

Calibrating the TOF-400 system in the recent Xe+Csl physical run

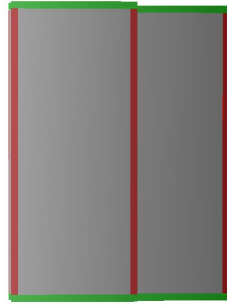
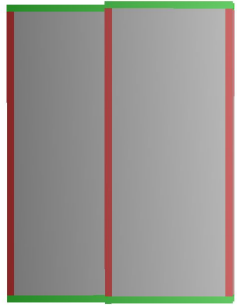
Mikhail Mamaev (MEPhI, INR RAS)
Mikhail Rumyantsev (JINR)



BM@N collaboration meeting, 16/05/2023



Overview of the TOF-400 subsystem



Comprised of 20 planes.

Each plane is assembly of 48 strips:

- Height: 300 mm
- Width: 10 mm
- Pitch: 12.5 mm

3-step correction procedure (for each strip individually):

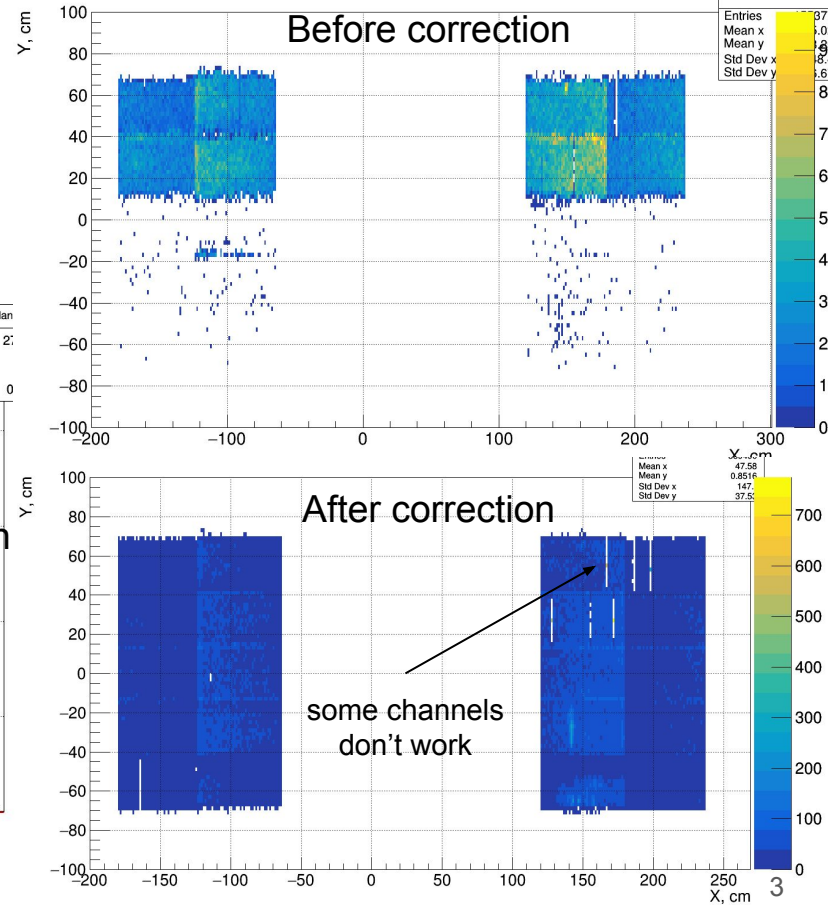
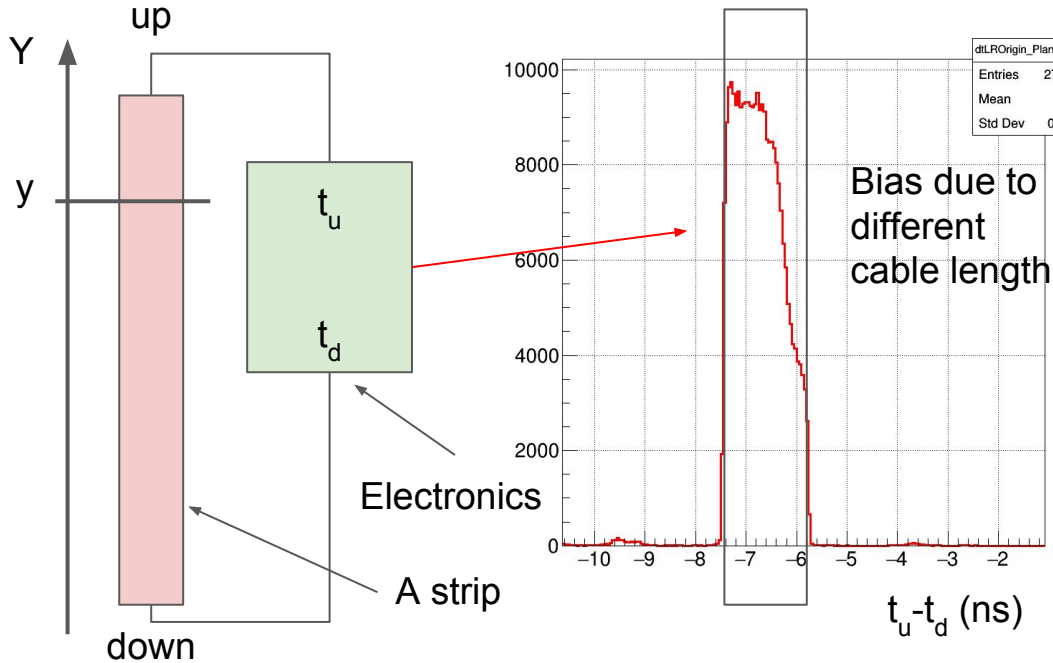
- Up-Down correction (y-coordinate calculation)
- T_0 correction
- TOF-correction

