

# **ecce-eic-prop update ("editorial/project")**

**Tom Cormier, Richard Milner, Peter Steinberg / ECCE IB meeting / 24 May 2021**

# Next iteration of proposal outline

- **v0.2 posted on google docs - private to ECCE, so please request access**
  - [https://docs.google.com/document/d/1HzVf\\_guuCeGrjJYftcOfKgEzvQzSZwNdQe4Mtqip4-c/edit](https://docs.google.com/document/d/1HzVf_guuCeGrjJYftcOfKgEzvQzSZwNdQe4Mtqip4-c/edit)
- **Very different than our original iteration in April**
  - Reflects developments in ECCE
  - Sub sections for every piece of strawperson detector design (needed for space planning)
  - Physics section reflects physics group structure
    - *3 page introduction on NAS/WP physics program*
  - Inclusion of DAQ, computing
  - Less direct focus on re-use (integrated as needed)
  - Incorporates helpful input from other team leaders
  - Initial page estimates for all major sections
    - *Useful to start seeing the very tight constraints*
- **Requesting input from team leaders**
  - Detector - appropriate sectioning, expected levels of detail
  - Physics - useful place to scope out ~10 physics plots on ~15 pages
  - Important: includes space to keep track of proposals for internal notes (please post topics) so we can get a sense of scope, and see if they match the proposal content

- I. EIC science with the ECCE detector (40 pages)
  - A. Key physics drivers (3 pages) and connection to EIC WP/YR and NAS report (3 pages)
    1. Longitudinal spin of nucleon
    2. Transverse motion of quarks and gluons inside the nucleon
      - a) TMDs in ep, eA with inclusive and SIDIS
    3. Spatial distribution of quarks and gluons inside the nucleon
      - a) DVCS, DVMP
    4. Gluon saturation in nuclei -
      - a) nPDF, F<sub>L</sub>, inclusive & diffractive charm, inclusive diffraction
    5. Hadronization - jets
  - B. Detector design (21 pages)
    1. Discussion of EIC experimental IRs (2 pages)
      - a) IR6
      - b) IR8
    2. Charged-particle tracking (6 pages)
      - a) BaBar 1.5T solenoid
      - b) Barrel silicon tracker
      - c) Forward
        - (1) Hadron endcap: Si tracker, MPGD
        - (2) Electron endcap: Si tracker, MPGD
    3. Calorimetry (6 pages)
      - a) Barrel
        - (1) Barrel EM (eID)
        - (2) Barrel Had (sPHENIX HCal)
      - b) Hadron endcap
        - (1) Forward EM (W/SciFi, W or Pb Shashlik)
        - (2) Forward Had (Pb/Sc, Fe/Sc)
      - c) Electron endcap
        - (1) Backward EM (PWO, Sciglass)
        - (2) Backward HCal (magnet steel, Fe/Sc, Pb/Sc)

4. Particle identification (5 pages)
  - a) Barrel
    - (1) hpDIRC
    - (2) AC-LGAD
  - b) Forward PID
    - (1) Hadron PID: dRICH & TOF
    - (2) Electron PID: TOF & Aerogel
  - c) Backward PID
    - (1) Hadron PID mRICH
5. Far forward detectors (1 page)
  - a) B0 spectrometer
  - b) Roman pot detectors
  - c) Off momentum detectors
  - d) Zero degree detectors
  - e) Low-Q<sup>2</sup> taggers
  - f) Luminosity detector
6. Data acquisition & streaming readout (1 page)
7. Assessment of proposed detector technology, needed R&D, potential risks
- C. Physics performance of ECCE detector (15 pages) - crucial here to indicate where the top 10 physics plots will go, and how much space is allocated to explain them.
  1. DIS kinematics reconstruction
  2. Inclusive processes
  3. Semi-inclusive DIS
  4. Exclusive processes
  5. Diffraction & tagging
  6. Jets and heavy flavor
  7. BSM & precision electroweak
  8. Proposed physics program (e.g. first 5 years)
- D. Computing plan (1 page)

