Bi-Weekly Meeting

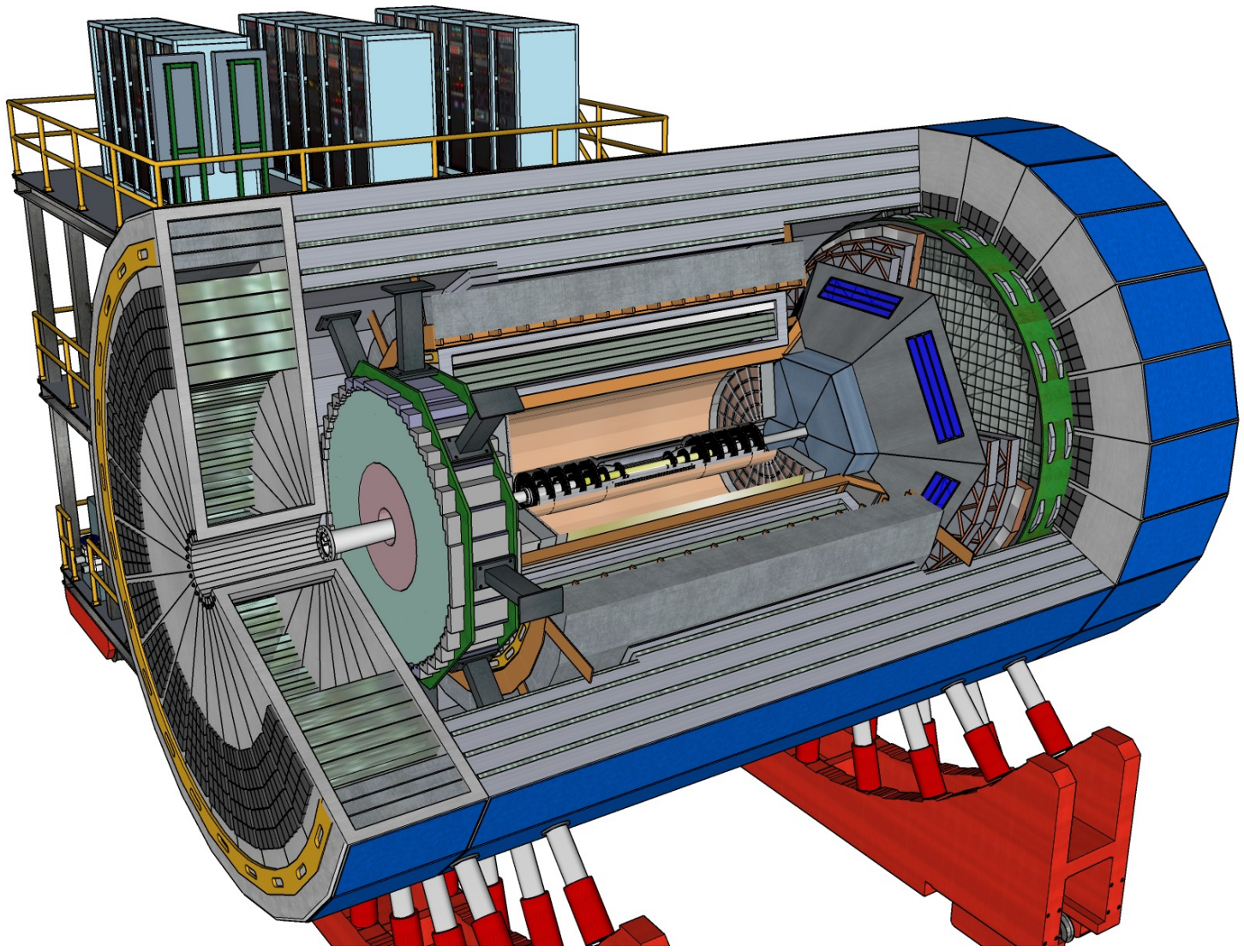
Monday, May 7th 2021

CCCE Consortium: May 7th

1. AANL/Armenia*
2. AUGIE
3. BGU/Israel*
4. BNL
5. Brunel University*
6. Canisius College
7. CCNU/China*
8. Charles U./Prague*
9. CIAE
10. CNU
11. Columbia
12. CUA
13. Czech. Tech. Univ.
14. Duquesne U.
15. Duke
16. FIU
17. Georgia State
18. Glasgow/Scotland*
19. GSI/Germany*
20. GWU
21. Hampton
22. HUJI
23. IJCLab-Orsay/France*
24. IMP/China*
25. Iowa State
26. IPAS/Taiwan*
27. JLab
28. Kyungpook Natl. Univ./Taiwan*
29. LANL
30. LBNL/Berkeley
31. Lehigh University
32. LLNL
33. Morehead State
34. MIT
35. MSU
36. NCKU/Taiwan*
37. NCU/Taiwan*
38. NMSU
39. NRNU MEPhI/Russia*
40. NTHU/Taiwan*
41. NTU/Taiwan*
42. ODU
43. Ohio U
44. ORNL
45. PNNL
46. Pusan Natl. Univ.*
47. Rice
48. RIKEN/Japan*
49. Rutgers
50. Saha / India*
51. SBU
52. SCNU/China*
53. Sejong U.
54. TAU/Israel*
55. Tsinghua U./China*
56. Tsukuba U./Japan*
57. CU Boulder
58. UConn
59. UH
60. UIUC
61. UKY
62. U. Ljubljana/Slovenia*
63. UNH
64. USTC/China*
65. UT Austin
66. UTK
67. UTSM/Chile*
68. UVA
69. Vanderbilt
70. Virginia Tech
71. Virginia Union
72. Wayne State
73. WI/Israel*
74. WM
75. Yonsei Univ.*
76. York/UK*
77. Zagreb U./Croatia*

