

Geometry of the Straw Tracker (Barrel)

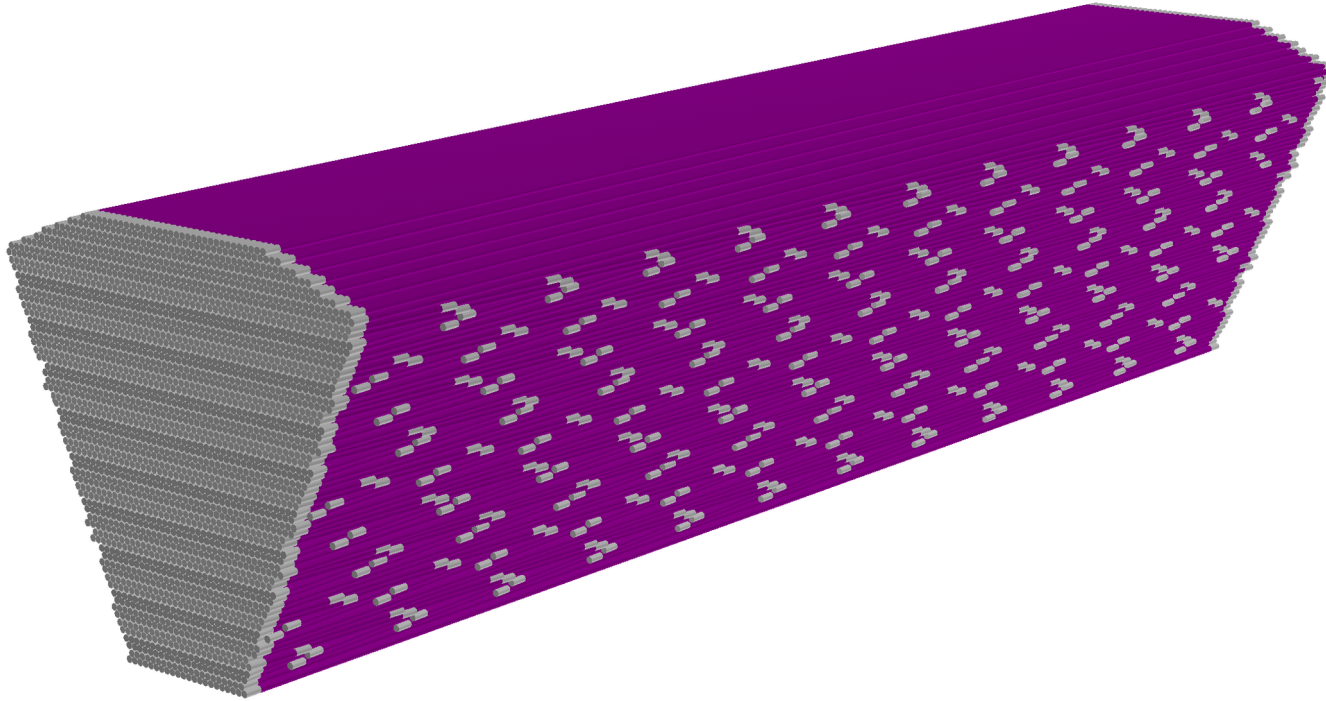
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JINR

SPD Physics & MC Meeting
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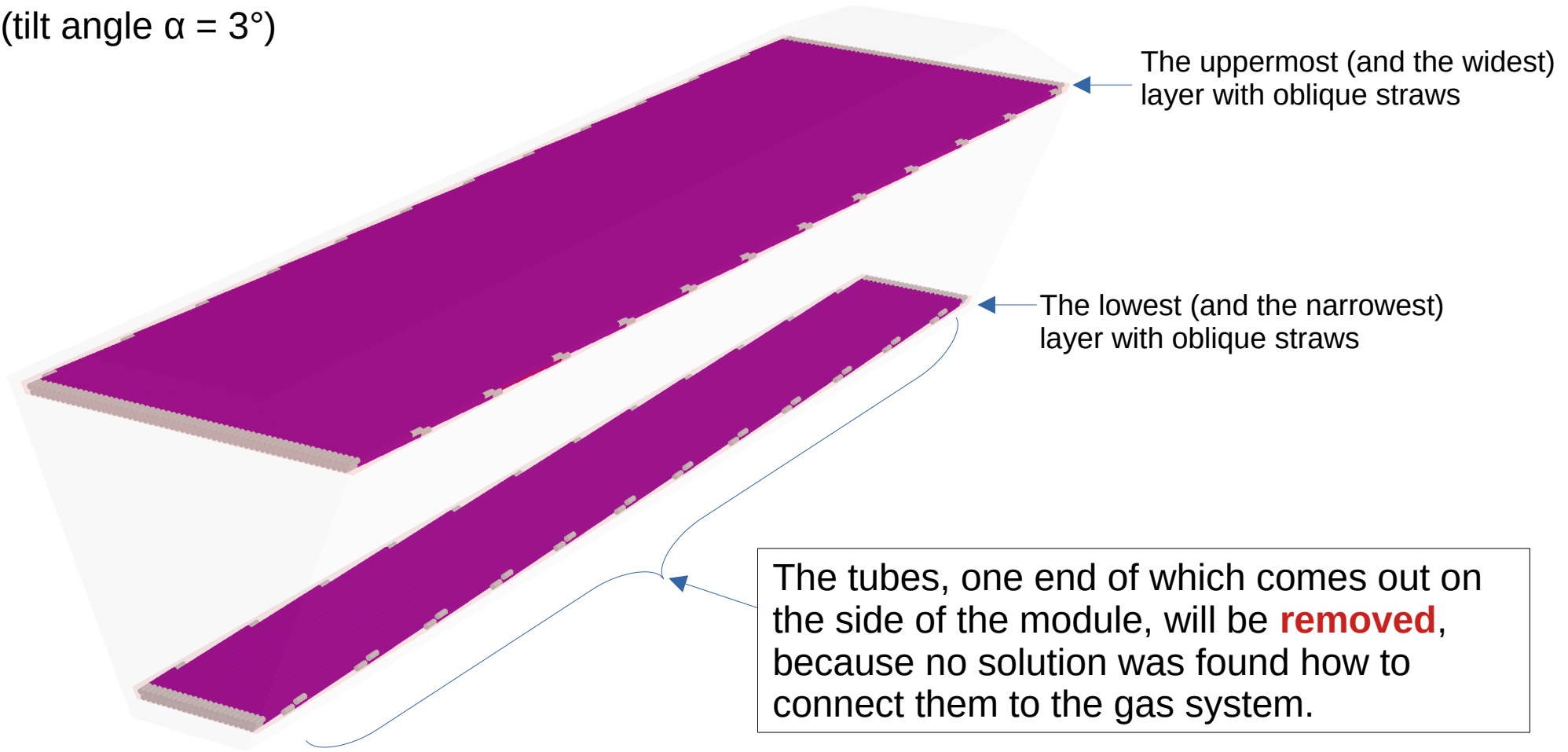
Outline

1. Problem with short straws
2. New (sextant-based) geometry of straw tracker
 - a) Initial version
 - b) Modified version

