Status of the ePIC Collaboration

John Lajoie and Silvia Dalla Torre

EICUG annual meeting
Warsaw, July 25-26, 2023

ePIC, the Context

- ePIC is the Project Detector →
  - the whole path to the EIC is also the path to ePIC

    White paper (2012, 2014)
    the **NAS assessment** (2018)
    the **Yellow Report** (2020)

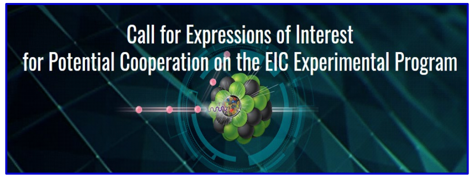
    Long range plan for Nuclear Science (2015)
    CD0 and site selection (Dec 2019/Jan 2020)
    the **ECCE** and **ATHENA** proposals (2021)

  - the whole EIC physics scope has to be addressed by ePIC

Now published in Nuclear Physics A

arXiv:2103.05419

- <u>Status 1 y ago</u> (@ EICUG annual meeting 2022, Stony Brook):
  - Merging of the ECCE and ATHENA Collaborations **forming a stronger collaboration for the Project Detector @ IP6 →** ePIC
  - Community merging was just completed
  - Structuring the ePIC collaboration just started
  - Detector consolidation and optimization at a very initial stage



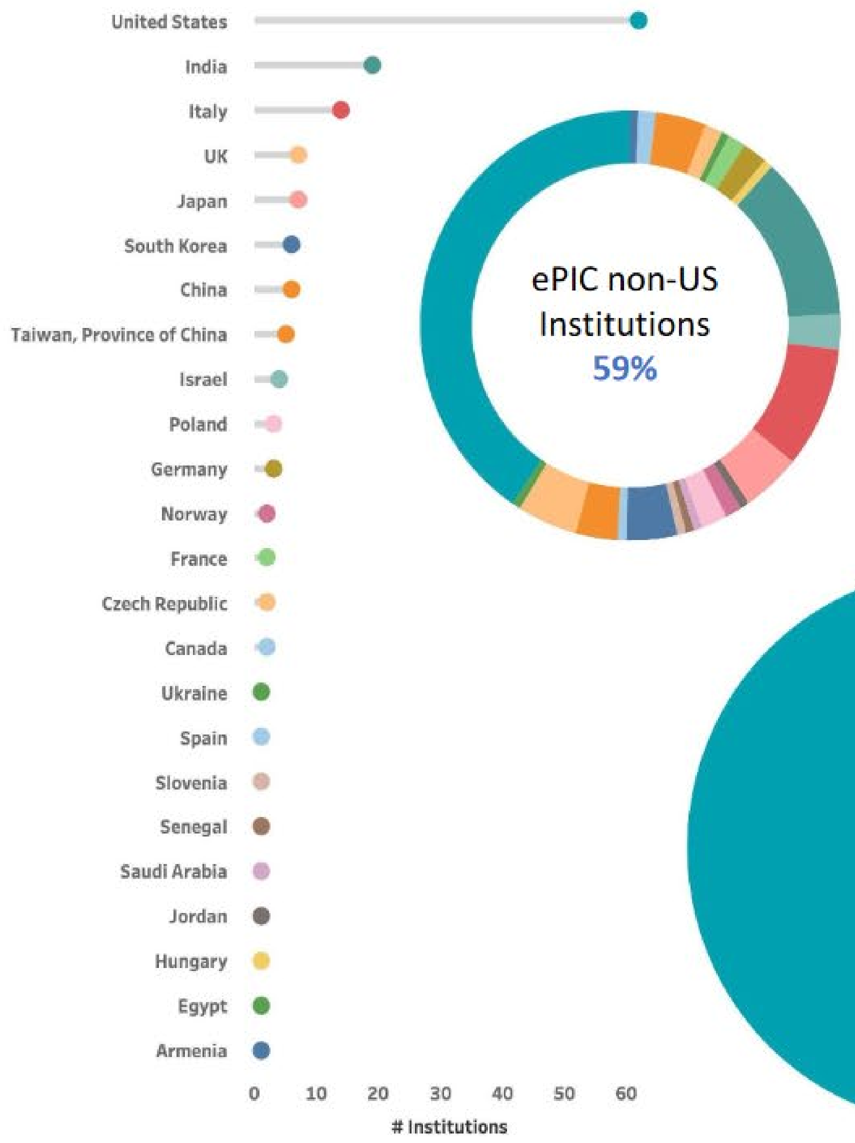
- **Today : an update about ePIC progress during the last year**

OUTLOOK

- The composition and the structure of the ePIC Collaboration
- The ePIC detector moving towards the TDR

The ePIC today

NOTE: This figure to be checked with Ernst !



171 institutions

24 countries

500+ participants

A truly global pursuit for a new experiment at the EIC!

The ePIC today

NOTE: This figure to be checked with Ernst !

171 institutions

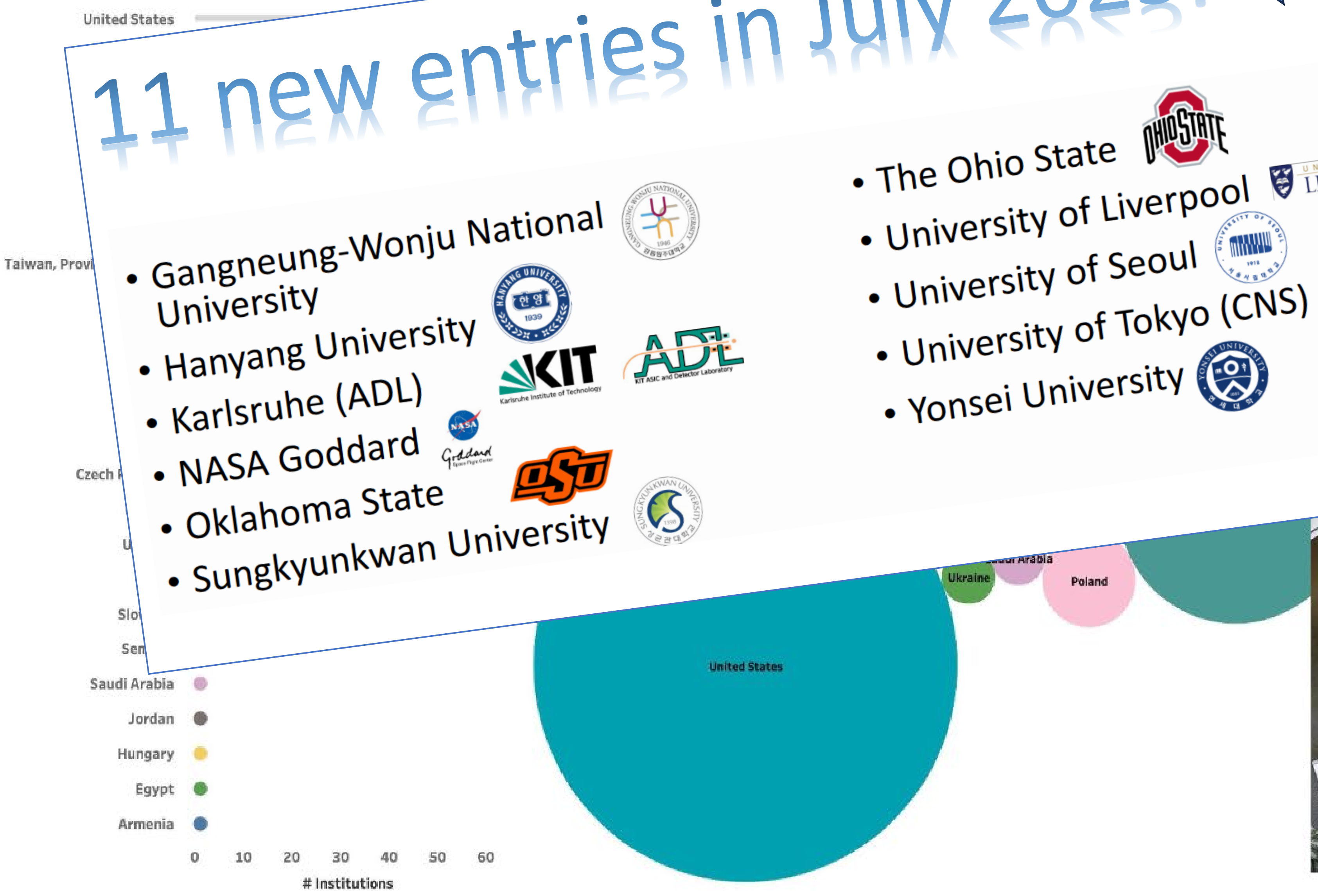
24 countries

500+ participants

A truly global pursuit for a new experiment at the EIC!

11 new entries in July 2023:

- Gangneung-Wonju National University
- Hanyang University
- Karlsruhe (ADL)
- NASA Goddard
- Oklahoma State
- Sungkyunkwan University
- The Ohio State
- University of Liverpool
- University of Seoul
- University of Tokyo (CNS)
- Yonsei University



COLLABORATION ORGANIZATION TIMELINE

Snapshot of collaboration activities towards structuring the COLLABORATION:

- June 2022: Collaboration roster established via institutional survey
- July 26th-28th: Collaboration formation meeting @ Stony Brook University

- August-December 2022: Collaboration Charter
  - December 14: **adoption of charter**

- December 2022 - February 2023: Nomination process & Collaboration leadership election
  - Mid February: **announcement of election results**

- After April 2022: forming the collaboration community

  - **Biweekly general meetings**, alternating meeting time to account for **a world-wide collaboration including 4 time-areas**: East Cost, West Cost, Europe, Asia
  - **First Collaboration Meeting**: July 26-28, 2022, at Stonybrook
  - **Second Collaboration Meeting**: January 9-11, 2023 at JLab
  - **Third Collaboration Meeting:** July 26-29, 2023, in Warsaw

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- June 2022: Collaboration roster established via institutional survey
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  - D…
- Decer…
  - M…
- April 20…
  - **Biwe…** …ernating meeting time to account for … **…de collaboration including 4 time-areas**: East Cost, West Cost, Europe, Asia
  - **Second Collaboration Meeting**: January 9-11 2023 @ JLab
  - **Third Collaboration Meeting:** July 26-29, 2023 in Warsaw

Till February 2023 the Collaboration has been managed by a Steering Committee:

Silvia Dalla Torre, Or Hen, Tanja Horn, John Lajoie, Bernd Surrow

Warm thanks to our colleagues for serving in the ePIC SC in the crucial initial phase!

The Joint WGs (April 22 – March 23)

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THANK YOU !

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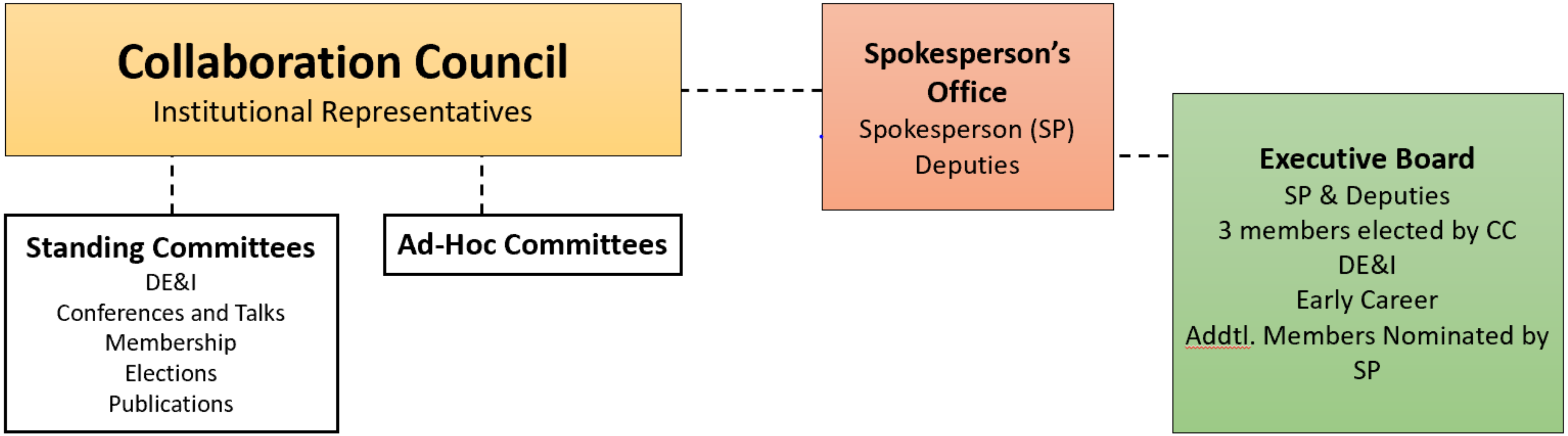
Collaboration structure from the Charter : the management



Collaboration structure from the Charter : the management

Formed (early career representants elected), Chair and vice elected



elected

EB formation in the pipeline for the next future

Collaboration Council
Institutional Representatives

Spokesperson's Office
Spokesperson (SP)
Deputies

Executive Board
SP & Deputies
3 members elected by CC
DE&I
Early Career
Addtl. Members Nominated by SP

Standing Committees
DE&I
Conferences and Talks
Membership
Elections
Publications

Ad-Hoc Committees

- Election Committee is in place:

John Arrington (Chair), Helen Caines, Domenico Elia, Or Hen

Ongoing the election process of chair and vice of:

- DE&I
- Conference and talks
- Membership

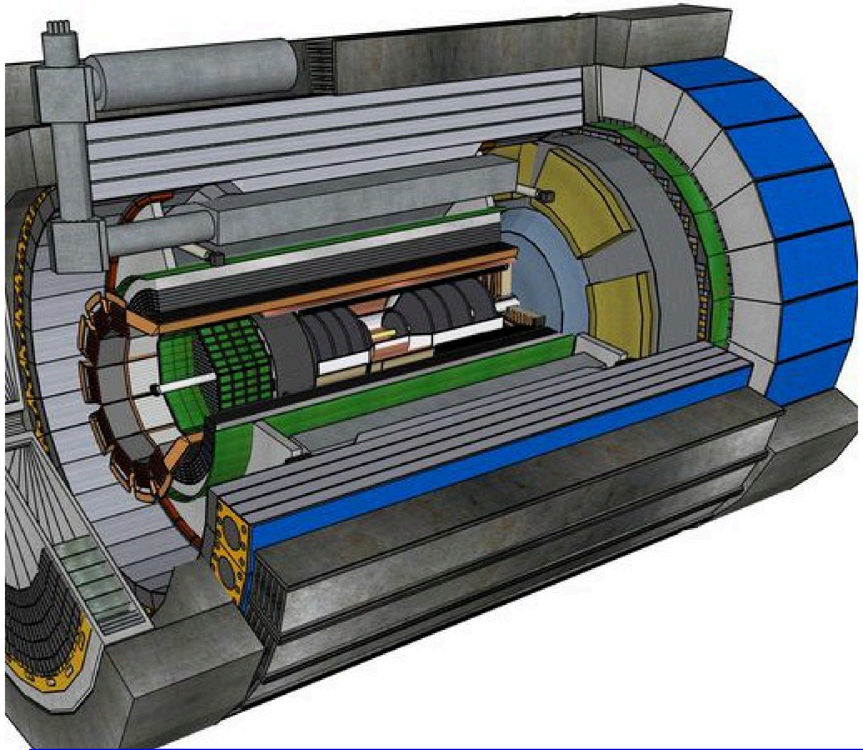
COLLABORATION ORGANIZATION TIMELINE

Snapshot of collaboration activities towards detector consolidation and optimization:

- April 2022: Formation of Working Groups and start of technological consolidation process, following EIC detector proposal closeout in March 2022

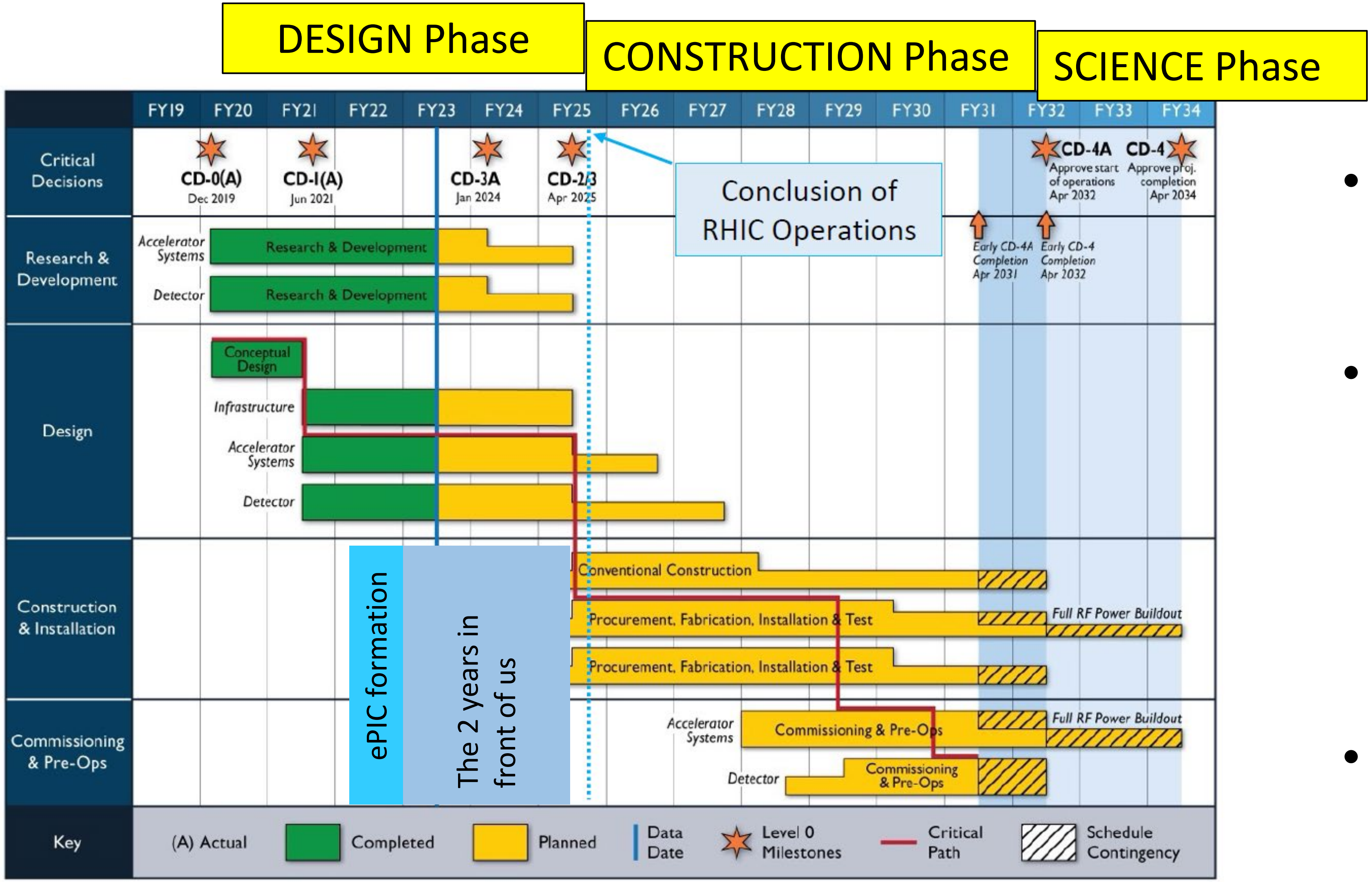
- April 2022 – March 2023: intense WG activity
  - Weekly/biweekly WG meetings
  - Biweekly meetings WG conveners- Collaboration Management
  - WG "Global Detector and Integration" acting as a proto-technical board, including review processes when appropriate
    - Recent reviews for optimization:
      Barrel EM Calorimeter, backward RICH

