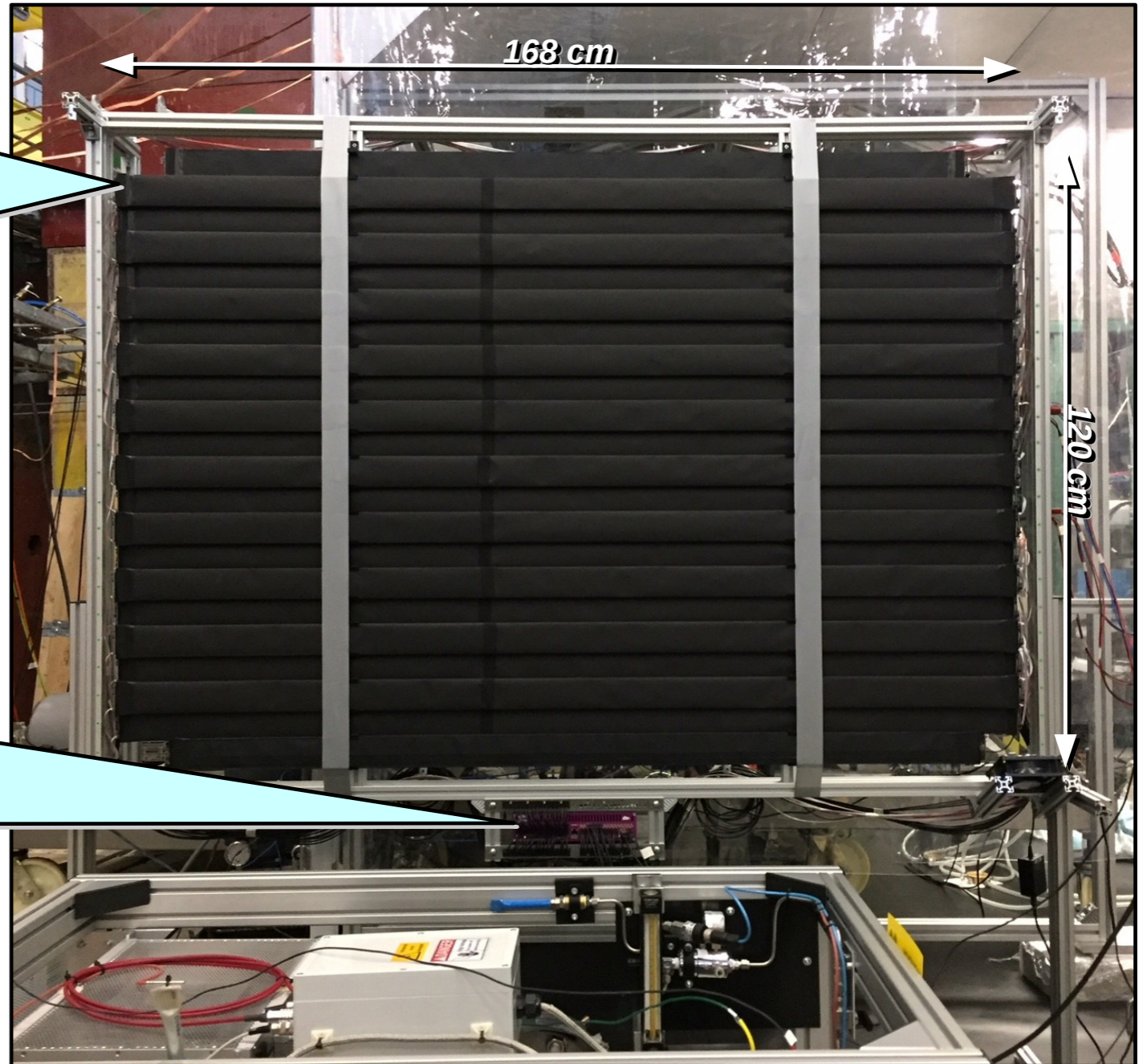
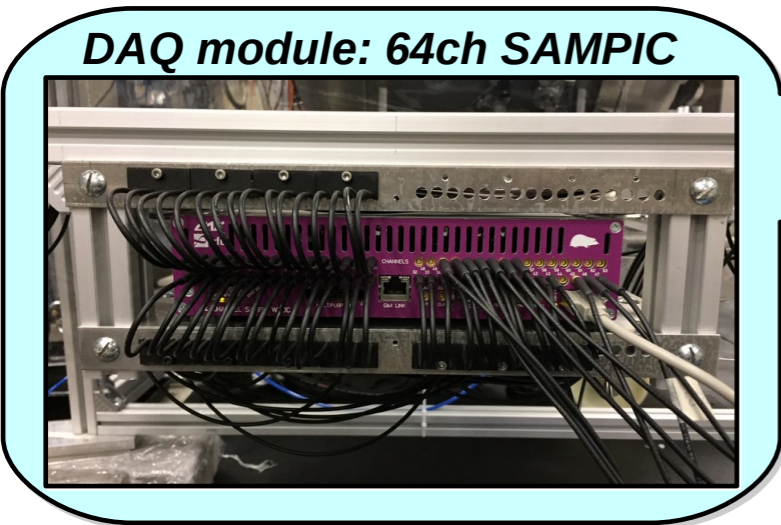
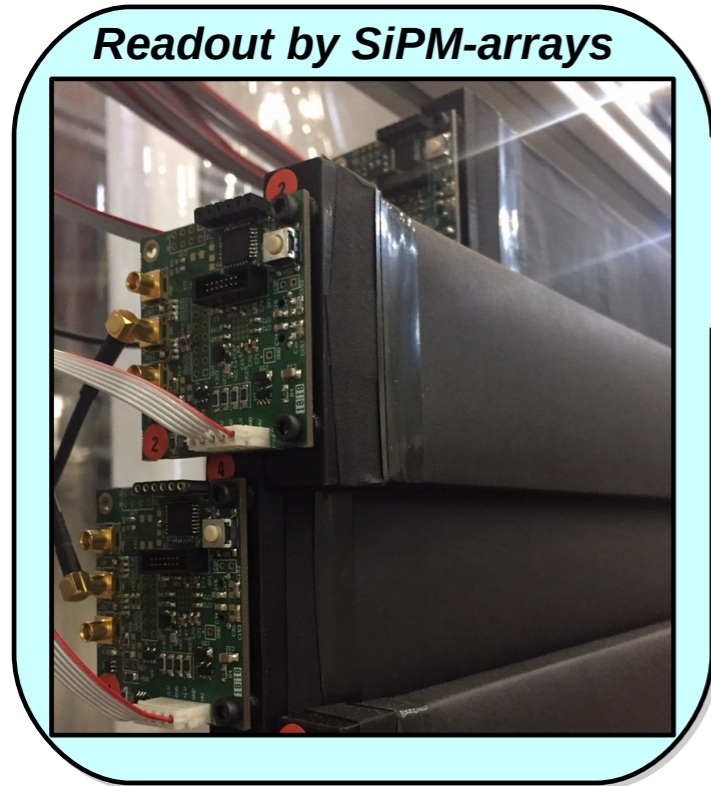


