14th Bi-Weekly Meeting

Or Hen, Tanja Horn, John Lajoie

September 27th, 2021.

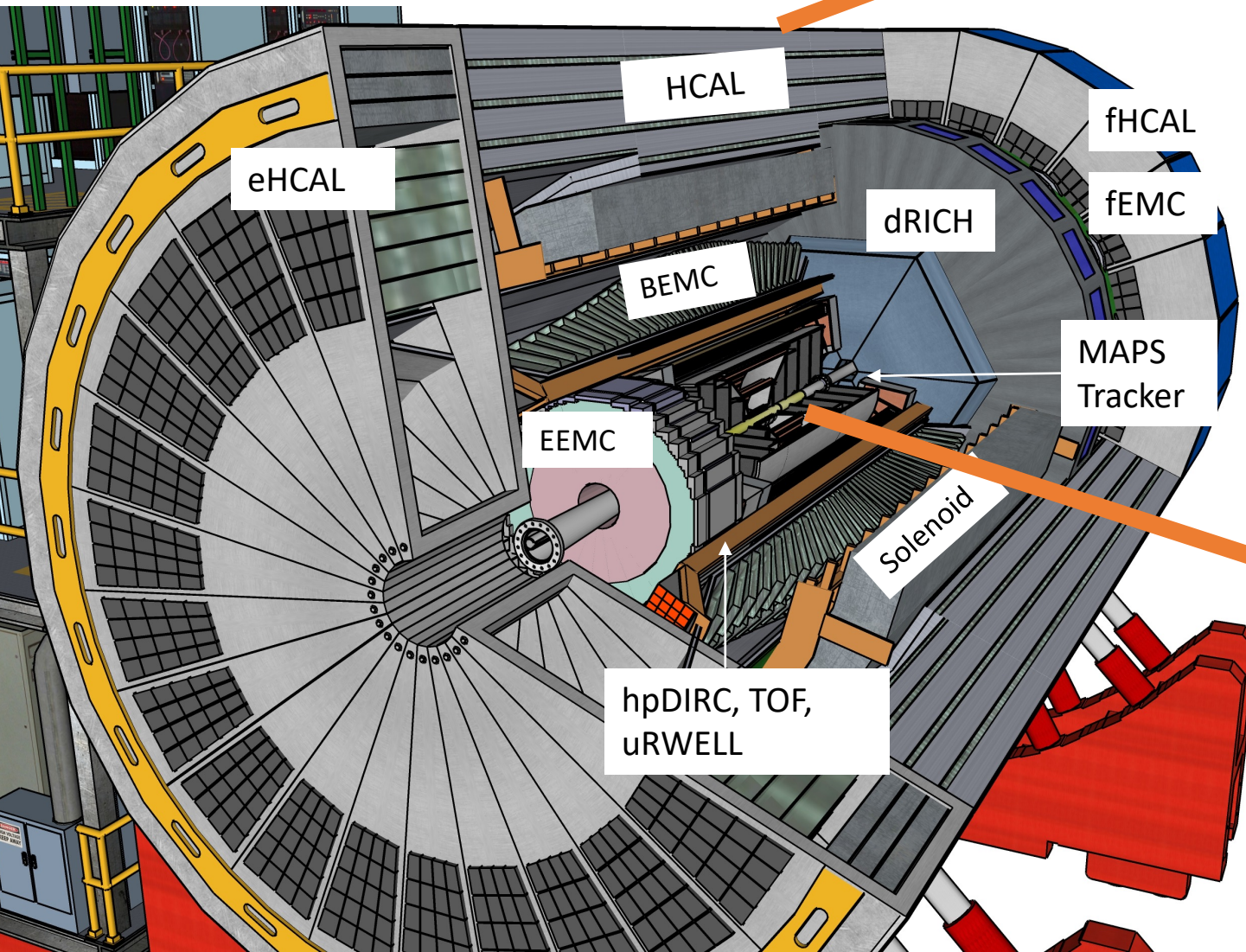
Outline

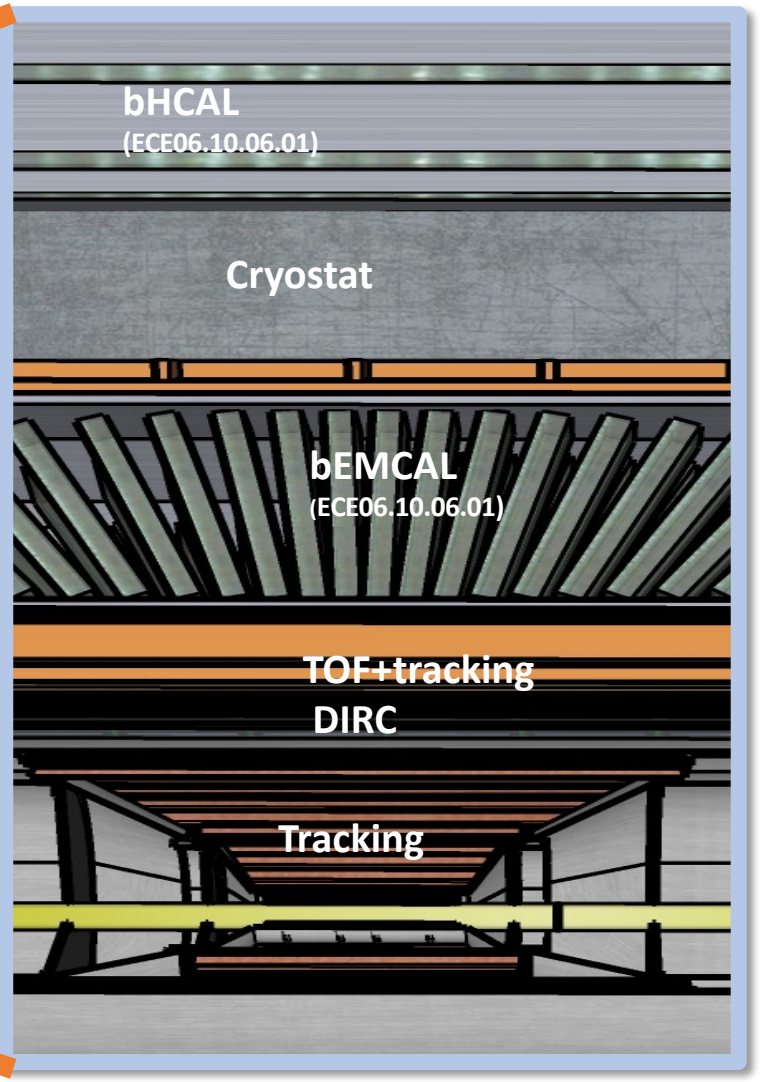
- Detector & simulations
- Proposal
  - Physics Godparents
  - Cost & Risk
  - Collaboration formation
- Path forward

Outline

- **Detector & simulations**
- Proposal
  - Physics Godparents
  - Cost & Risk
  - Collaboration formation
- Path forward

ECCE Detector Status





Last open items

Finalizing TOF system (30 – 50ps)

- Barrel:

  AC-LGADs too expensive.

  LYSO (CMS solution) work. ~x3 less expensive than AC-LGADs, but not cheap

  mRPC most attractive solution. Mechanics (space) being worked out.
- e-endcap:

  mRPC most attractive solution. Good resolution needed for t_0.
- h-endcap

  For ‘pure’ PID requirements mRPC / scintillators are enough.

  AC-LGAD motivated by Jets physics where combined excellent position and time resolution can help with particle flow.

Last open items

Finalizing TOF system (30 – 50ps)

- Barrel:

  AC-LGADs too expensive.

  LYSO (CMS solution) work. ~x3 less expensive than AC-LGADs, but not cheap

  mRPC [illegible] worked out.

ORNL organizing 2 day TOF 'mini-summit' in mid October (week after DNP) to finalize this.

Remote participation will be accommodated.

- e-endcap:

  mRPC most attractive solution. Good resolution needed for t_0.

- h-endcap

  For 'pure' PID requirements mRPC / scintillators are enough.

  AC-LGAD motivated by Jets physics where combined excellent position and time resolution can help with particle flow.

