GEANT4 Simulations for Spin Physics Detector

The Straw Tube Tracker

Vahagn Ivanyan
Postdoctoral Researcher
(DLNP, JINR)

vivanyan@jinr.ru

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Outline

- Introduction
- Status of a Tracker simulations
- Five Layer Ring version of the Tracker
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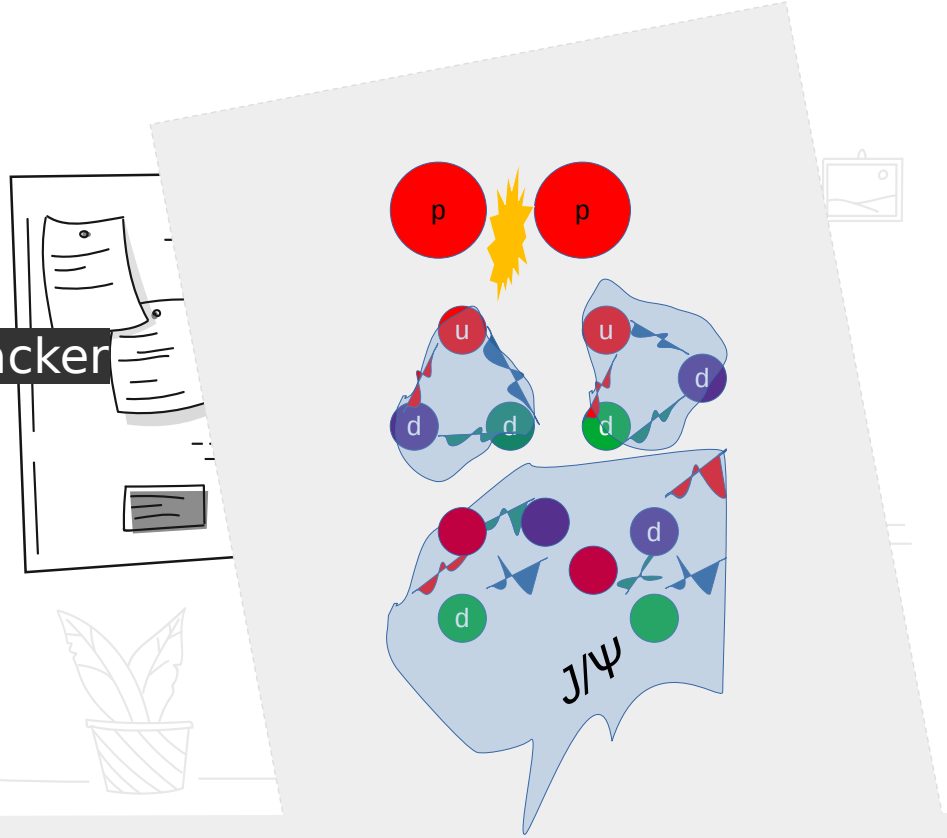


Contribution by the author (Vahagn Ivanyan):

Simulations of the Detector Response (Currently: The Straw Tracker)

Introduction

Program features for:

a) Hits (Hit Time)

b) Drift Time VS Drift Distance

c) Digits (digitization time)

Program used for Geometry: *GeoModel version 6.3*
Simulations: *GEANT4 version 11.2.2*

Status of a Tracker simulations

Geometry

GeoModel/GEANT4 based geometrical representation of a Tracker

Physics List

High Energy physics list

Primary Generator

1. Proton beam passing through the tracker
2. Pythia based particle generator*

* Should be integrated soon.