*Non-US institutions (36%)

ECCE Detector: previous



ECCE ELECTRON ENDCAP STRAWMAN

Tracking: MAPS, Micro Pattern Gaseous Detectors (MPGD)
Electron Detection: PWO&SciGlass
- Inner part: PWO crystals (reuse some)
- Outer part: SciGlass (backup PbGl)

h-PID: mRICH
- From yellow report

HCAL: Steel from magnet or Pb/Sc or Fe/Sc
- Not instrumented and only serve as flux return?
- Instrumented \w reduced thickness (lower energies)

ECCE CENTRAL BARREL STRAWMAN

Tracking: Silicon barrel tracker (optional Si/GEM hybrid)
Electron PID: SciGlass (backup: W/Sc (Pb/Sc) shashlik)
- SciGlass remains to be demonstrated
- Several backup options – lower resolution though

h-PID: hpDIRC & AC-LGAD
- Compact
- AC-LGAD never been shown for barrel configuration
- AC-LGAD backup: dE/dx (needs more space)

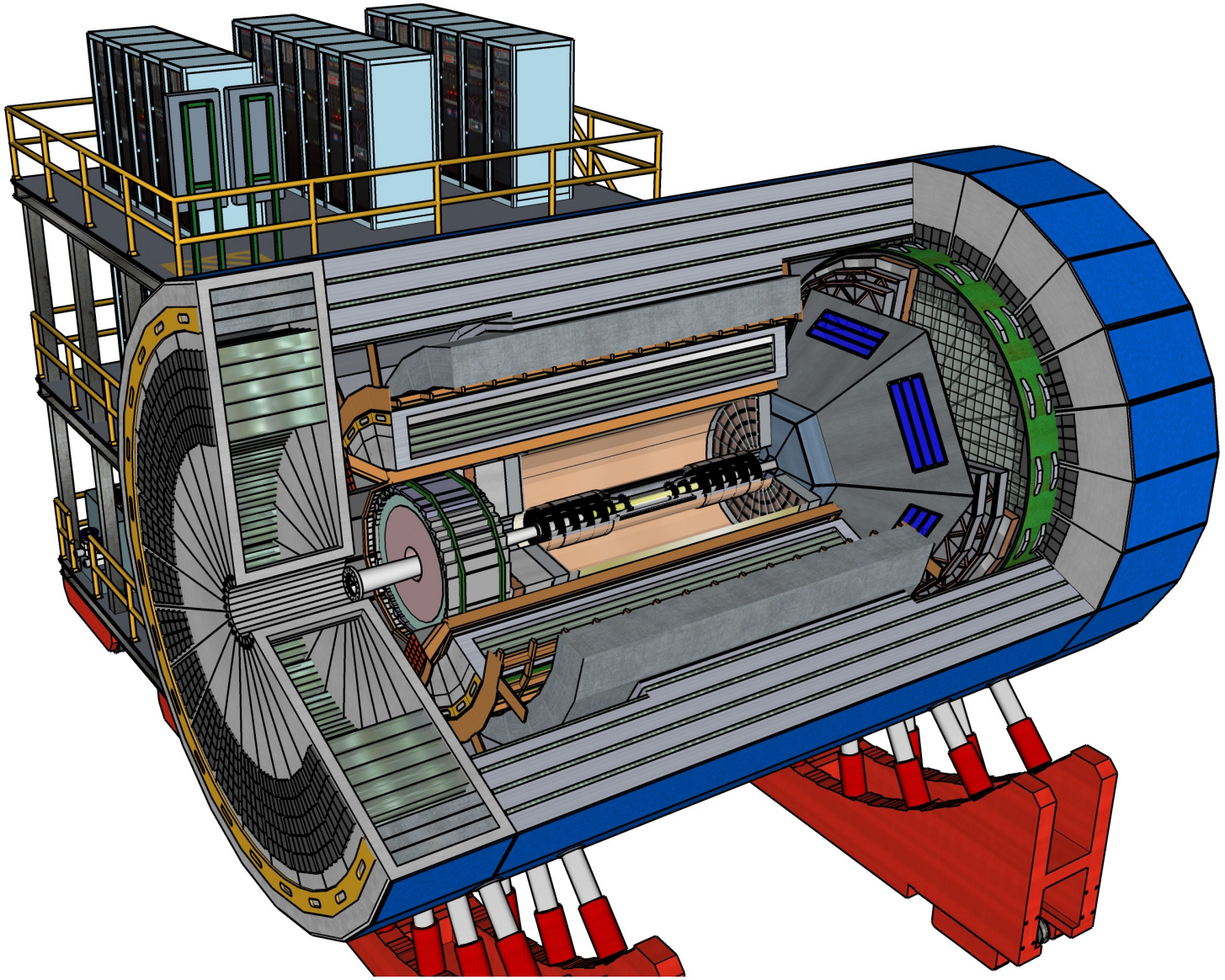
HCAL: magnet steel (**reuse**) - **Fe/Sc**

