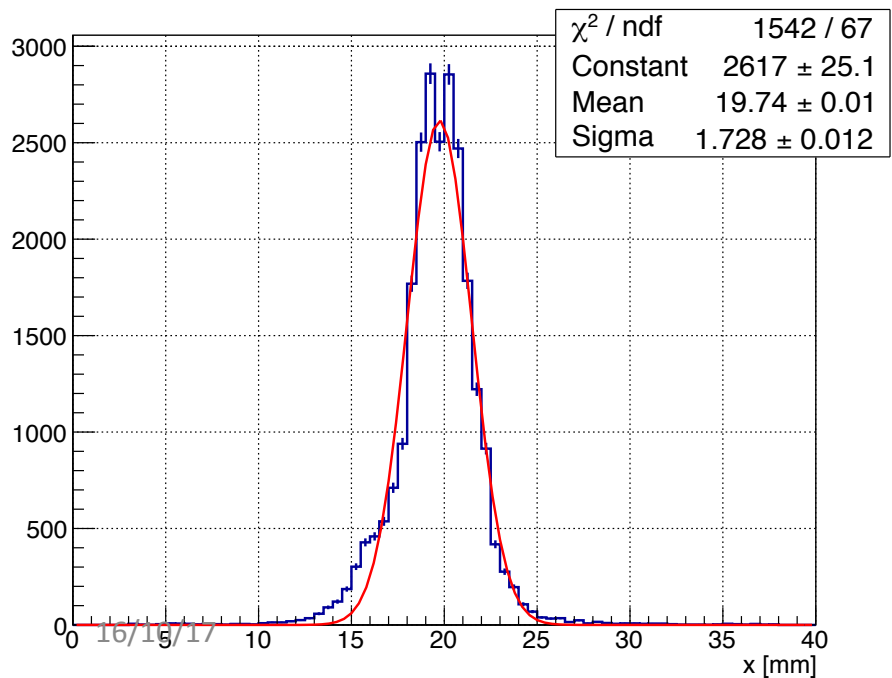# Paddy-2 Dec 2016 pion runs Efficiency study

F.Petrucci

χ² / ndf   190.9 / 32
Constant   3736 ± 30.3
Mean   21.2 ± 0.0
Sigma   2.564 ± 0.013

