

# ECCE Physics Benchmarks Team Bi-weekly Meeting Report

November 8<sup>th</sup>, 2021

Carlos Muñoz, Rosi Reed

# Analysis notes

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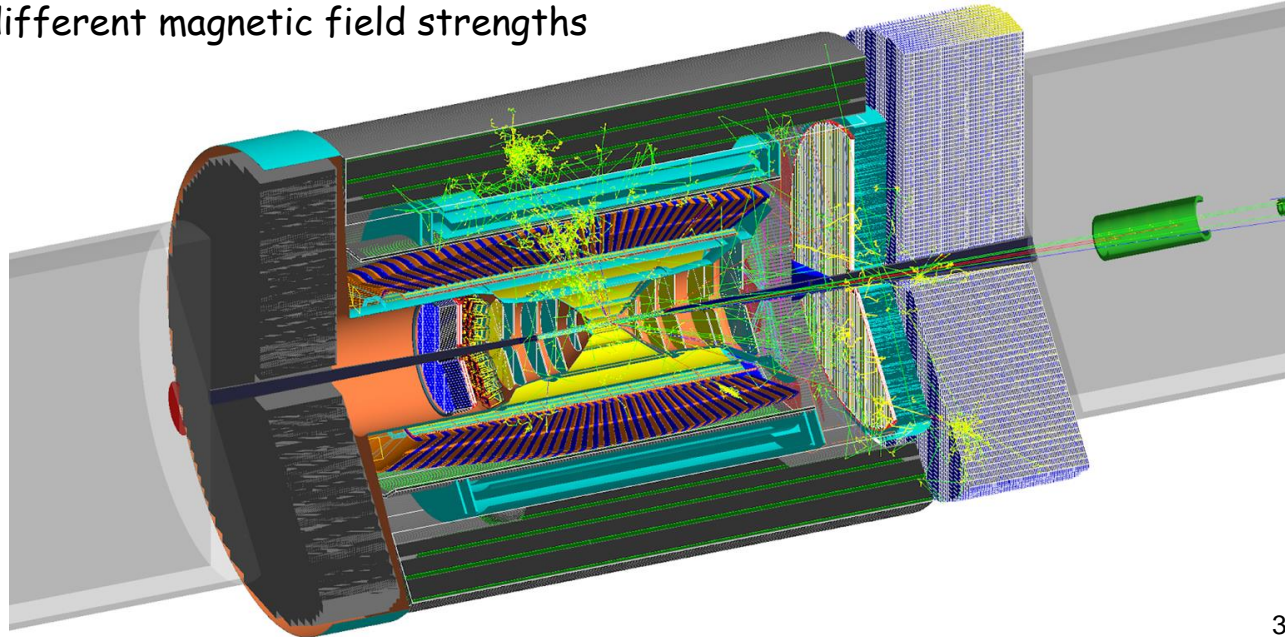
1	ECCE ID	Topic	Responsible	Github	Overleaf
2	ecce-note-phys-2021-01	Jet performance note	Tristan Protzman	<a href="https://github.com">https://github</a>	<a href="https://www">https://www</a>
3	ecce-note-phys-2021-02	Diffraction and tagging group note	Bill Li, Axel Schmidt	<a href="https://github.com">https://github</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