ECCE HADRON ENDCAP STRAWMAN

Tracking: MAPS, Micro Pattern Gaseous Detectors (MPGD)
h-PID: dRICH&TOF
e/h separation: TOF & aerogel
- TRD to separate electrons from high momentum hadrons?

Electron PID: W/ScFi, Pb/Sc or W/Sc shashlik
HCAL: Pb/Sc or Fe/Sc
- Alternative for improved resolution: dual readout, high-granularity

ECCE Detector: now



Red = preferred technology
Blue = preferred technology
\w some open questions
Black = still being discussed

ELECTRON ENDCAP

Tracking: GEM / MPGD
Electron Detection:
- Inner part: PWO crystals (reuse some)
- Outer part: SciGlass (backup PbGl)

h-PID: mRICH
HCAL: Steel from magnet or Fe/Sc
- Not instrumented and only serve as flux return?
- Instrumented \w reduced thickness (lower energies)

CENTRAL BARREL

Tracking: Silicon barrel + forward tracker (optional Si/GEM hybrid)
Electron PID: SciGlass (backup: PbGl or W(Pb)/Sc shashlik)
h-PID: hpDIRC & AC-LGAD [progress: DIRC orientation ☺]
HCAL: magnet steel (**reuse**) - Fe/Sc

HADRON ENDCAP

Tracking: GEM / MPGD
PID: dual-RICH & AC-LGAD
Calorimetry: standard W/ScFi + Fe/Sc
Upgrade: Dual Readout EM+Had Cal?

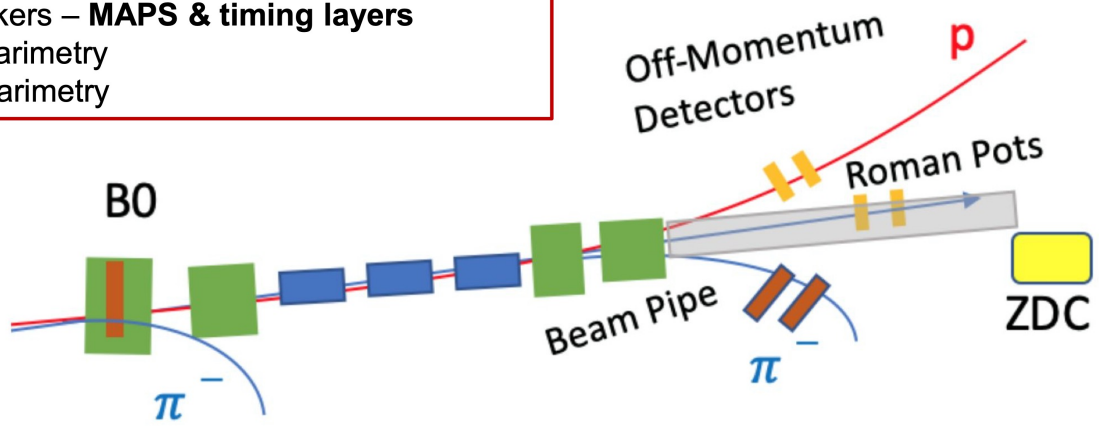
Example discussions:
- Backup for AC-LGAD in barrel
- SciGlass ongoing R&D timeline
- Hadron Endcap calorimetry

Far Forward / Back

FAR FORWARD DETECTORS

- ZDC – **Si/W & PWO (SciGlass)**
- Roman Pots – **Silicon sensors, AC-LGADs**
- Off-momentum det. – **Silicon sensors**
- B0-trackers – **MAPS & timing layers**