**Status of uToF analysis:
time-walk corrections
(time vs amplitude)**

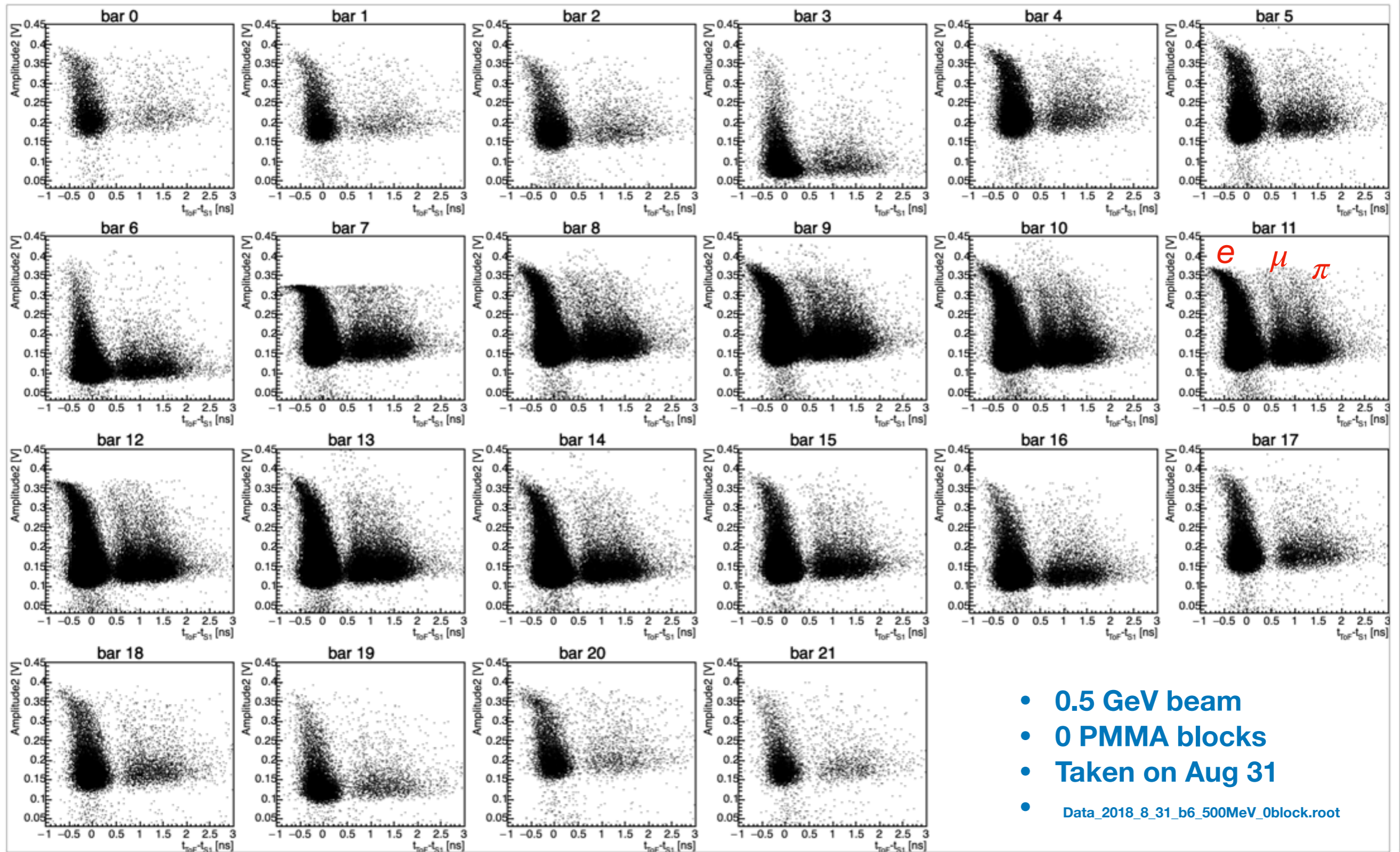
Alexander Korzenev, Uni Geneva

HPTPC analysis and soft meeting
Feb 1, 2019

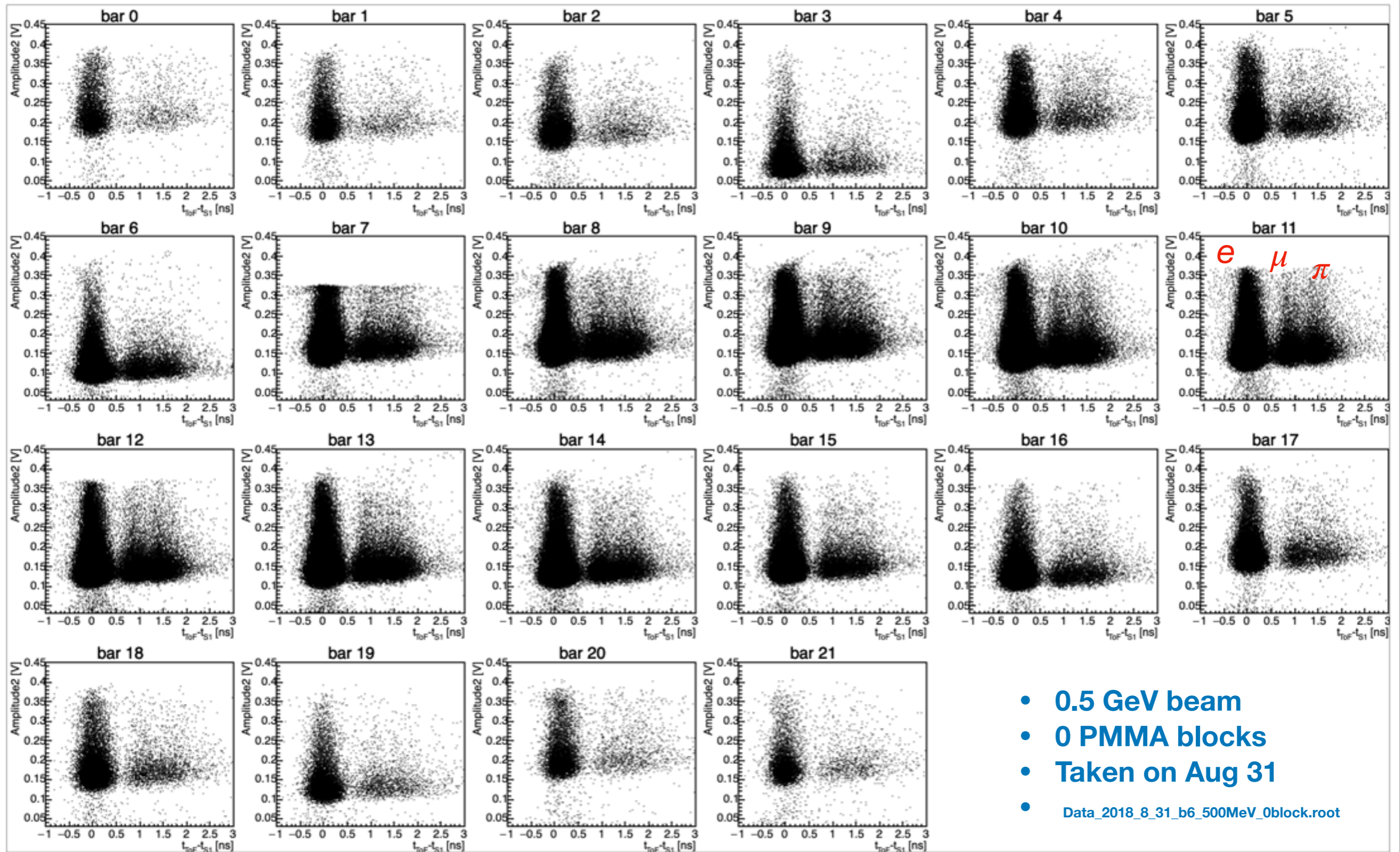
Upstream ToF setup



