A large-area prototype SiPM readout plane for the ePIC-dRICH detector at the EIC: realisation and beam test results

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on behalf of the dRICH collaboration

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Calorimetry:

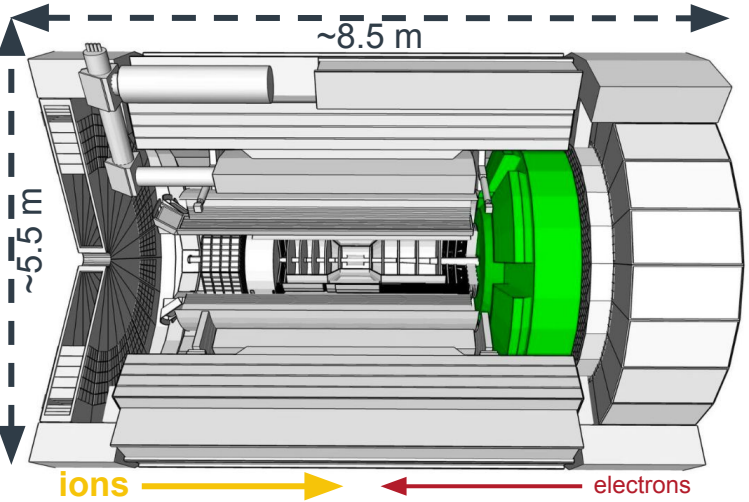
e-endcap: $PbWO_4$ EMCal
barrel: imaging EMCal
outer barrel: HCal
h-endcap: finely segmented

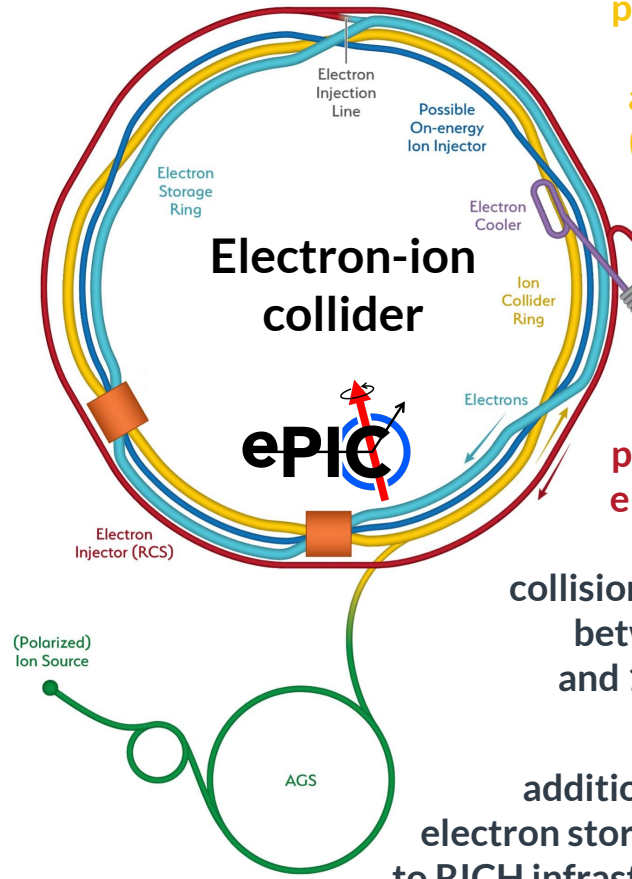
Tracking:

1.7 T magnet
Si-MAPS + MPGDs

PID:

AC-LGAD TOF
pfRICH
hpDIRC
dRICH





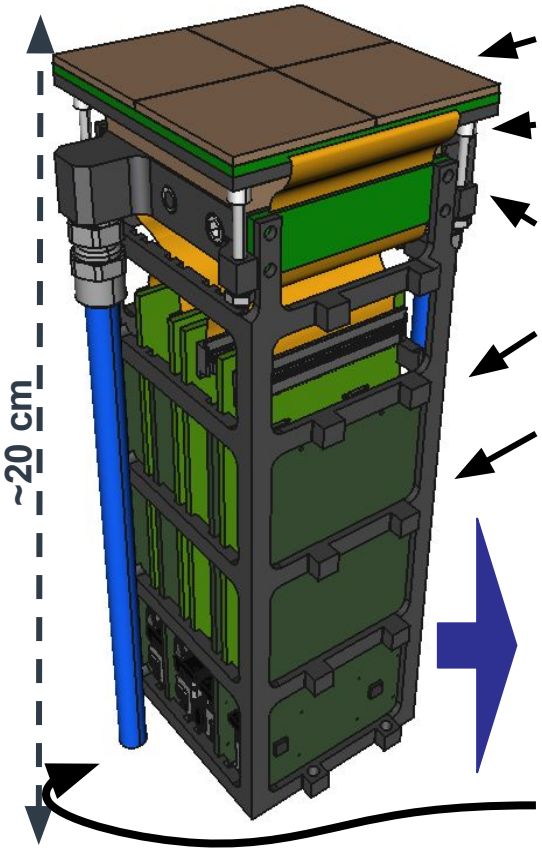
polarised protons and ions (p to Pb)

polarised electrons

collision energy between 20 and 140 GeV

addition of the electron storage ring to RICH infrastructure

https://www.bnl.gov/eic/



4x matrices of 8x8 SiPMs total 256 channels

2 peltier cells for subzero operating temperatures

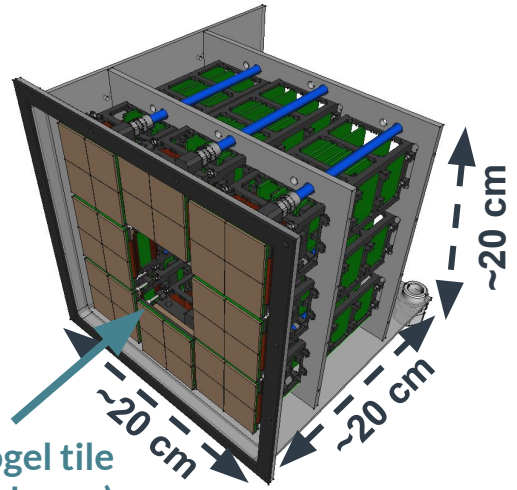
Temperature sensors both under the sensors and on the peltiers

light-weight aluminium structure

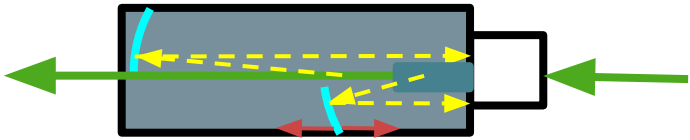
Front-end electronics featuring the ALCOR ASIC chip

Externally provided:
High voltage bias for sensors, low voltage power supply for electronics, T sensors piloting and read-out

liquid heat exchange for temperature control of hot-face of peltiers

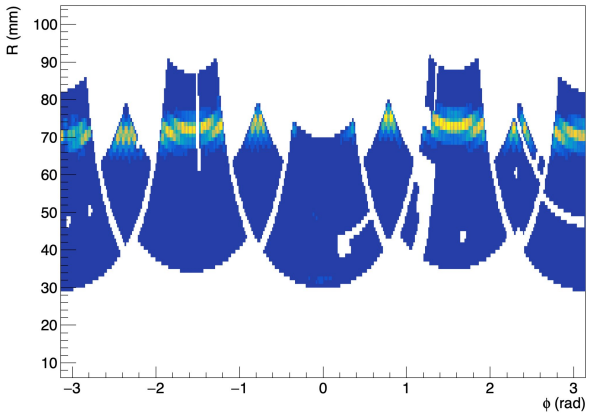


Aerogel tile (not shown)



Using the timing scintillators downstream our detector we can select signal hits in time with the incoming beam particle

