

# The Electron-Ion Collider Case

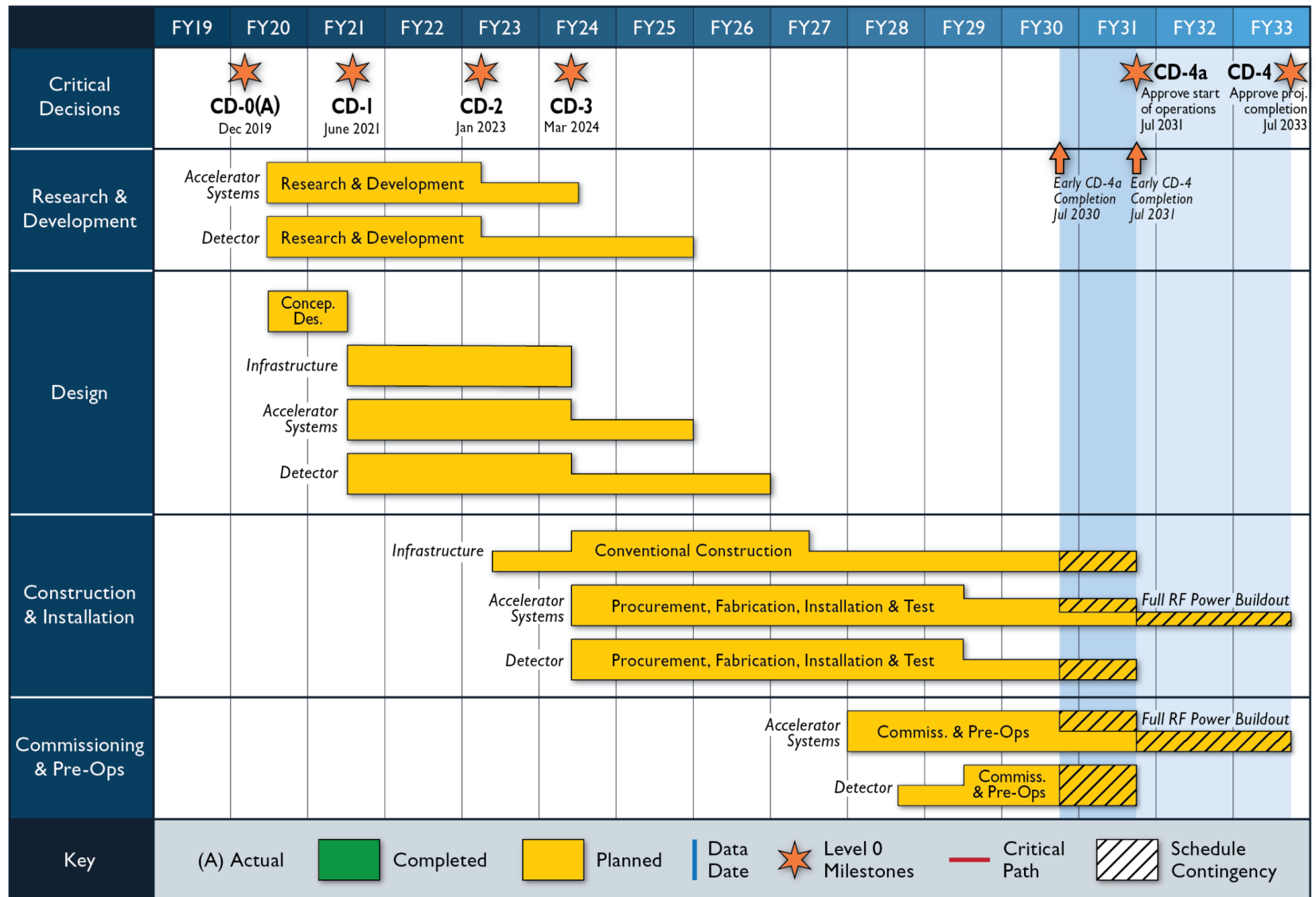
Marco Contalbrigo – INFN Ferrara

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Meeting - 6<sup>th</sup> April 2022

