Tracking hyperons with PANDA

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Pattern Recognition session
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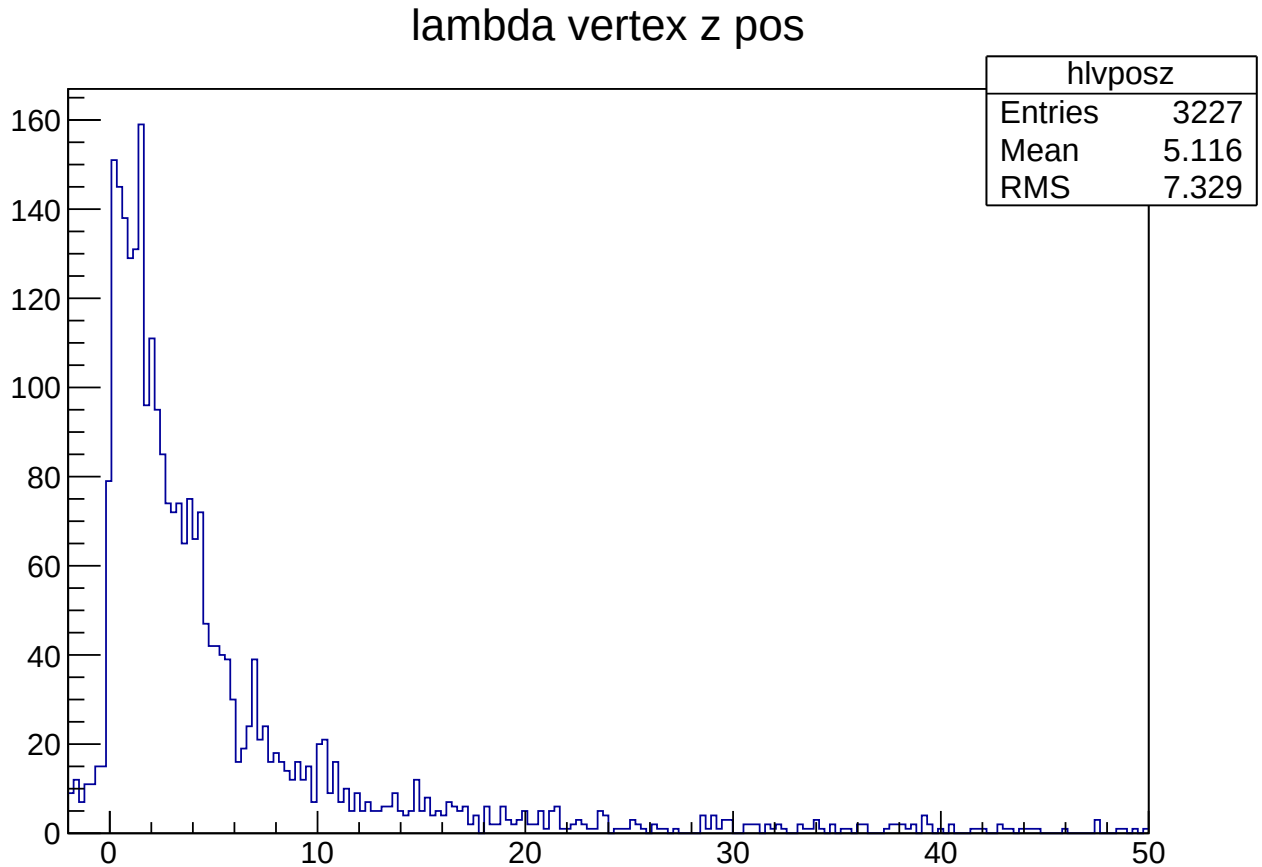
What makes hyperons so special?

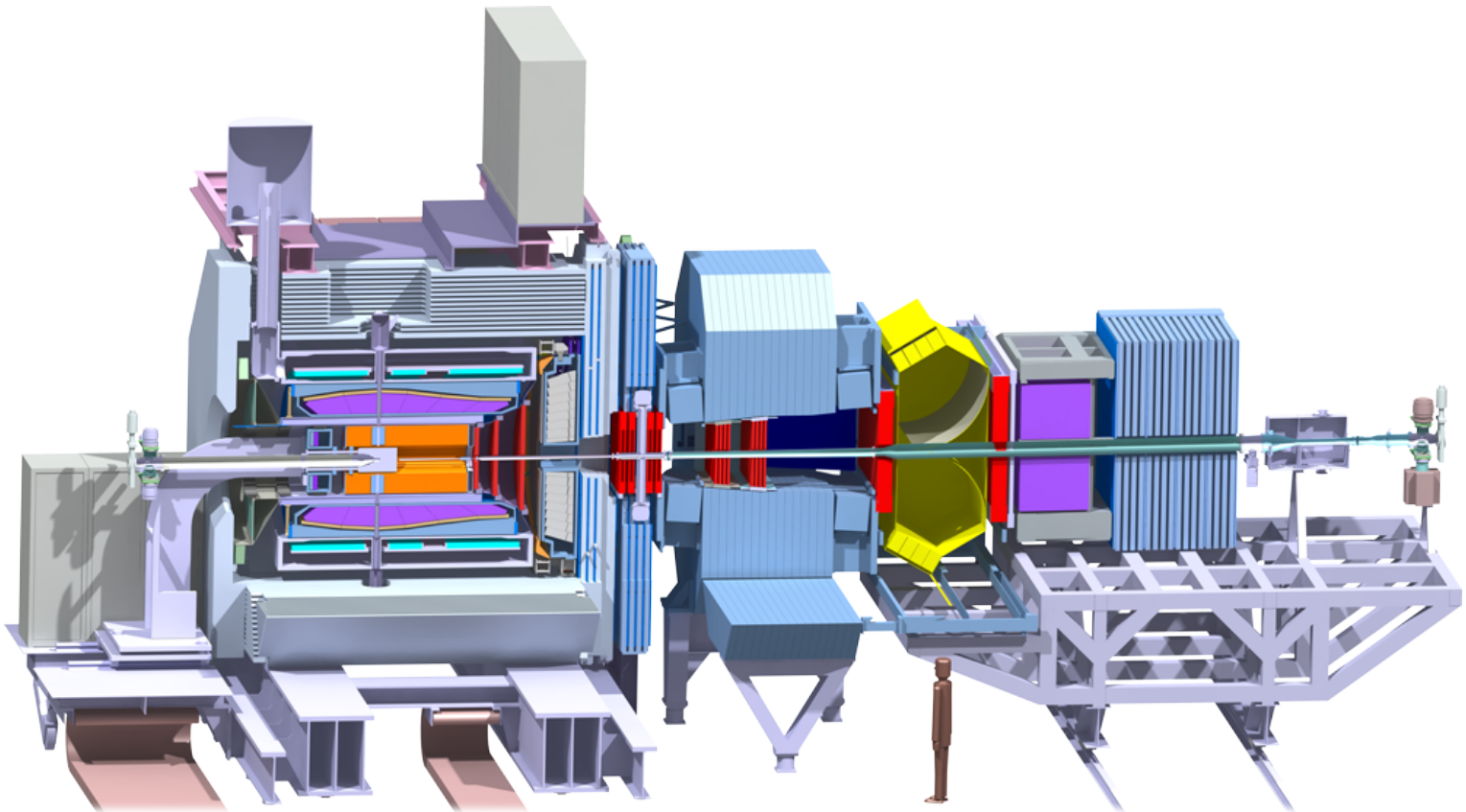
(in this particular case)

- Weak decay $\Lambda \rightarrow p + \pi^-$ ($\approx 64\%$)