Previously, on ECCE:

Second Simulation Campaign

- Has started!
  - https://lists.bnl.gov/pipermail/ecce-eic-public-l/2021-September/000220.html
- Currently running single-particle checks and debugging
- Anticipate full production to start in ~ 1 week

- ECCE 4th Simulation Workshop:
  - https://indico.bnl.gov/event/13060/
  - Will concentrate on details of making use of second campaign output

Previously, on ECCE:

Second Simulation Campaign

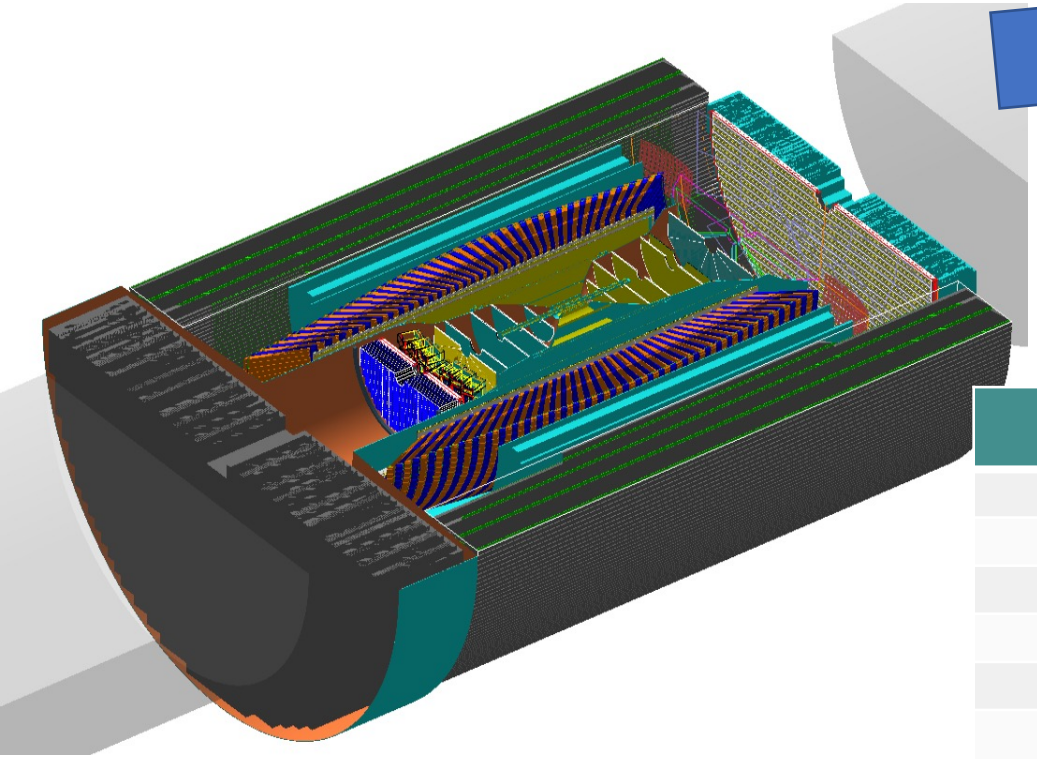
- Has started!
  - https://eic.github.io/tutorial-simulation-campaign/September/000220.html
- Currently running single-particle checks and debugging
- Anticipate full production to start in ~ 1 week
- ECCE 4th Simulation Workshop:
  - https://indico.bnl.gov/event/13060/
  - Will concentrate on details of making use of second campaign output

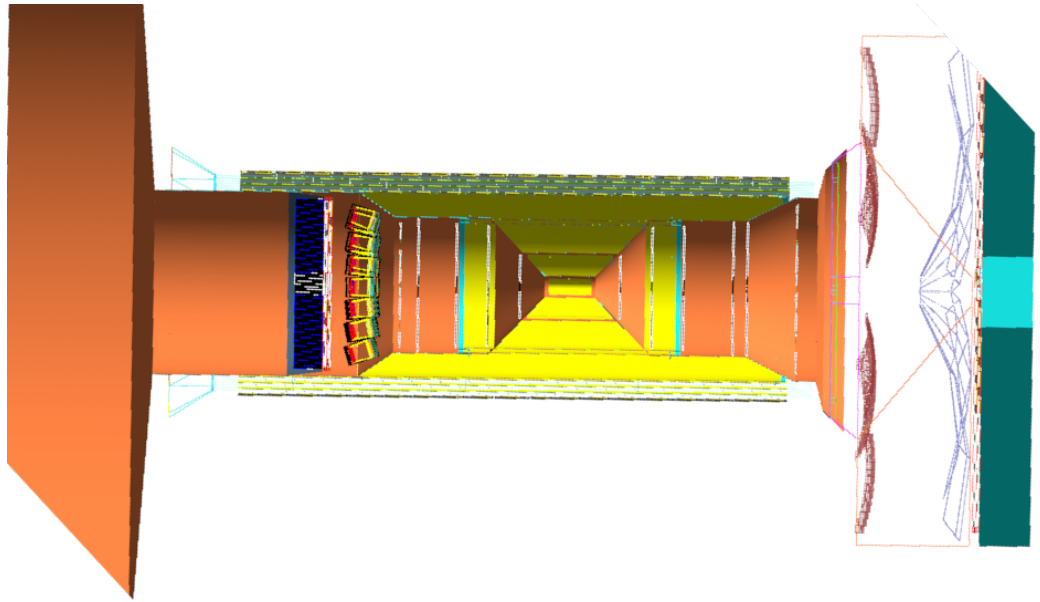
Got delayed by technical issues in the implementation of the latest detectors & support structures.

Took some time to solve but seem to be running well now!

ECCE Simulations: 2nd campaign running!

July concept includes a detailed model of supports & services materials!



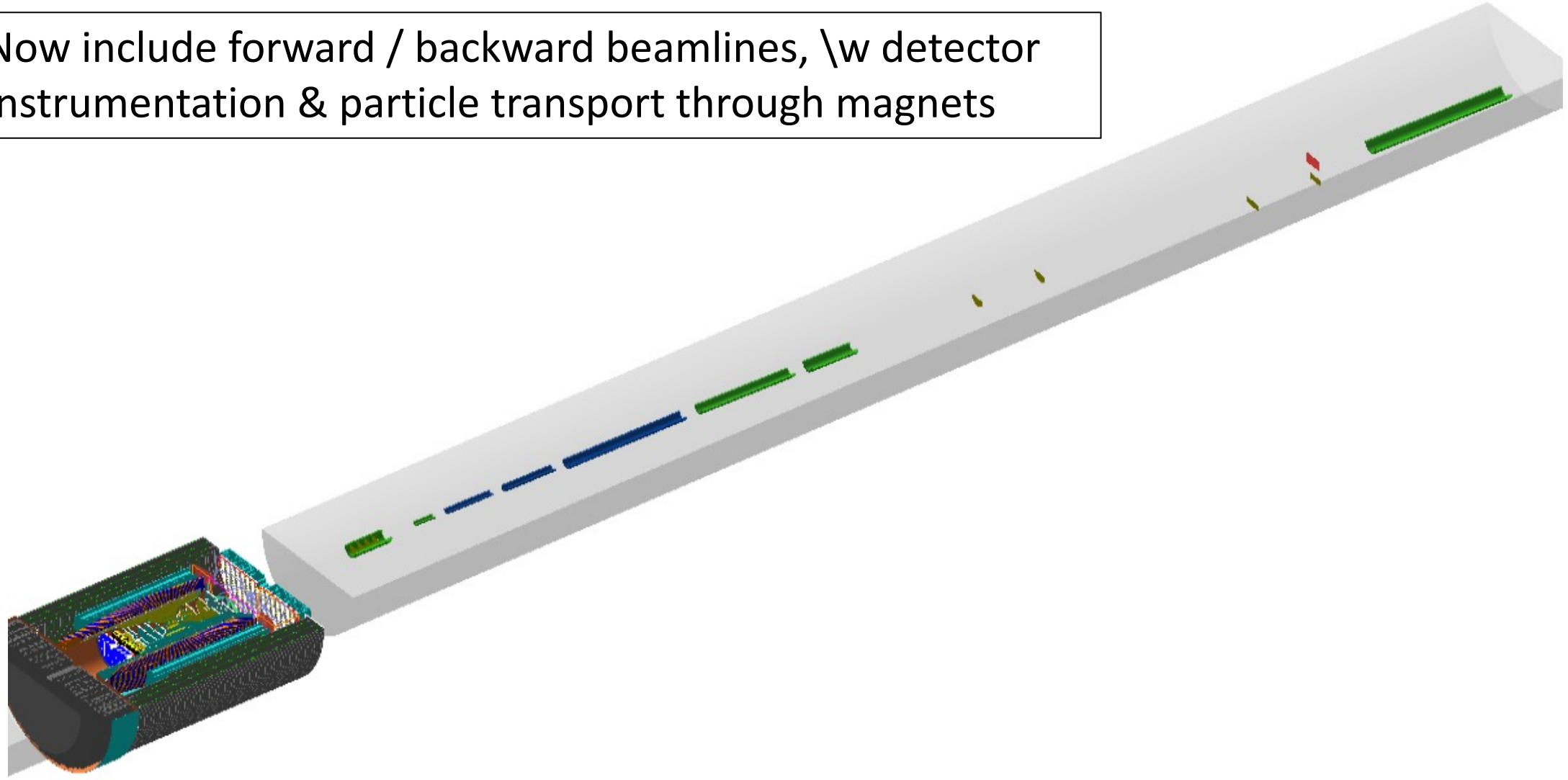


ECCE Supports Materials Listing

Name	z1	z2	r1	r2	Cu X_0	Al X_0	H_2O X_0	Plastic X_0	Carbon X_0	Fe X_0
ETrackingCylinderService_1	-400	-310	270	N/A	9	0	0.42	0.32	0.333	0
ETrackingConeService_1	-310	-295	270	65	9	0	0.42	0.32	0.333	0
ETrackingCylinderService_2	-295	-200	65	N/A	17	0	0.56	0.64	0.333	0
ETrackingCylinderService_3	-200	-150	65	N/A	15	0	0.56	0.56	0.333	0
ETrackingConeService_2	-150	-125	65	48	13	0	0.56	0.48	0.333	0
ETrackingCylinderService_4	-125	-107.1	48	N/A	11	0	0.56	0.40	0.333	0
ETrackingCylinderService_5	-107.1	-80	48	N/A	9	0	0.42	0.32	0.333	0
ETrackingCylinderService_6	-80	-57	48	N/A	7.5	0	0.28	0.24	0.333	0
...	...	...	...	...	...	...	...	...	...	...

