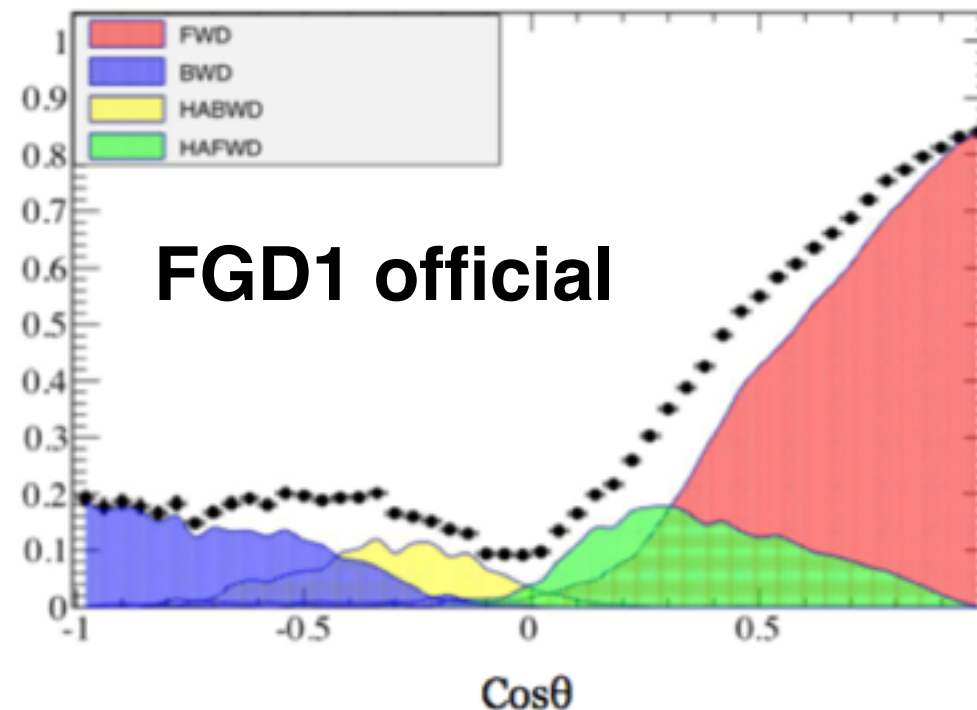


ToF MC Studies

Tatiana Oviannikova(INR), Davide Sgalaberna (University of Geneva)
“Neutrino Near Detectors based of gas TPCs” workshop, CERN
March 21 2017