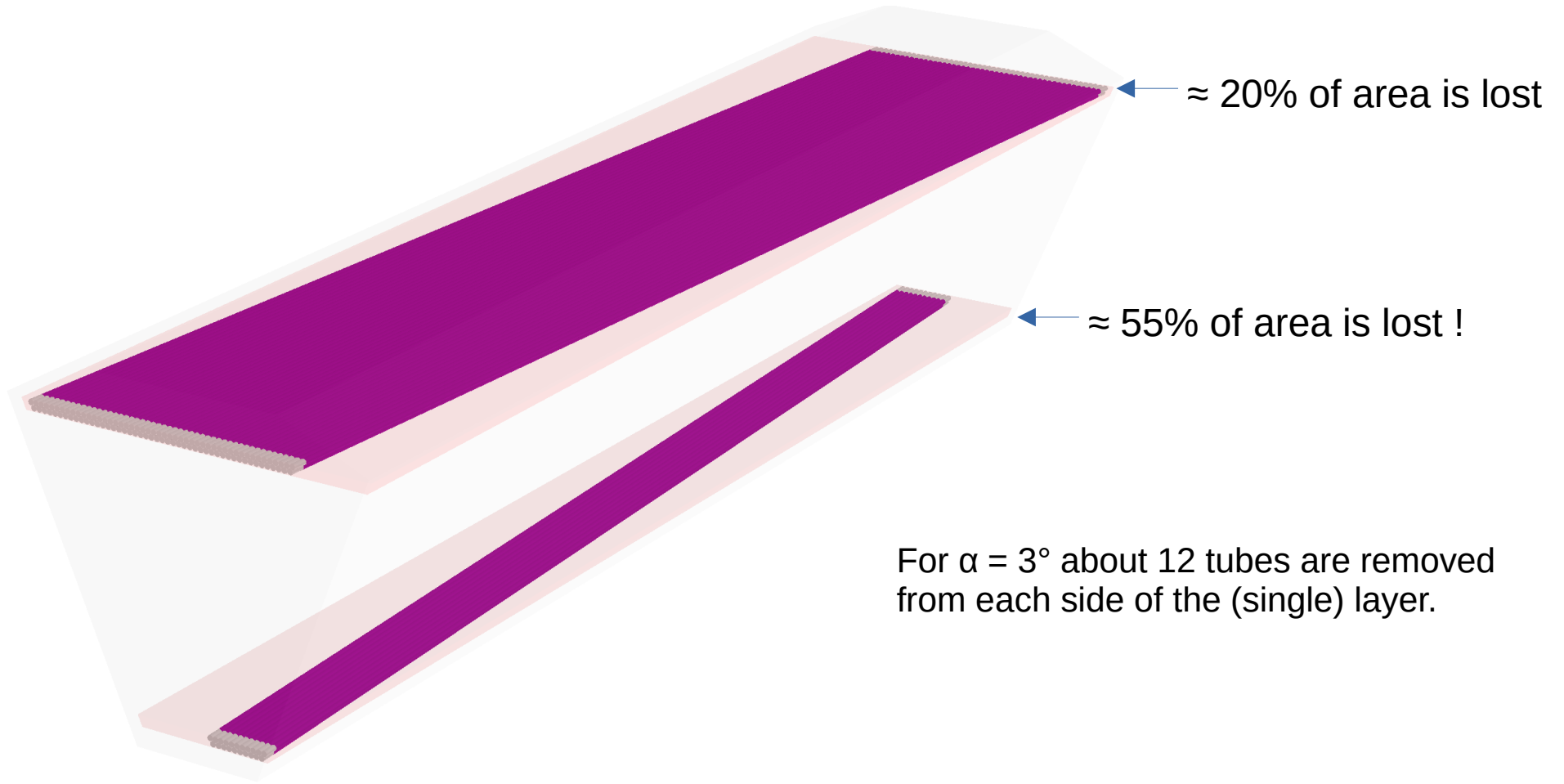
Module of straw tracker (barrel): current geometry



CURRENT GEOMETRY (tilt angle $\alpha = 3^\circ$)