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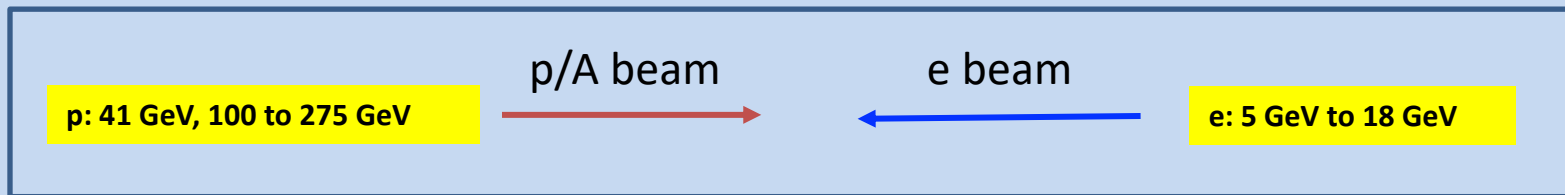
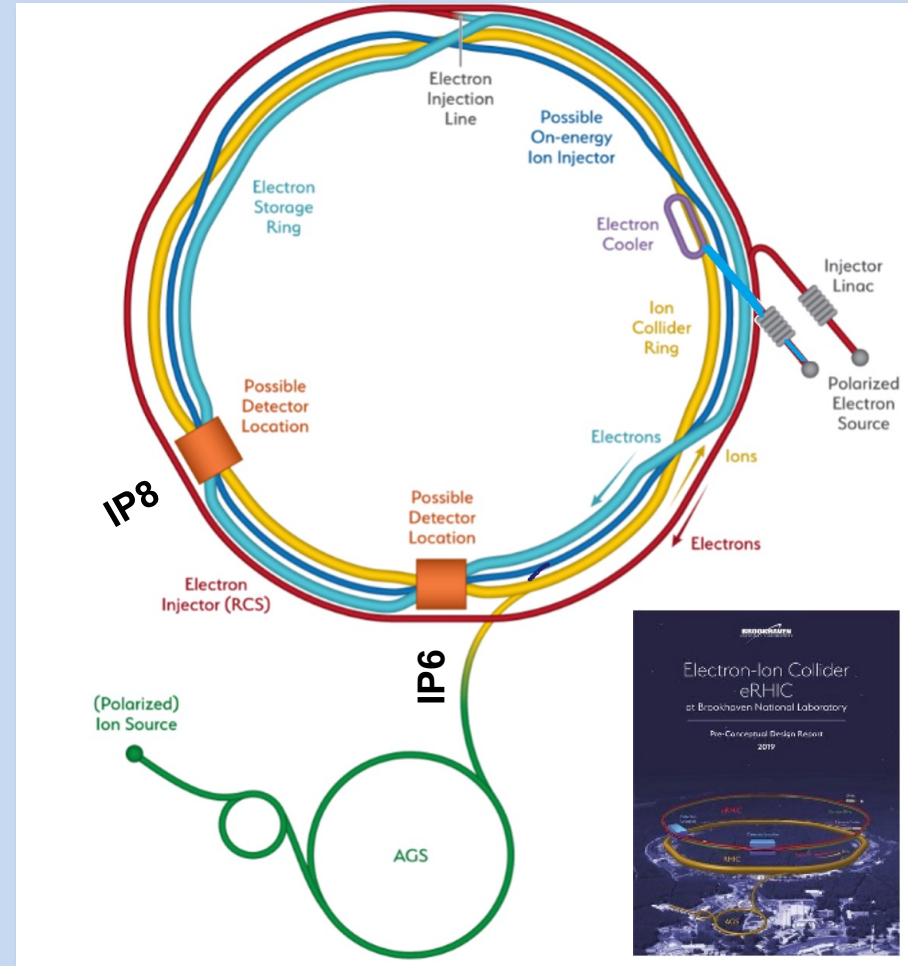
# EIC Timeline



# EIC Accelerator

Unprecedented Machine

Center of mass energy	20-140 GeV
Maximum luminosity	$10^{34} \text{ cm}^{-2} \text{ s}^{-1}$
Hadron Beam Polarization	80%
Electron Beam Polarization	80%
Ion Species Range.	P to Uranium
Number of IP	Up to two

