C+RWELL SIMULATION UPDATES

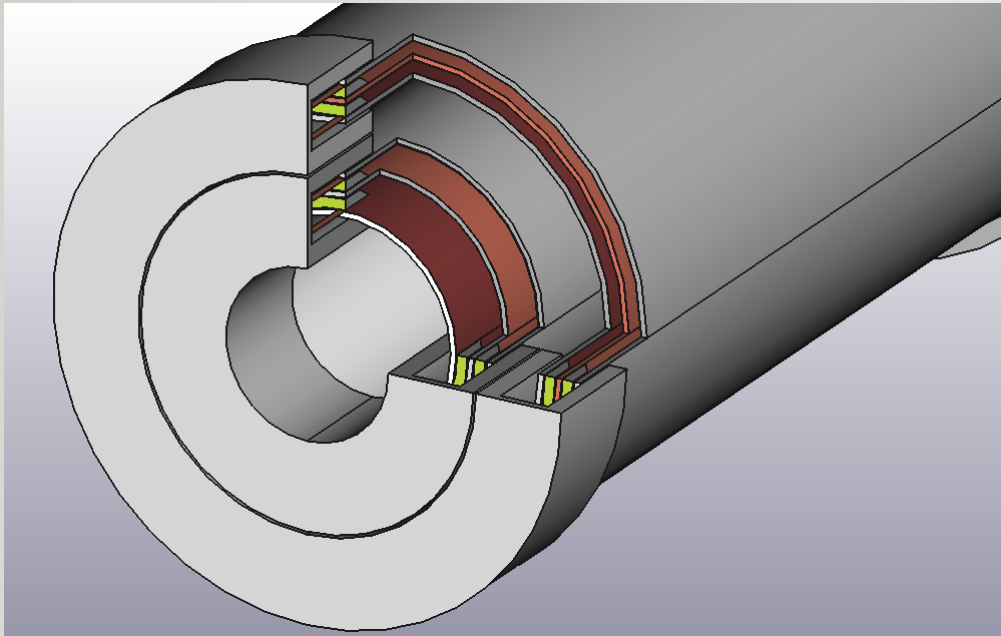E. DE LUCIA

READY TO INSERT OUR FIRST C+RWELL GEOMETRY (@WP5GM)

In *CmuRWELLGeom_geo.xml* the N. 2 small gap B2B C+layers geometry has been implemented

- ⊕ 2 x 1 cm gas gap/B2B device

- ⊕ 4 cm global sampling gas, readout in micro-TPC mode

- ⊕ 1.72÷1.92% X0 depending on material choices for mechanics, cathode and faraday cage