Time of Flight

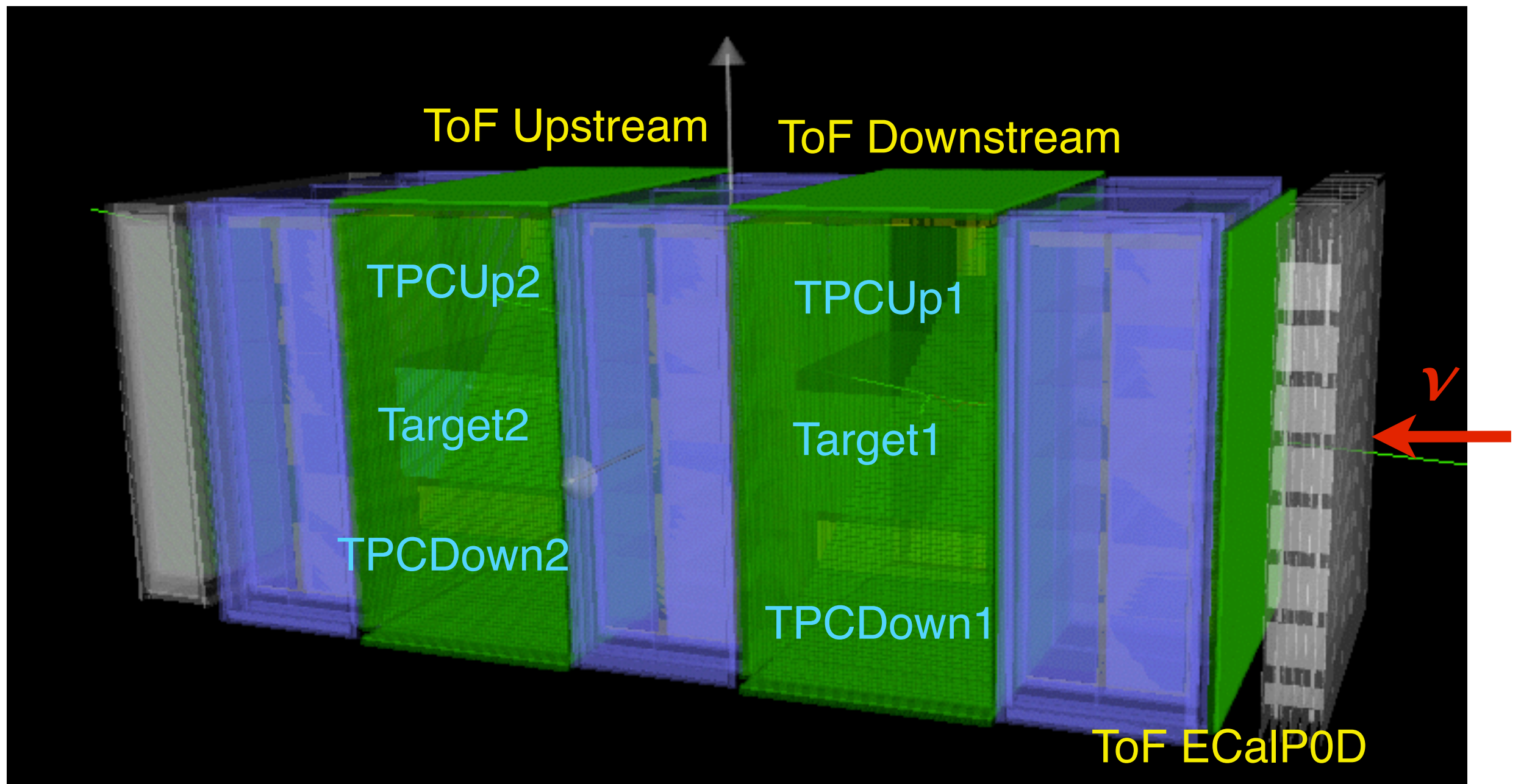
- Bad backward reconstruction at ND280



- ToF detectors will provide timing for most of the tracks and PID
- Flexibility in the framework to enable/disable the several ToF detectors, define the size, the # of plastic scintillator bars, the cross section of each bar, rotation, etc...
- Use the following scintillator bar dimensions:
 - 2 layers to measure XY
 - cross section: 25 (width) x 25 (height) mm²
- Scintillator bars simulated as rectangular bar with WLS fiber (same as ECal)