χ² / ndf   1542 / 67
Constant   2617 ± 25.1
Mean   19.74 ± 0.01
Sigma   1.728 ± 0.012
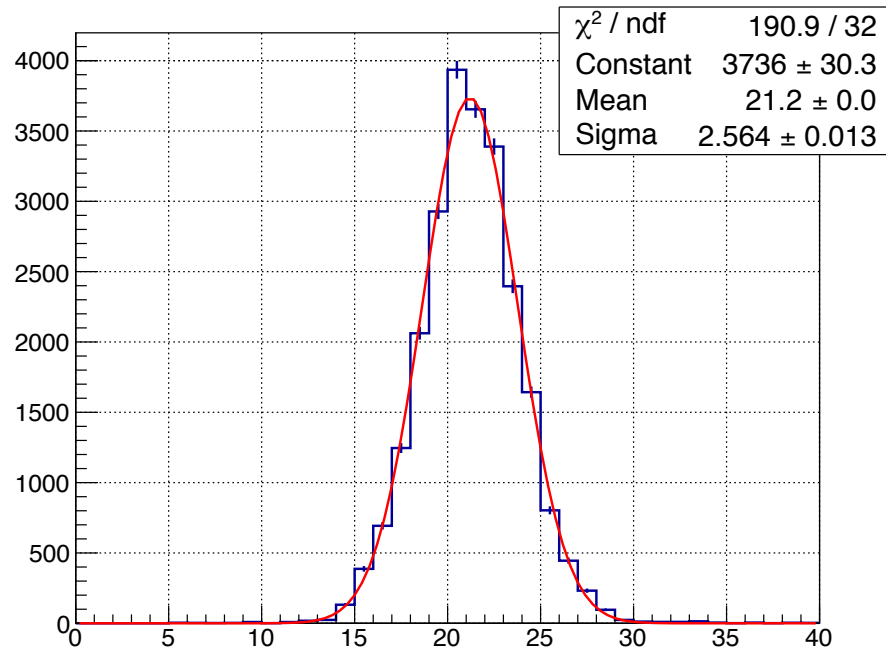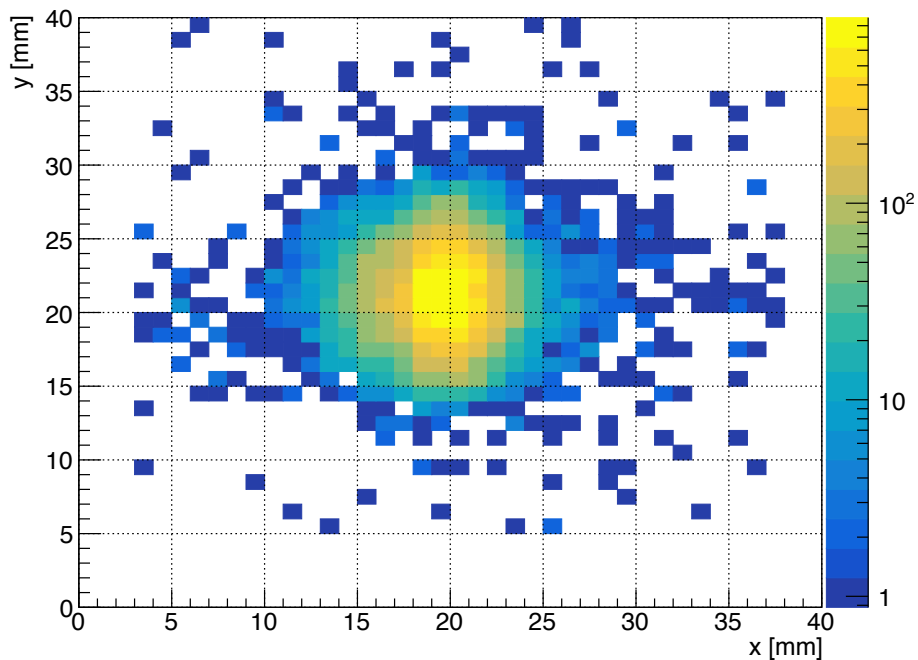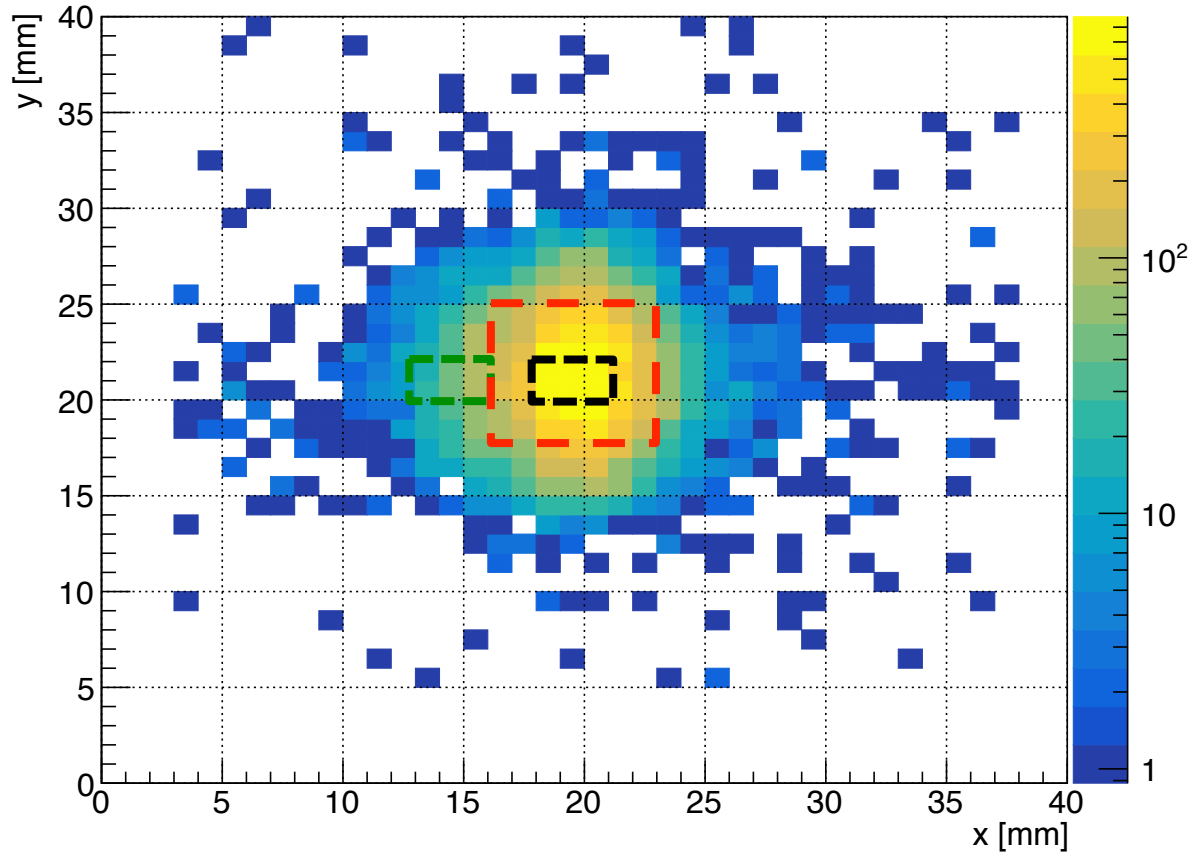
Beam-spot profile

