

# Beamline studies

CM48

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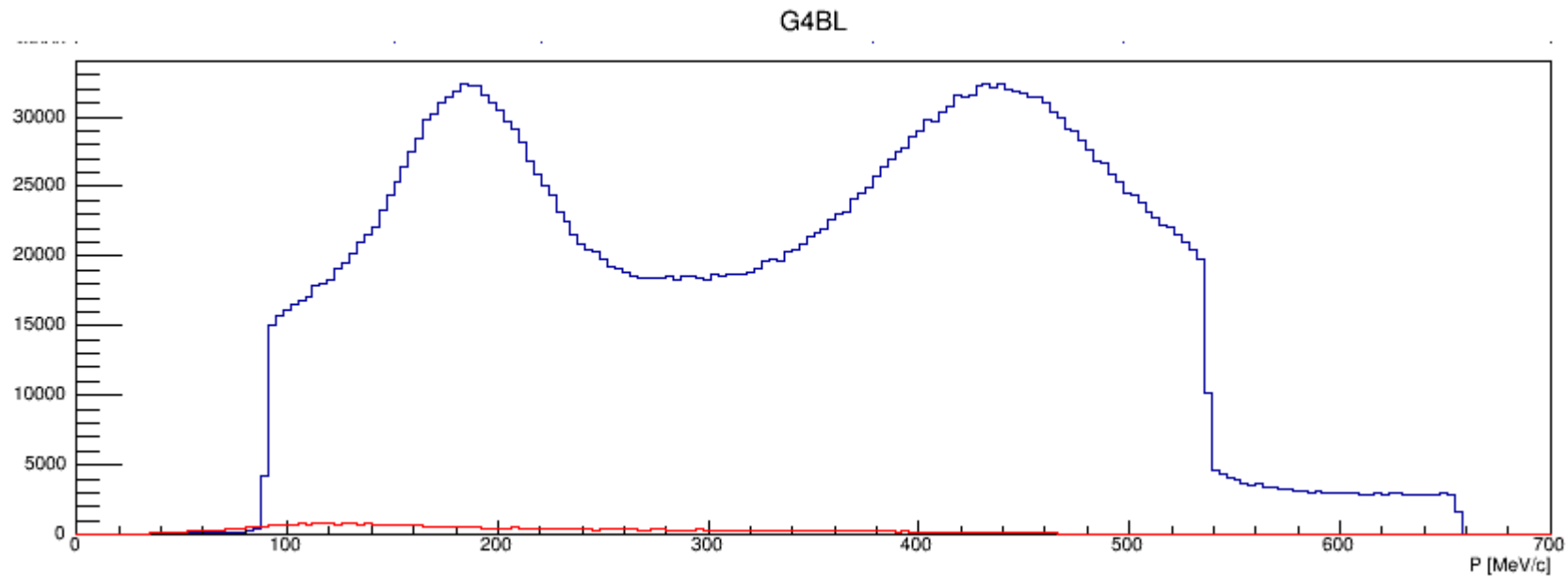
# Introduction

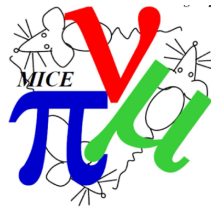
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- In the current G4BL+MAUS simulation there are few basic issues
  - Pions and muons yields in the time of flight
  - Pions and muons peak positions
- The absence of positrons was a bug, now fixed
- Positrons peak position

# Current G4BL target

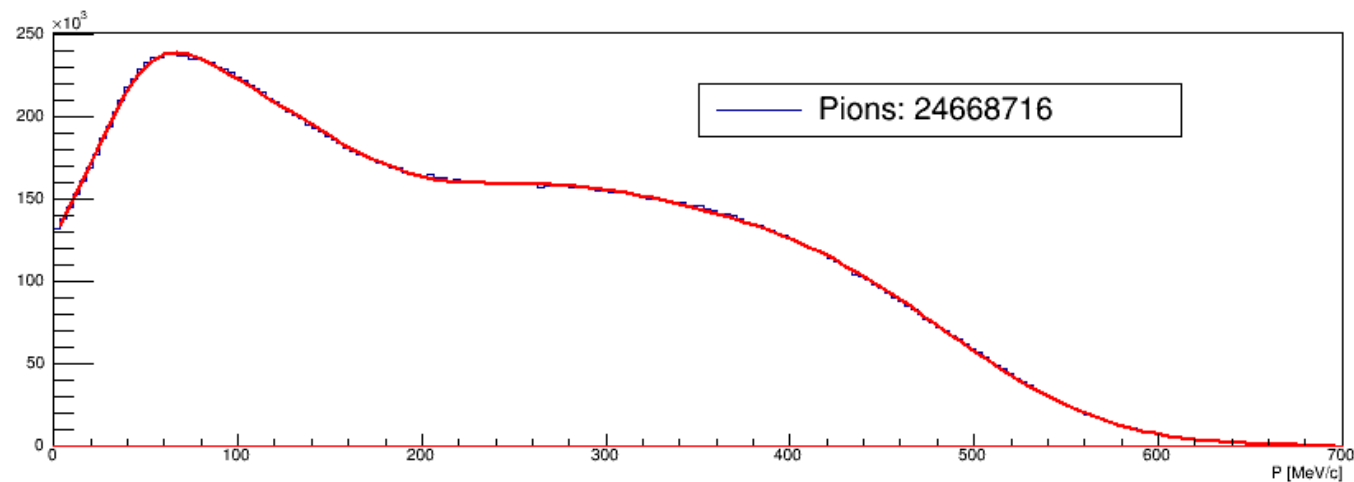
- Simulation used from 2007
- 4 gaussians are used to generate the pions from the target (together with a fraction of muons and positrons)