- The activity is continuing within **an upgraded structure of the collaboration scientific bodies**



The design of the ePIC Central Detector **now**, as resulting from the consolidation and optimization activity

PROJECT TIMELINES and COLLABORATION TIMELINES

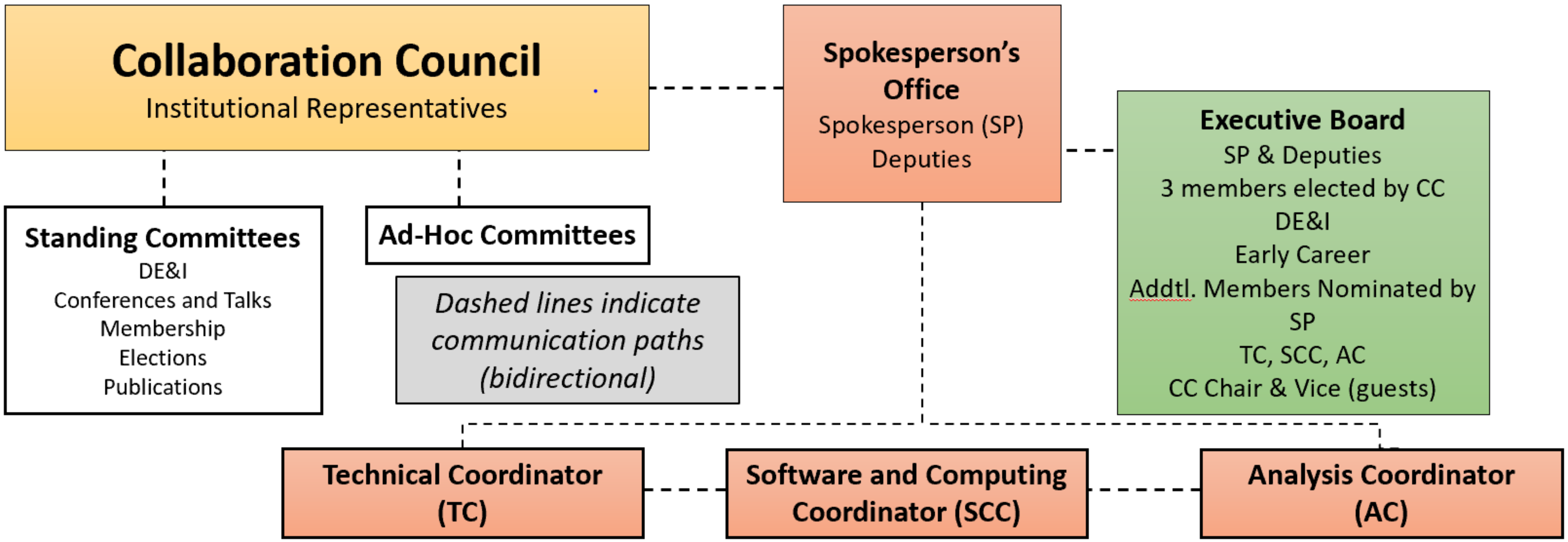


The ePIC goals for the current and next year:

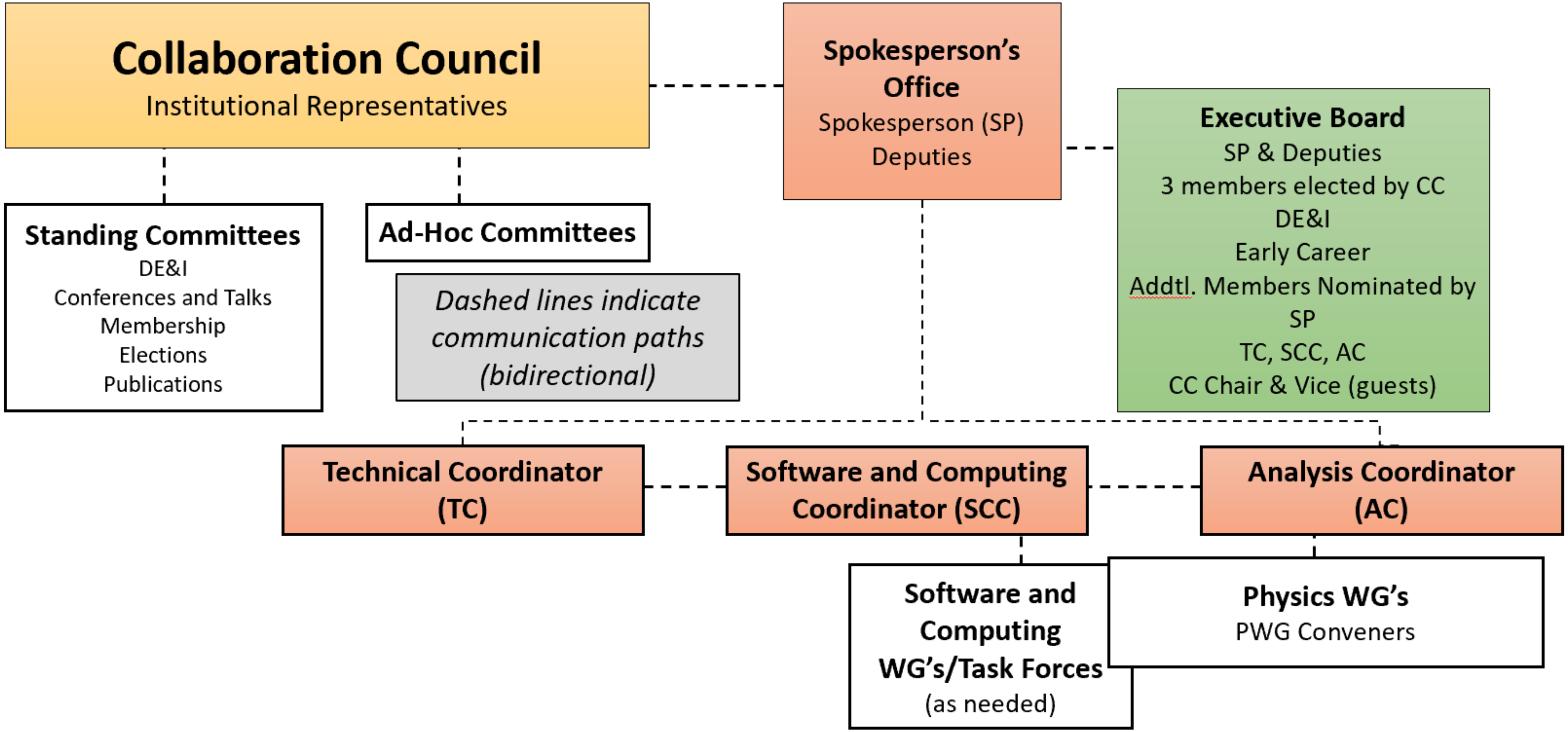
- to prepare the Technical Design Report (TDR) to get CD3 approval
- To organize the Collaboration so to be ready for the construction phase at the beginning of 2025

- The ePIC management plan by the SP–office is focused on the next two-years

Key aspects of the scientific structure : the Coordinators



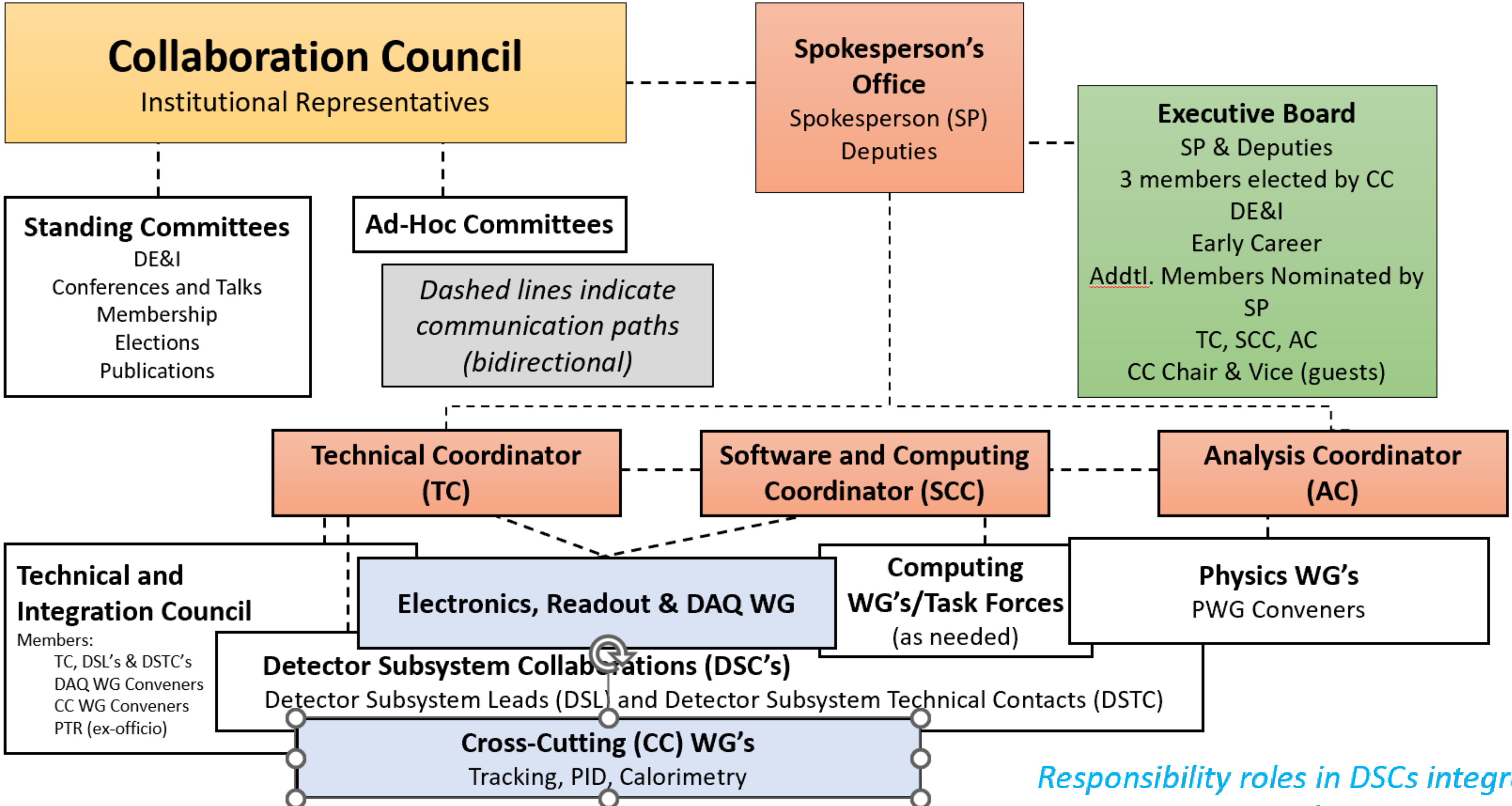
Key aspects of the scientific structure : Physics and /software/computing WGs



SSC activity includes

- **Operations and production**
- **Software development and reconstruction**
- **Infrastructure**

Key aspects of the scientific structure : DSCs and CC WGs



Responsibility roles in DSCs integrated in the Project at L4/L5 level

Scientific structure : the people

Collaboration Council

Email-list: eic-projdet-ib-l@lists.bnl.gov
Subscribe to mailing list through: https://lists.bnl.gov/mailman/listinfo/eic-projdet-ib-l restricted

Collaboration Council Chair: Ernst Sichtermann <epsichtermann@lbl.gov>

Collaboration Council Vice-Chair: Bernd Surrow <surrow@temple.edu>

Spokesperson's Office

Spokesperson: John Lajoie <lajoie@iastate.edu>

Deputy Spokesperson: Silvia Dalla Torre <Silvia.DallaTorre@cern.ch>

Coordinators

Technical Coordinator: Klaus Dehmelt <klaus.dehmelt@stonybrook.edu>

Software and Computing Coordinator: Markus Diefenthaler <mdiefent@jlab.org>

Deputy Software and Computing Coordinator (Operations): Wouter Deconinck <wouter.deconinck@umanitoba.edu>

Deputy Software and Computing Coordinator (Development): Sylvester Joosten <sjoosten@anl.gov>

Deputy Software and Computing Coordinator (Infrastructure): Torre Wenaus <wenaus@gmail.com>

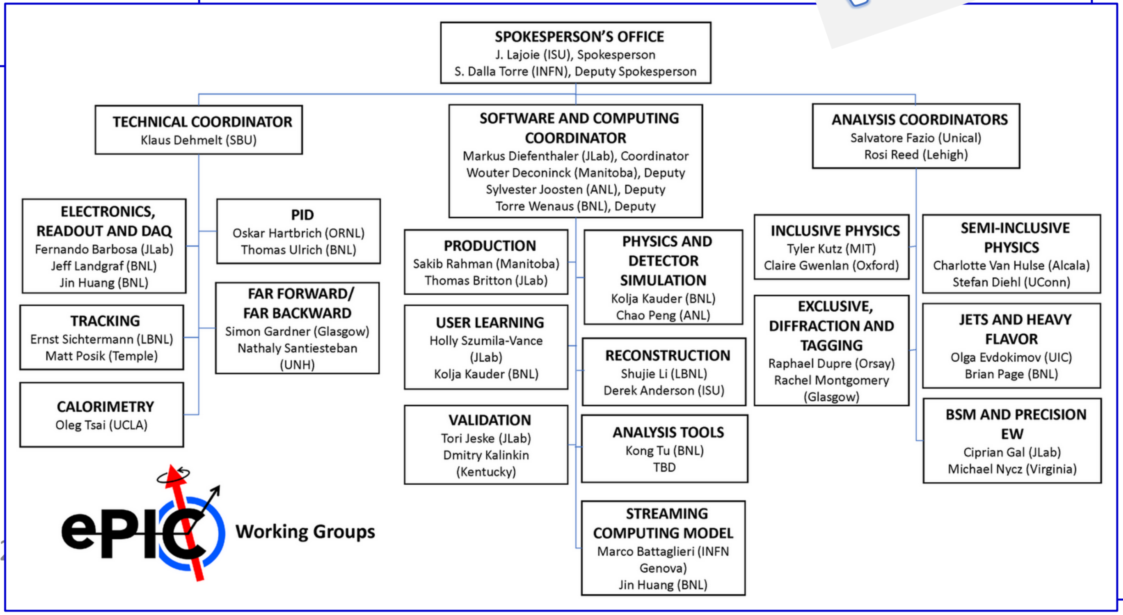
Co-Analysis Coordinator: Salvatore Fazio <salvatore.fazio@unical.it>

Co-Analysis Coordinator: Rosi Reed <rosijreed@lehigh.edu>

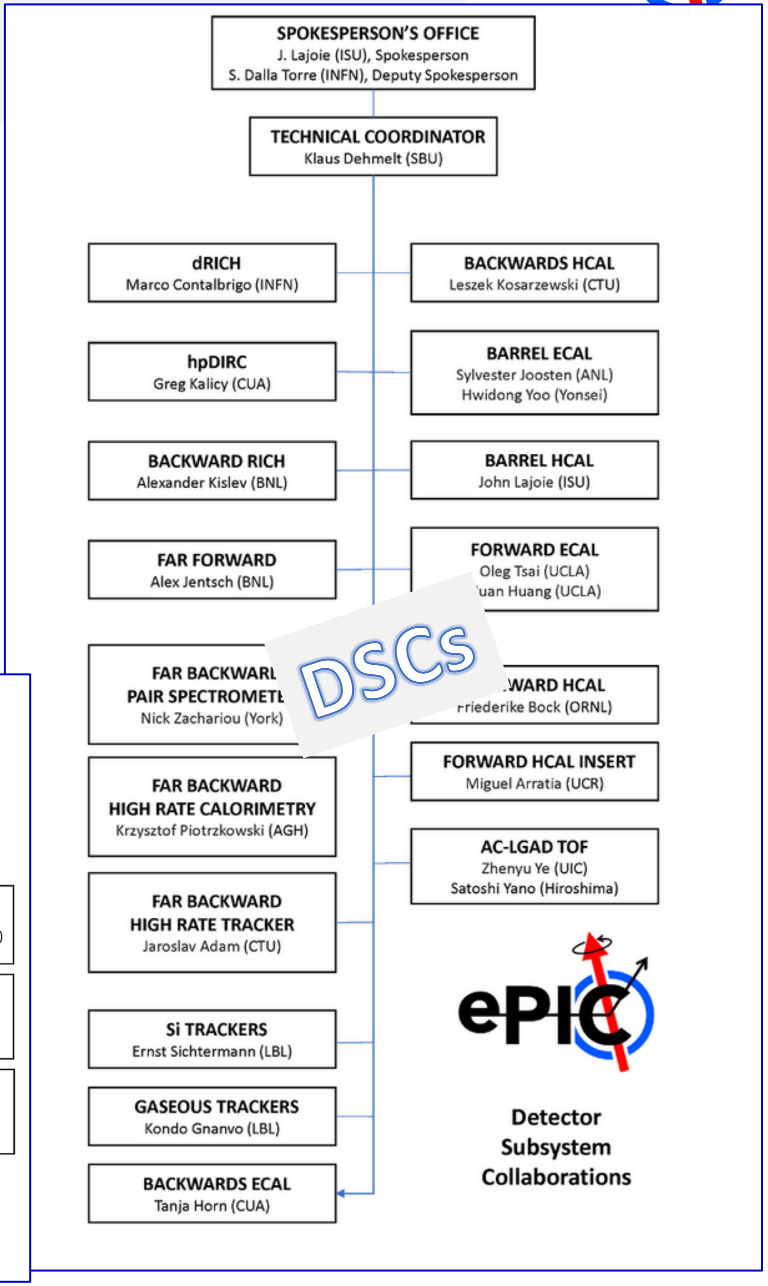
management

Thank you !

WGs



DSCs



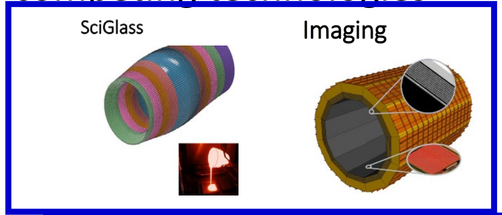
ePIC handling processes for technology choices, the barrel ECal and the backward RICH cases

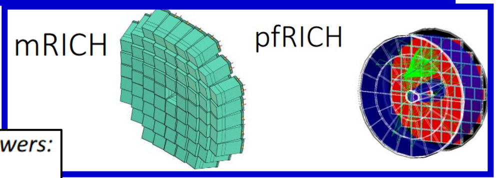
Why ?

