EICUG 2023

Electron-Ion Collider User Group Meeting 2023

EIC week @ Warsaw
Summary from BGU

17 August 2023

Michael Pitt (BGU&Kansas)

EICUG 2023

Electron-Ion Collider User Group Meeting 2023

EICUG week was divided into 4 parts – Early Career, User Group, ePIC, Second detector

SUNDAY 23 JUL	MONDAY 24 JUL	TUESDAY 25 JUL	WEDNESDAY 26 JUL	THURSDAY 27 JUL	FRIDAY 28 JUL	SATURDAY 29 JUL	SUNDAY 30 JUL	MONDAY 31 JUL
Early Career Workshop	Early Career Workshop	EIC	EIC	ePIC	ePIC	ePIC	Trip 3	Det II / IP8
Early Career Workshop	Early Career Workshop	EIC	ePIC evening: Conference Dinner	ePIC evening: Trip 1	ePIC	Trip 2	Det II / IP8	Det II / IP8

https://indico.cern.ch/event/1238718

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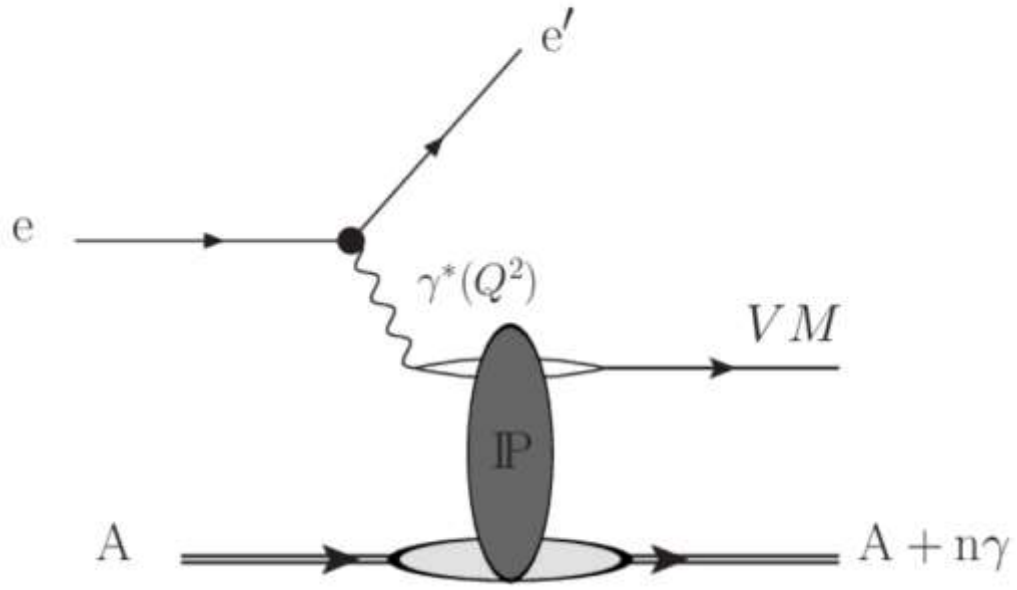
Probing the exclusive vector meson production at the EIC — *Dr Michael Pitt*
Warsaw, Poland 11:50 - 12:10

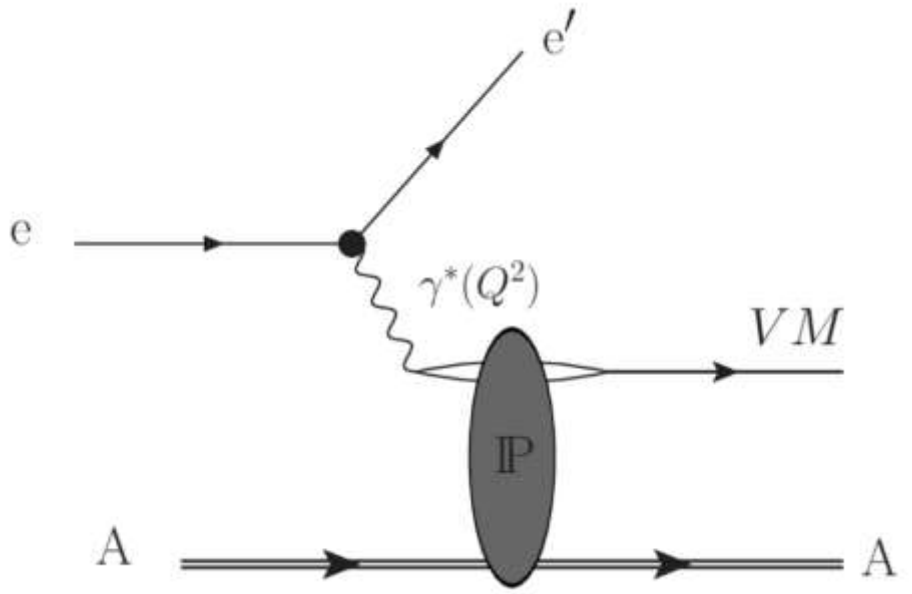
Measuring soft photons in eA collisions using the B0 detector — *Mr Eden Maunter*
Warsaw, Poland 16:40 - 17:00

DSC-FFWD — *Michael Pitt*
0.03, Faculty of Physics, University of Warsaw 12:45 - 13:00

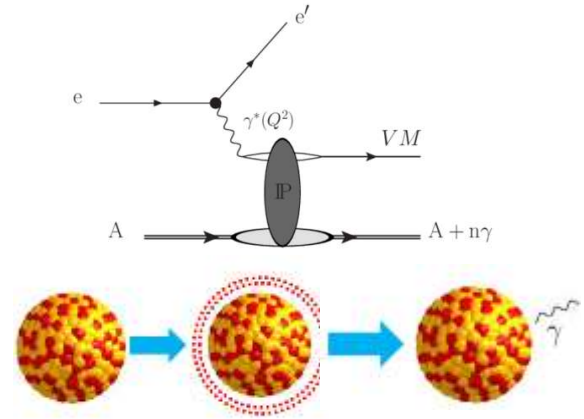
Early Career Workshop

- Early Career Workshop was dedicated for presentation of ongoing work from students and postdocs
  - Eden: study on “quasi-coherent” VM production (through the ion de-excitations)
  - Michael: study on coherent VM production at low Q

