

Data flow simulation for MPD

XIV Collaboration Meeting of the MPD Experiment at the NICA Facility

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MPD detectors

Fast detectors

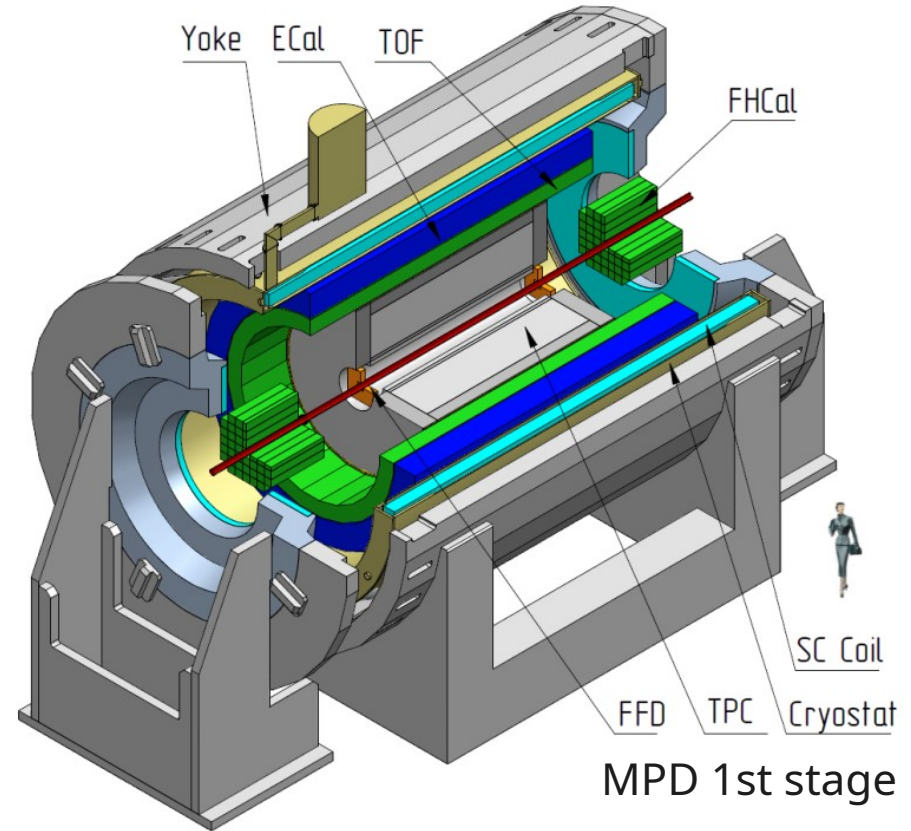
used as triggers and for data gathering

FFD
TOF
FHCaI

Slow detectors

used only for data gathering

TPC
ECaI



Particles reach time per detector (1)