# Simulations WG

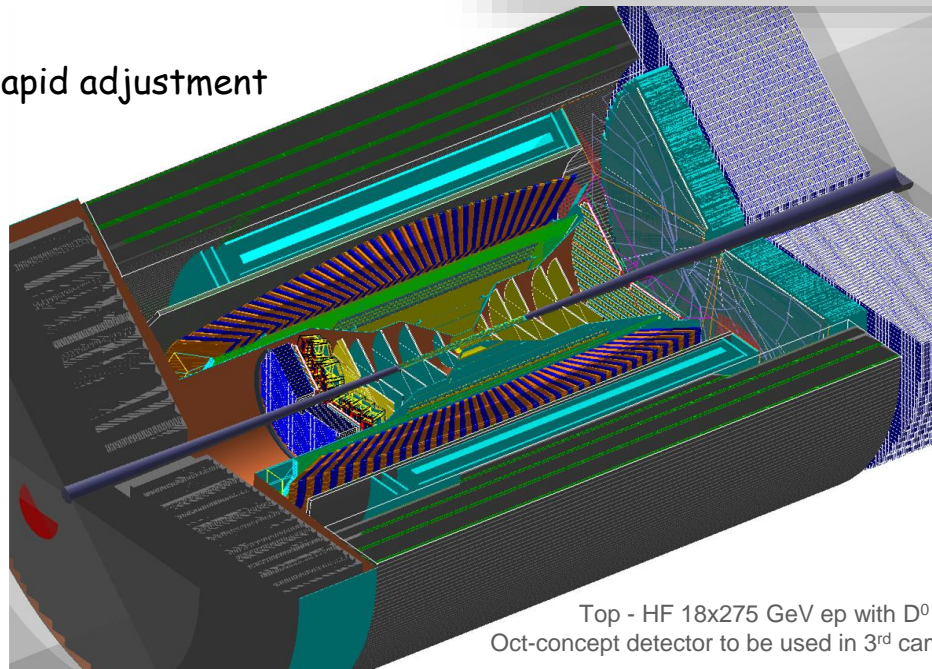
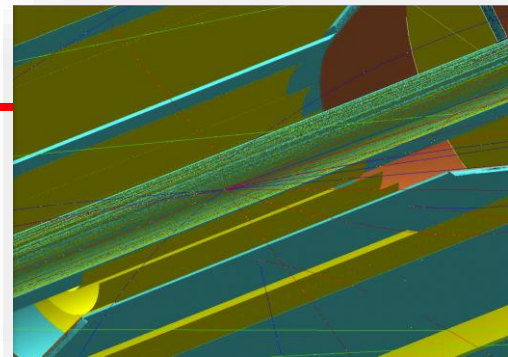
**Second Campaign:** July concept as reference of physics performance study.

- Since last bi-weekly, we produced several new samples  
All under the **prop.4.3** directory
- We have several samples with different magnetic field strengths  
0.0T, 0.7T, **1.5T**, 3.0T
- Locations of all data can  
be found on [productions table](#)



# Simulations WG: 3<sup>rd</sup> campaign

- Third Campaign: the final detector setup in proposal
  - For detector study in the proposal
  - Physics simulation by request
  - Possible homework simulation during review
- Status: thanks to the detector and AI groups for rapid adjustment of detector to reflect in simulation
  - Released to the macro master branch
  - Improved support cone comparing to 2nd campaign and consistent with costed tracker
  - All overlap resolved and passed production test





# Simulations WG: further detector optimization with AI

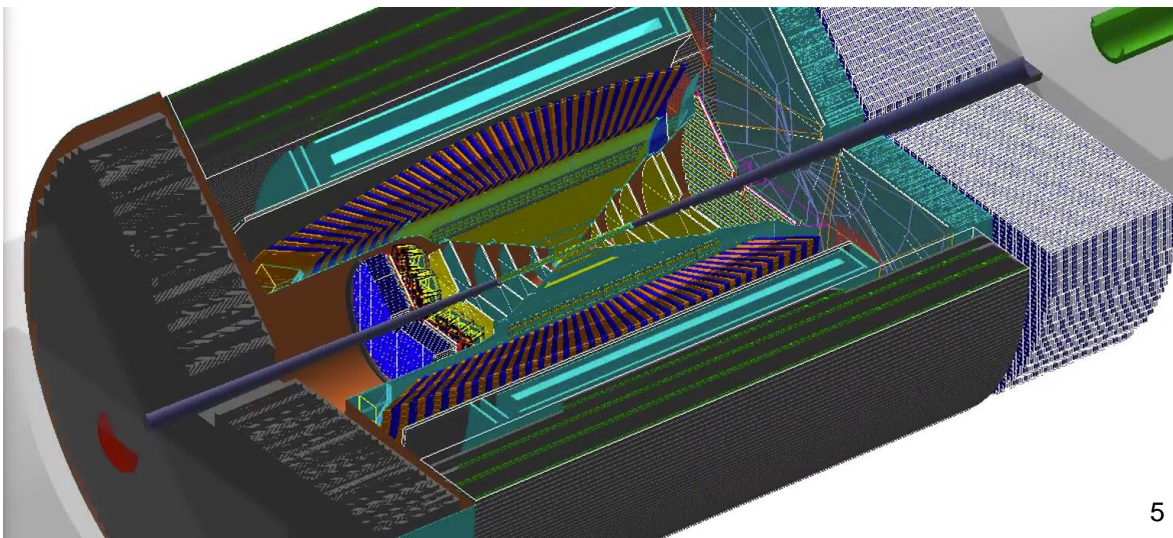
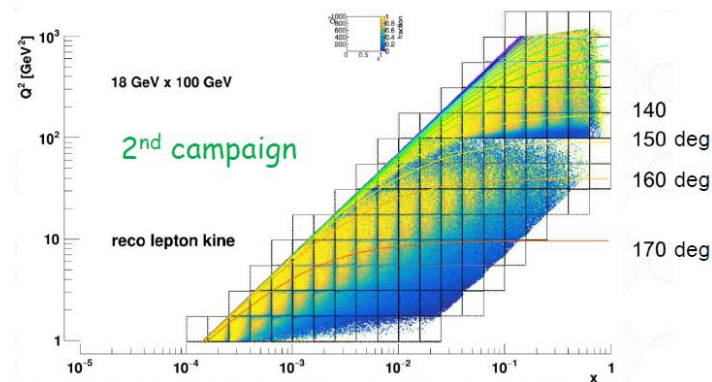
- In July-concept, a non-projective support cone is used with silicon tracker, which put significant material in the electron's path (as the SIDIS group reported in last biweekly meeting)
- In Oct-concept, we attempted to optimize it with two sections of projective cones
- A parallel setup prepared w/ a new inner tracker from AI group, which uses a fully projective cone and minimizes the missing acceptance:

[\[AI Optimization October 2021 Concept\]](#).

- Aim to run comparative production on this branch to show improvements on ECCE beyond the detector configuration in the proposal

[AI Optimization October 2021 Concept](#) branch with projective inner tracker support cone

Missing acceptance in SIDIS kinematic space  
(2nd campaign setup, non-projective support cone)

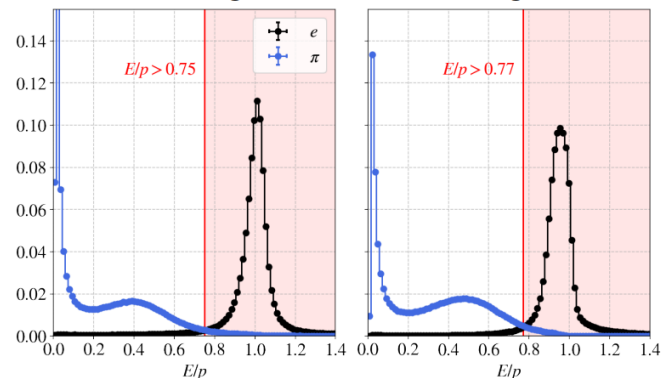


# Inclusive reactions WG

## Background estimate

EEMC

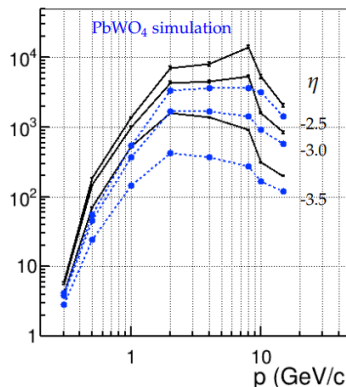
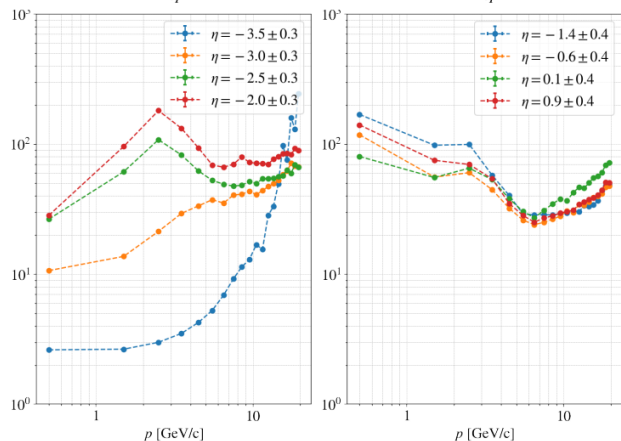
BEAL