Run/RunAction

Events & Steps

Hits

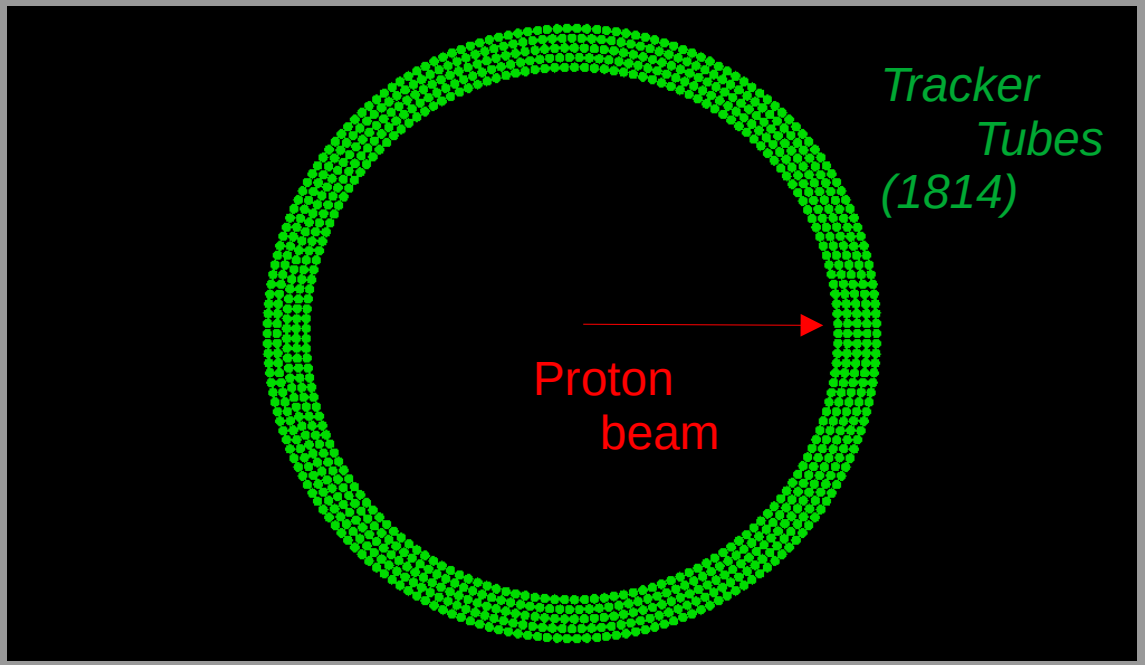
Interactions with matter/gas

(inside of the tracker tube)