- March 13, 2022 – EIC Project encourages proto-collaboration to "…integrate new experimental concepts and technologies that improve physics capabilities without introducing inappropriate risk."
- Spring/Summer 2022 – Barrel ECal and backwards PID identified by GD/I as consolidation items requiring additional scrutiny.

Preparatory phase

- October '22 – March '23:
  - First ePIC simulation campaign with 2 geometry concepts to support simulation studies for competing technologies
- Barrel ECal and backwards PID guidance to proponents, committee charge developed.
- External review committee members identified.
- GD/I review preparation meetings:
  - (ECal) https://indico.bnl.gov/event/17940/ ;
  - (bRICH) https://indico.bnl.gov/event/18140/, https://indico.bnl.gov/event/18221





Internal Reviews

- Barrel Ecal review: https://indico.bnl.gov/event/18517/

(at the INDICO site: charge to proponents, charge to reviewers and review report)

- Backward RICH: https://indico.bnl.gov/event/18499/

(at the INDICO site: charge to proponents, charge to reviewers and review report)

REVIEW Pannels: GD/I & external reviewers

Many thanks to our external reviewers:

Etiennette Auffray (CERN)
Tom LeCompte (SLAC)
Rainer Novotny (Univ. Giessen)

Many thanks to our external reviewers:

Ichiro Adachi (KEK)
Roberta Cardinale (U. Genova)
Carmelo D'Ambrosio (CERN)
Antonello Di Mauro (CERN)

Recommendation and motion approval

- SP-office and proto-EB → Recommendations
- April 14, 2023 : Recommendations presented at the ePIC General Meeting
- April 21, 2023 : Recommendations presented at the CC Meeting, motions to initiate the change control process presented
- May 1, 2023 : as result of a CC voting process, the motions to initiate the change control process are approved

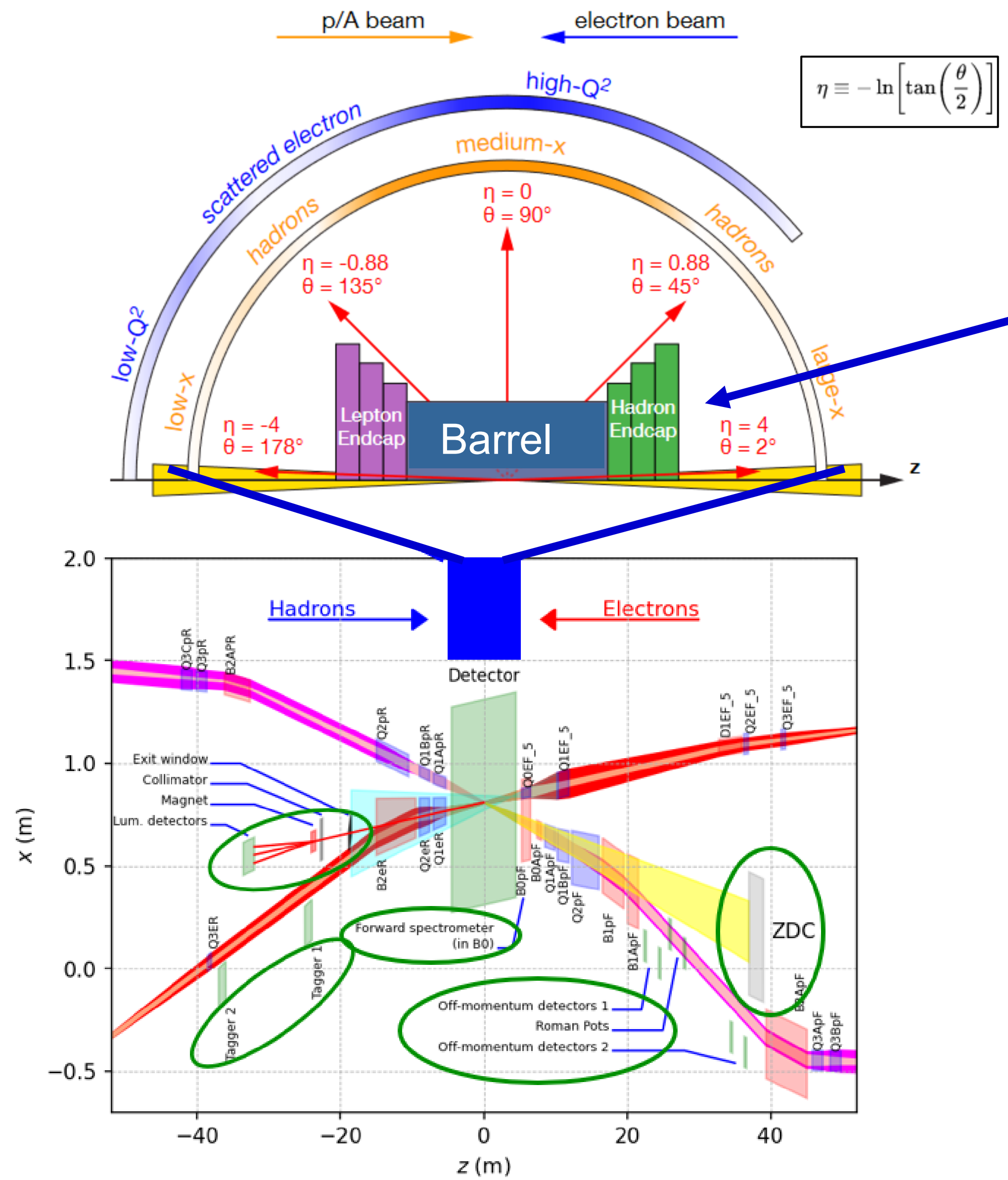
First meeting of ePIC proto Executive Board (proto-EB):

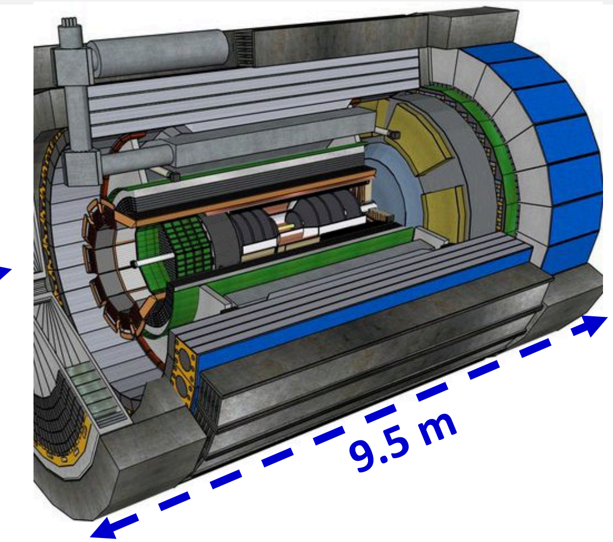
- **Members:** J. Lajoie, S. Dalla Torre, K. Dehmelt, M. Diefenthaler, R. Reed, S. Fazio
- **CC Chair/Vice Chair (invited):** E. Sichtermann, B. Surrow *(invited, non-voting)*
- **Temporary EB Members:** B. Jacak, O. Evdokimov, T. Gunji, D. Higinbotham
- **External Input Solicited:** P. Jones, P. Newman

OUTLOOK

- The composition and the structure of the ePIC Collaboration
- The ePIC detector moving towards the TDR

ePIC, an extended detector





Central Detector (CD)

Total size detector: ~75m

Central detector: ~10m

Far Backward electron detection: ~35m

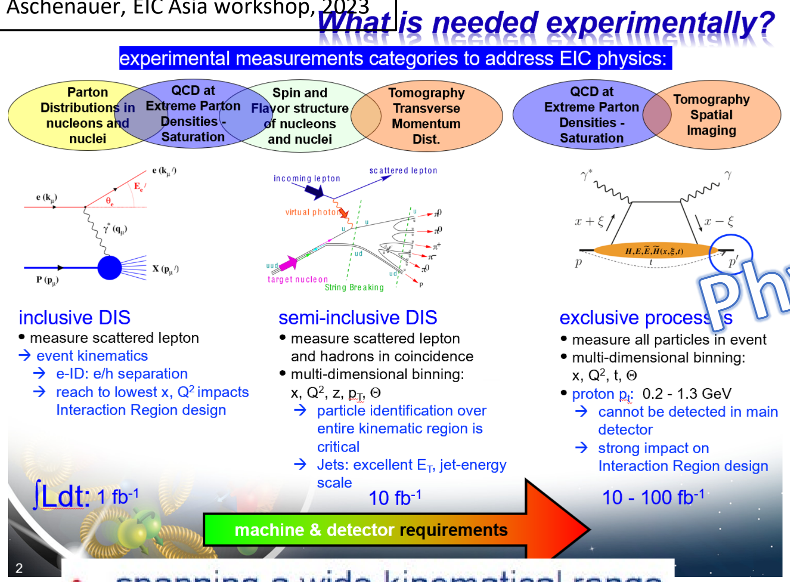
Far Forward hadron spectrometer: ~40m

Auxiliary detectors needed to tag particles with very small scattering angles both in the outgoing lepton and hadron beam direction (B0-Taggers, Off-momentum taggers, Roman Pots, Zero-degree Calorimeter and low Q2-tagger).

ePIC detector, the challenges

Background

E.C. Aschenauer, EIC Asia workshop, 2023



- spanning a wide kinematical range
  - **ECM: 20 – 141 GeV**

Background sources

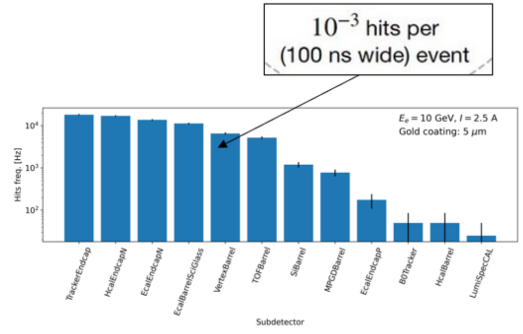
- **Beam-gas induced**
  - Hadron-gas interaction
  - Electron-gas interaction

- **Synchrotron radiation**

rates in kHz	5x41 GeV	5x100 GeV	10x100 GeV	10x275 GeV	18x275 GeV	Vacuum
DIS ep	12.5 kHz	129 kHz	184 kHz	500 kHz	83 kHz	
hadron beam gas	12.2kHz	22.0kHz	31.9kHz	32.6kHz	22.5kHz	10000Ahr
	131.1kHz	236.4kHz	342.8kHz	350.3kHz	241.8kHz	100Ahr
electron beam gas	2181.97 kHz	2826.38 kHz	3177.25 kHz	3177.25 kHz	316.94 kHz	

Main contribution to detector background are from Bethe-Heitler process:

$e_{beam} + H^2_{rest\ gas} \rightarrow e' + \gamma + H^2_{rest\ gas}$



Data from the ePIC wiki page

Bunches and beam crossing rates

Species	p	e	p	e	p	e	p	e	p	e
Beam energy [GeV]	275	18	275	10	100	10	100	5	41	5
$\sqrt{s}$ [GeV]	140.7		104.9		63.2		44.7		28.6	
No. of bunches	290		1160		1160		1160		1160	

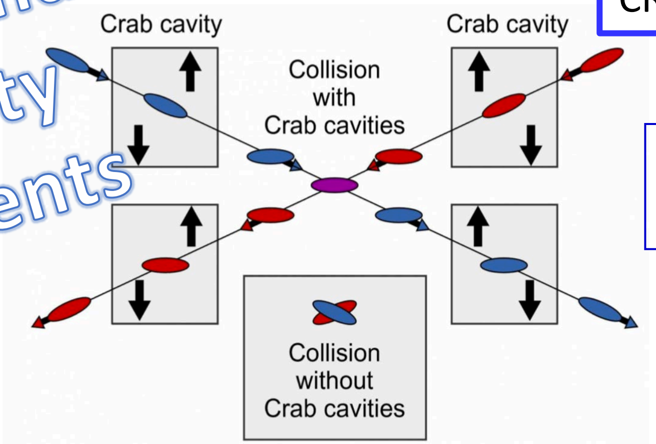
Species	Au	e	Au	e	Au	e	Au	e
Beam energy [GeV]	110	18	110	10	110	5	41	5
$\sqrt{s}$ [GeV]	89.0		66.3		46.9		28.6	
No. of bunches	290		1160		1160		1160	

Data from EIC CDR, 2020

Up to a beam crossing rate at the IP every 10ns, with a max collision rate of ~0.5 MHz (1 event every ~200 bunch crossing)

Machine and luminosity requirements

CRAB CROSSING ANGLE (25 mrad)

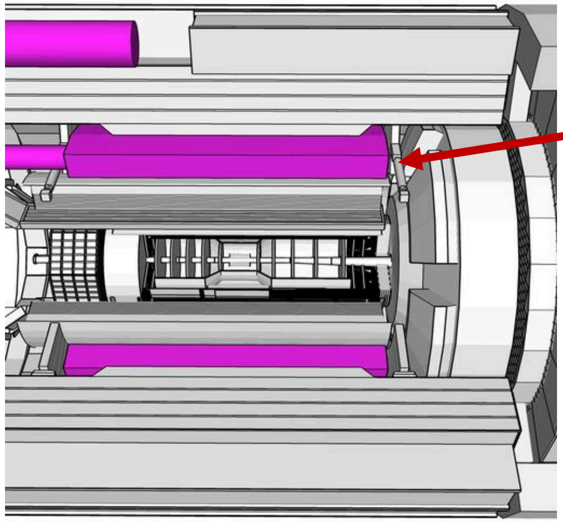


Head-on collision is restored by rotating the bunches before colliding and, then, back ("crab crossing")

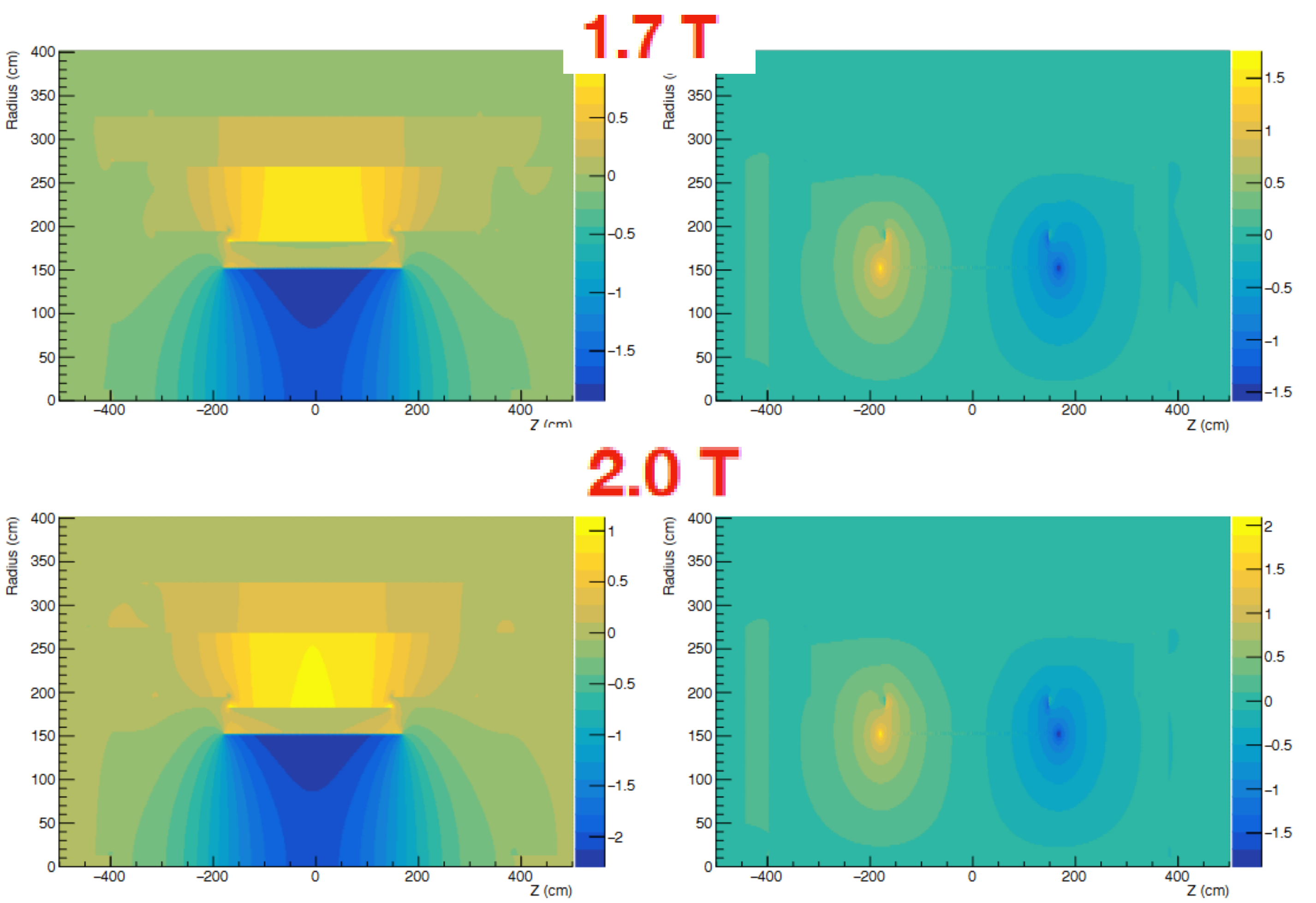
ePIC detector, the CD solenoid

@ ePIC meeting:
Talk by Valerio Calvelli on Thursday morning

The choice of a new in Spring 2022



magnetic field (Tesla) in **Z direction** magnetic field (Tesla) in **radial direction**;



- Design to operate at 1.7 T
- It can provide up to 2 T

Review in October 2022: 60% design readiness confirmed!

ePIC detector, tracking

@ ePIC meeting:
Talk by Ernst Siechterman
on Wednesday afternoon

ePIC

CHALLENGES

- Efficient pattern recognition
- Very low material budget for the central tracking region not exceeding 5% X/X_0 (p resolution!)
- Solenoidal magnetic field
  - Fine ∫ B· dl in the barrel
  - Limited ∫ B· dl in the endcaps
- Limited lever arm
  - Solenoid and overall detector design constrains in the barrel
  - IR design in the endcaps
- “low” interaction rate (< 0.5 GHz), but background !