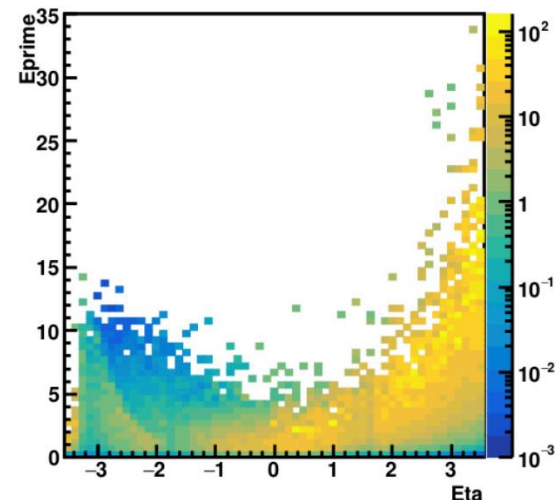
- prop.4.0 single-particle simulations
- $>10^2$  with E/p

- Yellow Report  $\pi$  suppression:

- $>10^3$  E/p only
- $>10^4$  E/p + shape



pi-/e- ratio

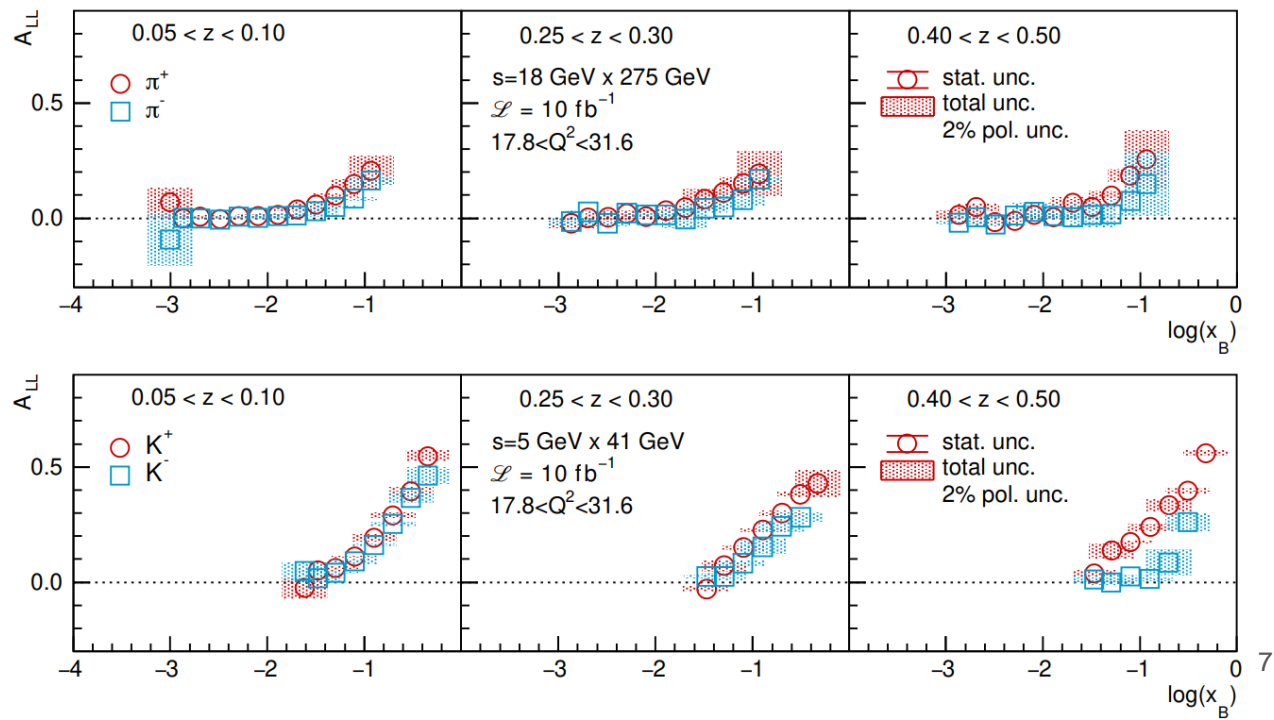


- Estimate background from pion suppression + simulated  $\pi/e$  ratio
- Also have simulated photoproduction background (trying to quickly get results from this)
- Last item to estimate background systematics

