Study of the CDC Wire hit efficiency

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Introduction

- The CDC may have aged faster than our expectation because of the high background

- One evidence is the leak currents in some layers will reach limit even in cosmic run. See the plots on Nanae-san's talk: https://kds.kek.jp/indico/event/28561/contribution/13/material/slides/1.pdf

- Aging effect shows up as localized deposits on the DC wires which may lead to reduced gain and localized inefficiency regions

- Check wire-vise efficiency vs Z to get better understanding of the CDC status

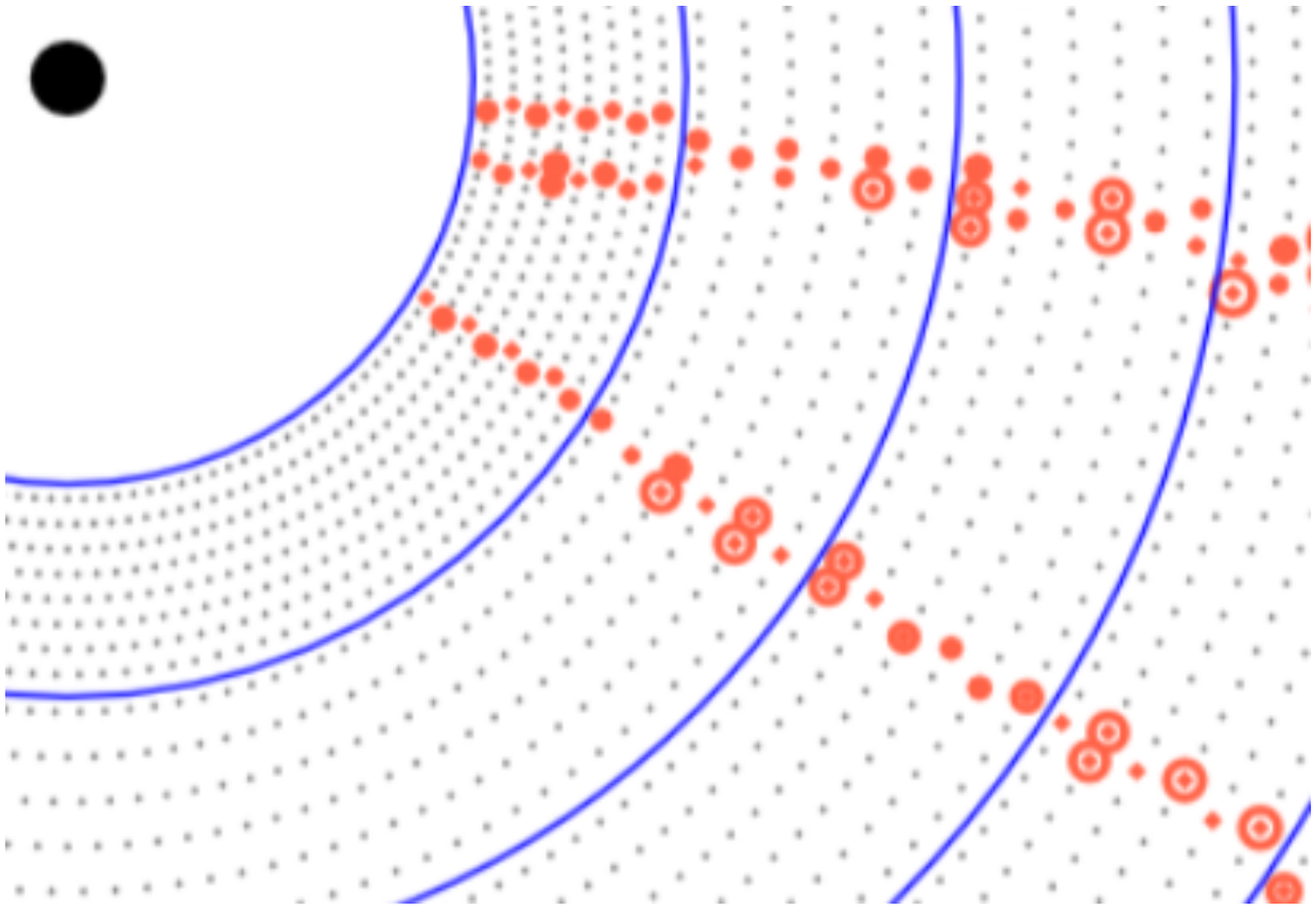
Basic ideas

- For now focus on axial wires (expect stereo wires to be similar)

- Use well reconstructed tracks with pt>0.5 GeV as a reference: the bias in efficiency should be small, the main interest is not absolute efficiency but efficiency variation vs wire / Z

- Use pattern-recognition level trajectory info

How to get the wire eff.

- 

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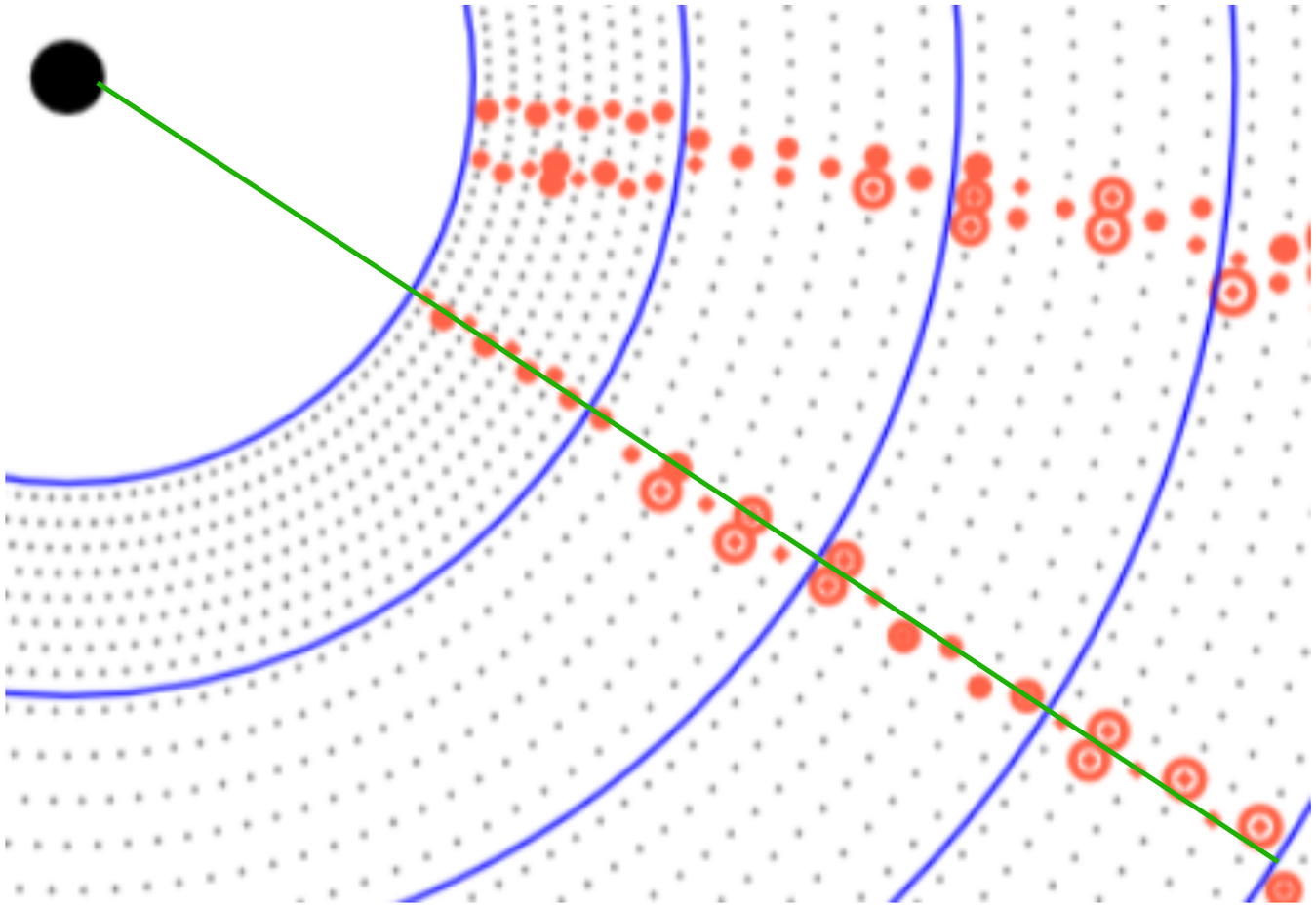