- ⊕ Cross-checking the composition of materials in official libraries.
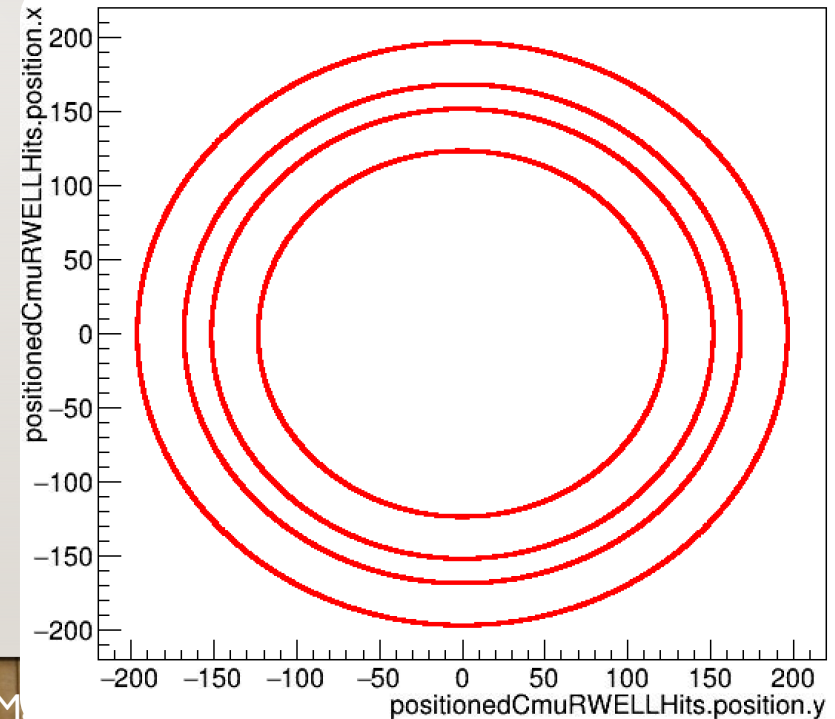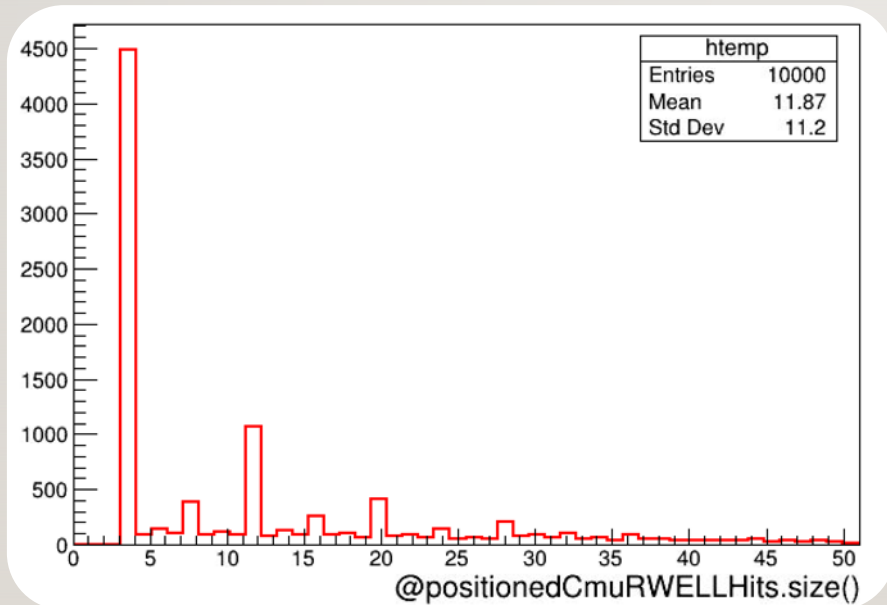 *To be inserted:*
  DLC, Prepreg & MILLIFOAM
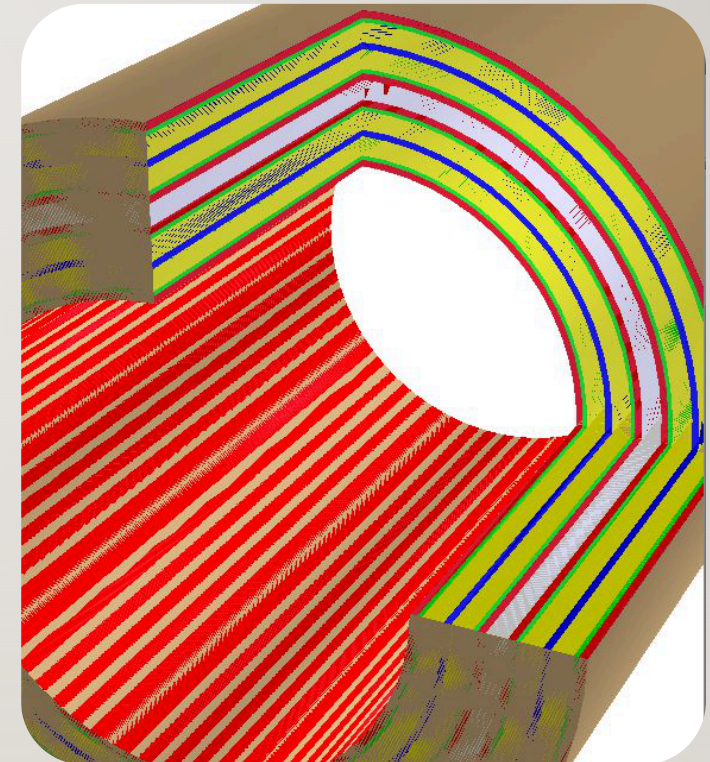
Screenshot from GeoDisplay.py CmuRWELL

PRODUCE & SAVE GEANT4 HITS (@WP5GM)

⊕ Define the detector *sensitive layer/material* in the C+RWELL geometry xml files with the attributes sensitive="yes" type="SimpleTrackerSD"

⊕ *DetectorDescription/DetSensitive/* contains all new definitions of sensitive readouts, dedicated readout type for sensitive detector C+RWELL to be inserted here when ready

⊕ *Full simulation* using */home/edelucia/workarea/aurora/Simulation/G4Sim/G4SimExamples/share/fullsim_example.py*
Generate 100 MeV pions from ParticleGun and *Save* Geant4 hits