# Semi-inclusive reactions WG

- All notes released for review
- Unpol. TMD and  $A_{UT}$  pseudo data sent to theorist for impact plots
- $A_{LL}$  code still running, to be sent by Tuesday to theorists
- Processing of DSTs of 3<sup>rd</sup> campaign ongoing

Example of  
observable  
plots for  $A_{LL}$



# Jets & HF WG

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Analysis notes status:

**Ecce\_note\_phys\_2021\_01, ECCE jet reconstruction performance**

**Ready**

**Ecce\_note\_phys\_2021\_10, Jets finding using Centauro Algorithm**

**Ready**

**Ecce\_note\_phys\_2021\_08, Jet ReA**

**Ready**

**Ecce\_note\_phys\_2021\_13, two-particle correlations**

**Ready**

**Ecce\_note\_phys\_2021\_04, Open HF ReA**

**Ready**

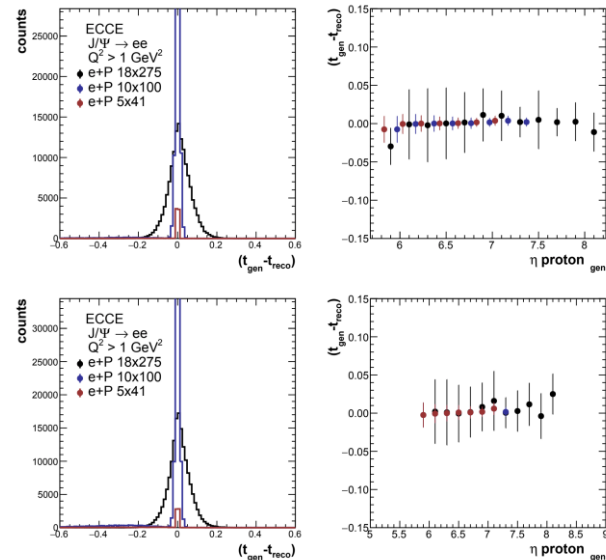
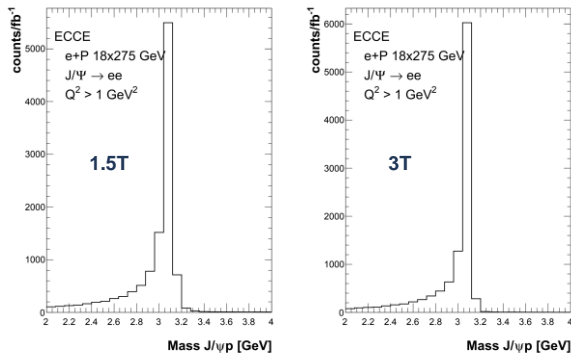
**Ecce\_note\_phys\_2021\_15, J/psi photoproduction**

**Need few more days**



# Exclusive reactions WG

- Starting to look at "to do" items following note completion
- DVCS ep
  - I. Korover started to look at EpIC for generator cross-check and pi0 contamination study, will also check with calorimeter studies
- DVCS eA
  - S. Fucini helping to cross-check x-sec values
- DVMP ep
  - N. Santiesteban ran 3T v 1.5T study (see plots)



Plots: N. Santiesteban (MIT)

- TCS
  - Would like to cross-check x-sec number
- Phi eA
  - Need to run more stats
- NB merging weekly meetings with diffractive time slots due to several clashes caused by semester etc