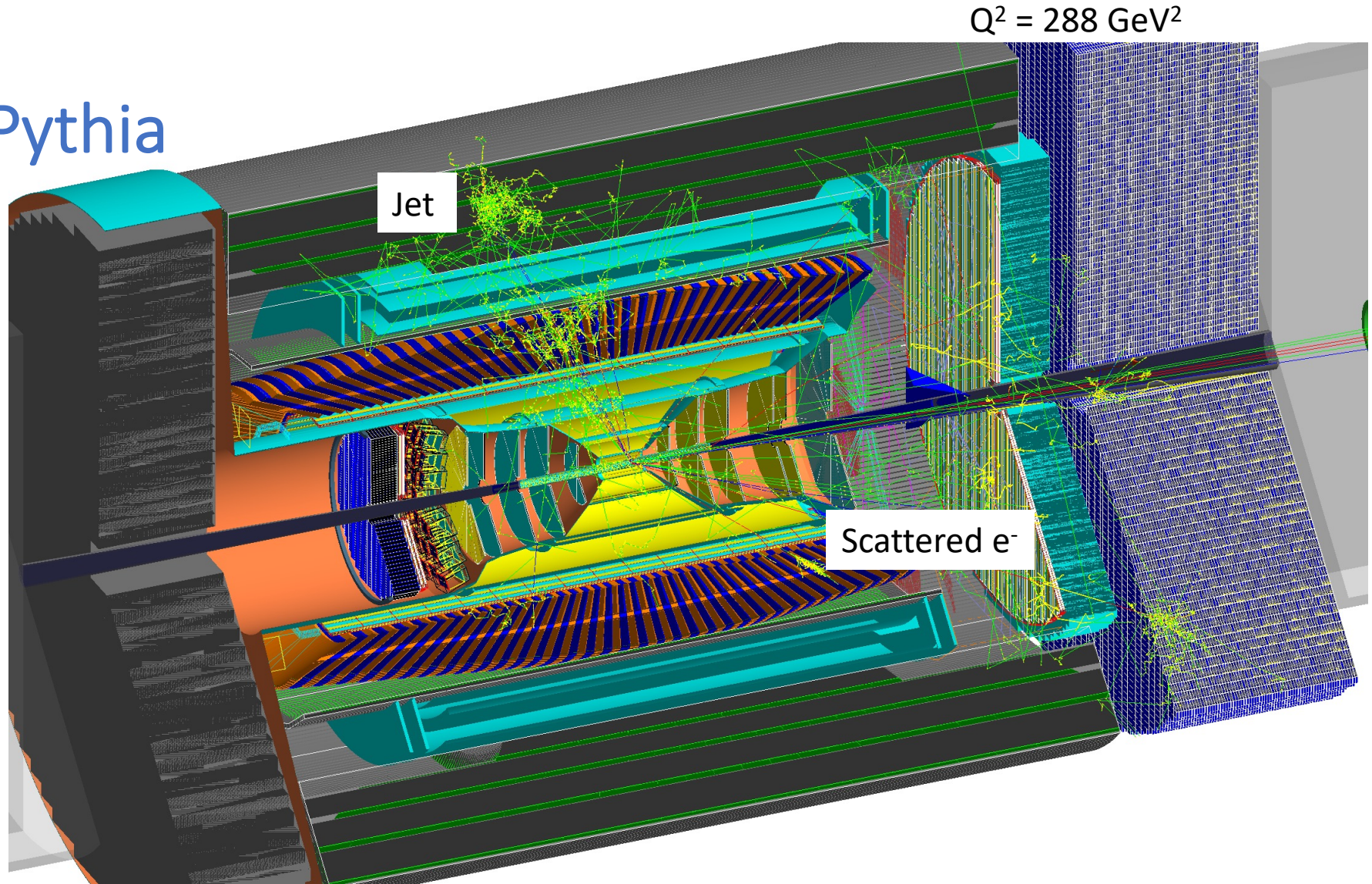
ECCE Simulations: 2nd campaign running!

Now include forward / backward beamlines, \w detector instrumentation & particle transport through magnets

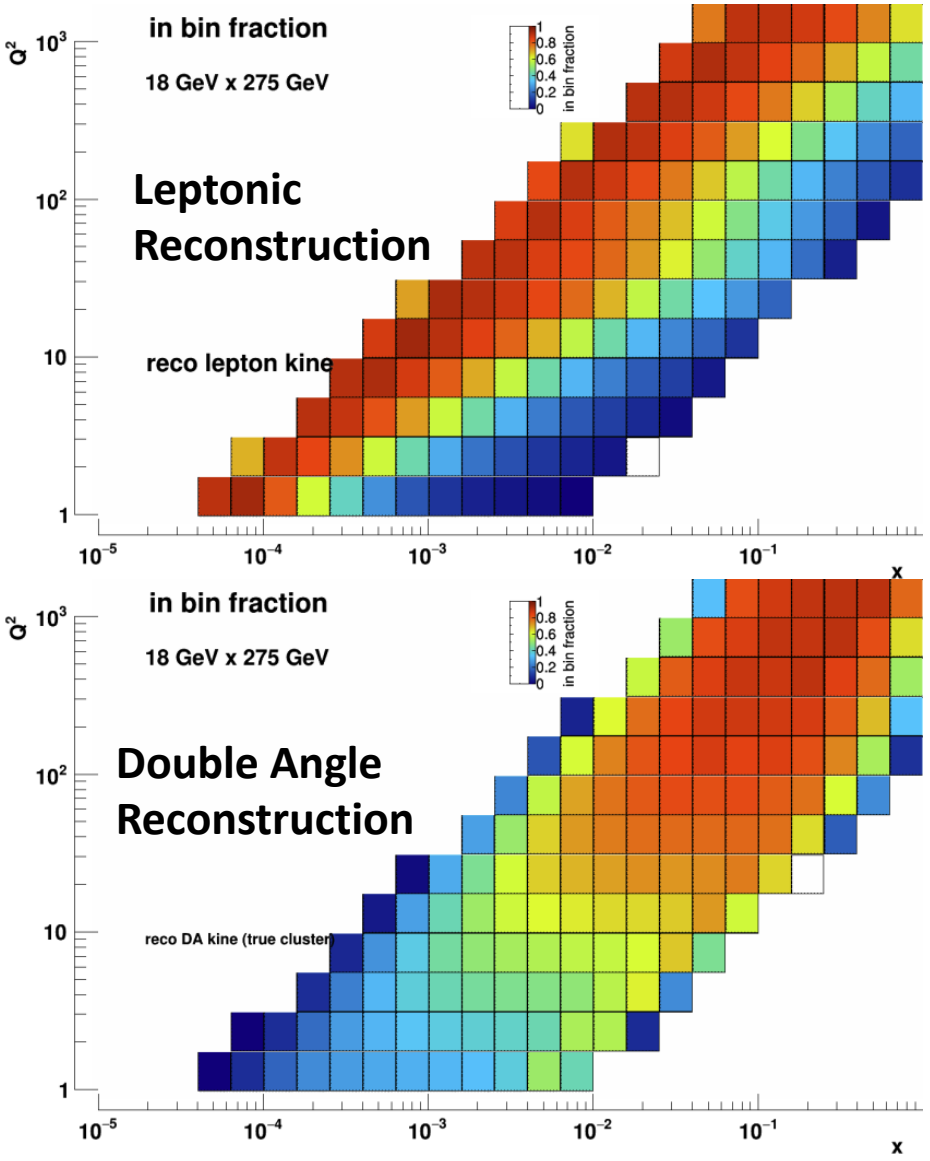


ECCE Simulations: 2nd campaign running!