Up-Down correction and calculation of hit coordinate

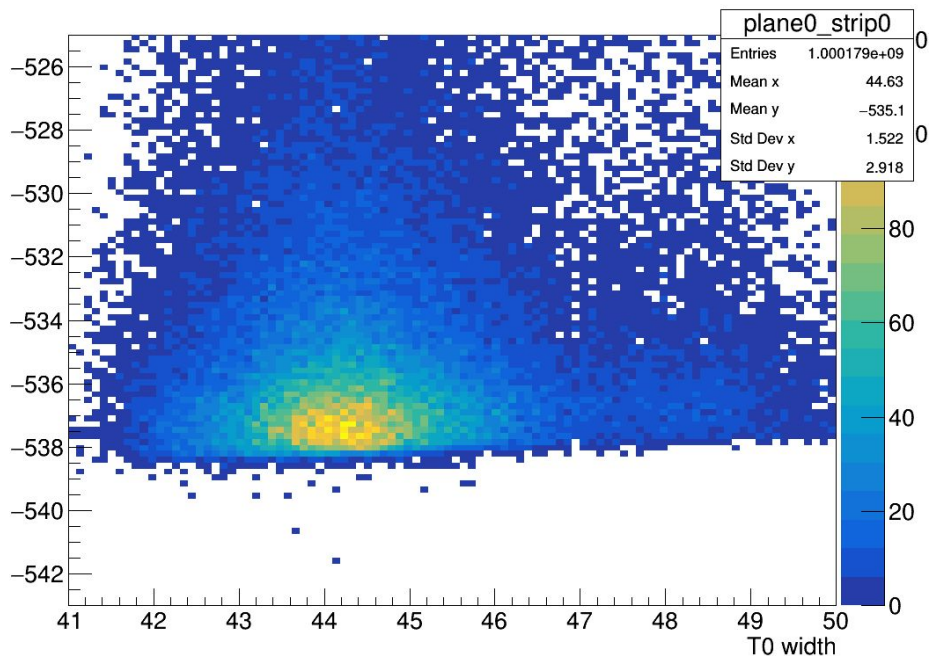
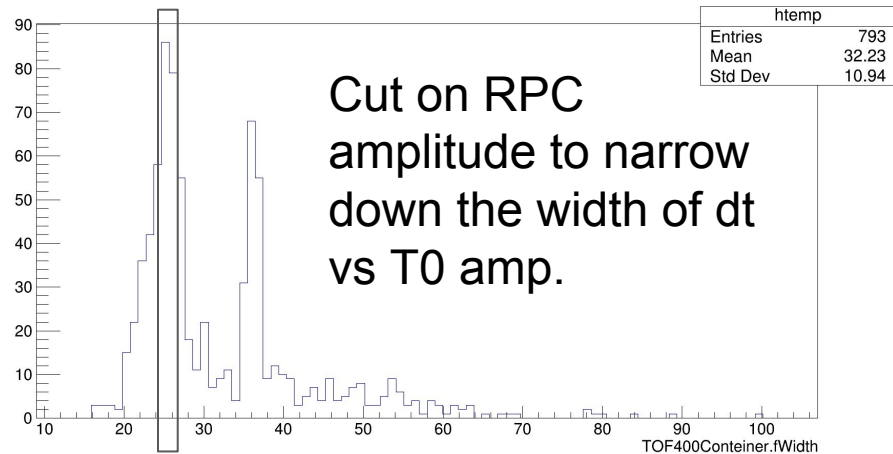
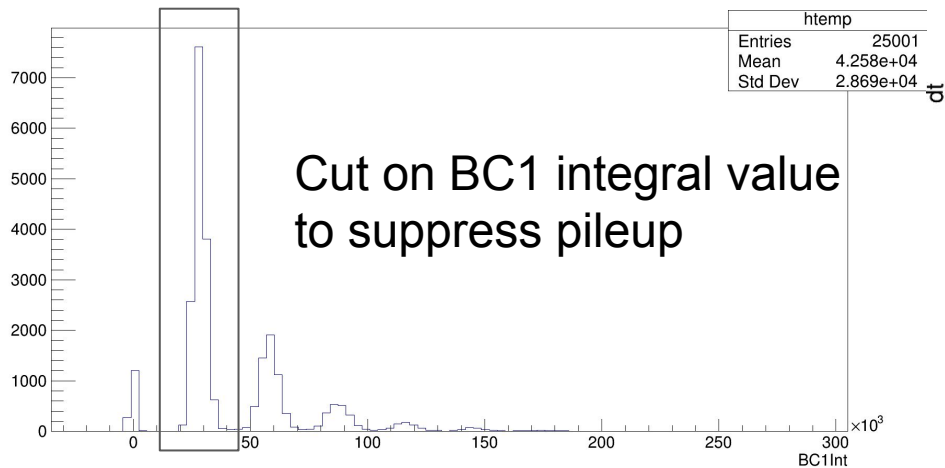
Coordinate on Y axis is calculated:

$$y = 0.5v_s(t_u + t_d)$$

Where y is coordinate of the hit, v_s is speed of the signal and t_u and t_d is time registered in up and down ends of a strip