Ideal conditions

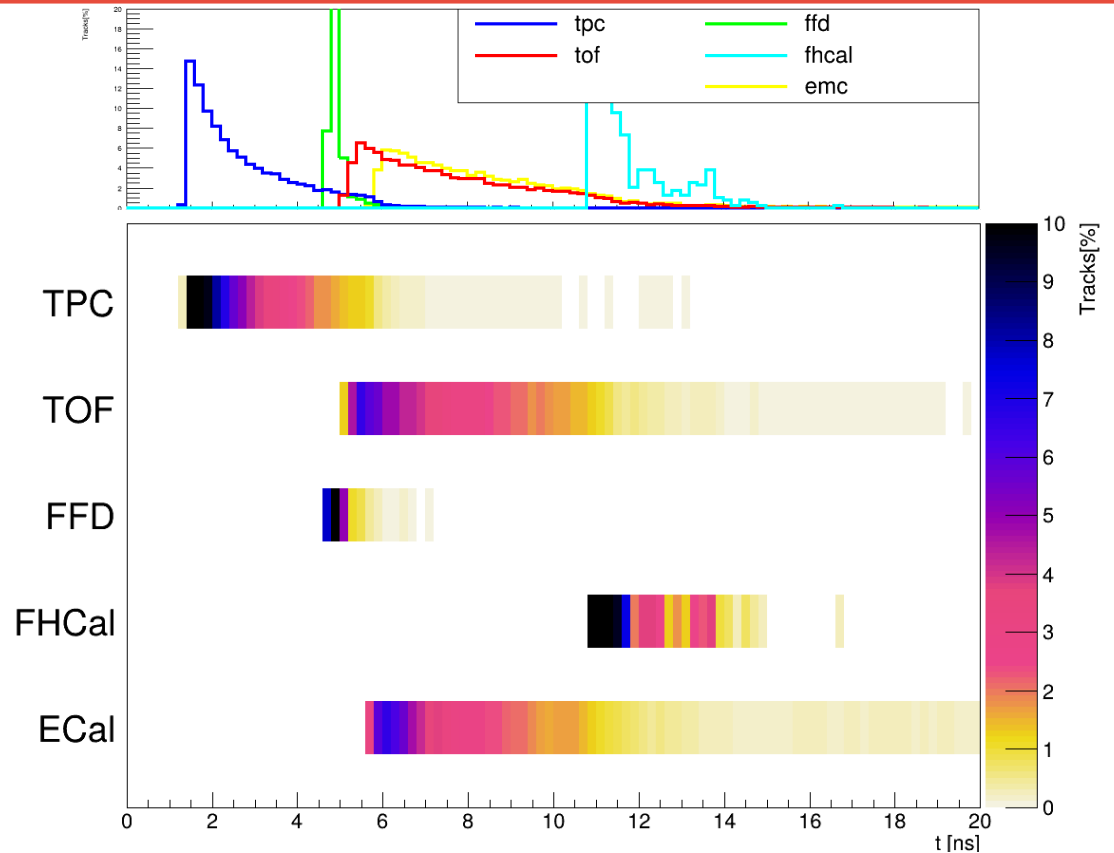
collision point exactly at (0, 0, 0)

100 events of PHSD generator

Reach time gathered from

Primary particles

π^0 gammas



Particles reach time per detector (2)