“Amplitude vs Time” before walk corrections

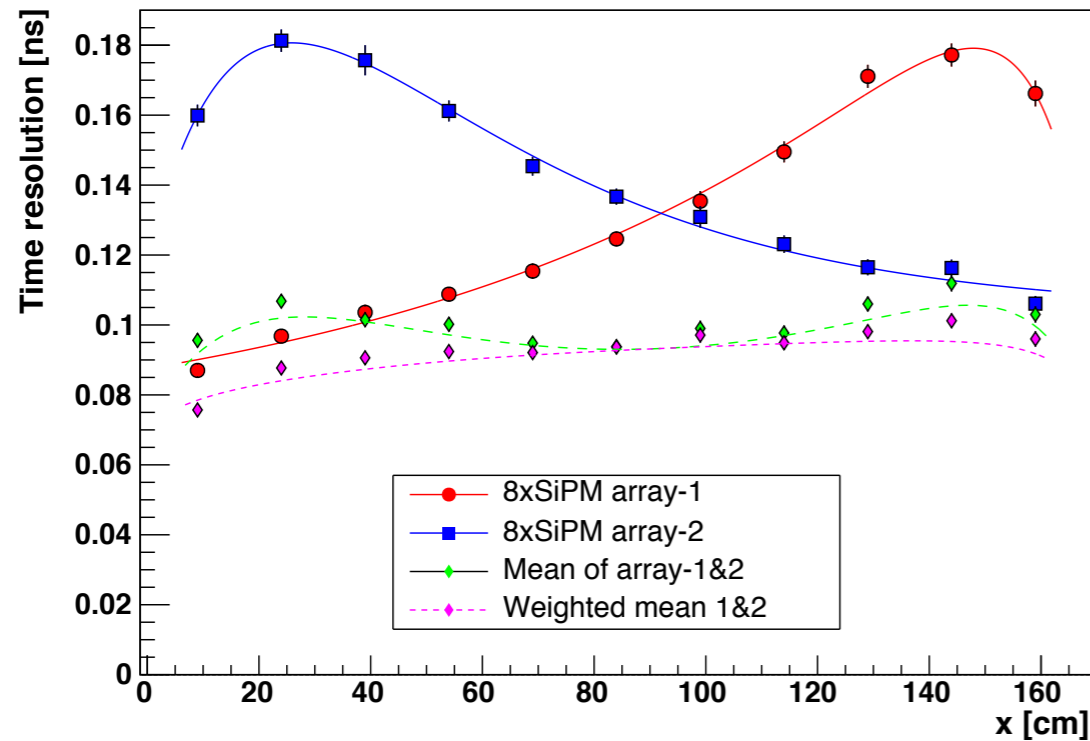


“Amplitude vs Time” after walk corrections



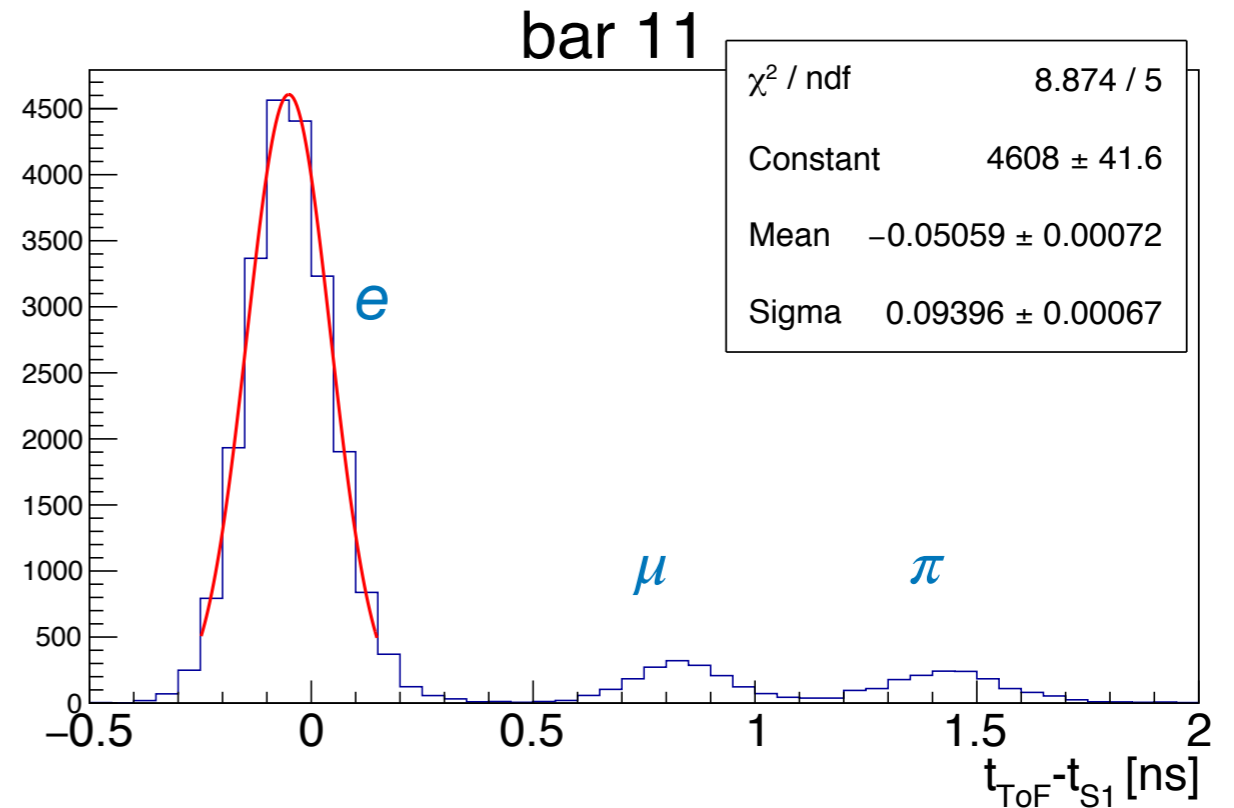
- 0.5 GeV beam
- 0 PMMA blocks
- Taken on Aug 31
- [Data_2018_8_31_b6_500MeV_0block.root](#)