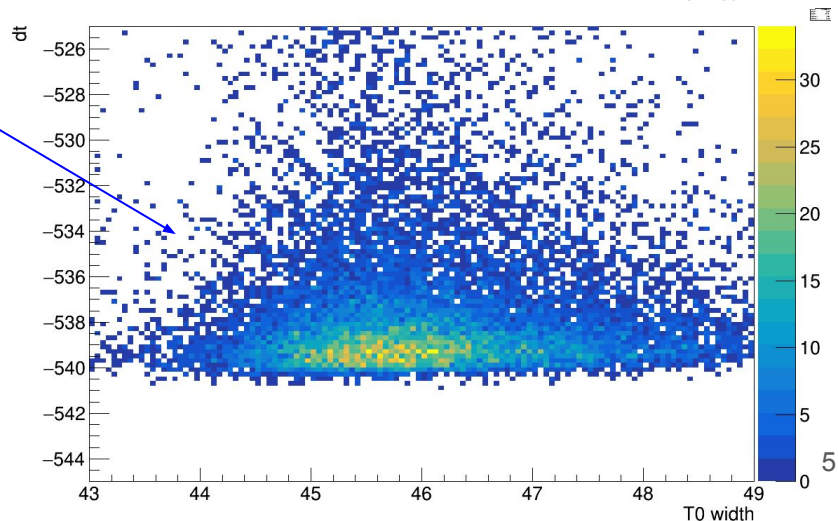
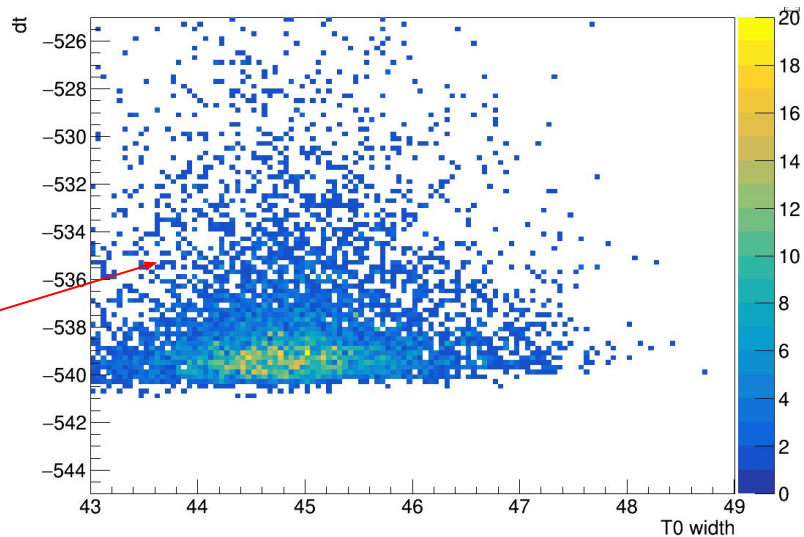
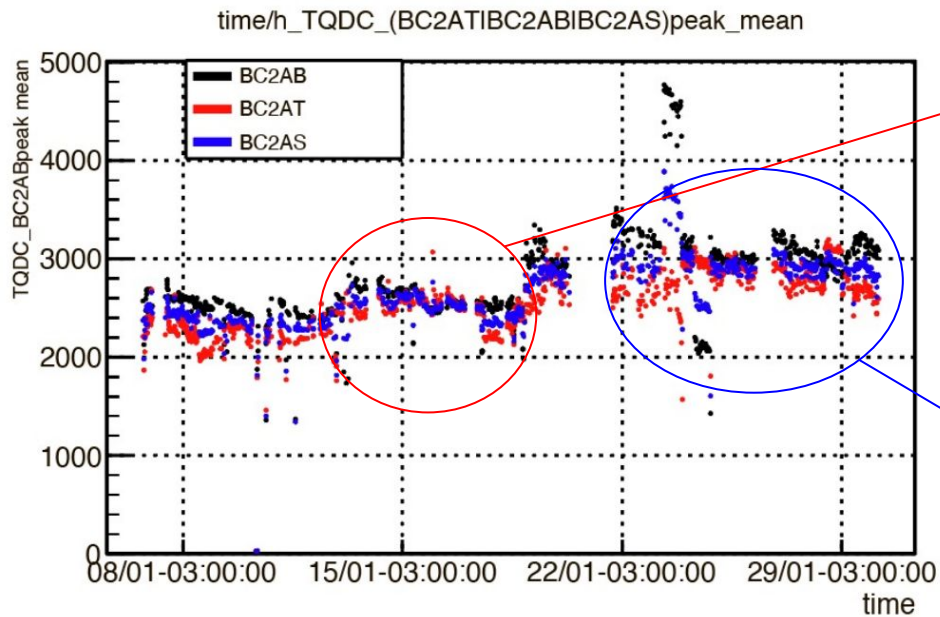