- Get the trajectory of each track

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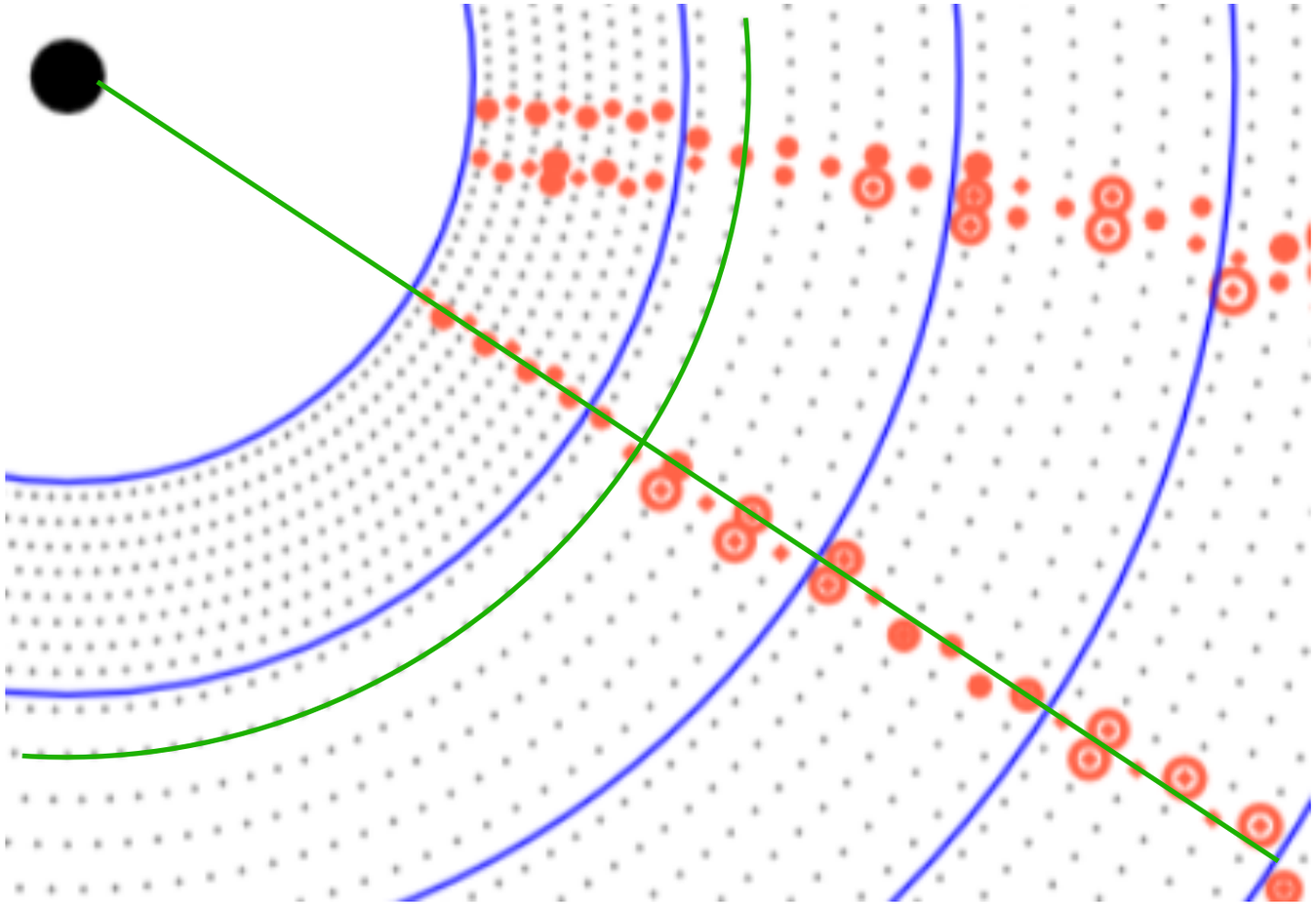

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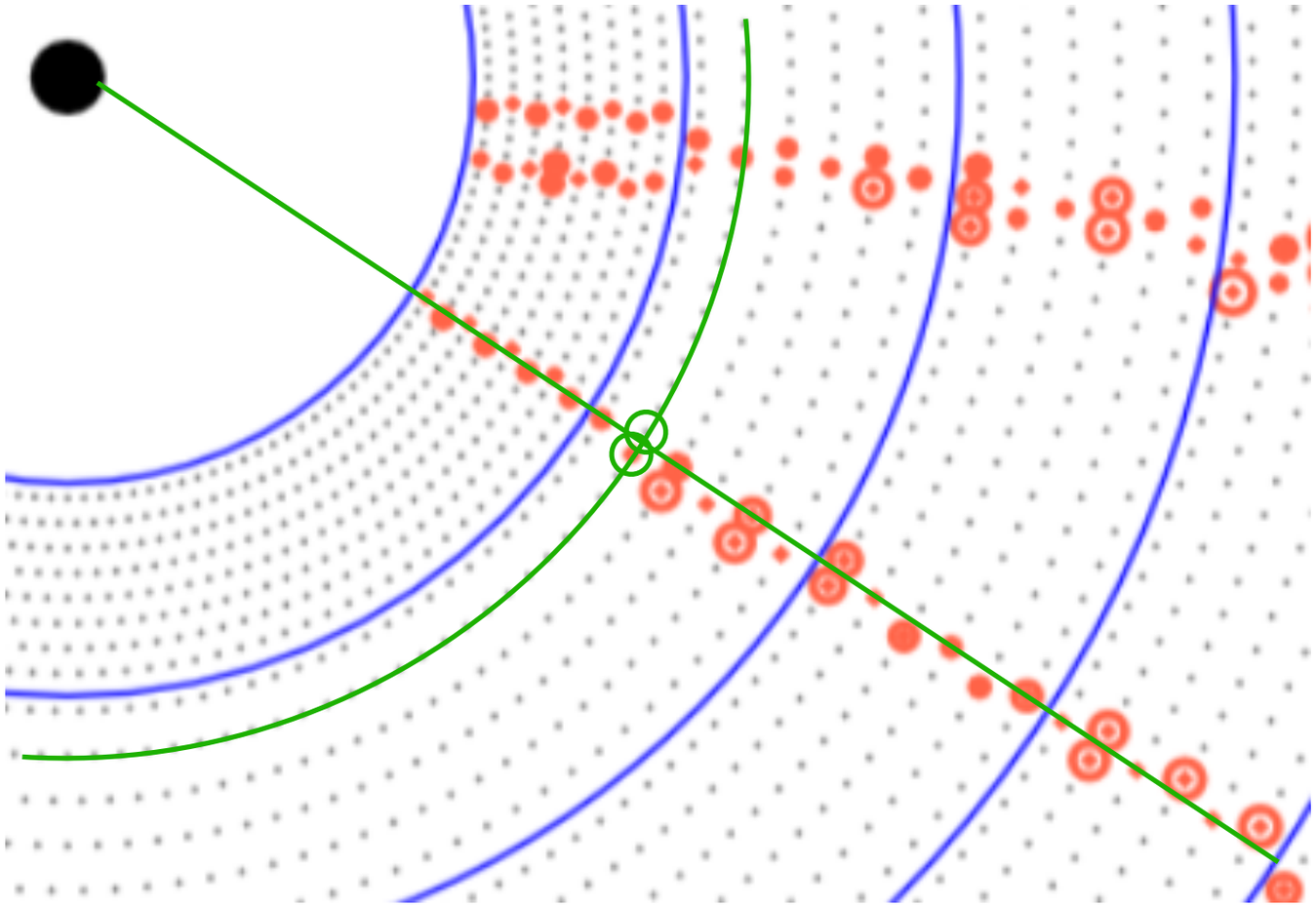