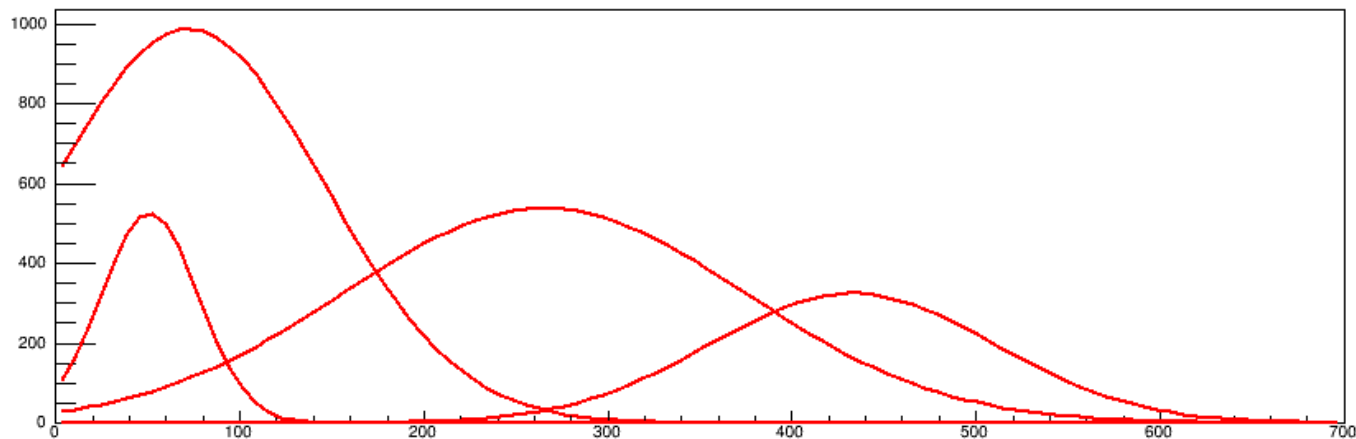


# Ao's target simulation

- Simulation done by Ao few months ago using MARS



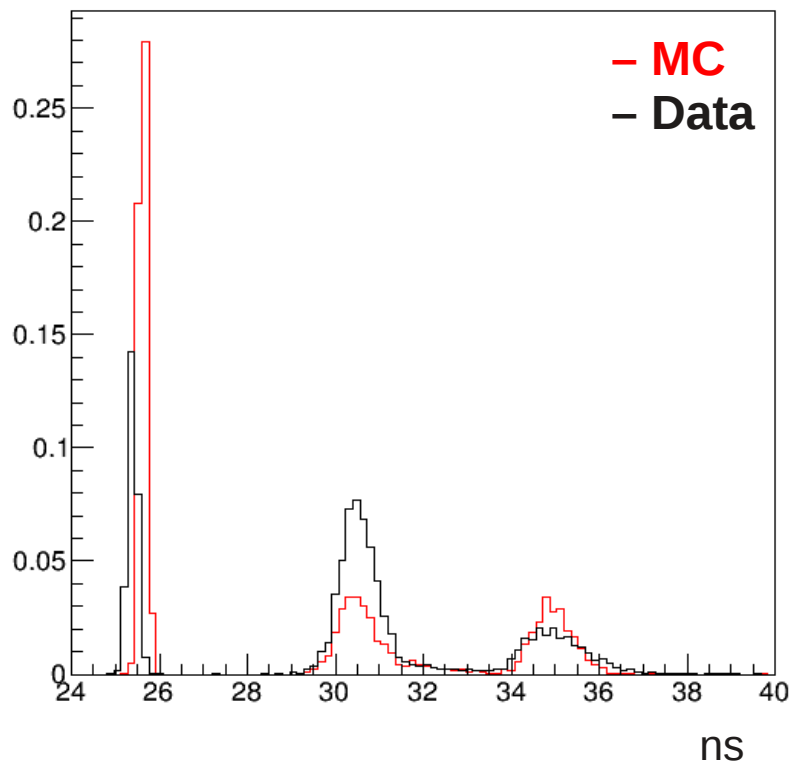
$$\frac{1}{\sqrt{2\pi}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)$$