Selection criteria and TOF vs T0 width

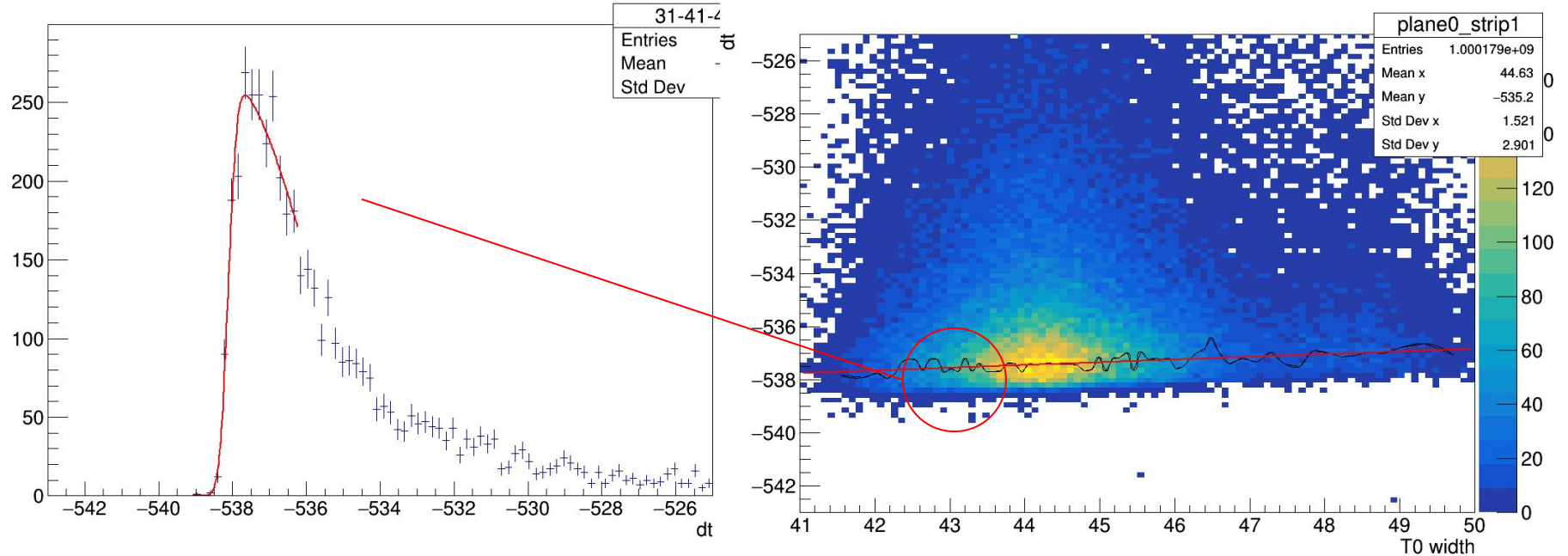


- TOF has an offset due to uncorrected cable length
- TOF depends on T0 signal width