Expected conditions

collision point smeared

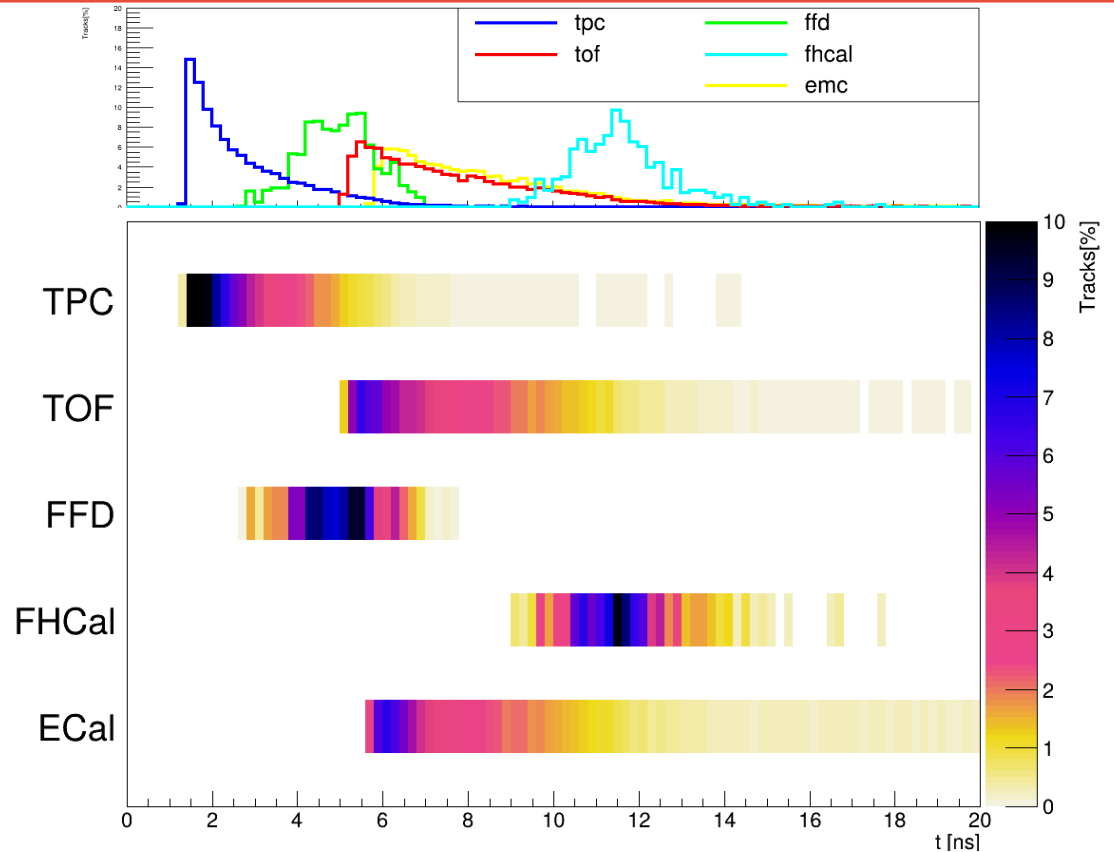
$\sigma = 24 \text{ cm}$

100 events of PHSD generator

Reach time gathered from

Primary particles

π^0 gammas



Particles reach time per detector (3)

