

# ECCE Physics Benchmarks Team Bi-weekly Meeting Report

December 6<sup>th</sup>, 2021

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LEHIGH  
UNIVERSITY

# Analysis notes

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1	ECCE ID	Topic	Responsible	Github	Overleaf
2	ecce-note-phys-2021-01	Jet performance note	Tristan Protzman	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
3	ecce-note-phys-2021-02	Diffraction and tagging group note	Bill Li, Axel Schmidt	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
4	ecce-note-phys-2021-03	Exclusive processes group note	Julie Roche, Rachel Montgomery	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
5	ecce-note-phys-2021-04	ReA for D&B	Xuan Li	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
6	ecce-note-phys-2021-05	SIDIS kinematics	Ralf Seidl & Charlotte van Hulse	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
7	ecce-note-phys-2021-06	SIDIS spin asymmetries with single hadron	Ralf Seidl & Charlotte van Hulse	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
8	ecce-note-phys-2021-07	SIDIS unpolarized TMD measurements	Ralf Seidl & Charlotte van Hulse	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
9	ecce-note-phys-2021-08	Jet ReA	Raymond Ehlers	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
10	ecce-note-phys-2021-09	Inclusive processes group note	Tyler Kutz & Claire Gwenlan	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
11	ecce-note-phys-2021-10	Centauro jets (JL)	John Lajoie	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
12	ecce-note-phys-2021-11	SIDIS (unspecified topic)	Ralf Seidl & Charlotte van Hulse	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
13	ecce-note-phys-2021-12	Spectroscopy	Derek.Glazier@glasgow.ac.uk	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
14	ecce-note-phys-2021-13	Dihadrons	Nathan grau	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
15	ecce-note-phys-2021-14	BSM group note	xiaochao@jlab.org	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
16	ecce-note-phys-2021-15	Quarkonium note	Xinbai Li	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>

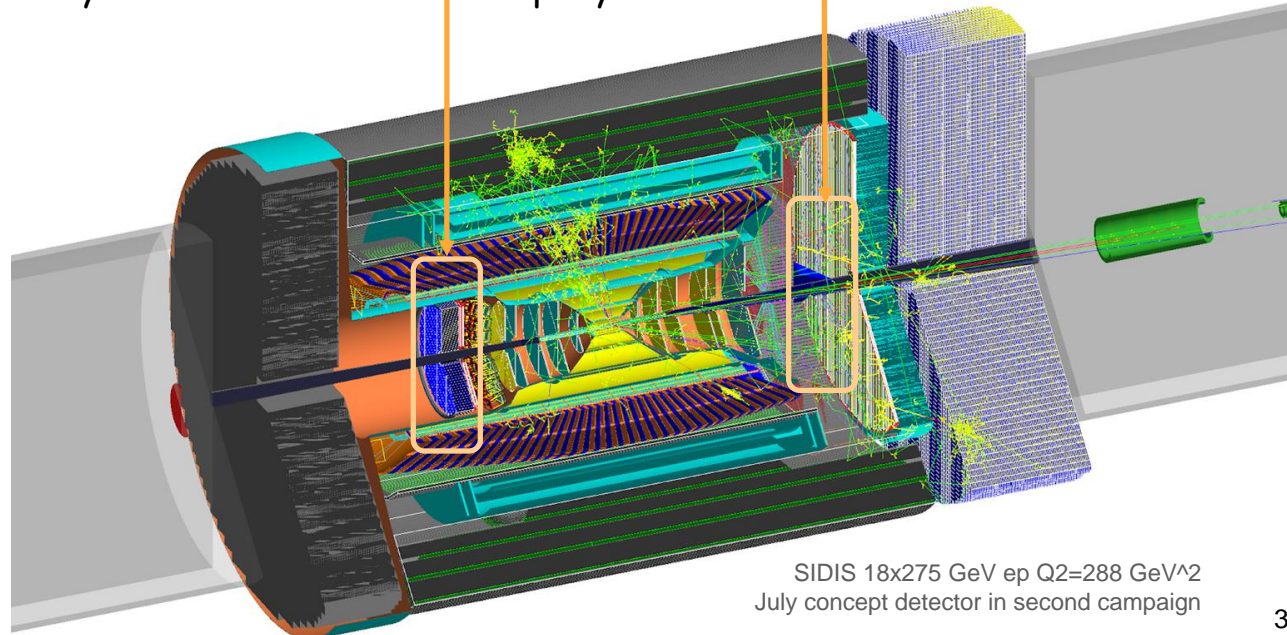
15 analysis notes produced by the 6 physics WG  
+ 1 simulation/software note

# Simulations WG

**Near term:** proposal review support

- Incorporating improvements on EEMC
- Remove  $\mu$ Rwell disks (as in costing)
- New proposal tag build; Plan to run single particle and physics samples
- Let the simulation WG know as early as reasonable which sample you would need towards the reviews in Dec & Jan

**Long term:** maintain a reliable software stack for ECCE simulation studies while continuously adapting new software tools to best serve each stage of the ECCE project and collaboration.