ToF in reference configuration

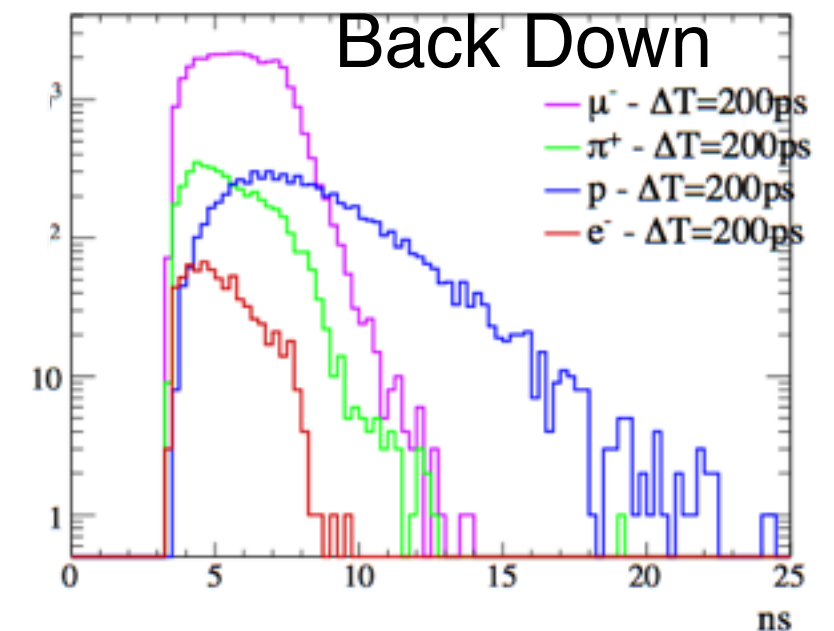
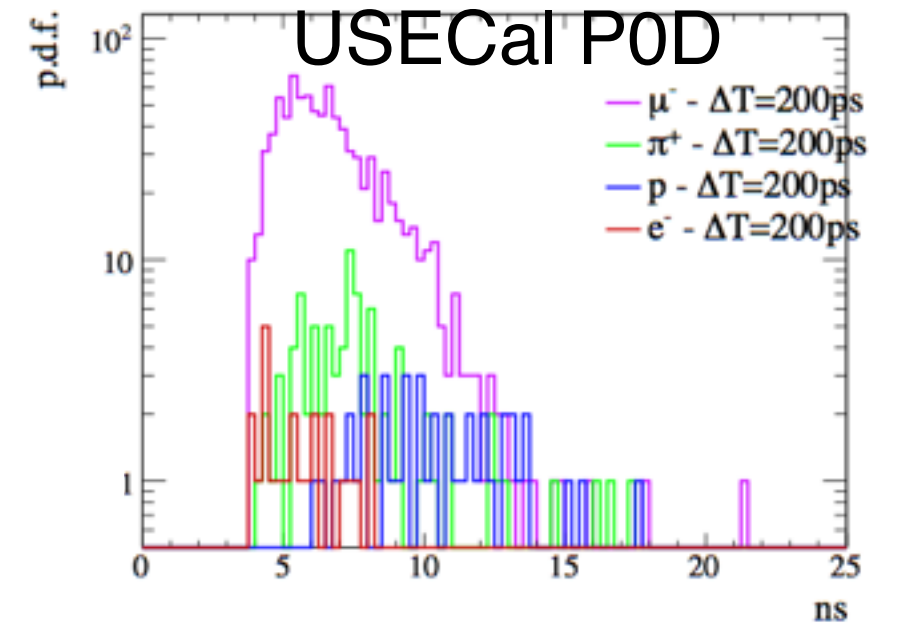
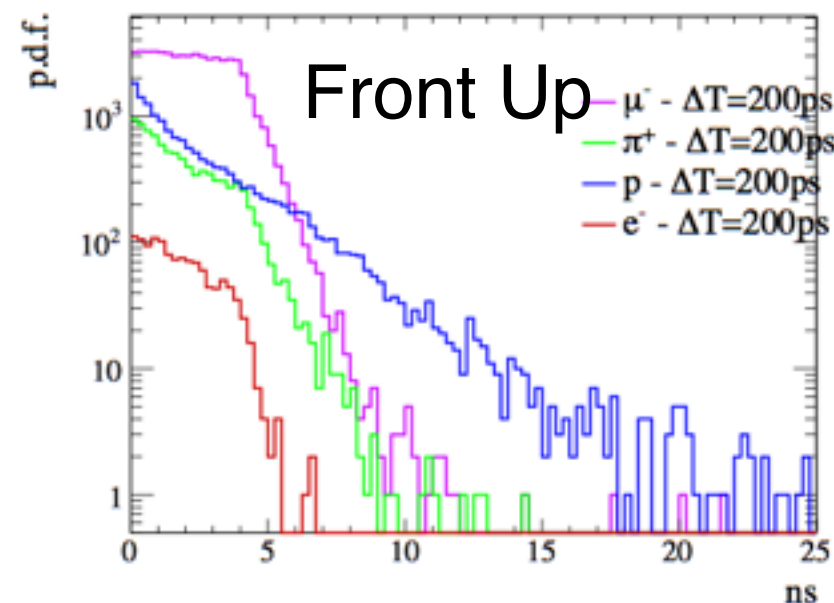