STATEGIES

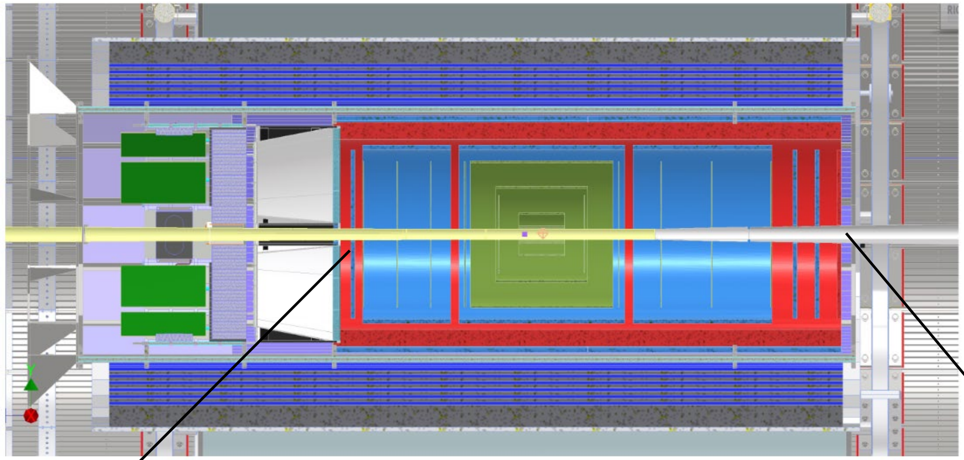
- Redundancy of the measured space point coordinates
- Monolithic Active Pixel Silicon (MAPS)
  - Guiding example: the inner tracking in ALICE (ALPIDE chip, also used in sPHENIX)
- Fine space resolution – fine granularity Si sensors
- Synergies among detector components (backward ECal, barrel ECal, RICH counters, …)
- Good time resolution to disentangle signal and background: this cannot be provided by MAPS, use additional MicroPattern Gaseous Detector layers

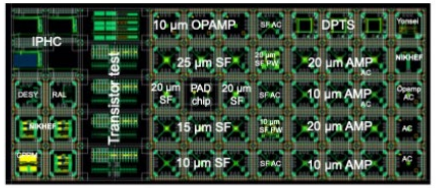
ePIC detector, tracking

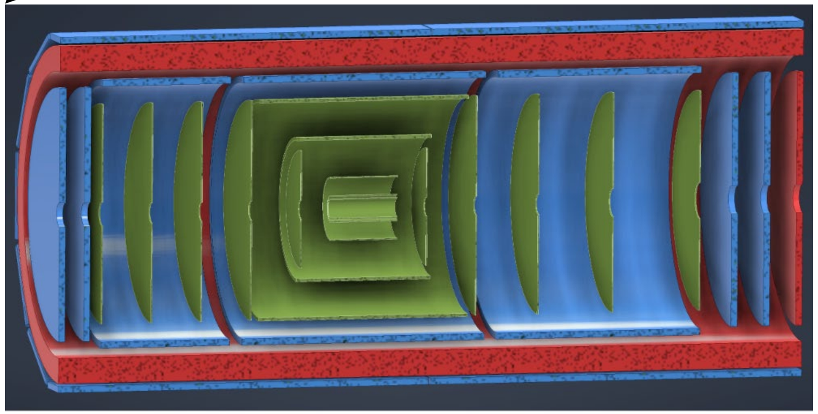
Ongoing layout optimization

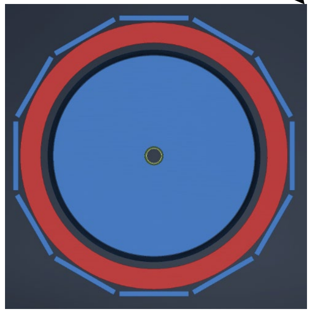
Monolithic Active Pixel Silicon (MAPS) Tracker:

- 1 single technology: 65-nm MAPS
  - O(20 µm) pitch, <20 mW/cm^2
  - No fine time resolution: signal length O(~5 µs)
  - Developed for ALICE ITS3
- Silicon VERTEX (3 layers)
  - First layer @ R ~ 4 cm
  - Material: 0.05% X/X_0 / layer
- Silicon BARREL (2 layers)
  - Material: 0.55% X/X_0 / layer
- F & B Silicon DISKs (5 in Front and Back)
  - Material: 0.24% X/X_0 / layer









SVT MPGDs ToF (fiducial volume)

Multi Pattern Gas DetectorS (MPGD):

2 technologies being considered

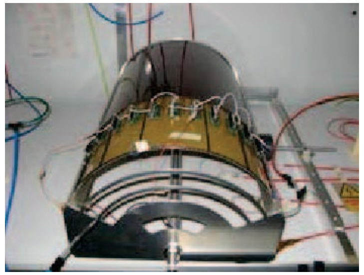
- MicroMEGAS
- µRWELL
- Time resolution < 10 ns

2 geometrical implementations

→ cylindrical (established for MM, R&D for µRWELL)
→ planar

Role of the MPGDs

→ Additional space points for pattern recognition / redundancy
→ time information



ePIC detector, tracking

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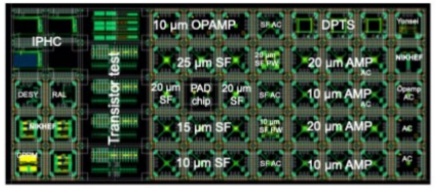
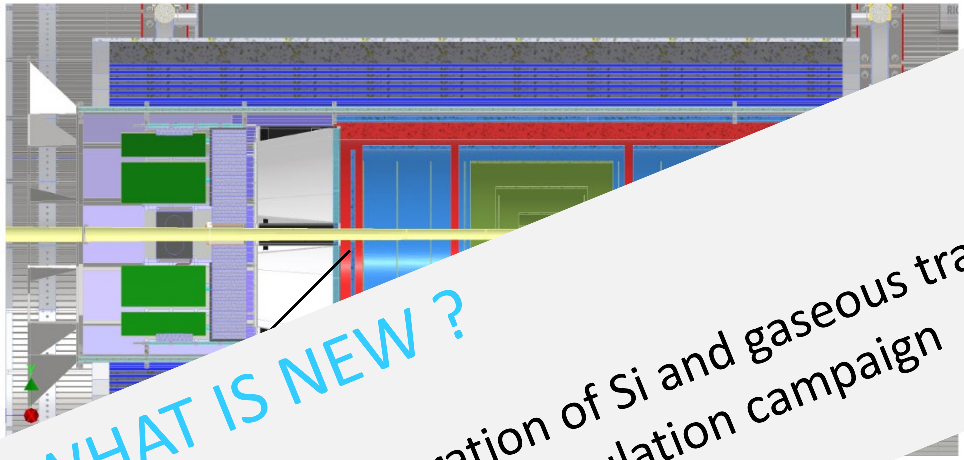
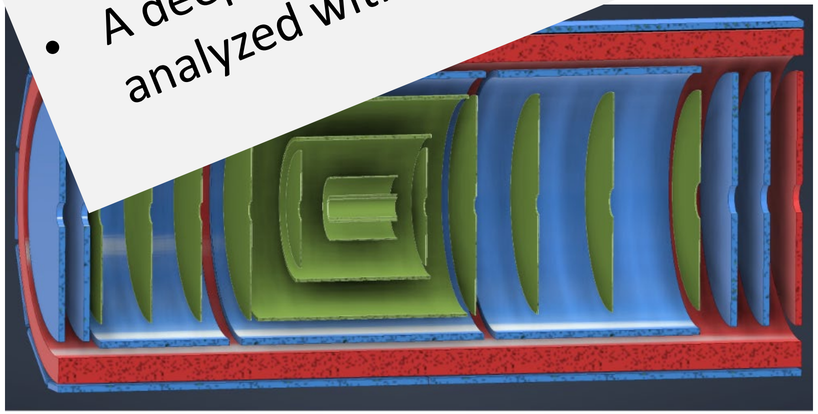
  - Material: 0.24% X/X_0 / layer

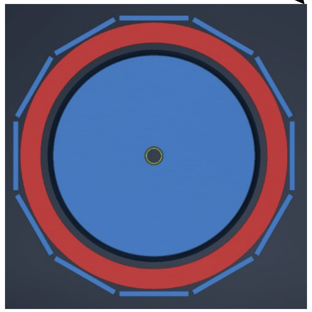




WHAT IS NEW ?

- A deeper integration of Si and gaseous trackers, analyzed with the simulation campaign





SVT MPGDs ToF (fiducial volume)

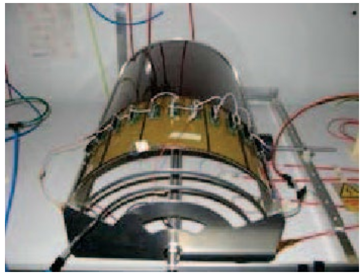
Multi Pattern Gas DetectorS (MPGD):

2 technologies being considered
- MicroMEGAS
  μRWELL
  Time resolution < 10 ns

Geometrical implementations
→ cylindrical (established for MM, R&D for μRWELL)
→ planar

Role of the MPGDs

→ Additional space points for pattern recognition / redundancy
→ time information



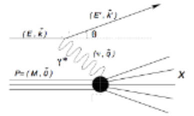
ePIC detector, electromagnetic calorimetry

@ ePIC meeting:
Talk by Oleg Tsai
on Friday afternoon

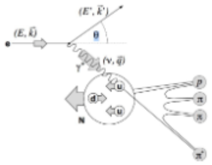
Electron/photon PID, energy, angle/position:

Coverage (in rapidity and energy), resolution, e/π, granularity, projectivity

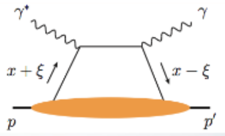
Inclusive DIS: scattered electron



Semi-Inclusive DIS: $\pi0 \rightarrow \gamma\gamma$, HF $\rightarrow$ e

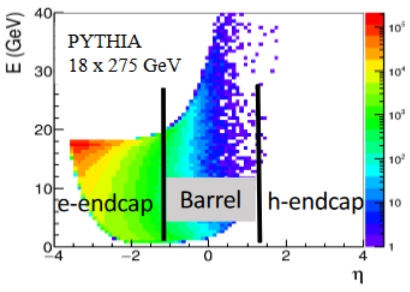


Exclusive DIS: DVCS photons, J/ψ→ee etc.

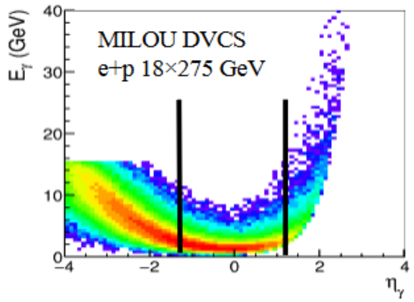


Alexander Bazilevsky,
Calorimetry Review, 2022

DIS e

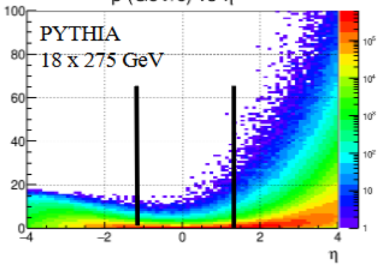


DVCS photons

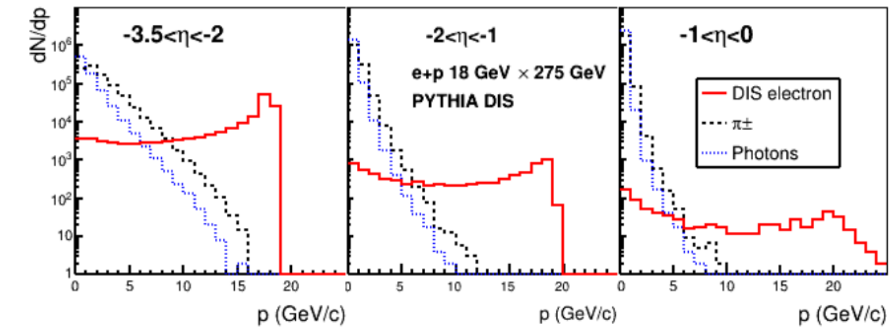


SIDIS π0

p (GeV/c) vs η



DIS kinematics: ePID

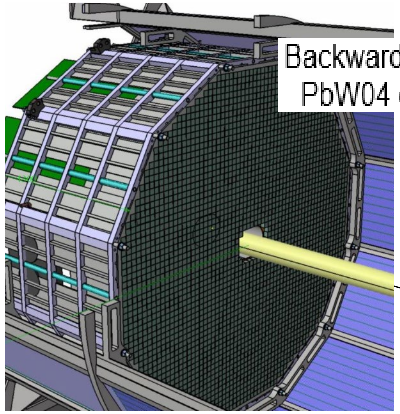


Detector Requirements: Summary

	σ_E/E	E range, GeV	$\pi^{\pm}$ suppression (In combination with other subsystems)	$\pi0/\gamma$ discr.
e-endcap	$\frac{(2-3)\%}{\sqrt{E}} \oplus (1-2)\%$	0.05–18 GeV	Up to 10^4	Up to 7 GeV/c
Barrel	$\frac{(7-10)\%}{\sqrt{E}} \oplus (1-3)\%$	0.05–50 GeV	Up to 10^4	Up to 10 GeV/c
h-endcap	$\frac{(10-12)\%}{\sqrt{E}} \oplus (1-3)\%$	0.1–100 GeV	Up to 10^4	Up to 50 GeV/c

- Continuous acceptance (particularly from e-endcap to barrel)
- Photosensors and FEE tolerate magnetic field
- Operate at full luminosity and expected background conditions (rad. dose, neutron flux)
- Minimal material budget on the way from the vertex (particularly for e-endcap to barrel)

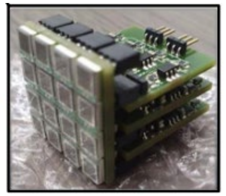
ePIC detector, electromagnetic calorimetry



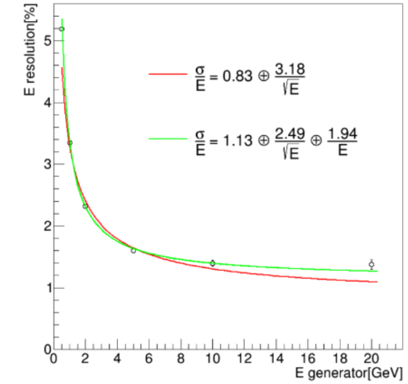
Backwards EMCal
PbW04 crystals

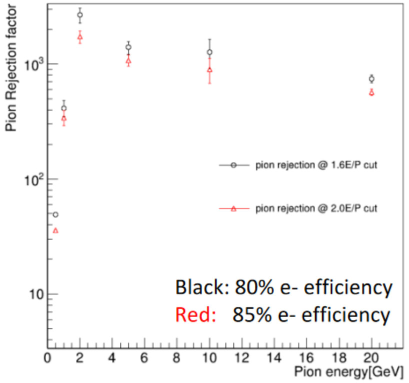
Concept based on a recent PWO calorimeter at JLab

SiPM 4x4 per crystal



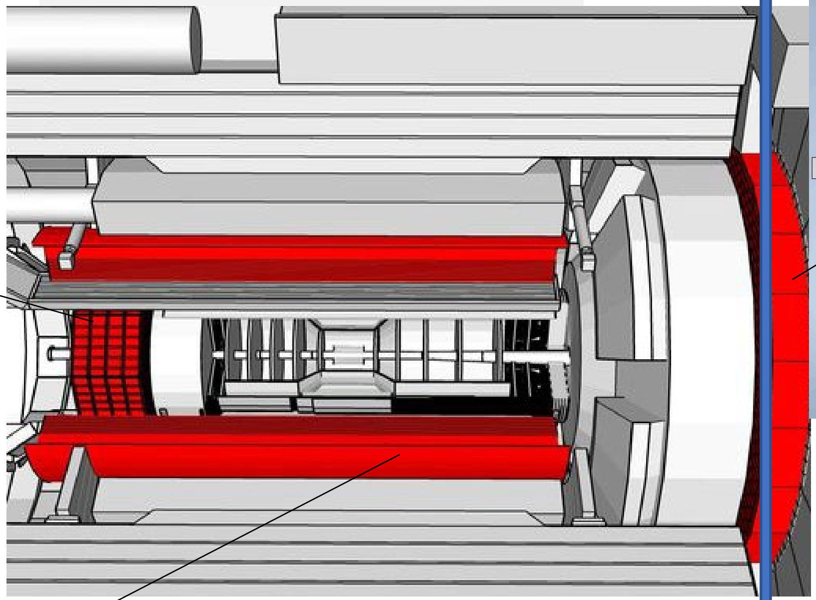
Carlos Muñoz Camacho, Calorimetry Review, 2022

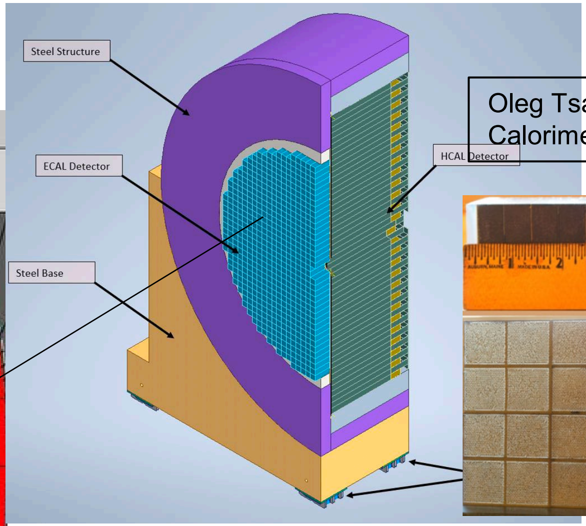




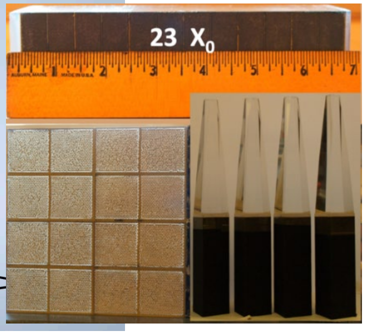
Black: 80% e- efficiency
Red: 85% e- efficiency

SiPMs of all Calorimeters





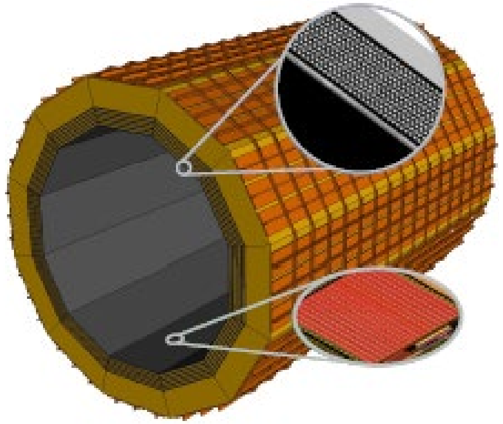
Oleg Tsai, Calorimetry Review, 2022

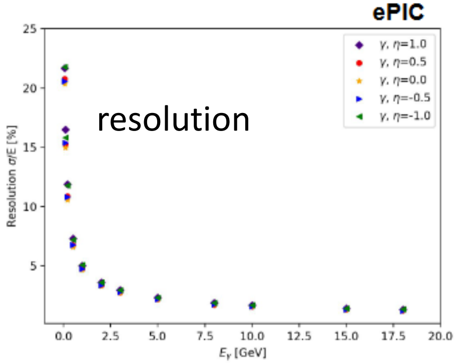


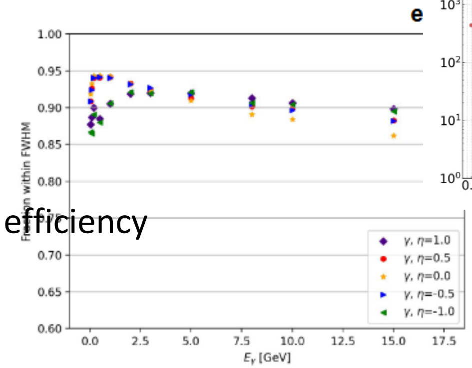
WScFi is a unique technology allowing to achieve e/h ~1 (response to hadrons) and at the same time keep em energy resolution at ~10%/√ E + 2%