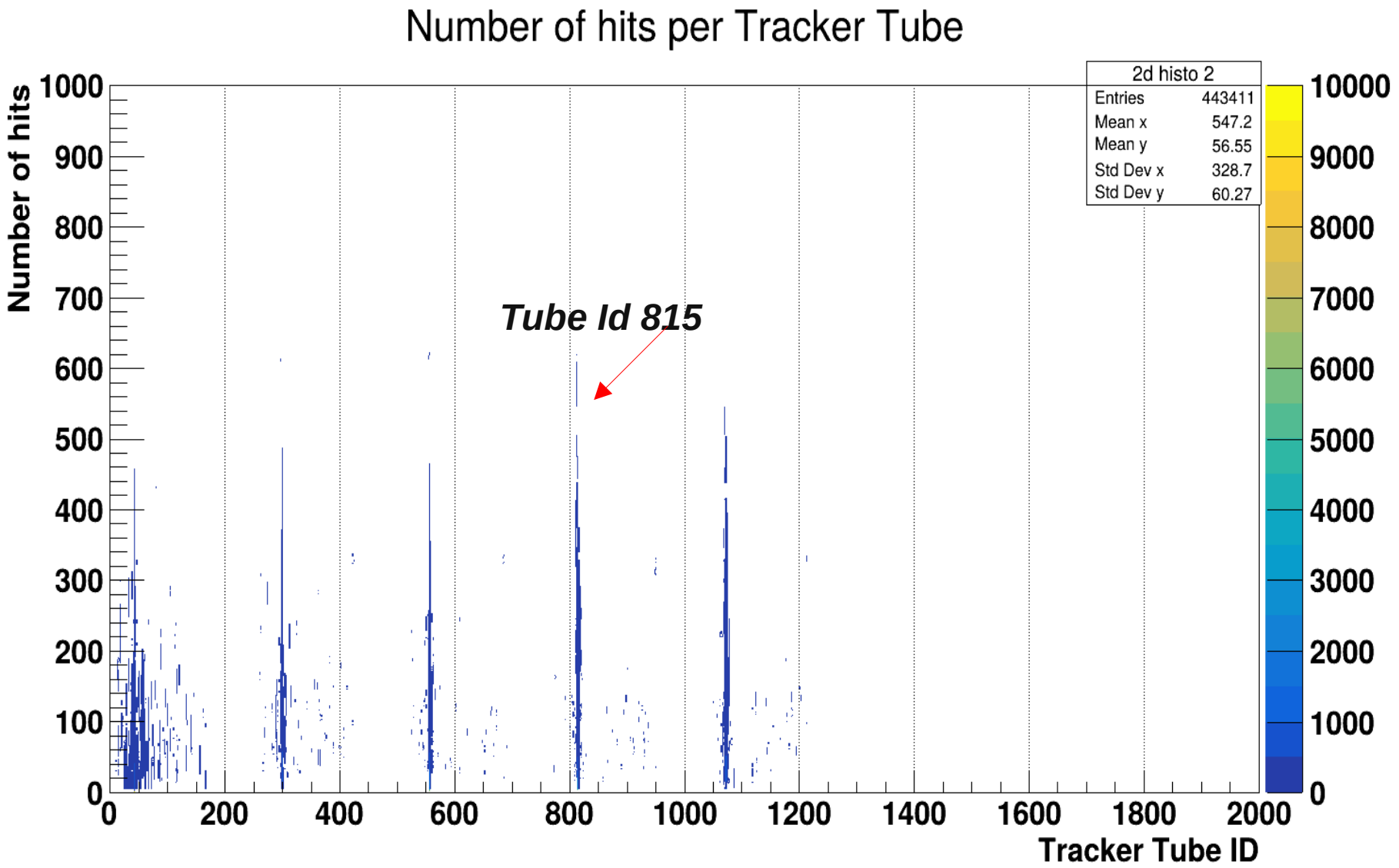
Digitization

Detection of the signals by imaginary string located at the center of each of the tracker tube