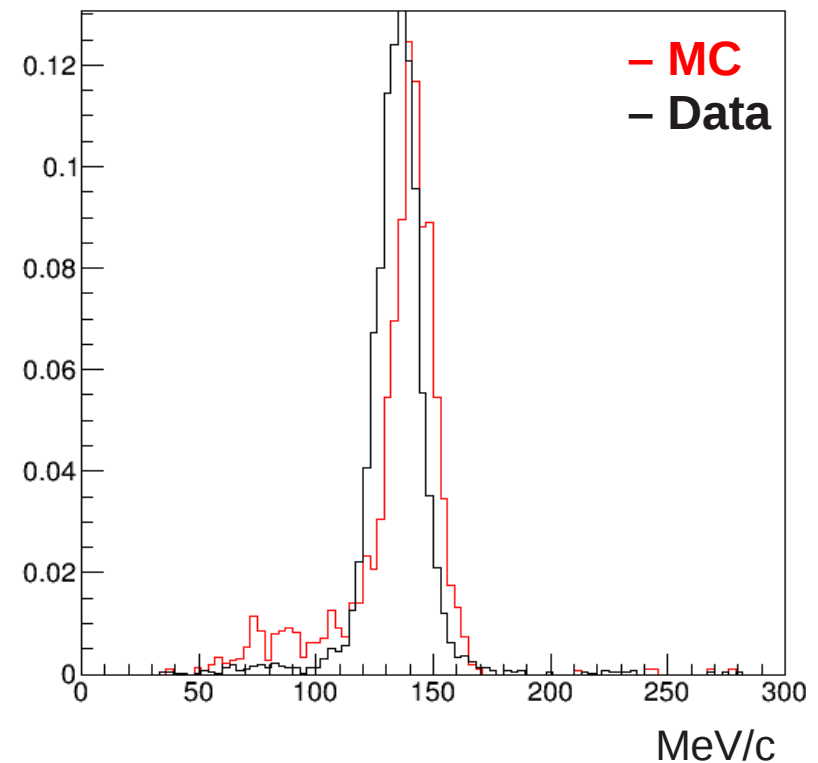
# Ao's target simulation

- Electron yield comes mostly from the primaries
- Pion/muon yield still incorrect
- Peaks position adjusted with the dipole currents