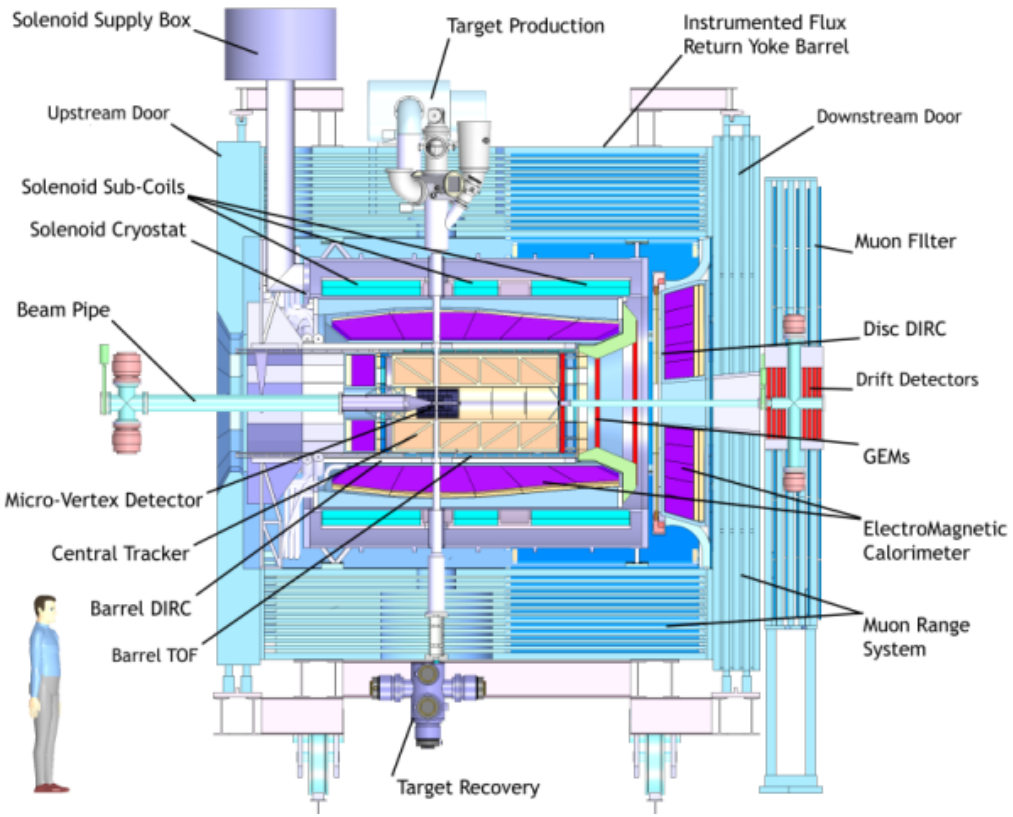
$\Rightarrow$ Decay vertex displaced from $\bar{p}p$ interaction point



PANDA



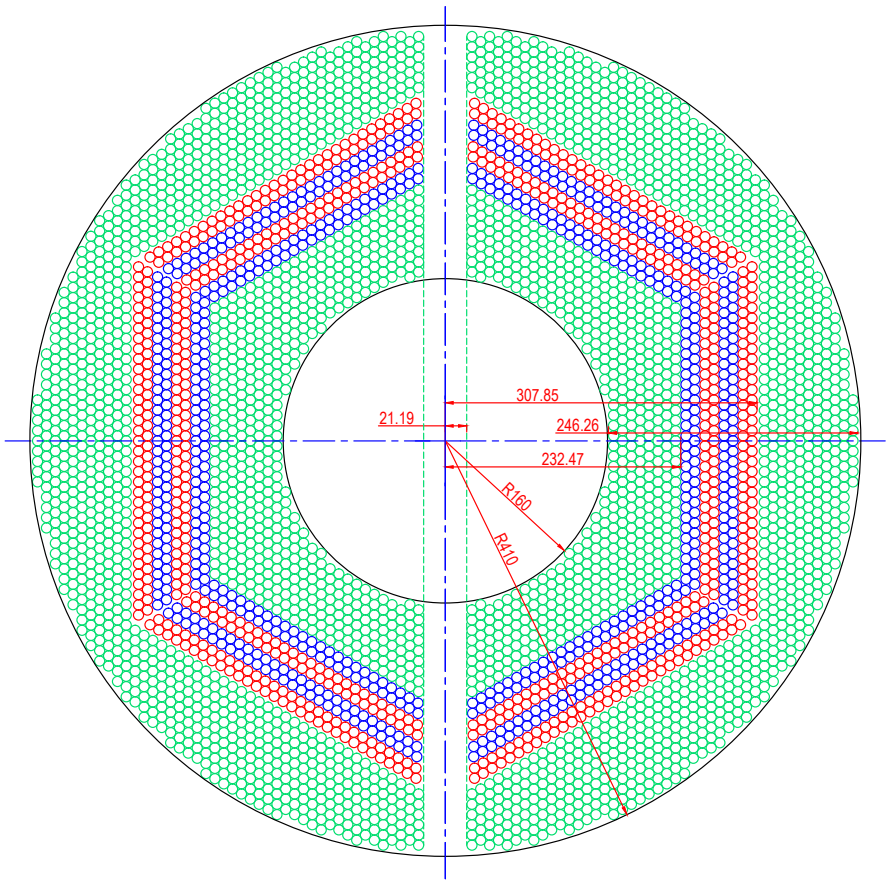
PANDA Target Spectrometer



(charged) track reconstruction

- STT (Straw Tube Tracker)
- MVD (Micro Vertex Detector)
- GEMs (Gas Electron Multiplier)
- SciTil / Barrel TOF (Scintillator Tile Hodoscope)

Let's focus on the STT for now

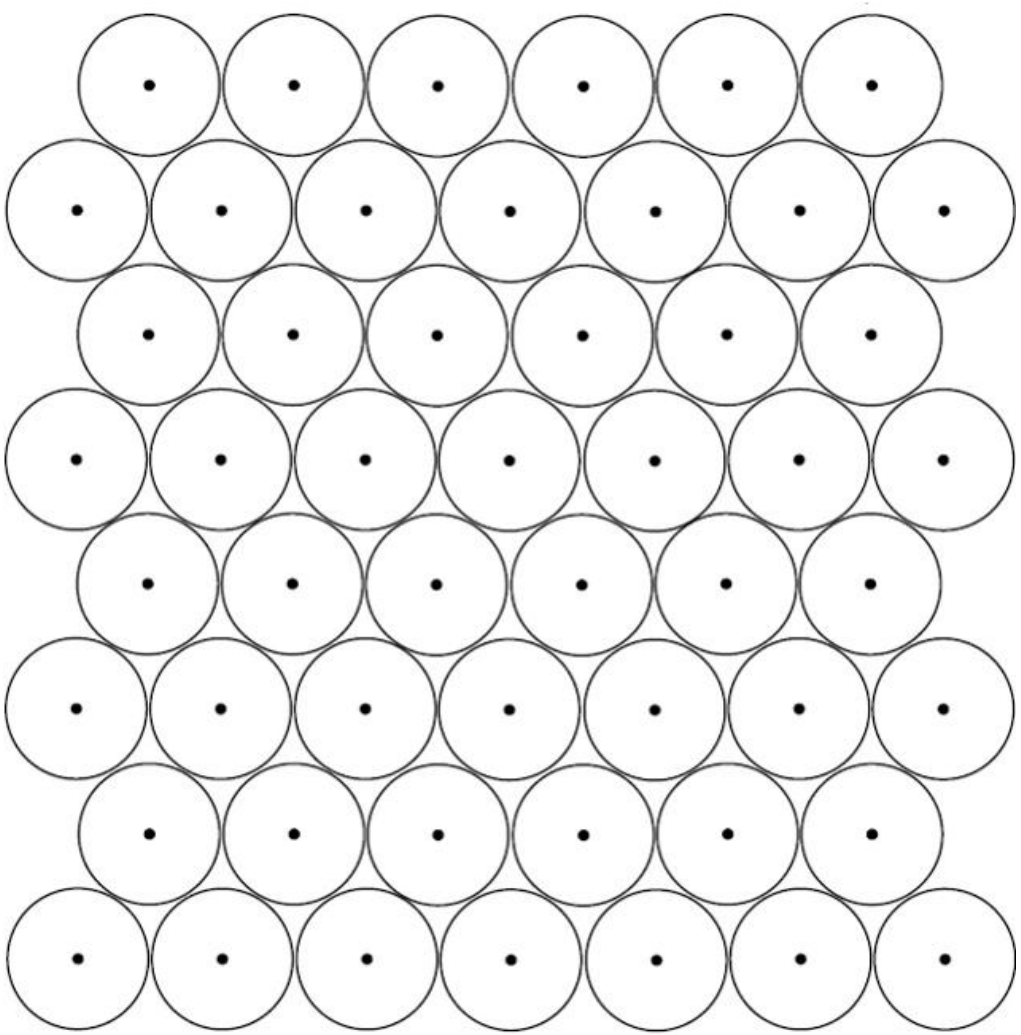


STT Layout

- Green: parallel to beam axis
- Blue: skewed by $+2.9°$
- Red: skewed by $-2.9°$