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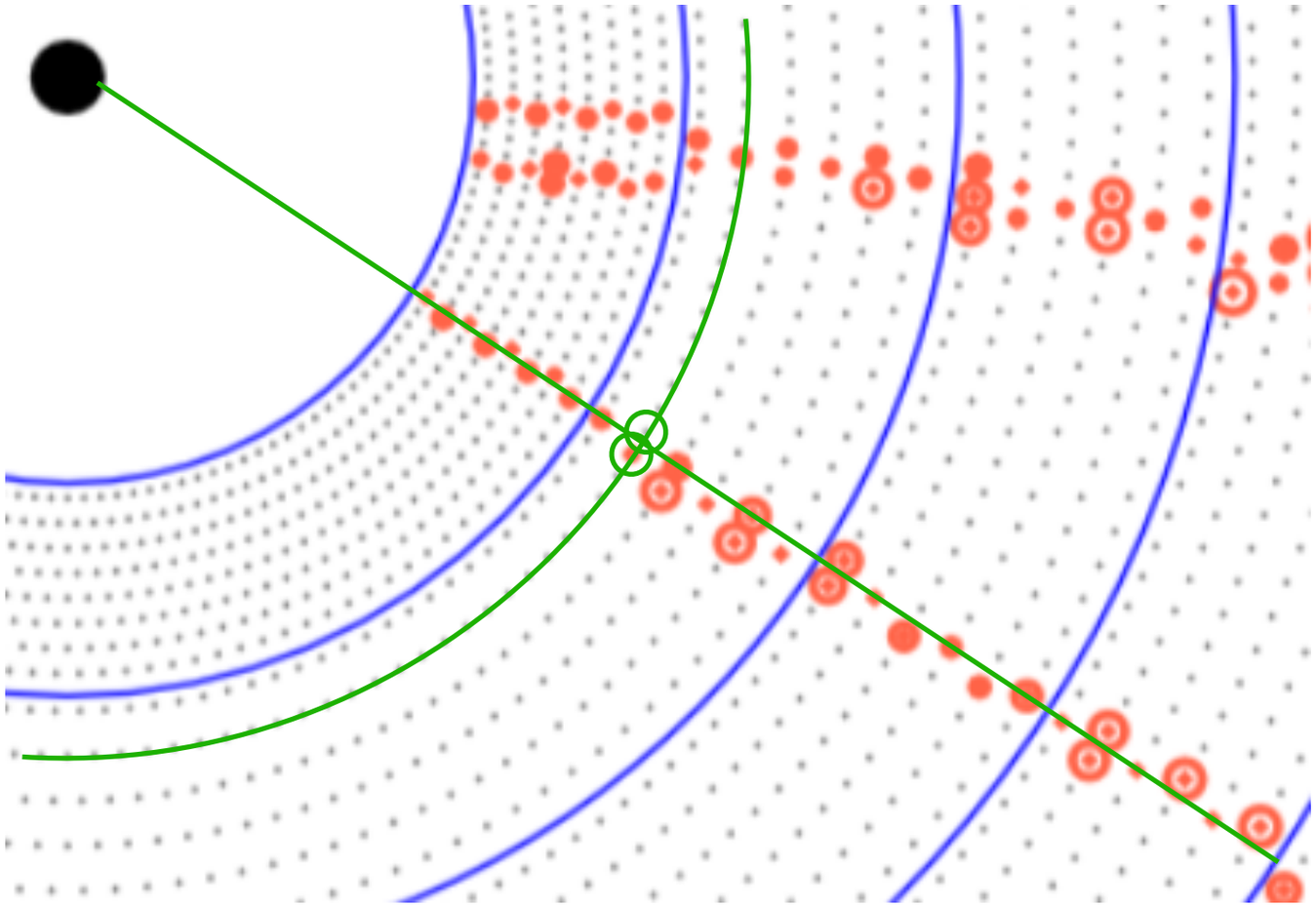

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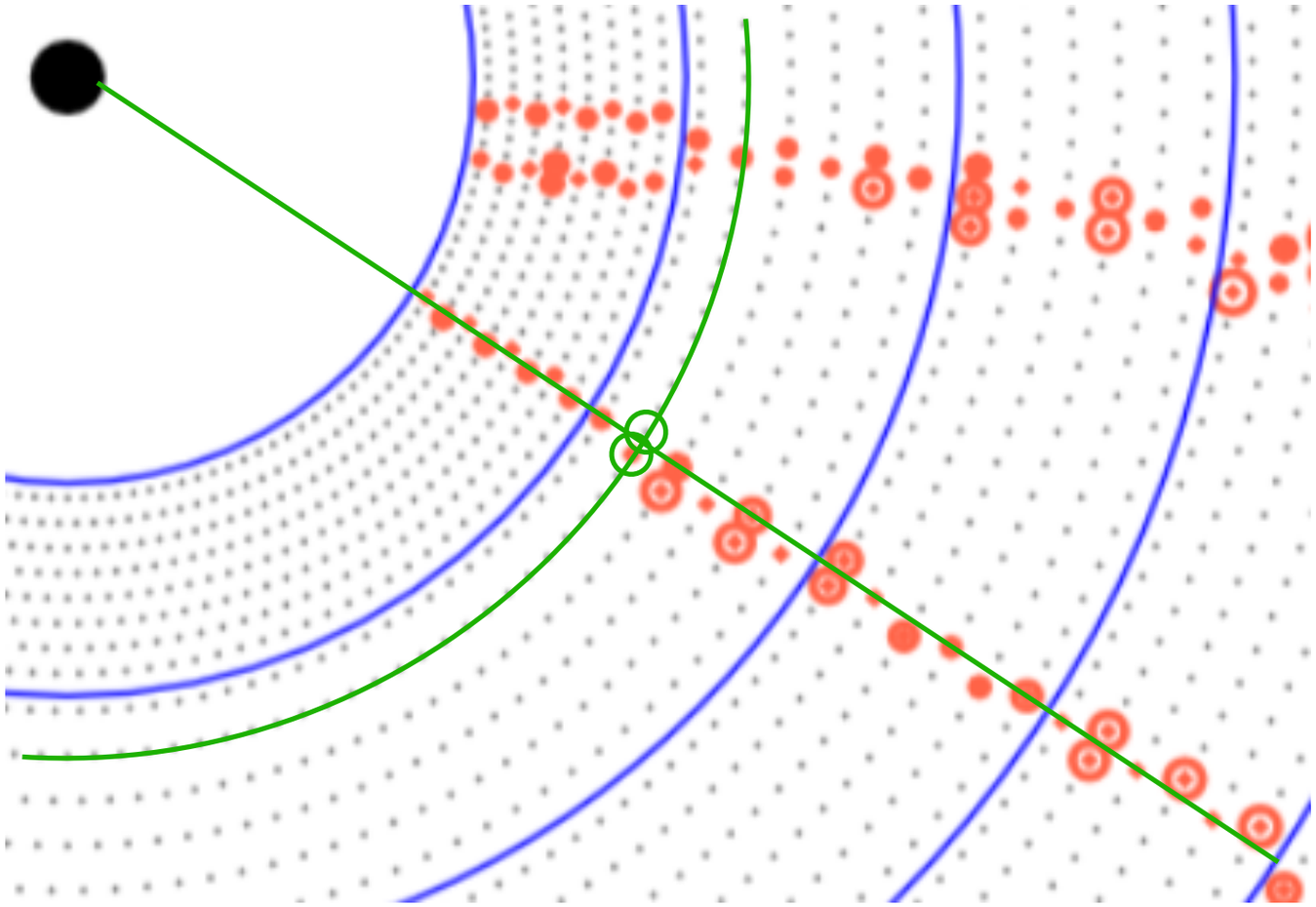