as obtained from tmm tracks
extrapolated to paddy-2 position

Run 165: trigger rate 400kHz

2

Pion flux

6mm^2 with 1.5% of the events:
400kHz*0.015/6mm^2 =
100kHz/cm^2

6mm^2 with 20% of the events:
400kHz*0.2/6mm^2 =
1.3MHz/cm^2

49mm^2 with 80% of the events:
400kHz*0.8/49mm^2 =
650kHz/cm^2

High rate efficiency "problem"

Pion efficiency vs pion rate
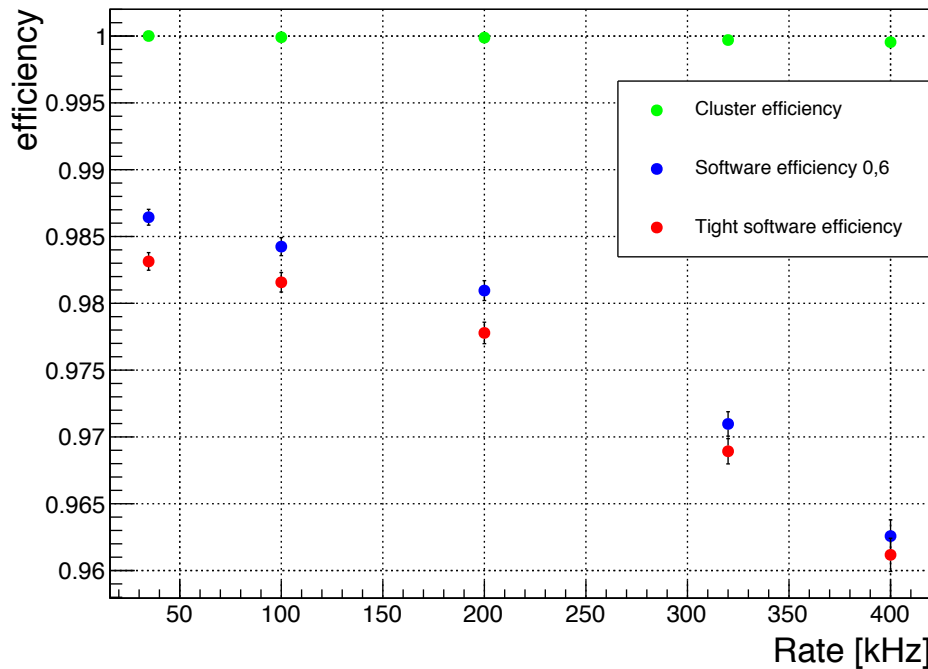
- A non negligible drop in the tracking efficiency is observed with increasing trigger rate.

- In this slide the tight software efficiency is the 3sigma efficiency where sigma is the resolution as measured for that specific run.
- As the resolution varies from 180um to 194um, the 3sigma and 0.6mm sw efficiency are very similar. In the following, the 0.6mm resolution is used.