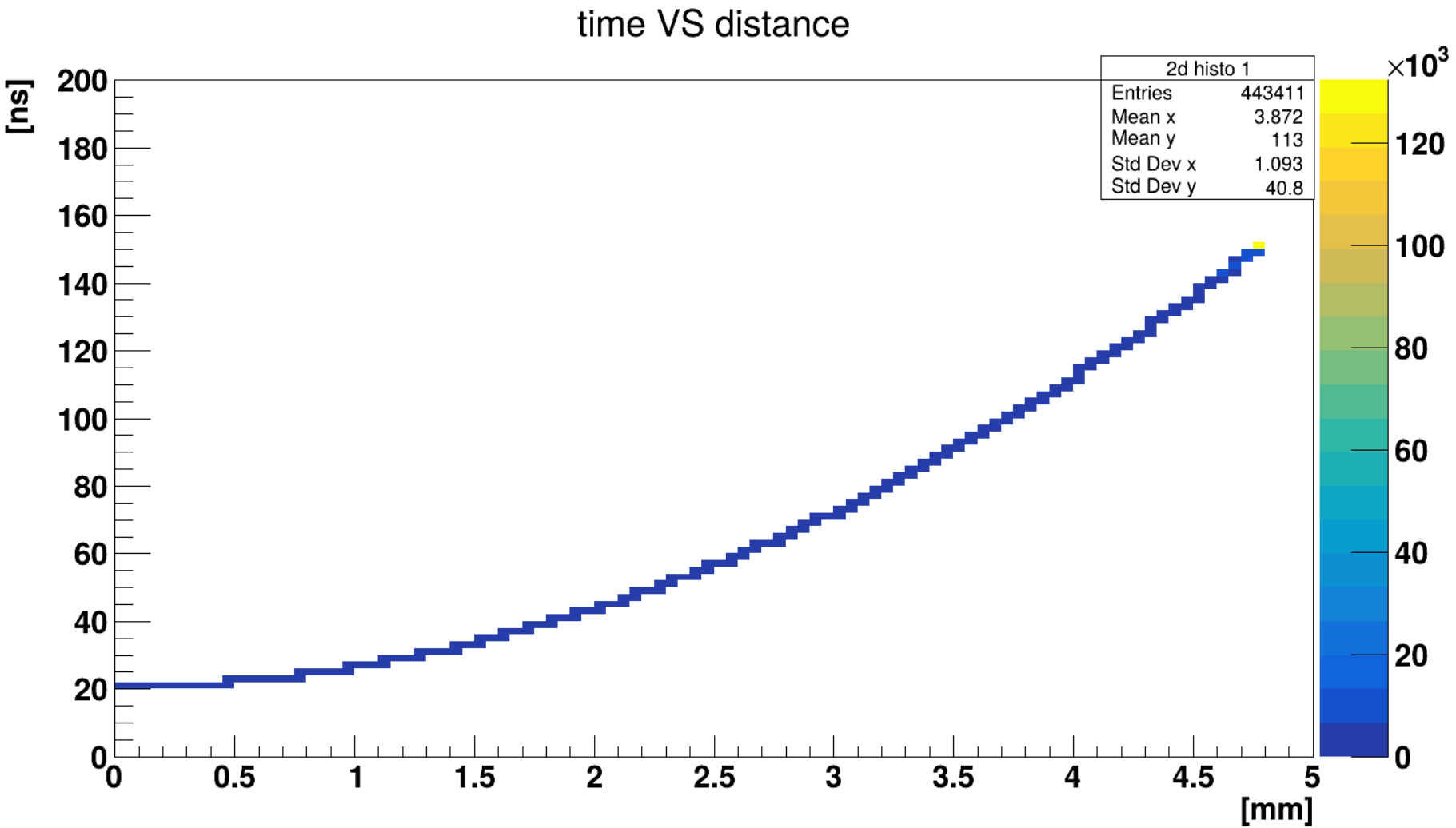
Five Layer Ring version of the Tracker



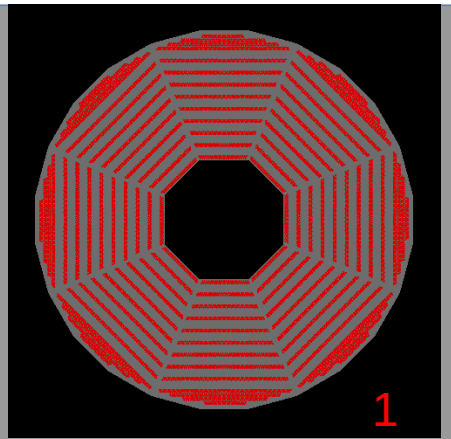
Point Source Proton beam coordinates (0, 0, 0)

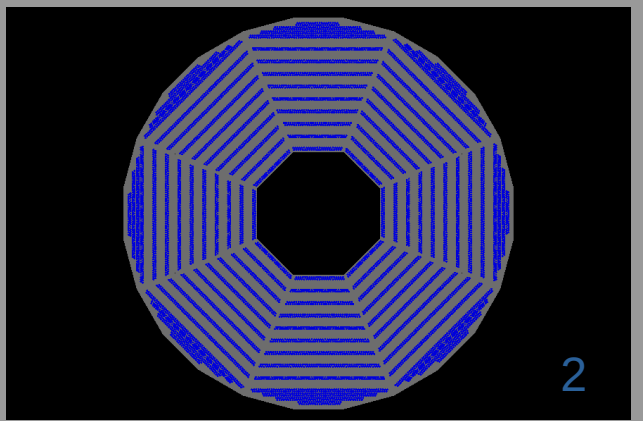

Number of hits per Tracker Tube
2d histo 2
Entries 443411
Mean x 547.2
Mean y 56.55
Std Dev x 328.7
Std Dev y 60.27
Tube Id 815
Number of hits
Tracker Tube ID
0
100
200
300
400
500
600
700
800
900
1000
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000

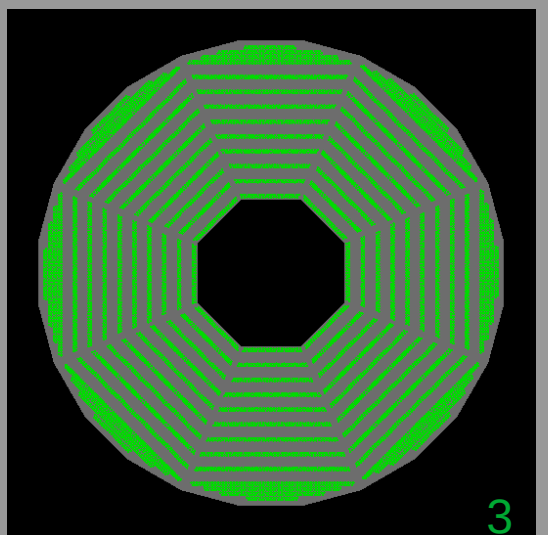
Digitization



Straw Tracker Octant version







Volume Names

1) ST_bar_v_gas (Red)