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- Calculate the cross point at each layer
- Find the closest 2 wires
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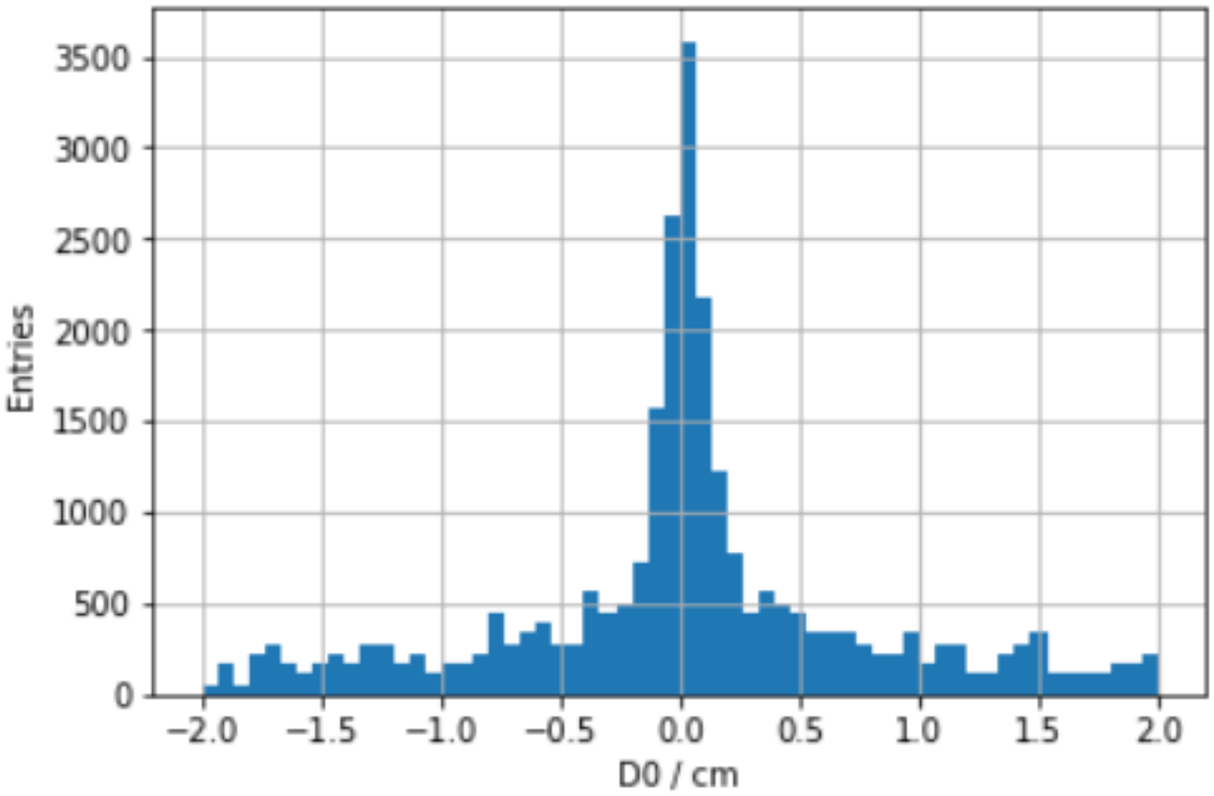
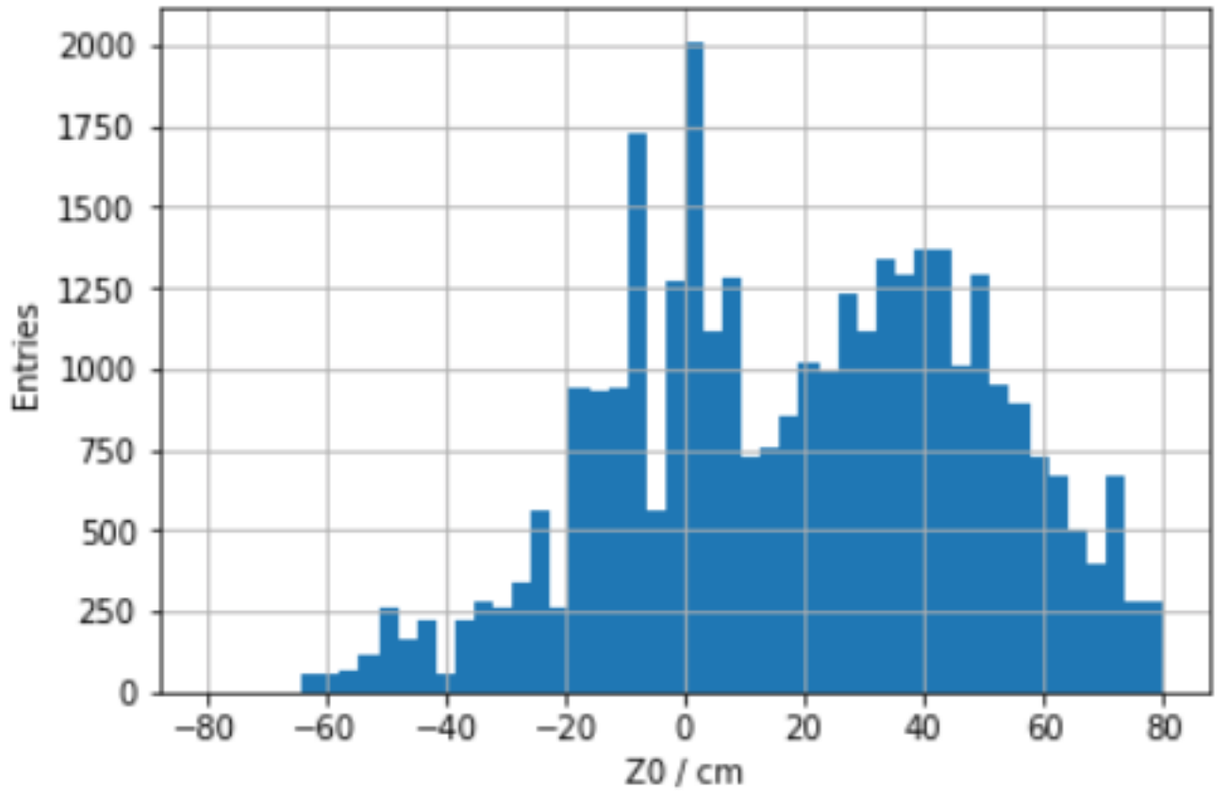
- Obtain the 2D hit efficiency plot

D0 and Z0 of trajectories





- D0 = trajectory2D.getGlobalImpact()
- Z0 = trajectorySZ.getZ0()
- D0 distribution is reasonable, but Z0 seems problematic
- Require |D0|<0.2 cm, and |Z0|!=0

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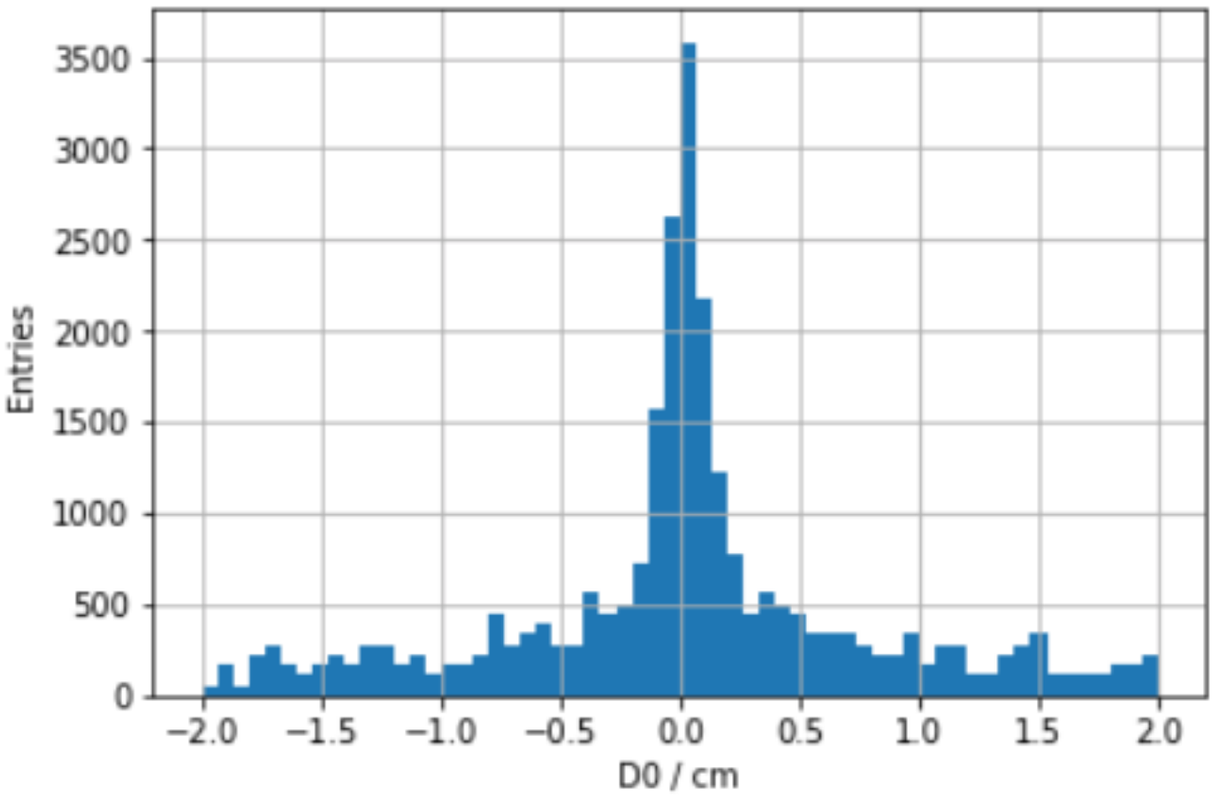