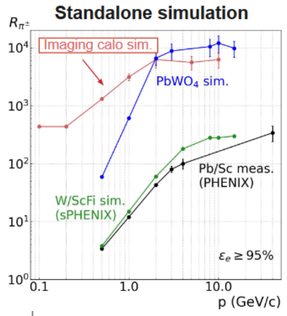
4 (6) layers of imaging calorimetry by Astropix MAPS, and sampling calorimetry by Pb/SciFi

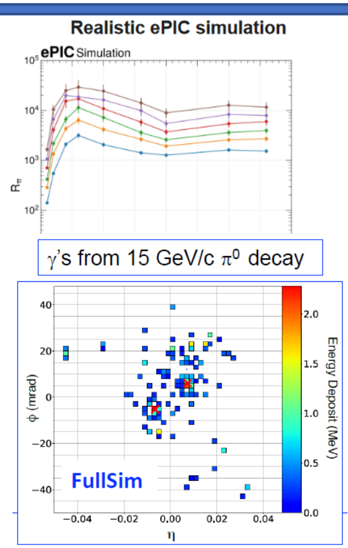
Maria Zurek, GD/I Review, 2023





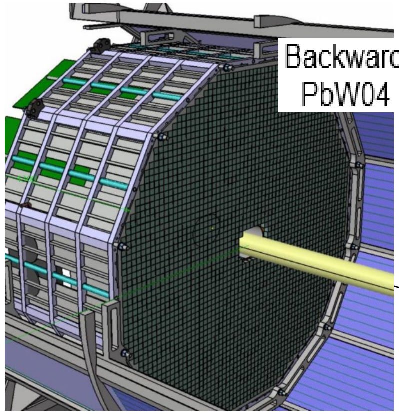




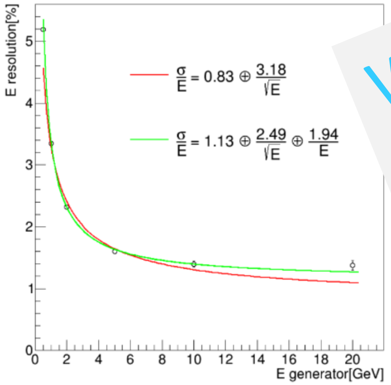


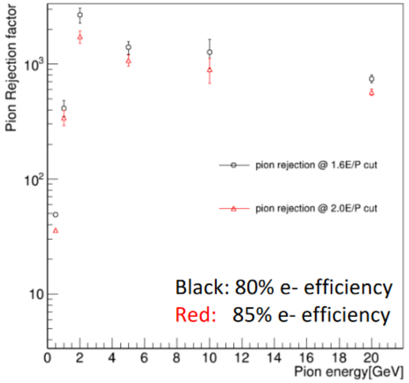
joie, S. Dalla Torre)

ePIC detector, electromagnetic calorimetry

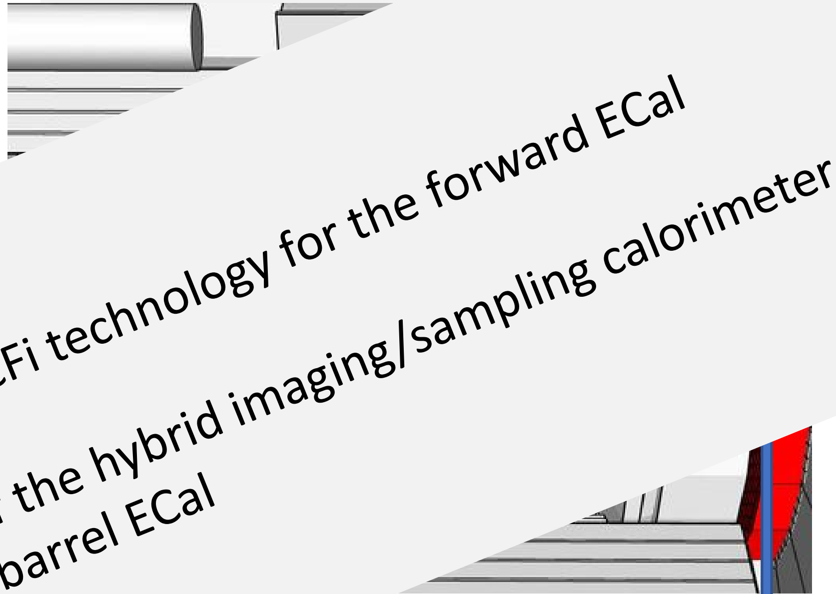


Concept based on a recent PWO calorimeter at JLab



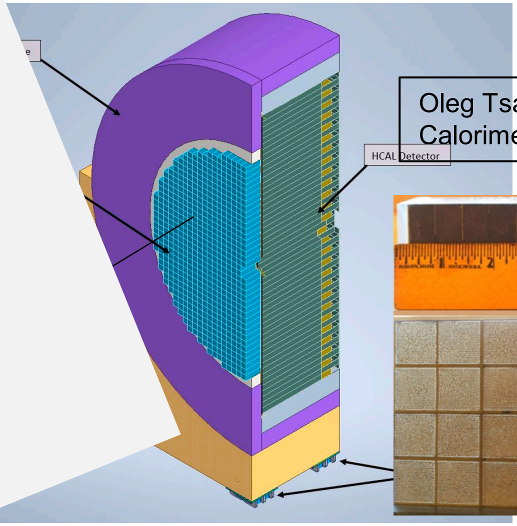


SiPMs of all Calorimete

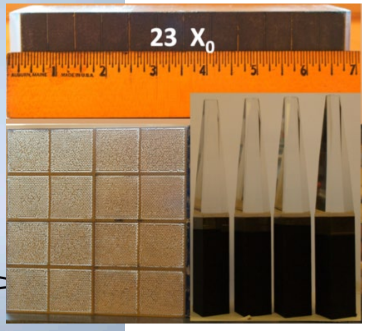


WHAT IS NEW ?

- The choice of WScFi technology for the forward ECal
- The adoption of the hybrid imaging/sampling calorimeter design for the barrel ECal



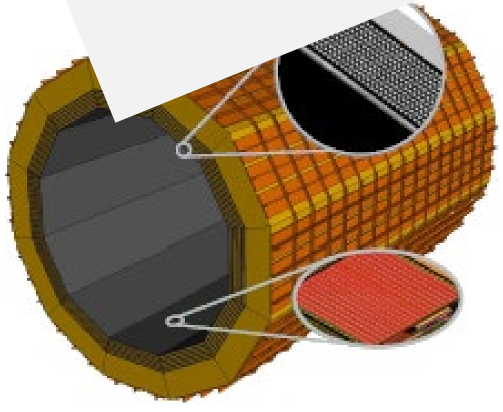
Oleg Tsai, Calorimetry Review, 2022

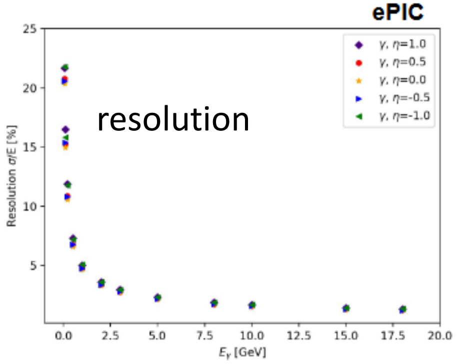


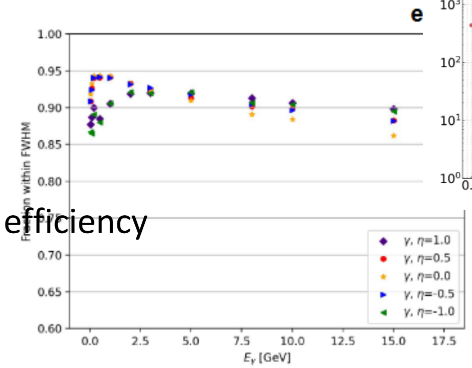
WScFi is a unique technology allowing to achieve e/h ~1 (response to hadrons) and at the same time keep em energy resolution at ~10%/√ E + 2%

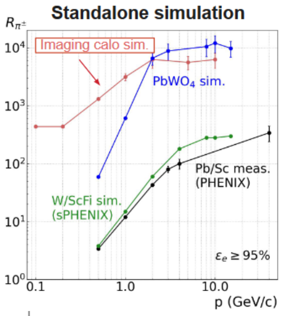
…stropix MAPS, …ry by Pb/SciFi

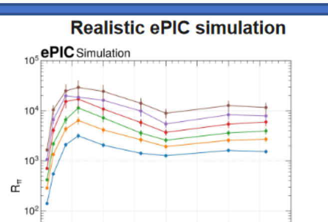
Maria Zurek, GD/I Review, 2023



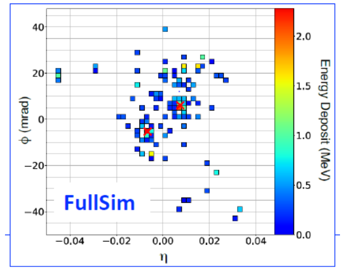








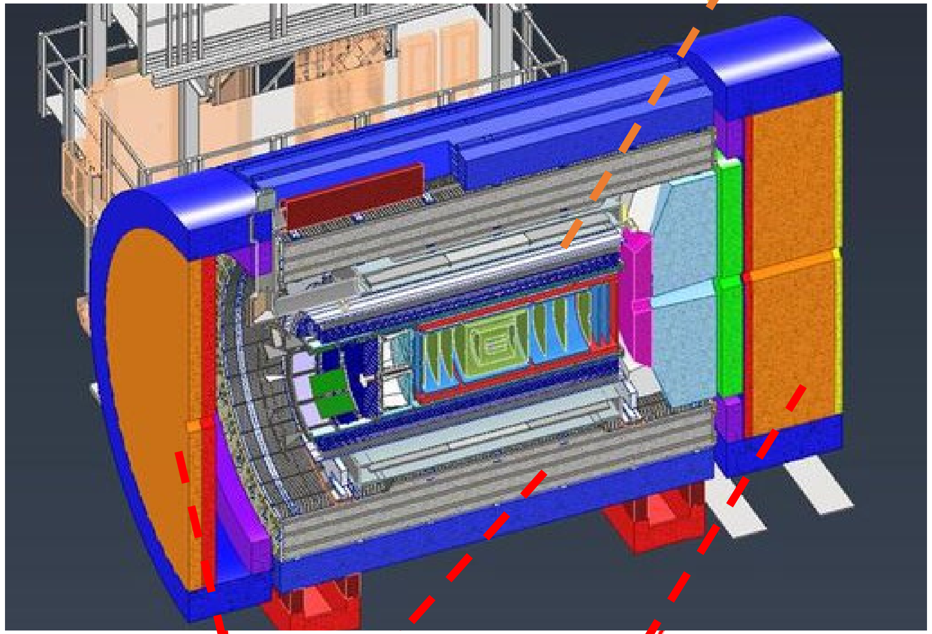
γ's from 15 GeV/c π^0 decay



…joie, S. Dalla Torre)

ePIC detector, the hadron calorimetry

@ ePIC meeting:
Talk by Oleg Tsai
on Friday afternoon



- Jet energy measurement
  - Tag jets with a neutral component
- DIS kinematics reconstruction
  - Hadronic method

- Solenoid flux return
- Additional capability: muon ID

Requirements

η	σ_E/E, %	E_{min}, MeV
-3.5 to -1.0	$50/\sqrt{E}+10$	500
-1.0 to +1.0	$100/\sqrt{E}+10$	500
+1.0 to +3.5	$50/\sqrt{E}+10$	500

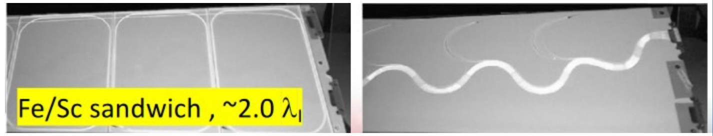
Barrel HCal	Refurbished sPHENIX barrel calorimeter
Backward HCal	Scintillator recycled from STAR endcap EmCal
Forward HCal	Brand new design

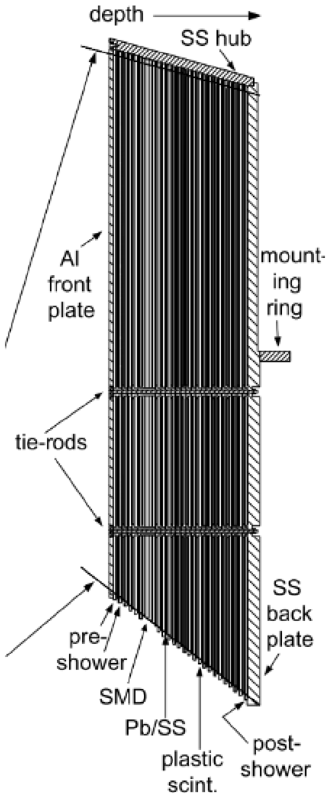
All: sampling sandwich design with WLS fibers & SiPM readout

Alexander Kiselev,
Calorimetry Review, 2022

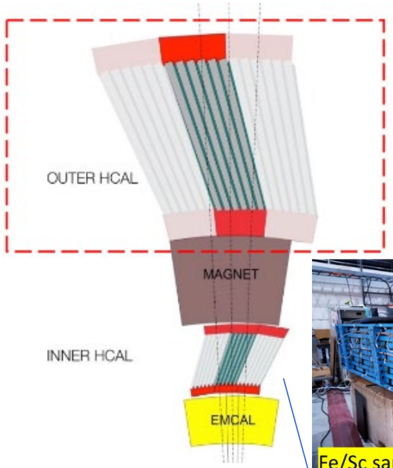
ePIC detector, the hadron calorimetry

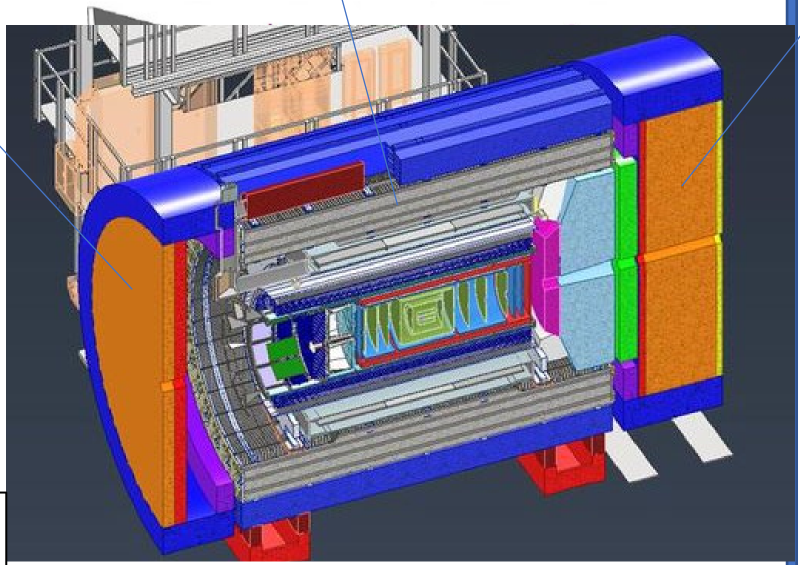
Friedericke Bock,
Calorimetry weekly, 2023

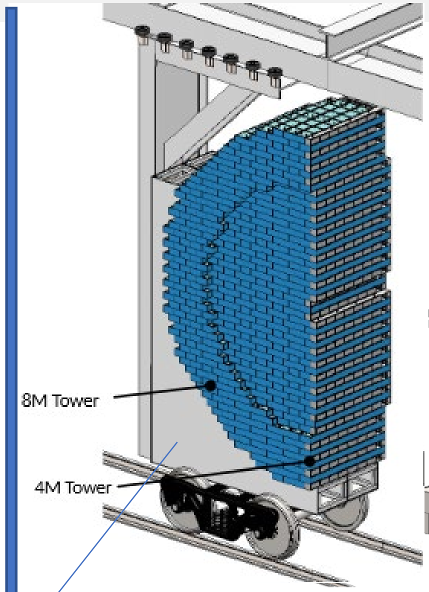




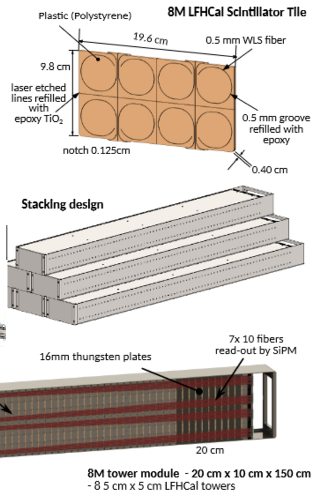
Alexander Kiselev,
Calorimetry Review, 2022





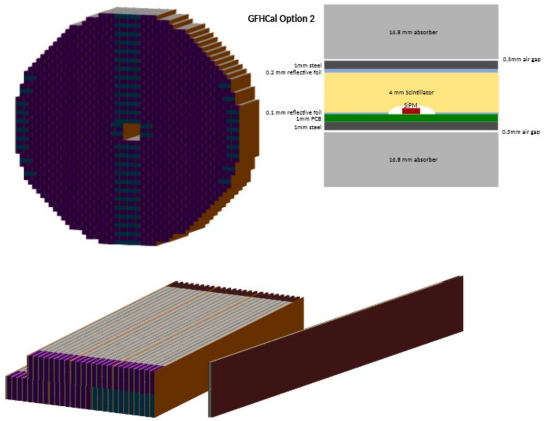


Option 1 (WLS fibers)



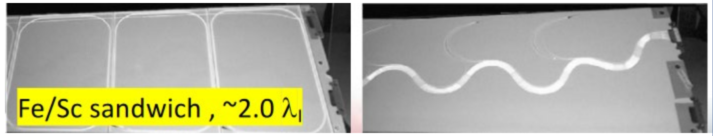
Option 1b (Buried SiPM)

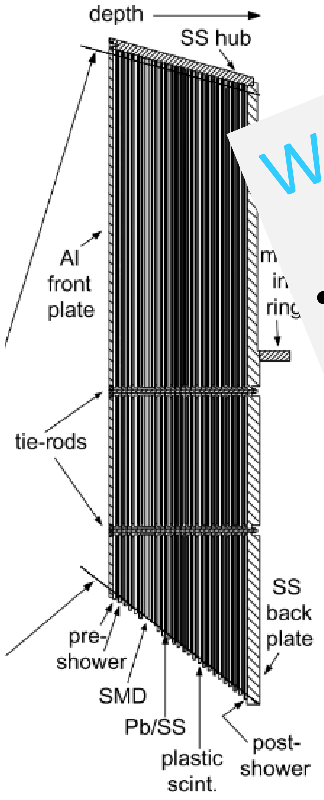
Option 2 - GFHCal



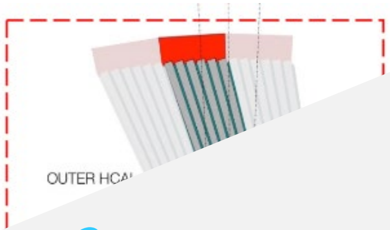
ePIC detector, the hadron calorimet

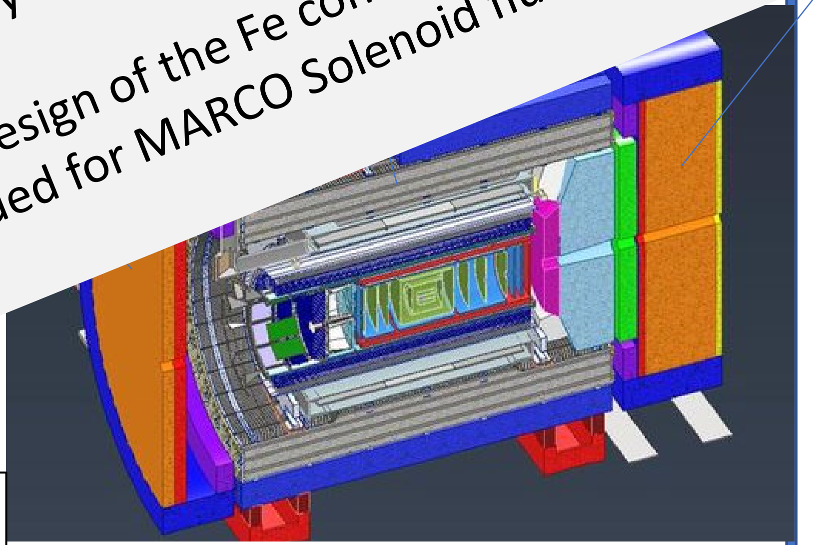
Friedericke Bock,
Calorimetry weekly, 2023





Alexander Kiselev,
Calorimetry Review, 2022

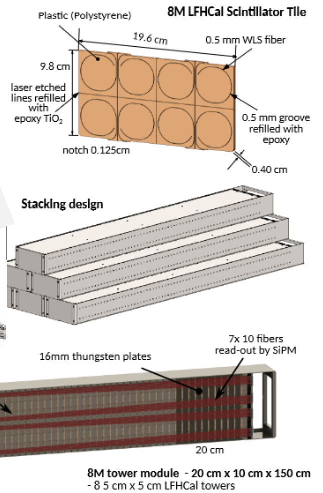




WHAT IS NEW ?