T0 gain while data collection

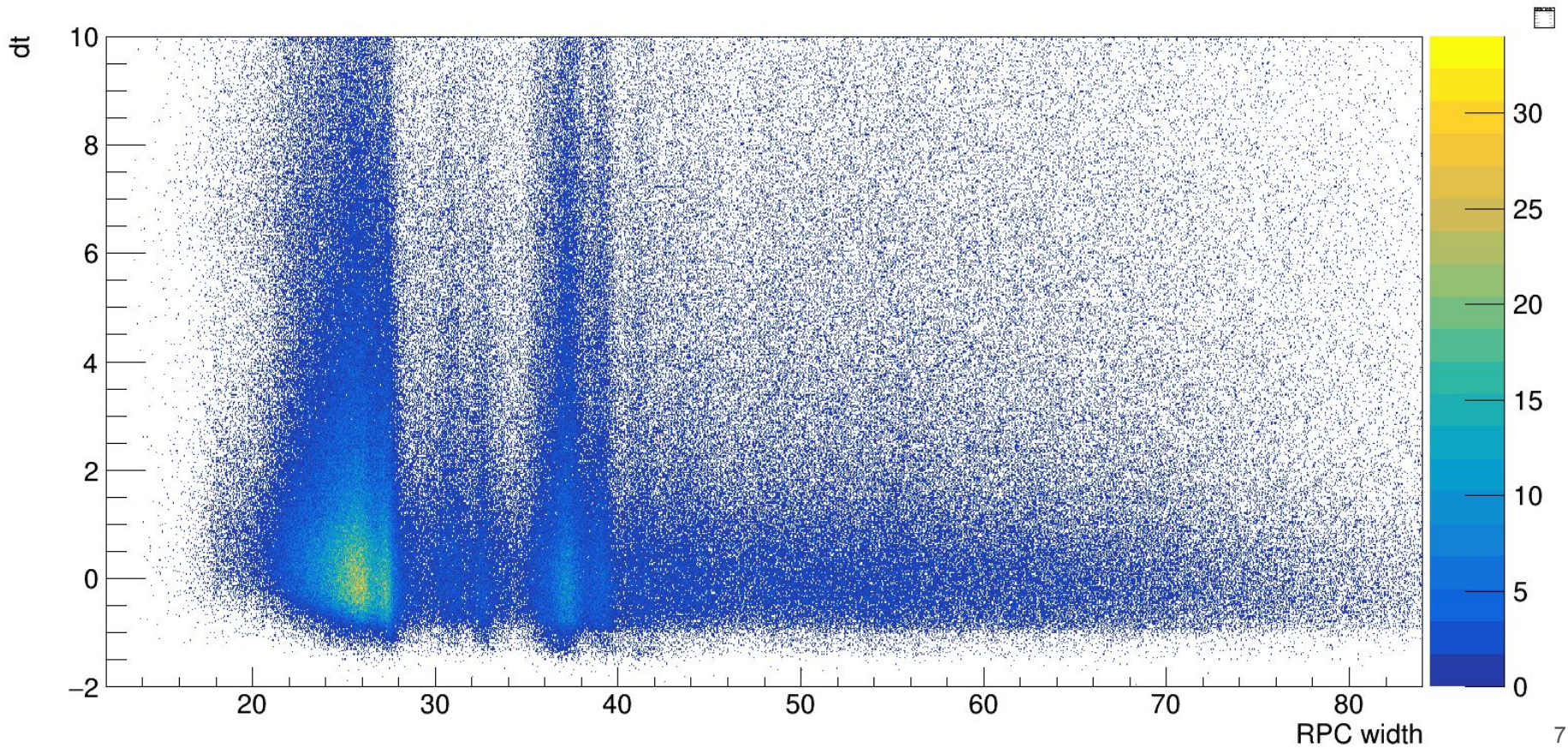


T0 correction



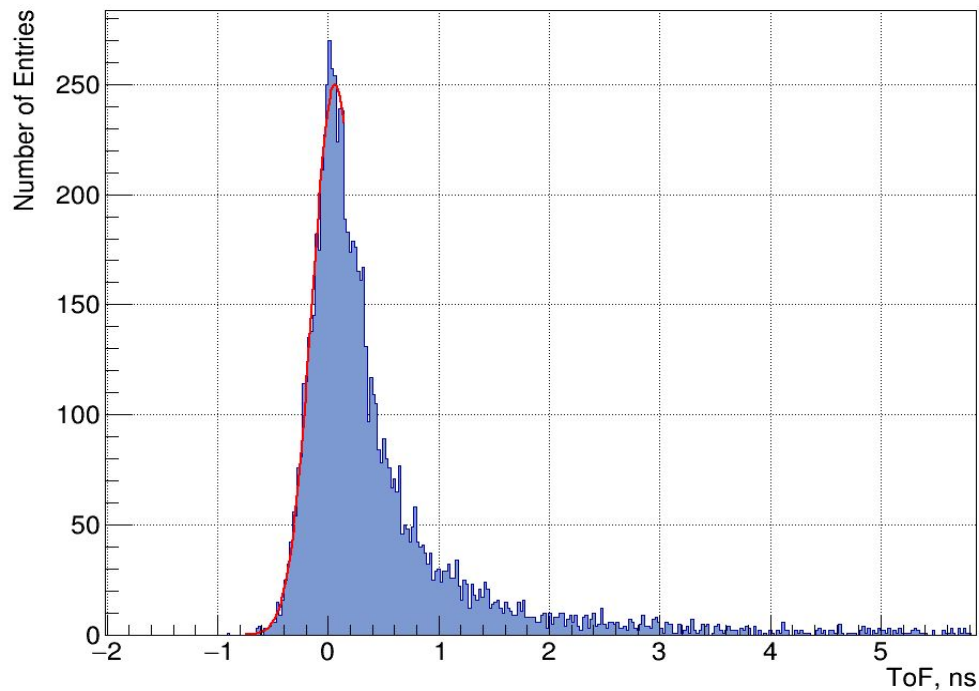
Fitting with asymmetrical gauss and taking the maximum of the function
Resulting points are approximated with the polynomial of the first order