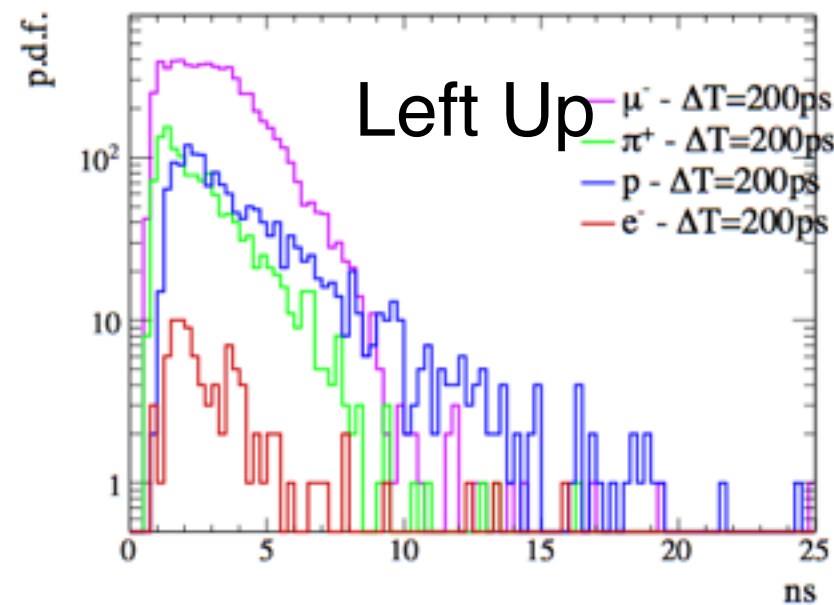
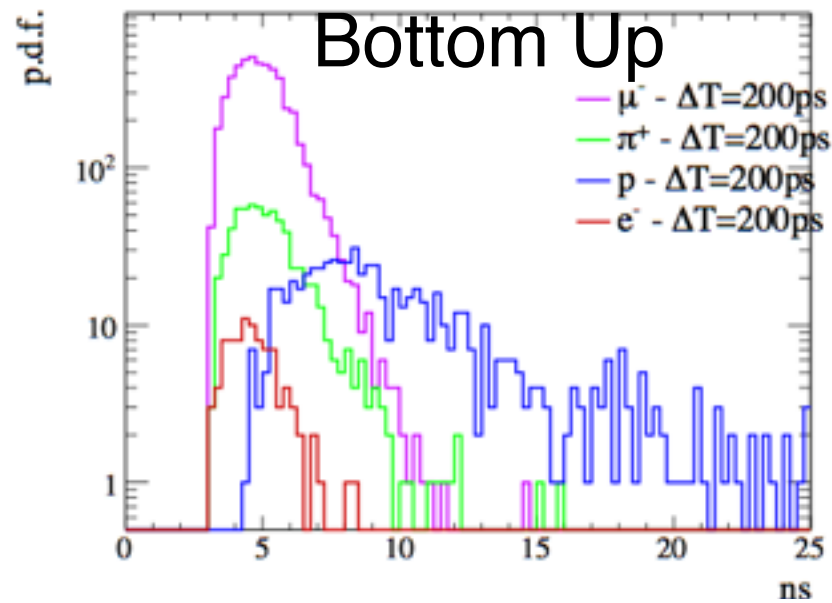
- ND280 upgrade reference configuration