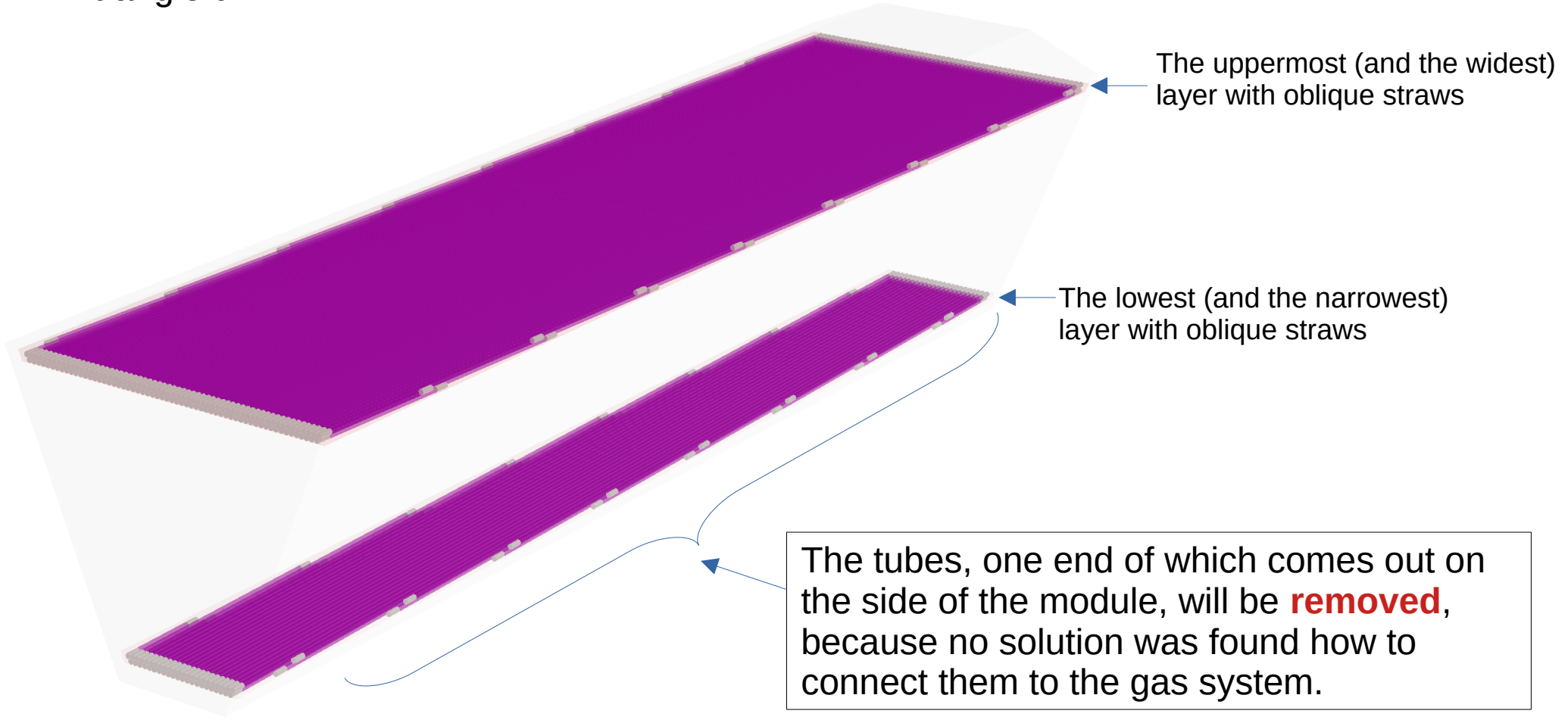


“SHORT” TUBES REMOVED

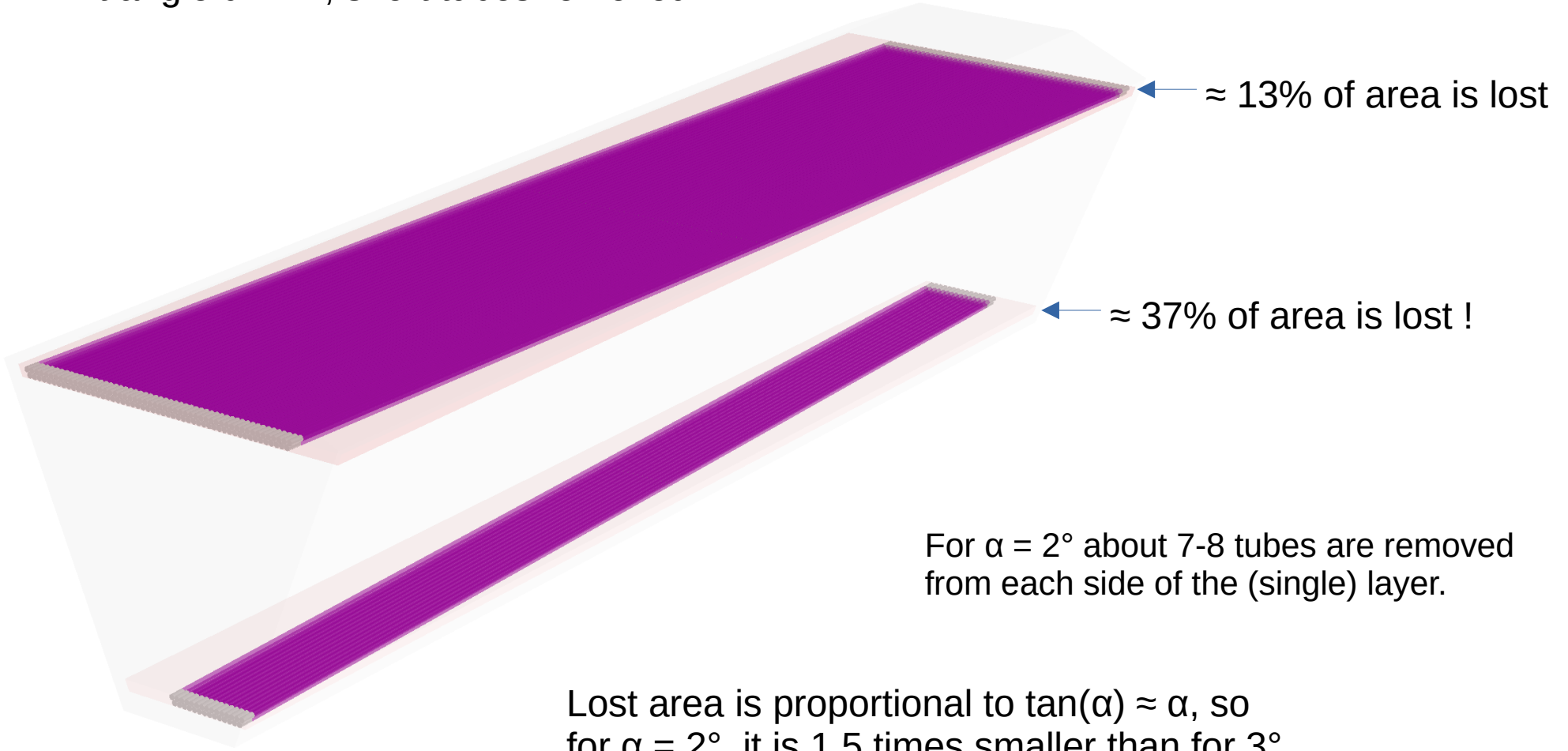


For $\alpha = 3^\circ$ about 12 tubes are removed from each side of the (single) layer.

Tilt angle $\alpha = 2^\circ$



Tilt angle $\alpha = 2^\circ$, short tubes removed



For $\alpha = 2^\circ$ about 7-8 tubes are removed from each side of the (single) layer.

Lost area is proportional to $\tan(\alpha) \approx \alpha$, so for $\alpha = 2^\circ$, it is 1.5 times smaller than for 3° .

New version of straw tracker geometry

Initial version

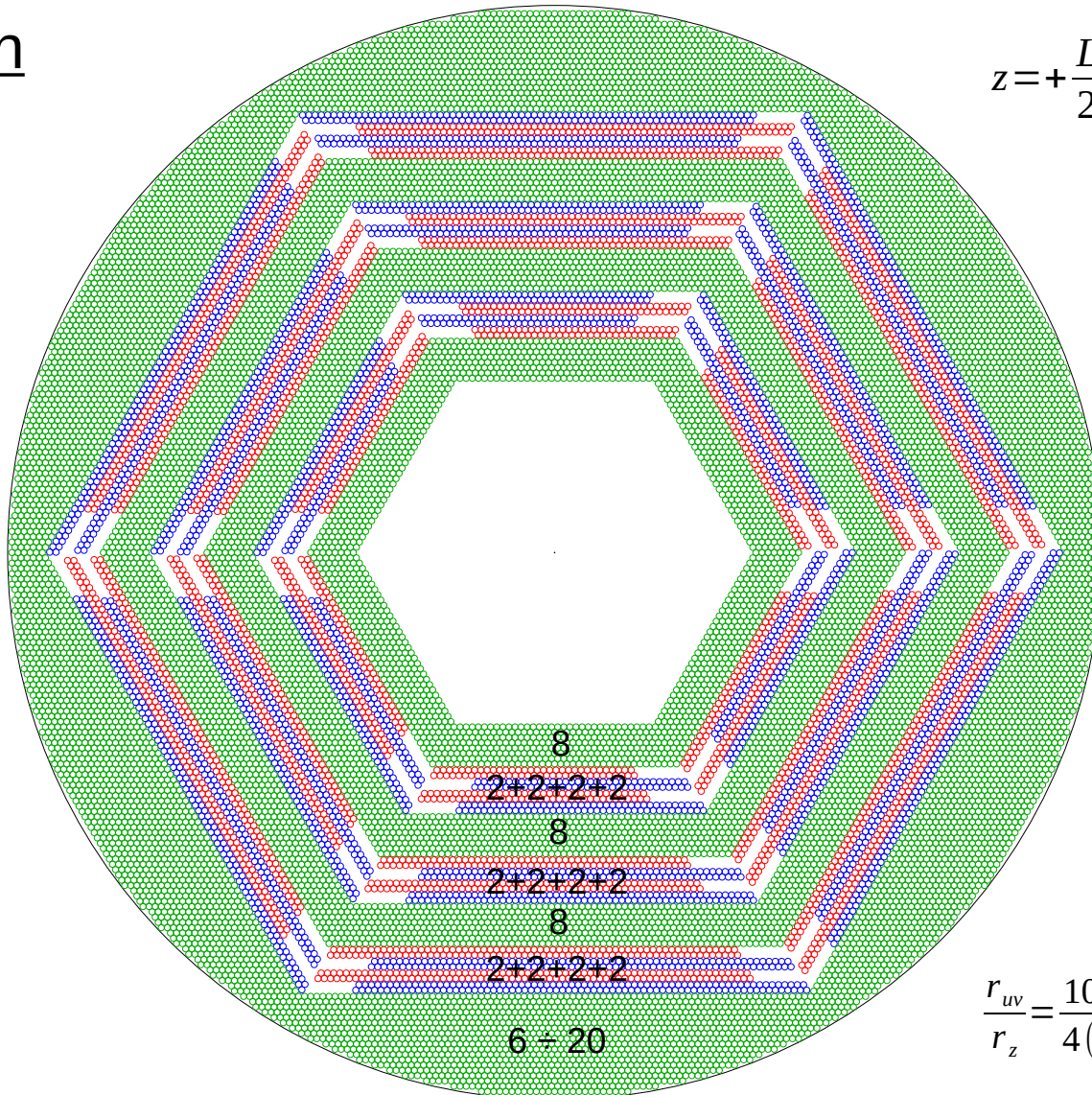
$$z = +\frac{L}{2}$$

$$\alpha = 2^\circ$$

z tubes form dense (honeycomb-like) packing everywhere, that enhances rigidity of the structure.

Nontrivial thing is how to insert u/v layers into this structure:

- 1) Arrange them so as not to spoil the position of the z layers;
- 2) Try to avoid dead zones at the joints of modules (see modified version below).