Delta t TOF0-TOF1



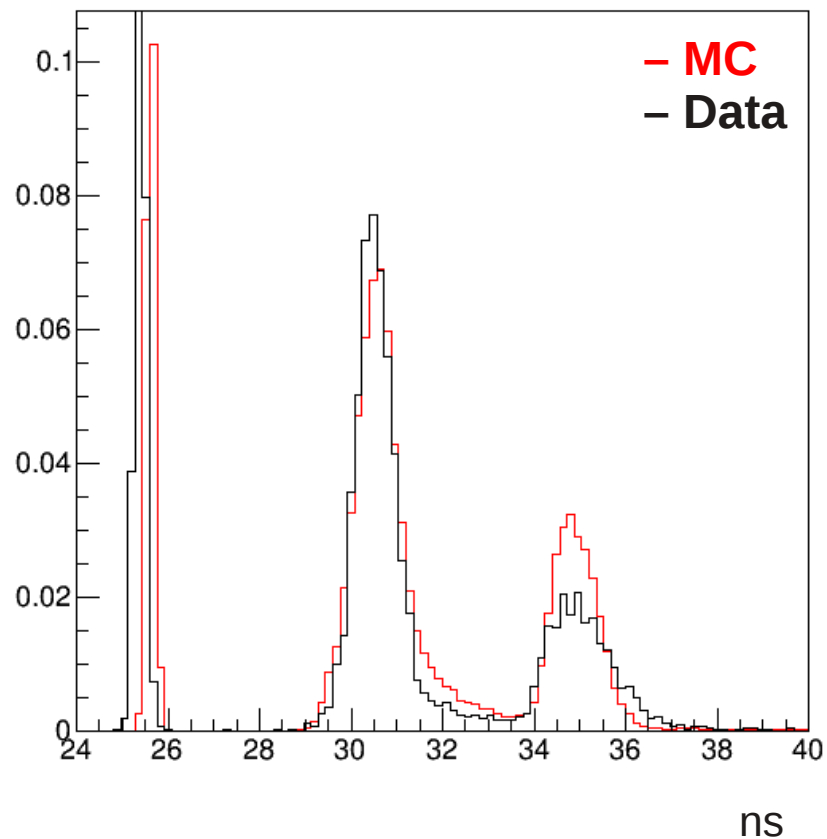
Muons at TKU-Station 5 - Pz



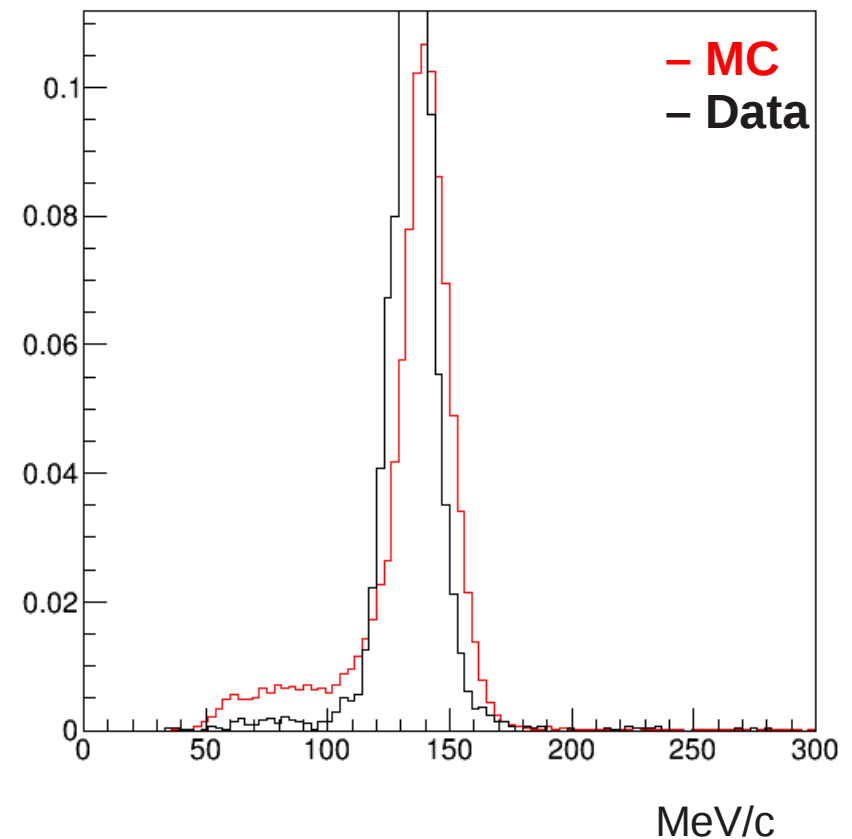
# Custom target definition

- 3-140 MeV/c

Delta t TOF0-TOF1



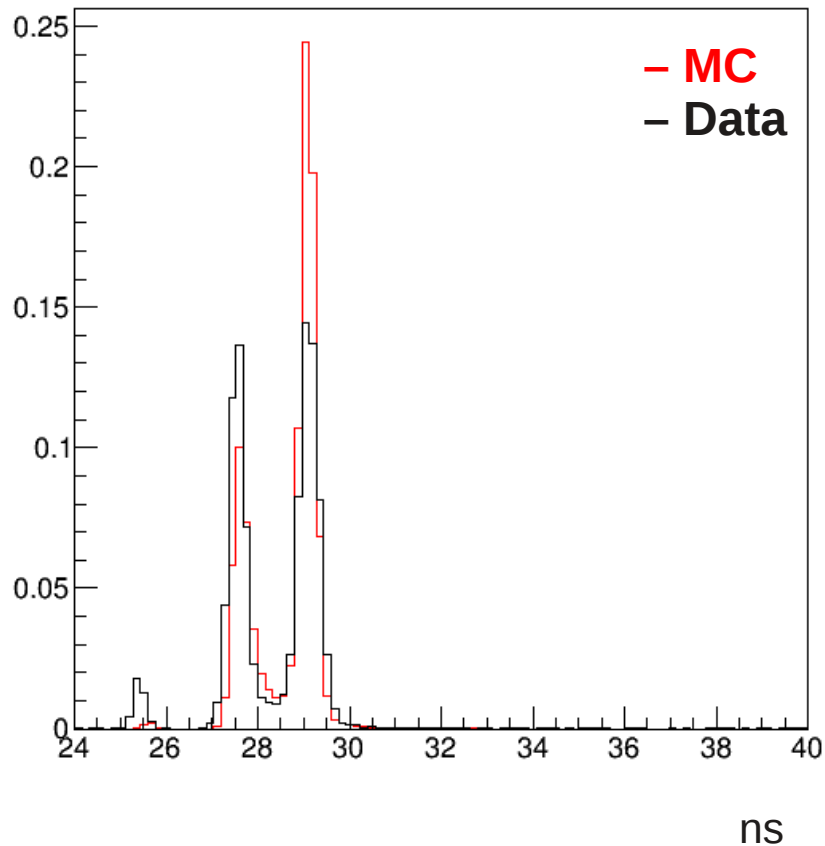