1. TrackletGenerator

Cellular Automaton - Apply to STT



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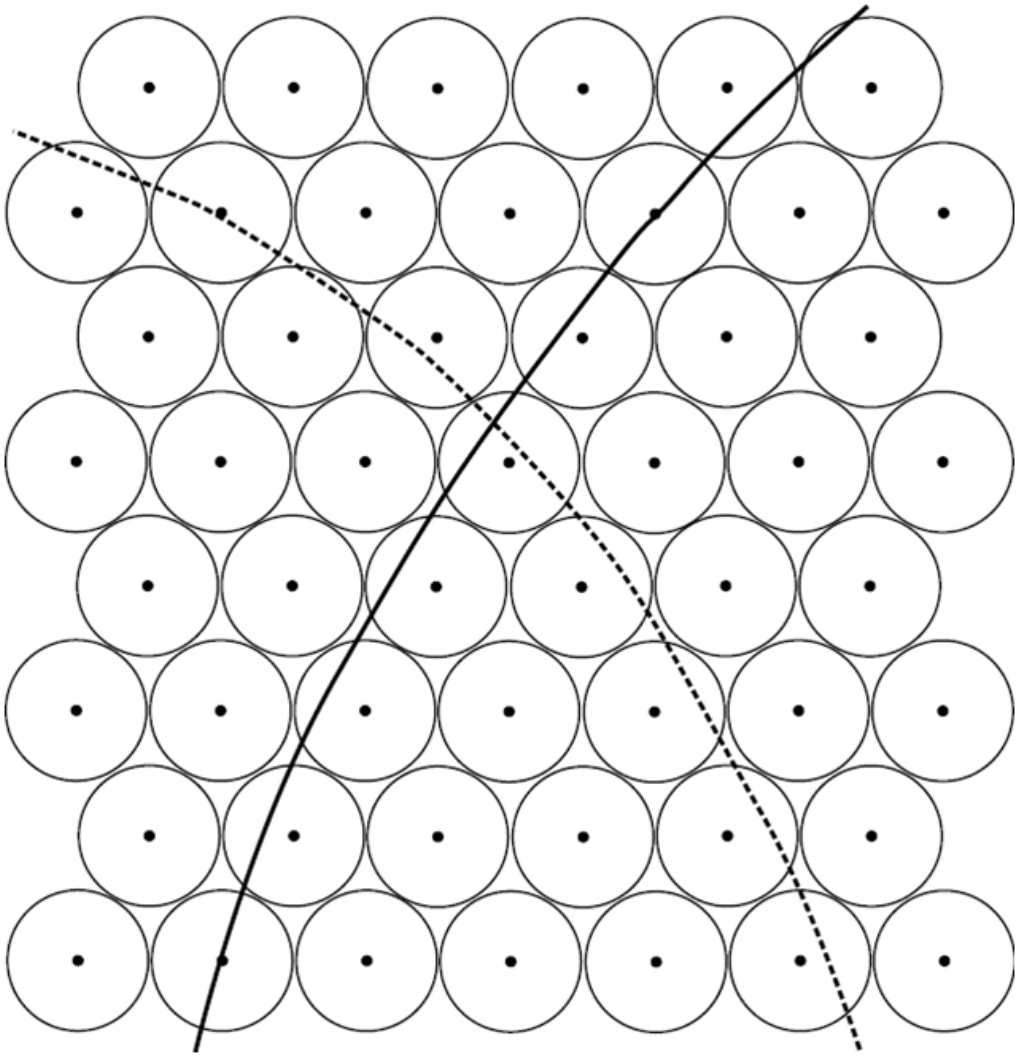

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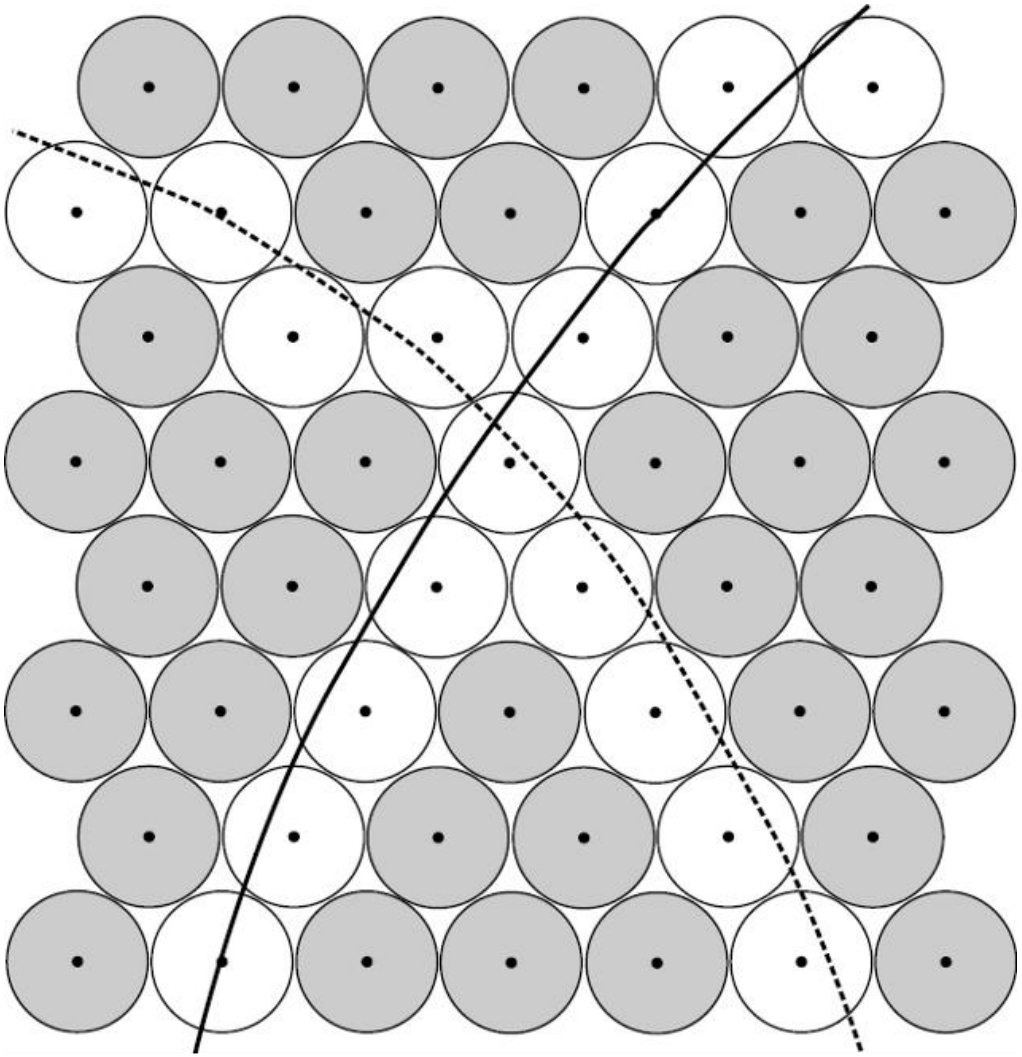

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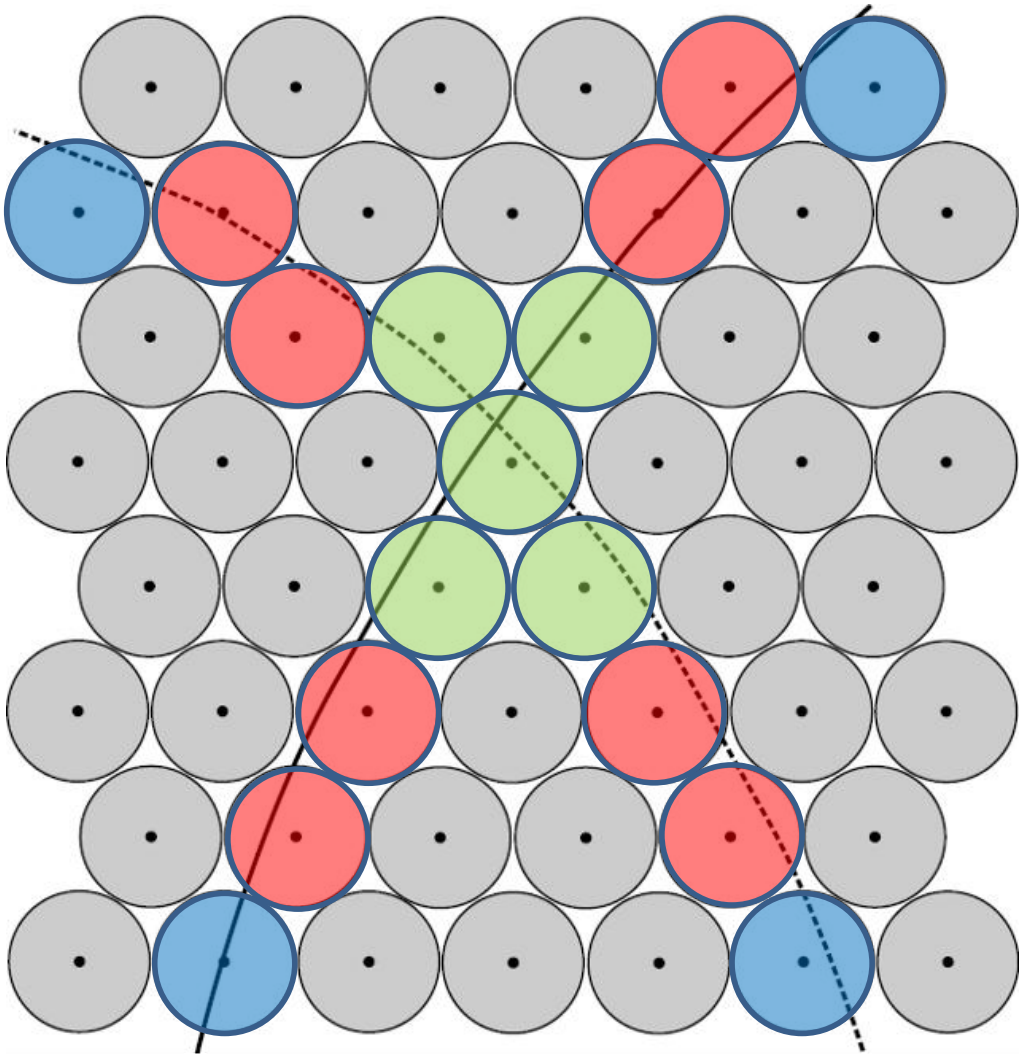