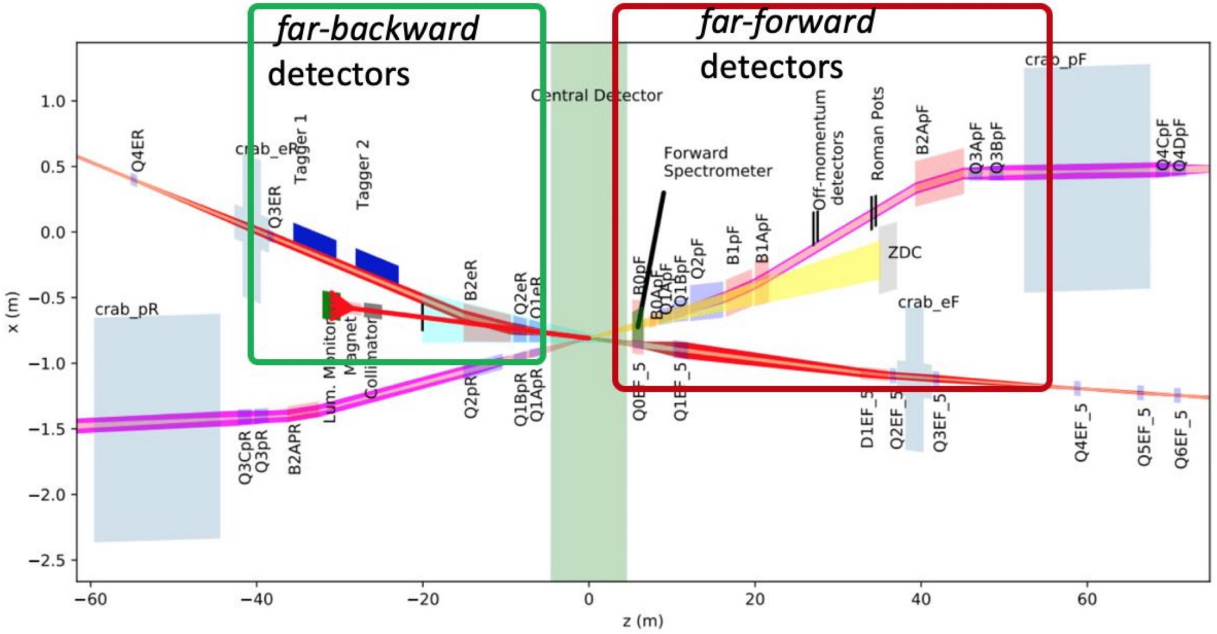
Lepton polarimetry
hadron polarimetry



FAR BACKWARD DETECTORS

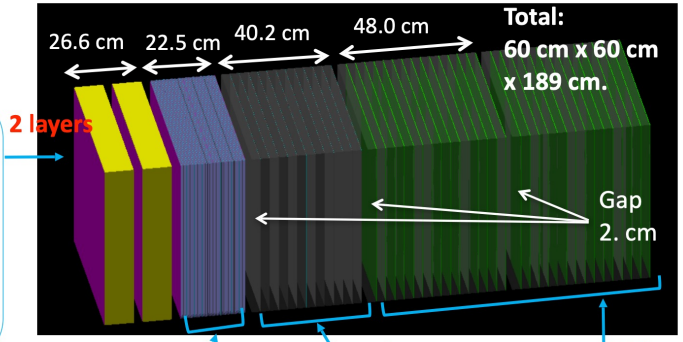
- low-Q2 tagger
- Lumi-detector

Lepton polarimetry
hadron polarimetry



What I put in Fun4All
-- ongoing

Shima Shimizu



Silicon
3 mm x 3mm x 300 µm
PET (Glue) 0.11 mm
PET (FPC) 0.28 mm
Gap 1.2mm
Crystal (PbWO4)
3cm x 3cm x 10 cm
Gap 3 cm

2 layers

Si +

Tungsten 3.5 mm Thickness
PET (Glue) 0.11 mm
Silicon 1 cm x 1 cm x 320 µm
PET (Glue) 0.13 mm
PET (FPC) 0.28 mm
Gap 1. mm
5.34 mm

Tungsten 3.5 mm Thickness
PET (Glue) 0.11 mm
Silicon 3 mm x 3mm x 300 µm
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Gap 1.2mm
5.5 mm

x 2
20 layers
+
1 layer

Total:
W: 42 layers,
Si: 3 layers,
Si: 40 layers

12 layers

Pb 3cm Thickness
PET (Glue) 0.11 mm
Silicon 1 cm x 1 cm x 320 µm
PET (Glue) 0.13 mm
PET(FPC) 0.28 mm
Gap 1. mm

30 layers
(15 layers x 2)