2) ST_bar_max_gas (Blue)

3) ST_bar_rv_gas (Green)

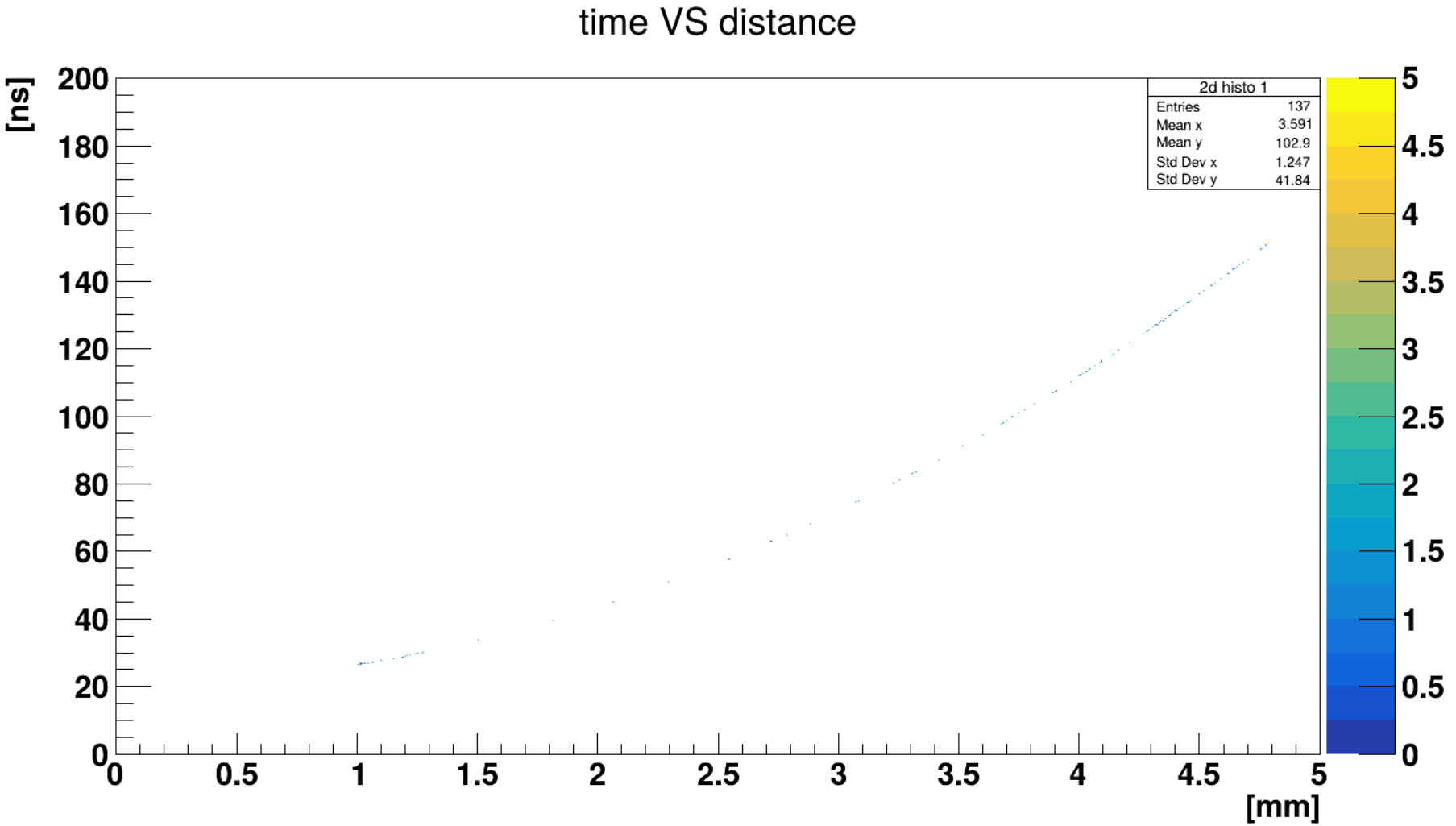
Note: Due to overlaps some volumes are not “workable”.