Extended conditions

collision point smeared

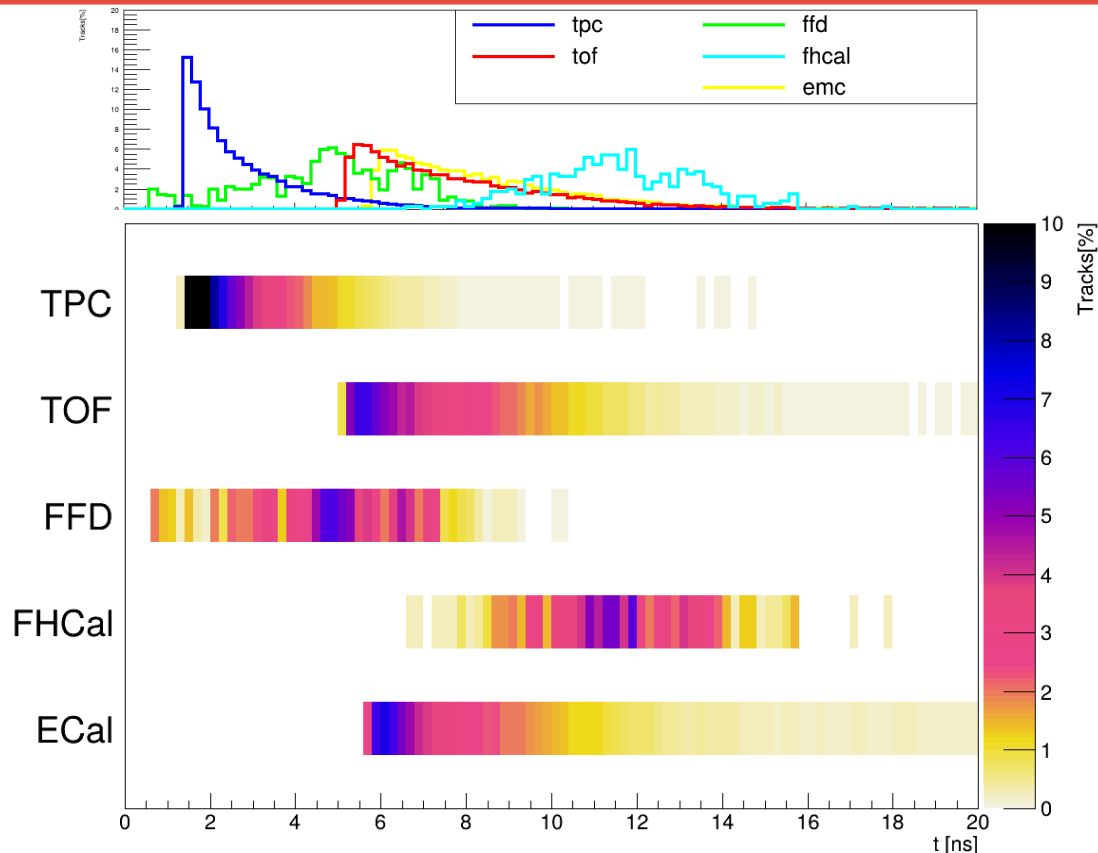
$\sigma = 50$ cm

100 events of PHSD generator

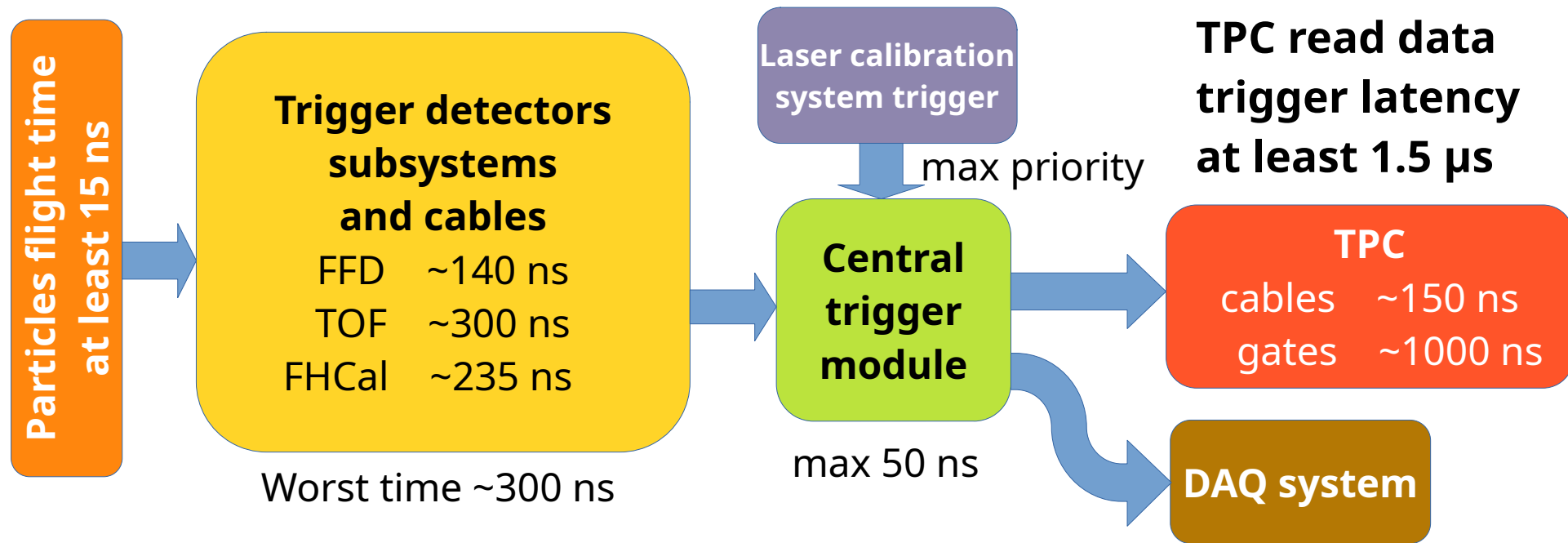
Reach time gathered from

Primary particles

π^0 gammas



Trigger flow



TPC trigger problems

TPC — slow detector with «memory»