- 6 ToFs around the tracker (Top, Bottom, Right, Left, Back, Front)
- 1 ToF next to ECal-P0D

Track time of flight

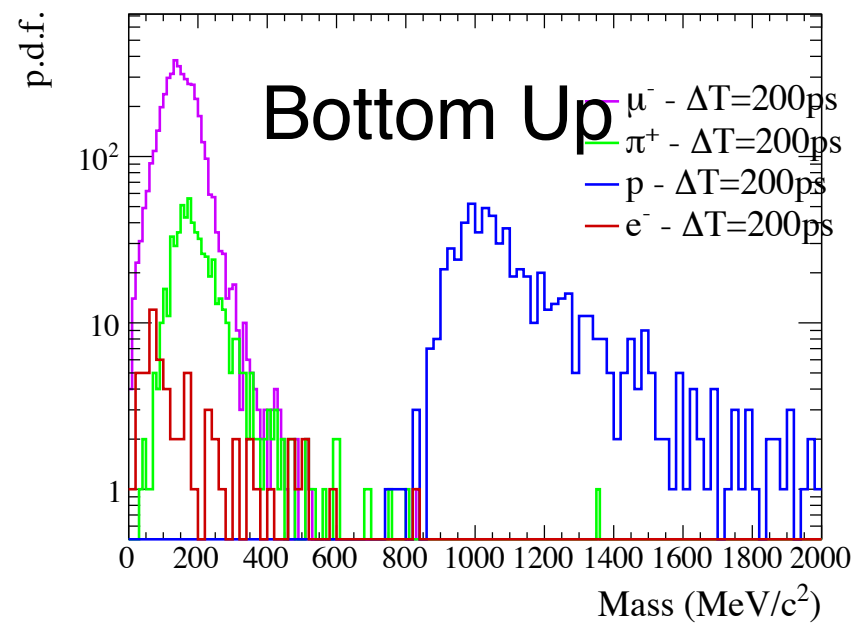
- Evaluate the track ToF to understand which time resolution is needed to reconstruct the tracks



- A quite good time resolution (a few hundred ps) should be enough to define the time of the tracks going into the TPCs