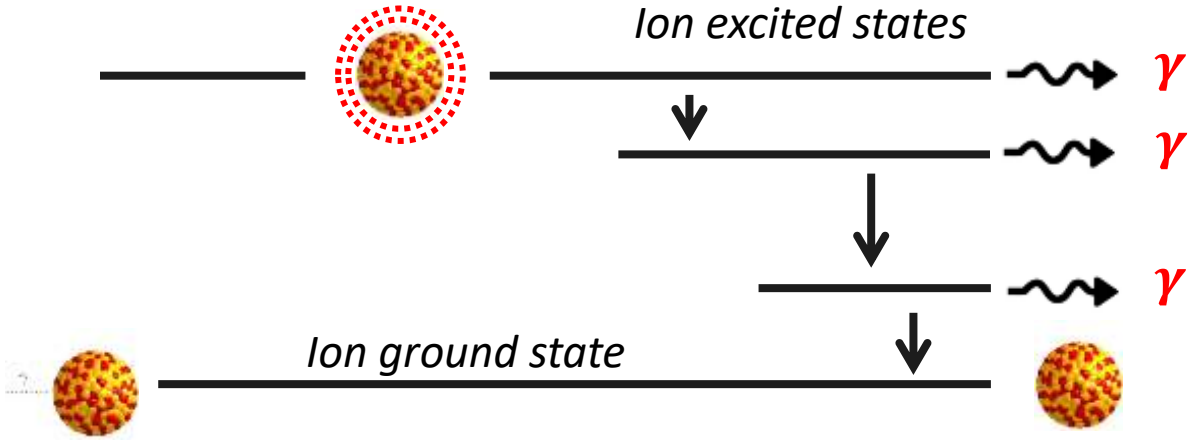


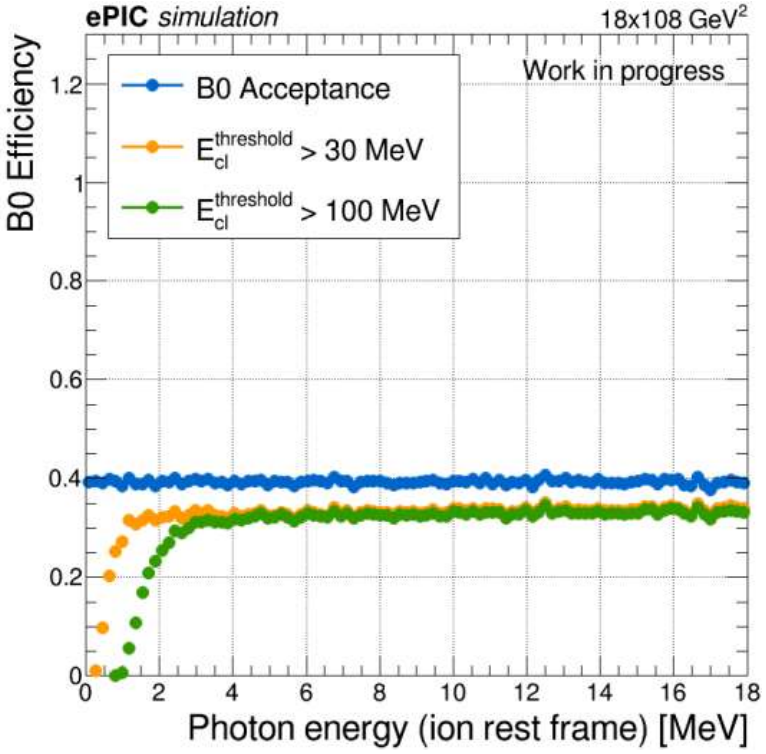


"quasi-coherent" VM production



- Excitation energy (w/o ion break up) is up to ~10 MeV
- Due to Ion boost ($\frac{E_{beam}}{m_p} \times \frac{Z_{ION}}{A_{ION}}$) photons gain energy
- Far-Forward Detectors → **rare isotope decays**
  - B0 → detect ion de-excitations