Pb 3cm Thickness
Scintilator 10 cm x 10 cm x 2 mm
Gap 0.0013 mm

Far Forward / Back

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- Off-momentum det. – **Silicon sensors**
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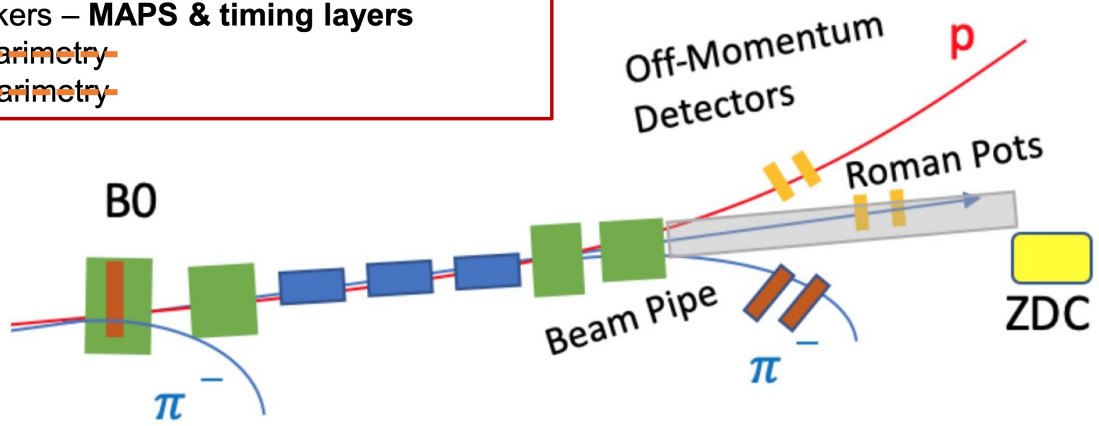
~~hadron polarimetry~~



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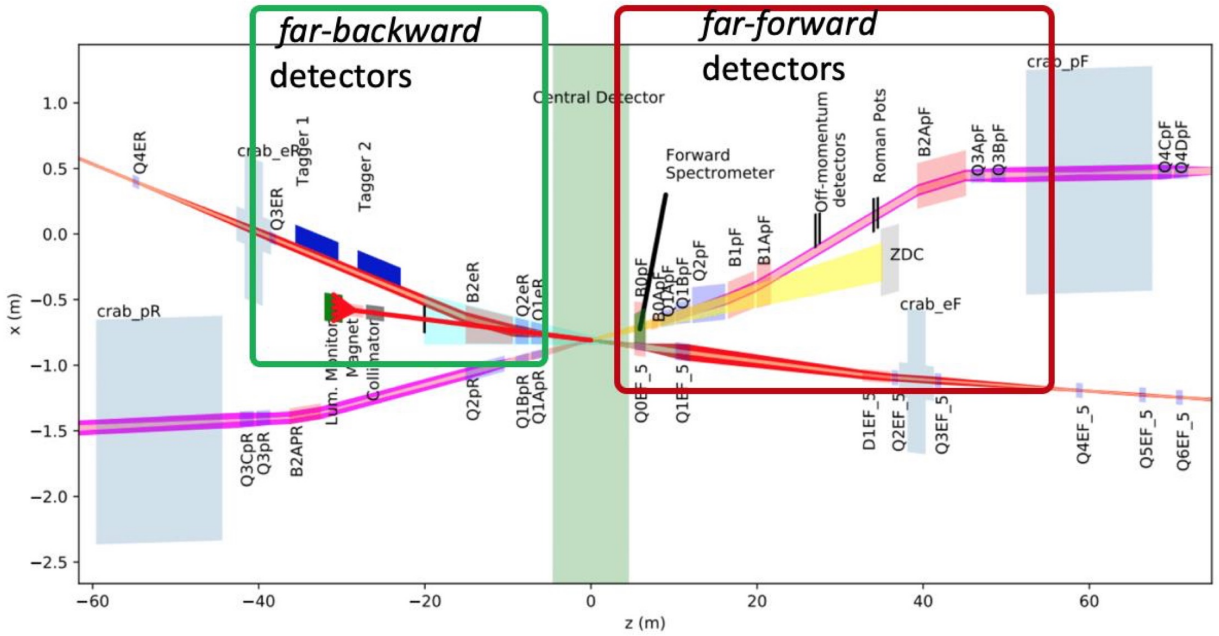
- ~~Lumi detector~~

~~Lepton polarimetry~~
~~hadron polarimetry~~



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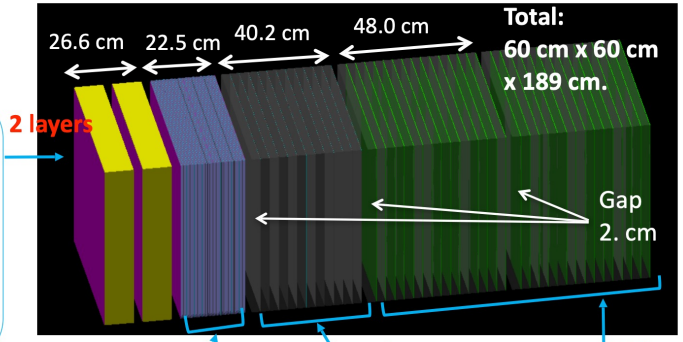