PID with ToF

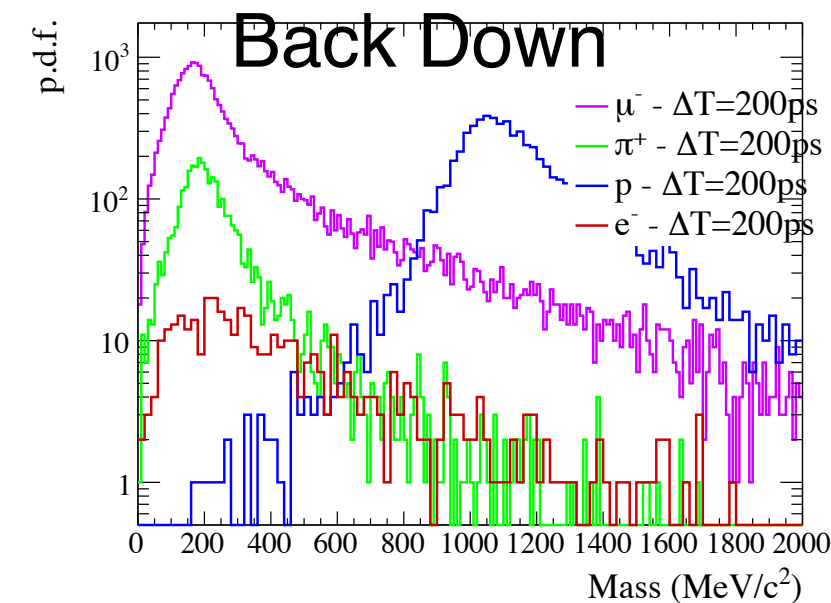
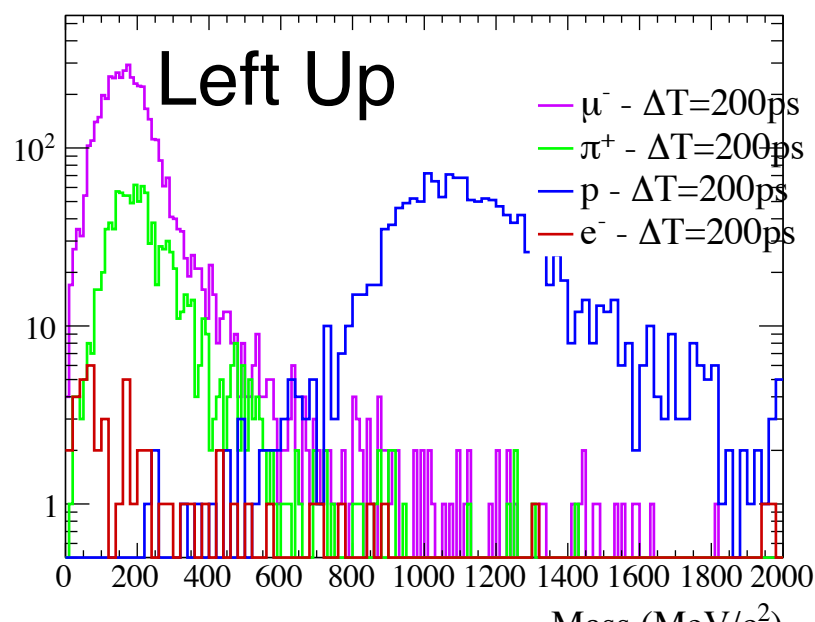
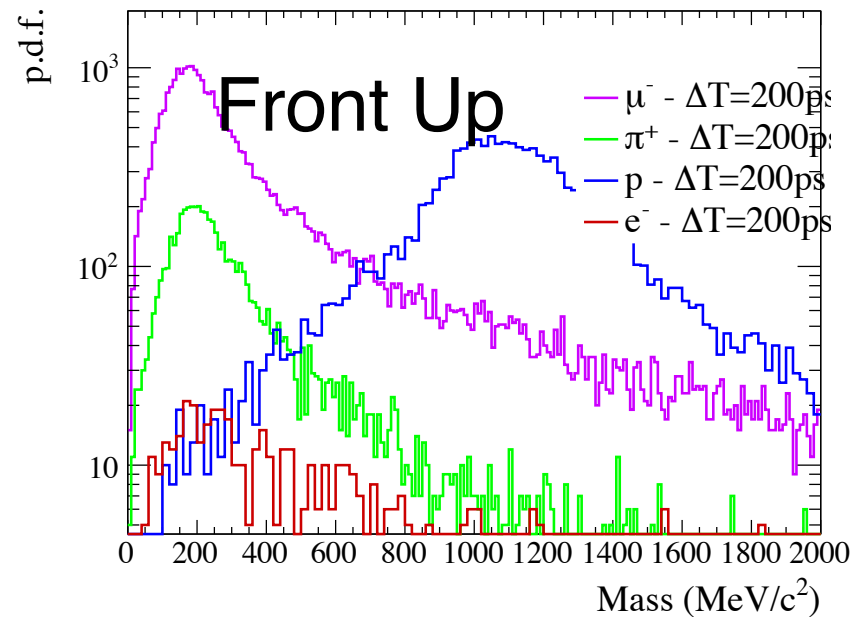
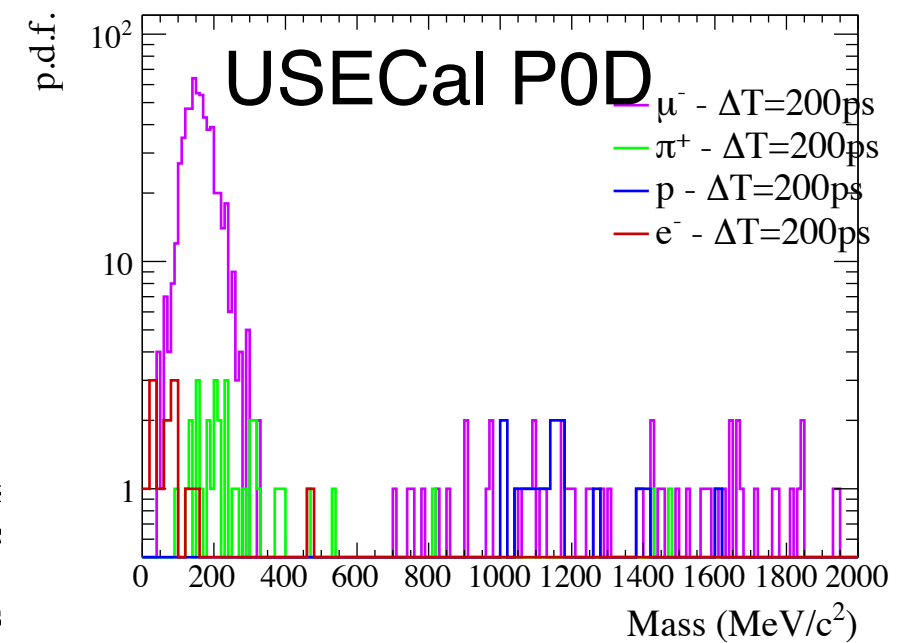
- Preliminary PID results. Mass defined as $m(\text{MeV}/c^2) = p \sqrt{\frac{c^2 t^2}{L^2} - 1}$
- Apply a gaussian smearing on track length, time and momentum
- Muons, pions and protons generated from numu beam interactions w/ 10^{21} POT
- Electrons generated from nue beam interactions w/ 10^{21} POT