75° < θ < 105°
0° < φ < 360°

MATERIAL UPDATE

⊕ *Inserted FR4 and HONEYCOMB new materials in* DetectorDescription/DetBase/xml/Materials/material_mixture.xml

⊕ ROHACELL definition present in the library

```
<material name="Rohacell31">
    <D type="density" value="0.032" unit="g/cm3"/>
    <composite n="9"  ref="C"/>
    <composite n="13" ref="H"/>
    <composite n="2"  ref="O"/>
    <composite n="1"  ref="N"/>
</material>
```

```
<!-- Start CmuRWELL materials-->

<material name="FR4">
    <D type="density" value="1.7" unit="g/cm3"/>
    <fraction n="0.30" ref="Quartz"/>
    <fraction n="0.70" ref="Epoxy"/>
</material>

<material name="HONEYCOMB"> <!-- slides Software meeting 2/2/21 -->
    <D type="density" value="0.032" unit="g/cm3"/>
    <composite n="22" ref="H"/>
    <composite n="14" ref="C"/>
    <composite n="2" ref="O"/>
    <composite n="2" ref="N"/>
</material>

<!-- End CmuRWELL materials-->
```
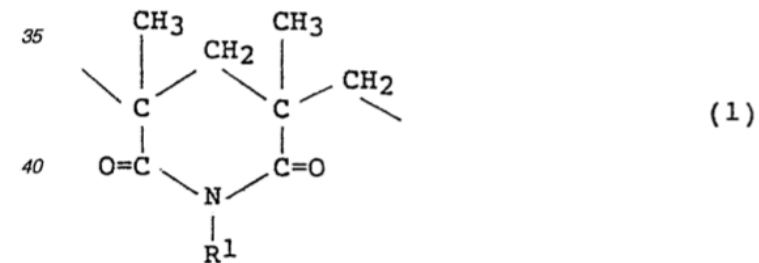
⊕ MILLIFOAM difficult to insert.
 No unique definition.
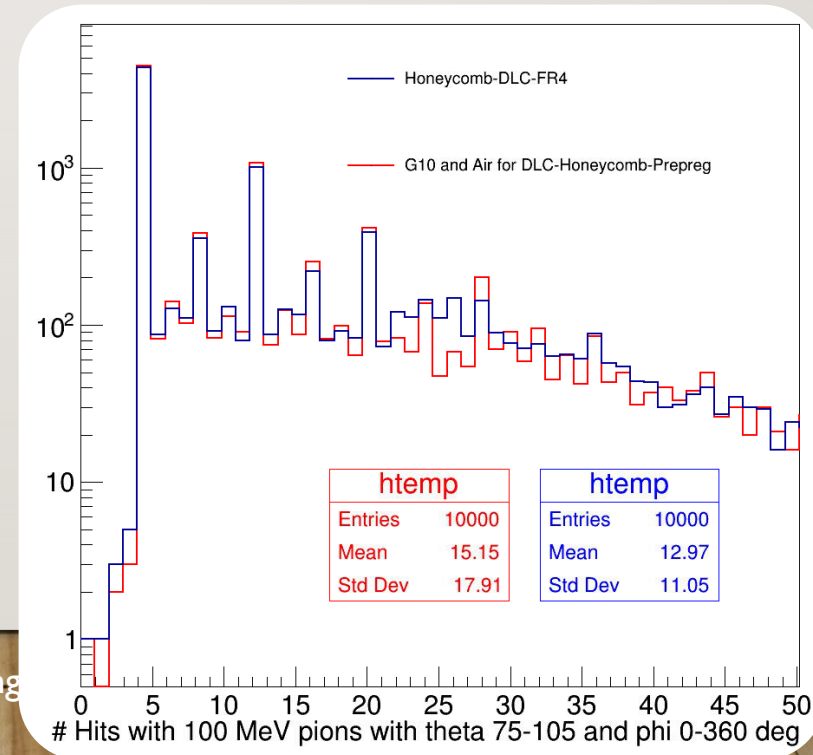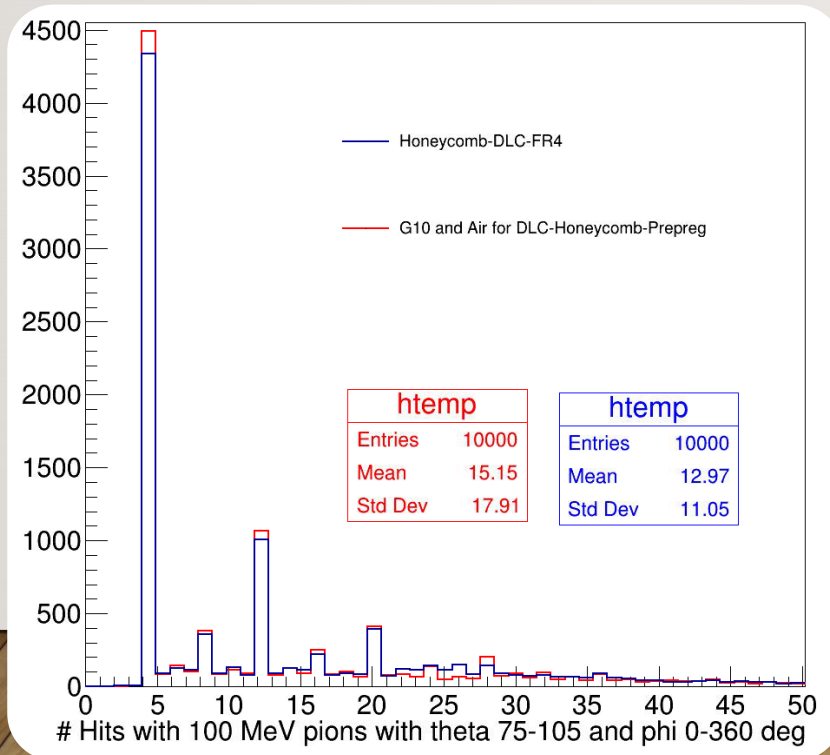 Ask the company to provide us with its molecular formula?

