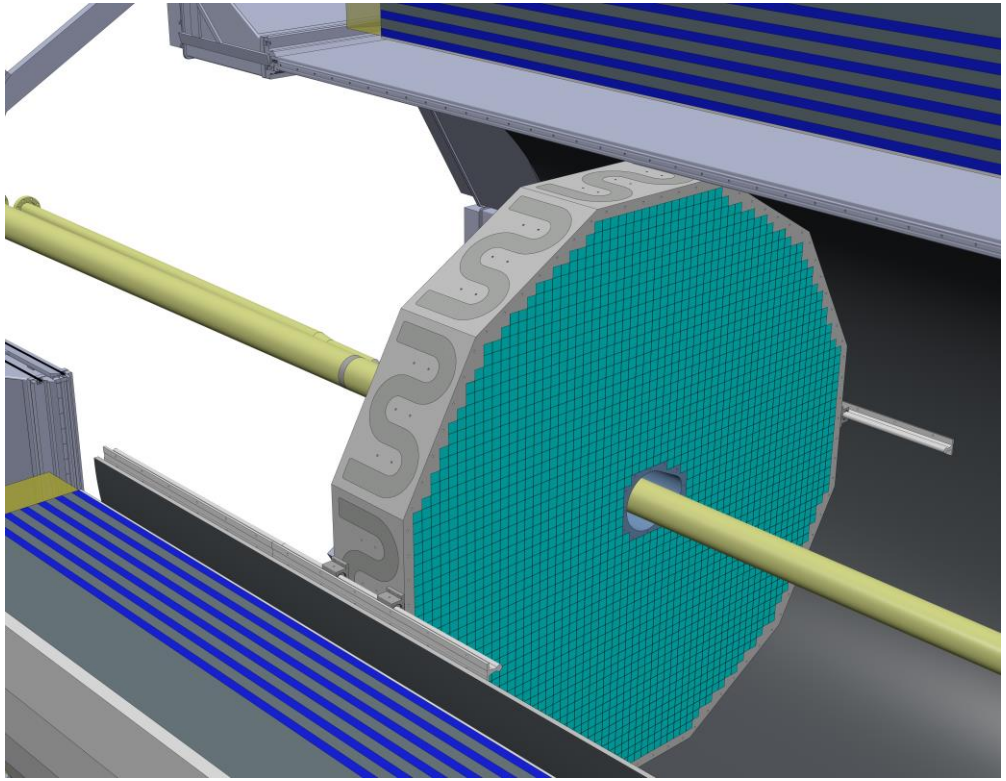


Backward ECal

ePIC calo meeting

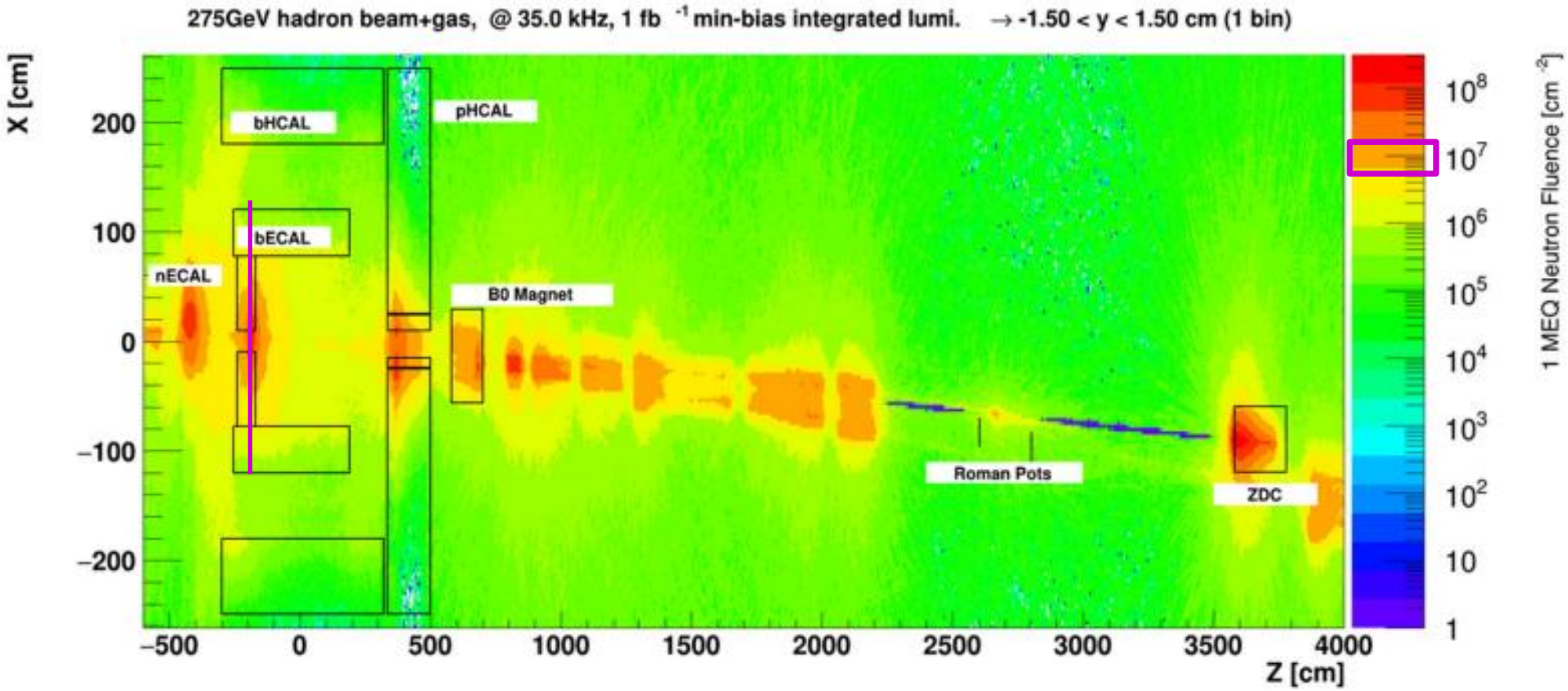
June 25, 2025

Questions asked

1. Expected neutron fluxes for an integrated luminosity of 100 fb^{-1}
2. Expected dark current levels
3. Light yield (LY) per GeV in pixels
4. Readout threshold in pixels
5. Noise contribution to energy resolution
6. Rates of hits above threshold caused by SiPM noise
7. Planned measurements and/or additional measurements you believe are necessary
8. Potential impact on readout electronics
9. Any other relevant information or concerns

Tentative answers

1. Expected neutron fluxes for an integrated luminosity of 100 fb^{-1}



~10^9 cm^{-2}

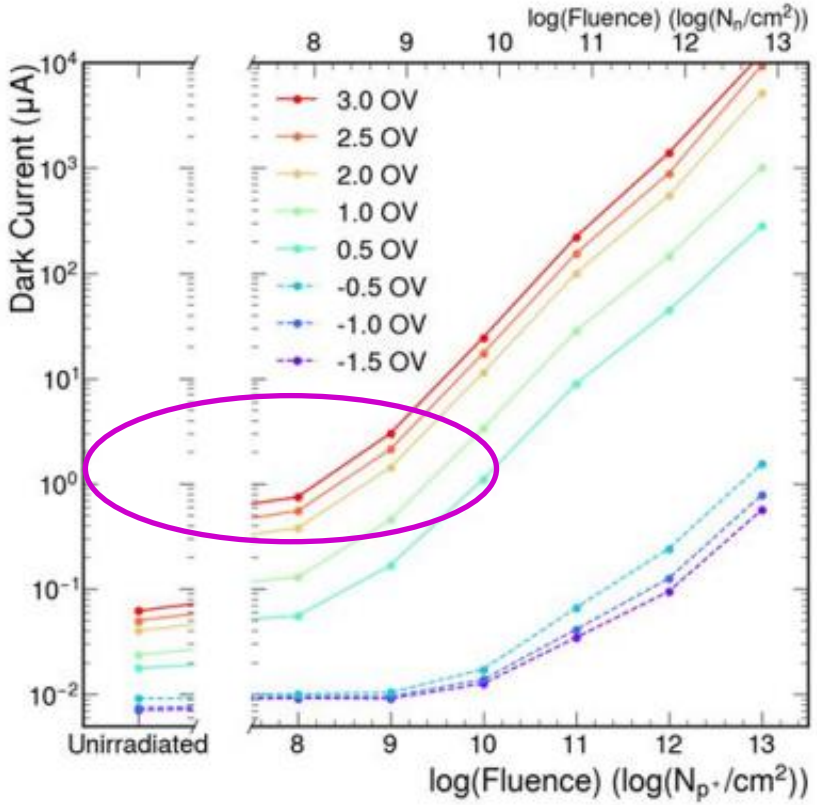
Tentative answers

2. Expected dark current levels

For S14160-3015PS:

1.7 ± 0.4 Mcps (measurement before irradiation, at Vop (Vbr+4V)

~ ×10 after irradiation (equivalent to 100 fb^{-1})



UC Davis results

Tentative answers

3. Light yield (LY) per GeV in pixels

18000 p.e. / GeV (PWO) x 16*9/400 (light collection) x 1/0.25 (QE PMT) x 0.25 (PED)