# Diffraction & Tagging WG

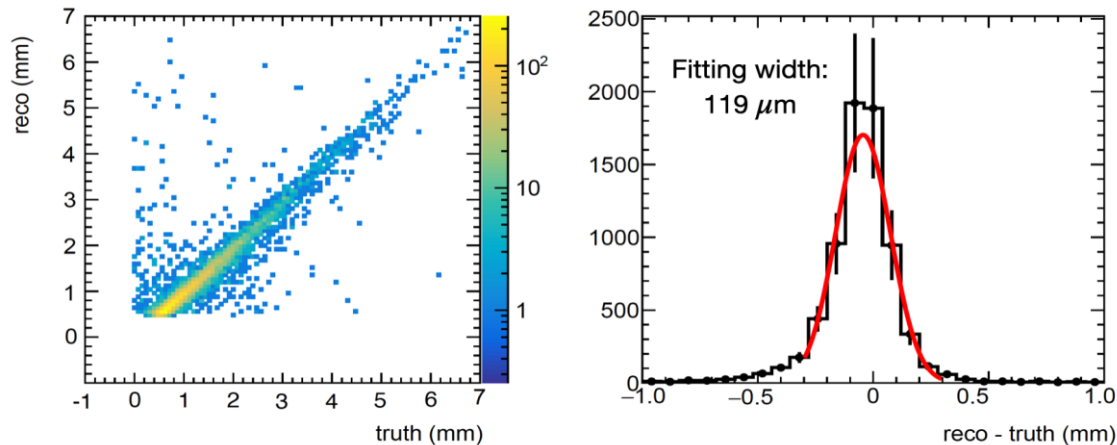
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	Note completed?	Ready for comments?
Pion Form Factor (Hi priority)	Yes	Yes (submitted for review)
pion structure function (Hi priority)	No (new sim., completed in 1 week )	No
Neutron Spin Structure(Hi priority)	Yes	Yes (submitted for review)
eA Diffractive Study(Hi priority)	Yes (IP6 vs IP8, 1.4T vs 3T )	Yes (submitted for review)

- **Next Step:**

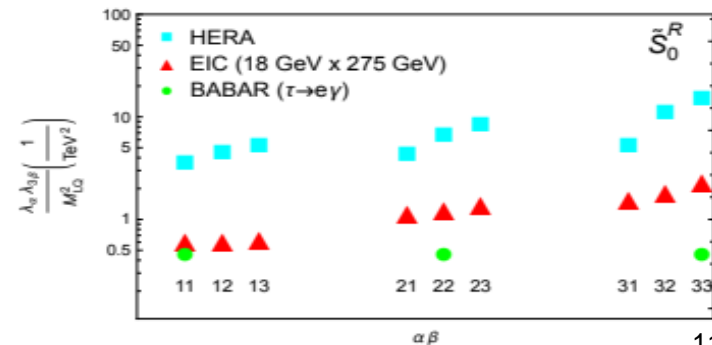
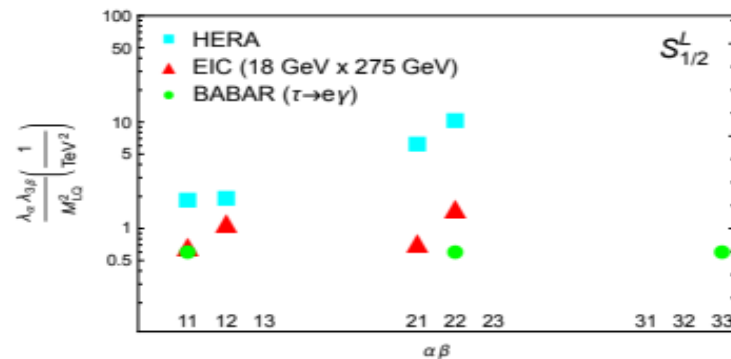
- Document detector assumptions (smearing) used for the FFR simulation
- Document detector layout used in the Fun4all
- Collect and document different beam parameters for different ep and eA studies
- Support and complete the low priority studies (before Dec 1st)
  - u-Channel  $\pi^0$  production
  - $\Upsilon$  production

# Electroweak & BSM WG: Leptoquarks



- > difference between reconstructed and truth 2<sup>nd</sup> vertex  $\sim 119$  microns resolution  $\rightarrow$  sufficient for identifying tau decay

- caveats: DIS NC and photo-production background still being analyzed
- If we ignore DIS NC and photo-production background then can set leptoquark limits (only scalar LQs shown, vector LQs and others are all similar)



# Summary & Outlook

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- All physics WG finalized analyses notes, currently under external review
- Call for volunteers to review analysis notes !  
(Some notes can benefit from several reviewers)
- Work ongoing to add some more studies before the Dec 1<sup>st</sup> deadline if possible  
(eg. different magnetic fields, backgrounds, systematic uncertainties, etc)