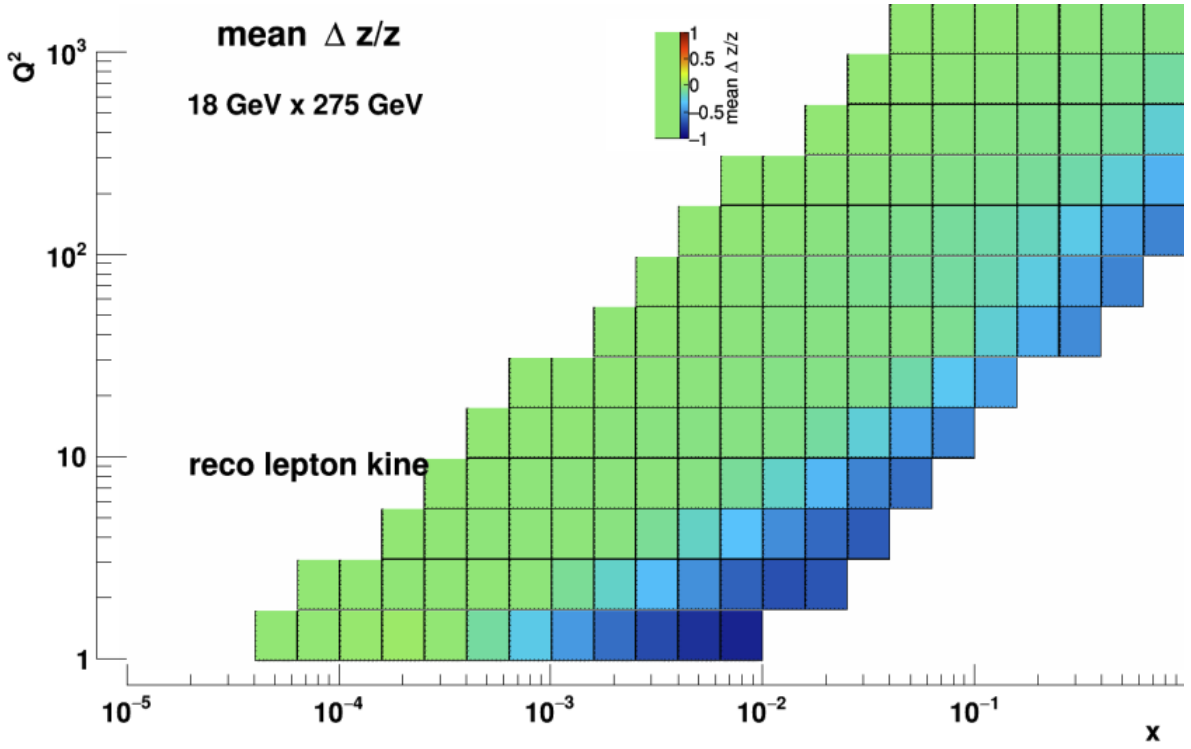
Example Pythia DIS Event



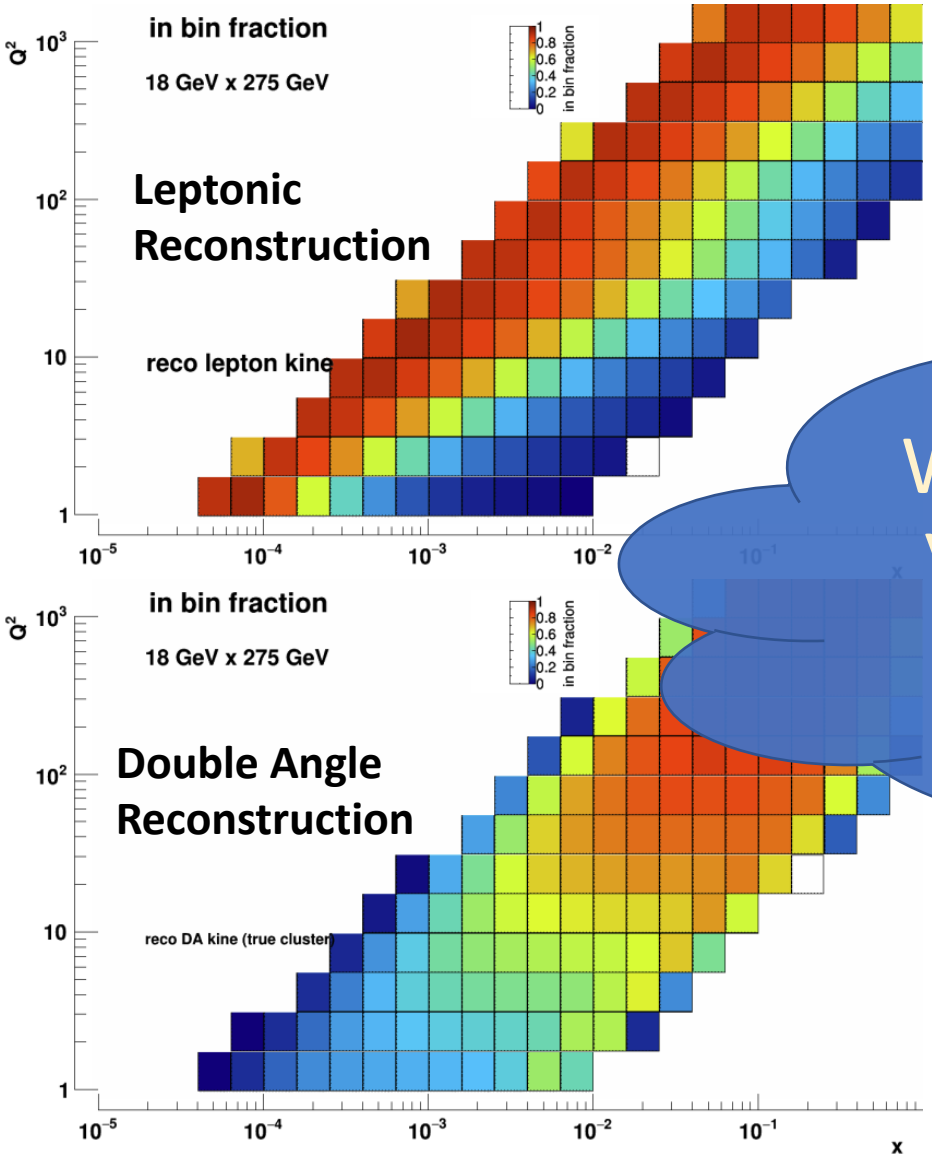
Good DIS Kinematic Reconstruction



Good reconstruction of DIS kinematics and recoil hadron for SIDIS.

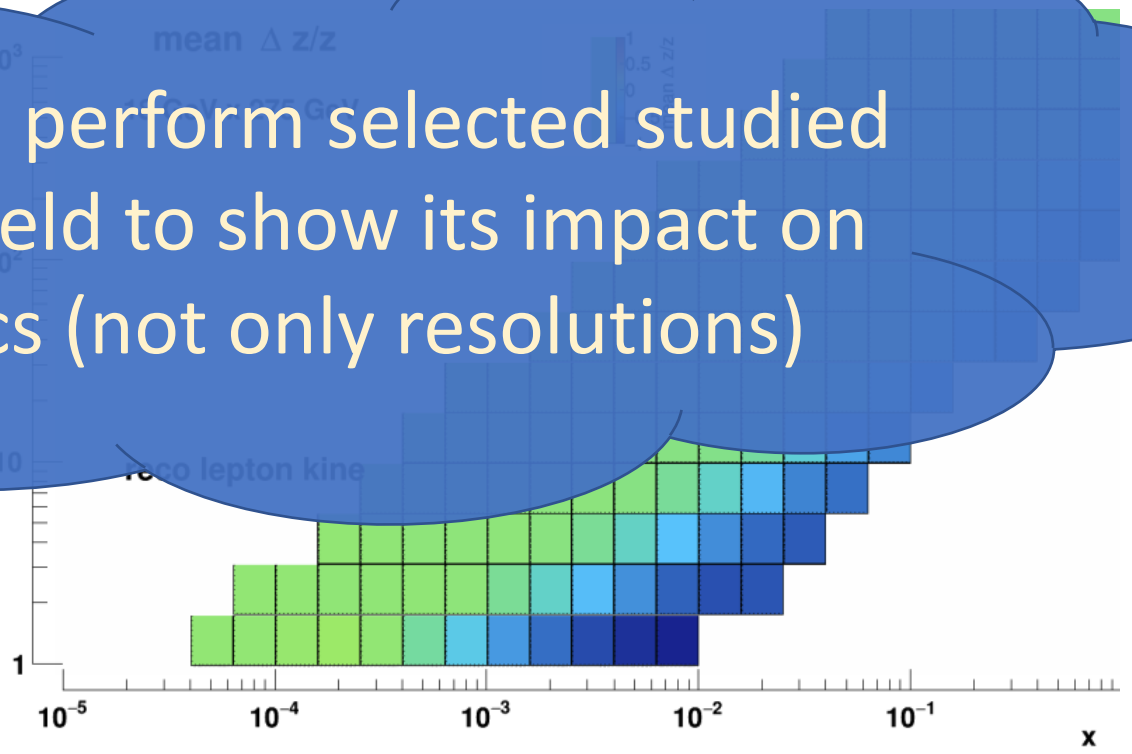


Good DIS Kinematic Reconstruction



Good reconstruction of DIS kinematics and recoil hadron for SIDIS.