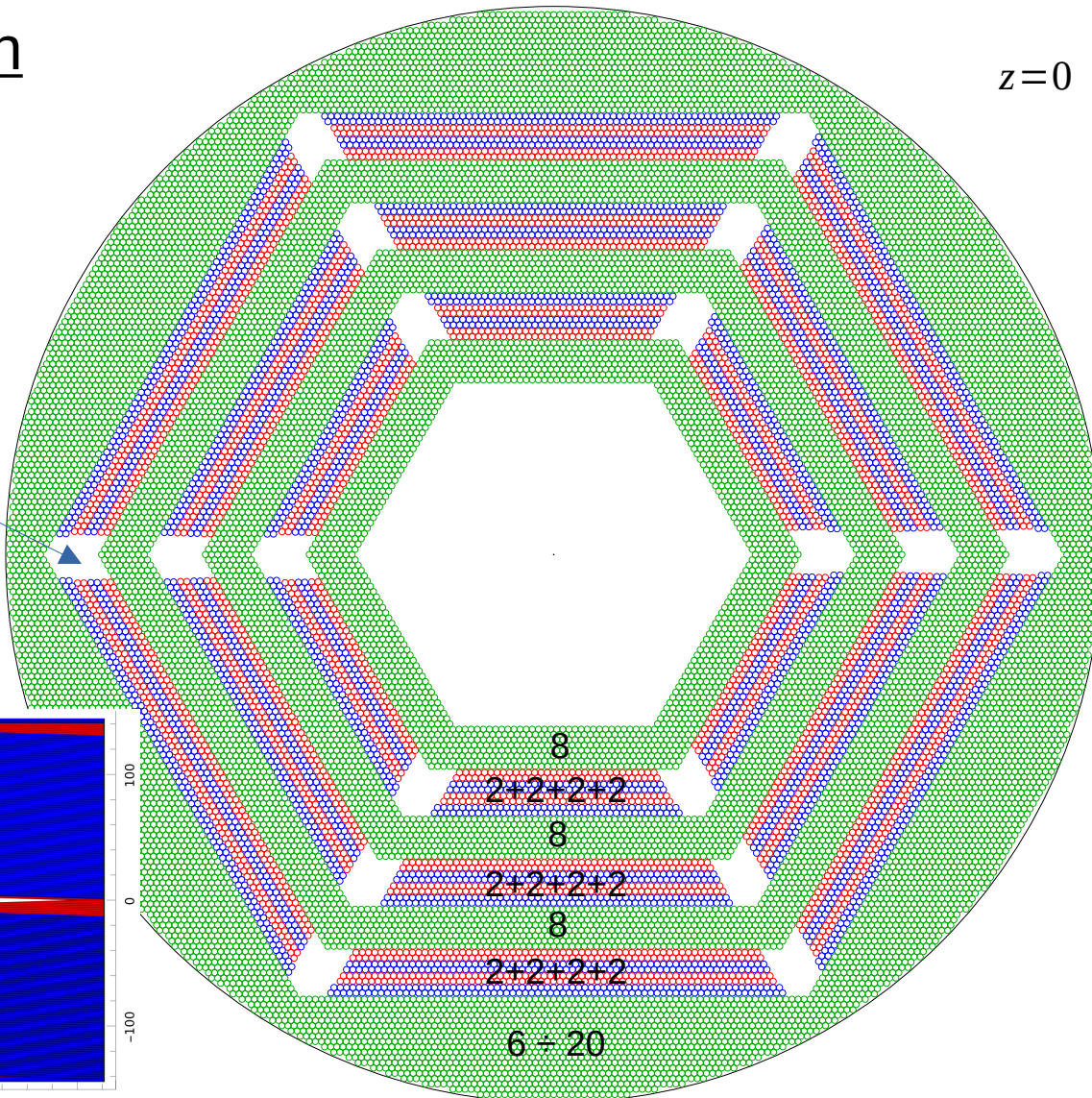
z
u
v

$$\frac{r_{uv}}{r_z} = \frac{10\sqrt{3}-2}{4(\sqrt{3}+2)} = 1.0263$$

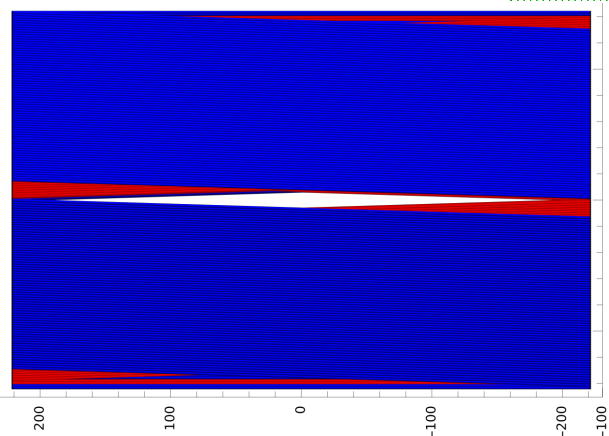
Initial version

$z=0$

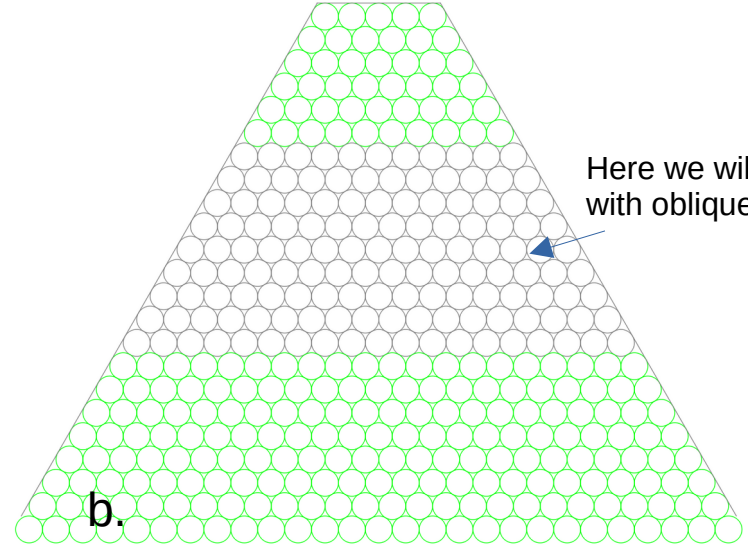
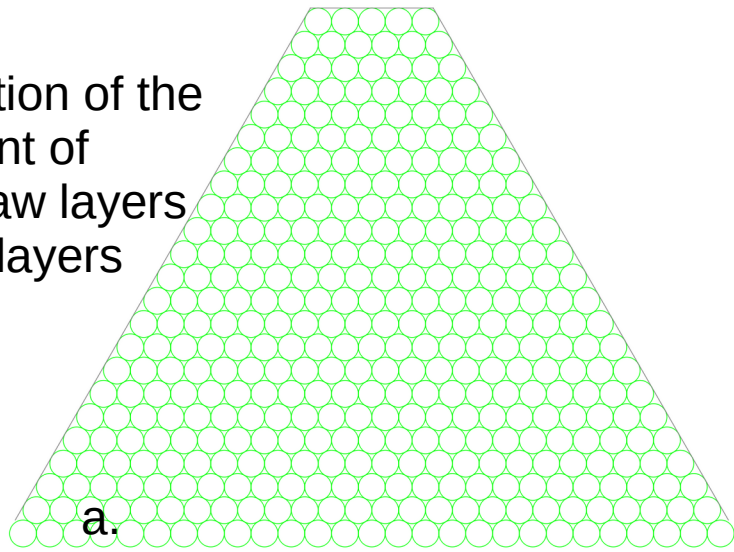
dead zones