- I
- II. ECCE project (20 pages)
  - A. Collaboration structure (4 pages)
  - B. Diversity, equity and inclusion (1 pages)
  - C. Collaborating institutions (2 pages)
  - D. Potential funding sources (1 pages)
  - E. Construction schedule (6 pages)
  - F. Cost and risk (6 pages)
  - G. Upgrade paths (wouldn't this make more sense in I.B.?)
- III. Internal notes for supporting material (related: how do we manage a set of interrelated documents?)
  - A. Detector
    - 1. [Fill in notes here]
  - B. Physics
    - 1. Inclusive processes
      - a) Fill in notes here
    - 2. Semi-inclusive DIS
    - 3. Exclusive processes
    - 4. Diffraction & tagging
    - 5. Jets and heavy flavor
    - 6. BSM & precision electroweak
  - C. DAQ & online computing
  - D. Offline computing model

# What is the Matrix?

Processes Topics	Inclusive	Semi-Inclusive	Jets, Heavy Quarks	Exclusive	Diffractive, Forward Tagging
Global properties & parton structure	<b>incl. SF</b>	<b>h, hh</b>	jet, Q	<b>excl. <math>Q\bar{Q}</math></b>	<b>incl. diffraction, tagged DIS on D/He</b>
Multidimensional Imaging		<b>h</b>	jet, di-jet, jet+h, Q, $Q\bar{Q}$	<b>DVCS, DVMP, elast. scattering</b>	
Nucleus	<b>incl. SF</b>	<b>h, hh</b>	jet, di-jet, Q, $Q\bar{Q}$	<b>coh. VM, di-jet, h, hh, D/He FF</b>	<b>diff. SF, incoh. VM, di-jet, h, hh, nucl. fragments</b>
Hadronization		<b>h, hh, jet+h</b>	jet, Q, $Q\bar{Q}$		
Other fields	incl. SF with $e^+$ , $\sigma_{\gamma A}^{\text{tot}}$	charged curr. DIS, $\sigma_{\gamma A \rightarrow hX}$		$\sigma_{\gamma A}^{\text{elast}}$	$\sigma_{\gamma A}^{\text{diff}}$

**Table 6.1:** Relationship between the EIC science topics (rows) and the categories of measurements (columns). Measurements already discussed in the White Paper [2] or the NAS Report [1] are highlighted in red. Various additional measurements and physics ideas that have emerged since are also included in this table, but the table is not meant to be exhaustive. "Other fields" refers to neutrino, cosmic-ray and high-energy physics. The acronym "SF" refers to structure function, "FF" to form factor, "h" to identified hadrons, Q to heavy quarks;  $Q\bar{Q}$  to heavy-quark bound states (quarkonium), and "VM" to vector mesons.

Excellent starting point but we can make it an "index" to the ECCE proposal: associating priorities (rows) with physics groups (columns), with specific references to proposal subsections (for key measurements) and potentially links to external notes (for topics that don't fit)

# Proposal

- **Document management**

- github/gitea for individual papers, using issue tracking for comments
  - *Need to converge on utility of internal vs. external instance*
- overleaf for day-to-day writing, ideally using BNL instance
  - *BNL instance is still in progress, slowly (according to Jerome)*
- still need a viable scheme for document handling
  - *No news on invenio (CDS replacement)*
  - *Jerome is looking into whether DocDB instance at BNL can be used for publishing documents beyond people with SDCC accounts.*

- **Discourse**

- Lots of uptake, thanks to physics teams for encouraging this!
- Starting to create new categories (sets of topics) for different subgroups

# Project (from Tom)

- **Building ECCE in P6 underway at ORNL**
- **First contacts with detector group have started**
- **Team is meeting 2x/week**
  - More details expected after today's meeting