Number of Neighbours:

1 unambiguous

2

> 2 ambiguous

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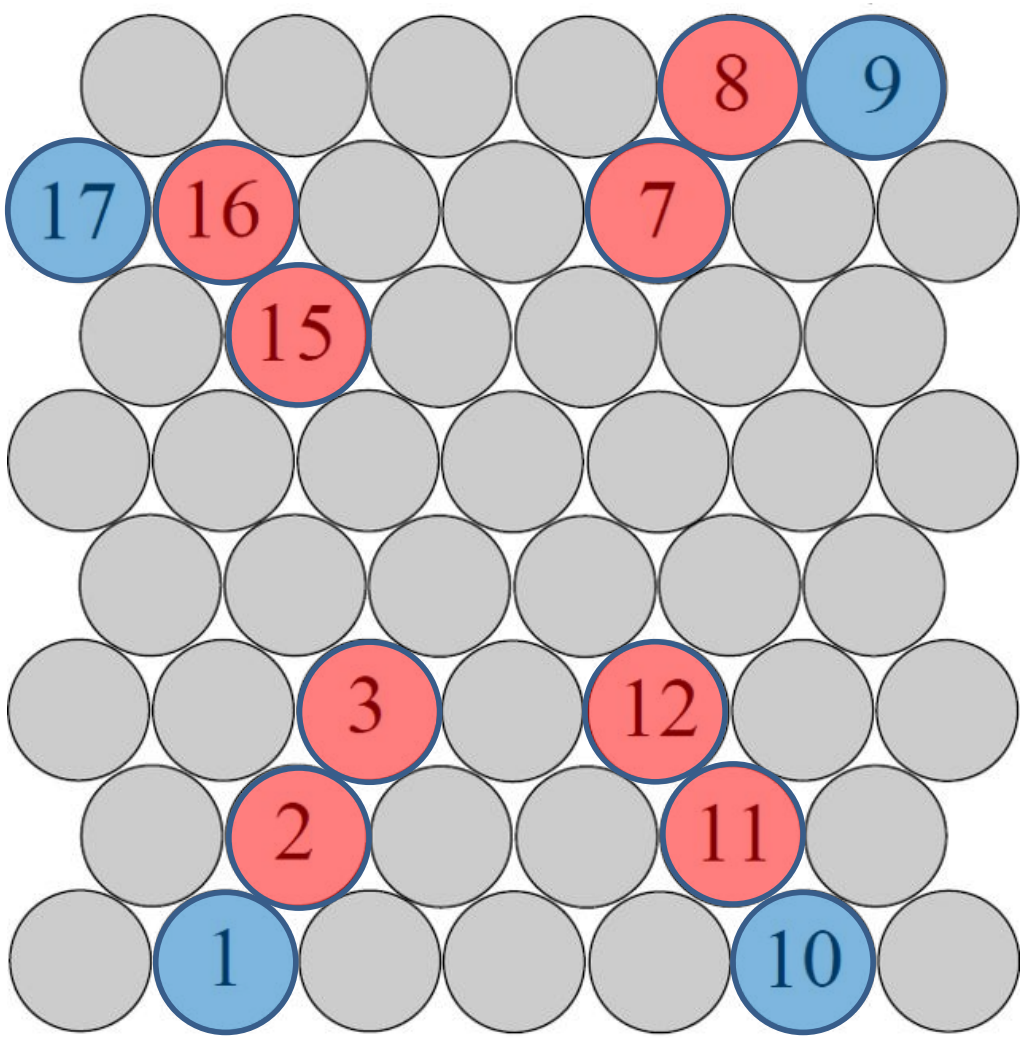

Cell: Straw with hit and one or two neighbours

Rule: Compare your status with the status of your neighbours and take the smallest one

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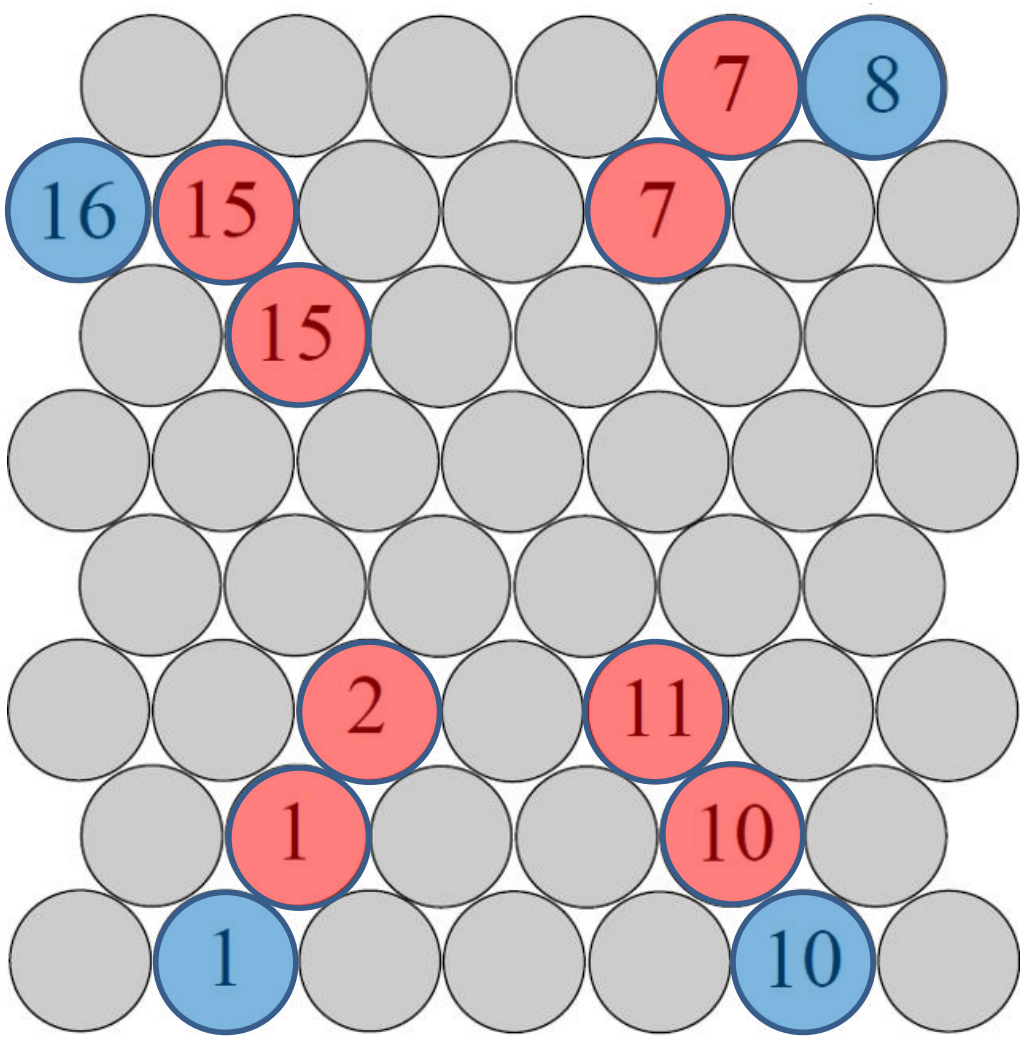