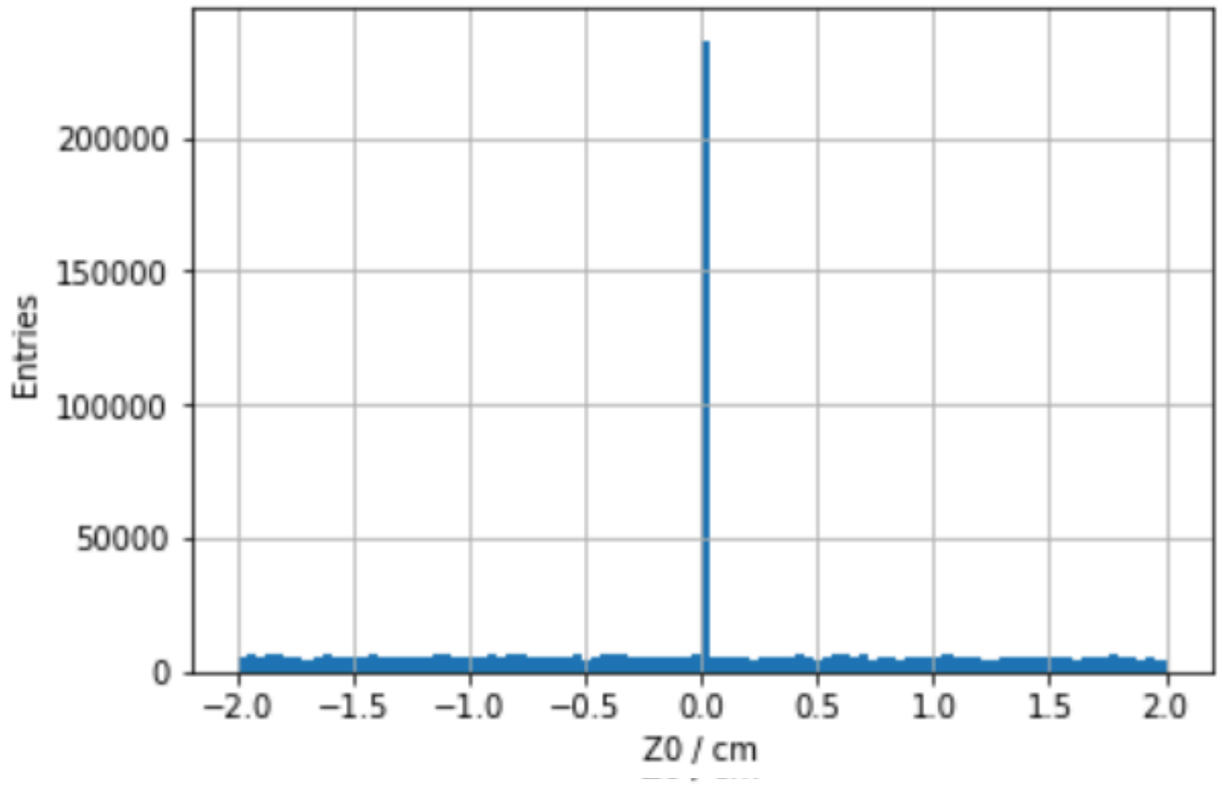

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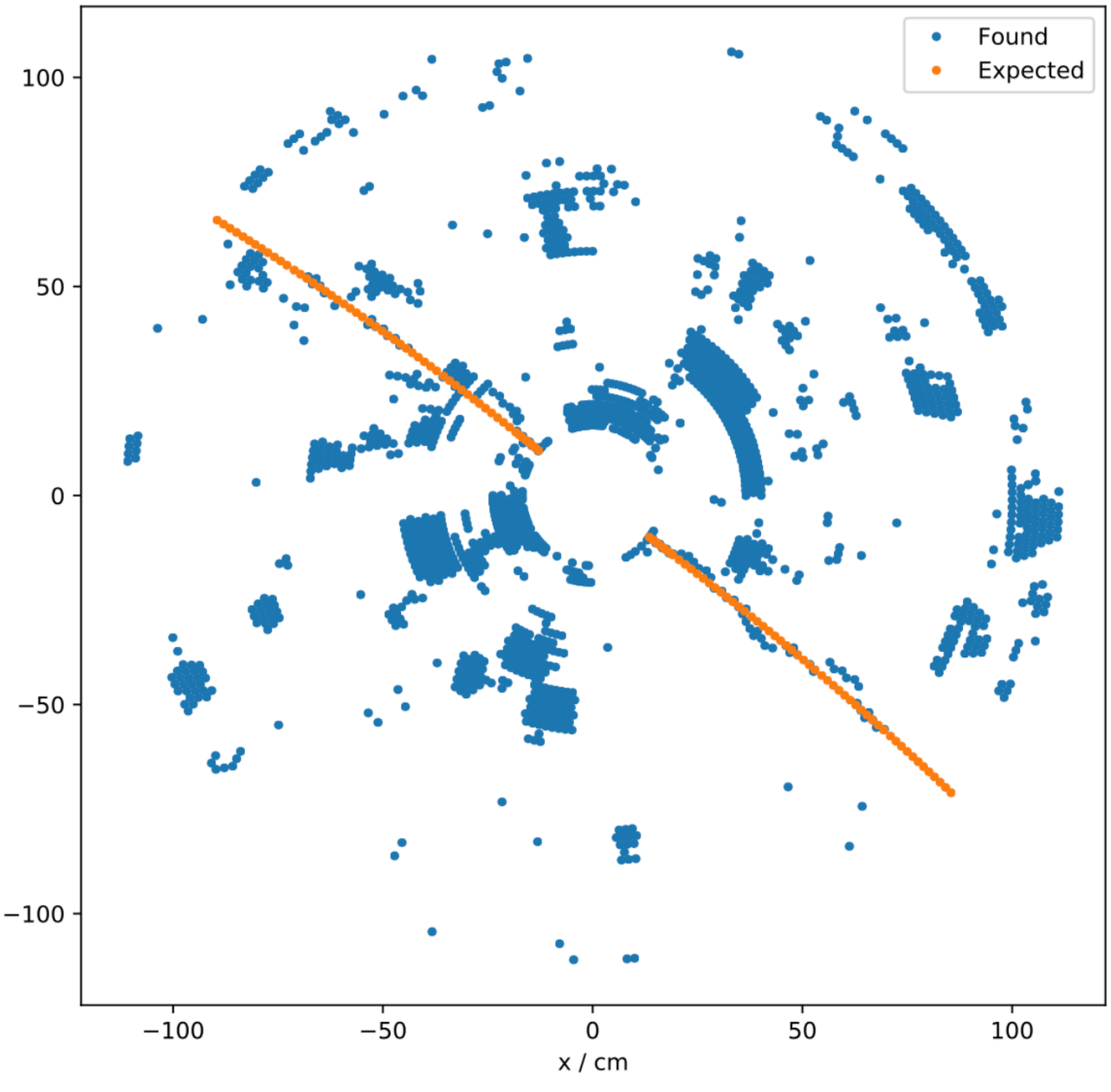
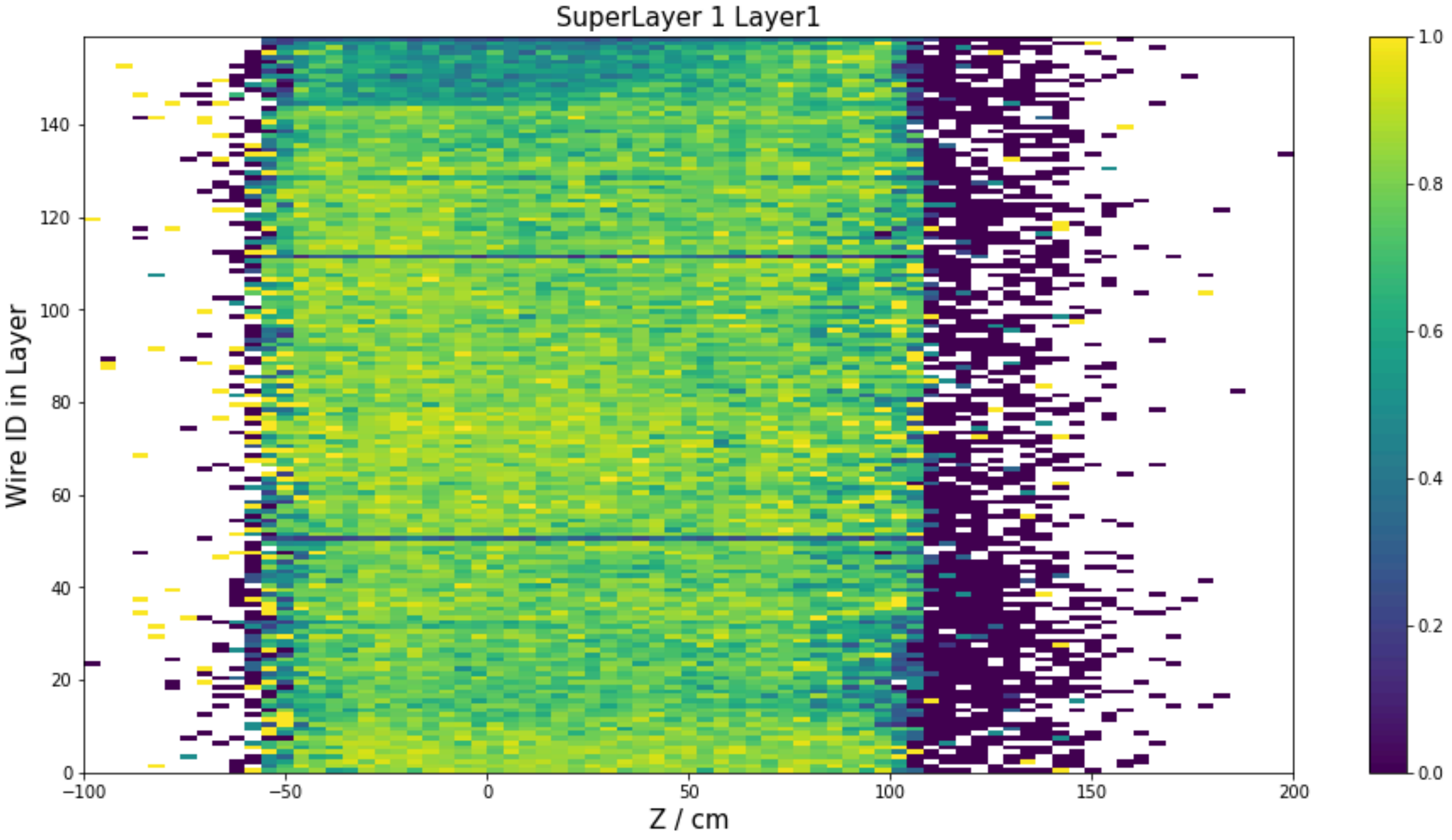
Event display



- The algorithm work well for axial layer
- But for stereo layer, hit efficiency will drop sharply when the track are not perpendicular to the Z axis.
- Need different algorithm for stereo wires