High rate efficiency "problem"
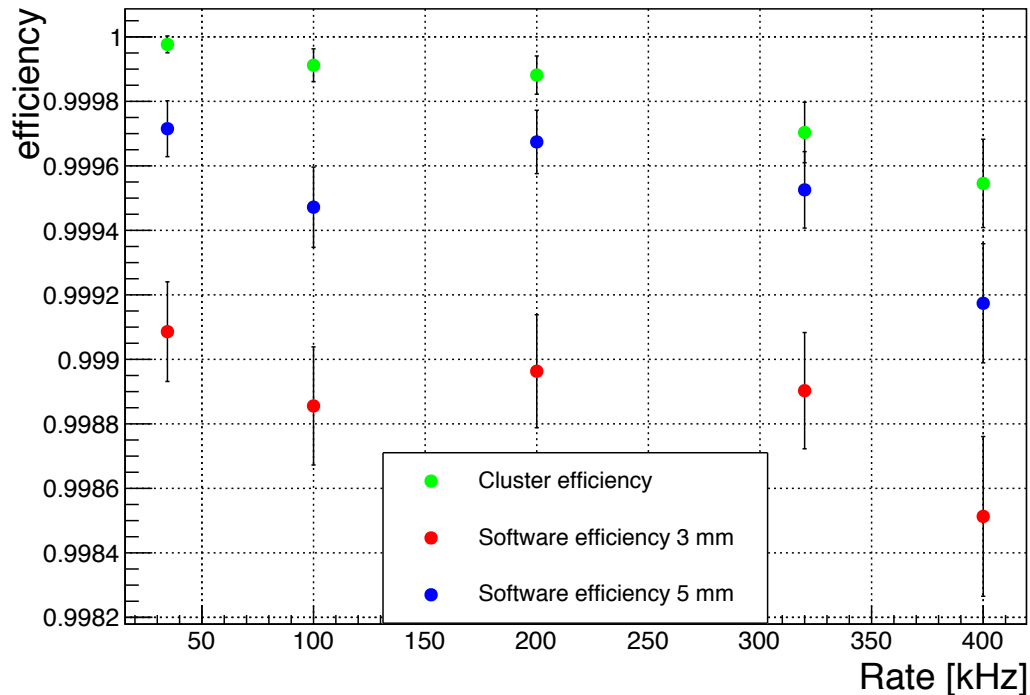
If the efficiency is computed within a larger window, the drop vanishes.
Already at 3mm, the efficiency is basically constant and >0.998.

→ the cluster is good but is slightly shifted from its correct position so to be excluded when computing the efficiency on a 3sigma level.
→ clusters (pads) coming from activity due to the higher rate are added to the good cluster?

Pads time difference
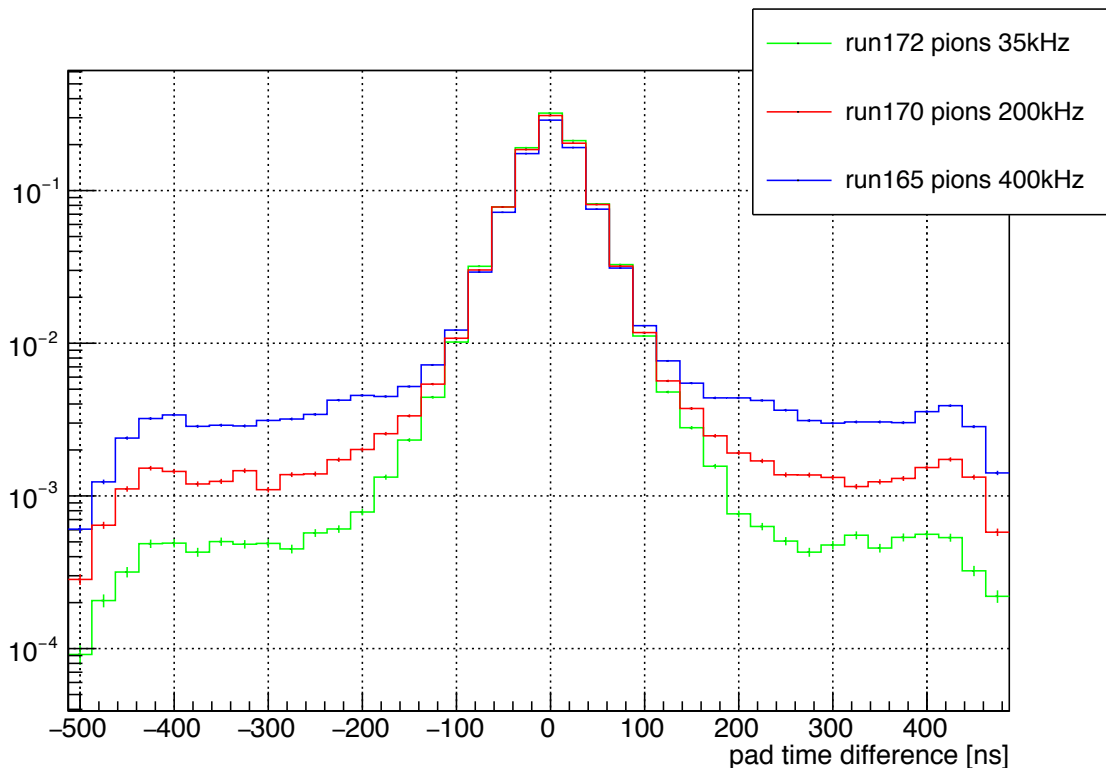
Each pad has a time given by the position of the charge-signal peak.

