# MCS in $LH_2$, Field-off

## Content

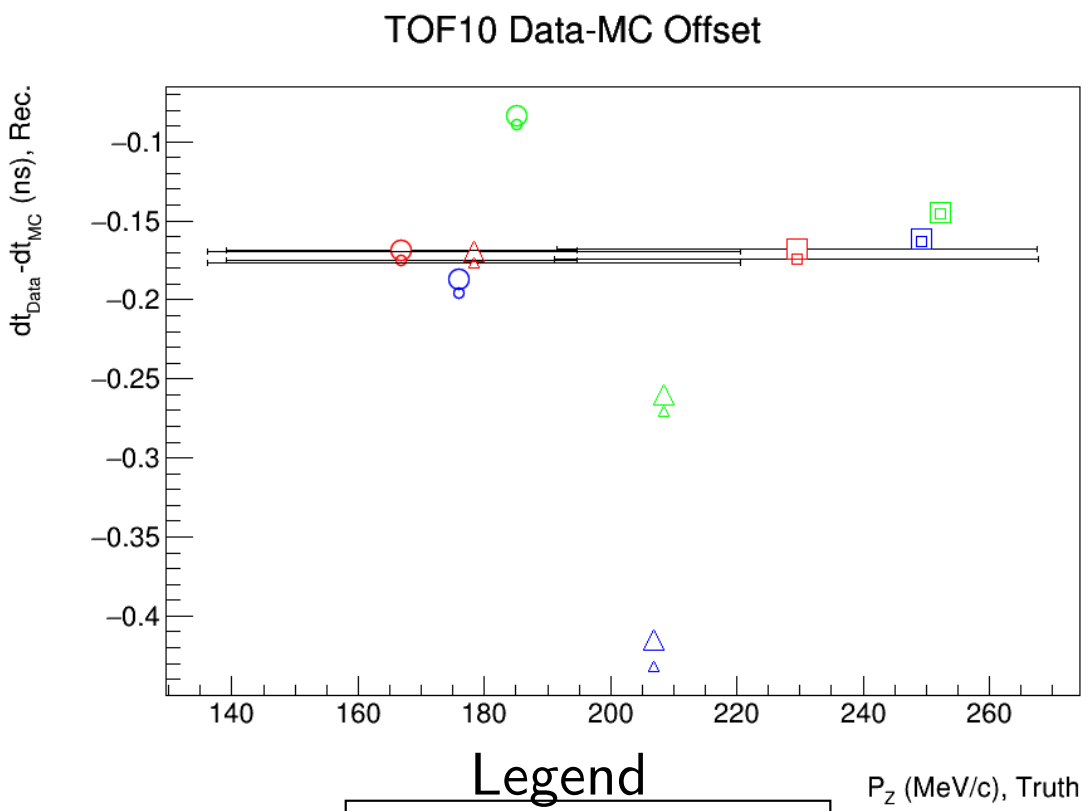
- Assessing beam momentum in Data/MC

# TOF10 in Data/MC

TOF offset between Data/MC can be explained by:

- Different beam momenta
- A combination of $\Delta L$ and $\Delta t$, a beam path and systematic TOF residual between Data/MC

The $\Delta L$ and $\Delta t$ has been previously assessed. Now pion and muon peak momenta are calculated by their inter-peak distance in TOF, independently of $\Delta L$ and $\Delta t$.



# TOF10 in Data/MC

The below method is used:

**[1]** $dt^i_{TOF10} = \frac{L}{v^i} + \Delta t$

with $i = e, \pi, \mu$

**[2]** $R = \frac{dt^{\mu} - e}{dt^{\pi} - e} = \frac{(c - v^{\mu})v^{\pi}}{(c - v^{\pi})v^{\mu}} = \frac{(1-\beta^{\mu})\beta^{\pi}}{(1-\beta^{\pi})\beta^{\mu}}$