Digitization

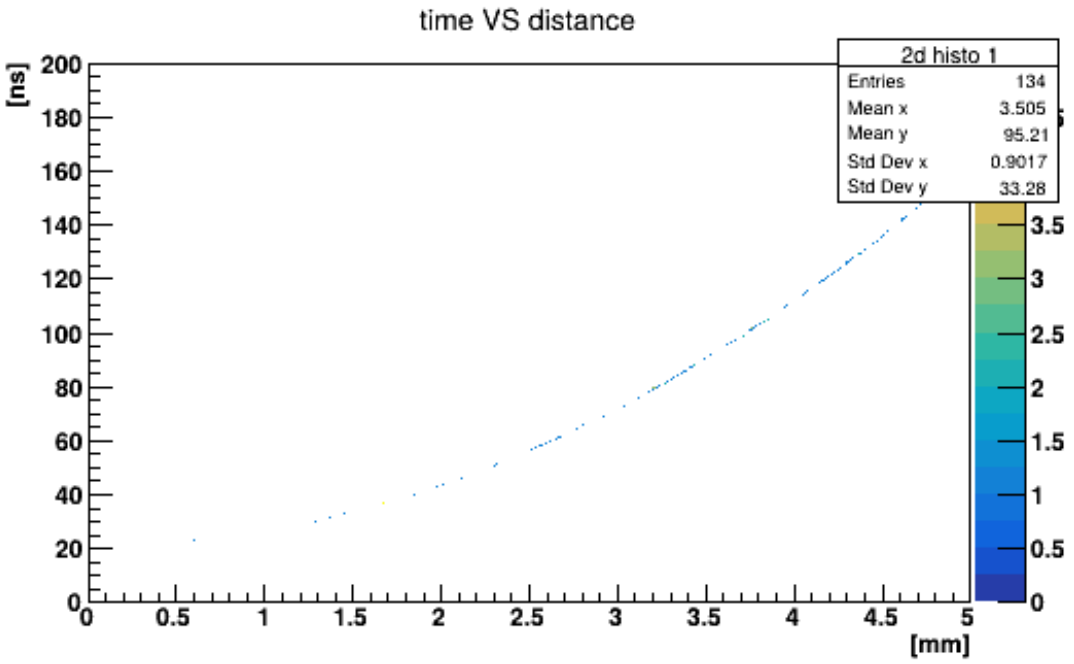
Drift time + Hit time = digiTime

Drift time + Hit time = digiTime

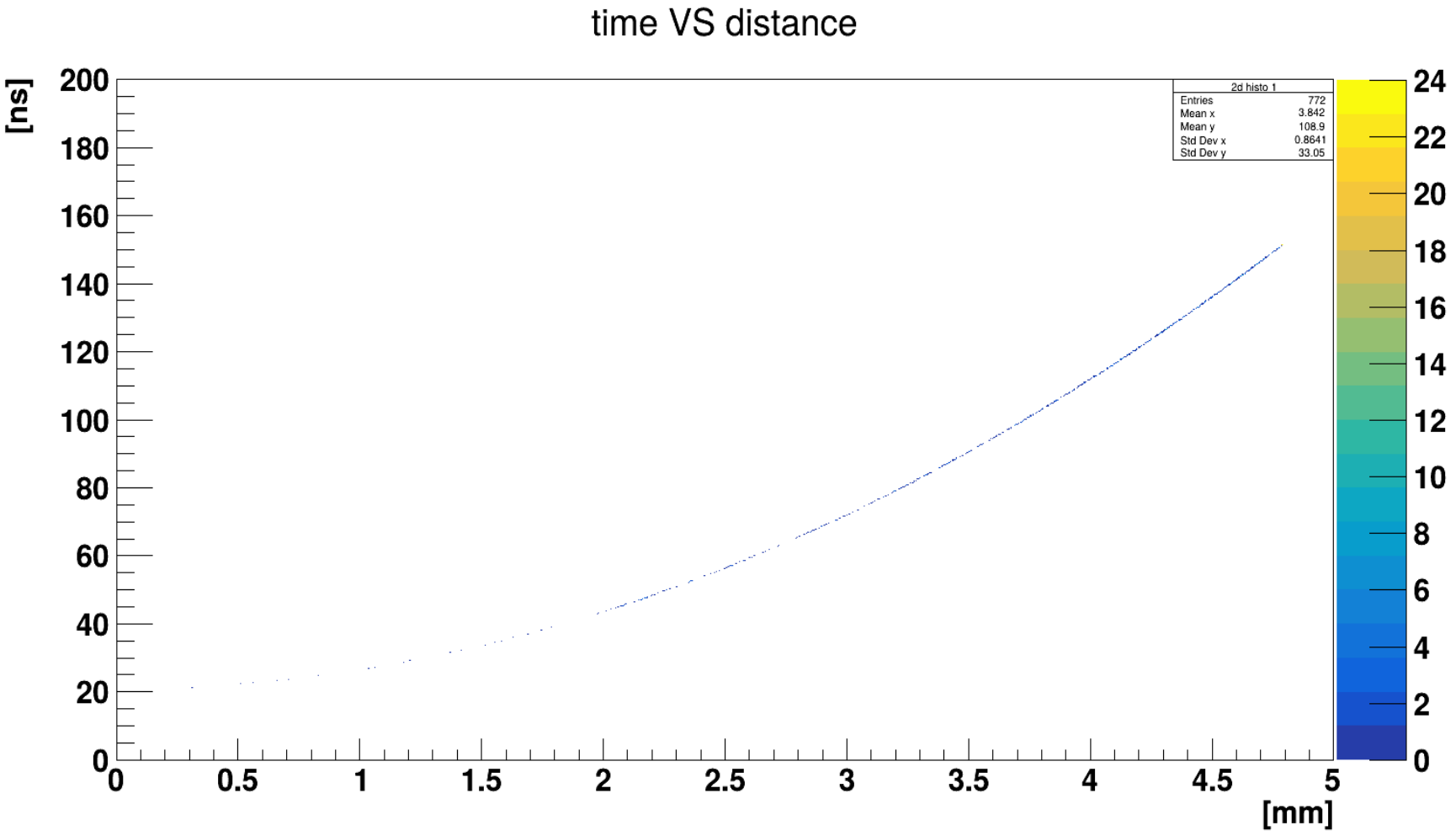
Hit time is the time from the center of the source to the hit point.



Volume Name: St_bar_v_gas



Volume Name: St_bar_max_gas



Volume Name: St_bar_rv_gas

Future Plans

GEANT4 simulations for the Straw Tracker (Octant)

- Digitization correctness
- Integration of the Pythia program