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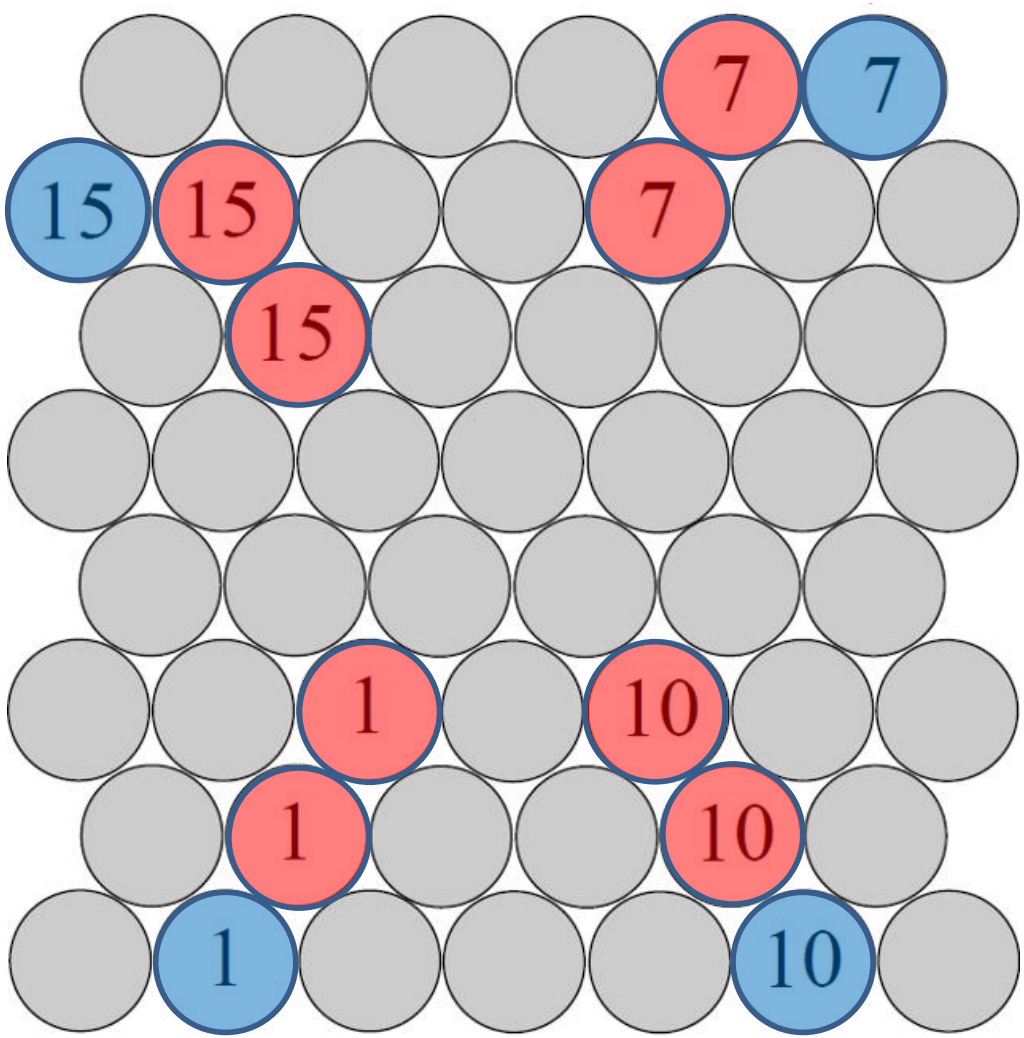

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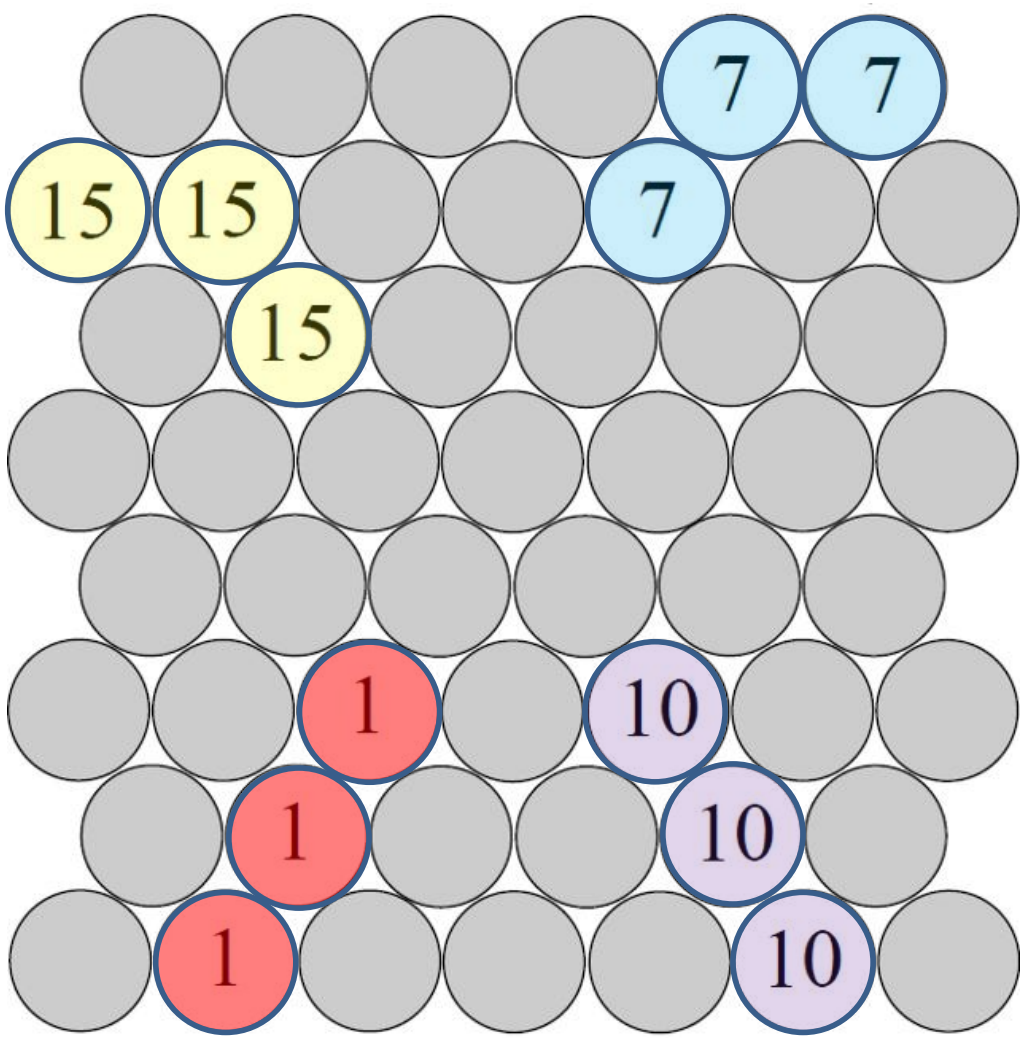

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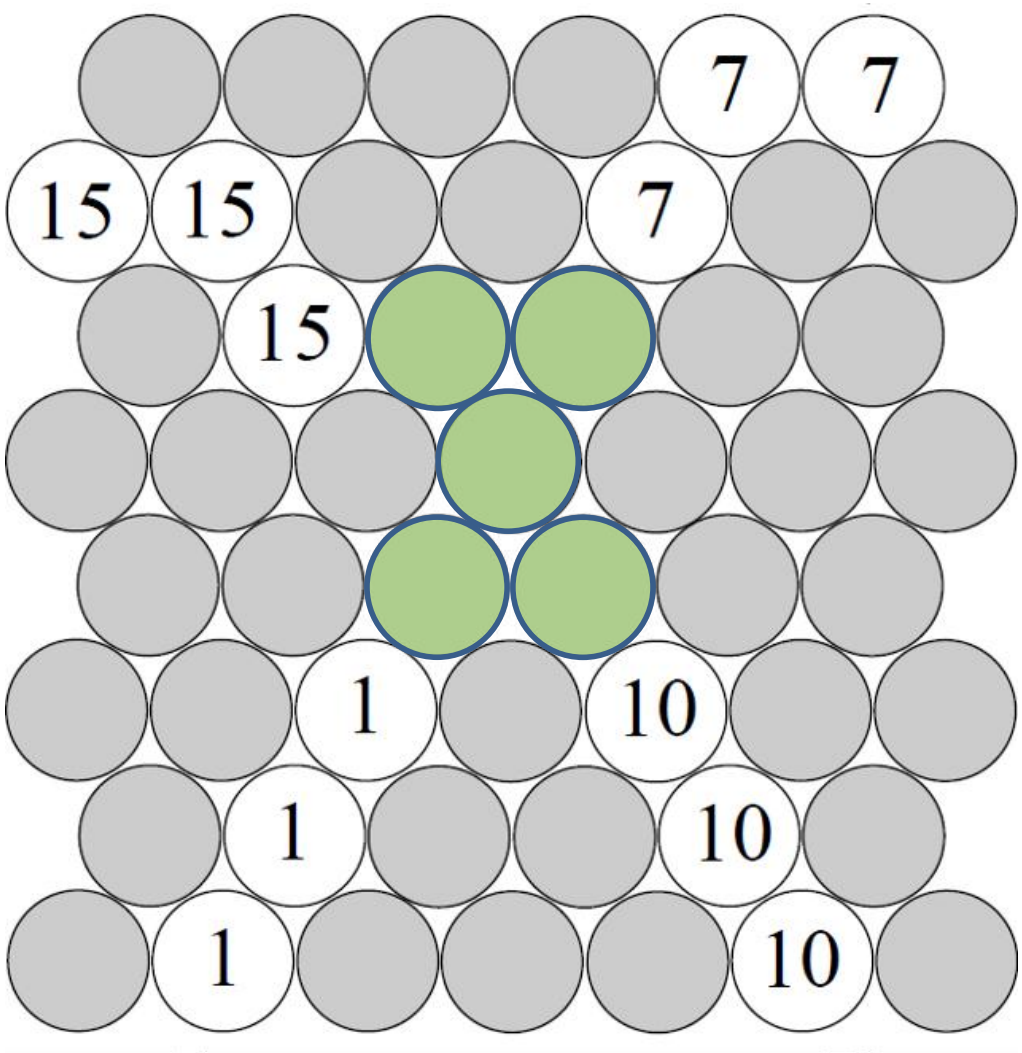