Time resolution vs reference

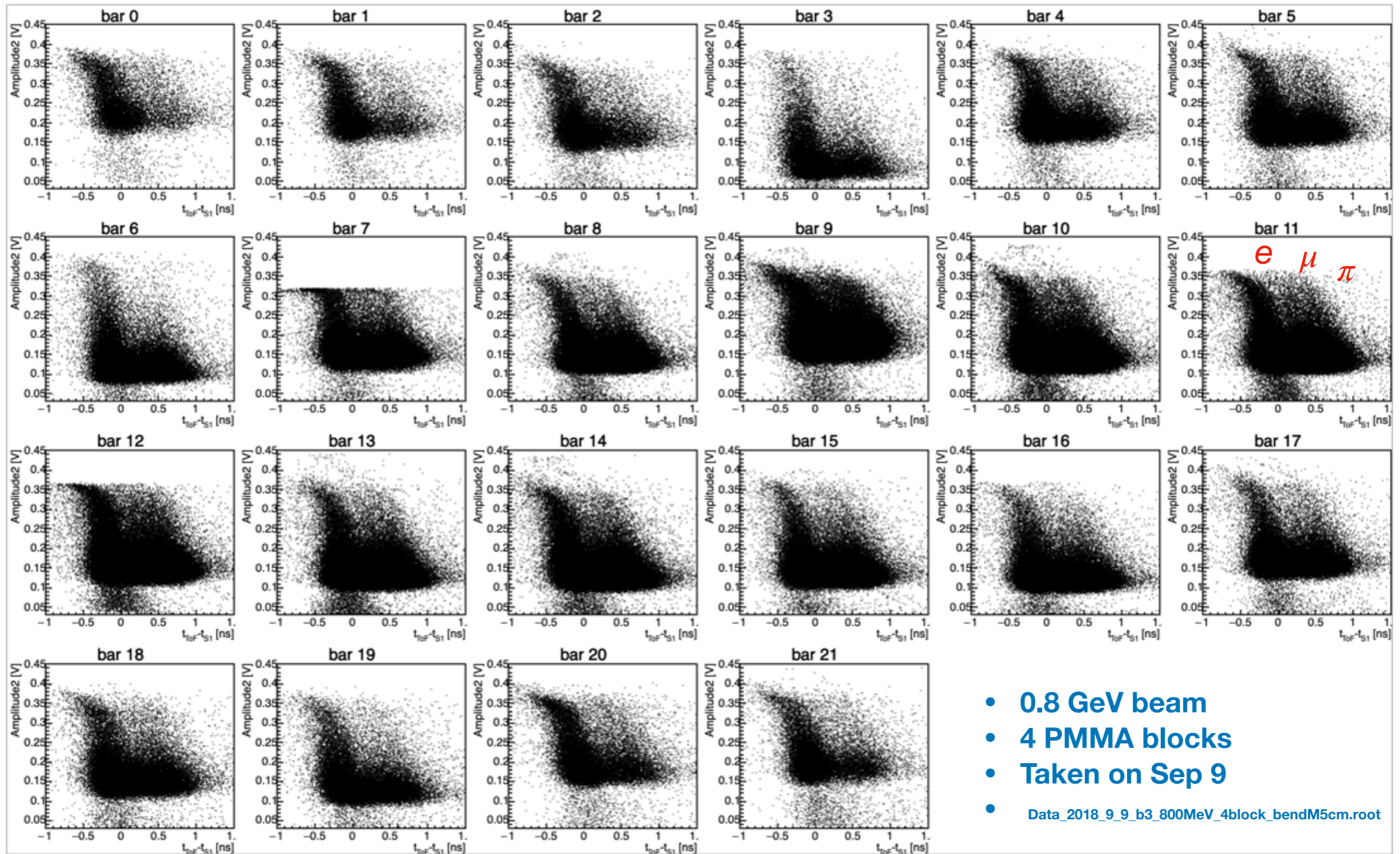


- Time resolution for one bar has been measured in a dedicated testbeam after the HP-TPC data taking
- Two small trigger counters were placed 20 cm up- and downstream of the bar
- Veto counter was used
- Mean time calculation
 - No tracking detector: $(t_1+t_2)/2$
 - With tracking information: weighted mean
- Weighted mean is not possible for the HP-TPC data