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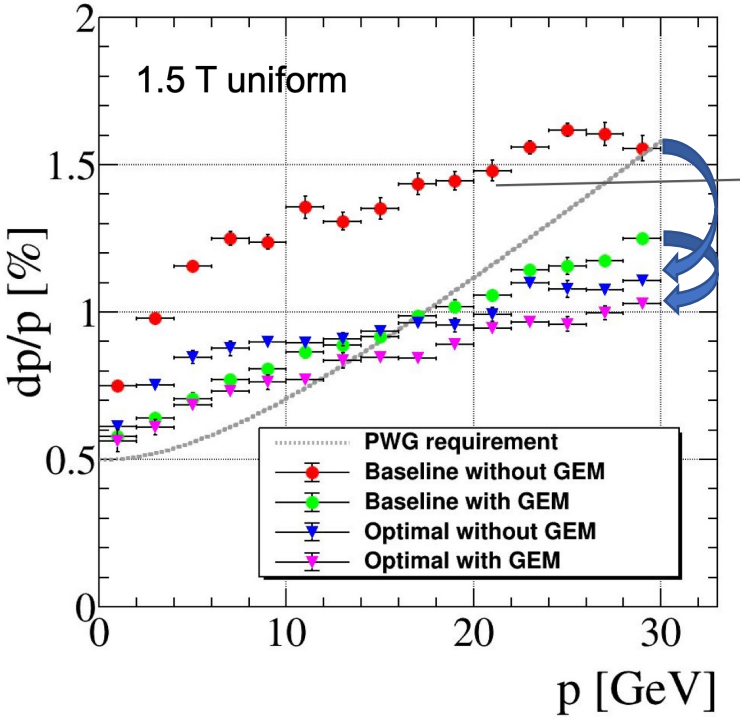
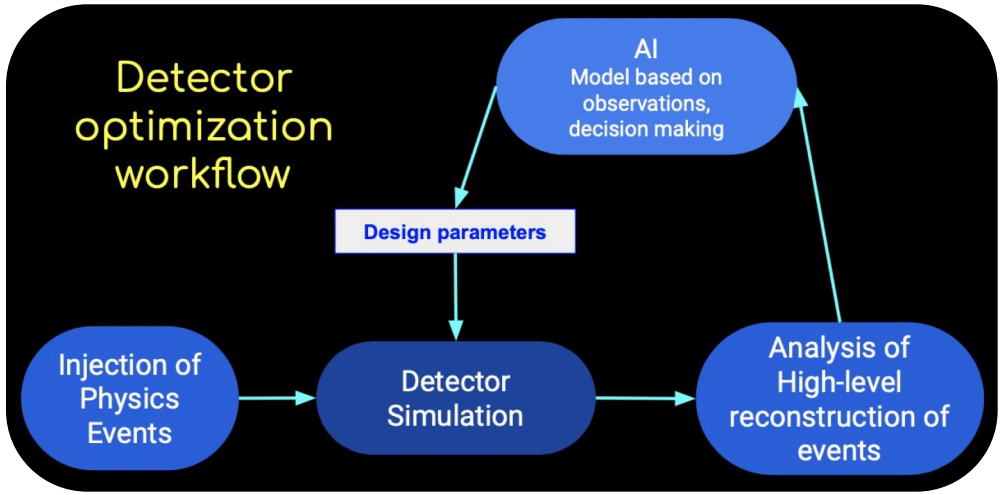
ECCE Detector

- DWGs proceeding with evaluation of leading technology alternatives.
- **Converging on initial setup for first IP6 simulations champaign starting next week!**
- Detector Team Group Meeting June 10th 11am to 2pm:
  - co-conveners will present latest evaluated technology options,
  - Focus on detectors choices to move forward with DAQ and determining optimal re-use,
  - https://indico.bnl.gov/event/12079/
- Still need to optimize performance / cost / risk with inputs from simulations.
- See DWG talk for details.

AI Optimization

- AI WG is starting to optimize ECCE
- Building on existing experience (e.g. Dual RICH)
- Working from the inside out
- First ECCE-specific example: Tracker layer radii
- Pushing to optimize for PHYSICS as oppose of single detector element performance
- See AI talk in this meeting