wherein R¹ represents a hydrogen atom, or an alkyl, cycloalkyl, aryl, alkaryl, aralkyl or allyl group having 1 to 20 carbon atoms,

PRODUCE & SAVE GEANT4 HITS W UPDATED MATERIALS

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- *CmuRWELL simulation* using */home/edelucia/workarea/aurora/Simulation/G4Sim/G4SimExamples/share/fullsim_example.py* *Generate* 100 MeV pions from ParticleGun and *Save* Geant4 hits

$75° < \theta < 105°$
$0° < \phi < 360°$

Honeycomb-DLC-FR4

G10 and Air for DLC-Honeycomb-Prepreg

htemp	
Entries	10000
Mean	15.15
Std Dev	17.91

htemp	
Entries	10000
Mean	12.97
Std Dev	11.05

Hits with 100 MeV pions with theta 75-105 and phi 0-360 deg

Honeycomb-DLC-FR4

G10 and Air for DLC-Honeycomb-Prepreg

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Mean	15.15
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Hits with 100 MeV pions with theta 75-105 and phi 0-360 deg

PRODUCE & SAVE GEANT4 HITS W UPDATED MATERIALS

- Define the detector *sensitive layer/material* in the C+RWELL geometry xml files with the attributes sensitive="yes" type="SimpleTrackerSD"