Muons at TKU-Station 5 - Pz



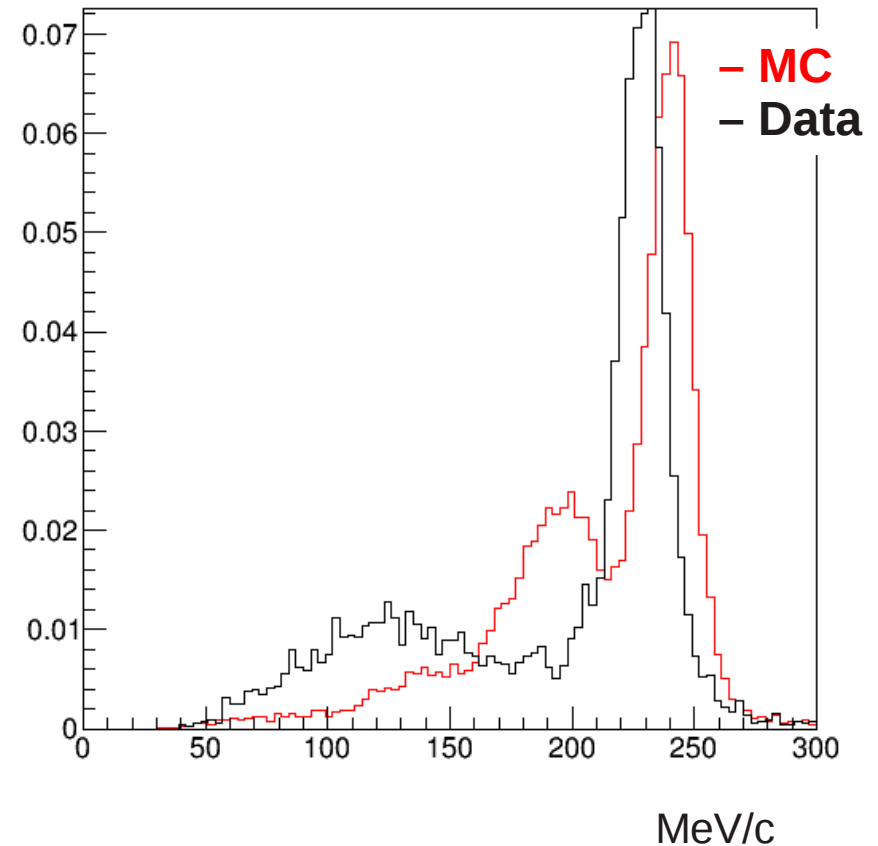
# Custom target definition

- 3-240 MeV/c generated using the 3-140 MeV/c target model

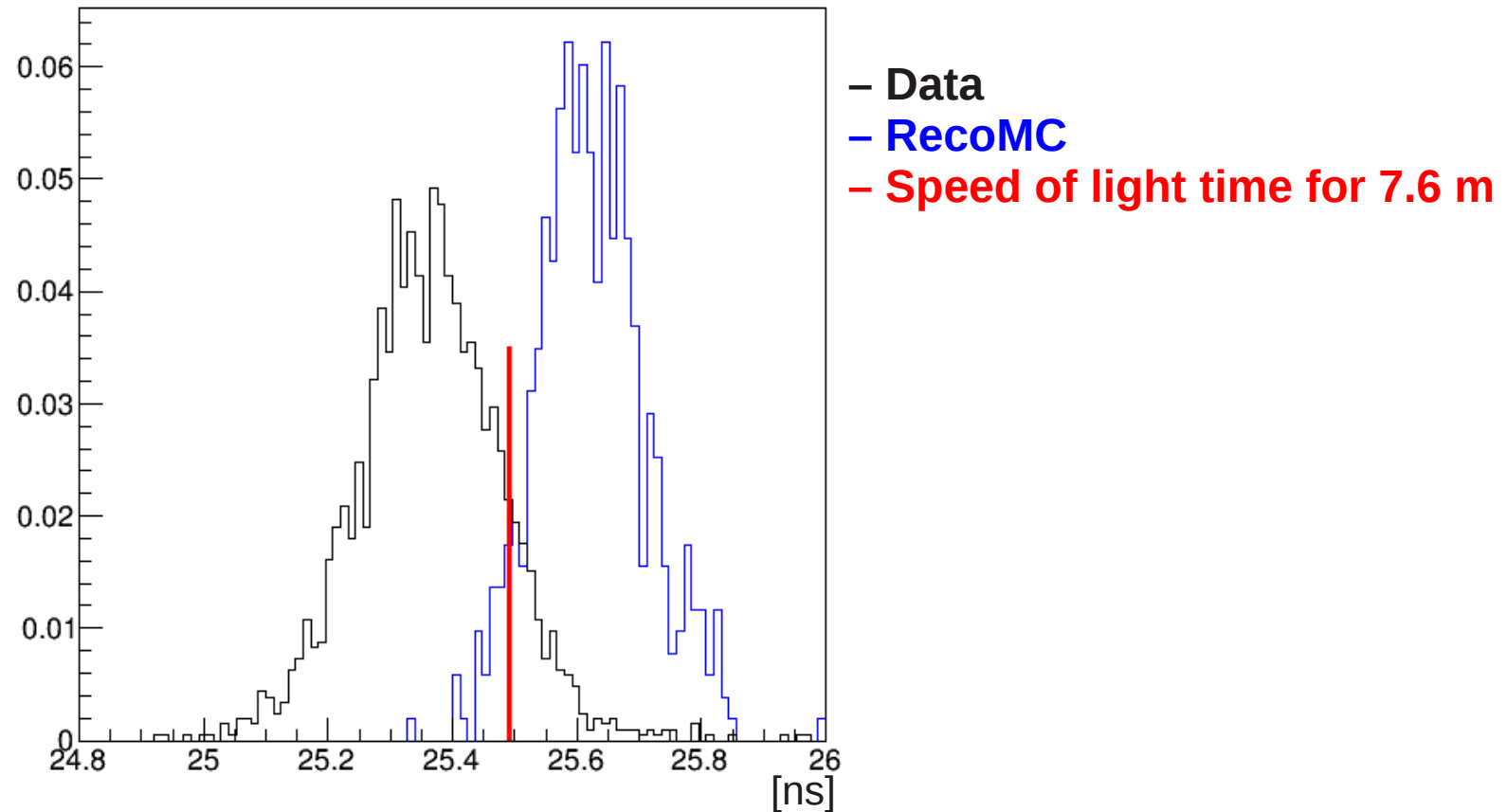
Delta t TOF0-TOF1



Muons at TKU-Station 5 - Pz