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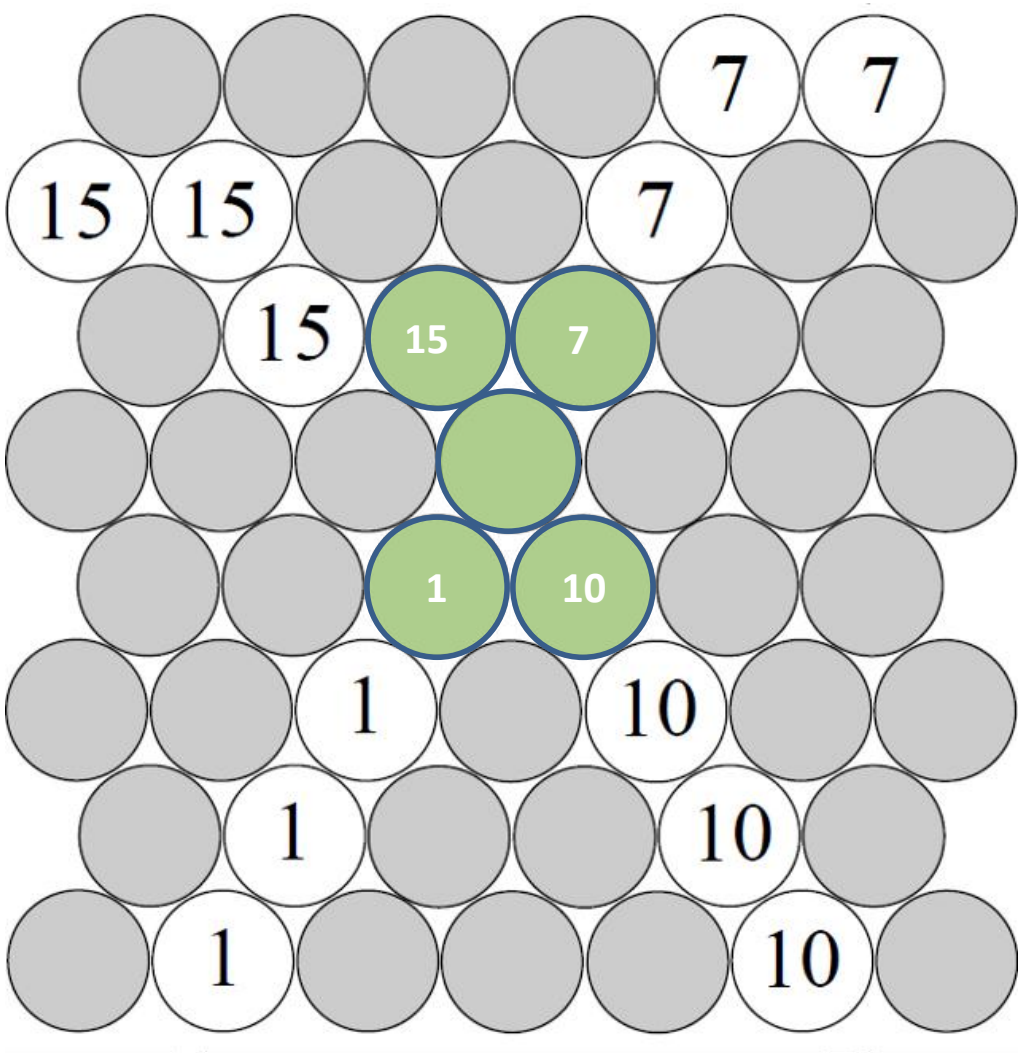

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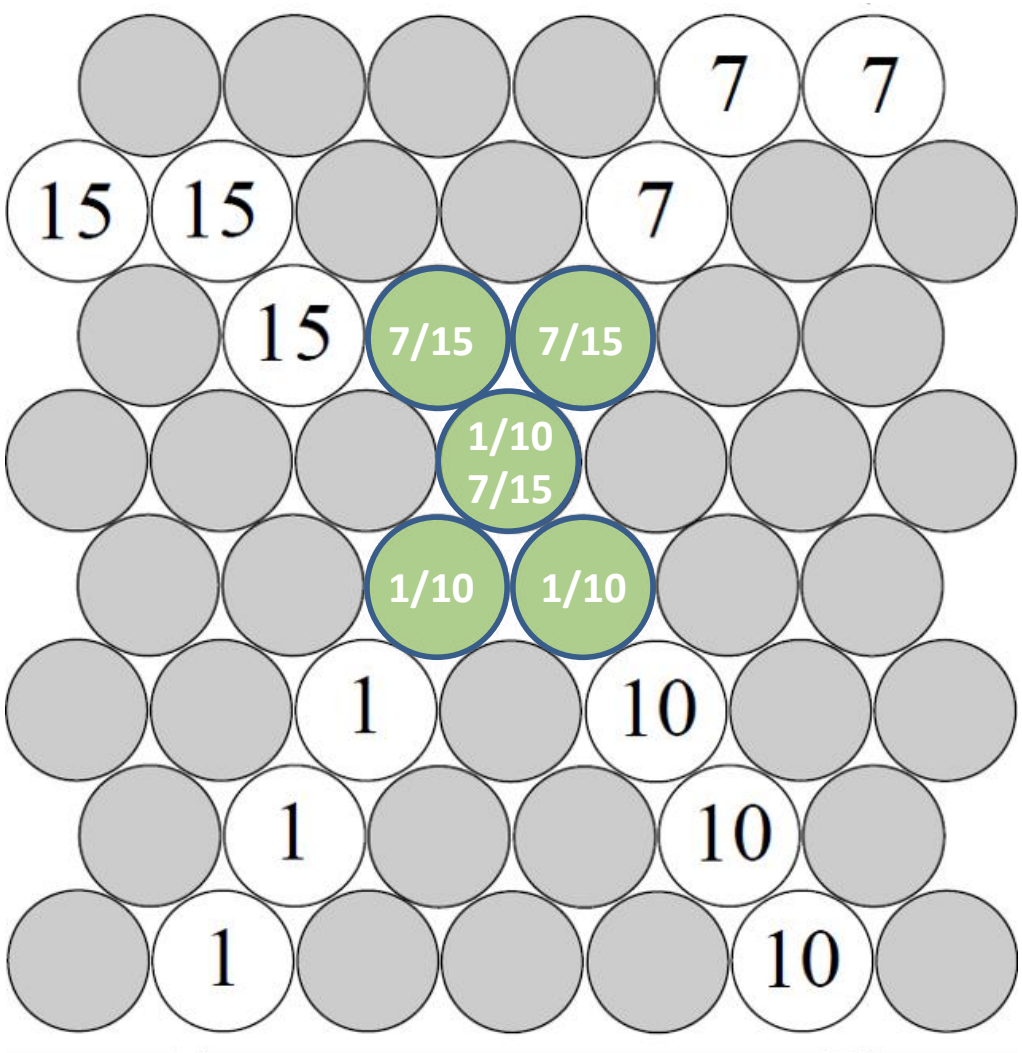