We still have a few background hits that can be rejected with the average ring information



$$F(\mathrm{R},\phi) = e^{\frac{(\mathrm{R}-f(\phi))^2}{\sigma^2}}$$

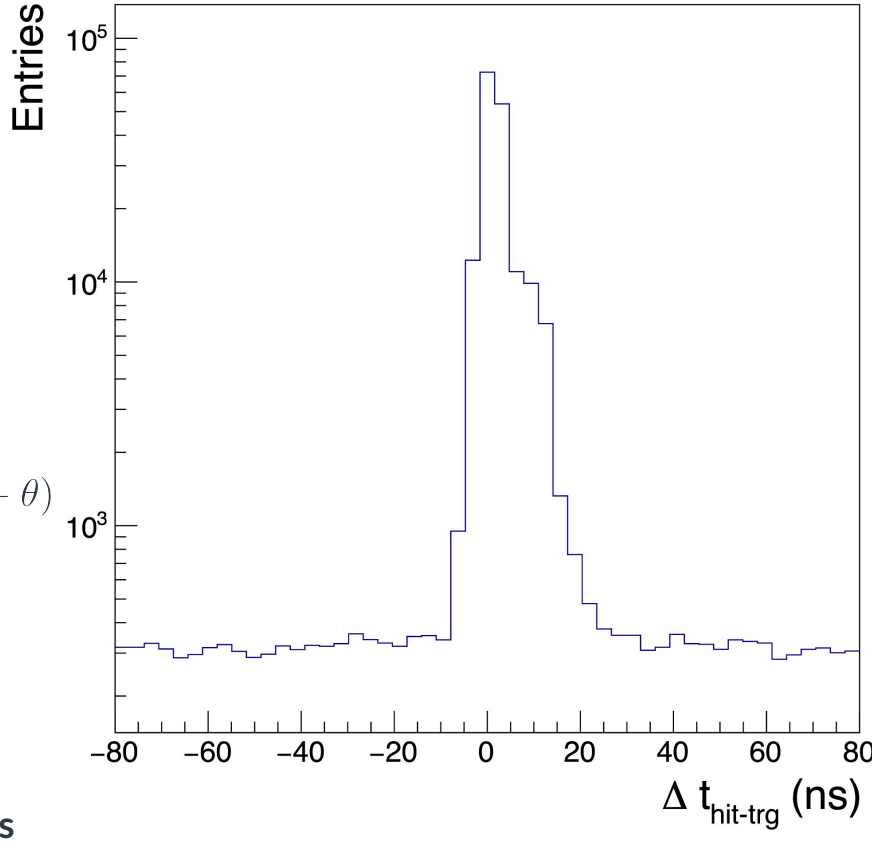
$$f(x) = R_0 + r_0 \cdot sin(\phi - \theta)$$

We can recover the ring center by the means of:

$$x_0 = -r_0 \cdot sin(\theta)$$

$$y_0 = r_0 \cdot cos(\theta)$$

Then, R_0 is the ring radius



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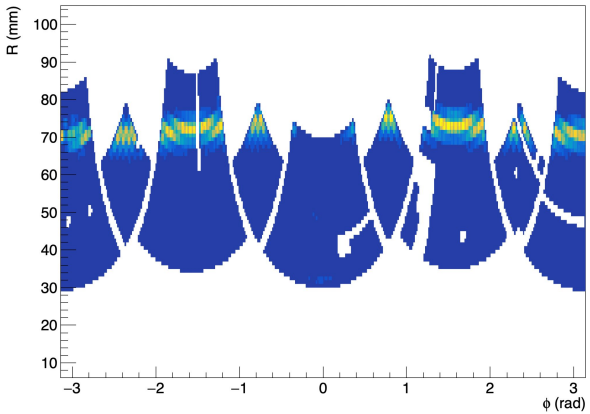