Will also perform selected studied \w 3T field to show its impact on physics (not only resolutions)



Outline

- Detector & simulations
- **Proposal**
  - **Physics Godparents**
  - Cost & Risk
  - Collaboration formation
- Path forward

ECCE Proposal: Physics Godparents


Mass


Spin


Gluons


Tomography


EW&BSM


EW&BSM

Successful kickoff meeting

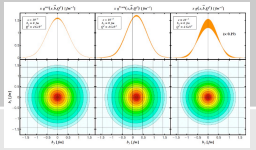
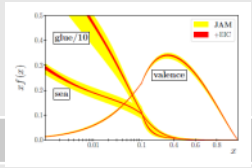
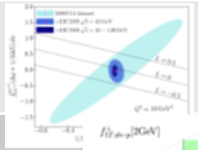
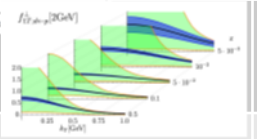
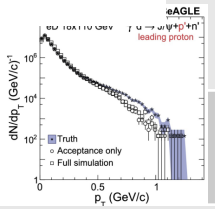
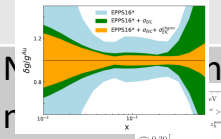
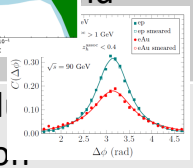
- Discussion of godparents role
- Initial physics discussion \w emphasis on studies we might be missing

Input in the coming week: expected plots to go into proposal and main points that go with them.

Physics Drivers and EIC Science

Working with PWG convenors: need a detailed list and description of physics performance plots to be produced.

Evolve how the NAS report topics are addressed by ECCE in conjunction with the godparents.

NAS Report Topics	NAS Report Sub-topis	ECCE Measurements	Yellow Report enhancement
Origin of Mass	Tomographic Imaging Quarks and Gluons		
	Heavy-quarkonia exclusive production at threshold (check NAS report)		π/K structure 
	(mention) 3D Imaging in Momentum Space		
Origin of Spin	Gluon spin and orbital motion		
	Transverse motion in polarized nucleons		
Dense Systems of Gluons	Propagation of energetic quarks through matter		D/D* reconstruction and heavy-flavor in jets. 
	Properties of Nuclei in QCD	 	Light-i
	Diffraction	Dense gl saturatio..	

"Experiments must address the EIC White Paper and NAS Report science case"

Physics Drivers and EIC Science

NAS topics:	
1) Tomographic Imaging of Quarks and Gluons	MASS
2) Heavy-quarkonia exclusive production at threshold	MASS
3) 3D imaging in Momentum Space	MASS
4) Gluon spin and orbital motion	SPIN
5) Transverse motion in polarized nucleons	SPIN
6) Propagation of energetic quarks through matter	DENSE GLUONS
7) Properties of Nuclei in QCD	DENSE GLUONS
8) Diffraction	DENSE GLUONS

Plot	NAS topic	Additional NAS topic	Person in charge	WG
Dihadron azimuthal angle correlation: delta phi distribution	1		Nathan Grau	Jets & HF
DVCS (ep) cross section vs t, Q2 and xB	1		Igor	Exclusive
DVCS (He4) cross section vs t, Q2 and xB	1	7	Gary	Exclusive
Exclusive J/Psi cross section vs t, Q2 and xB	1	4	Nathaly, Stuart	Exclusive
Exclusive phi (eA) cross section (or asymmetries) vs t	1	8	Justin	Exclusive
TCS cross section (or asymmetries) vs t, Q2 and xB	1		Kayleigh	Exclusive
Pion form factor vs Q2	1		S. Kay, G. Huber	Diffractive & Tagging
Pion structure function vs x	1		R. Trotta	Diffractive & Tagging
A_UT Sivers sin(\phi_h - \phi_S) or Collins sin(phi_h + phi_S) asymmetry moments for pi+ and pi- vs z	3	5	Ralf	SIDIS
Up and down quark Sivers functions as a function of k_T in several bins of x (YR Fig 7.53)	3	5	Ralf	SIDIS
Jet eta vs. jet z for primary particle jet, reconstructed track jet and reconstructed track+cluster jet	3		John Lajoie	Jets & HF
Reconstructed track+cluster jet q_perp vs. z	3		John Lajoie	Jets & HF
Distribution of jet charge for u-quark and d-quark jets	3		John Lajoie	Jets & HF
Proton double-spin asymmetry ALL vs. xB	4	7	Jackson, Tyler, Claire	Inclusive
Helium-3 double-spin asymmetry ALL vs. xB	4	7	Jackson, Tyler, Claire	Inclusive
Proton double-spin asymmetry ALT vs. xB	4	7	*Needs assignment*	Inclusive
A1p, A1He3, A1n vs. xB (A1n extracted from A1p, A1He3) : IMPACT	4	7	Jackson	Inclusive
Constraints on polarized PDFs vs. xB : IMPACT	4	7	*Needs assignment*	Inclusive
A_LL double helicity asymmetries for pi+/- and K+/-$ as a function of x in bins of Q2 and z	4		Charlotte	SIDIS
Expected impact of the EIC on the anti-up, anti-down and strange quark helicities (YR Fig 7.19)	4		Charlotte	SIDIS
Nuclear modification factor (ReA) of J/psi vs momentum fraction (z)	6		Xinbai Li and Wangmei Zha	Jets & HF
Projected uncertainties for the nuclear modification factor (ReA) of open heavy flavor vs momentum fraction (z)	6		Xuan Li	Jets & HF
Jet ReA vs jet pT	6		Raymond Ehlers	Jets & HF

Physics Drivers and EIC Science

NAS topics:	
1) Tomographic Imaging of Quarks and Gluons	MASS
2) Heavy-quarkonia exclusive production at threshold	MASS
3) 3D imaging in Momentum Space	MASS
4) Gluon spin and orbital motion	SPIN
5) Transverse motion in polarized nucleons	SPIN
6) Propagation of energetic quarks through matter	DENSE GLUONS
7) Properties of Nuclei in QCD	DENSE GLUONS
8) Diffraction	DENSE GLUONS

Inclusive NC e+P cross section vs. xB, for bins of Q2		7		Tyler	Inclusive
Inclusive NC e+D cross section vs. xB, for bins of Q2		7		Tyler	Inclusive
Inclusive NC e+He3 cross section vs. xB, for bins of Q2		7		Tyler	Inclusive
Proton structure functions F2, FL, xF3 vs. xB		7		Sonny, Tyler, Claire	Inclusive
Deuterium structure functions F2, FL, xF3 vs. xB		7		Sonny, Tyler, Claire	Inclusive
Helium-3 structure functions F2, FL, xF3 vs. xB		7		Sonny, Tyler, Claire	Inclusive
Constraints on unpolarized PDFs vs. xB : IMPACT		7		Claire, Eimear	Inclusive
A1n through e-He3 vs x: 5x41 GeV/u		7		D. Nguyen, J. Pybus	Diffractive & Tagging
eA diffraction: d sigma/dt vs t		8		M. Baker. P. Steinberg	Diffractive & Tagging
Electroweak mixing angle vs. Q2 (ep and eD)		N/A		Xiaochao	Electroweak & BSM
An impact plot for tau searching (Receiver Operating Characteristic curve)		N/A		Jinlong Zhang	Electroweak & BSM
xB, Q2 resolution vs. x, Q2 for different reconstruction methods		Detector performance		Claire	Inclusive
Mean Delta z/z values in bins of x and Q2 for the scattered lepton kinematic reconstruction method		Detector performance		Ralf, Charlotte	SIDIS
Jet energy scale and resolution vs jet energy		Detector performance		Tristan Protzman & Rosi Reed	Jets & HF
Dectector acceptance and efficiency for DVCS (ep) vs rapidity		Detector performance		Igor	Exclusive
Dectector acceptance and efficiency for DVCS (He4) vs rapidity		Detector performance		Gary	Exclusive
Dectector acceptance and efficiency for DVCS (J/Psi) vs rapidity		Detector performance		Nathaly, Stuart	Exclusive
Dectector acceptance and efficiency for DVCS (for exclusive phi) vs rapidity		Detector performance		Justin	Exclusive
Dectector acceptance and efficiency for DVCS (for TCS) vs rapidity		Detector performance		Kayleigh	Exclusive
Reconstructed Tau lepton decay length vs. truth decay length		Vertex tracking detector performance		Jinlong Zhang	Electroweak & BSM

Outline

- Detector & simulations
- **Proposal**
  - Physics Godparents
  - **Cost & Risk**
  - Collaboration formation
- Path forward

Previously, on ECCE:

ECCE Cost and Schedule *Snapshot*

Previously, on ECCE:

ECCE Cost and Schedule *Snapshot*

WBS	EIC Ref Project $M	EIC Ref In-Kind $M	EIC Ref Total $M	ECCE Project $M	ECCE In-Kind $M	ECCE Total $M	Notes
Detector management			7.4	7.4	0.0	7.4	
Detector R&D			12.1	12.1	0.0	12.1	Backup: R&D plan document; for ECCE details see TH estimate from 9/8/2021 (email)
Tracking			31.1	22.9	4.3	27.2	Initial estimate MAPS SI: Check: any contribution from UK? Japan? China? Czech Republic? Disks: Check: in-kind LANL engineers?
PID			26.5	28.7	4.0	32.7	Assume $10M for dRICH and $2M for TOF $4M Check: in-kind value of re-using bar boxes. ~$300k/box, 12 boxes Check: in-kind GSI design/engineering/expertise?
EM Calorimetry			36.2	21.4	14.0	35.4	in-kind: $1.0M Electron Endcap: re-use ~500 PWO crystals, Charles U./Czech Rep. buys 200-250 crystals in-kind: $1.0M Electron Endcap: FTEs from EEEMCal Team (Engineering/Design IJCLab-Orsay/Armenia in-kind: $2.0M Electron Endcap: EEEMCal team pursuing external funding, e.g., NSF MRI or MSRI $0 Barrel EMCal: check in-kind $0 Hadron Endcap EMCal: check in-kind EIC-Japan, Korea **Assume** $10M Hadron Endcap EMCal: re-use of PHENIX EMCal, ALICE EMCal or PbGl?
Hadronic Calorimetry			33.1	9.1	24.0	33.1	**Assume** in-kind ~$3.5M Electron Endcap HCAL: re-use STAR (Project: $0.5M) in-kind: $10.5M Barrel HCAL: re-use sPhenix HCAL (Project: $0.3M) **Assume** in-kind: ~$10M Hadron Endcap HCAL: check in-kind EIC-Japan, Korea
Magnet			29.7	3.0	6.0	9.0	
Electronics			17.1	17.1	0.0	17.1	
DAQ Computing			8.7	8.7	0.0	8.7	
Detector Infrastructure			26.4	26.4	0.0	26.4	Check: possible in-kind cradle, platform etc.; for IP8 additional costs?
IR Integration & Auxiliary Detectors			8.1	1.5	6.6	8.1	Auxiliary detectors in-kind
Detector Pre-Ops & Commissioning			8.7	8.7	0.0	8.7	
TOTAL	**153.1**	**92.0**	**245.1**	**167.0**	**58.9**	**225.9**	

- DWG's working to finalize cost and schedule information with ORNL team
- Continuing to develop detailed plans for re-use items
- SC "drill-downs" with subsystems to begin this week

Previously, on ECCE:

ECCE Cost and Schedule *Snapshot*

WBS	EIC Ref Project $M	EIC Ref In-Kind $M	EIC Ref Total $M	ECCE Project $M	ECCE In-Kind $M	ECCE Total $M	Notes
Detector management			7.4	7.4	0.0	7.4	
Detector R&D			12.1	12.1	0.0	12.1	Backup: R&D plan document; for ECCE details see TH estimate from 9/8/2021 (email)
Tracking			31.1	22.9	4.3	27.2	Initial estimate
PID			35	28.7	4.0	32.7	Assume $10M for dRICH and $2M for TOF
EM Calorimetry			38.2	21.4	14.0	35.4	$4M check: in-kind value re-using bar boxes. ~$300k/box, 12 boxes
Hadronic Calorimetry							
Magnet							
Electronics							
DAQ Computing			8.7	8.7	0.0	8.7	
Detector Infrastructure							
IR Integration & Auxiliary Detectors							
Detector Pre-Ops & Commissioning			8.7	8.7	0.0	8.7	
TOTAL	153.1	92.0	245.1	167.0	58.9	225.9	

Working groups provided very detailed information on cost, risk, schedule.

SC, team leaders, and ORNL project team undergoing detailed drill-downs to verify and refine our current estimates.

- DWG's working to finalize cost and schedule information with ORNL team
- Continuing to develop detailed plans for re-use items
- SC "drill-downs" with subsystems to begin this week

ECCE Proposal: oHCAL Example

WBS ID	WBS Name	Activity Description (Separate between conceptual design, preliminary design, final design, long lead procurements etc.)	Activity Type (Pull Down)	Units	Unit Pricing	Basis of Estimate for costing (Pull Down)	Labor Hours	Resource Name (Pull Down)	Funding Source (Pull Down)	% of cost to Project	% of cost Inkind	Direct Materials Total $$ (Calculated)	Total Labor cost $$ (Calculated)
ECE06.10.06.01	Barrel Hadronic Calorimetry	oHCAL Steel Sectors	Vendor Fabrication	32	195,512	Historical Costs		Other	repurpose	0	100	$6,256,384	$0
			Final Design			Historical Costs	1,250	Mechanical Engineer	repurpose	0	100	$0	$191,463
			Final Design			Historical Costs	1,000	Mechanical Designer	repurpose	0	100	$0	$116,100
			Procurement Support			Historical Costs	40	Mechanical Engineer	repurpose	0	100	$0	$6,127
ECE06.10.06.01	Barrel Hadronic Calorimetry	oHCAL Splice Plates, Pucks and Pins	Vendor Fabrication	1	209,500	Historical Costs		Other	repurpose	0	100	$209,500	$0
		oHCAL Support Rings, Magnet Supports	Vendor Fabrication	1	270,000	Historical Costs		Other	repurpose	0	100	$270,000	$0
			Final Design			Historical Costs	950	Mechanical Engineer	repurpose	0	100	$0	$145,512
			Final Design			Historical Costs	700	Mechanical Designer	repurpose	0	100	$0	$81,270
			Procurement Support			Historical Costs	40	Mechanical Engineer	repurpose	0	100	$0	$6,127
ECE06.10.06.01	Barrel Hadronic Calorimetry	oHCAL Scintillating Tiles	Vendor Fabrication	1	1,709,915	Historical Costs		Other	repurpose	0	100	$1,709,915	$0
			Procurement of Material	1	77,292	Historical Costs	5	Mechanical Tech	repurpose	0	100	$77,292	$505
			Procurement of Material	1	10,700	Historical Costs	5	Mechanical Tech	repurpose	0	100	$10,700	$505
			Procurement of Material	48	155	Historical Costs	5	Mechanical Tech	repurpose	0	100	$7,440	$505
			Procurement of Material	1	14,500	Historical Costs	5	Mechanical Tech	repurpose	0	100	$14,500	$505
			Final Design			Historical Costs	160	Mechanical Designer	repurpose	0	100	$0	$18,576
			Procurement Support			Historical Costs	40	Mechanical Tech	repurpose	0	100	$0	$4,040
			Q&A / Testing			Historical Costs	160	Mechanical Tech	repurpose	0	100	$0	$16,162
			Q&A / Testing			Historical Costs	2,200	PhD Student	repurpose	0	100	$0	$44,000
			Q&A / Testing			Historical Costs	50	Electrical Tech	repurpose	0	100	$0	$5,051
ECE06.10.06.01	Barrel Hadronic Calorimetry	oHCAL Sector Assembly	Vendor Fabrication	1	46,465	Historical Costs		Other	repurpose	0	100	$46,465	$0
			Procurement Support			Historical Costs	40	Mechanical Tech	repurpose	0	100	$0	$4,040
			Q&A / Testing			Historical Costs	50	Scientist	repurpose	0	100	$0	$7,853
			Q&A / Testing			Historical Costs	6,400	PhD Student	repurpose	0	100	$0	$128,000
			Q&A / Testing			Historical Costs	100	Mechanical Tech	repurpose	0	100	$0	$10,101
			Q&A / Testing			Historical Costs	100	Electrical Tech	repurpose	0	100	$0	$10,101
ECE06.10.06.01	Barrel Hadronic Calorimetry	oHCAL Electronics	Procurement of Material	7680	10	Historical Costs		Other	repurpose	0	100	$76,800	$0
			Vendor Fabrication	7680	12	Historical Costs		Other	repurpose	0	100	$92,160	$0
			Vendor Fabrication	1536	31	Historical Costs		Other	repurpose	0	100	$47,616	$0
			Vendor Fabrication	64	444	Historical Costs		Other	repurpose	0	100	$28,416	$0
			Vendor Fabrication	64	234	Historical Costs		Other	repurpose	0	100	$14,976	$0
			Vendor Fabrication	64	668	Historical Costs		Other	repurpose	0	100	$42,752	$0
			Vendor Fabrication	1	242,000	Historical Costs		Other	repurpose	0	100	$242,000	$0
			Final Design			Historical Costs	2,080	Electrical Engineer	repurpose	0	100	$0	$318,594
			Final Design			Historical Costs	2,080	Electrical Tech	repurpose	0	100	$0	$210,101
			Procurement Support			Historical Costs	120	Electrical Tech	repurpose	0	100	$0	$12,121
ECE06.10.06.01	Barrel Hadronic Calorimetry	Labor to disassemble oHCAL and magnet in IP8 and reassemble in IP6											
		Remove and Lift Sectors	In House Assembly			Historical Costs	256	Mechanical Tech	Project	100	0	$0	$25,859
		Transport from IP8 to IP6	In-House Assembly			Historical Costs	256	Mechanical Tech	Project	100	0	$0	$25,859
		Lift Sector, Rotate into Position and Install	In-House Assembly			Historical Costs	768	Mechanical Tech	Project	100	0	$0	$77,576
		Confirm Sector Positions	In-House Assembly			Historical Costs	32	Mechanical Tech	Project	100	0	$0	$3,232
		Lift Magnet, Install in Shipping Cradle	In-House Assembly			Historical Costs	24	Mechanical Tech	Project	100	0	$0	$2,424
		Transport Magnet from IP8 to IP6	In-House Assembly			Historical Costs	24	Mechanical Tech	Project	100	0	$0	$2,424
		Install Magnet in flux return	In-House Assembly			Historical Costs	48	Mechanical Tech	Project	100	0	$0	$4,848
		ECCE In Kind Calculation:	$10,057,718										