Pb ions at the highest EIC energy

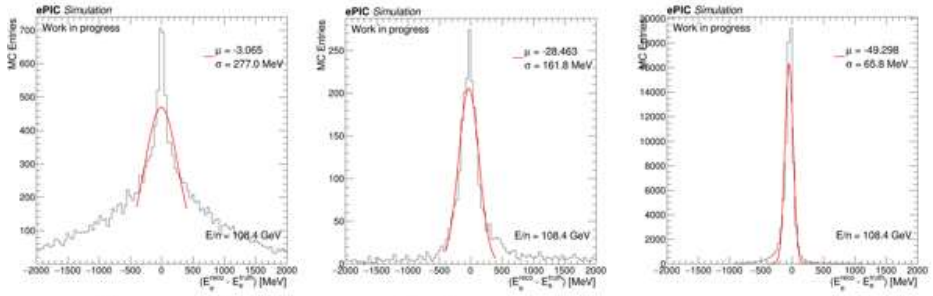
Early Career Workshop

Coherent VM production

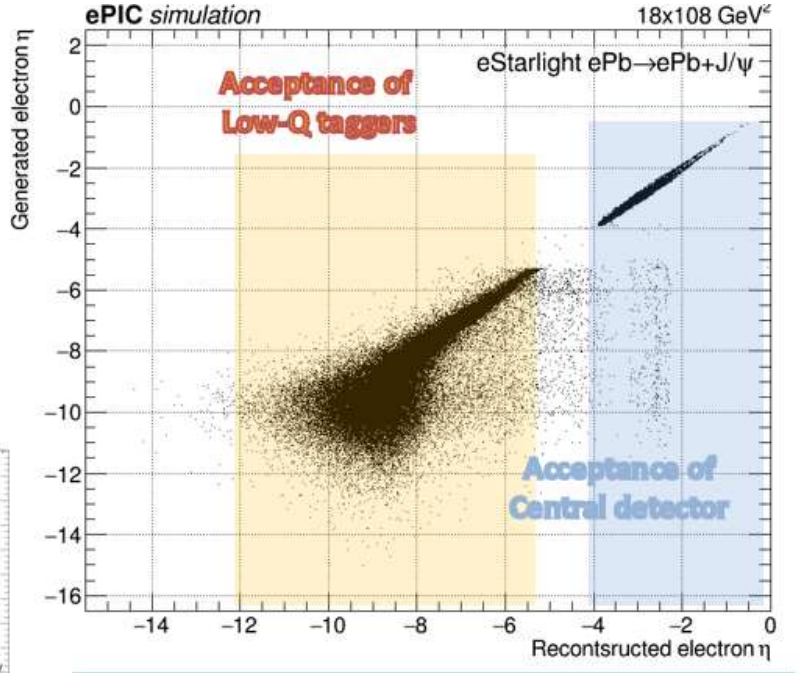
- Utilized the usage of the low-Q taggers

Event categorization

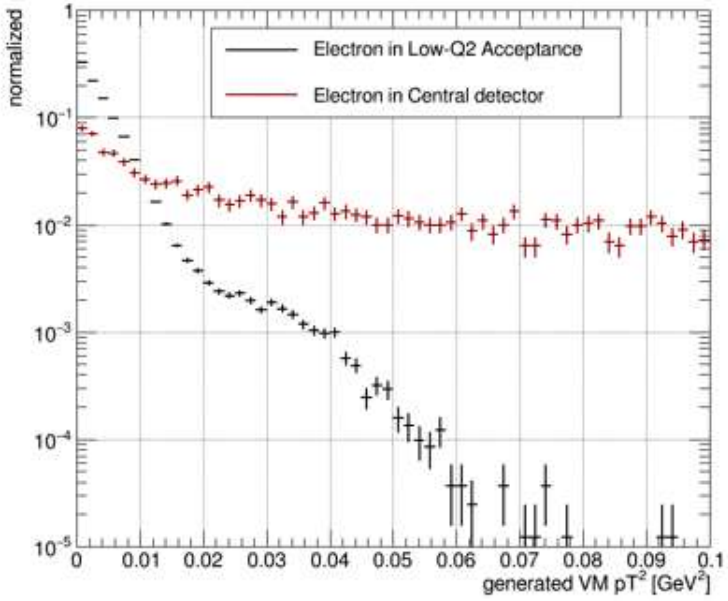
- Depends on the electron reconstructed eta
  - Central detector: ~10%
  - Low-Q2 taggers: ~40%
- Energy resolution – larger in the central region



$-4 < \eta < 0$ $\quad -6 < \eta < -4$ $\quad \eta < -6$



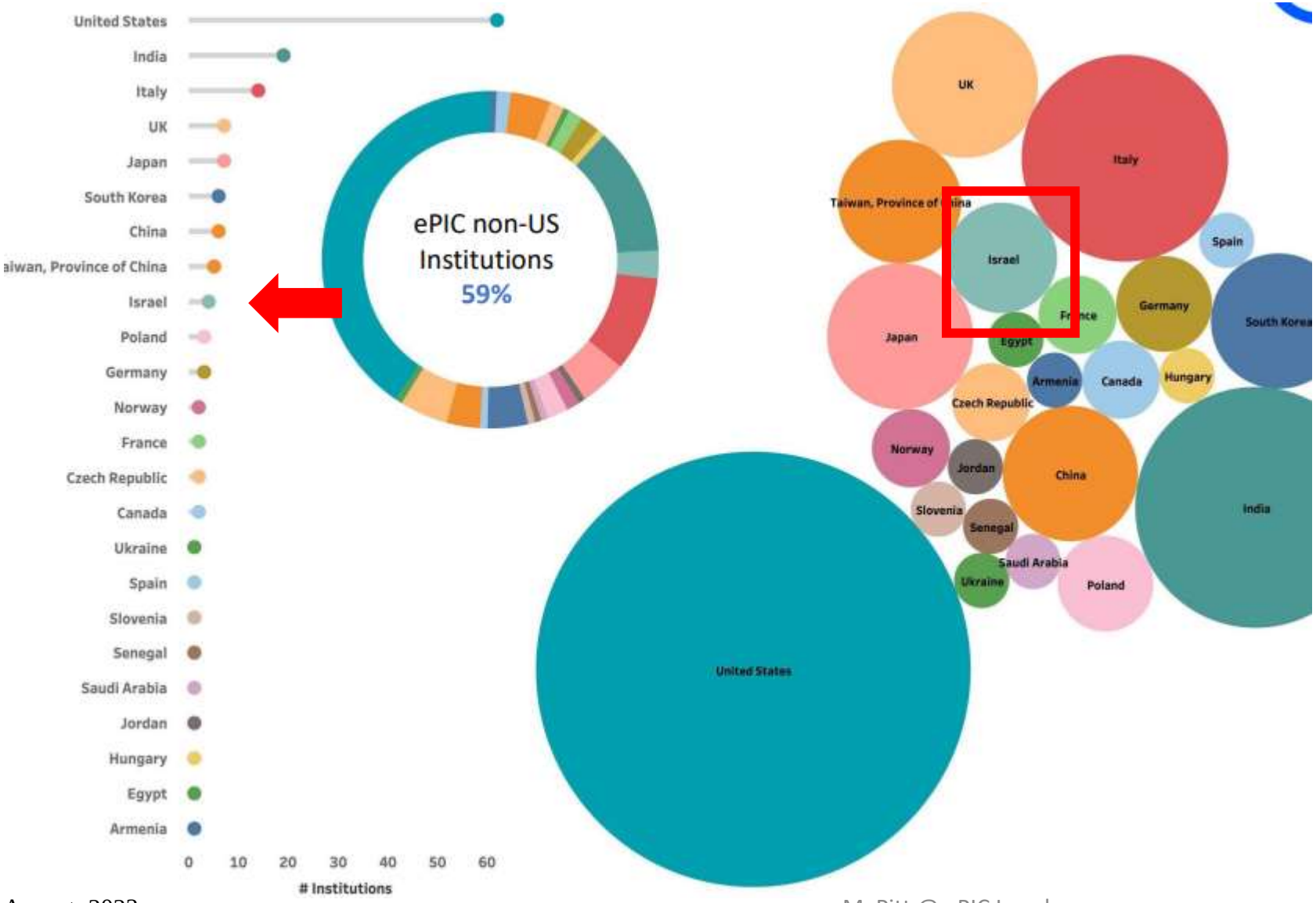
Adding low-Q2 category increases signal acceptance by x5