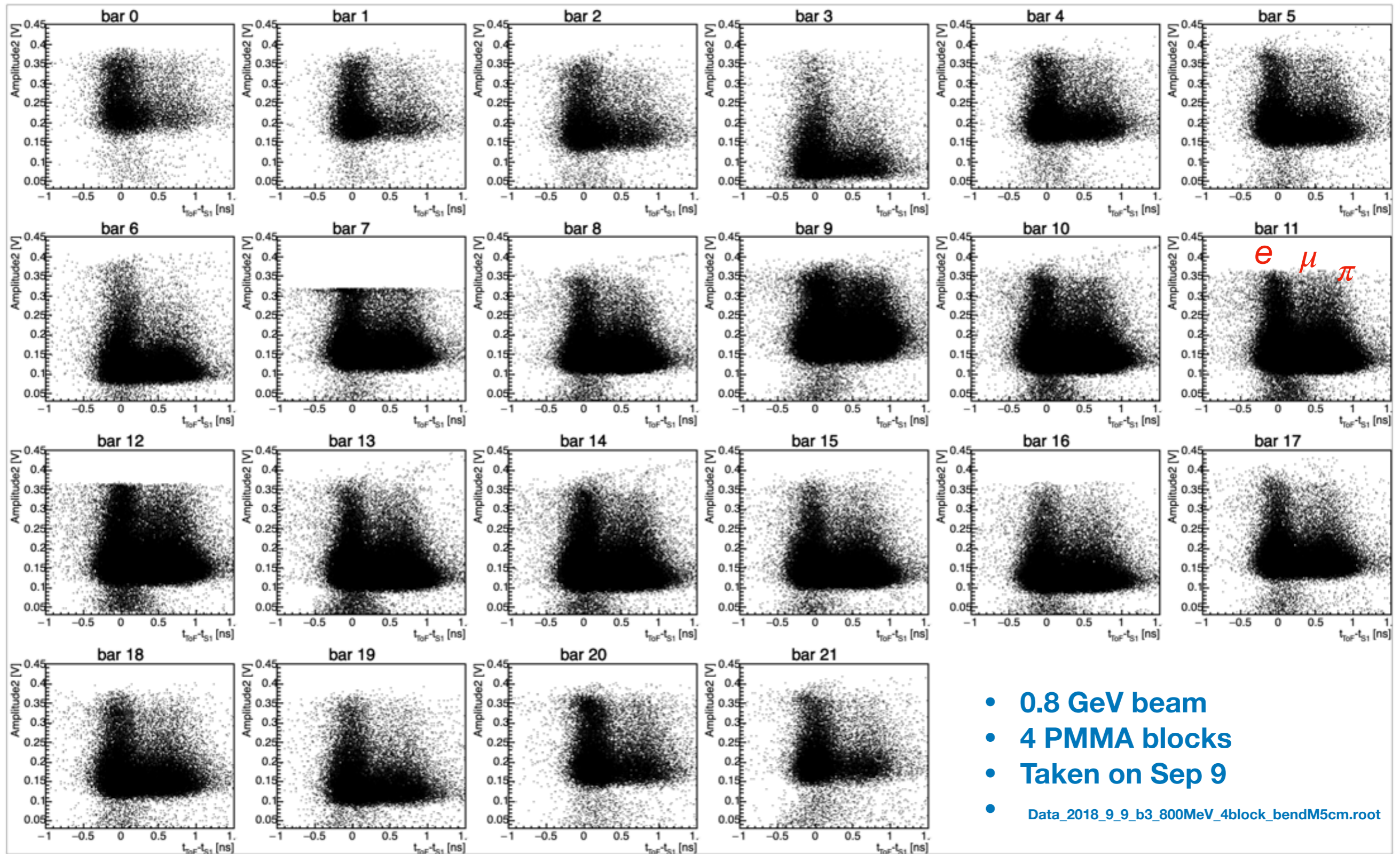
- For the HP-TPC data, time is measured with respect to S1
- Additional cuts:
 - Amplitude of S1 > 0.2 V
 - Position of beam spot: $45 \text{ cm} < x < 55 \text{ cm}$
- Dispersion in e momentum gives additional contribution to the $t_{uToF}-t_{S1}$ width
- Asymmetric shape due to the energy loss
- The resolution is consistent with the 100 ps results from the dedicated measurements