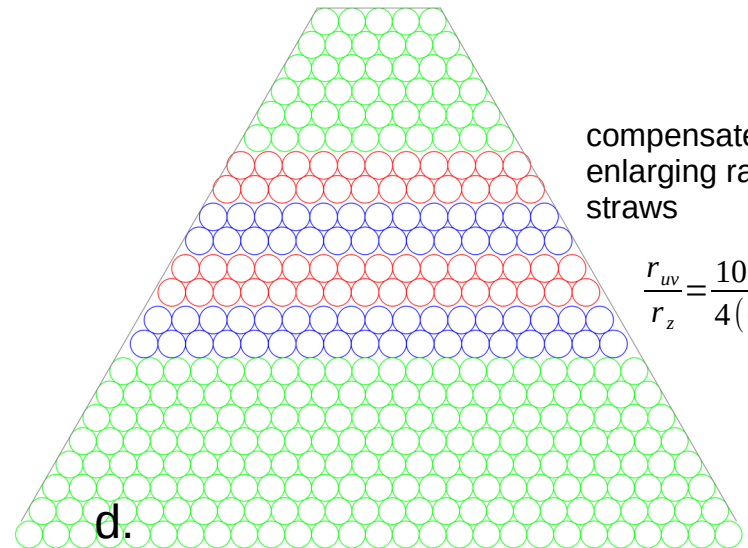
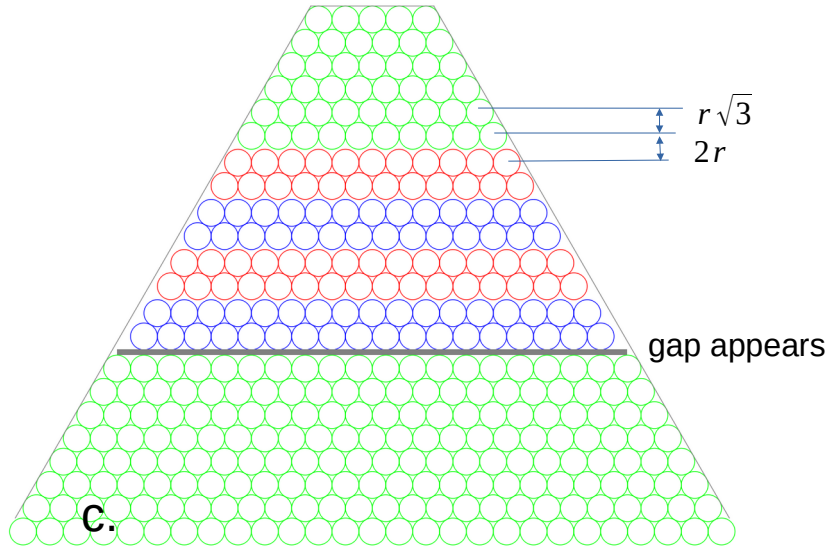
Side view:



Schematic representation of the arrangement of oblique straw layers between z layers