https://indico.bnl.gov/event/12052/

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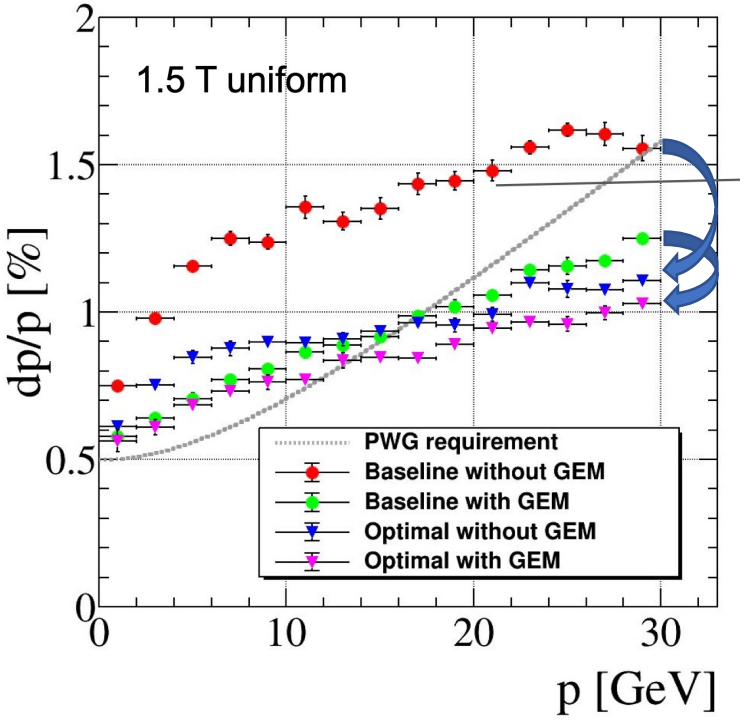
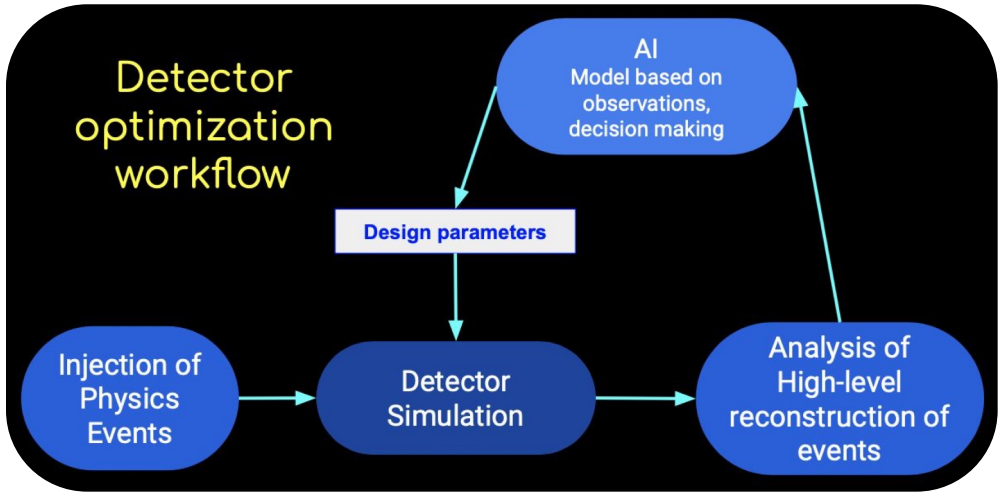




https://indico.bnl.gov/event/12052/

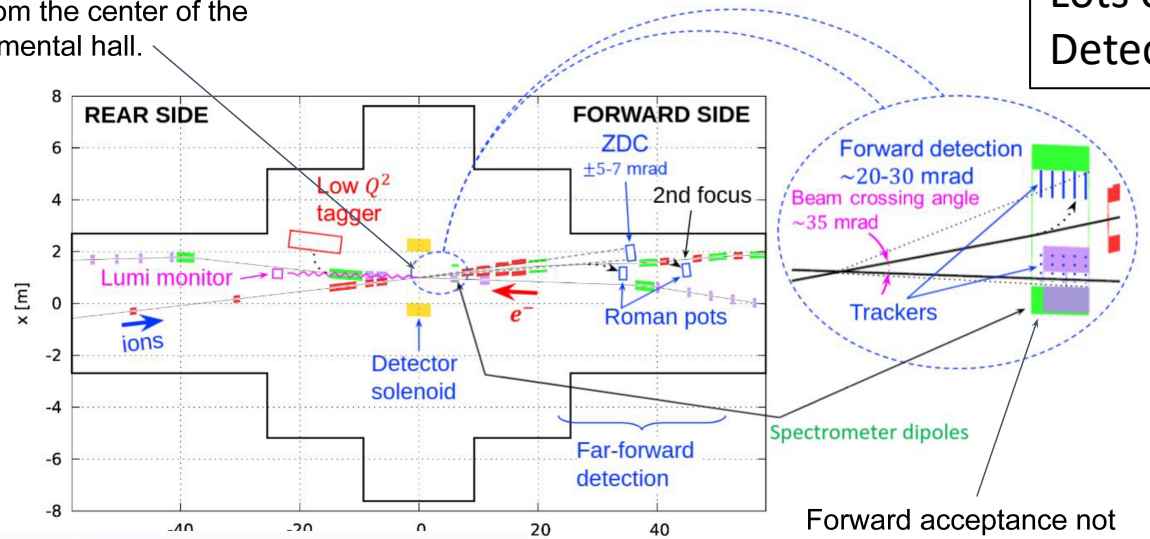
EXCELLENT Opportunities:

A. For collaborators to contribute and gain experience,
B. For ECCE to showcase its novelty by integrating AI starting from its early design stage

IP8 Layout: Hot off the presses!

Meeting w/PM and proto-collaborations today: https://indico.bnl.gov/event/12068/

IP is 1m towards the center of the ring from the center of the experimental hall.