$$\delta_p = 10\%$$

$$\sigma_t = 200\text{ps}$$

$$\sigma_L = 1\text{cm}$$

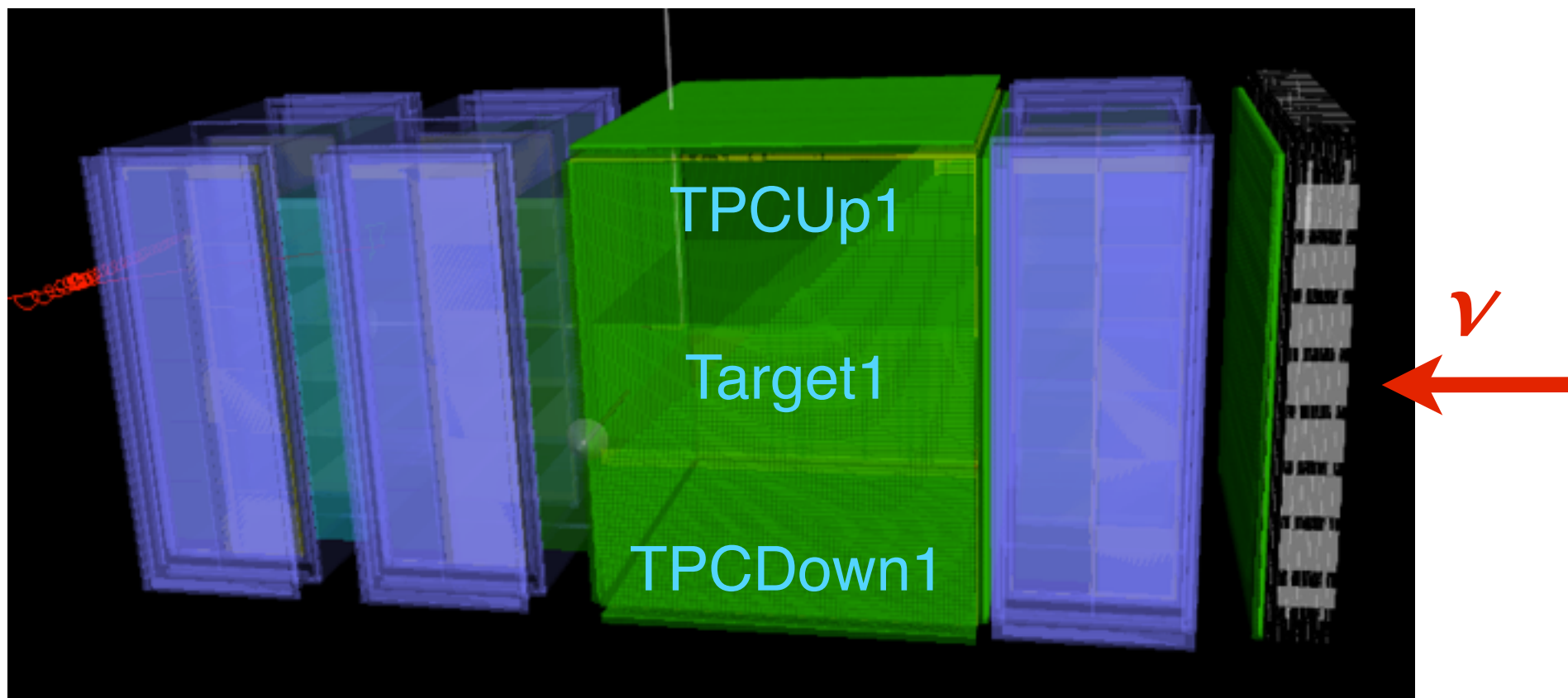
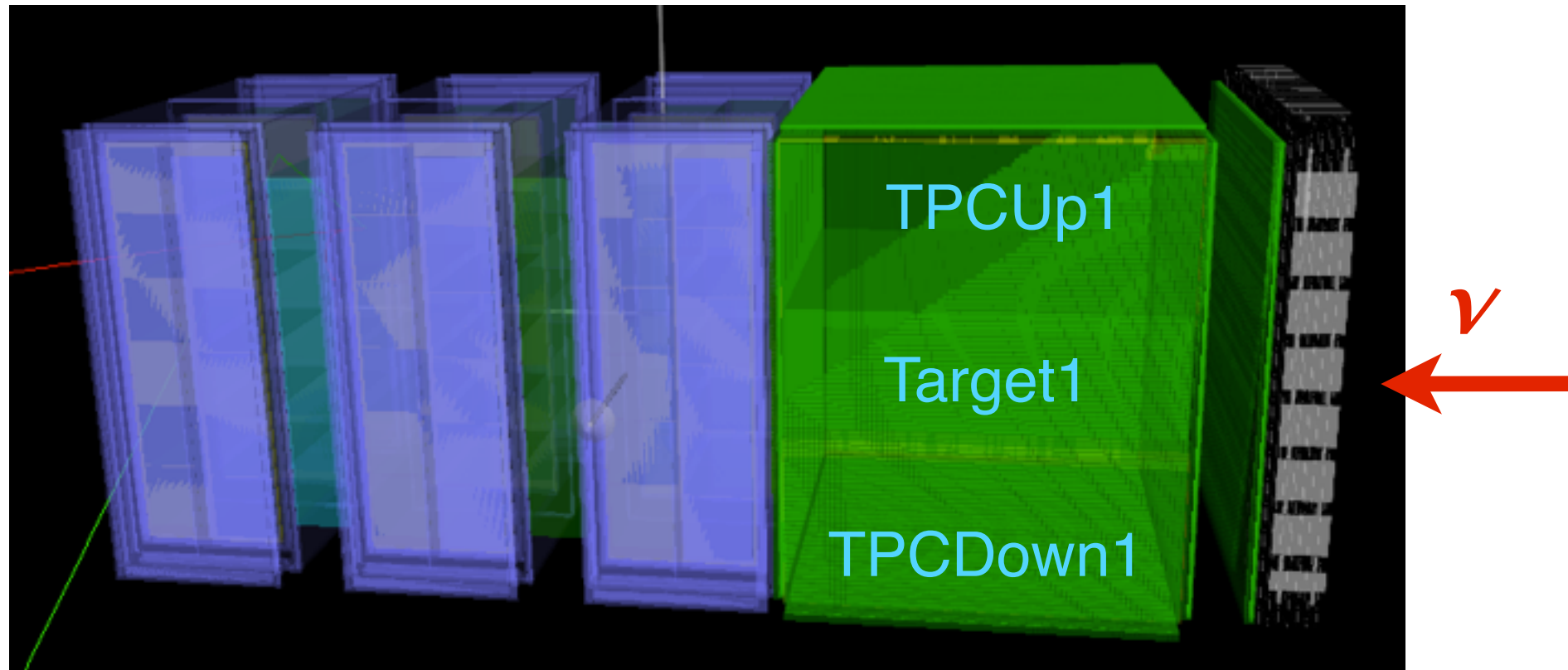