Here we will place layers with oblique straws

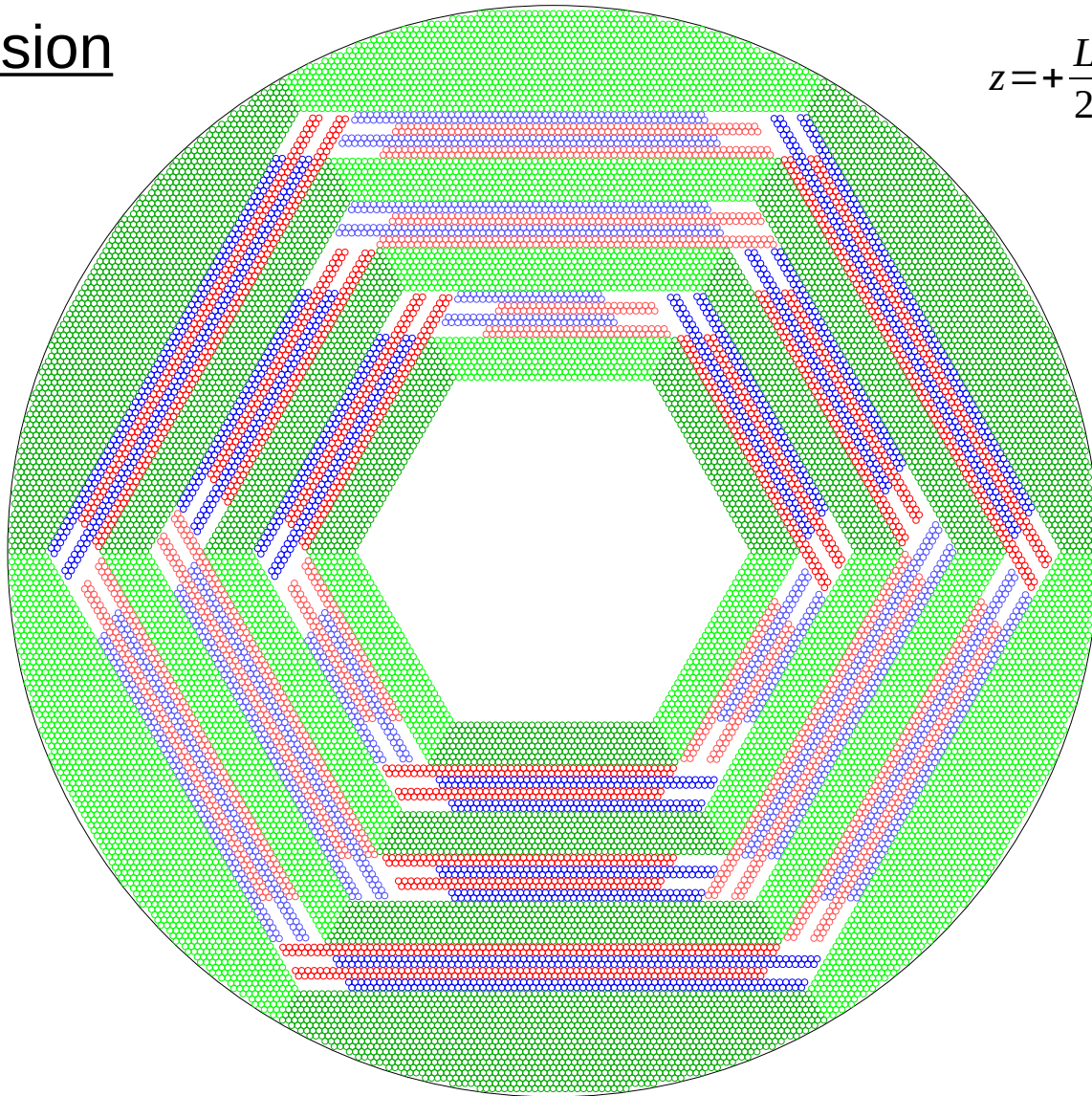


compensate for gap by enlarging radius of oblique straws

$$\frac{r_{uv}}{r_z} = \frac{10\sqrt{3}-2}{4(\sqrt{3}+2)} = 1.0263$$

Modified version

$$z = +\frac{L}{2}$$

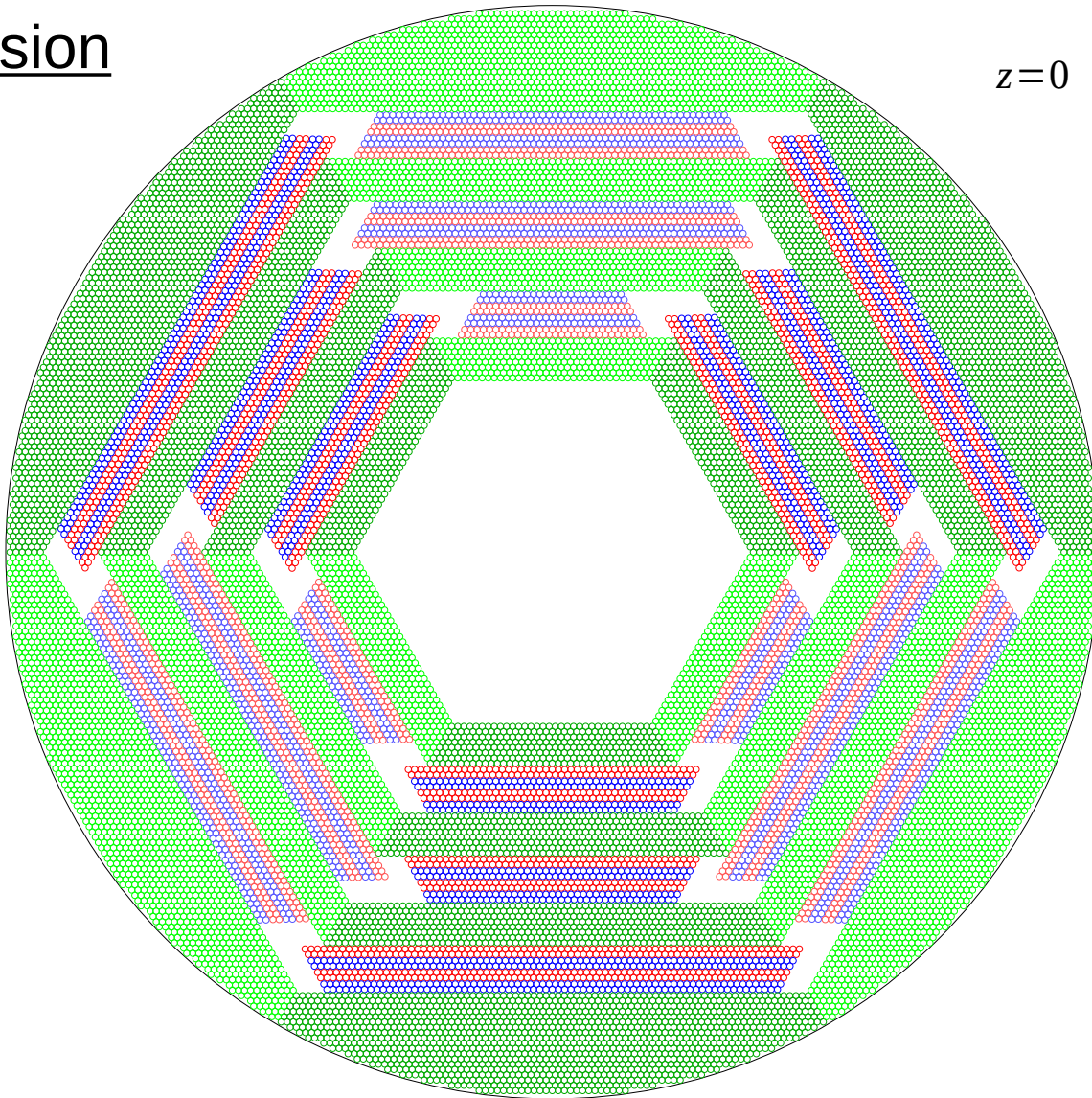


Two types of
modules

Modified version

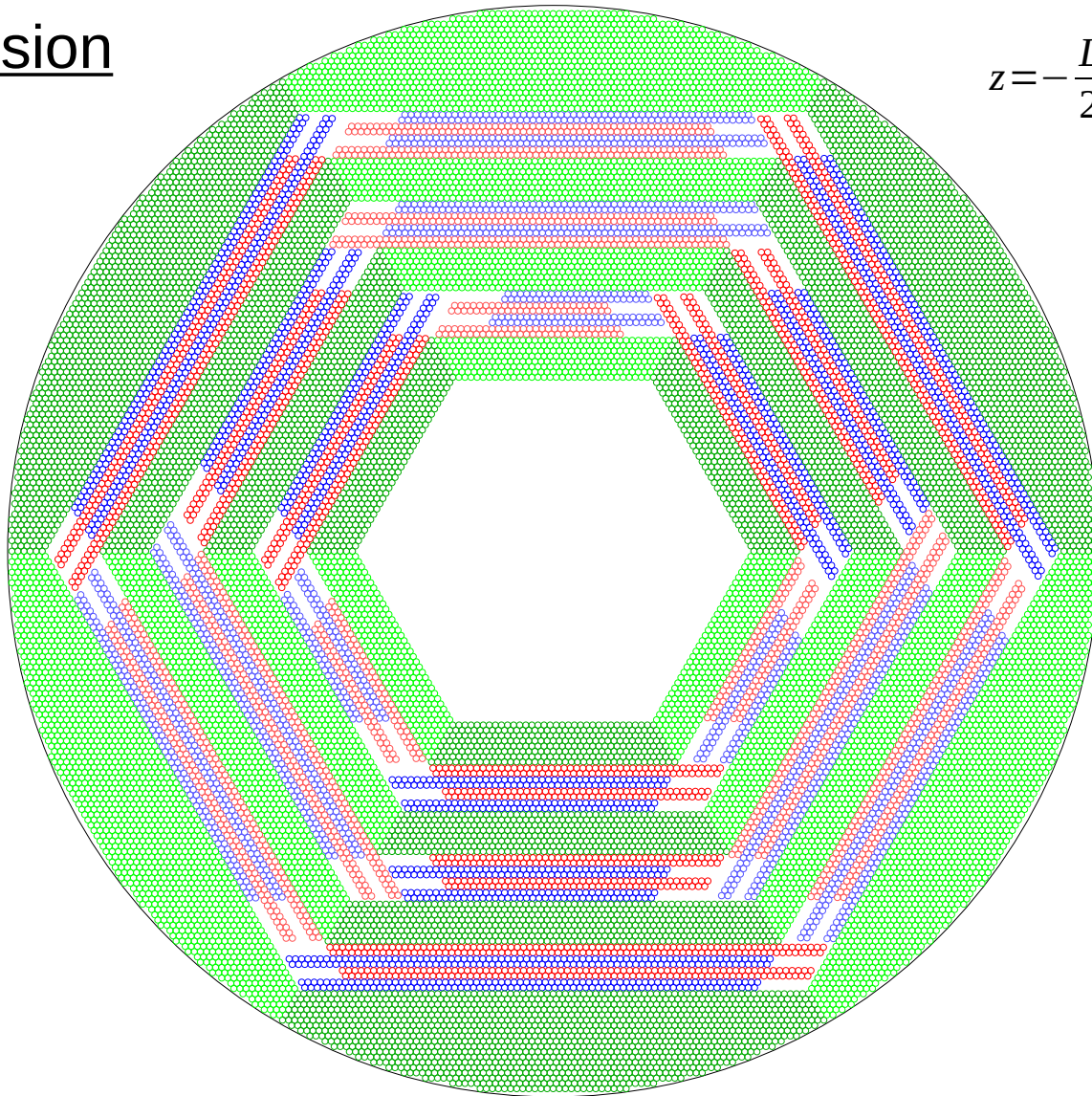
$z=0$

No dead zones →



Modified version