Work in progress

- Improving t reconstruction
  - Adding the electron reconstruction information
  - Ion mass constrain

ePIC collaboration meeting

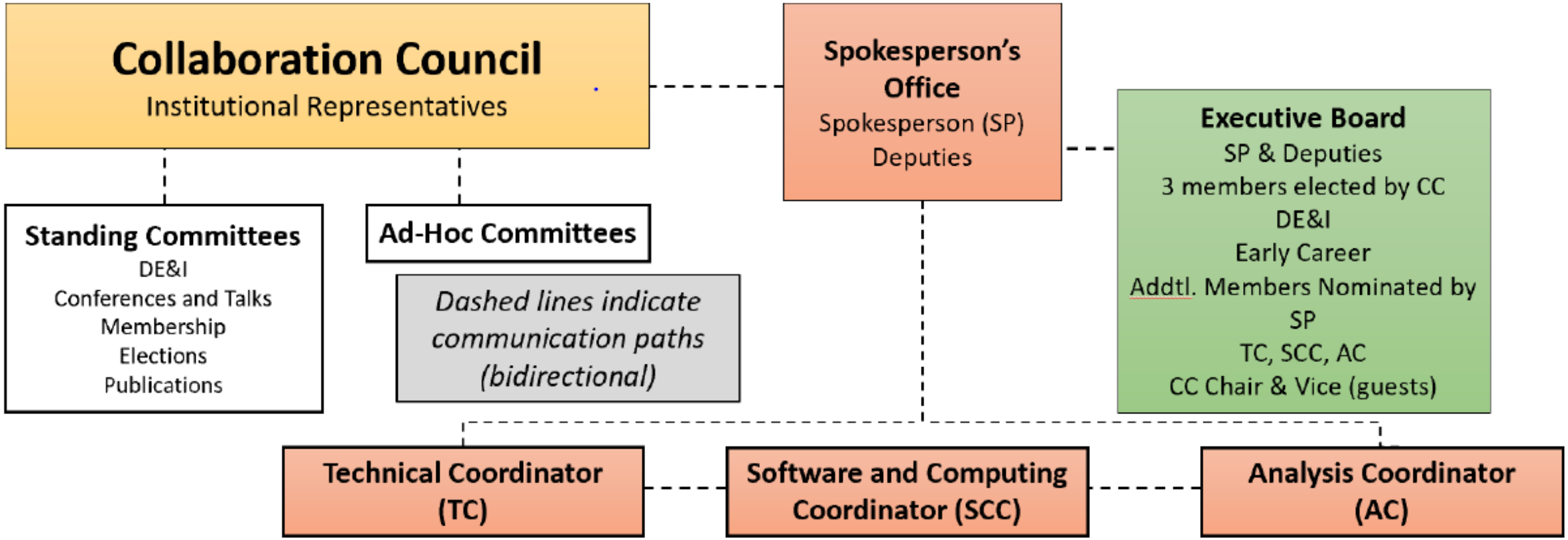


171 institutions
24 countries

500+ participants

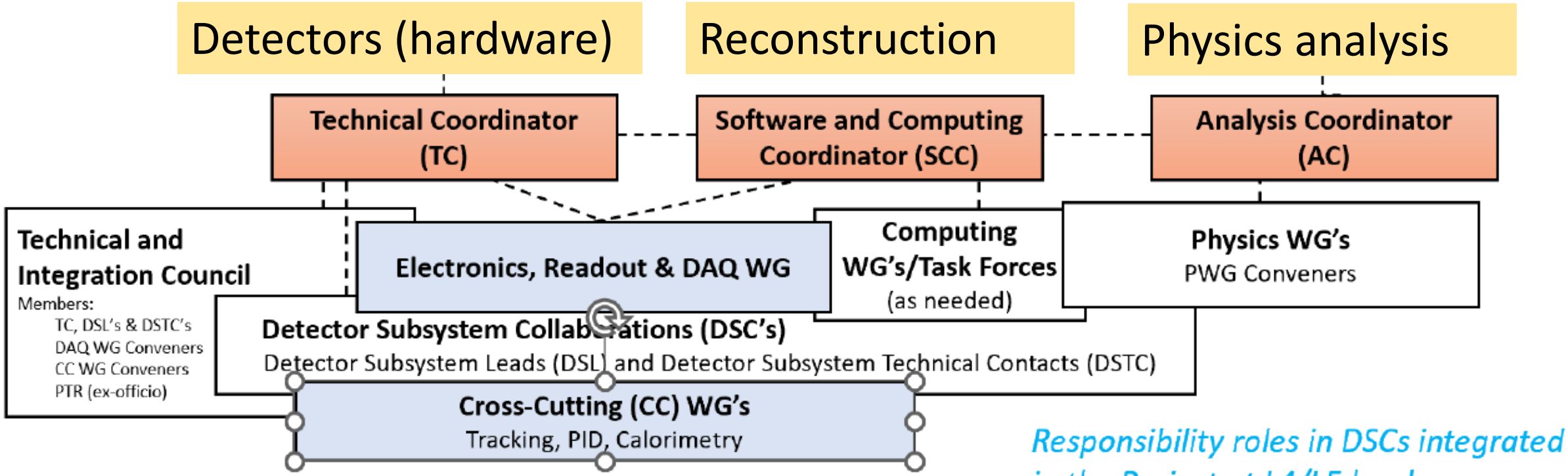
A truly global pursuit for a new experiment at the EIC!