Electrons drifts while read-out electronics waits gates opening and trigger

Loose data near end-caps of TPC

Pseudorapidity reducing $\Delta\eta = \sim 0.1$

Offset of all data if there is no measurement or calculation of trigger latency

Offset ~ 8.3 cm with expected drift velocity 5.5 cm/ μ s

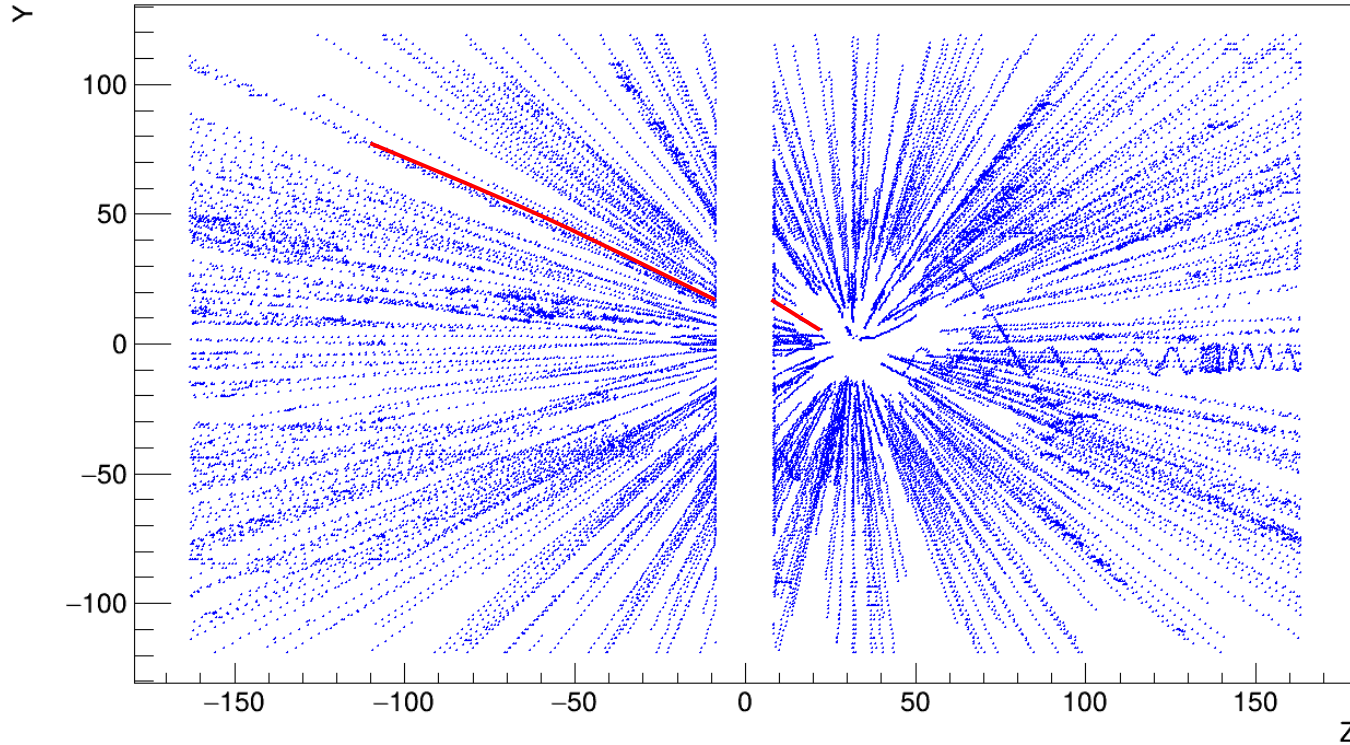
TPC read-out electronics has no time sync with White Rabbit

No info about latency between firing trigger and actual start of gathering data

Trigger latency expected to be measured «in place» on assembled MPD facility

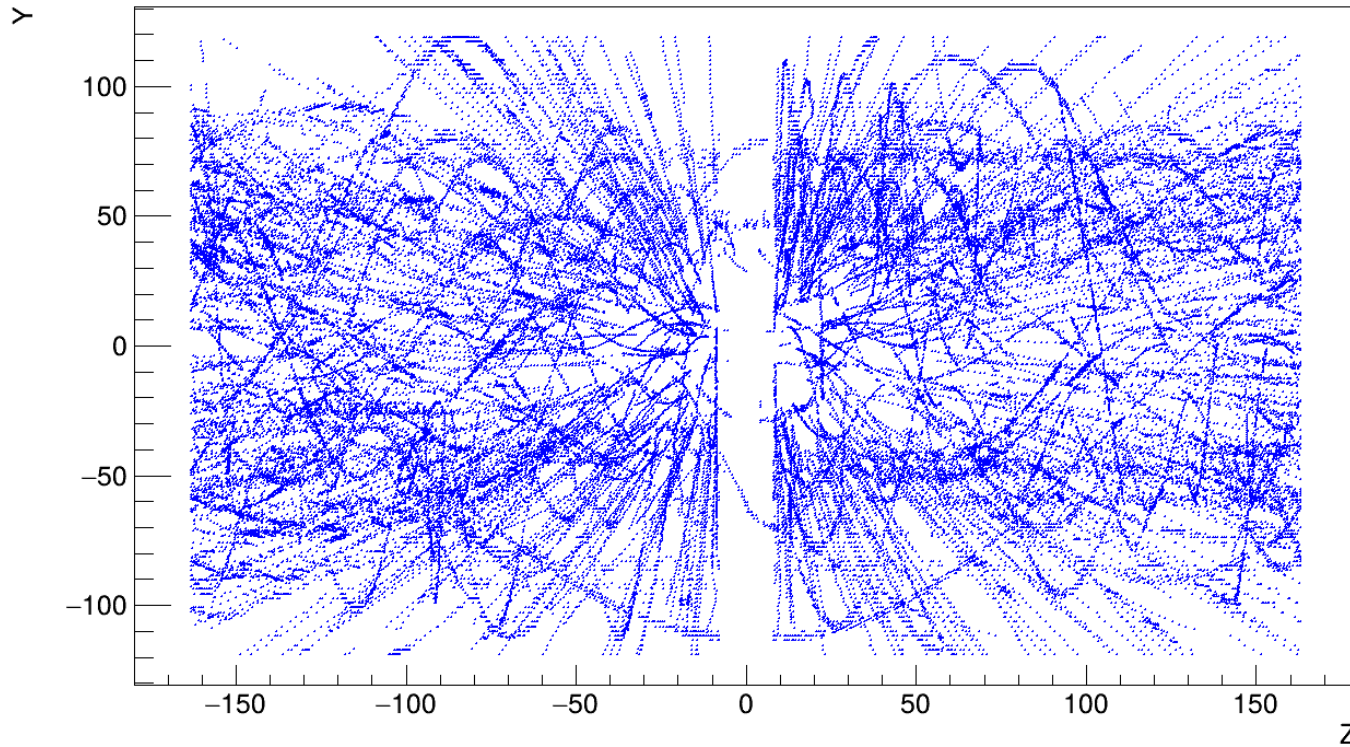
Simulations of event in TPC with trigger latency (1)