No fit is performed (perpendicular tracks...) the resolution is 25 ns.

The difference between the pads in an event that could be joined in a cluster is reported.

The tails of this time-difference distribution becomes larger with increasing rate.

Pads with a minimum time difference with repect to any other pad in the cluster larger than a given value are NOT merged into the cluster.

#pad per cluster
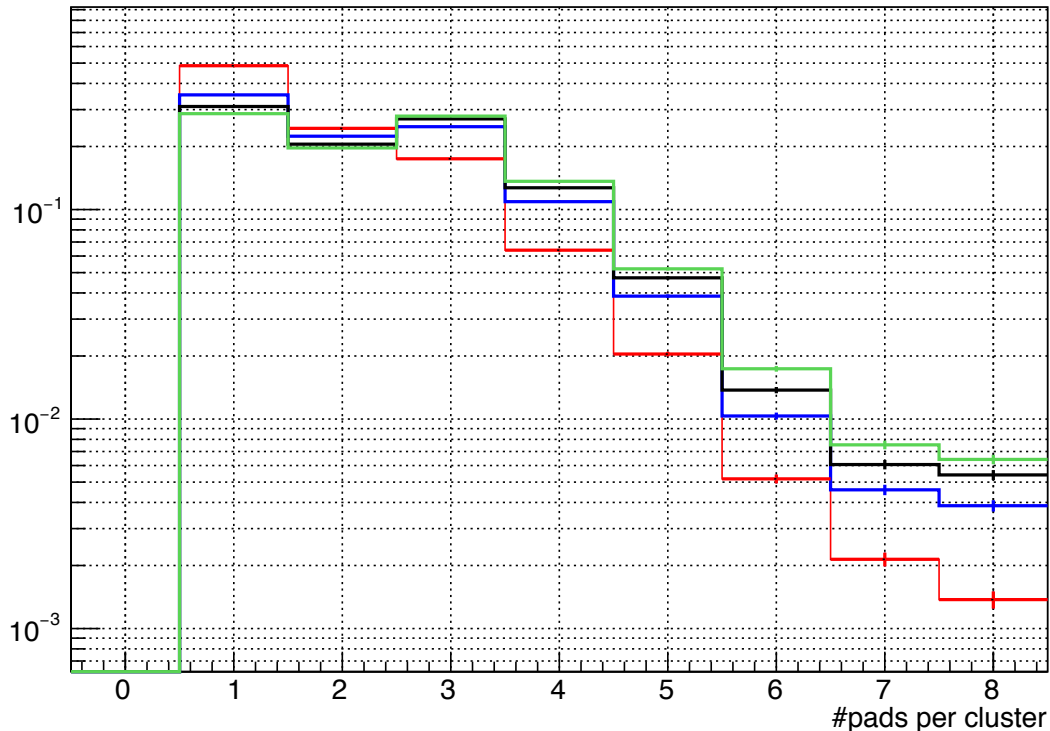
Run172: 35kHz trigger rate
No time-difference cut
100ns time-difference cut
75ns time-difference cut
50ns time-difference cut