ePIC collaboration meeting



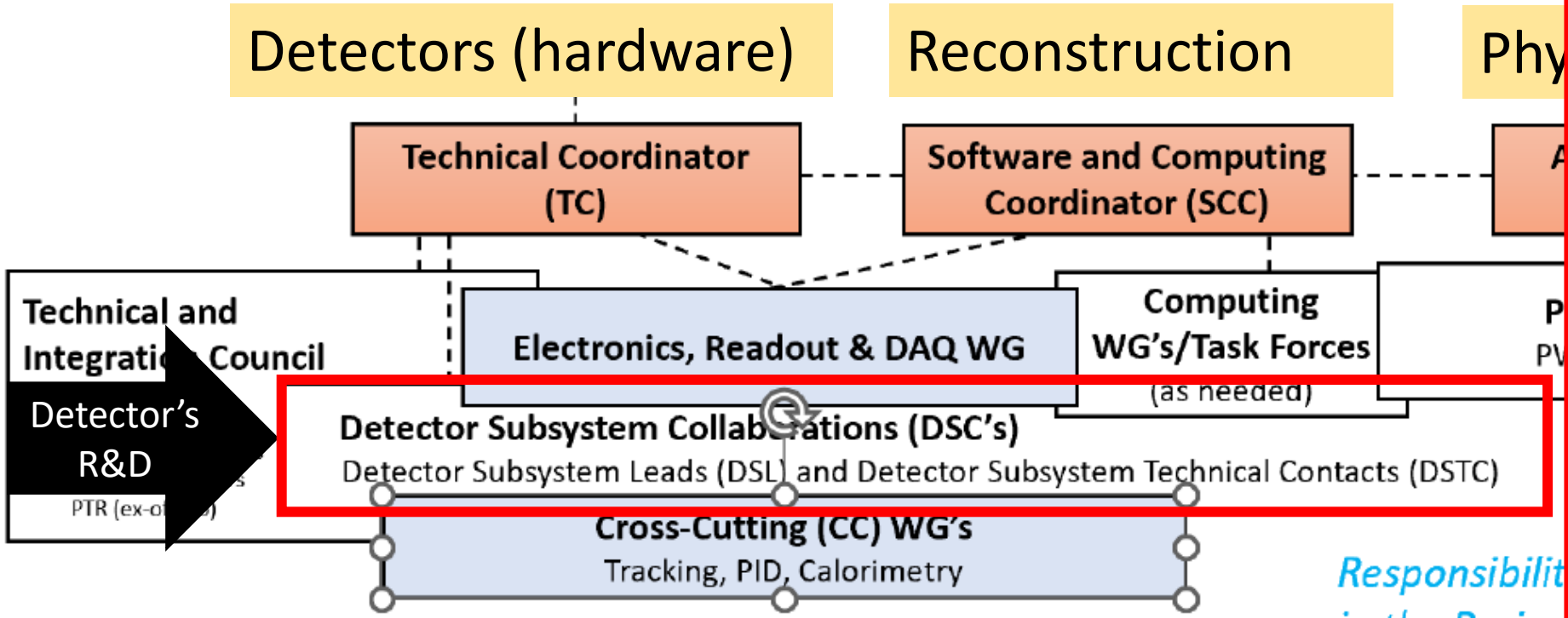
Detectors (hardware) → Reconstruction → Physics analysis