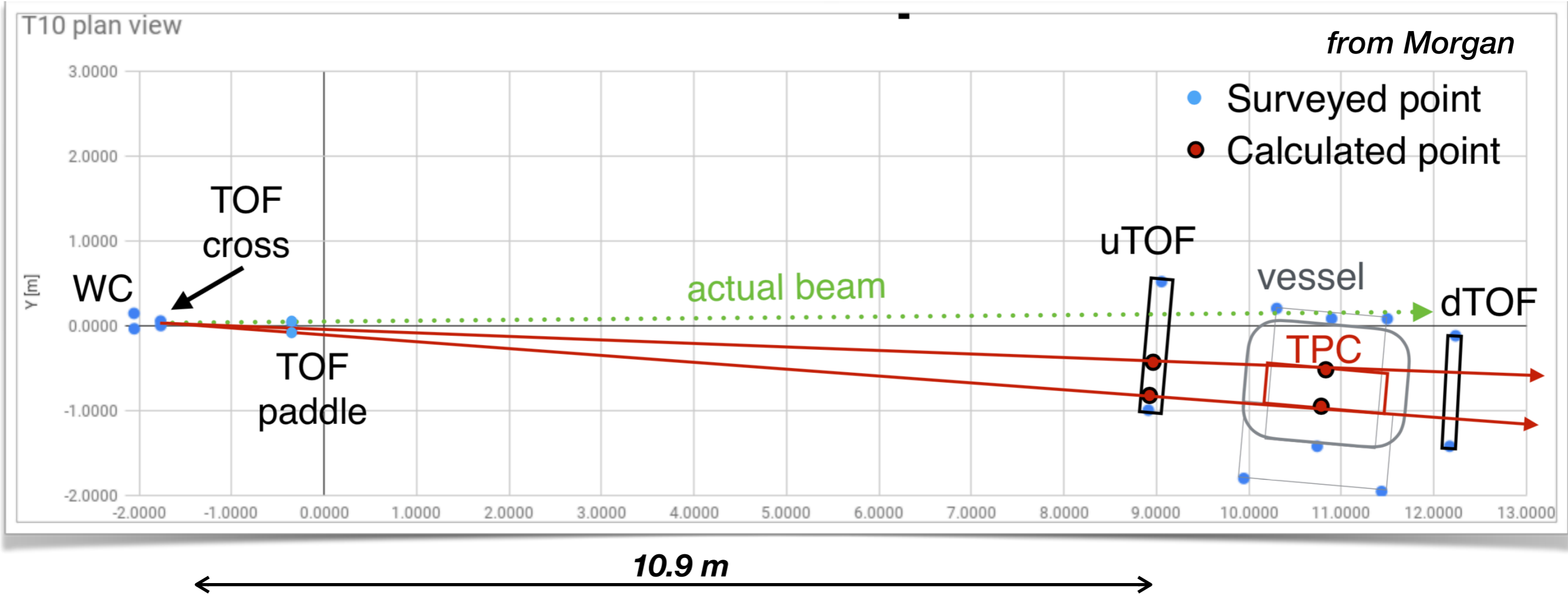
“Amplitude vs Time” before walk corrections