We expect:
- an increase of the number of cluster per event (not a problem)
- a decrease of the number of pads per cluster

Decreasing the number of pads per cluster causes a worsening of the resolution (2 or 3 pads cluster have a better resolution that cluster with only 1 pad).
The cut on the time difference should be taken to increase the efficiency but not to affect too much the resolution.
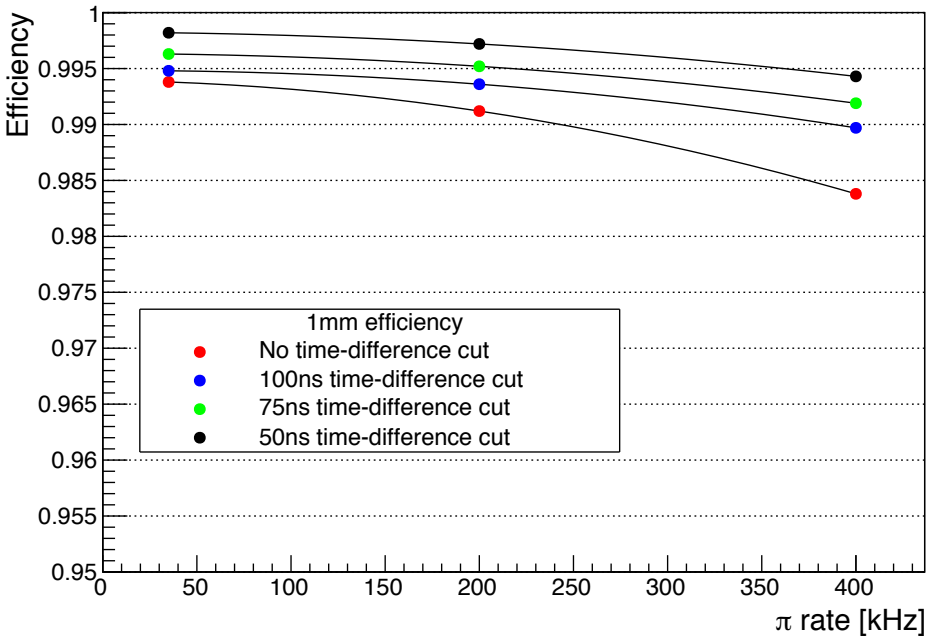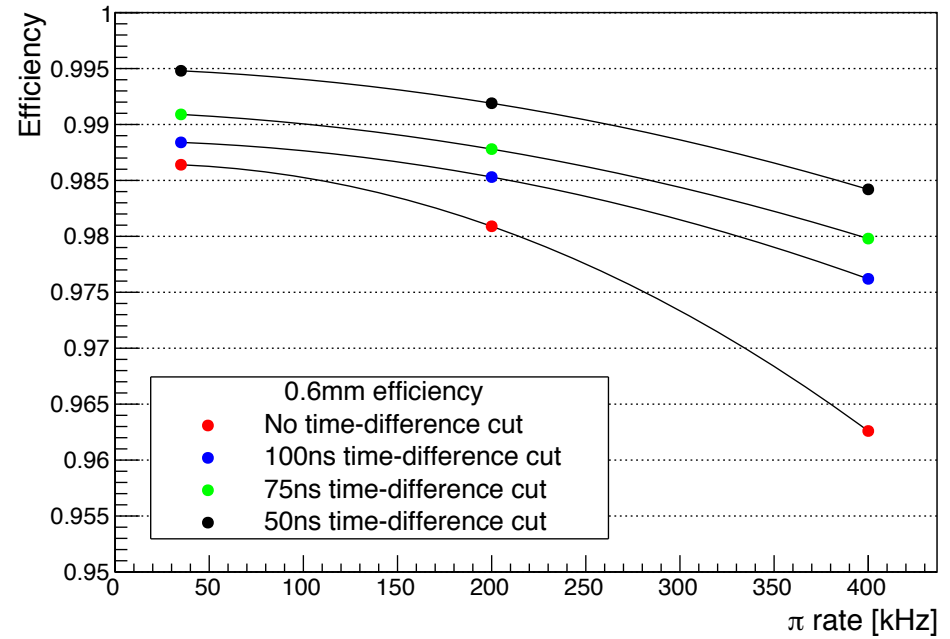
Effect on the resolution
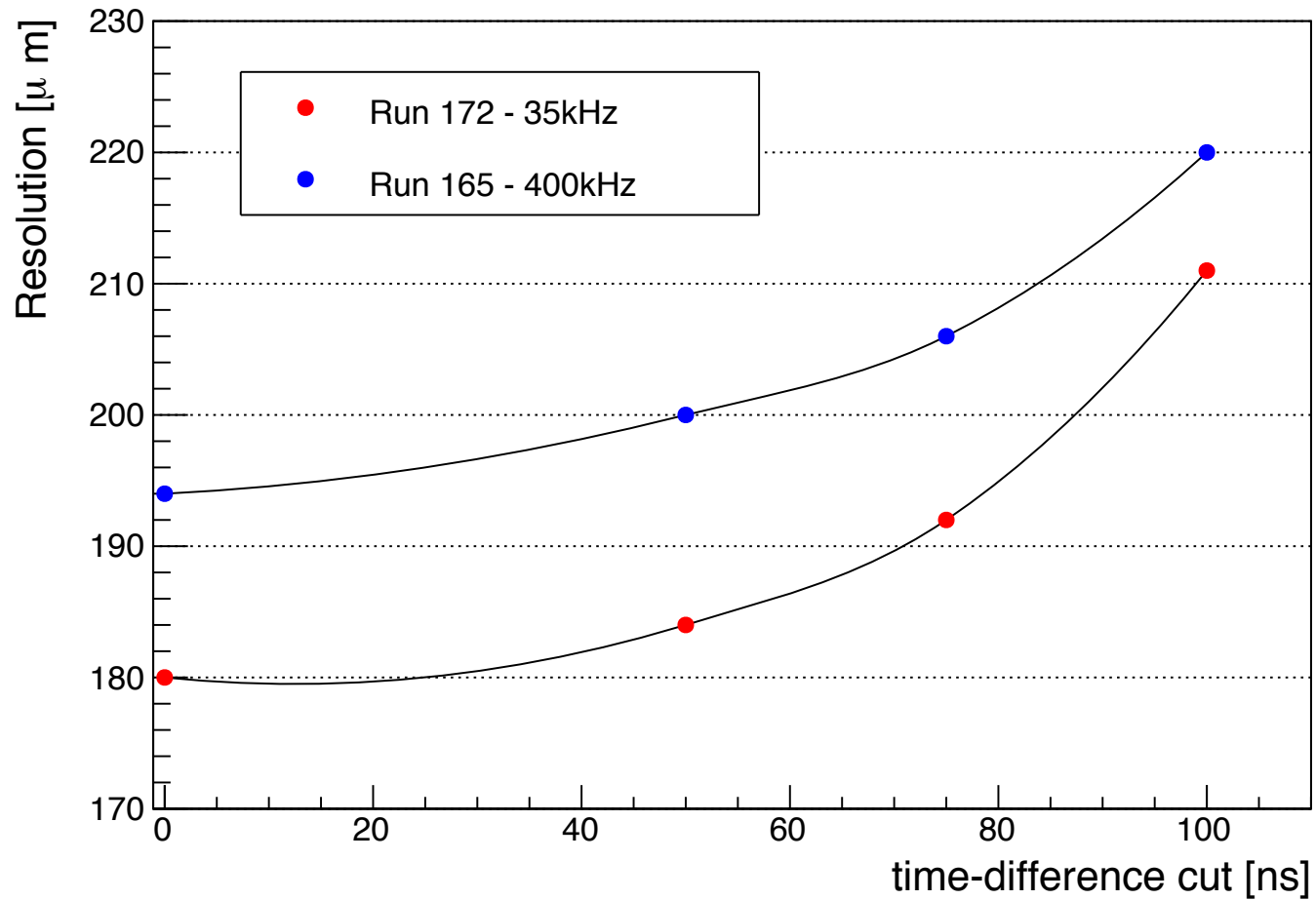
Efficiency

Efficiency VS π rate

Efficiency VS π rate

Backup

Resolution vs Rate