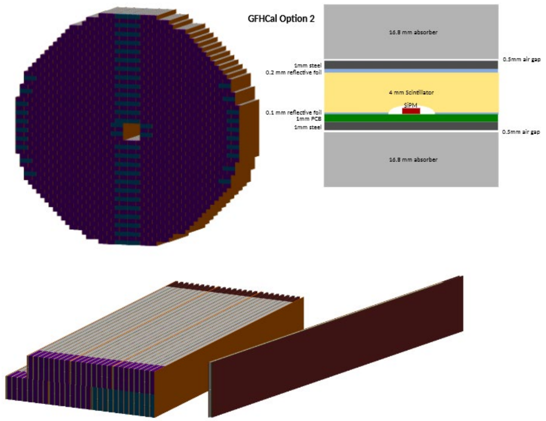
- The variety of layouts under consideration for the forward HCal, with the goal of simplifying the construction and assembly w/o compromising the performance
- The design of the Fe configurations in the various HCals, needed for MARCO Solenoid flux return

Option 1 (WLS fibers)



Option 1b (Buried SiPM)

Option 2 - GFHCal



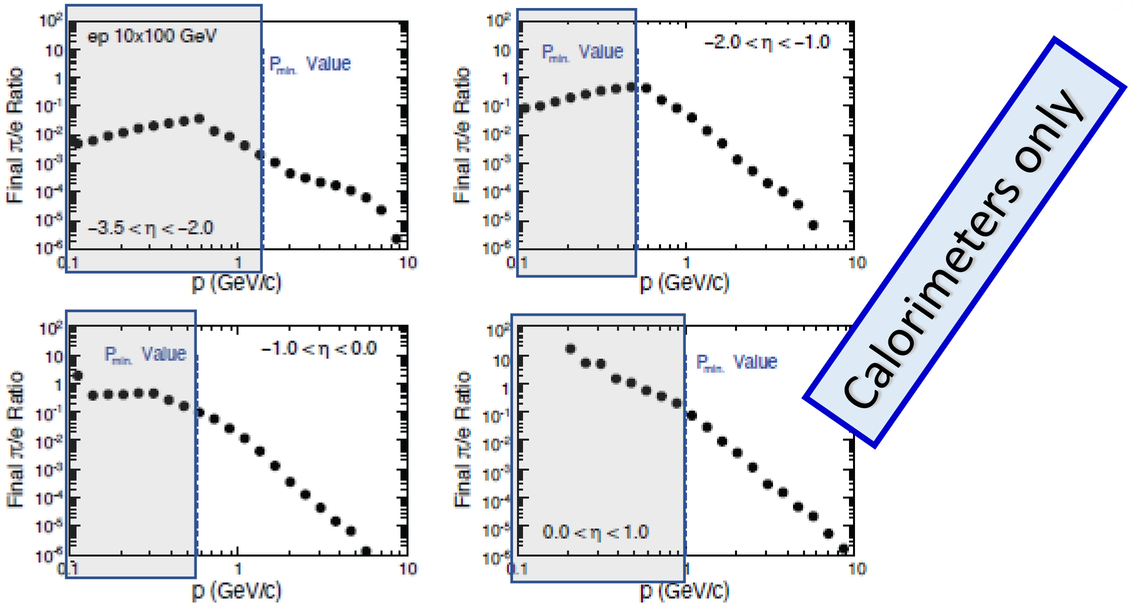
ePIC detector, PID subsystems : double mission

@ ePIC meeting:
Talk by Thomas Ullrich
on Friday morning

e-π separation:

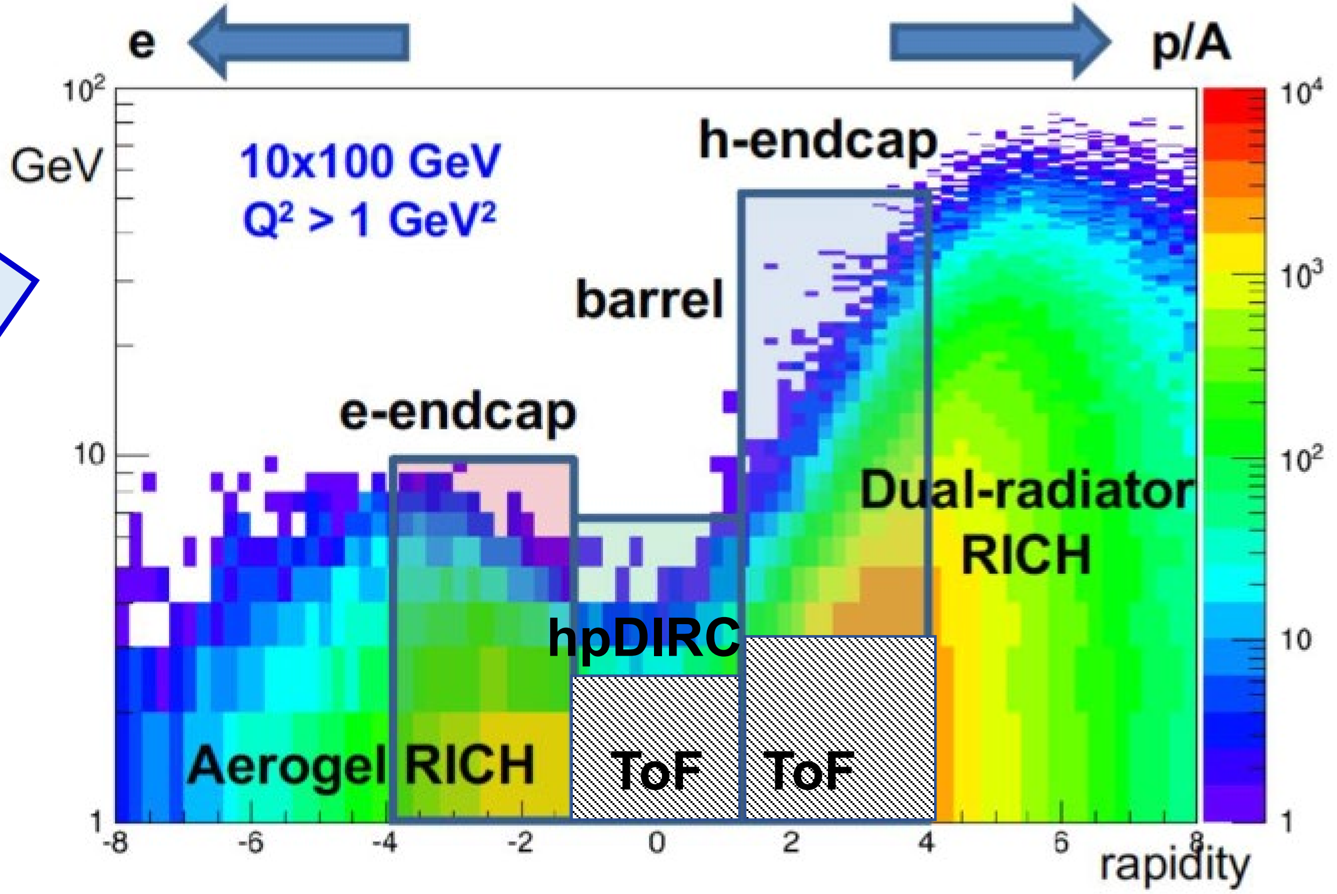
Cherenkov imaging support the Ecal effort, in particular needed at low momenta

(the whole EIC physics scope)



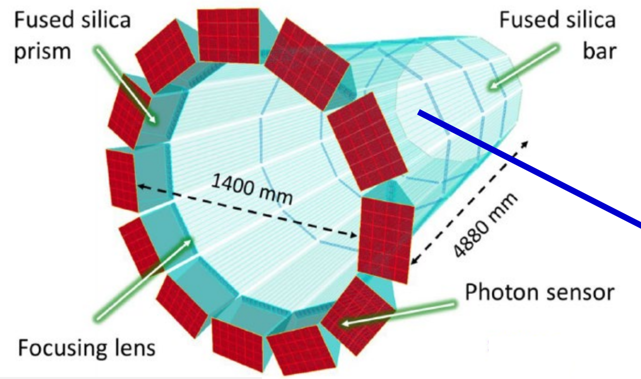
h-PID: Cherenkov imaging complemented with ToF

(SIDIS, heavy flavour, …)



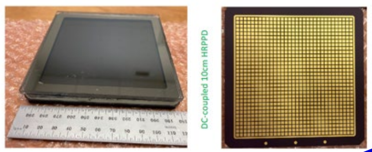
ePIC detector, PID subsystems

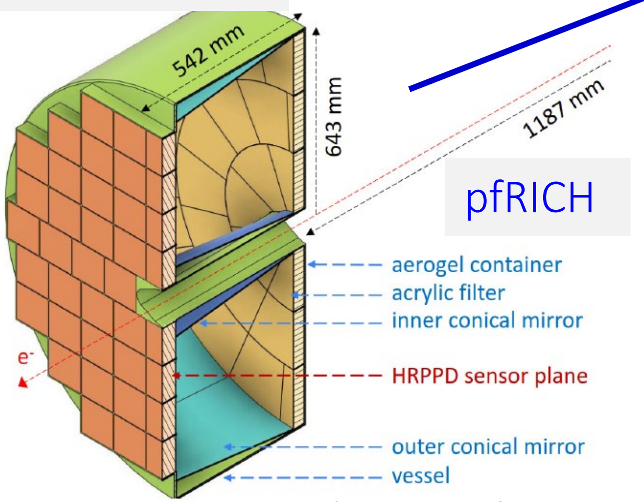
hpDIRC



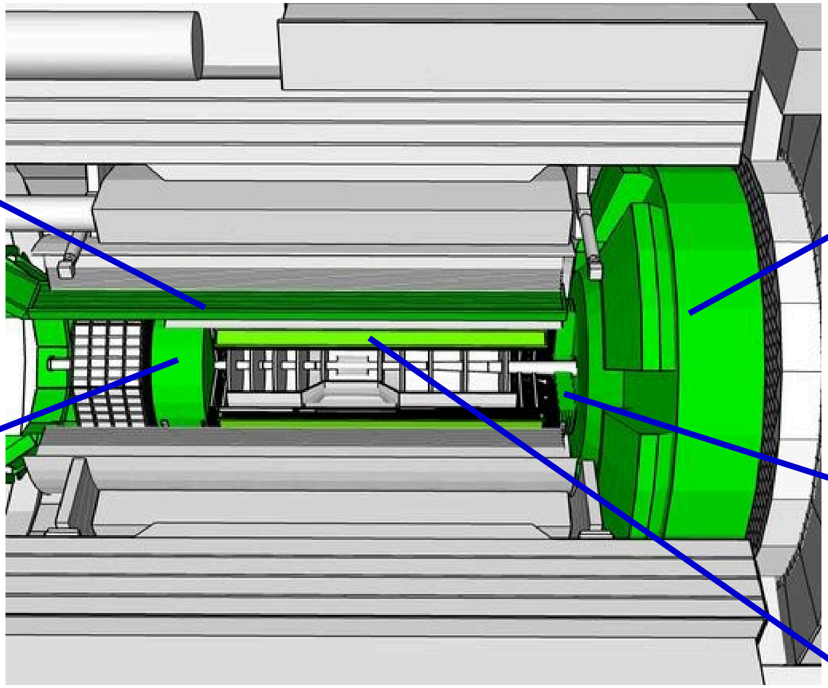
HRPPD photosensors (hpDIRC, pfRICH)
Also providing timing in pfRICH

HRPPD (10 x 10 cm², 10 μm pore)

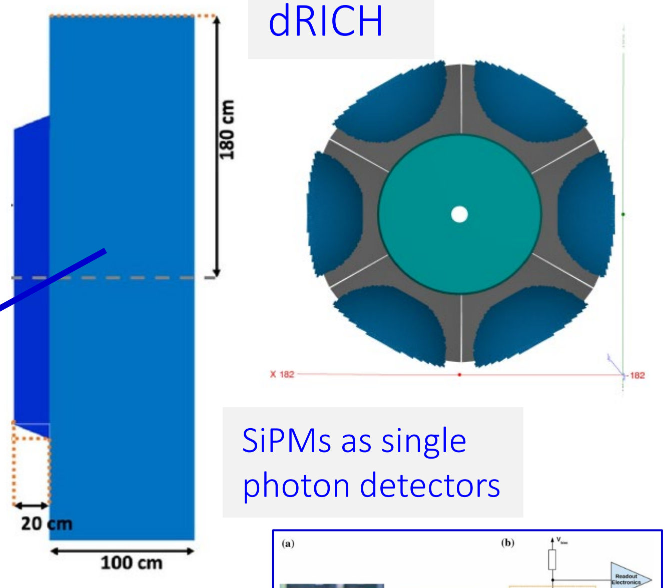




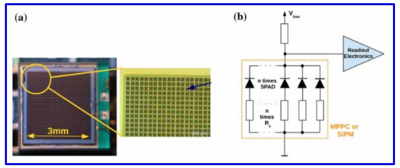
pfRICH



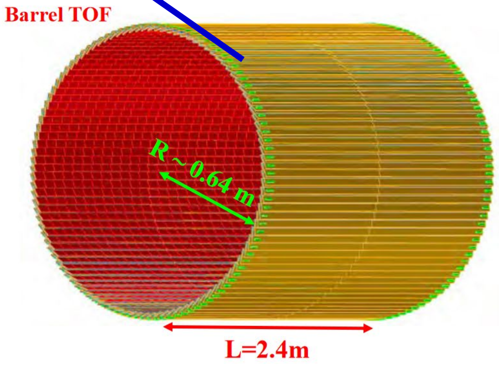
dRICH

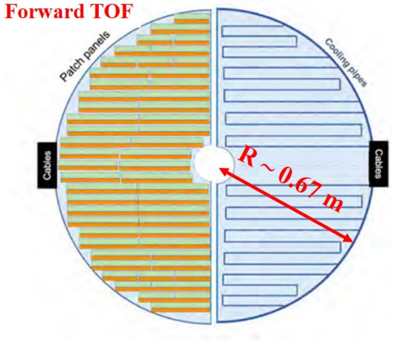


SiPMs as single photon detectors



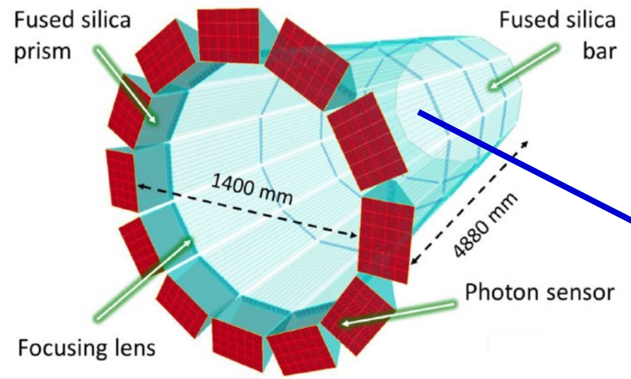
ToF layers by AC-LGADs





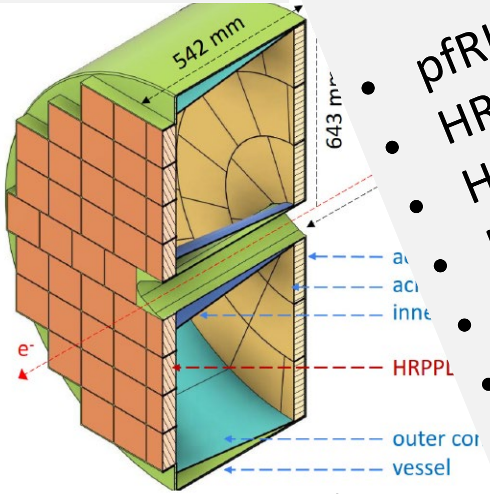
ePIC detector, PID subsystems

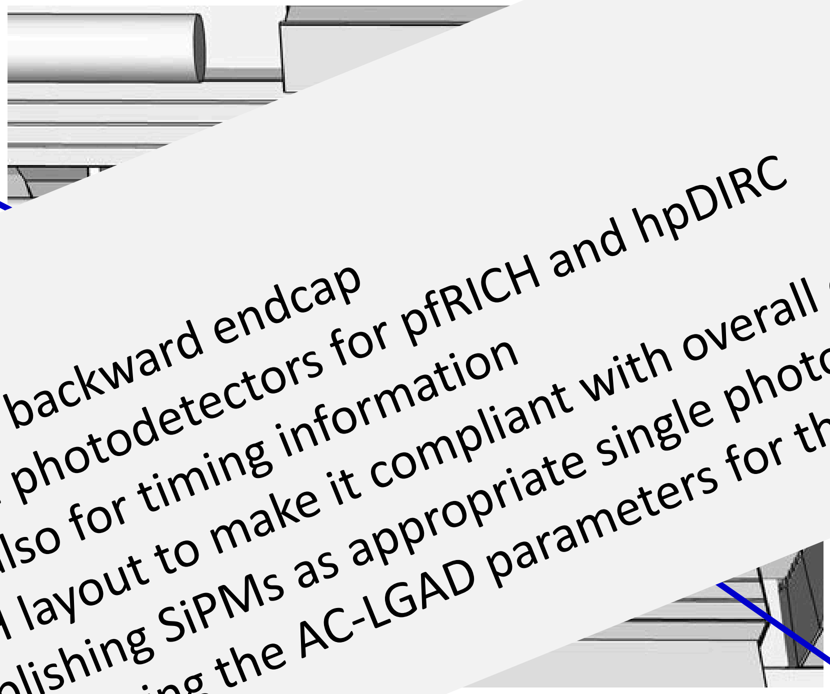
hpDIRC



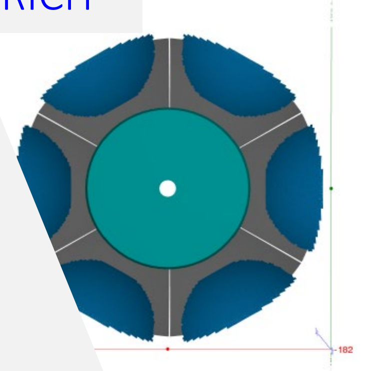
HRPPD photosensors (hpDIRC, pfRICH)
Also providing timing in pfRICH