Preliminary results



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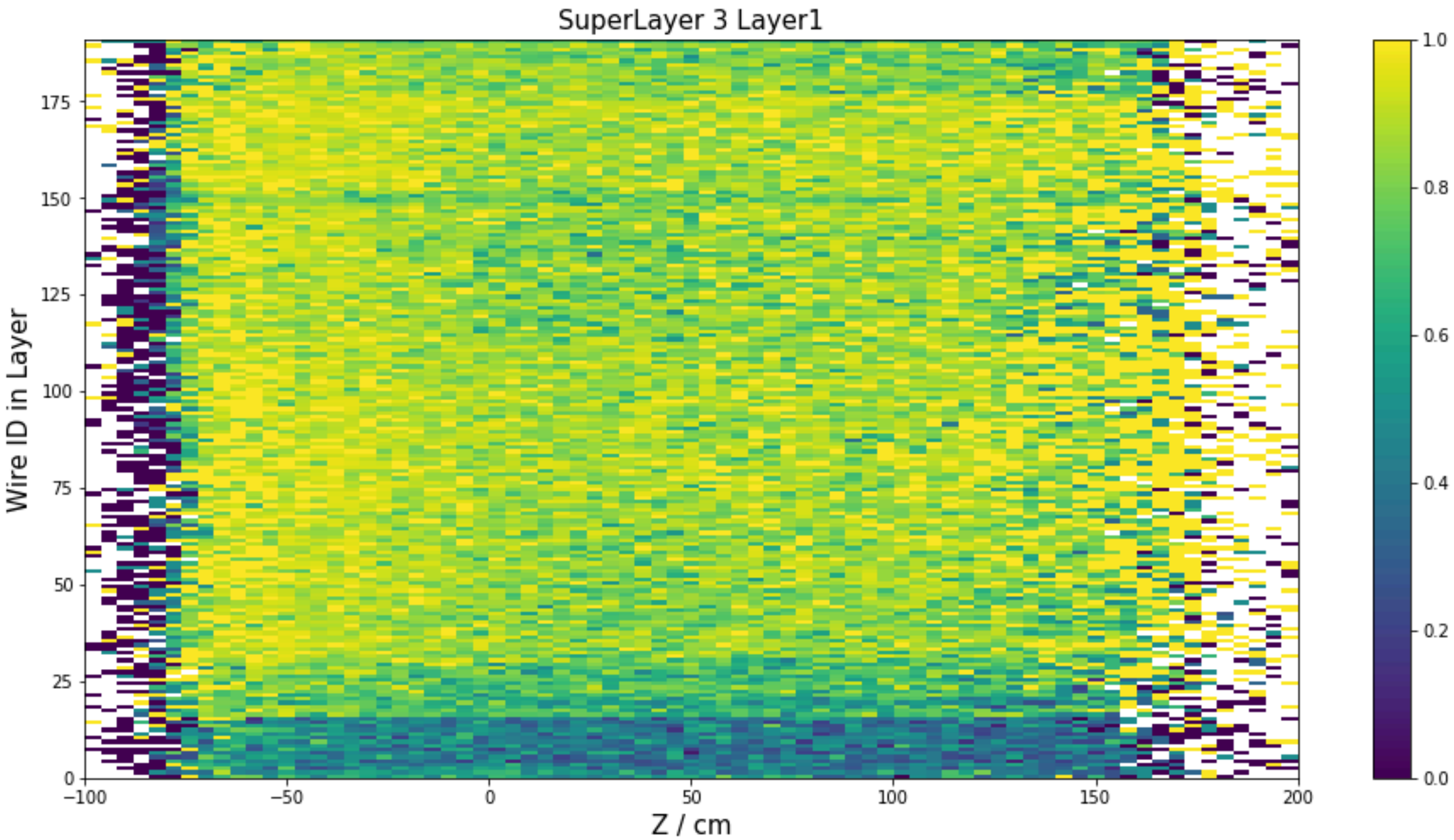

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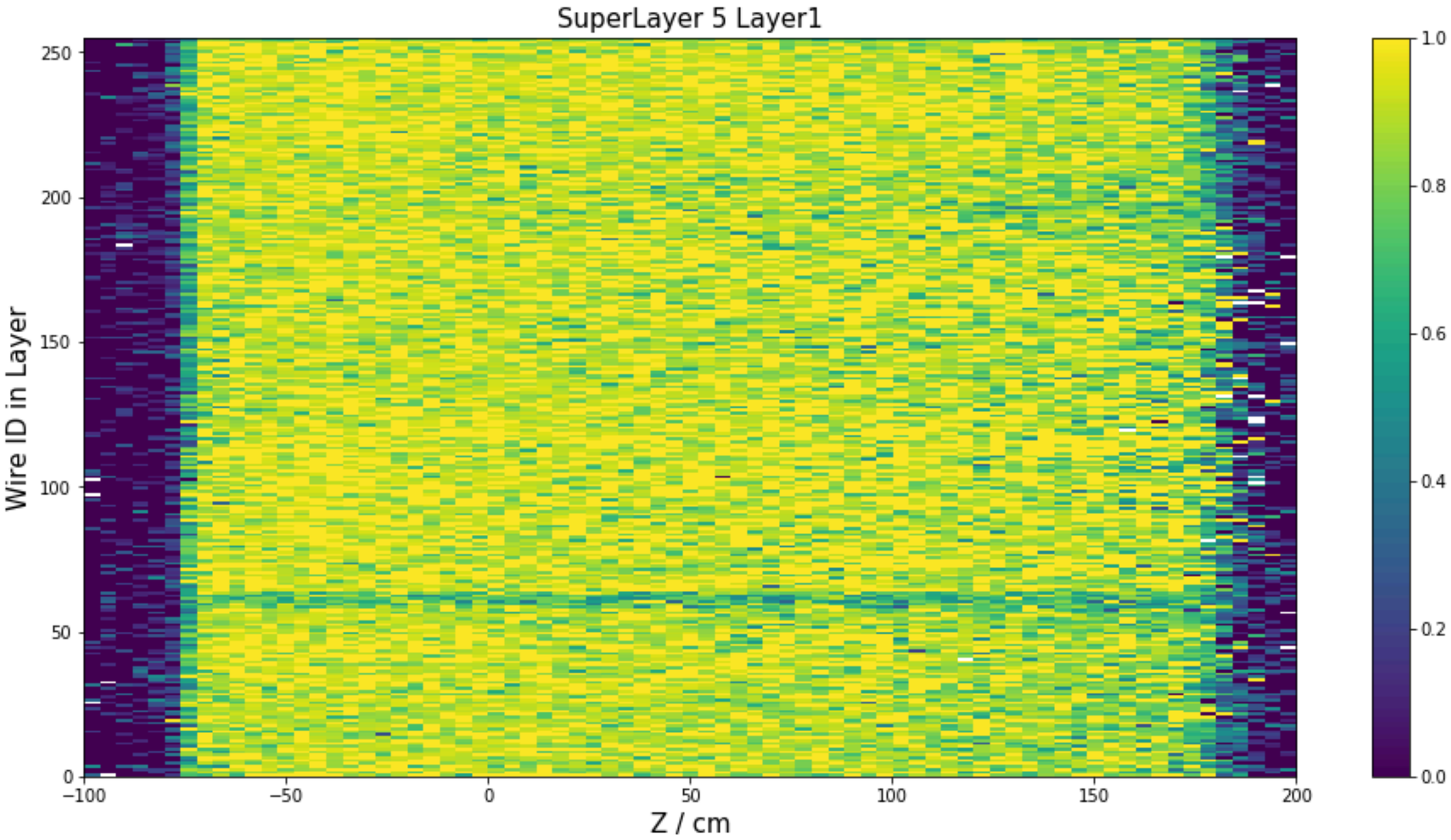

