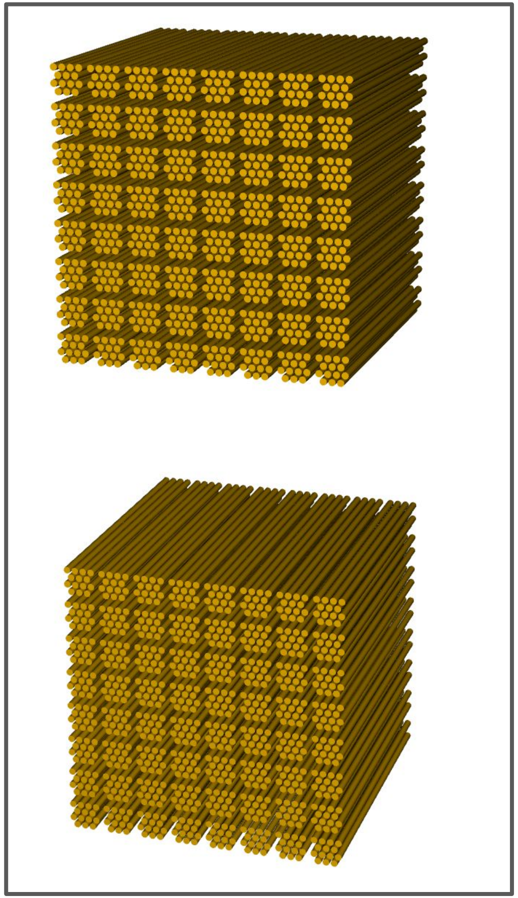
Luminosity Detector Study
W Scifi Detector

- Change in yield with respect to incident e- angle

W Scifi Detector



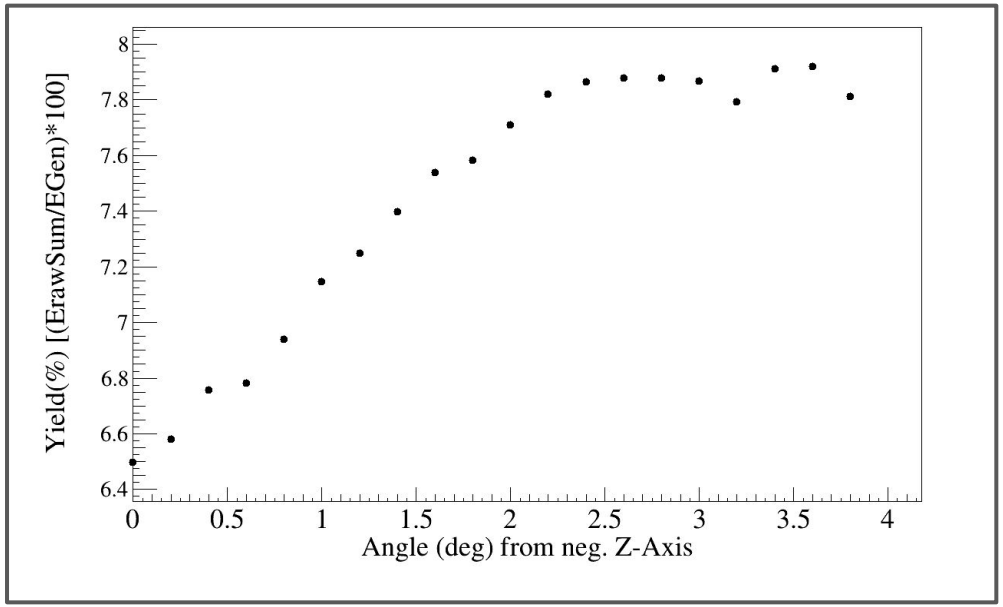
Detector Geometry :

```
// Fibers are placed in a honeycomb with the radius = sqrt(3)/2. * hexagon side length
// So each fiber is fully contained in a regular hexagon, which are placed as
//           ______________________________________
//           |                                    |
// even:     |        ____         ____           |
//           |       /    \       /    \          |
//           |   ___/      \____/       \____     |
// odd:      |  /   \      /    \       /    \    |
//           | /     \____/      \____/       \   |
//           | \     /    \      /    \       /   |
//           |  \___/      \____/      \____/     |
// even:     |      \      /    \      /          |
//           |       \____/      \____/       ___|___
//           |___________________________________|___offset
//                                               | |
//                                               |offset
// the parameters space x and space y are used to add additional spaces between the hexagons
```

```xml
<define>
        <constant name="EcalLumiSpec_FiberRadius" value="0.235*cm"/>
        <constant name="EcalLumiSpec_FiberOffset" value="0.5*mm"/>
        <constant name="EcalLumiSpec_FiberSpaceX" value="0.265*mm"/>
        <constant name="EcalLumiSpec_FiberSpaceY" value="0.425*mm"/>
</define>

<detectors>
        <detector id="LumiSpecCAL_ID" name="LumiSpecCAL" type="LumiSpecScifiCAL" vis="FFPreVis" readout="LumiSpecCALHits" sizeXY="LumiSpecCAL_DXY">
                <module sizex="25*mm" sizey="25*mm" sizez="LumiSpecCALTower_DZ" frameSize="0.0*mm" material="TungstenDens24" vis="FFPreModuleVis">
                        <fiber material="Polystyrene"
                                radius="EcalLumiSpec_FiberRadius"
                                offset="EcalLumiSpec_FiberOffset"
                                spacex="EcalLumiSpec_FiberSpaceX"
                                spacey="EcalLumiSpec_FiberSpaceY"
                                vis="EcalEndcapBlockVis"/>
                </module>
                <sector id="0">
                        <position x="0.0*cm" y="LumiSpecCAL_Y" z="LumiSpecCAL_Z"/>
                        <rotation x="0.0*rad" y="0.0*rad" z="0.0*rad"/>
                </sector>
                <sector id="1">
                        <position x="0.0*cm" y="-1*LumiSpecCAL_Y" z="LumiSpecCAL_Z"/>
                        <rotation x="0.0*rad" y="0.0*rad" z="0.0*rad"/>
                </sector>
        </detector>
</detectors>

<readouts>
        <readout name="LumiSpecCALHits">

                <segmentation type="NoSegmentation"/>
                <id>system:8,sector:8,module:8,fiber_x:16,fiber_y:16</id>
        </readout>
</readouts>
```

- Design/Parameters reference Jaraslav Adam
- xml/cpp files pushed into new branch “https://github.com/eic/epic/tree/Upgrade_LumiPairSpectrometerDesign ”

W Scifi Detector



- e- is incident on top CAL @ random location in front of CAL.

```
double Vz = -64900; //-55610; //in mm
double Vy = r1->Uniform(77,265); //5 mm offset
double Vx = r2->Uniform(-95,95); // 5 mm offset

double theta = ( TMath::Pi()/180 )* (theta_deg);
theta = TMath::Pi() - theta; //converting angle with res. +z-axis
double phi   = TMath::Pi()/2. ; //Y-axis
```

- Egen = 10 GeV
- 150 such Event for each angle
- Raw hit energy in each event is used to calculate yield.

- Increases with angle until 2.5°, after which it is approx. constant
- Study will help to understand calibration matrix for W Scifi Detector