“Amplitude vs Time” after walk corrections



Time to be converted to mass or momentum

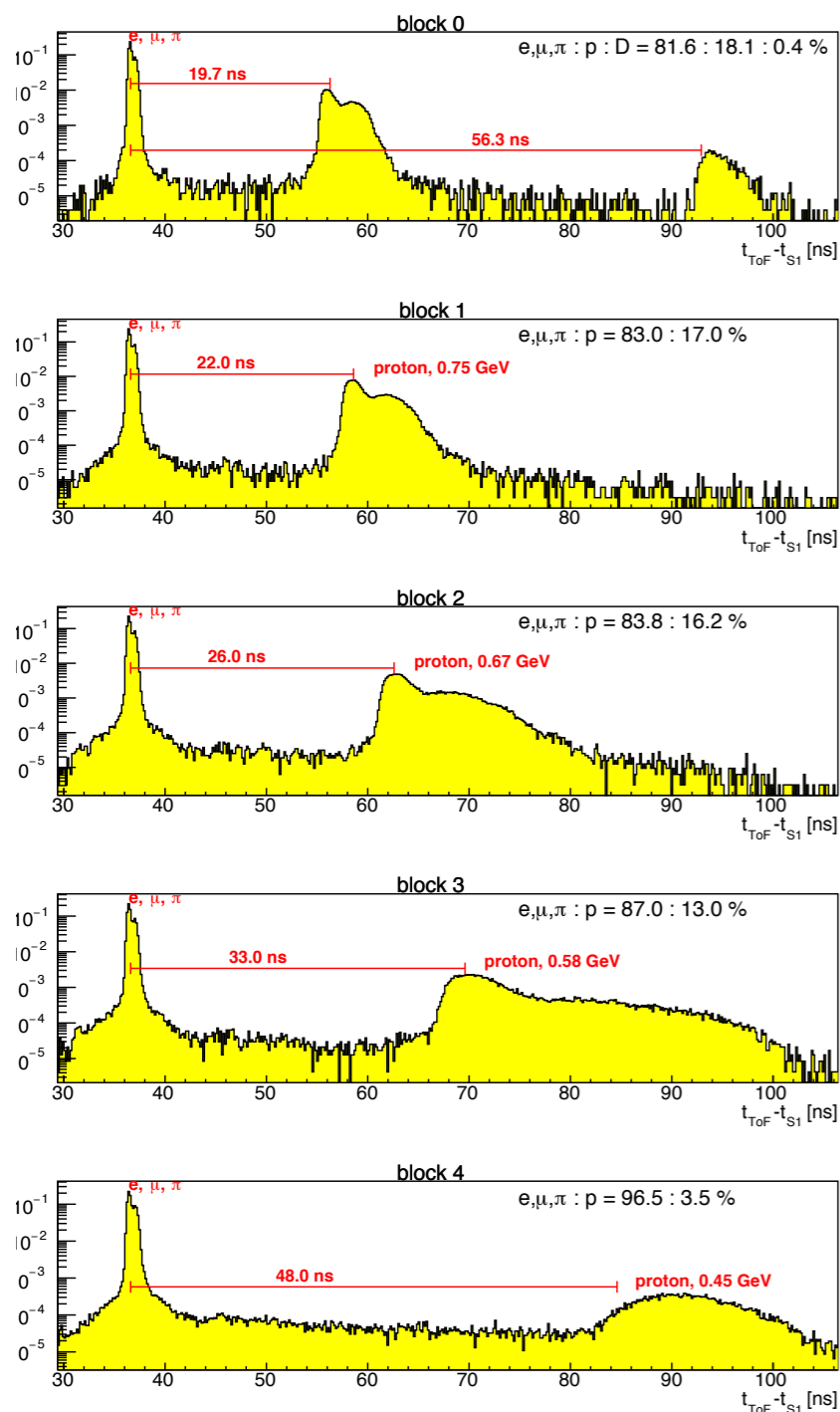


Time is converted to m^2 using formula:

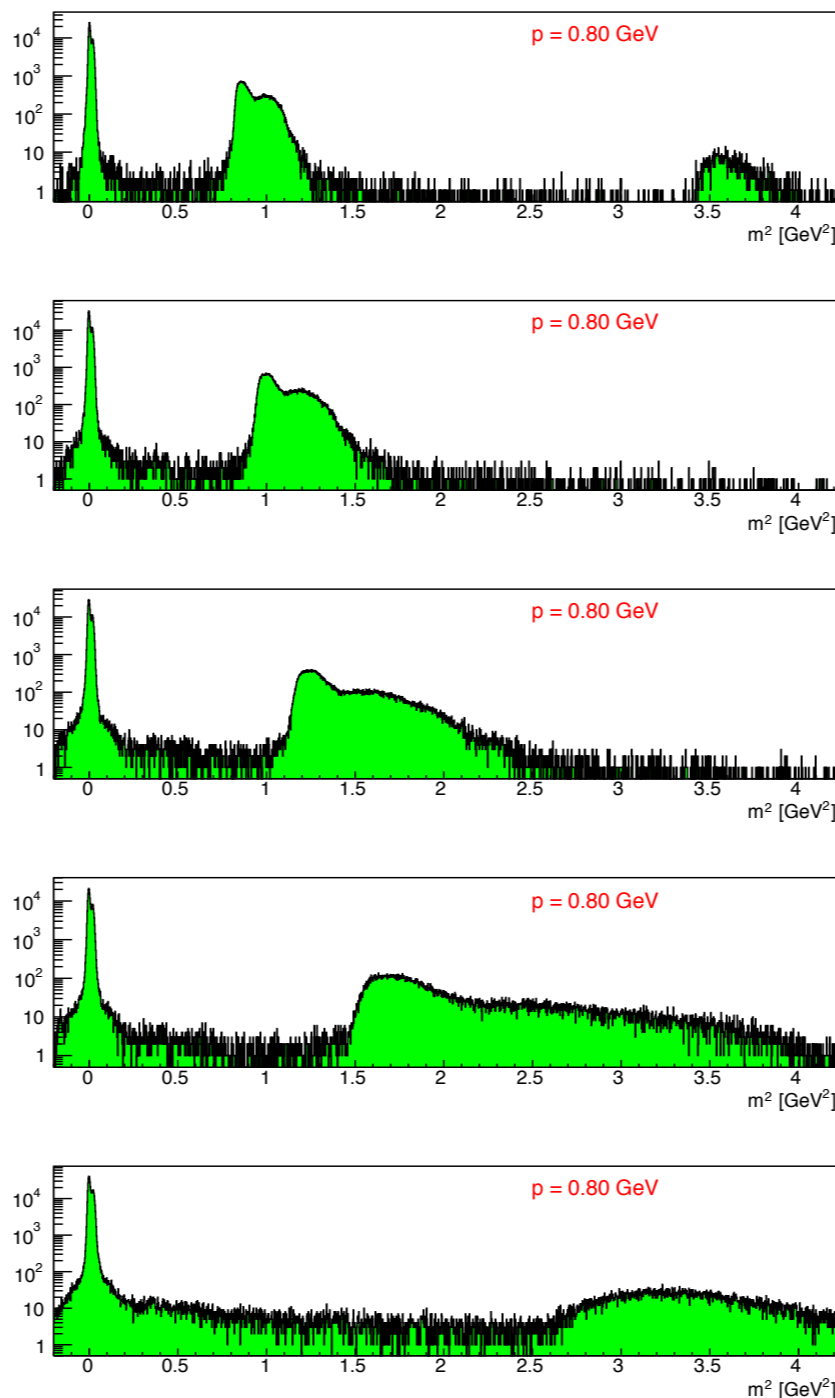
$$m^2 = p^2 \left(\frac{t^2}{L^2} - 1 \right)$$