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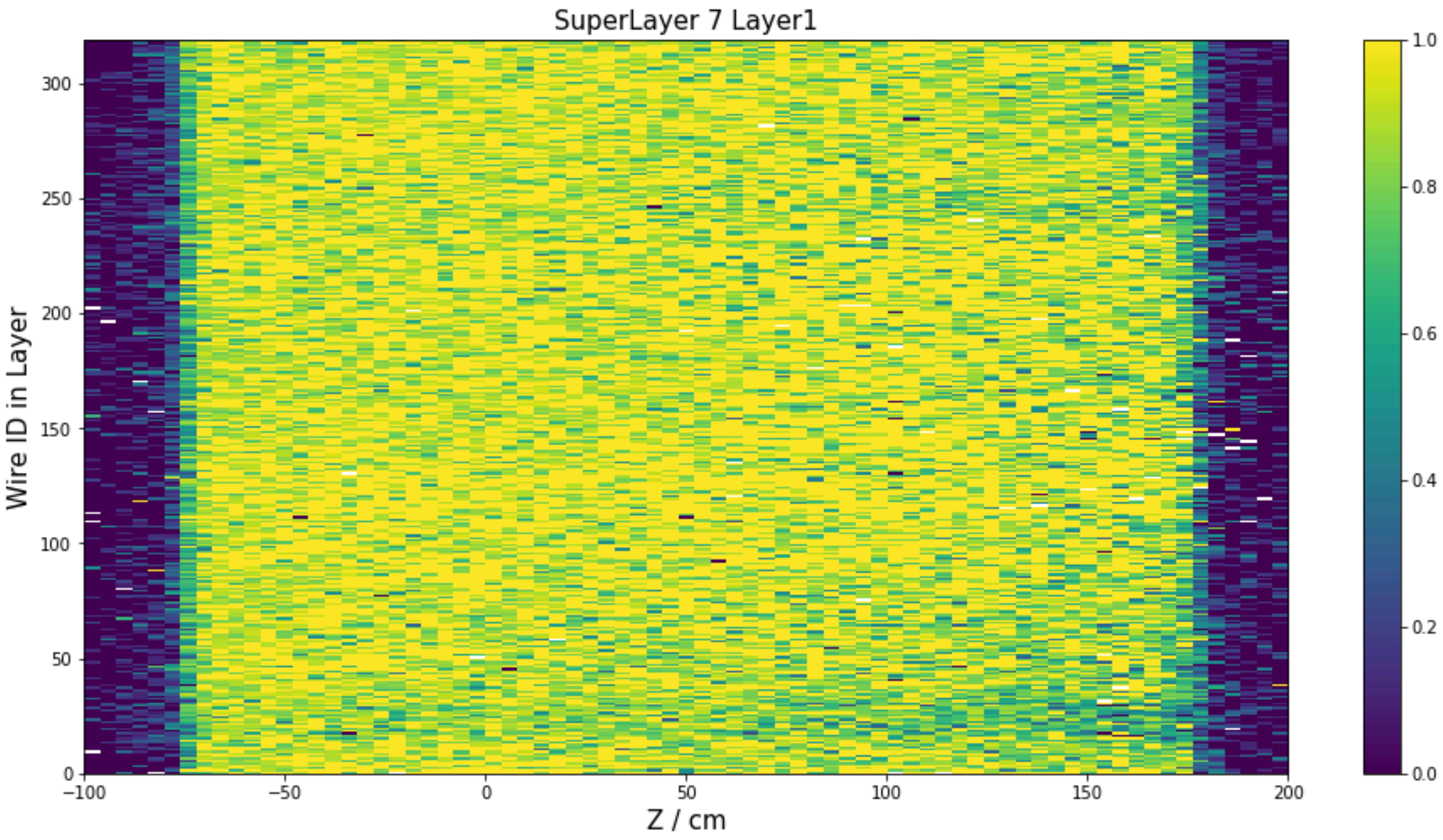

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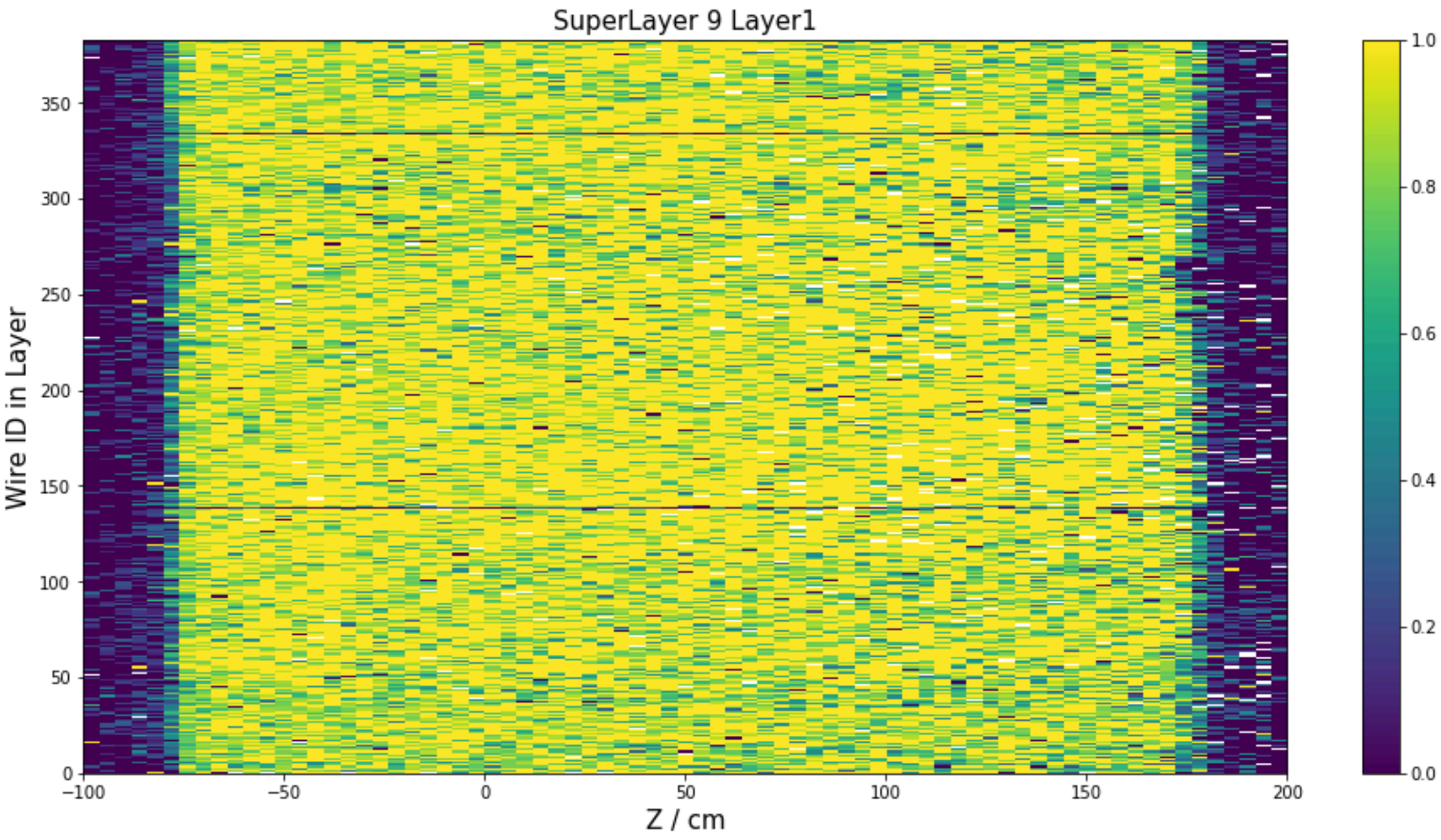

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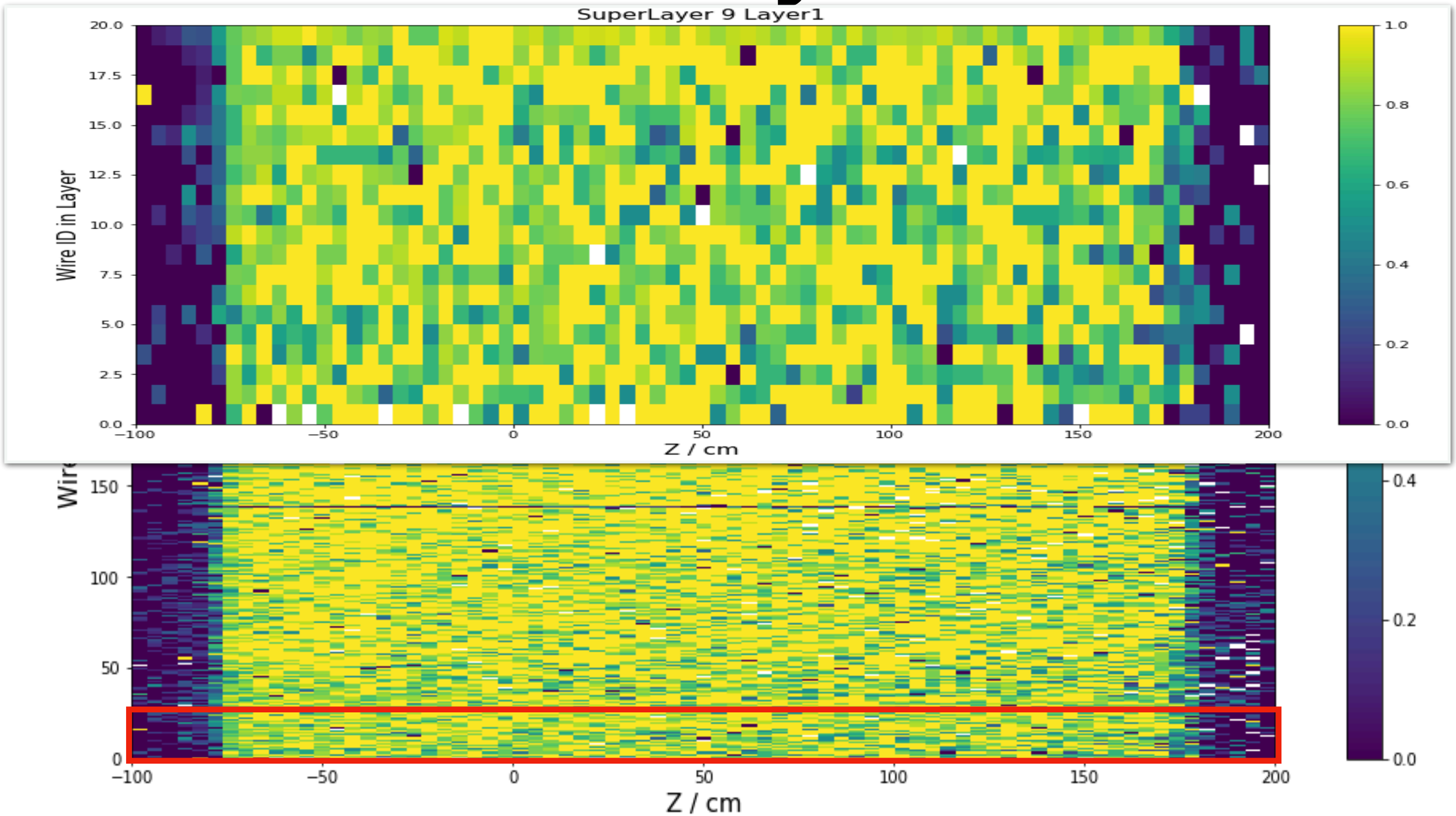

