funding sources and assumptions), and potential upgrade paths.

If possible, the proposal should not exceed 60 pages, 40 pages for the first part and 20 for the second.

Outline

- I. EIC science with the ECCE detector (40 pages)**
- II. ECCE collaboration and project (20 pages)**
- III. Supporting notes**

A lot here borrowed a lot from the 2018 EIC-sPHENIX document:
and should not be seen as final — this is just to start discussion!

I. EIC science with ECCE

A. Key physics measurements

1. Longitudinal spin of nucleon
2. Transverse motion of quarks and gluons inside the nucleon
3. Spatial distribution of quarks and gluons inside the nucleon
4. Gluon saturation in nuclei (diffraction)
5. Hadronization

B. Detector & impact of IR design

1. IR6 vs. IR8 (possibly spun off into appendix or public note)
2. Available resources from sPHENIX
3. Charged particle tracking
4. Calorimetry
5. Particle ID
6. Far forward

I. EIC science with ECCE (cont.)

C. Physics performance

1. Tracking performance
2. Particle identification
3. Jet reconstruction
4. DIS kinematics reconstruction
5. Heavy flavor tagging
6. DVCS reconstruction
7. Diffraction (gap measurements)
8. Exclusive J/psi

Needs cleaner separation of physics objects from physics *measurements*, impact on uncertainties, etc.

D. Assessment of proposed detector technology, needed R&D, potential risks

1. Impact of 1.5T field (vs. 3T) vs. risks
2. All Si vs. TPC+Si
3. Forward calorimetry

E. Day 1 / Year 1 physics program

1. This should be a particular strength of the ECCE philosophy, and a detailed plan for day-1/year-1 physics could be spelled out, along with the strategy that supports it
2. ECCE support of machine commissioning

II. ECCE project & collaboration

A. Collaboration structure

B. Collaborating institutions

C. Potential funding sources

D. Construction cost, schedule, and risk

E. Upgrade paths

III. Internal notes

A. Subsystems

B. DAQ/trigger

C. Physics object performance (tracking, jets, HF, forward arms, far-forward, etc.)

D. Combined physics performance (DIS, diffraction, jet measurements, exclusive J/psi, etc.)

Technical support

- **Setting up overleaf project for main proposal**
 - will make sure it can be restructured without too much difficulty
 - Currently planning to use sPHENIX BUP template from Dave
- **Technical notes should use a similar template**
 - Would be helpful to work out a rough document numbering scheme, a la sPHENIX
- **Document storage and review procedure is not obvious to us yet**
 - Need a few basic features
 - *Managing documents & revisions, posting final drafts in well-organized public area*
 - *Managing reviews (posting comments and replies, sign-offs)*
 - *Access control (easily manage various levels e.g. group, collaboration, lab, world)*
 - *Search functionality*
 - Email/google docs is very cumbersome
 - No equivalent of CERN CDS available at BNL yet
 - *Invenio (CDS replacement) is apparently coming but not imminently*
 - Options under discussion
 - *STAR drupal*
 - *DocDB*
 - *BNL gitea*

Some useful references

- **BNL/TJNAF call for collaboration proposals (CFC):** <https://www.bnl.gov/eic/CFC.php>
- **Yellow report:** <https://arxiv.org/abs/2103.05419>
- **EIC CDR:** https://www.bnl.gov/EC/files/EIC_CDR_Final.pdf
- **NAS report:** <https://www.nap.edu/catalog/25171/an-assessment-of-us-based-electron-ion-collider-science>
- **Energy dependence:** <https://arxiv.org/pdf/1708.01527.pdf>
- **EIC white paper:** <http://arxiv.org/pdf/1212.1701.pdf>
- **ePHENIX 2014 document:** <https://arxiv.org/abs/1402.1209>
- **EIC-sPHENIX 2018 document:** <https://indico.bnl.gov/event/5283> (password “babar1008”)
- **Workshops:**
 - **First ECCE workshop (11 Feb):** <https://indico.cern.ch/event/1005396/>
 - **IR2 workshop (17-19 March 2021):** <https://indico.bnl.gov/event/10677/>
 - **EIC@IP6 workshop:** <https://indico.bnl.gov/event/10825/>