$$z = -\frac{L}{2}$$

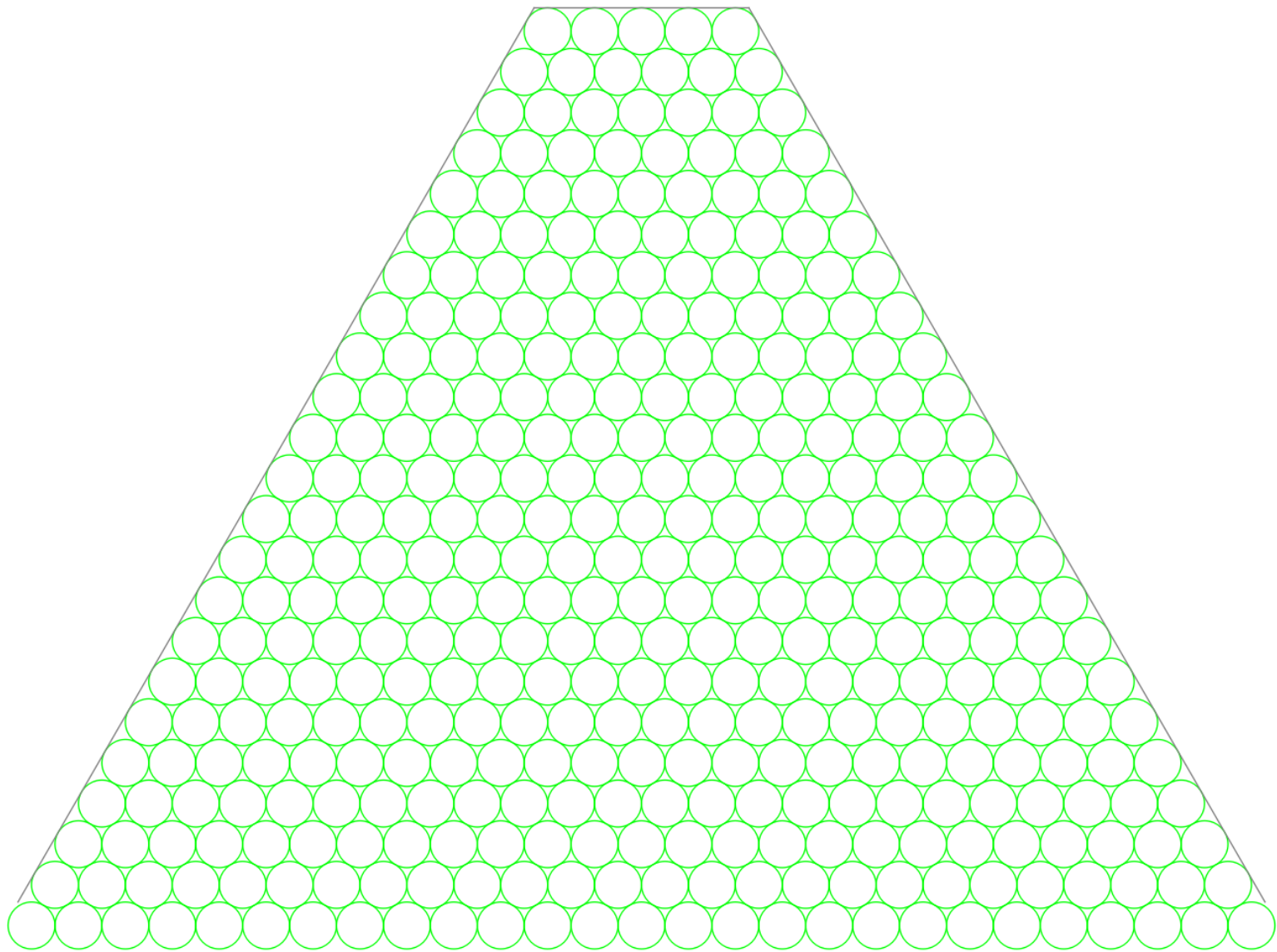


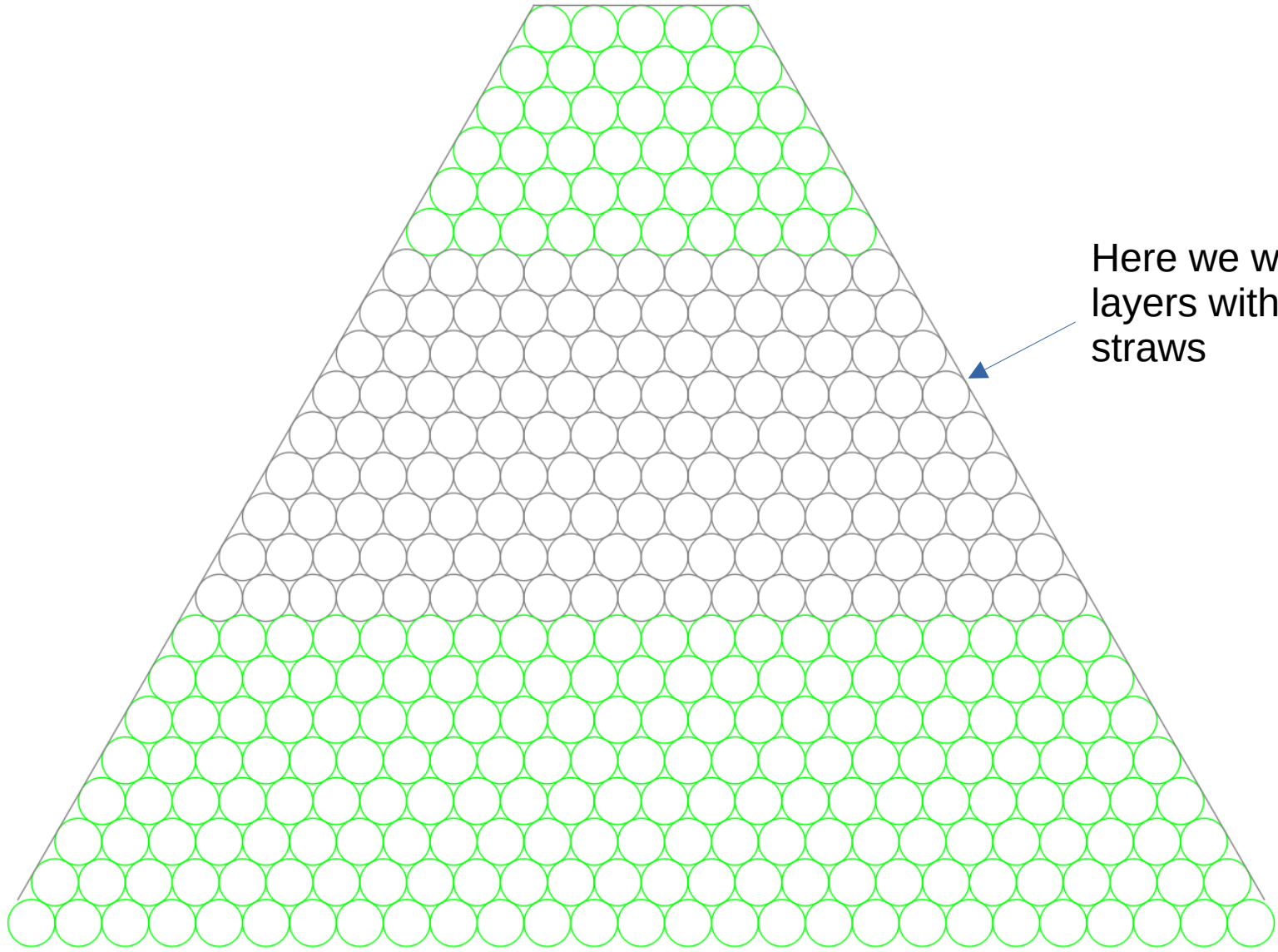
Conclusions

- Removal of short straws in current version of geometry leads to a big loss of sensitive areas at borders of layers with oblique straws, and problems with determination of longitudinal momentum for certain angles of tracks.
- Modified sextant-based version of straw tracker avoids this problem.