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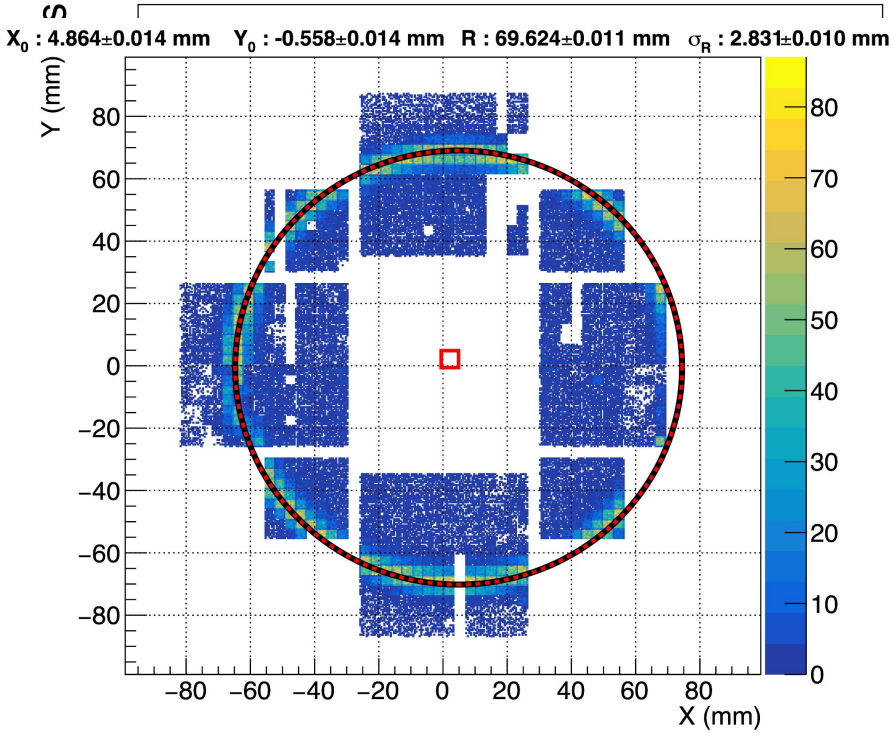