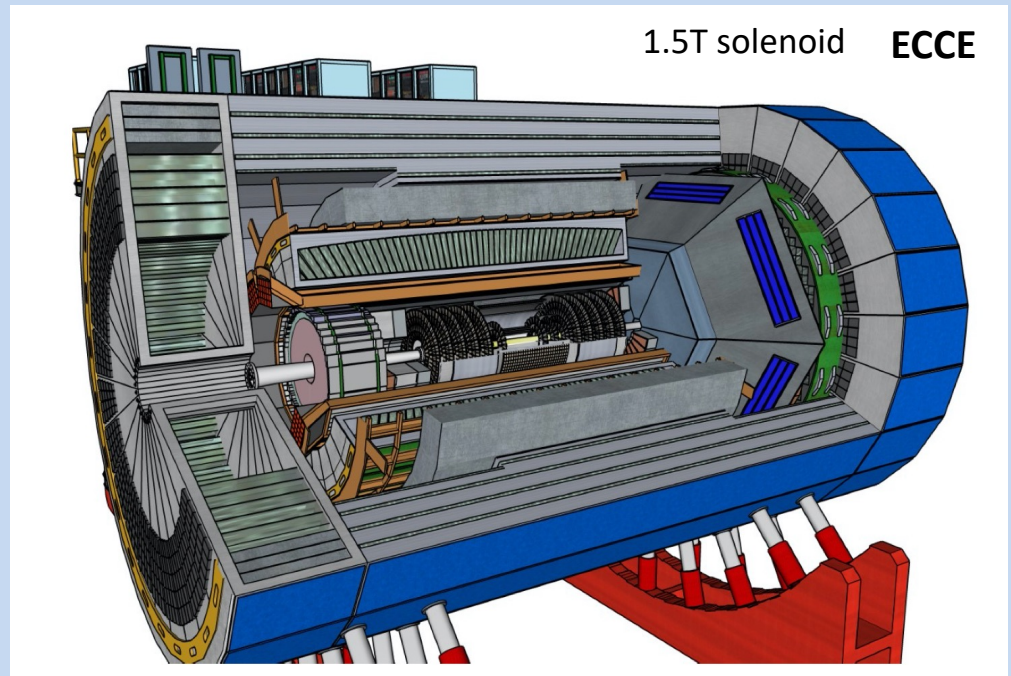


# EIC Detector

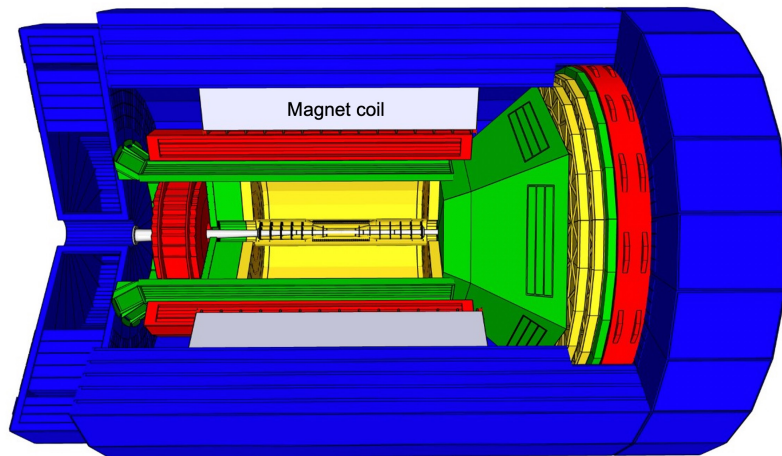
Alternative options

Common challenge for endcap PID is

Ring-imaging in high magnetic field

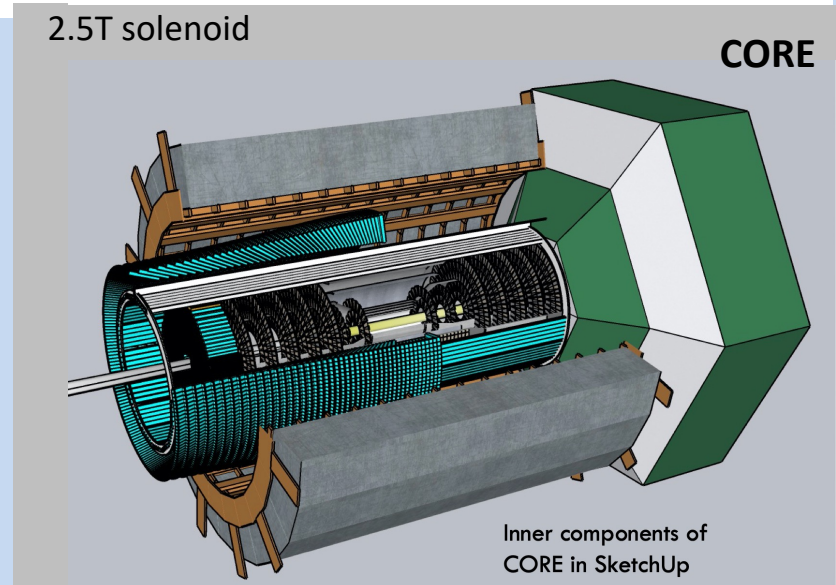


**ATHENA** 3T solenoid



Tracking Particle Id EM calorimetry Hadron calorimetry

2.5T solenoid



## R&D for photo-sensors: single-photon sensitivity in high-magnetic field

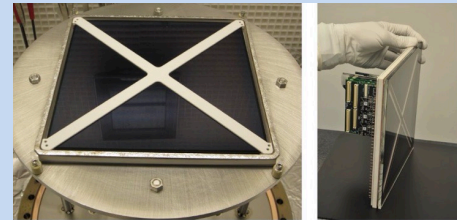