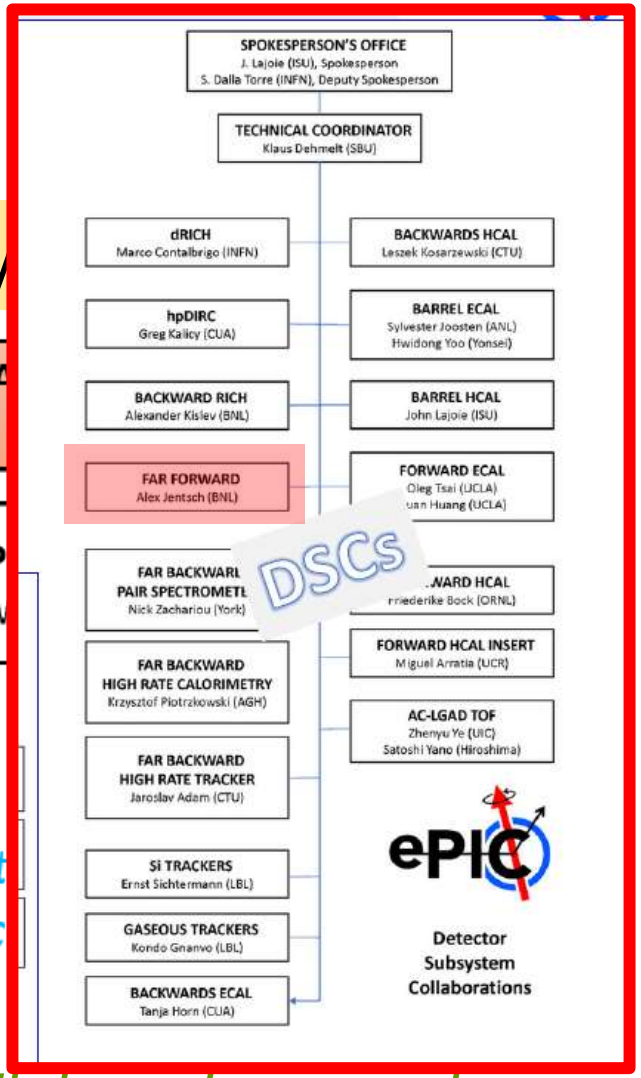
ePIC collaboration meeting



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

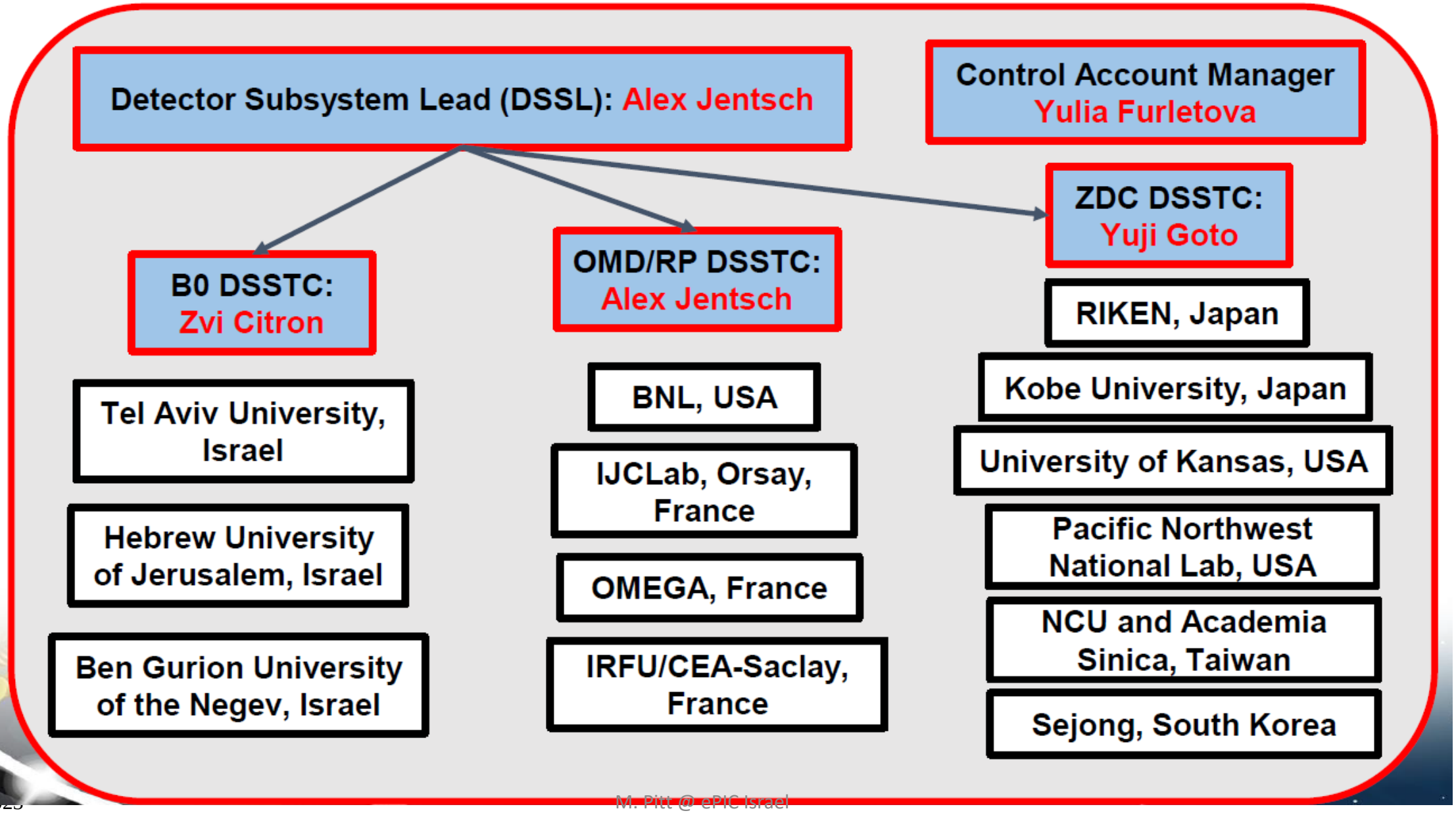
ePIC collaboration meeting



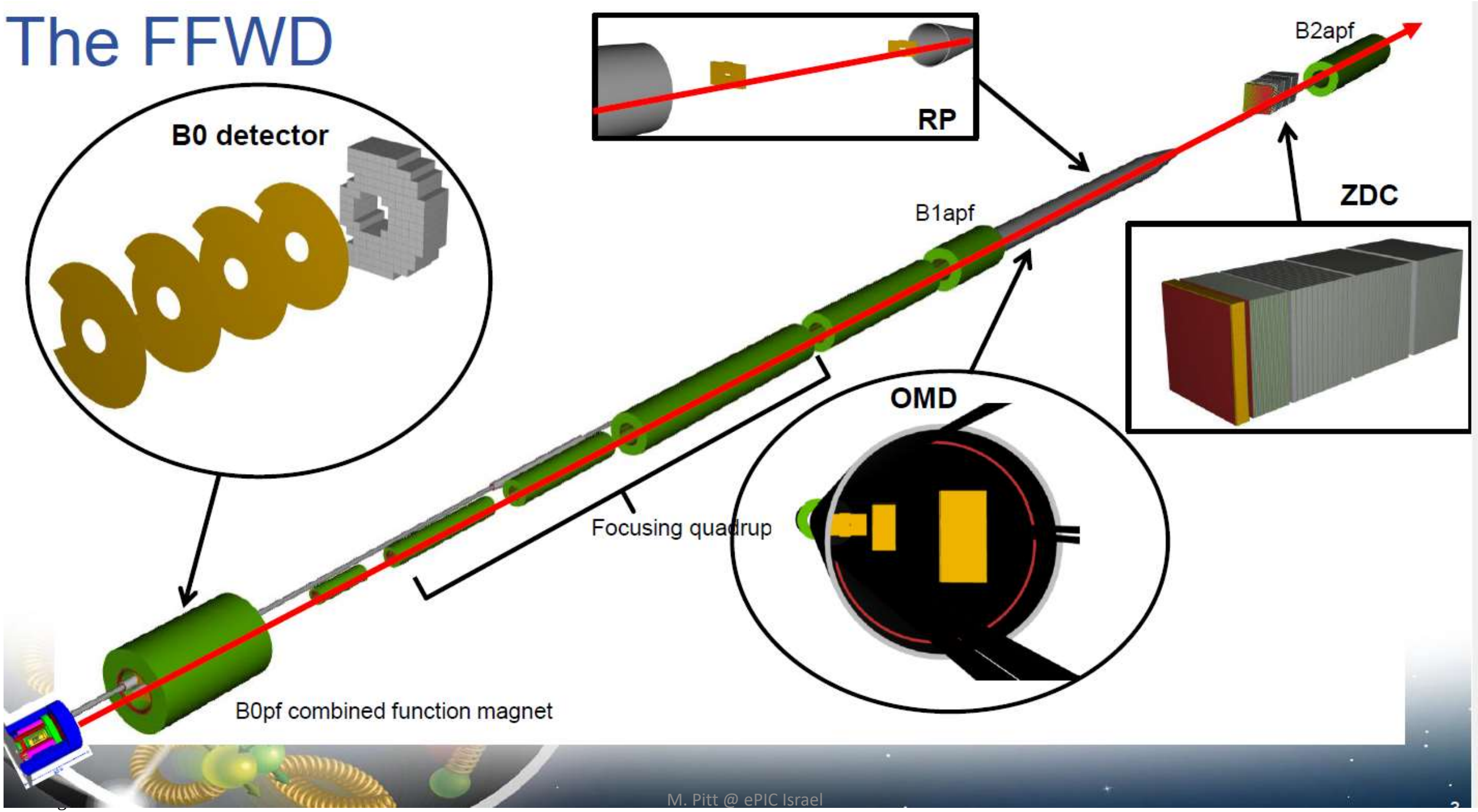


- *A full review of the sub-group activities was done during the collaboration meeting*
- *I will not go through all the reports, but just highlight relevant topic for us*

The Far-Forward Detectors collaboration