ECCE Proposal: oHCAL Example

WBS ID	WBS Name	Activity Description (Separate between conceptual design, preliminary design, final design, long lead procurements etc.)	Activity Type (Pull Down)	Units	Unit Pricing	Basis of Estimate for costing (Pull Down)	Labor Hours	Resource Name (Pull Down)	Funding Source (Pull Down)	% of cost to Project	% of cost Inkind	Direct Materials Total $$ (Calculated)	Total Labor cost $$ (Calculated)
ECE06.10.06.01	Barrel Hadronic Calorimetry	oHCAL Steel Sectors	Vendor Fabrication	32	195,512	Historical Costs		Other	repurpose	0	100	$6,256,384	$0
			Final Design			Historical Costs	1,250	Mechanical Engineer	repurpose	0	100	$0	$191,463
			Final Design			Historical Costs	1,000	Mechanical Designer	repurpose	0	100	$0	$116,100
			Procurement Support			Historical Costs	40	Mechanical Engineer	repurpose	0	100	$0	$6,127
ECE06.10.06.01	Barrel Hadronic Calorimetry	oHCAL Splice Plates, Pucks and Pins	Vendor Fabrication	1	209,500	Historical Costs		Other	repurpose	0	100	$209,500	$0
		oHCAL Support Rings, Magnet Supports	Vendor Fabrication	1	270,000	Historical Costs		Other	repurpose	0	100	$270,000	$0
			Final Design			Historical Costs	950	Mechanical Engineer	repurpose	0	100	$0	$145,512
			Final Design			Historical Costs	700	Mechanical Designer	repurpose	0	100	$0	$81,270
			Procurement Support			Historical Costs	40	Mechanical Engineer	repurpose	0	100	$0	$6,127
ECE06.10.06.01	Barrel Hadronic Calorimetry	oHCAL Scintillating Tiles	Vendor Fabrication	1	1,709,915	Historical Costs		Other	repurpose	0	100	$1,709,915	$0
			Procurement of Material	1	77,292	Historical Costs	5	Mechanical Tech	repurpose	0	100	$77,292	$505
			Procurement of Material	1	10,700	Historical Costs	5	Mechanical Tech	repurpose	0	100	$10,700	$505
			Procurement of Material	48	155	Historical Costs	5	Mechanical Tech	repurpose	0	100	$7,440	$505
			Procurement of Material	1	14,500	Historical Costs	5	Mechanical Tech	repurpose	0	100	$14,500	$505
			Final Design			Historical Costs	160	Mechanical Designer	repurpose	0	100	$0	$18,576
			Procurement Support			Historical Costs	40	Mechanical Tech	repurpose	0	100	$0	$4,040
			Q&A / Testing			Historical Costs	160	Mechanical Tech	repurpose	0	100	$0	$16,162
			Q&A / Testing			Historical Costs	2,200	PhD Student	repurpose	0	100	$0	$44,000
			Q&A / Testing			Historical Costs	50	Electrical Tech	repurpose	0	100	$0	$5,051
ECE06.10.06.01	Barrel H	adronic Calorimetry	oHCAL Sector Assembly	Vendor Fabrication	1	46,465	Historical Costs		Other	repurpose	0	100	$46,465	$0
				Procurement Support			Historical Costs	40	Mechanical Tech	repurpose	0	100	$0	$4,040
				Q&A / Testing			Historical Costs		Scientist	repurpose	0	100	$0	$7,838
				Q&A / Testing			Historical Costs	800	Mechanical Tech	repurpose	0	100	$0	$128,000
				Q&A / Testing			Historical Costs	100	Mechanical Tech	repurpose	0	100	$0	$10,101
				Q&A / Testing			Historical Costs	100	Electrical Tech	repurpose	0	100	$0	$10,101
ECE06.10.06.01	Barrel Hadronic Calorimetry	oHCAL Electronics	Procurement of Material	7680	10	Historical Costs		Other	repurpose	0	100	$76,800	$0
			Vendor Fabrication	7680	12	Historical Costs		Other	repurpose	0	100	$92,160	$0
			Vendor Fabrication	1536	31	Historical Costs		Other	repurpose	0	100	$47,616	$0
			Vendor Fabrication	64	444	Historical Costs		Other	repurpose	0	100	$28,416	$0
			Vendor Fabrication	64	234	Historical Costs		Other	repurpose	0	100	$14,976	$0
			Vendor Fabrication	64	668	Historical Costs		Other	repurpose	0	100	$42,752	$0
			Vendor Fabrication	1	242,000	Historical Costs		Other	repurpose	0	100	$242,000	$0
			Final Design			Historical Costs	2,080	Electrical Engineer	repurpose	0	100	$0	$318,594
			Final Design			Historical Costs	2,080	Electrical Tech	repurpose	0	100	$0	$210,101
			Procurement Support			Historical Costs	120	Electrical Tech	repurpose	0	100	$0	$12,121
ECE06.10.06.01	Barrel Hadronic Calorimetry	Labor to disassemble oHCAL and magnet in IP8 and reassemble in IP6											
		Remove and Lift Sectors	In House Assembly			Historical Costs	256	Mechanical Tech	Project	100	0	$0	$25,859
		Transport from IP8 to IP6	In-House Assembly			Historical Costs	256	Mechanical Tech	Project	100	0	$0	$25,859
		Lift Sector, Rotate into Position and Install	In-House Assembly			Historical Costs	768	Mechanical Tech	Project	100	0	$0	$77,576
		Confirm Sector Positions	In-House Assembly			Historical Costs	32	Mechanical Tech	Project	100	0	$0	$3,232
		Lift Magnet, Install in Shipping Cradle	In-House Assembly			Historical Costs	24	Mechanical Tech	Project	100	0	$0	$2,424
		Transport Magnet from IP8 to IP6	In-House Assembly			Historical Costs	24	Mechanical Tech	Project	100	0	$0	$2,424
		Install Magnet in flux return	In-House Assembly			Historical Costs	48	Mechanical Tech	Project	100	0	$0	$4,848
		ECCE In Kind Calculation:	$10,057,718										

Final updates by groups required by Oct. 8!

ECCE R&D Estimate

WBS	R&D for ECCE Subsystem	Project R&D Identifier	FY22	FY23	FY24	FY25	FY26	SUBTOTAL	Comment
10.02	mRICH	eRD101	140,000	140,000	140,000	0	0	**420,000**	
10.02	dRICH	eRD102	260,000	200,000	77,000	0	0	**537,000**	
10.02	hpDIRC	eRD103	450,000	250,000	80,000	0	0	**780,000**	
10.02	Si Service Reduction	eRD104	42,840	85,680	85,680	71,400	0	**285,600**	
10.02	SciGlass	eRD105	90,000	50,000	50,000	0	0	**190,000**	
10.02	Forward HCAL	eRD107	100,000	200,000	100,000	0	0	**400,000**	This R&D would be redirected to ECCE longitudinal segmented calorimeter
10.02	Cylindrical MPGD	eRD108	140,000	100,000	5,000	0	0	**245,000**	This R&D would be for GEM/uRWELL
10.02	ASICS	eRD109	275,000	900,000	760,000	500,000	0	**2,435,000**	
10.02	Photosensors	eRD110	180000	80000	25000	0	0	**285,000**	Main R&D: Radiation hard SiPMs. LAPPD is generic R&D for cost reduction
10.02	Si-Vertex (excl. sensors)	eRD111	340,160	680,820	567,600	0	0	**1,588,580**	
10.02	AC-LGAD	eRD112	235,000	240,000	240,000	240,000	200,000	**1,155,000**	
10.02	Low-Mass GEM Tracker	TBD	20000	0	0	0	0	**20,000**	
10.02	Low-Q2 Taggers	TBD	100000	50000	0	0	0	**150,000**	
10.02	ZDC	TBD	100000	50000	0	0	0	**150,000**	
10.02	Si Sensor Development	TBD	740000	852000	1189000	639000	0	**3,420,000**	
							TOTAL	**12,061,180**	
OTHER R&D Categories not relevant for ECCE realization									
10.02	Forward EMCal	eRD106	90,000	50,000	50,000	0	0	**190,000**	This R&D does not seem critical for ECCE
10.02	Roman pots	TBD	40000	40000	20000	0	0	**100,000**	Main relevant R&D integrated in AC-LGAD above
	GEM TRD	TBD	70000	30000	60000	0	0		
	TOF	TBD	0	45000	90000	90000	0		
	MPGD for RICH/Nano-Diam	TBD	0	0	130000	200000	180000		
	CSGalss for HCALs	TBD	0	30000	200000	350000	250000		
	PID for high-pT	TBD	0	50000	90000	95000	100000		
	SC nanowires	TBD	0	0	200000	400000	400000		Relevant but partially included in photosensors
	Radiation hard SiPM	TBD	0	0	690000	1175000	1060000		