HRPPD (10 x 10 cm², 10 µm pore)

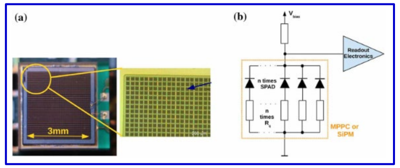




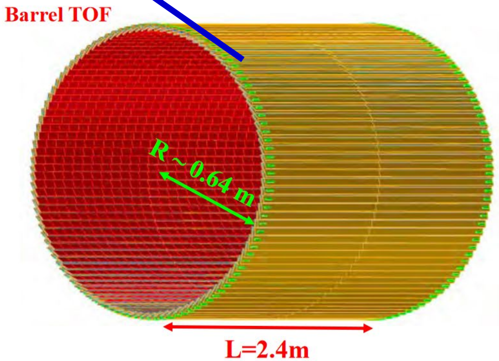
dRICH

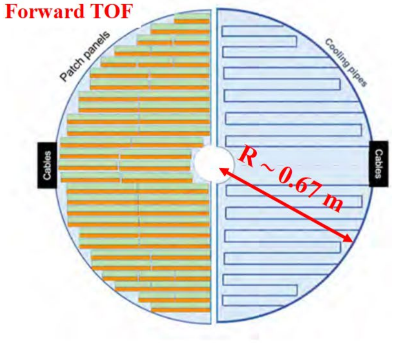


ngle
n detectors



ToF layers by AC-LGADs

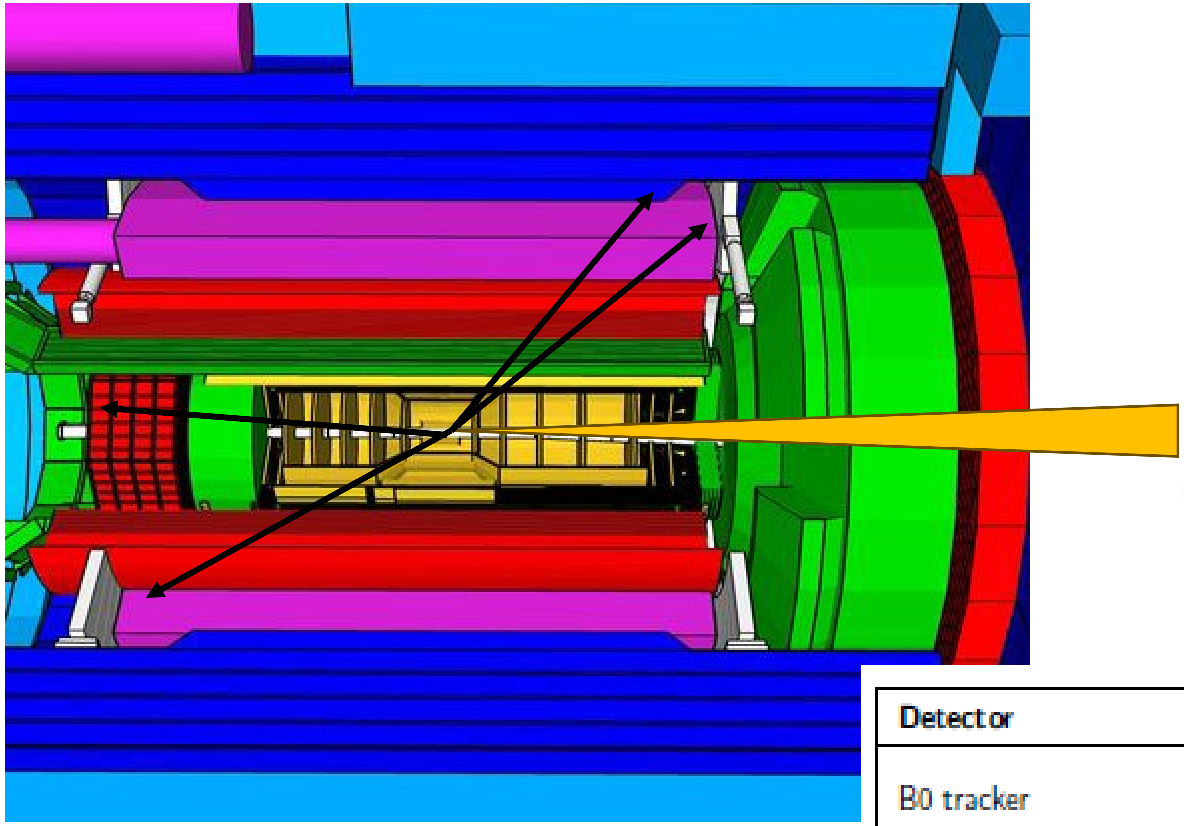


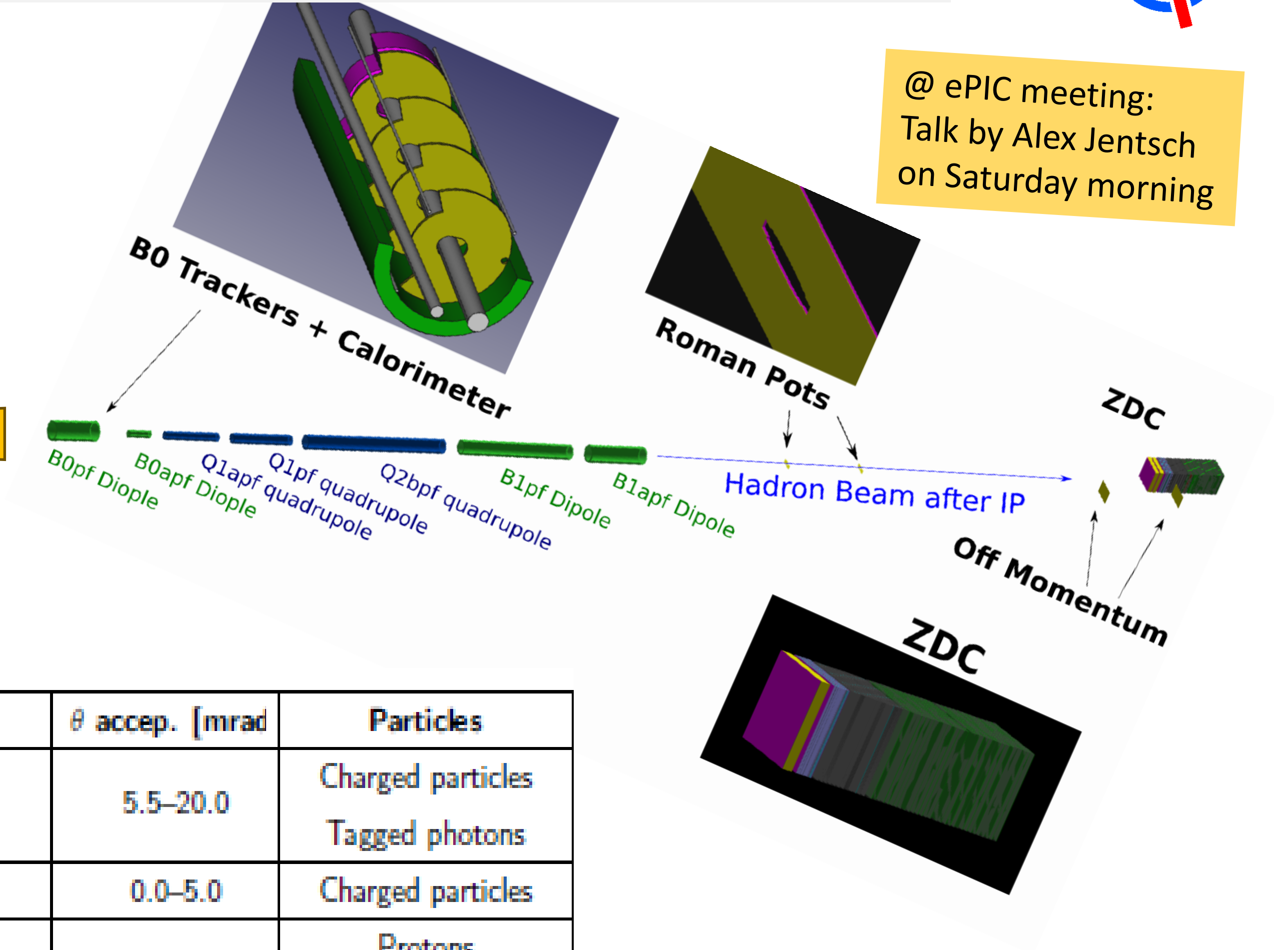


WHAT IS NEW ?

- pfRICH for PID in the backward endcap
- HRPPDs as baseline photodetectors for pfRICH and hpDIRC
- HRPPD in pfRICH also for timing information
- Progress in dRICH layout to make it compliant with overall detector layout
- Progress in establishing SiPMs as appropriate single photon detectors
- Steps forward in defining the AC-LGAD parameters for the ToF layers

ePIC detector, the far forward region



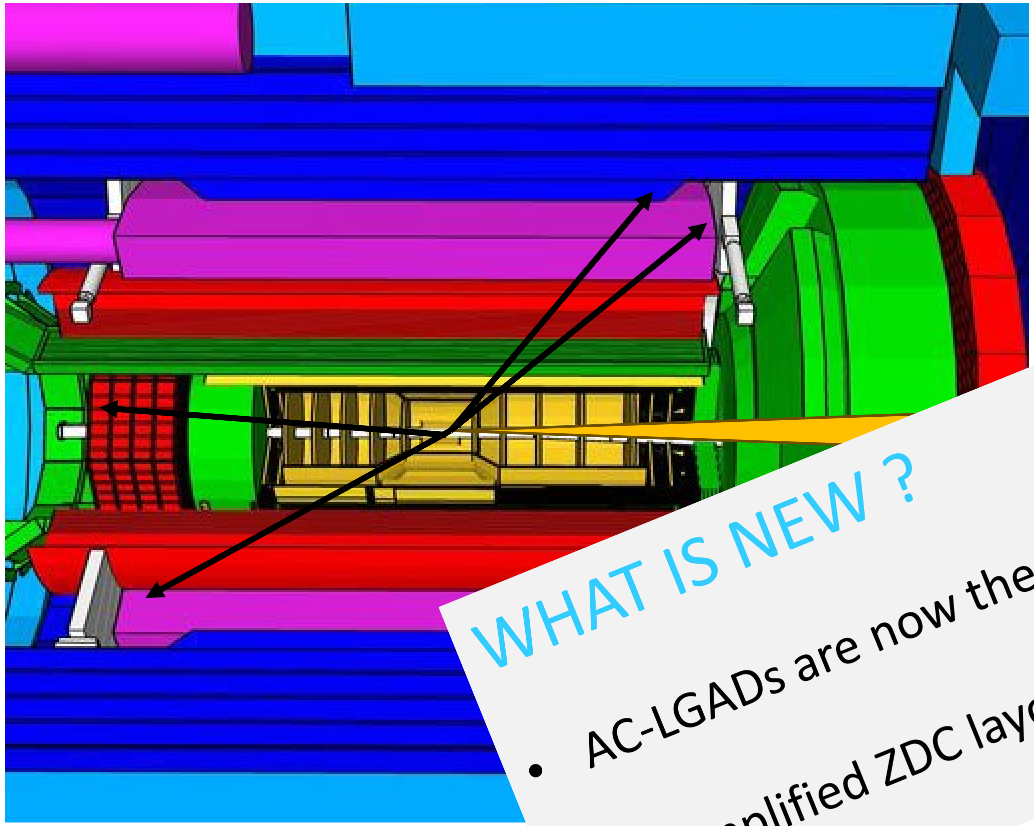


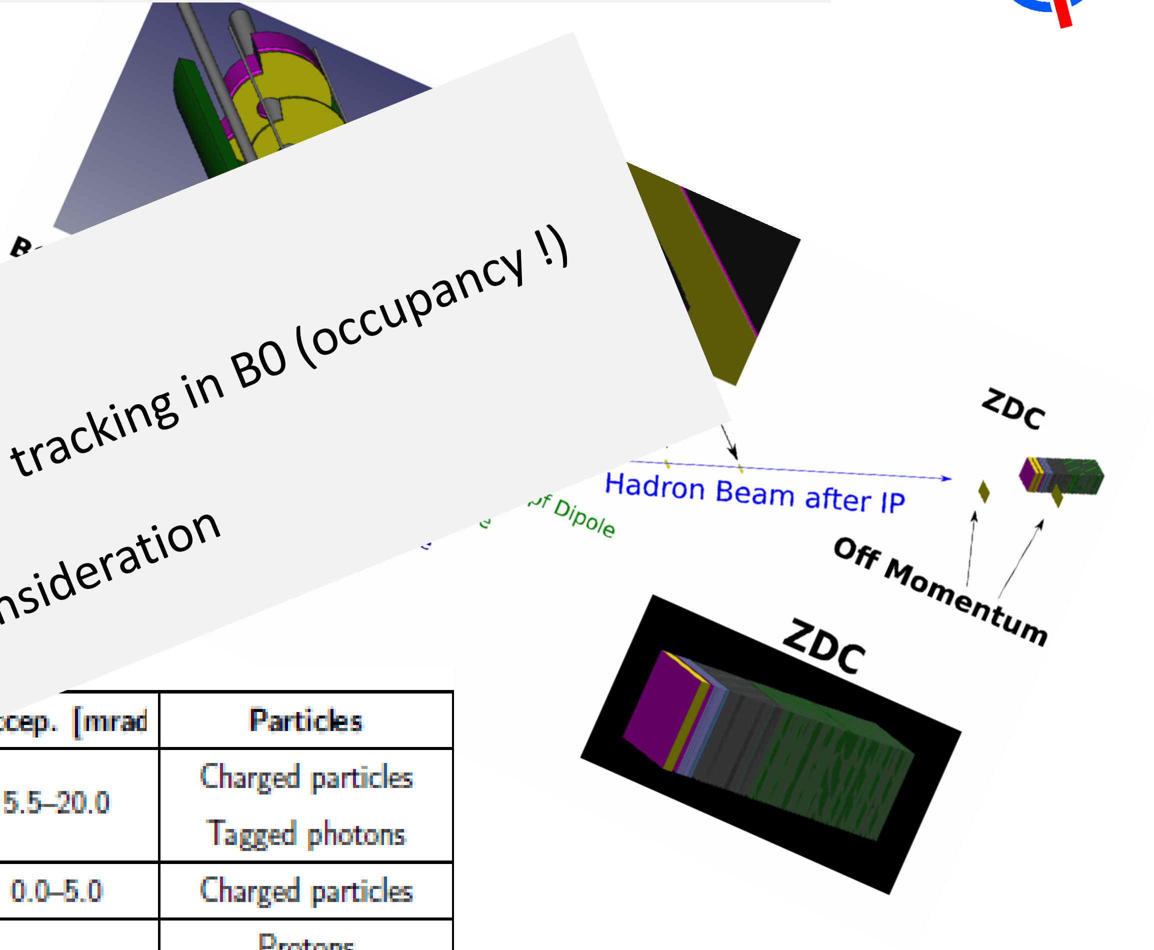
@ ePIC meeting:
Talk by Alex Jentsch
on Saturday morning

Detector	θ accep. [mrad	Particles
B0 tracker	5.5–20.0	Charged particles Tagged photons
Off-Momentum	0.0–5.0	Charged particles
Roman Pots	0.0–5.0	Protons Light nuclei
Zero-Degree Calorimeter	0.0–4.0	Neutrons Photons

Physics channels require tagging of **charged hadrons** (protons, pions) or **neutral particles** (neutrons, photons) at **very-forward rapidities** **($\eta > 4.5$).**

ePIC detector, the far forward region





WHAT IS NEW ?