To check and remake if needed!

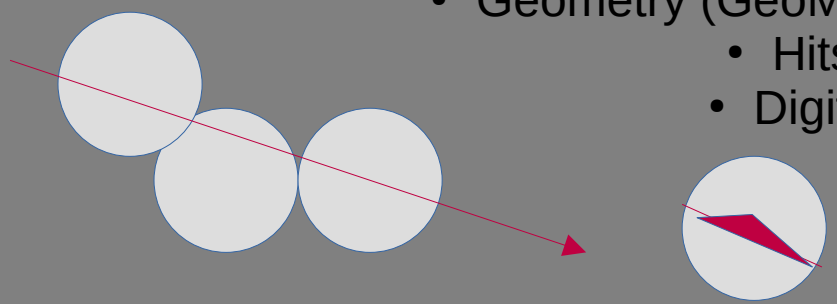
Conclusion

Ring version of the Tracker

- Geometry (GeoModel / Geant4) +
- Hits +
- Digits +

Octant version of the Tracker (Straw Tube Tracker)

- Geometry (GeoModel / Geant4) + -
- Hits + -
- Digits + -



ID	Volume Name	Entries/Events
33797	ST_bar_v_gas	137/10000
2359301	ST_bar_max_gas	134/10000
2786309	ST_bar_rv_gas	772/10000

Note: (+-) means need to be checked and changed!

Thank You