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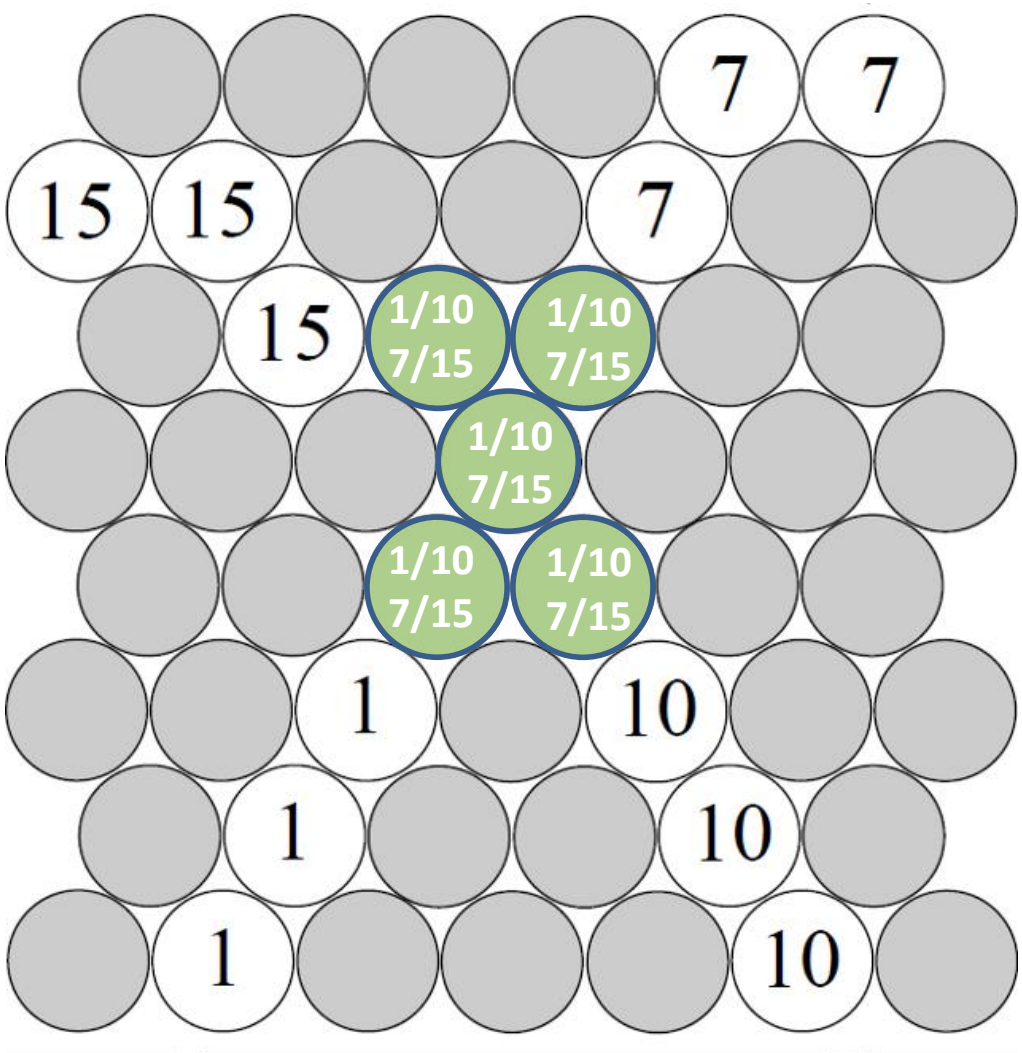

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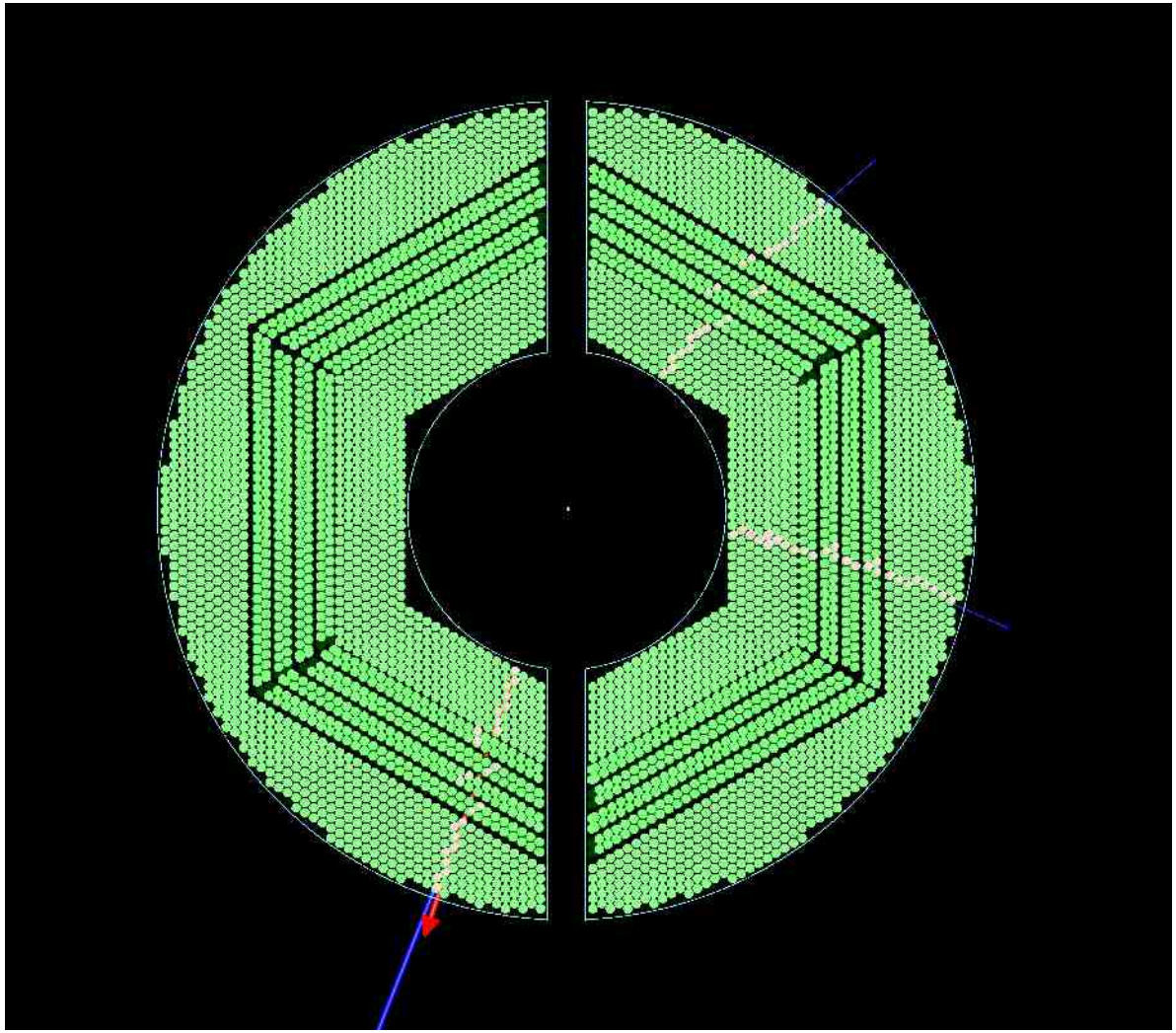
Fitting

- Tracks in the x-y plane are basically circles (neglecting energy loss and small angle scattering for now!)
- Use existing PandaRoot classes for Riemann circle fits
- Use Riemann fits for combining tracklets
- Riemann fit needs at least 3 points

$\rightarrow$ No assumption made about vertex position

So, how does it look like?



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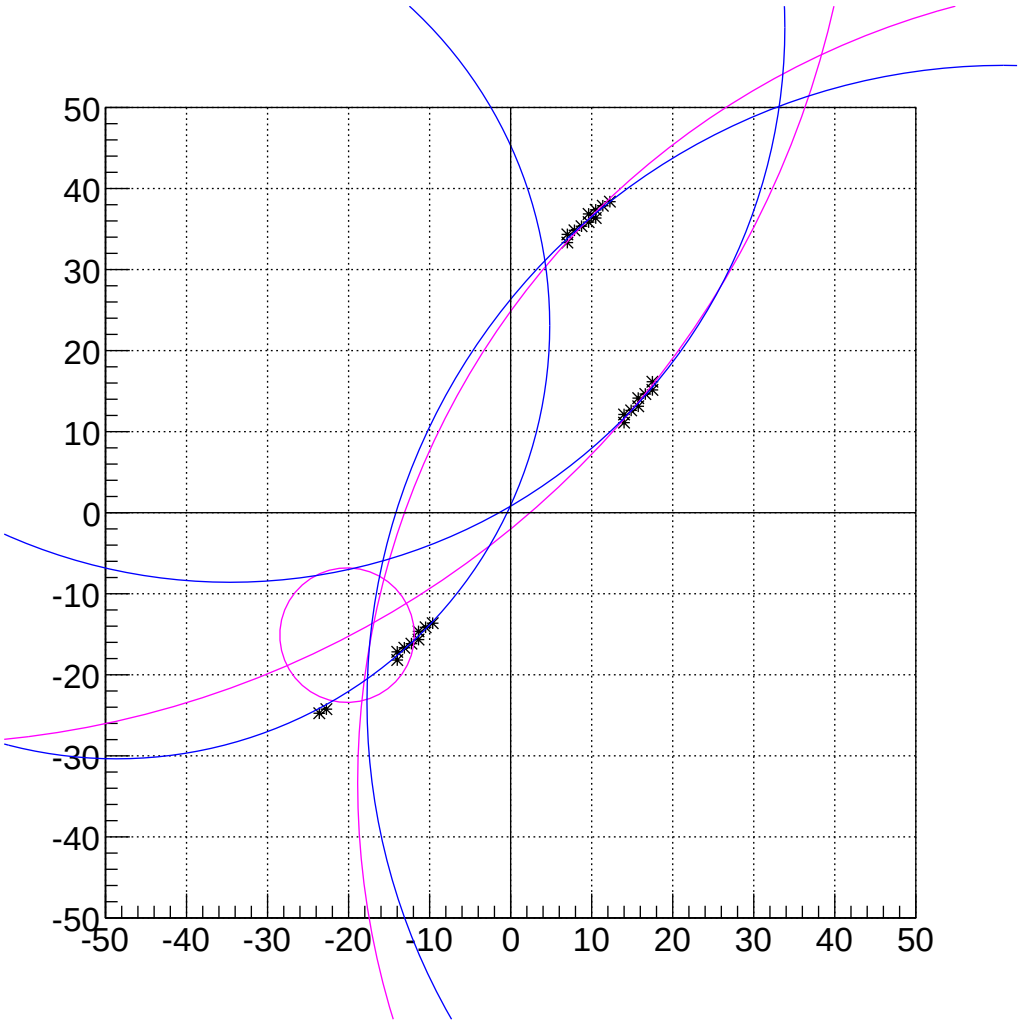