Collision point at (0, 0, 24 cm), BOX muons



Simulations of event in TPC with trigger latency (2)

Collision point at (0, 0, 0), PHSD



Possible algorithm to calculate TPC trigger latency

Provide possibility to check measurements of trigger latency

Calculates based on only events with vertex that has significant offset along beam axis from membrane position

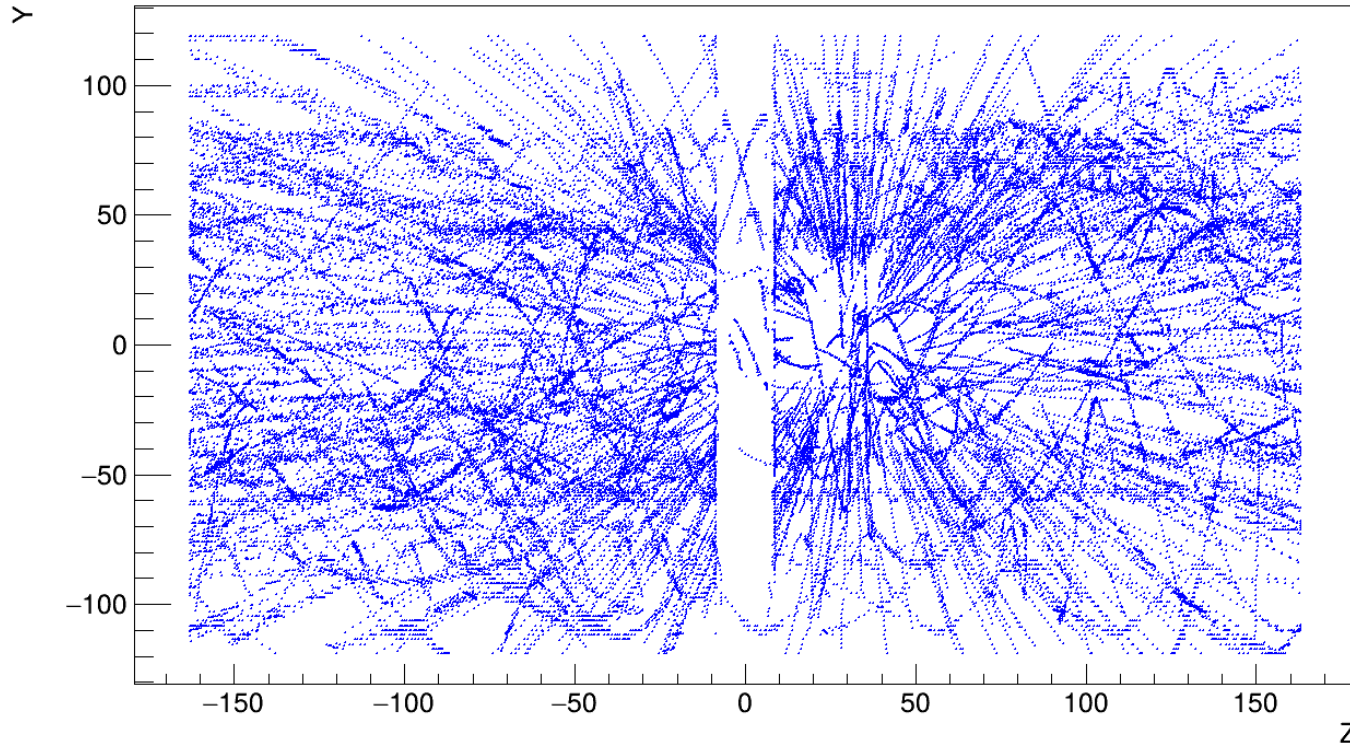
Tracks that crosses membrane have gap in data around membrane