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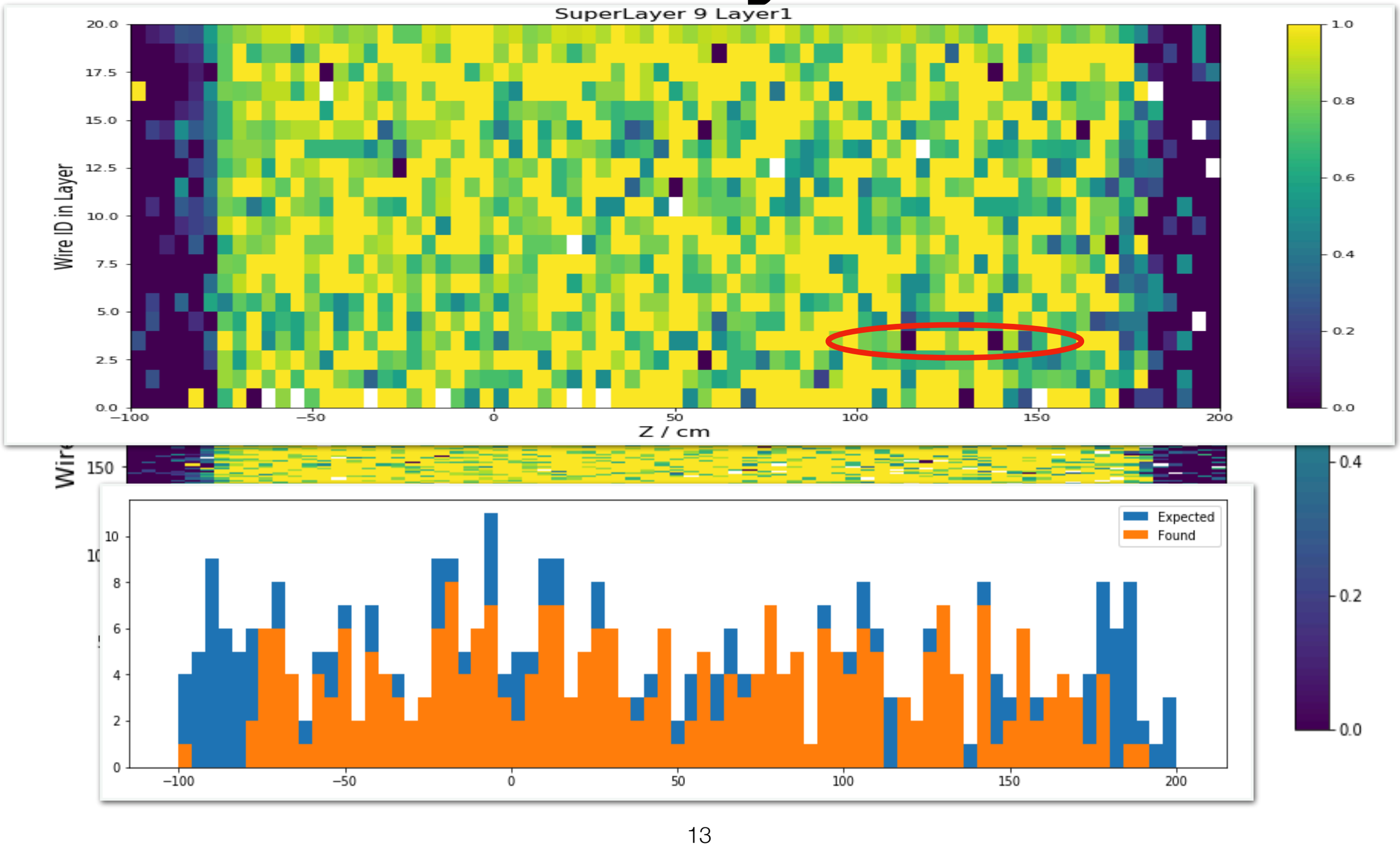

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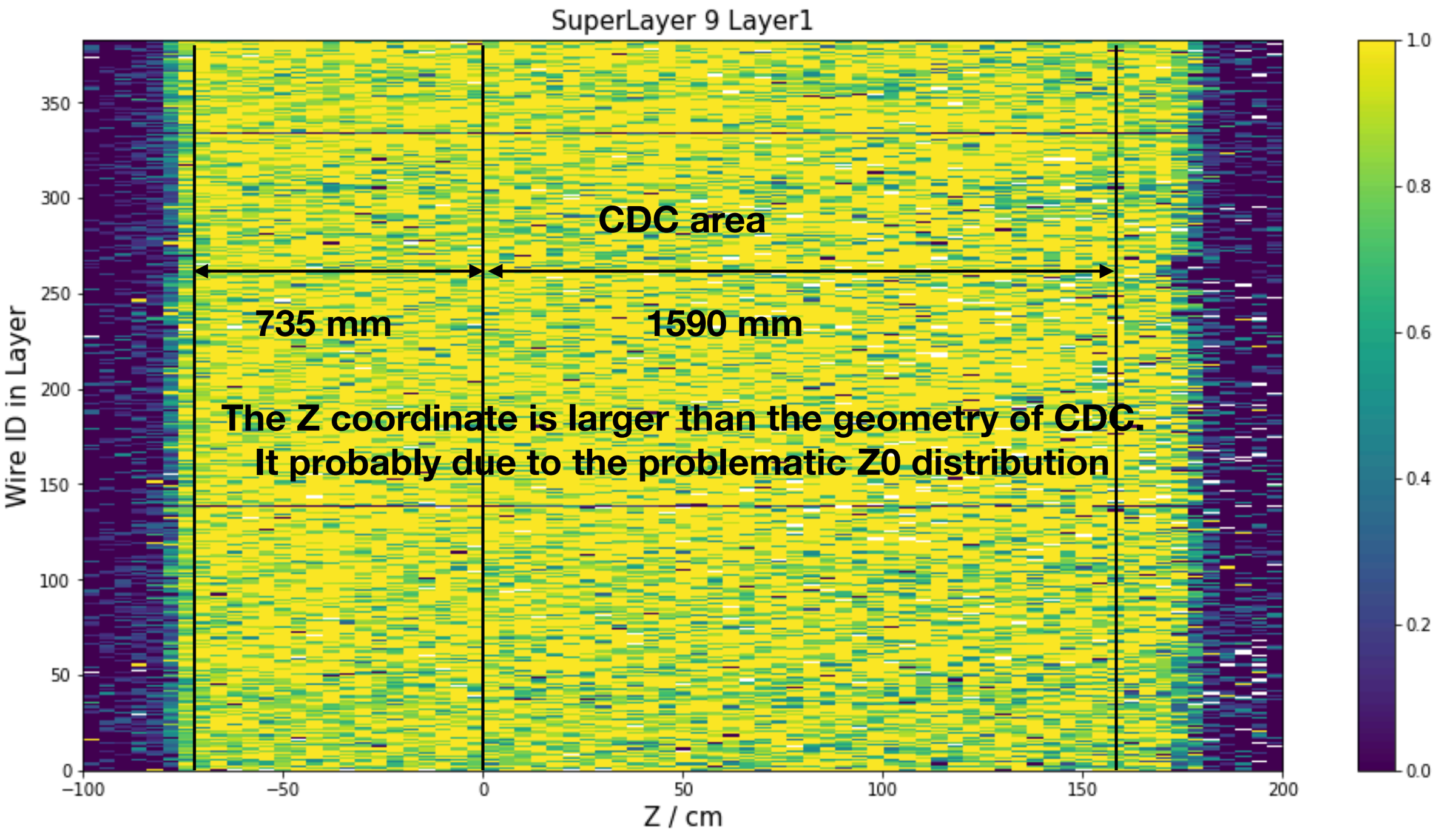

Summary

- Z dependent Wire hit efficiency is studied to investigate the CDC status
- Currently, we just exam the axial super layer
- Besides known dead wires, no particular problems is found.
- Some bins have zero efficiency, but we can’t draw clear conclusion because of the low statistics.
- Results from more statistics is on the way.
- How to improve the Z0 (and Z) information?