- Crosses: Center positions of hit straw tubes
- Magenta: Riemann fits to these hits
- Blue: Fits to "corrected" hits (from isochrones)

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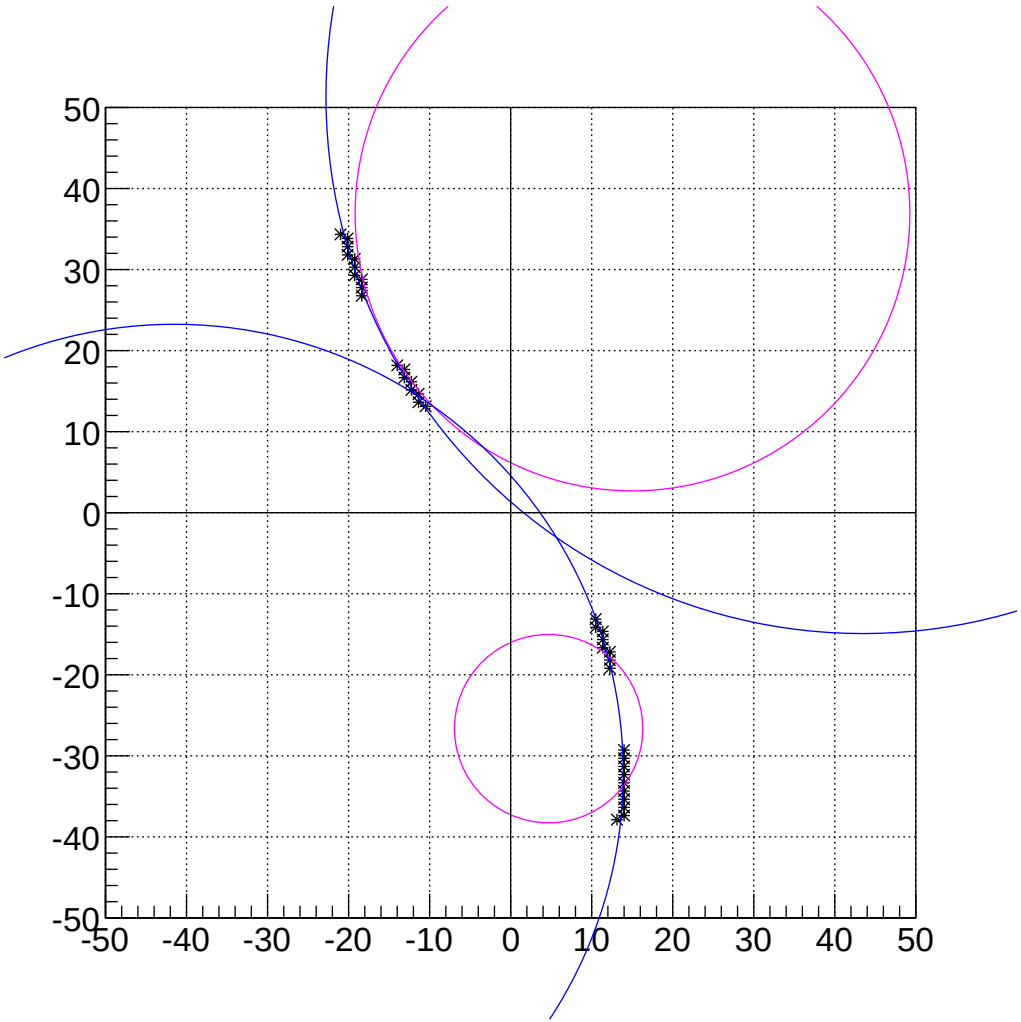

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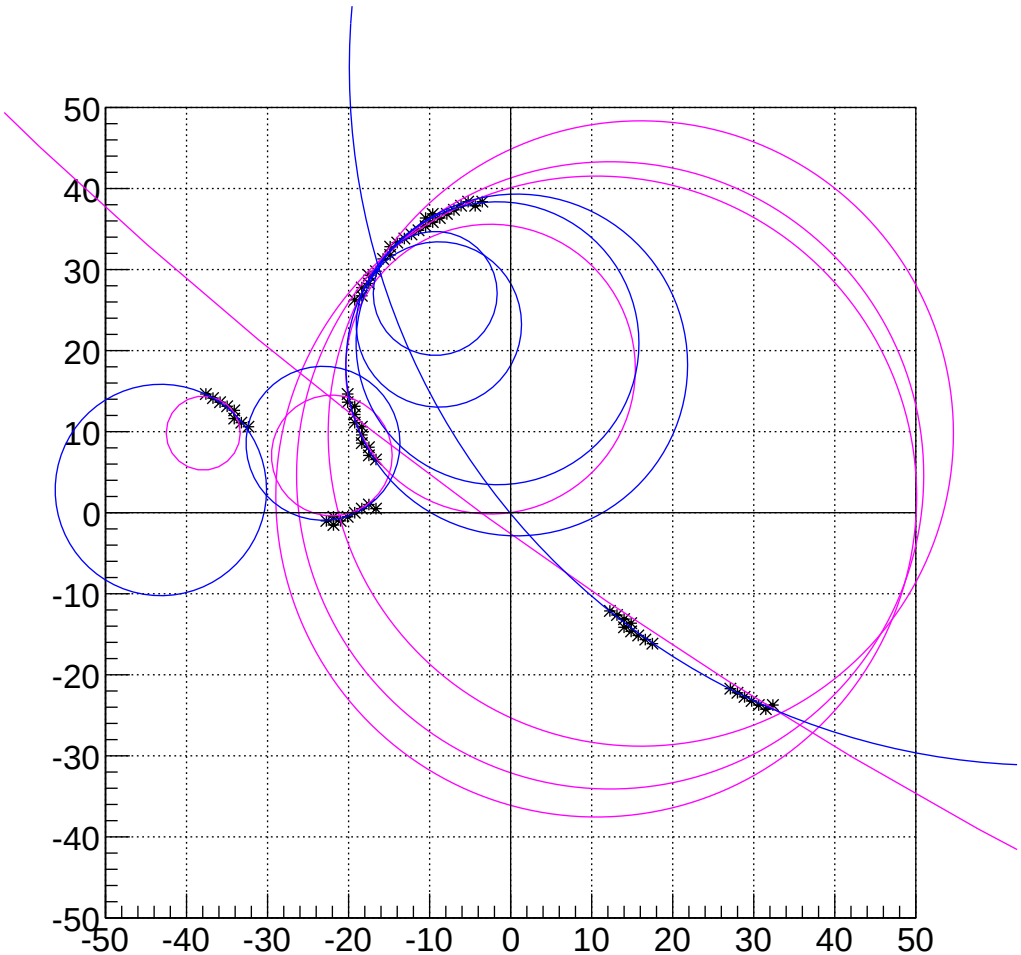

- Kinematically unreasonable tracks (e.g. vertices in same quadrant, energy loss not considered, etc.)
- Will probably improve with additional signals from skewed tubes and also MVD / SciTil

Current status

- Only (parallel) STT hits are considered
- Still some “unphysical” tracks

$\Rightarrow$ Investigate tracklet combination

What’s next?

- Add skewed hits
- Add MVD hits

$\rightarrow$ Use Riemann trajectory and maybe also SciTil time information for this?

- Make use of physical / kinematical constraints?

Further down the road

- Many tracks go to the forwards spectrometer

→ This has to be considered for hyperon reconstruction!

- Do same methods apply for the forwards part?
- Combine efforts with FTS group?

The End

Thank you for your attention!