# Positrons peak

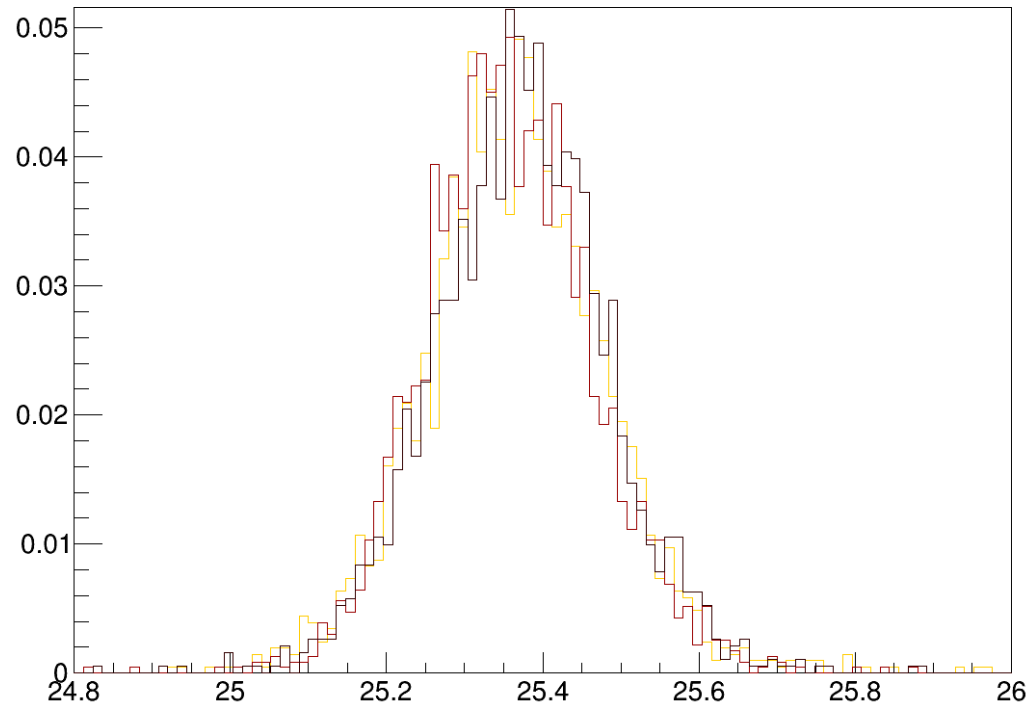


- Distance used in MC: **7642.32 mm**: discrepancy  $\sim 3.3$  cm ( $\sim$  slabs width?)
- Discrepancy between **MC** and **data** peaks: 0.25 ns  $\rightarrow$  7.5 cm