7258 pixels / GeV

$$N_{fired} = \frac{N_{pixel} \times PW}{T_d} \left(1 - e^{-\frac{N_{photon} \times PDE \times T_d}{N_{pixel} \times PW}}\right)$$

- N_{pixel}=39984*16=639744
- PW= 100 ns (PWO)
- Nphoton=18000 p.e. / GeV (PWO) x 16*9/400 (light collection) x 1/0.25 (QE PMT)
- Td=80 ns (Hamamatsu datasheet)
- PDE=0.28 (Hamamatsu datasheet) = QE PMT

7728 pixels / GeV

Tentative answers

4. Readout threshold in pixels

   5-10 MeV: 39-77 pixels

5. Noise contribution to energy resolution

- 1.7 Mcps x 100 ns = 0.17 → Noise: sqrt (0.17) = 0.41 (before irradiation)
- 4 pixels after irradiation (~0.51 MeV) **per SiPM (x4 for 16 SiPM – 2.1 MeV)**

Tentative answers

6. Rates of hits above threshold caused by SiPM noise

TBD by simulation

7. Planned measurements and/or additional measurements you believe are necessary

Investigation on noise observed during last DESY beam test (~13 MeV/crystal) – work ongoing

8. Potential impact on readout electronics

9. Any other relevant information or concerns

Backup