SIDIS 18x275 GeV ep Q2=288 GeV<sup>2</sup>  
July concept detector in second campaign

# Inclusive reactions WG

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## Near term:

- Attempt to show improved reconstruction using EEMC information

## Long term:

(from analysis note;  
not in order of importance)

- A more comprehensive study of systematics, including utilizing an independent Monte Carlo simulation.
- Extending analyses to lower  $Q^2$ , not only by lowering the range on generated events, but also with more detailed simulation of the far-backward detectors.
- Structure function analysis of reduced cross sections, which will provide significant new constraints on  $F_L$
- Studying impact of measurements with a positron beam, which would allow direct extraction of  $xF_3$  and provide additional constraints on PDFs.
- Improving simulation and analysis of calorimeter data, including fixing misconfigured geometry in the simulation and refining calibrations.
- More in-depth investigation of alternative reconstruction methods, and establishing the best methods to use in different regions of phase space.
- Implementing a more sophisticated ePID algorithm using information from detectors in addition to  $E/p$  cuts from tracking and calorimetry.
- Further investigation of sources and rejection of background.
- Full simulation of  $e + A$  collisions with heavy nuclei, and the impact on nuclear PDFs.

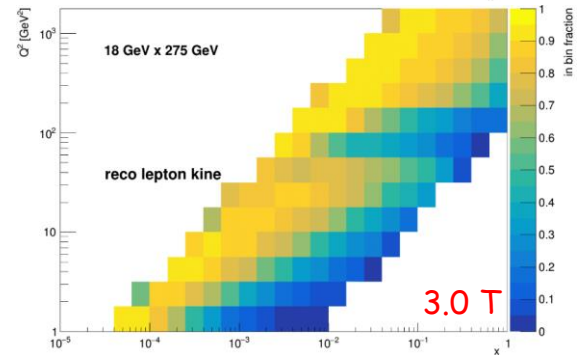
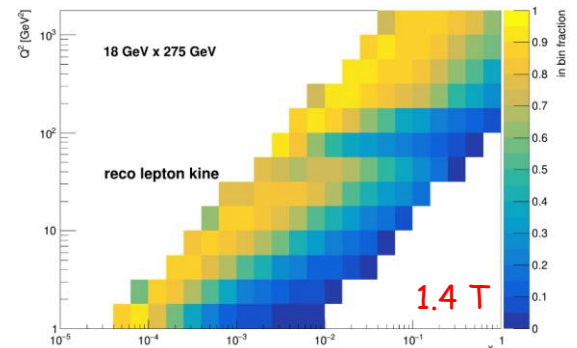
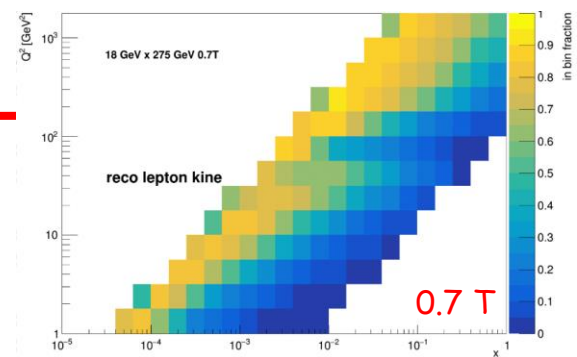
# Semi-inclusive reactions WG

## Near term:

- Re-looking at 0.7T data (had to be re-run and could not be included in the note)
  - High magnetic field improves DIS reconstruction at lower  $y$
  - Little impact on the  $z$  resolutions (some improvement at higher  $z$ )
  - Substantial reduction of acceptance for hadron momenta  $< 1$  GeV at higher field
- Impact plot for helicity distributions (obtained from  $A_{LL}$  projections) will be included if provided by theorists

## Long term:

- Include radiative effects in simulations and projections



# Exclusive reactions WG

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## Near term:

- Neutral pion backgrounds to DVCS

## Long term:

- Include radiative effects in simulations and projections
- Additional background studies for other channels
- Projection for spin observables for eg. TCS, DVCS

# Diffractive & Tagging WG

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## Near term:

- High priority: Completing u-Channel  $\pi^0$  production at IP6 to justify using PbWO4 in B0 calorimeter

## Long term:

- IP8 studies
  - Double Tagged NSS measurement
  - eA Diffractive J/psi at IP8
  - Pion Form factor and Pion structure function study
- Continuing  $\Upsilon$  production study

## Special task:

- Including scattering beam characteristics at different beam energies and combinations.
- Refining IP8 design based on suggestion especially around 2nd focus region

# Electroweak & BSM WG

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## Near term:

- Awaiting for homework...

## Long term:

- Extending the analysis note:
  - More SMEFT analysis: polarized hadron  $A_{pv}(p)$ ,  $A_{pv}(D)$ ; combine/compare with HERA data
  - Leptoquarks: need to analyze more decay channels, higher statistics for backgrounds (NC and photoproduction)
- Beyond the analysis note:
  - JAM analysis of PVDIS asymmetries
  - positron potential



# Summary & Outlook

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- A few WGs have immediate tasks they would like to address for mid-Dec/Jan
- All groups are "eagerly" awaiting homework over Christmas...
- All groups have long-term plans beyond Jan 2022 !