# Positrons peak

Delta t TOF0-TOF1 positrons

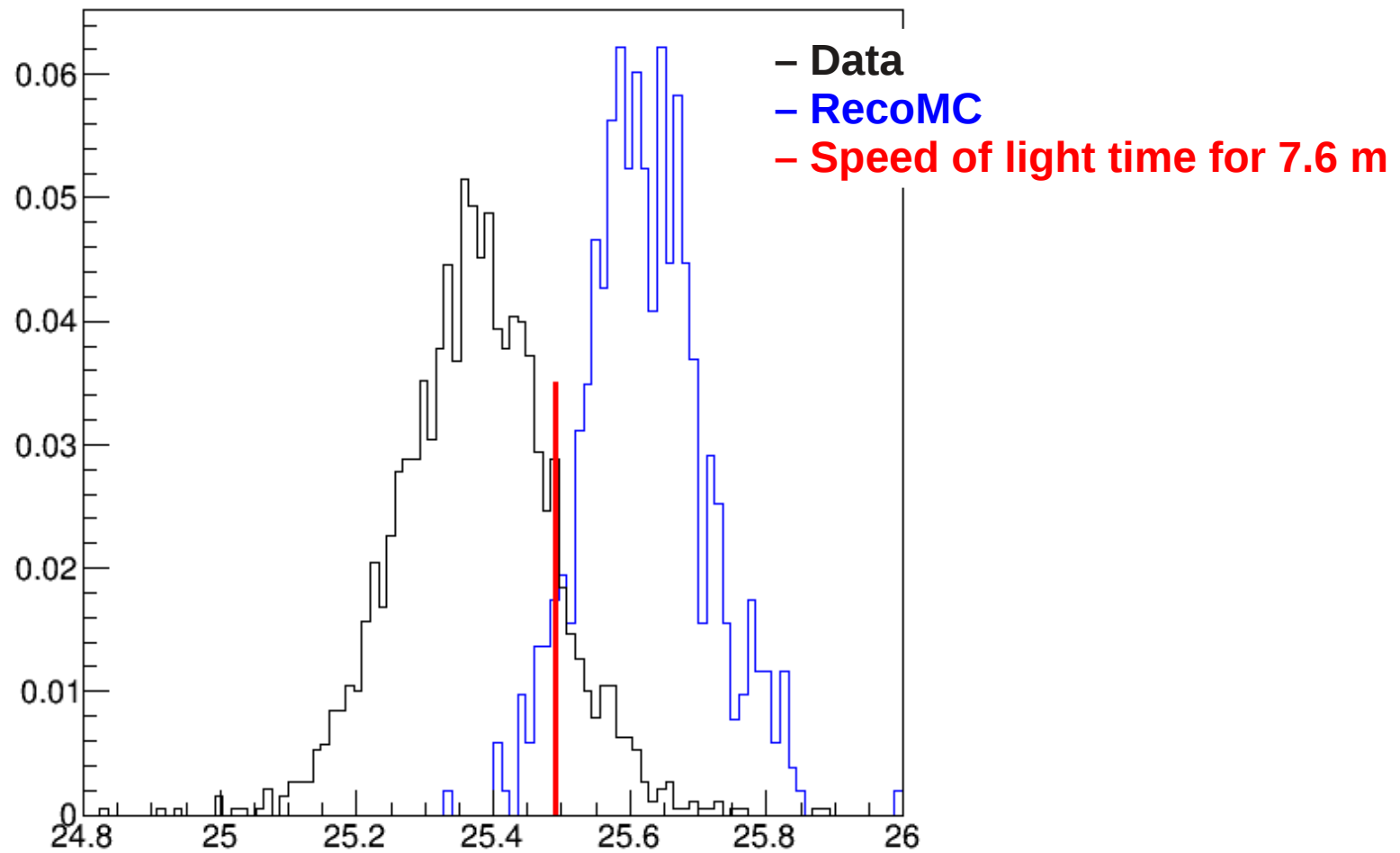


		run	Mean [ns]	distance [mm]
Q7/8/9	no field	9299	25.3636	7609.08
	half field	9300	25.3579	7607.37
	full field	9301	25.3712	7611.36