- AC-LGADs are now the base line for tracking in B0 (occupancy !)
- A simplified ZDC layout under consideration

	accep. [mrad	Particles
	5.5–20.0	Charged particles Tagged photons
Off-Momentum	0.0–5.0	Charged particles
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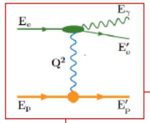
Physics channels require tagging of **charged hadr** pions) or **neutral particles** (neutrons, photons) at **very-for rapidities** **($\eta > 4.5$).**

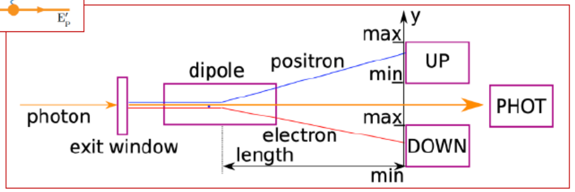
ePIC detector, the far backward region

Luminosity measurement

- measure IP6 luminosity with **an absolute precision better than 1% absolute and a relative precision better than 0.01%** using the electron-ion bremsstrahlung by three largely independent and complementary measurements
- electron detectors will also be used to tag low-Q^2 Events (photoproduction)



principle



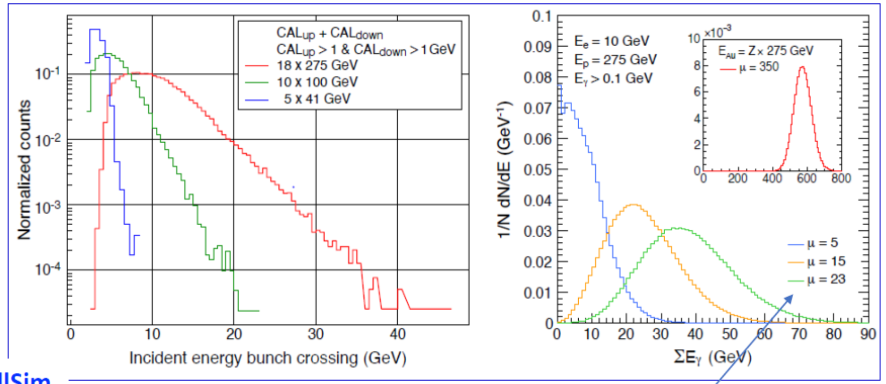
Technologies for the calorimetry:

- Spaghetti W-calorimeter with radiation-hard scintillating fiber, read out with fast PMTs
- Cherenkov-radiating quartz fibers read out by SiPMs

different CM energy

PHOT

different Luminosity



FullSim

L = 2.2, 6.5 and 10 × 10^{33} cm^{-2}s^{-1}, corresponding to the average photon multiplicity μ

27

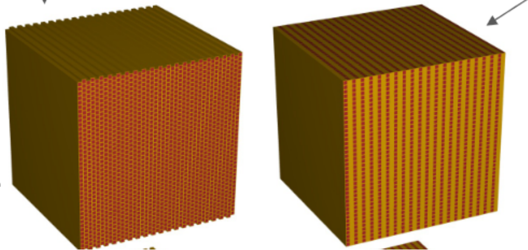
CAL designs

Similar to forward ECAL

Performance and practicality of construction being studied

X fibers

XY fibers



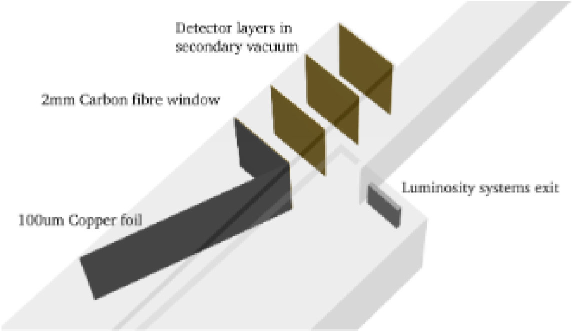
D. Gangadharan,
TIC meeting , 6/26/2023

Low Q^2 taggers

@ ePIC meeting:
Talk by Alex Jentsch
on Saturday morning

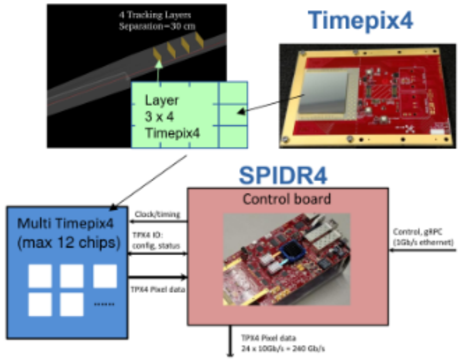
Updated default configuration

Including some integration considerations.
Detectors in secondary vacuum.
2 mm Carbon fibre exit window @ 90 degrees to beam.
100 foil @ 30 degrees to beam.
Lots of optimisation studies still required.
Beam impedance not yet studied just given guidance.



Timepix4

Timepix4 ASIC.
Thin silicon sensor ~ 50μm.
Appropriate rate capabilities.
Good spatial resolution 55μm pixel.
Sub beam bunch timing resolution (~ 2ns currently limited by sensor).
Rates from synchrotron and separation technique unknown.
Need to determine radiation load and tolerance.



S. Gardner,
TIC meeting , 6/26/2023

ePIC detector, the far backward region

Luminosity measurement

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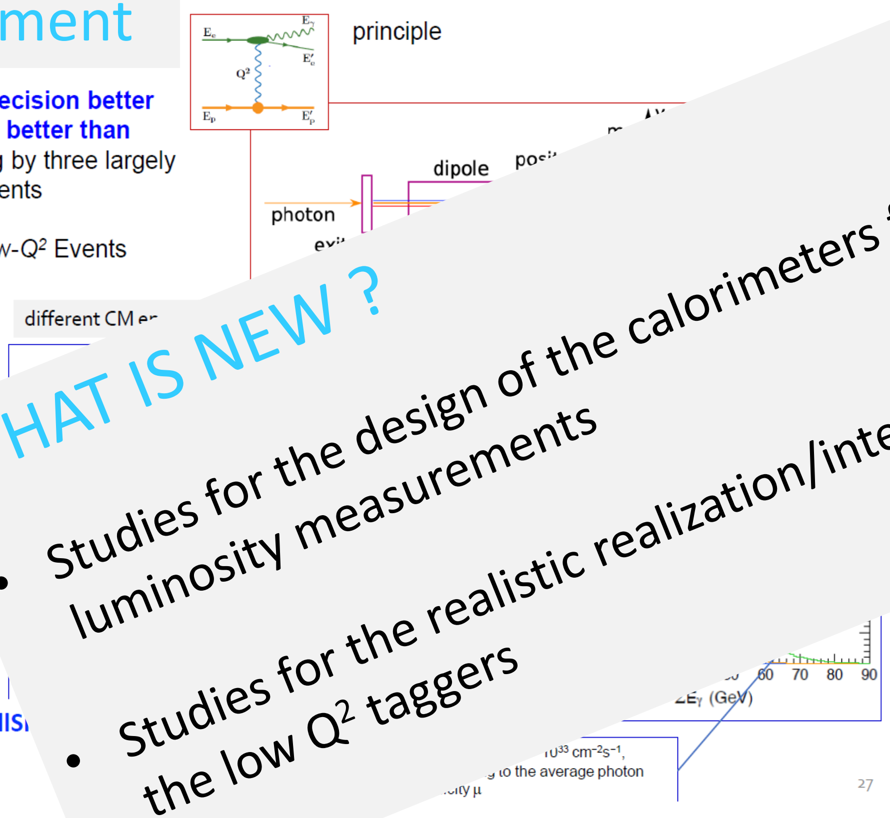


Technologies for the calorimetry:

- Spaghetti W-calorimeter with radiatic hard scintillating fiber, read out with fa PMTs
- Cherenkov-radiating quartz fibers read out by SiPMs

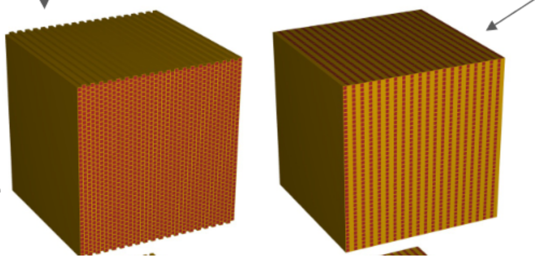
WHAT IS NEW ?

- Studies for the design of the calorimeters for luminosity measurements
- Studies for the realistic realization/integration of the low Q^2 taggers

CAL designs

Similar to forward ECAL

Performance and practicality of construction being studied



D. Gangadharan,
TIC meeting , 6/26/2023

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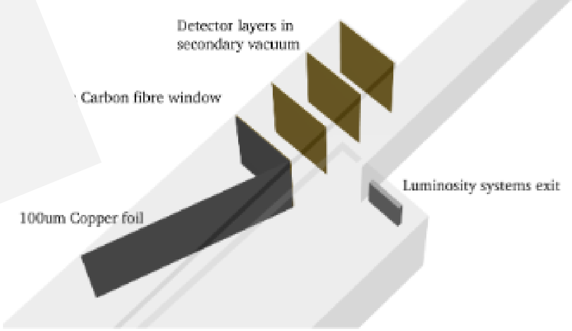

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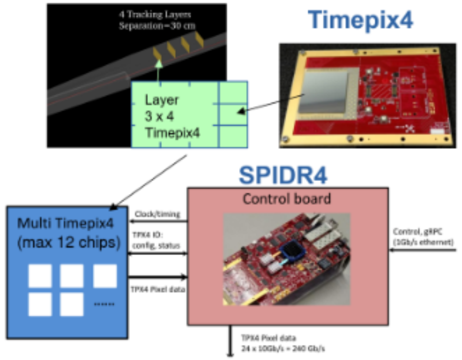
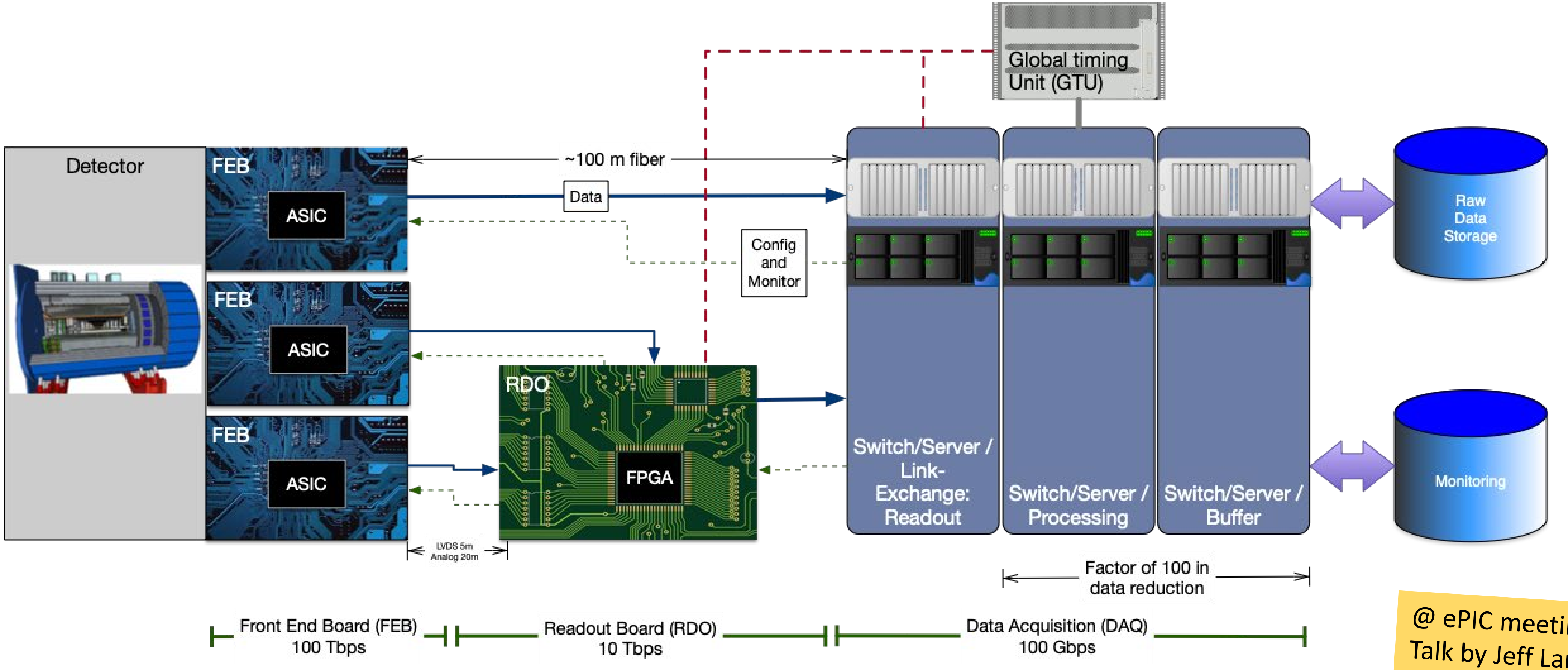


S. Gardner,
TIC meeting , 6/26/2023

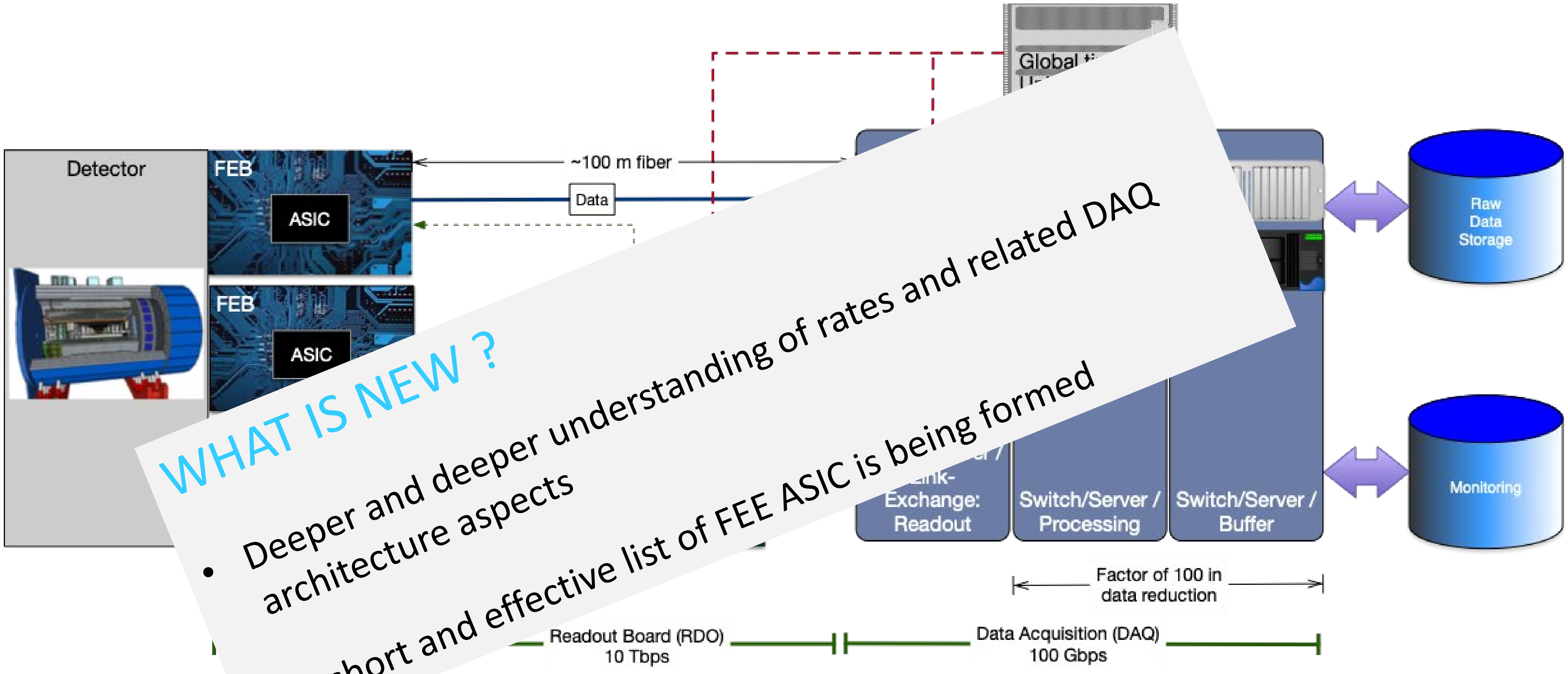
ePIC detector, R-O & electronics & DAQ

A R-O and DAQ architecture with built-in streaming read-out concept



@ ePIC meeting:
Talk by Jeff Landgraf
on Friday afternoon

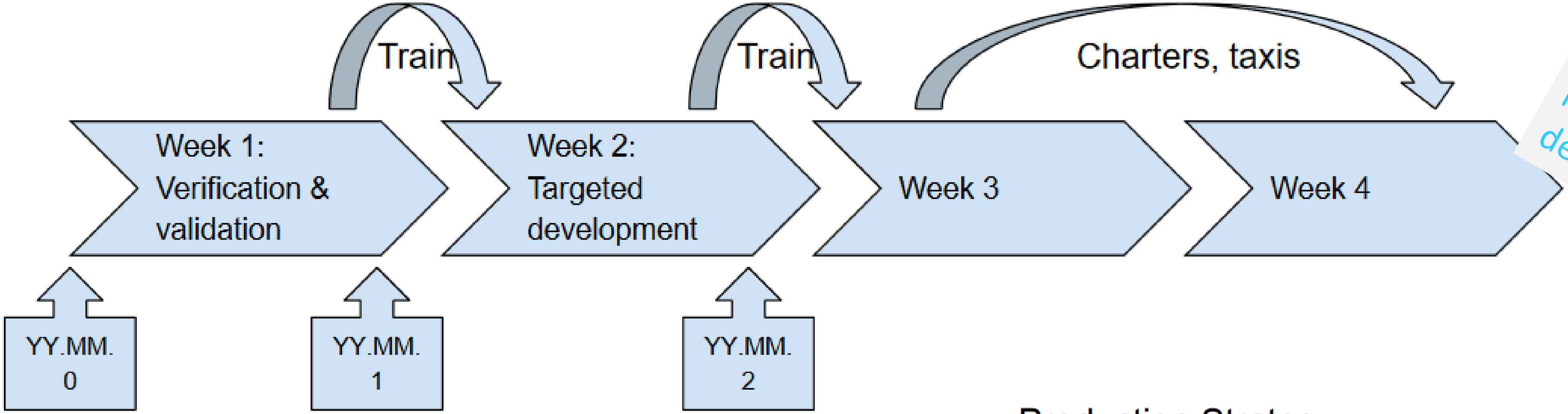
ePIC detector, R-O & electronics & DAQ



WHAT IS NEW ?

- Deeper and deeper understanding of rates and related DAQ architecture aspects
- A short and effective list of FEE ASIC is being formed

ePIC detector, a new strategy for the simulation campaign



Continuous production of data according to needs with every month improved reconstruction code and detector implementation

Strategy

We use three types of simulation productions:

- *Train*: a simulation production for validation and verification that is submitted on a fixed time schedule, with whichever features are available at that time. The *train* leaves the station at a fixed time.
- *Charter*: a simulation production that is requested by the Technical and Physics Coordinators, with larger standard data sets that are already benchmarked. *Charter* simulation productions can be run after the validation and verification, in the third and fourth week of a month only. The Production WG determines when the *charter* starts (within a launch window).
- *Taxi*: a simulation production that is requested on a one-off basis, for individual datasets. A *taxi* is only available when no *train* or *charter* is available. *Taxi* simulation productions can be run in the third and fourth week of a month only. Due to the overhead required for a *taxi* simulation production, no *taxi* can be guaranteed.

Production Strategy

Simulation Production Strategy Document

Critical Dates:

Cut-off Date for Inclusion in Train Campaigns: Last working day before first Monday of the month- **June 2 and June 30** for next two months.

Discussion of summary of changes, identification of missed targets, and prioritization of sprint goals in compSW meeting: First wednesday of the first working week- **June 7 and July 5** for next two months.

Discussion of validation studies in compSW meeting: Second wednesday of second working week- **June 14 and July 12** for next two months

Week 1: YY.MM.0
Verification and Validation

Last working day of first week: Train 1

Week 2: YY.MM.1
Targeted development

Last working day of the second week: Train 2

Week 3+4: YY.MM.2

Charters and taxis - Requests for charters by DSSs, DSCs, and PWGs, need to be filtered through Technical and Analysis Coordinators

@ ePIC meeting:
Talks by Markus Diefenthaler on Thursday morning and by Salvatore Fazio on Friday afternoon

Short-form summary

Last year: **1 year of great progress for ePIC**

- **Structuring the collaboration**
  - SP-office, CC, Coordinators, new scientific bodies, the DSCs
  - Welcoming new collaborators world-wide
- **Consolidating and optimizing the detector layout**
  - Tracking, calorimetry, PID, FF/FB, r-o & electronics & DAQ
- **A new strategy for continuous work and progress in the simulation studies**
  - The monthly simulation cycle
- **And much, much more that will be illustrated during the ePIC meeting**

EVERYONE WELCOME to our Collaboration Meeting !

Thank you

Backup