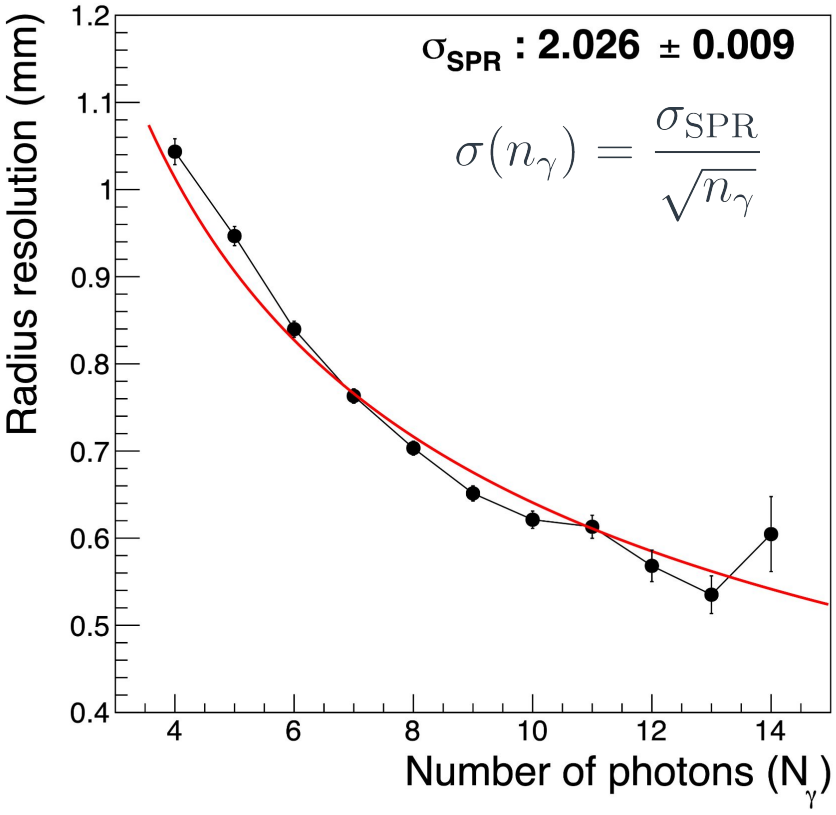
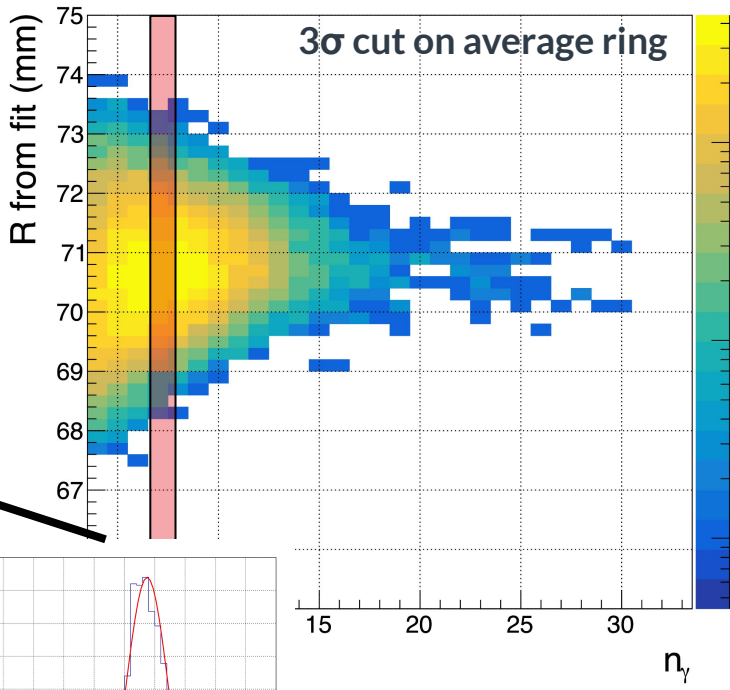
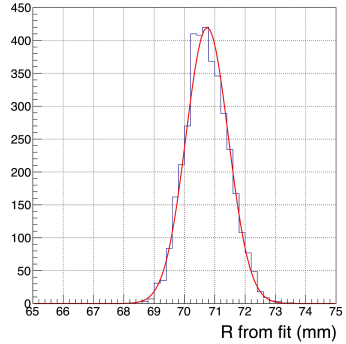