Mapping of EIC generic detector R&D to ECCE (Tanja)

Some optimization and merging of categories still needs to be done.

https://indico.bnl.gov/event/10974/contributions/53172/attachments/36485/59965/Detector_RD_Plan_Aug10.2021.pdf

Outline

- Detector & simulations
- **Proposal**
  - Physics Godparents
  - Cost & Risk
  - **Collaboration formation**
- Path forward

ECCE Proposal: Collaboration Formation

Once selected as project detector, the consortium will add new groups (most likely) and evolve into a collaboration. Here we show our initial thinking to stat a discussion.

ECCE Proposal: Collaboration Formation

Once selected as project detector, the consortium will add new groups (most likely) and evolve into a collaboration. Here we show our initial thinking to stat a discussion.

Key point: after proposal review, ECCE will appoint a collaboration leadership team & formulate its bylaws. While we do not decide on things now, we do need to show our vision for this process and resulting structure.

e.g.:

We envision that the successful realization of an on-time and on-budget project detector will require a collaboration leadership structure consisting of an elected IB chair and spokesperson, and a spokesperson appointed leadership team consisting of two deputy spokespersons and a series of coordinators (technical, detector resources, physics, diversity equity and inclusion, and software and computing).

ECCE Proposal: Collaboration Formation

Envision of a 'collaboration formation meeting', soon after the proposal review, with spokesperson and IB chair election and initiation of bylaws formation process.

The decision to defer this for after the review is motivated by our desire to fully integrate new groups and best benefit from their expertise. To this end we believe it is important to allow them to take an active part in the collaboration formation process

While discussions at the 'collaboration formation meeting' will initiate based on the structure described in the proposal (that will eventually be endorsed by the ECCE consortia IB), we will have the ability to modify it as desired by the newly forming collaboration.

Code of Conduct Vote

- Final Code of Conduct document:
  - https://docs.google.com/document/d/1yWBw47xXJNLXV3zRgOmYzmDOB2rcVE3RWghghZGfuDM/edit?usp=sharing
- DE&I Team Reply to Comments:
  - https://docs.google.com/document/d/1HHa6Isgz-EKYnvg_JkmRjarmBfh3Yve-T3nqixvBjB0/edit?usp=sharing
- Emails with voting links have been sent to all ECCE IB members
- Voting is open for seven days, closes 9/19
- Simple majority of voting institutions required to pass
- If you have a question, or your IB rep did not receive the email, contact us

Approved by IB!
42 – yes; 1 – no.

Outline

- Detector & simulations
- Proposal
  - Physics Godparents
  - Cost & Risk
  - Collaboration formation
- **Path forward**

ECCE forward: Inputs!

As we move forward, we need more input from institutions / working groups

<u>Institutes ('EOI update'):</u>

- What are you planning to work on
- At what effort level
- With what in kind contribution (if any)

e.g. dRICH issue

<u>Working groups (Sep. 27th deadline; i.e. today):</u>

- List of assumption
- Detector R&D needs
- Physics studies for proposal (done! ☺)

ECCE Detector Scope DRAFT

Evolving with PM and DWG's – assumptions must be clearly stated in proposal

List of Assumptions
1) The accelerator/cryogenics scope will provide a cryogenic distribution can in the experimental Hall at IP6. The remaining scope in the Hall is included in the detector magnet.
2) The IR and vacuum (IR magnets, beam pipes, pumps, valves, windows, etc.) are part of the accelerator/IR scope.
3) The luminosity detector is included in this detector proposal and includes anything that comes behind the conversion/exit window. Up to that window is assumed to be accelerator scope.
4) The polarimetry scope is not included in this detector proposal as it is handled external to the proposals through the across proto-collaborations polarimetry working group.*
5) Any required IP-6 de-installation costs are assumed to be covered as regular laboratory operations costs.
6) ….

**Note that for the CD-1 EIC Project cost estimates the polarimetry and luminosity detector scope was still covered under accelerator/IR scope.*

ECCE Detector Requirements (DRAFT)

Needs additional input from DWG/PWG's

Topic	Issue	ECCE solution	Comment
Barrel PID – e/π separation: up to 10^{-2}-10^{-4} down to 0.2 GeV	Need good EMcal resolution; need additional e/π below 2GeV	Use SciGlass with 55 cm space as option with good precision; use hpDIRC as π veto down to p = 0.3 GeV/c	Below 0.3 GeV/c can also augment with TOF. Leave 5-10cm for MRPC.
Barrel PID – π/K/p separation down to 0.2 GeV	hpDIRC covers down to 0.6 GeV, need to augment PID below this	Cover 0.2 < p < 0.6 GeV/c with TOF option	Leave 5-10 cm space for this (in region up to forward/backward TOF). Can be MRPC but allows upgrade options (AC-LGAD or LYSO-based TOF)
Hermetic coverage of e-detection	Leave no gaps in e-detection while also folding in PID/hpDIRC need.	hpDIRC readout in backwards region; Moved backward EMCal 15 cm inwards; extended barrel EMCal	Good coverage for negative rapidity needs; performance needs to be verified with simulations.
Backward e-determination, e/π separation up to 10^{-4}	Need highest precision EM calorimetry	Assume all $PbWO_4$	Partial coverage with SciGlass can be scope contingency
Momentum resolution in barrel	Assume 1.5 T field	AI Optimization; base choice is 3 Si vertex layers and 2 intermediate Si outer layer μRwell	Need to work out how to stage such that early beam commissioning starts without Si.
Momentum resolution in forward/backward regions at high η	Assume 1.5 T field	Five disks forward, four disks backward to move EMCal in. Additional MPGD tracking behind dRICH and mRICH	Upgrade options: TRD for PID; AC-LGAD for tracking
Forward Hadronic calorimetry	Forward hadronic calorimetry resolution < 50%/√(E)	Longitudinally separated calorimeter to meet needs in high-η region	Upgrade Option: Dual calorimeter (or can fold in earlier in region of highest need)
Forward Particle Identification	Constrained space in forward region	dRICH based on C4F10; make use of recirculation and gas recovery systems	Recirculation and gas recovery systems for environmentally unfriendly gas use

ECCE Detector R&D Needs DRAFT

Needs additional input from DWG's – critical to show how R&D addresses risks and verifies ECCE design

Plus a GANTT chart visualization with milestones

Topic	What R&D is needed to realize the ECCE Detector	What are the milestones to validate R&D for the ECCE Detector
mRICH (eRD101)		
dRICH (eRD102)		
hpDIRC (eRD103)		
Si Service (eRD104)		
SciGlass (eRD105)	Prove that SciGlass is a viable cost-effective solution	Beam test with small prototype (2021) Scale-up from 20 cm to 45 cm (2021/22) Test different geometries (2022)
Forward Calorimeter (eRD106/eRD107)		
MPGD (eRD108)	Prove that μRwell with capacitive readout works	
ASICS (eRD109)		
Si-Vertex (eRD111)		
AC-LGAD (eRD112)		

Timeline

Today, September 13th

Tasks	Duration (months)	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Startup	**1.5**									
Review by external colleagues										
Final edits										
Proposal Submission (1 Dec. 2021)										

Only ~~5~~ 4 more bi-weekly meetings until the proposal is due!

Keep it up! ☺

DWG and PWG Deadlines

- In order to keep to the schedule we have to write the proposal and have time to do some external review, we have to set the following deadlines:

- Input for List of Assumptions and Detector Requirements:
  - DRAFT: Sept. 20, 2021
  - FINAL: Sept 27, 2021

- Input for Physics Plots:
  - First DRAFT: (list of plots and descriptions) Sept. 17, 2021
  - Second DRAFT: (plots w/partial stats and/or analysis) Oct 8, 2021
  - FINAL: Oct 22, 2021