Conclusions

- The first studies of ToF was done
- Few ps resolution should be enough to define tracks going to TPCs
- Separation between positrons and protons
- To do:
 - OOFV studies

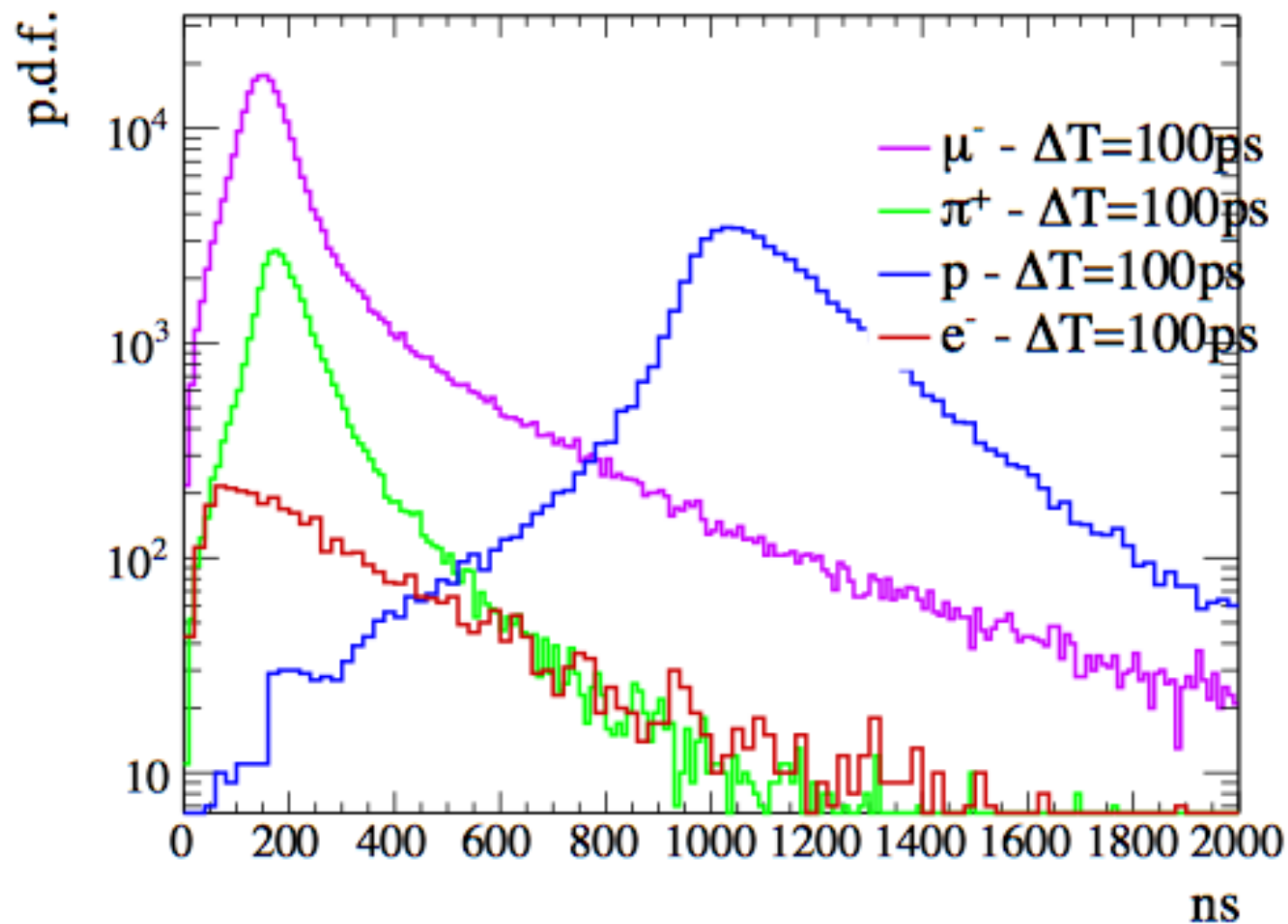
BACKUP

ToF in Alternative configurations



Track time of flight

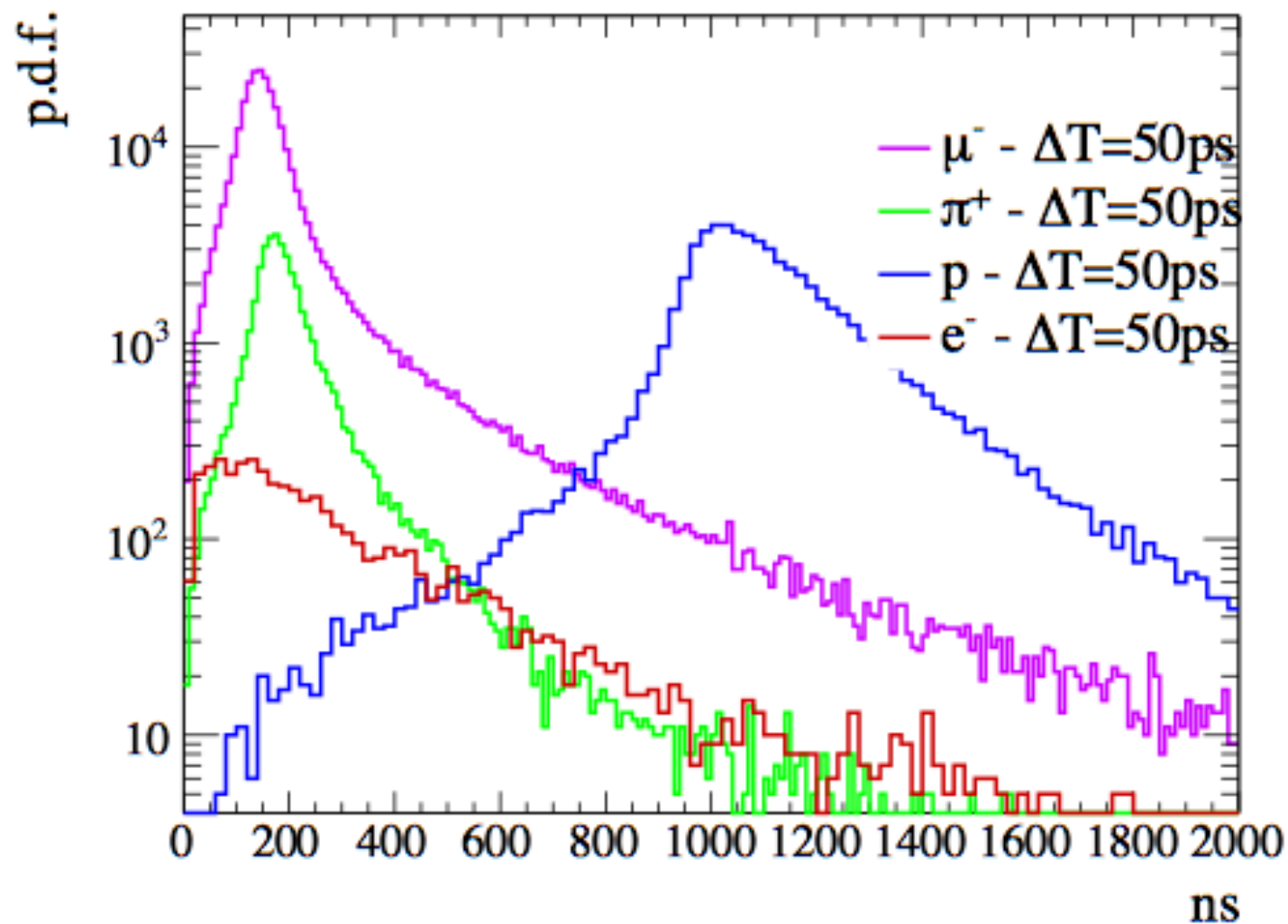
- Evaluate the track ToF to understand which time resolution is needed to reconstruct the tracks



- A quite good time resolution (a few hundred ps) should be enough to define the time of the tracks going into the TPCs

Track time of flight

- Evaluate the track ToF to understand which time resolution is needed to reconstruct the tracks



- A quite good time resolution (a few hundred ps) should be enough to define the time of the tracks going into the TPCs