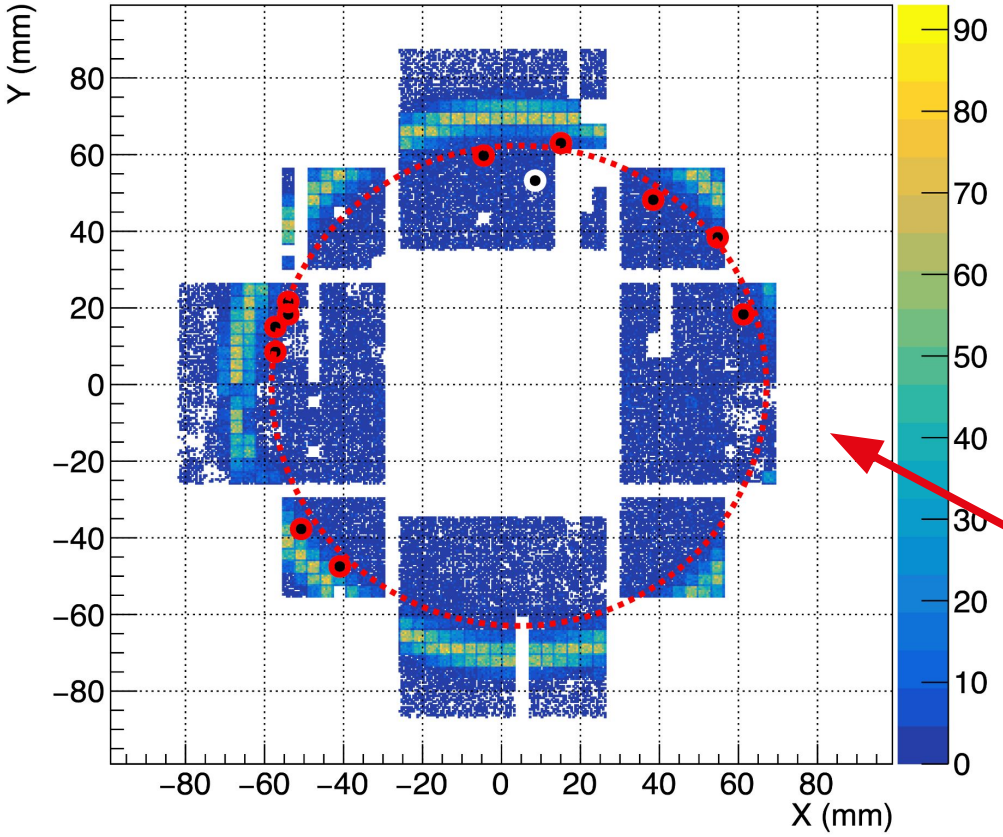


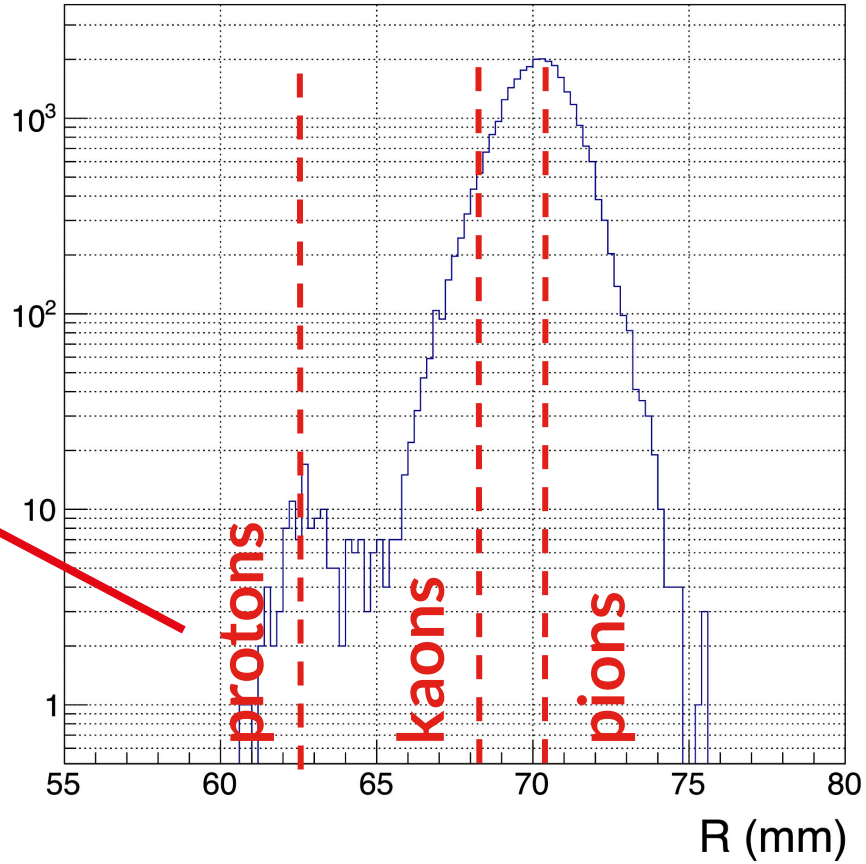
We can calculate the single-photon resolution by fitting this curve





We fit the slices to measure the std. dev.


Y (mm)
X (mm)
80
60
40
20
0
−20
−40
−60
−80
−80 −60 −40 −20 0 20 40 60 80
90
80
70
60
50
40
30
20
10
0


protons
kaons
pions
10^3
10^2
10
1
55 60 65 70 75 80
R (mm)

Thank you!

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