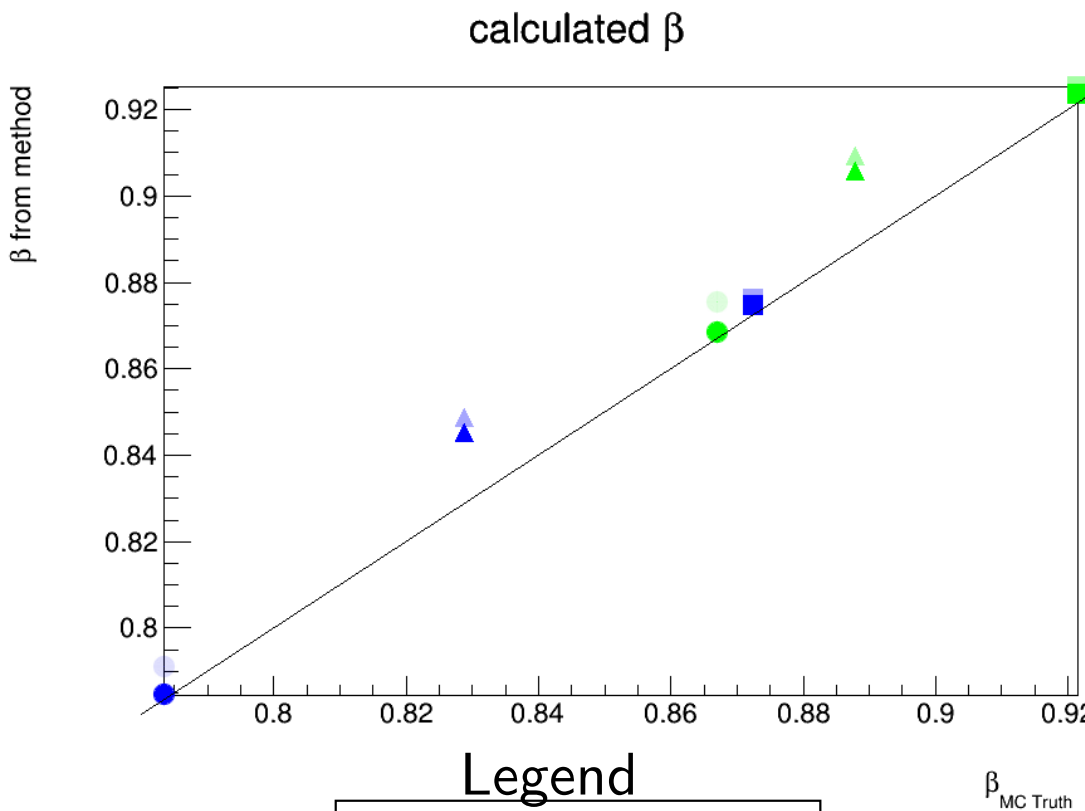
**[3]** $\beta^{\mu} = \frac{(R-M)}{M(M-R)}$

**[4]** $\beta^{\pi} = \frac{(M-R)}{1-R}$

with $M = \frac{\beta^{\pi}}{\beta^{\mu}}$

Time-of-flight is assumed to be in the form of **[1]**.

Calculating **[2]** eliminates $\Delta L$, $\Delta t$. The ratio M is taken for MC truth.



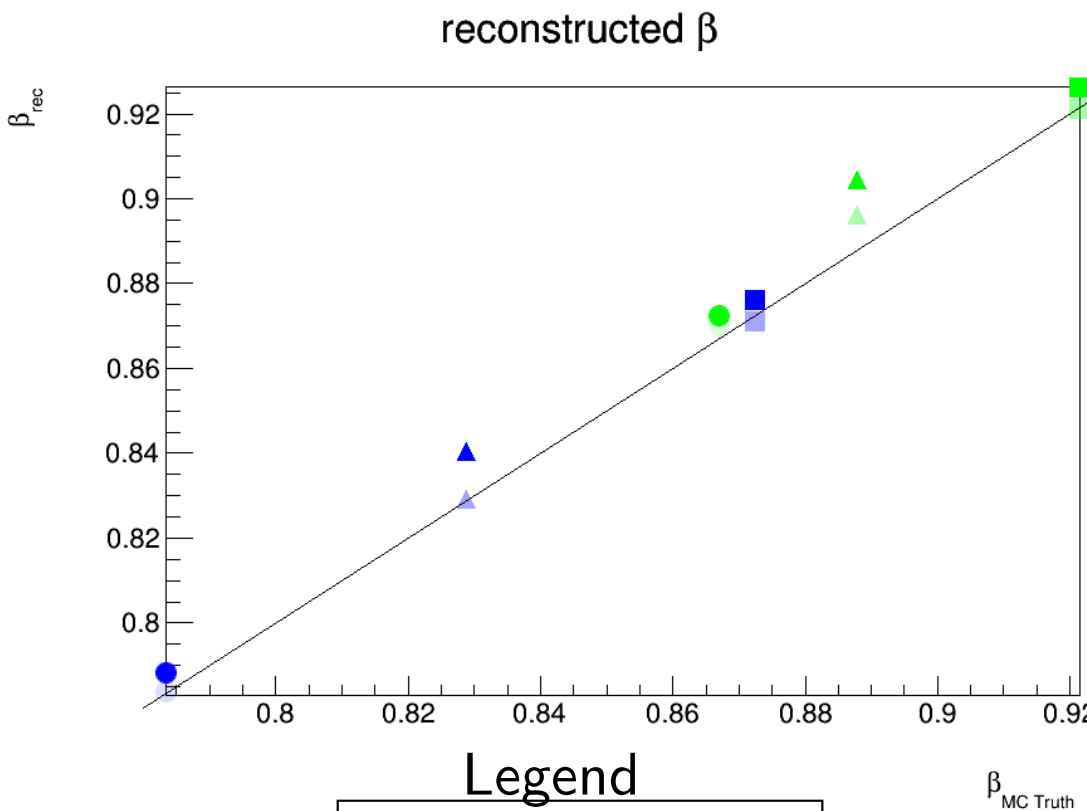
# TOF10 in Data/MC

$\beta_{Rec} = dt_c/dt_i$

with $dt_c = \frac{7.642}{c} 10^9$, $dt_i$ peak TOF of $i = \pi, \mu$

$$\beta_{Truth} = \frac{P_{zTruth}}{\sqrt{m^2 + P^2_{zTruth}}}$$

The raw TOF is distributions are used to get the time-of-flight of particle species.



# TOF10 in Data/MC

The ratio $M = \frac{beta_\pi}{beta_\mu}$ is plotted