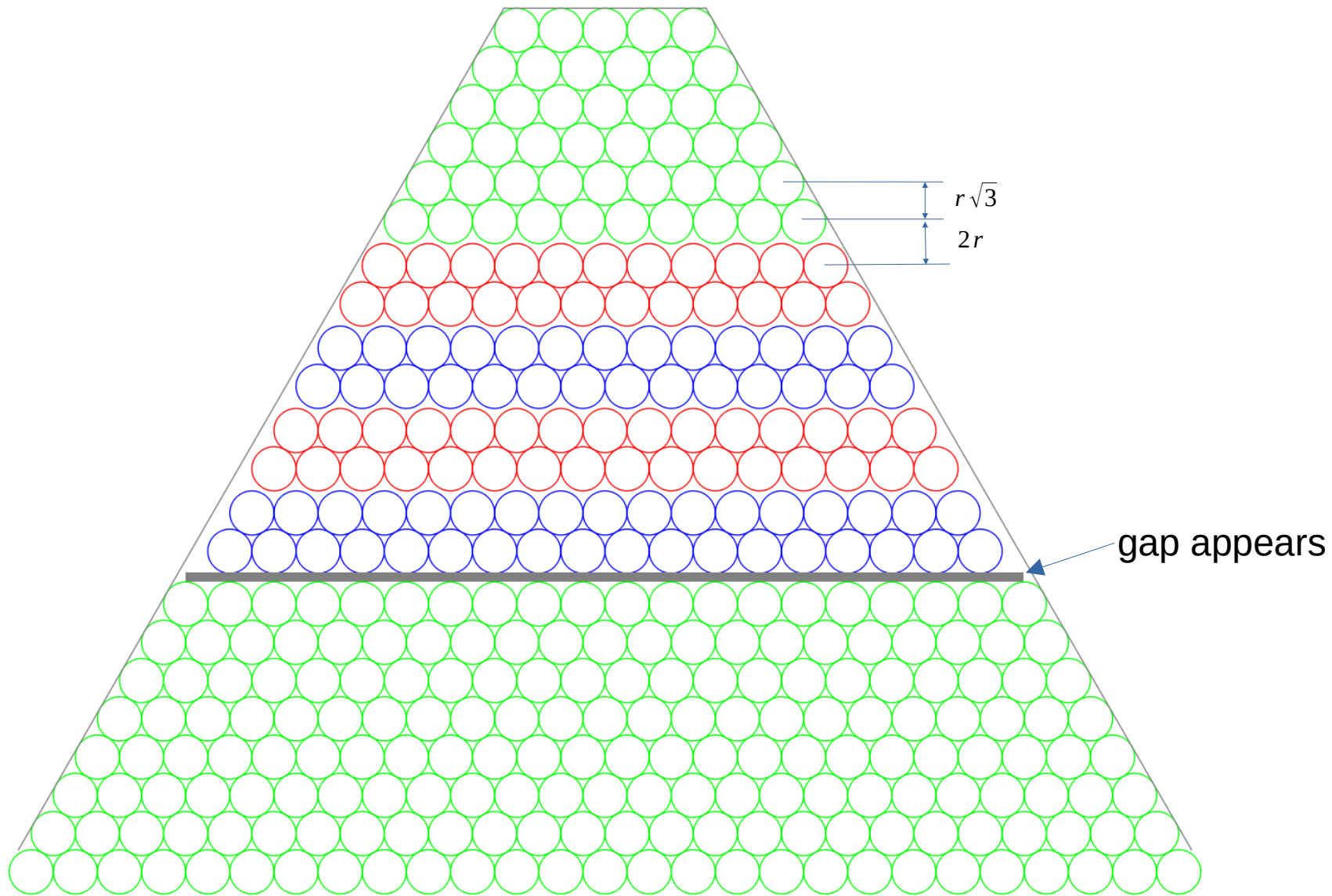
Thank you for your attention!

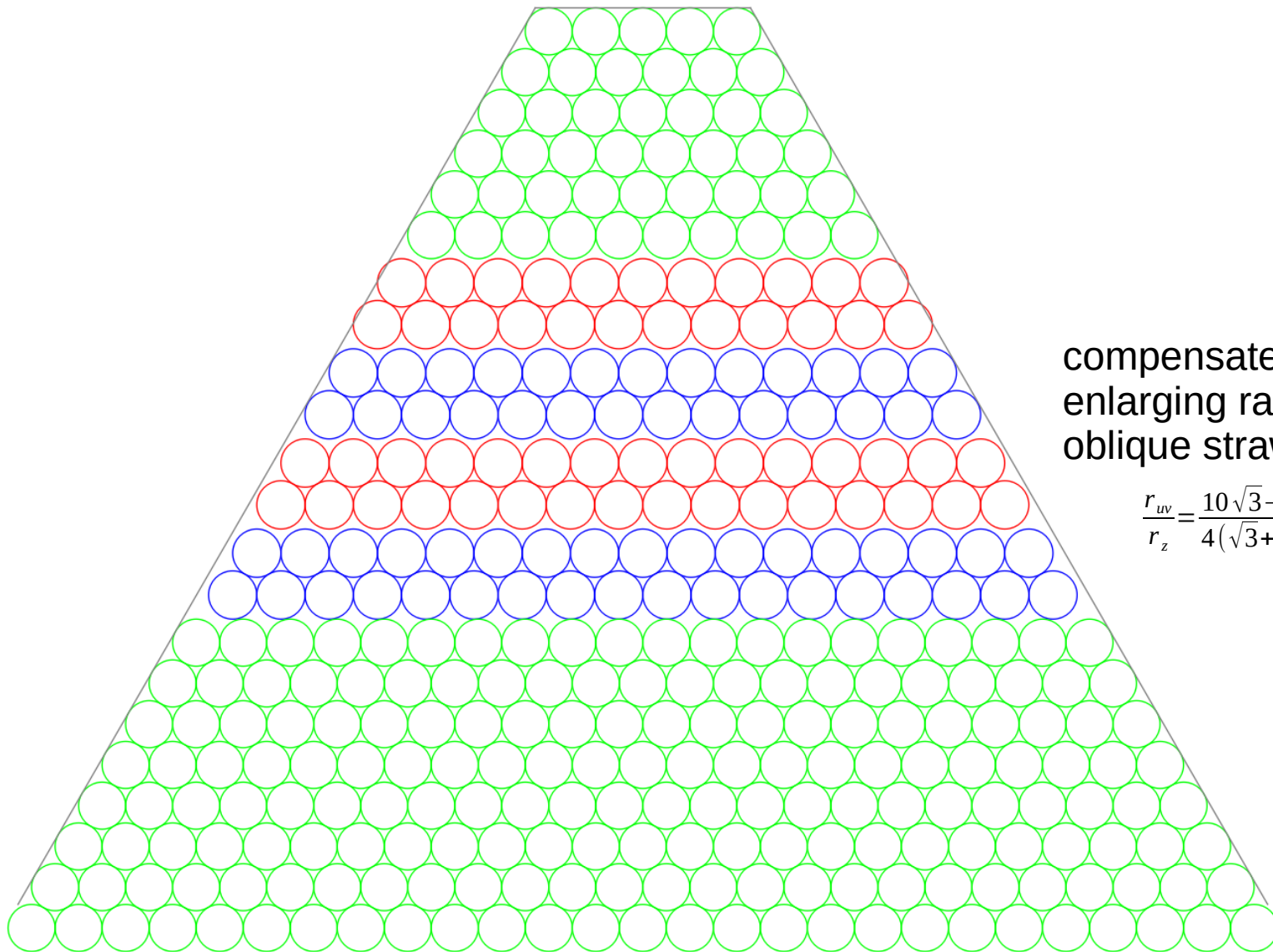
Backup slides





Here we will place
layers with oblique
straws





compensate for gap by
enlarging radius of
oblique straws

$$\frac{r_{uv}}{r_z} = \frac{10\sqrt{3}-2}{4(\sqrt{3}+2)} = 1.0263$$

Initial version: side view

