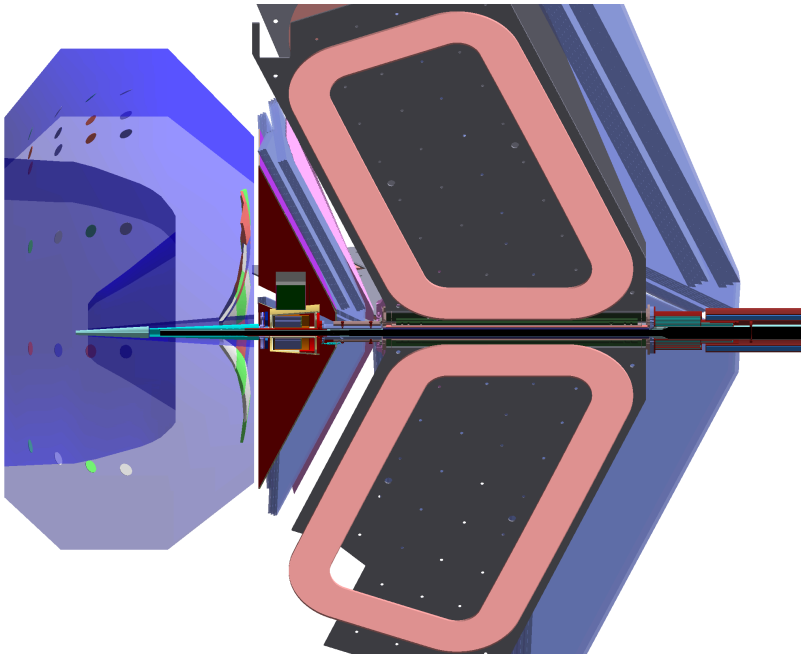
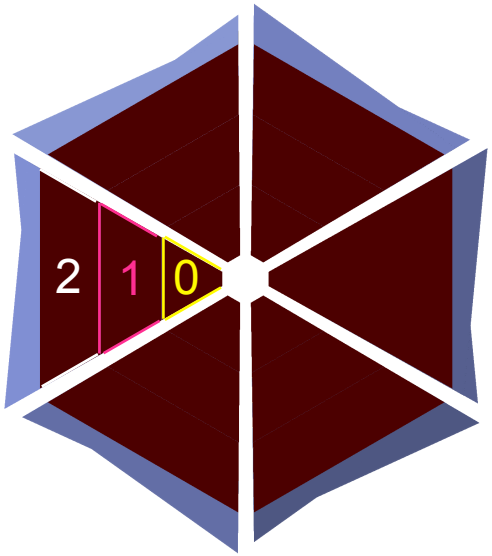
CLAS12 - URWELL simulation

- Implementation of large-size uRwell detectors in GEMC
  - Geometry:
    - CLAS12-reconstruction geometry service
  - Digitization: “effective” description of detector response

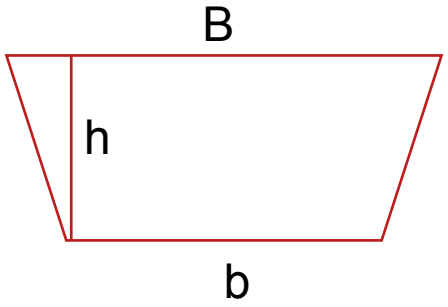


uRwell: geometry and materials

- Implementation of new detector:
  - Geometry : implemented all relevant volumes and materials
    - CLAS12 reconstruction geometry service