- *DetectorDescription/DetSensitive/* contains all new definitions of sensitive readouts, dedicated readout type for sensitive detector C+RWELL to be inserted here when ready
- *CmuRWELL simulation* using */home/edelucia/workarea/aurora/Simulation/G4Sim/G4SimExamples/share/fullsim_example.py* *Generate* 50 and 100 MeV pions from ParticleGun and *Save* Geant4 hits
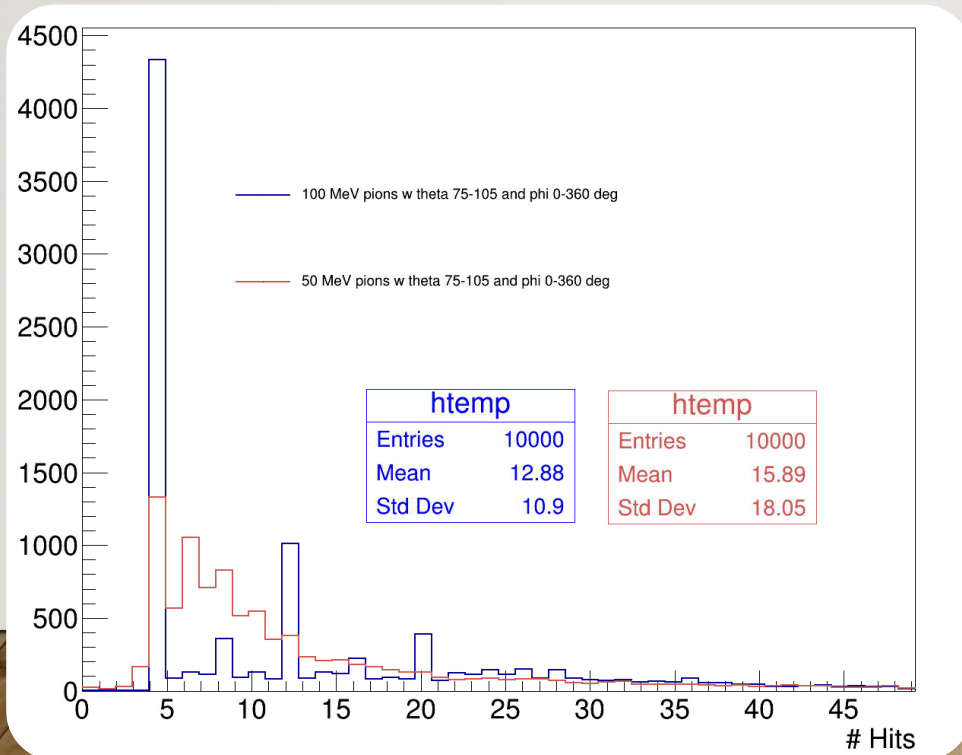
$75° < \theta < 105°$
$0° < \phi < 360°$
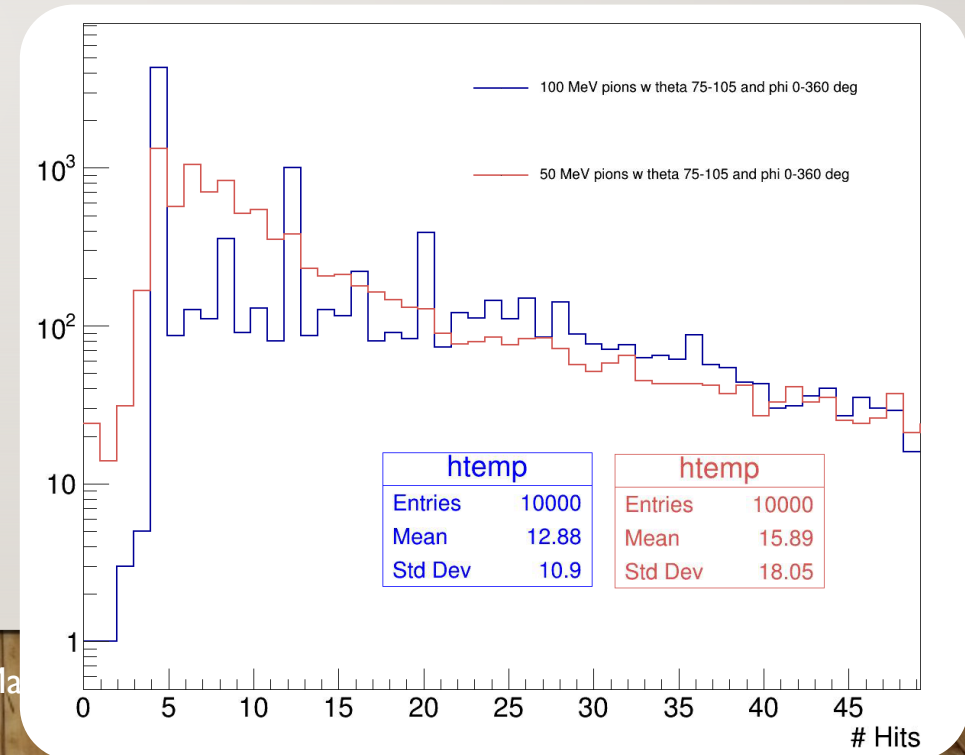
PRODUCE & SAVE GEANT4 HITS (I)

⊕ Define the detector *sensitive layer/material* in the C+RWELL geometry xml files with the attributes sensitive="yes" type="SimpleTrackerSD"

⊕ *DetectorDescription/DetSensitive/* contains all new definitions of sensitive readouts, dedicated readout type for sensitive detector C+RWELL to be inserted here when ready

⊕ *ALL detectors simulation* using */home/edelucia/workarea/aurora/Simulation/G4Sim/G4SimExamples/share/fullsim_example.py*

Generate 50 MeV pions from ParticleGun and *Save* Geant4 hits

$75° < \theta < 105°$

$0° < \phi < 360°$