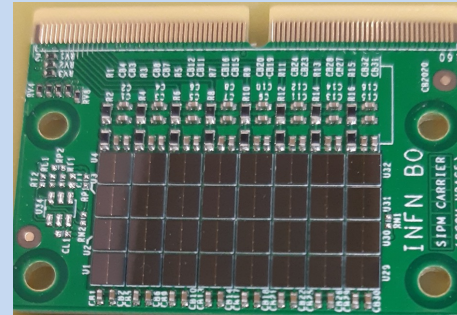
### Silicon photomultipliers (SiPM)

@ low-T with dedicated ASICS and DAQ for fast and precise timing  
note: high dark rate, moderate radiation tolerance

### Large-area Picosecond Photodetector (LAPPD)

cost-effective microchannel plate detectors  
note: still under development

with (AI) streaming readout

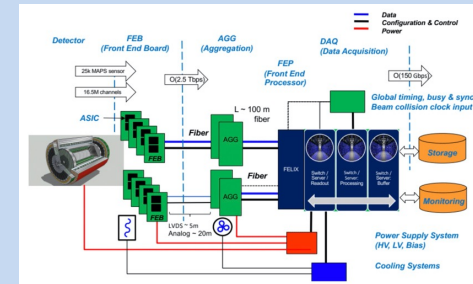


## R&D for aerogel section:

High transparency aerogel at low refractive index ( $n=1.02$ )