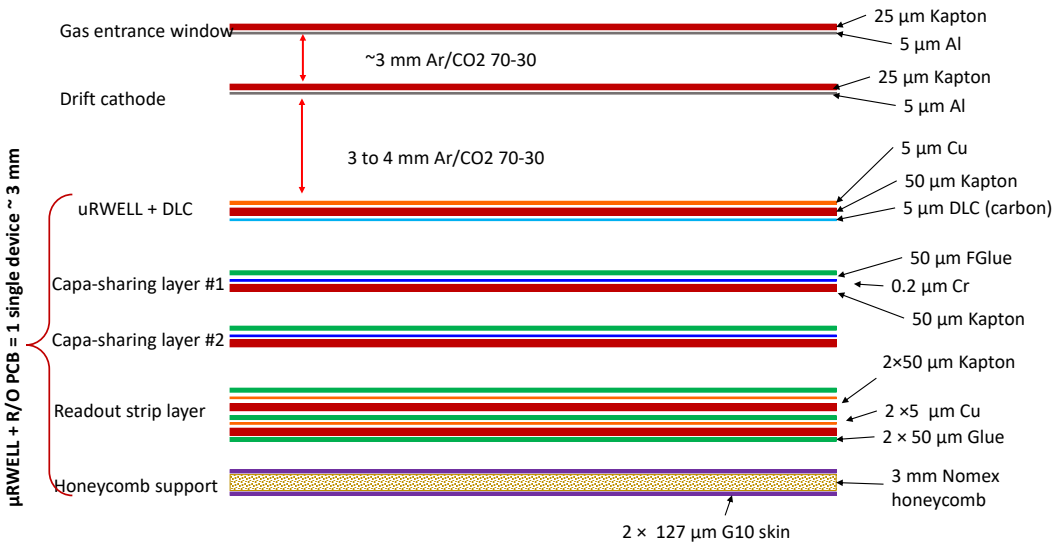


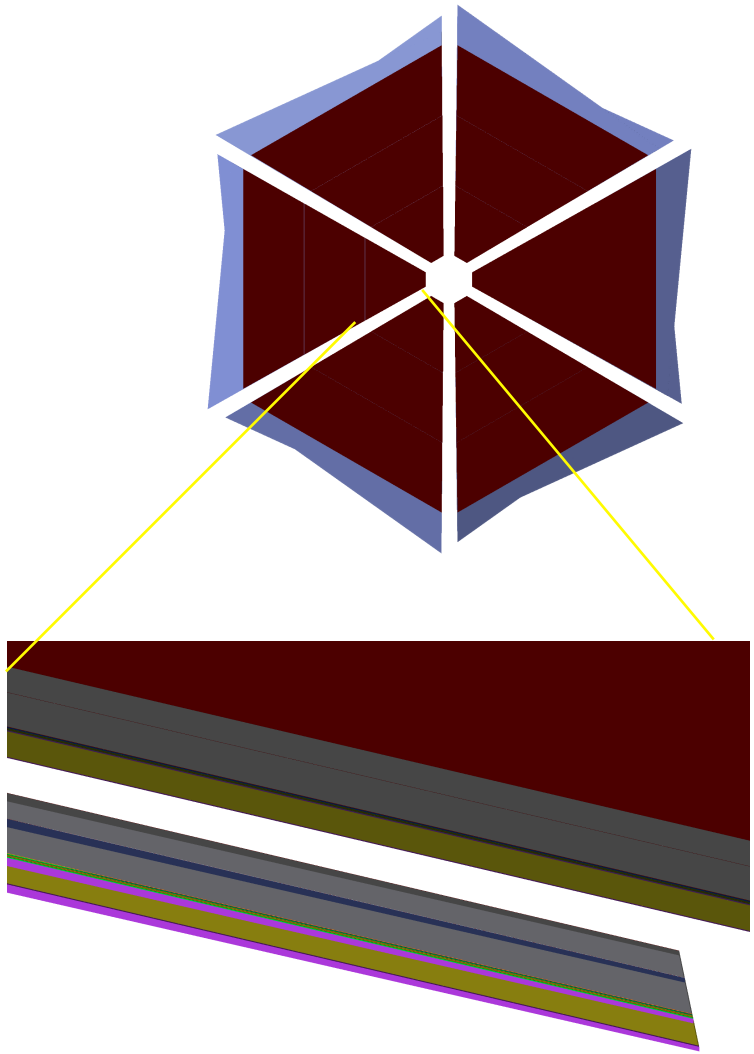
- 6 sectors:
  - each sector: 3 chambers
    - chamber 0:
      - h= 488 mm, b = 104mm, B = 600mm
    - chamber 1:
      - h= 488 mm, b = 600mm, B = 1098mm
    - chamber 2:
      - h= 488 mm, b = 1098mm, B = 1594mm



uRwell: geometry and materials

- Implementation of new detector requires:
  - Geometry : implemented all relevant volumes and materials
- Geometry: materials

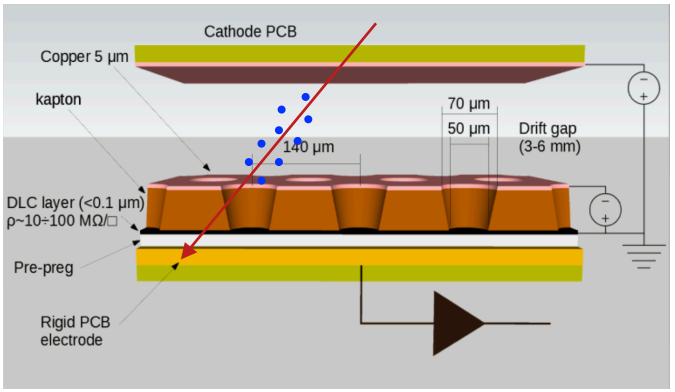




uRwell: Digitization

- Implementation of new detector requires:
  - Digitization : “Effective” description of detector response
  - Energy deposited on the gas gap -> estimate number of electrons produced in the primary ionization: Ne = Edep/ wi - wi: ionization potential
    - Number of electron after amplification stage: Ne_tot = G4Poisson(gain*Ne)
    - Geometry strip description in the digitization routine
    - Identify closest strip and estimate the charge

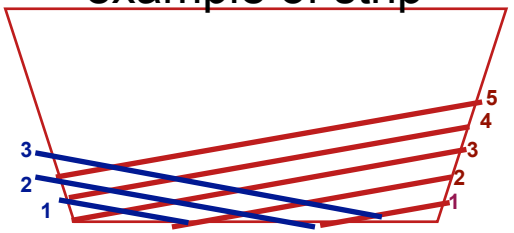
$$Q = \frac{Ne_{tot} * qe}{4}[erf(\frac{stripY + stripWidth/2 - y}{\sqrt{2}\sigma}) - erf(\frac{stripY - stripWidth/2 - y}{\sqrt{2}\sigma})] * [erf(\frac{stripX + stripLength/2 - x}{\sqrt{2}\sigma}) - erf(\frac{stripX - stripLength/2 - x}{\sqrt{2}\sigma})] \quad (1)$$



M.S Dixit, A. Rankin *Simulating the charge dispersion phenomena in Micro Pattern Gas Detectors with a resistive anode* NIM A 566 (2006) 281

- Check strips around closest one and estimate for each of them the charge by using (1)
- Time = time_gemc + time_drift + time_signal_to_readout It is then smeared by a resolution (20 ns) using a gaussian function

example of strip



- strip width : 0.4 mm
- strips pitch: 0.8 mm
- stereo angle relative to the trapezoid base : 10°

uRwell: Digitization

- Digitization : “Effective” description of detector response
- The digitized output bank variables are:
  - **sector**: 1 to 6. For the prototype sector is 6
  - **layer**: odd for u-strip, even for v-strip.
  - **component** : strip ID
  - **ADC**: strip charge
  - **time**: strip time (Time = time_gemc + time_drift + time_signal_to_readout It is then smeared by a resolution (20 ns) using a gaussian function)