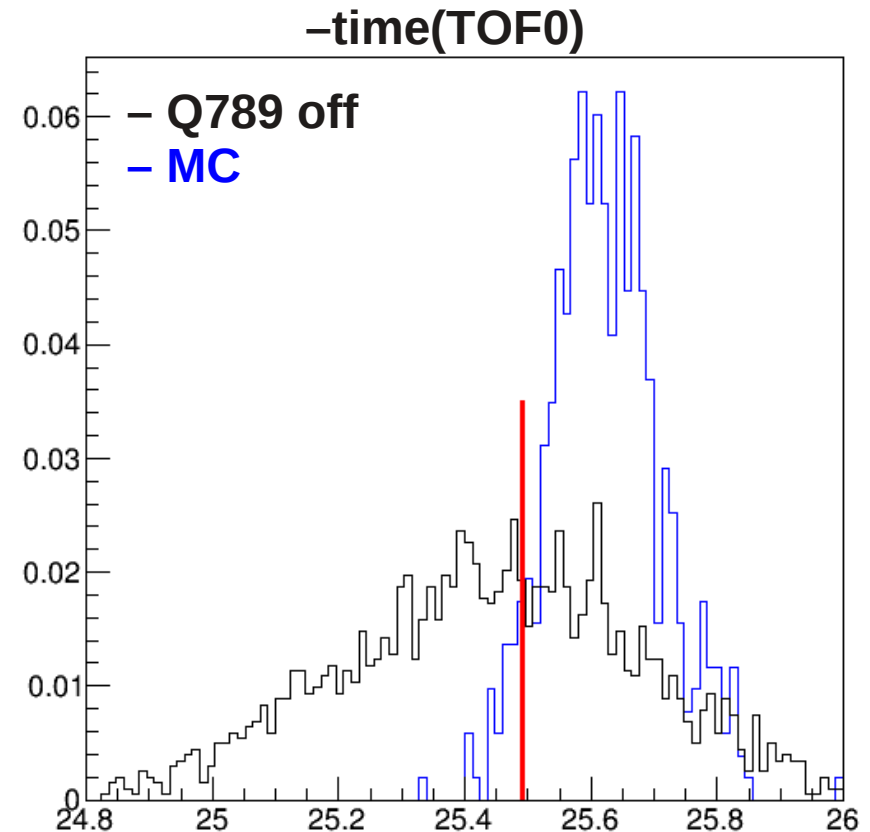
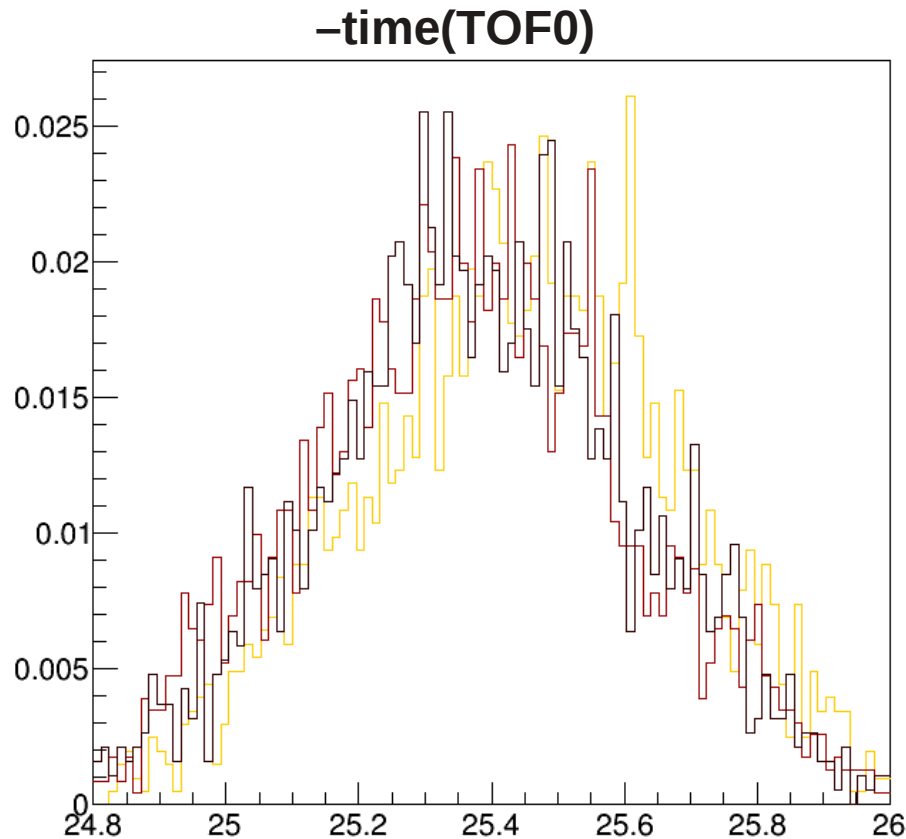
- Not any sensible effect from the path length

# Same for Q789 off

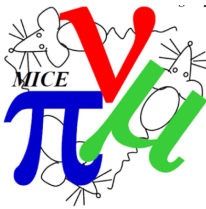
Delta t TOF0-TOF1 positrons



# Plotting only $-tof0$ time



- **Q789 off** has mean at the speed of light time (right plot)
- **Q789 on** (and the **half field**) are still left shifted (left plot)



# Conclusion

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- MC can be adjusted for every beam setting
- Define a target simulation good enough for all the settings
- Dig into the TOF calibration to understand the positron peak discrepancy