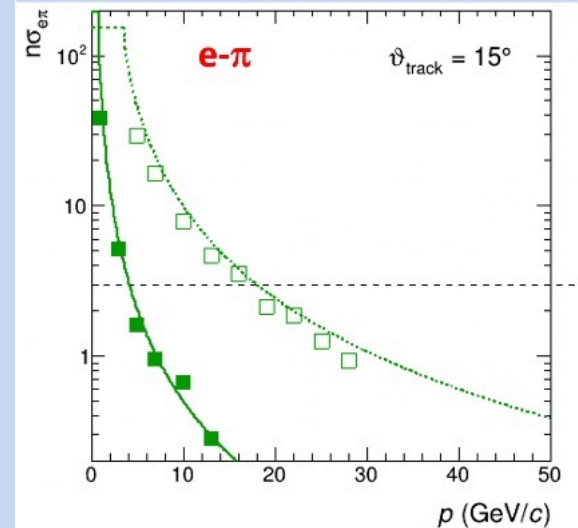
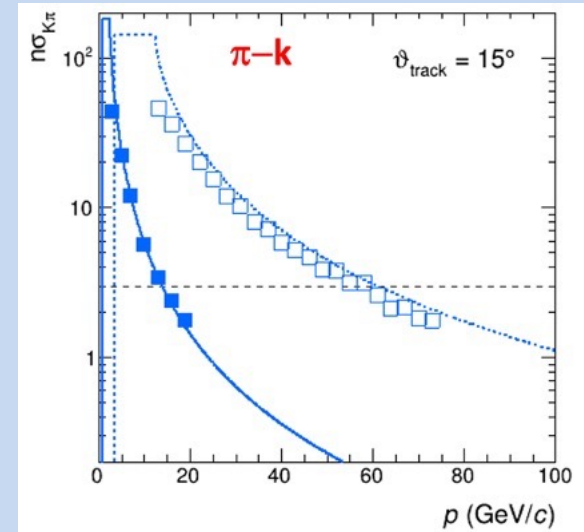
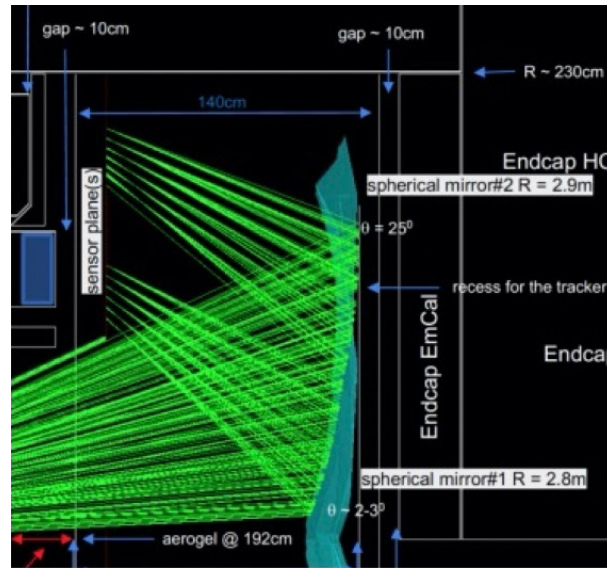
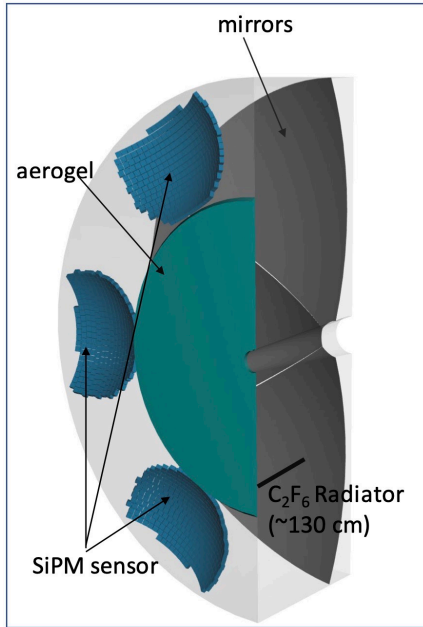
## R&D for gaseous section:

High-pressure Argon as alternative to greenhouse gases



# Dual Radiator RICH @ EIC

Two challenges: cover wide momentum range 3 - 60 GeV/c  
work in high ( $\sim 1\text{T}$ ) magnetic field



**dRICH: effective solution, part of EIC reference detector**

Radiators: Aerogel ( $n_{\text{AERO}} \sim 1.02$ ) + Gas ( $n_{\text{C}_2\text{F}_6} \sim 1.0008$ )

Detector:  $0.5 \text{ m}^2/\text{sector}$ ,  $3 \times 3 \text{ mm}^2$  pixel.  $\rightarrow$  SiPM option

Phase Space:

- Polar angle: 5-25 deg
- Momentum: 3-60 GeV/c