The FFWD


B0 detector
RP
B2apf
ZDC
B1apf
OMD
Focusing quadrup
B0pf combined function magnet

Detectors - What's New

CAD Look credit: Jonathan Smith

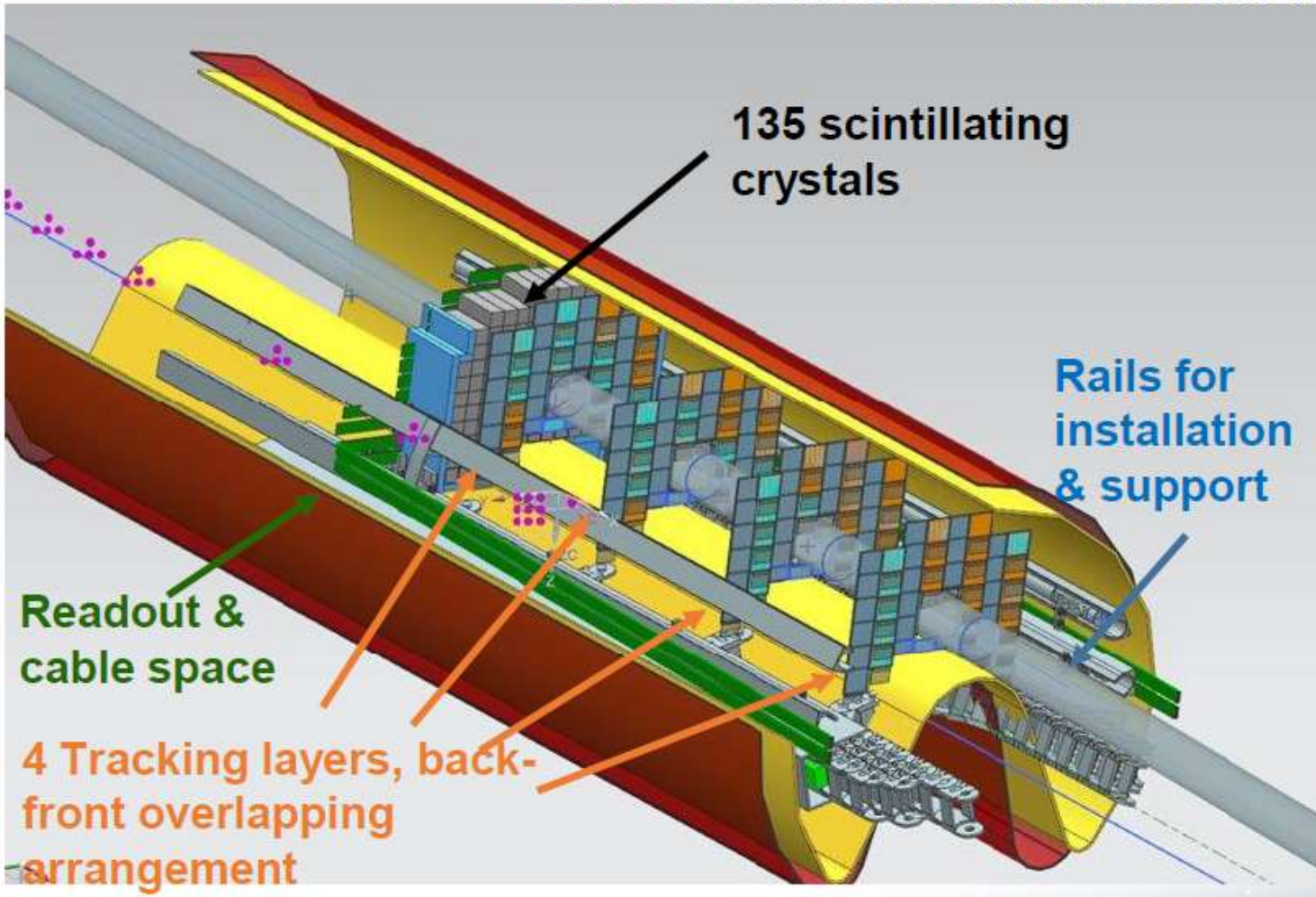
Design for two detectors is converging:

Si Tracker:

- 4 Layers of **AC-LGAD**
- Great timing capabilities
- Sufficient position resolution by utilizing charge sharing
- Technology overlap w/ Roman pots

EM Calorimeter:

- 135 2x2x7*cm^3 LYSO crystals
- Good timing and position resolution
- Technology overlap with ZDC

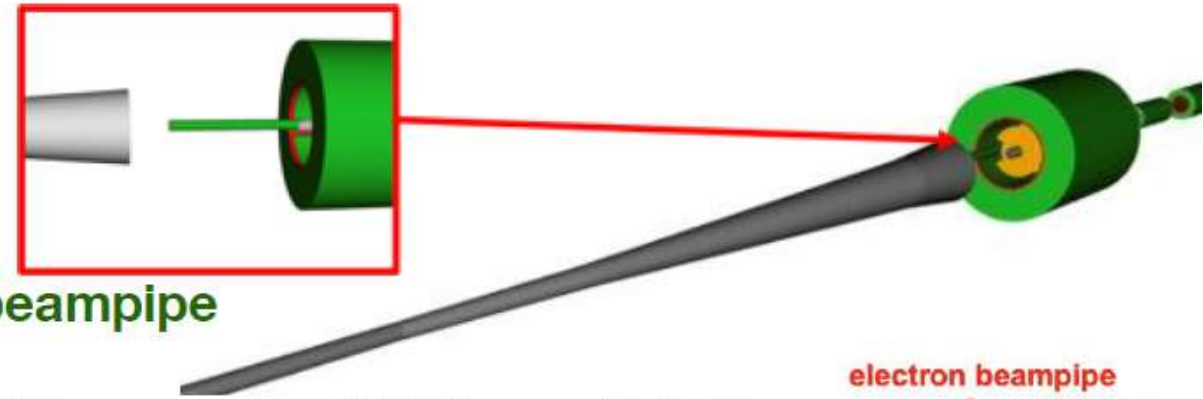


* ZDC wants slightly longer crystals, ideally, we will use the same length in both detectors

B0 EMCal - Performance

- Acceptance 5.5 < θ < 20 mrad
- Very low material budget in 5 < η < 5.5

Particles within 5.5 < θ < 15 mrad don't cross the beampipe

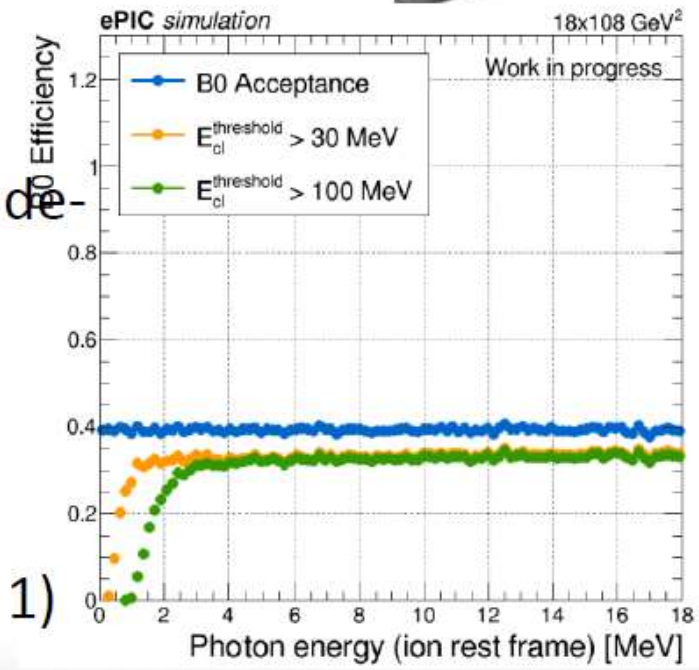


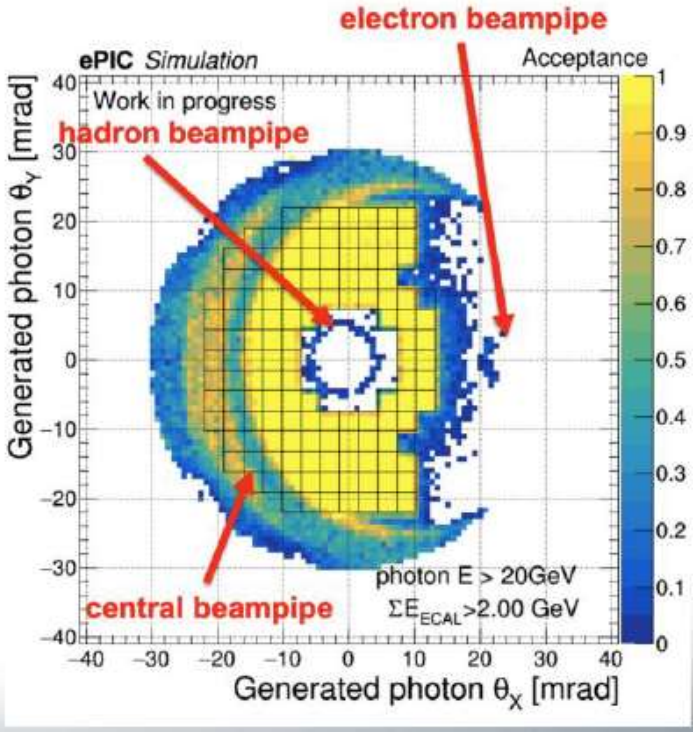
Photons:

- ➢ High acceptance in a broad energy range (> 100s MeV), including ~MeV de-excitation photons
- ➢ Energy resolution of 6-7%
- ➢ Position resolution of ~3 mm

Neutrons:

- ➢ 50% detection efficiency (λ is almost 1)





Summary

B0 Detector related

- Good feedback received during the meeting about the progress of the FF detectors in particularly about the B0 detector.
- Already well-established communication between detector and physics parties.
- Far-Forward Detector review is planned for ~December 2023, ideal technology choices are identified, along with suitable alternate designs for risk mitigation.

Physics related

- In BGU we plan to focus on several topics:
  - Coherent VM production with ePIC (paper soon – before CD-3A)
  - Excited ions with B0 detector (Master project)
  - Isotope tagging / rare isotopes with forward detector