RPC tof vs tot after applying T0 correction

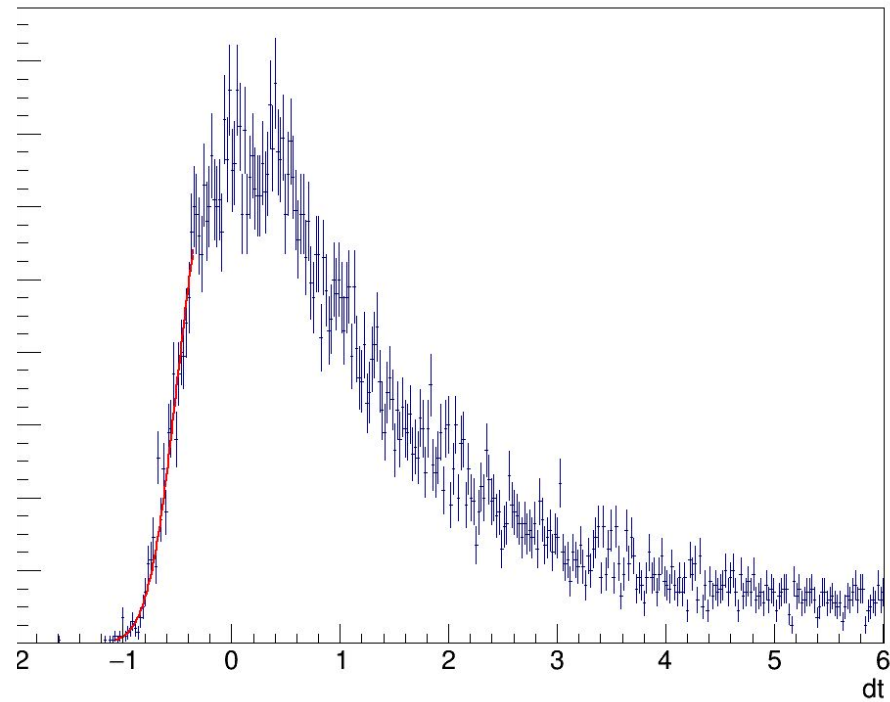


Issue with number fast and slow particles

Previous run

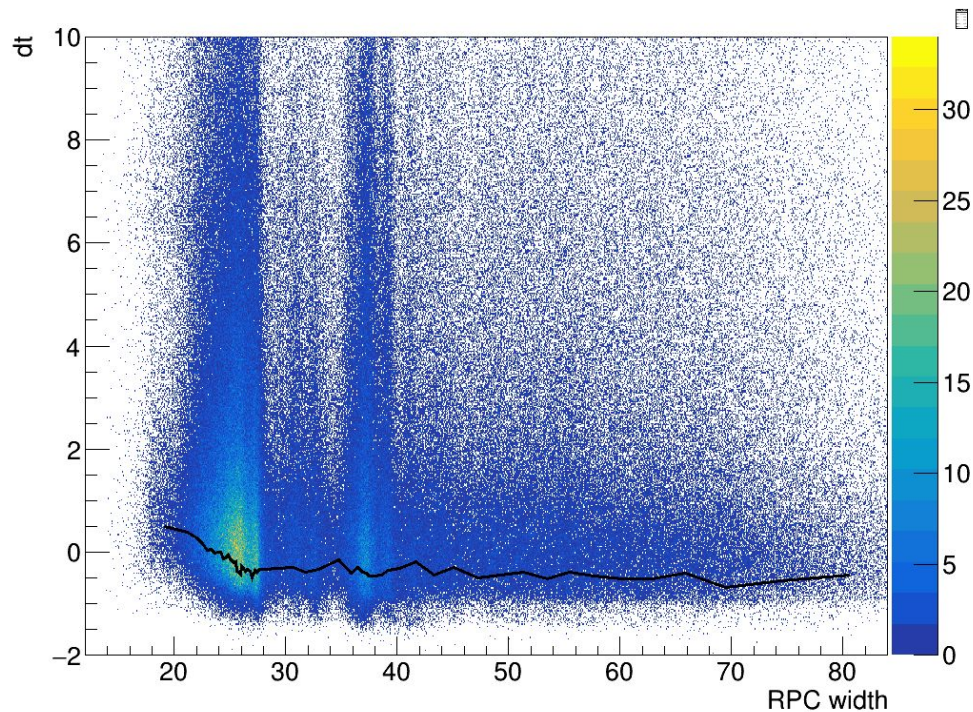
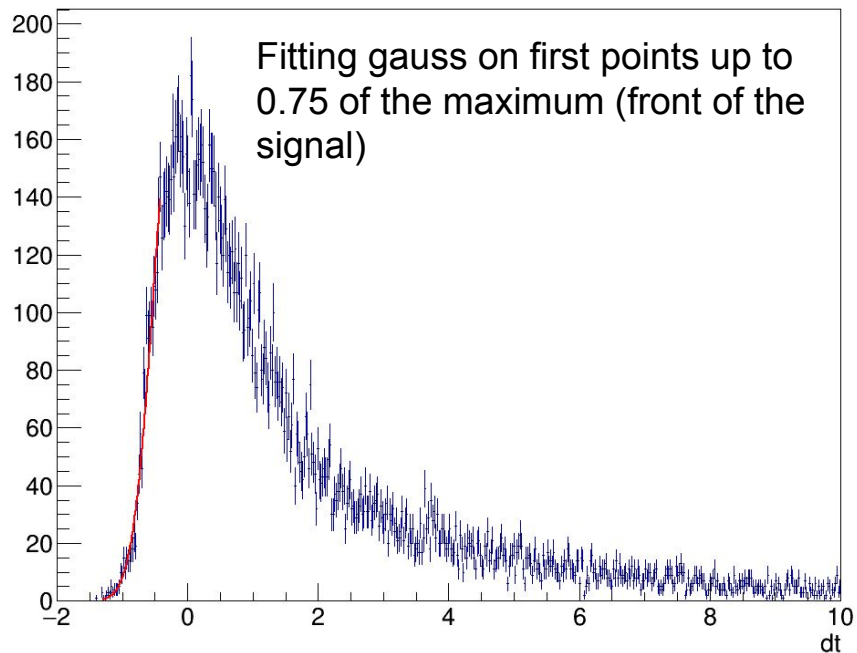


RUN8



In the previous run was easier to select fast particles

Calculating the correction for RPC tof vs tot



- Overall satisfactory result for tof vs tot dependence applying this fit technique
- Probably situation will be improved after matching with tracks and selecting only pion/high momenta proton

Summary

- Calibration of the TOF-400 detected data is ongoing
- The up-down correction was performed by M.Rumyantsev, reconstruction of Y-coordinate is performed correctly
- Effects of varying gain on BC2 during data collection were studied. No additional correction is required
- Correction of T0 time-amplitude dependence was performed
- Significant contribution from slow particles was observed in time-of-flight distribution comparing to the previous run data
- Attempts on calculating the time vs amp. correction were performed. We observe a satisfactory results, however matching is required.to refine the procedure.