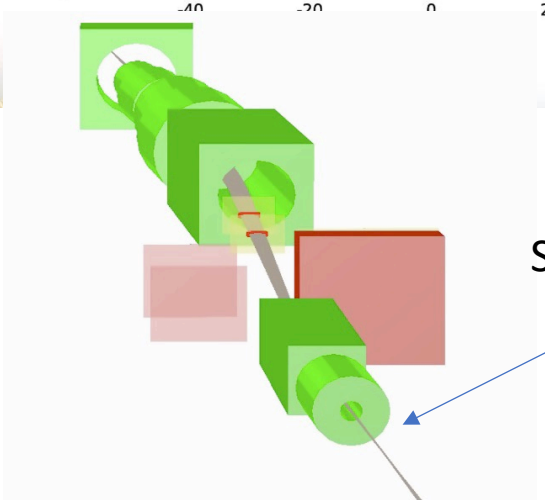


Forward acceptance not azimuthally symmetric because of electron dipole

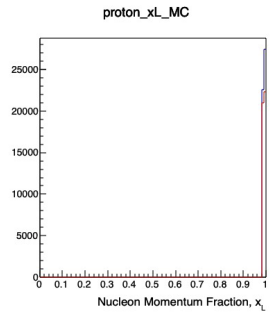
Lots of new information – need some time to absorb.
Detector location optimization/technologies choice for ECCE.

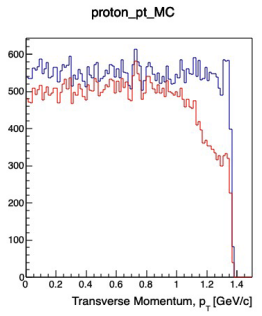
- Hadron beamline
  - Further optimization is needed for a proper match into ARCs in terms of geometry and optics.
  - Increasing the magnet lengths in the forward side FFQ to improve acceptance may be an option.
  - B0 dipole field and aperture needs further study.
- Electron beamline
  - Not yet matched in to ARCs
  - spin rotators angle relative to the IP is the same as IR6

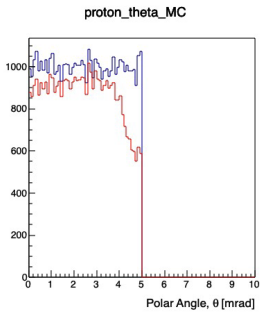
From Alex Jentsch – improvements from secondary focus seen in GEANT, “remarkable”

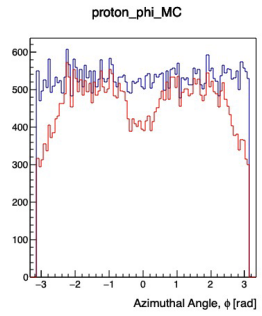


Secondary focus









Physics Simulations

- PWG have well defined analysis priorities and most relevant generators are ready,
- Groups learning to analyze Fun4All output,
- Identifying components where analysis algorithms still not implemented.
- Working with simulation experts to implement missing detector components.

ECCE Proposal Update: ECCE Godparents

Background:

- ECCE physics studies carried out in working reaction-focused groups (inclusive, semi-inclusive, exclusive etc.).
- ECCE proposal will present studies based on physics topics (mass, spin & flavor, emergent properties etc.).
- Each process-focused working group studies several physics topics (e.g. inclusive studies spin, emergent properties etc.)
- Don't have experts dedicated to looking at how well we cover each physics topic.
- Proposal will also be complemented by supplementary documents that will each cover an individual physics topic.

Proposal: appoint a 'godparent' (or two) for each physics topic.

Godparent responsibilities:

- Work with the process-focused working group to define priorities for studies based on three categories:
  - Studies most important to showcase our ability to deliver on EIC science as defined in the EIC white paper and NAS study report.
  - Most significant early results that can be obtained from 5 fp-1 of e-p @ 250x10 / e-A @ 110 x10.
- Draft the outline and text for the proposal section discussing the physics topic (in collaboration with the steering committee and proposal editorial and physics teams).

Communication \w Project

In one word: Excellent.

- Communication lines open via contact person (Rolf Ent) & direct discussions with relevant individuals.
- Standing ‘update’ meetings with project, EICUG, CORE and ATHENA.
- Example outcome:
  - Initial discussion on review process,
  - Costing and risk assessment guidance,
  - Equipment reuse guidance,
  - Today’s IP8 design rollout,
  - …
- All are invited to participate in cross-collaboration working groups on luminosity, calorimetry, etc.
- Joint far-forward meeting with the IP6 focus.

ECCE Code of Conduct (CoC)

- Draft CoC produced by DEI committee and is under discussion.
- Guiding principle:

  Individuals on ECCE should conduct themselves

  in a way that allows others to do their work

- Discussing mechanisms to handle violations and/or complaints.
- Will continue working on DIE @ ECCE-collaboration which will help integrate DIE into our bylaws and culture as we will transition to a full collaboration in ~mid ‘22.

Excellent Progress Towards Making ECCE the Project Detector!

ECCE is a low-risk, Inexpensive, flexible and optimized EIC detector!

- **Low risk** due to re-use of existing magnet and various detectors.
- **Inexpensive** due to magnet and detector reuse (we hope)
- **Flexible and optimized** by studying both IRs
- **Most realistic detector to be ready by CD4a.**