Finding clusters/hits with similar transverse position (ends of a cut track) near a membrane in both sides of the TPC

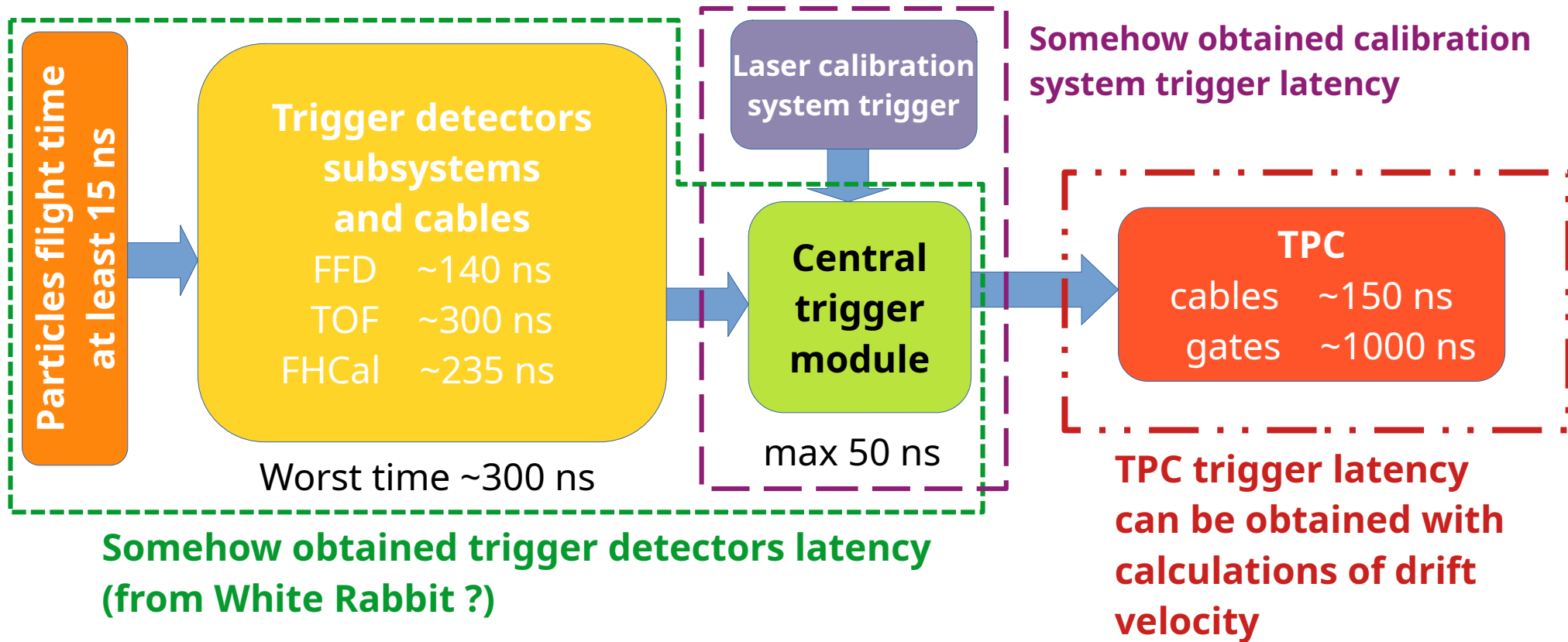
Calculate latency from gap between cut track ends taking into account drift velocity

Simulations of event in TPC with trigger latency (3)

Collision point at (0, 0, 24 cm), PHSD



Another way of trigger latency calculation



Results of simulations

Reach times of particles for each MPD facility detectors was simulated

Trigger latency has significant impact on TPC data gathering

trigger latency leads to loosing data in TPC

trigger latency should be measured

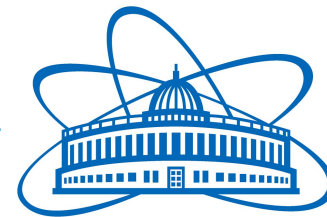
trigger latency should be considered during event reconstruction

trigger latency may be calculated with some limitations

That`s it

Thank you for attention!

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