Conversion from the time to mass squared

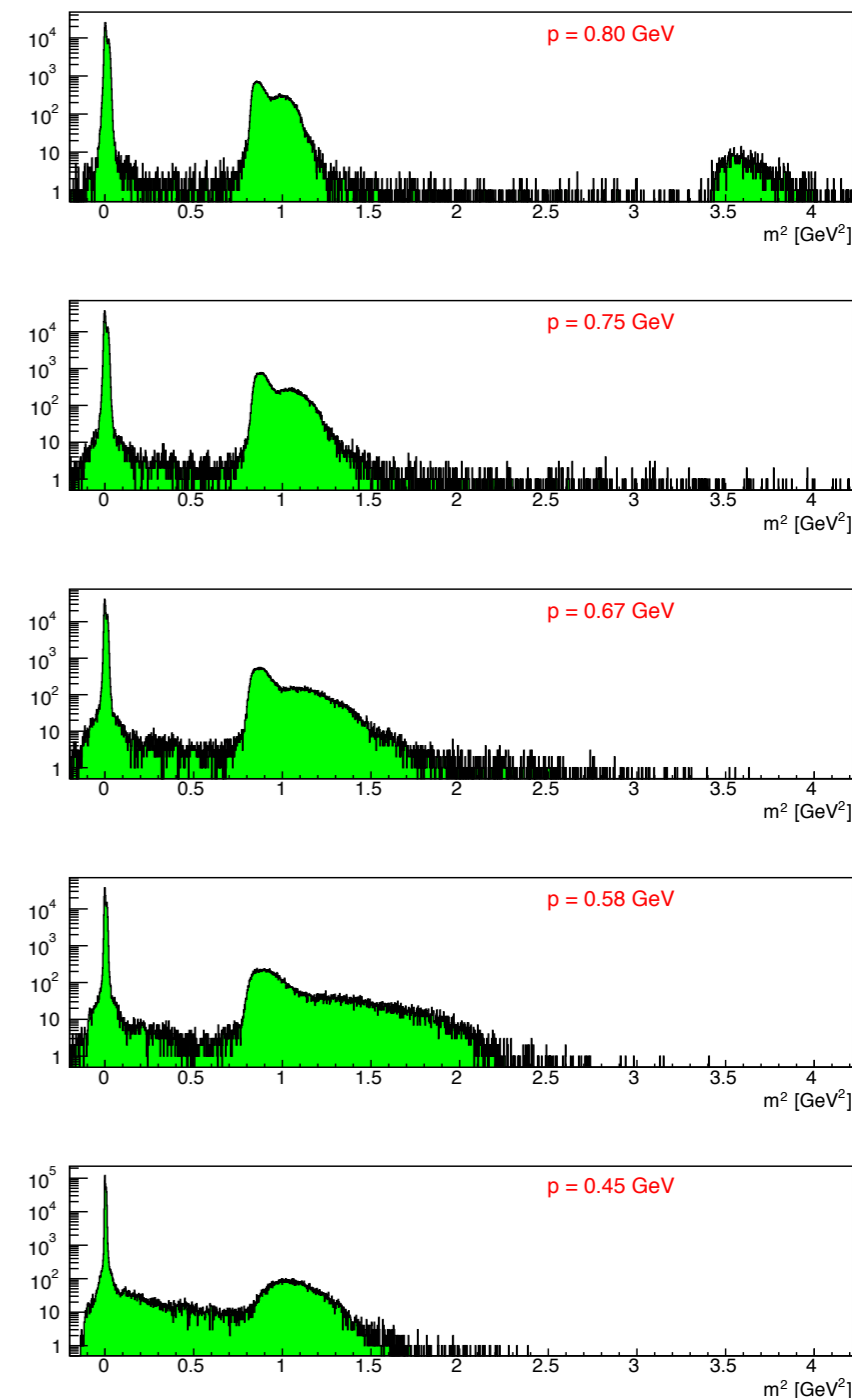
Time difference: $t_{uToF} - t_{S1}$



Mass, $p = 0.8 \text{ GeV}$



Mass, $p = 0.45 - 0.8 \text{ GeV}$



- Data_2018_8_31_b2_800MeV_0block.root
- Data_2018_9_1_b4_800MeV_1block_bend4cm.root
- Data_2018_9_1_b2_800MeV_2block_bend4cm.root
- Data_2018_9_1_b3_800MeV_3block_bend4cm.root
- Data_2018_8_30_b1.root

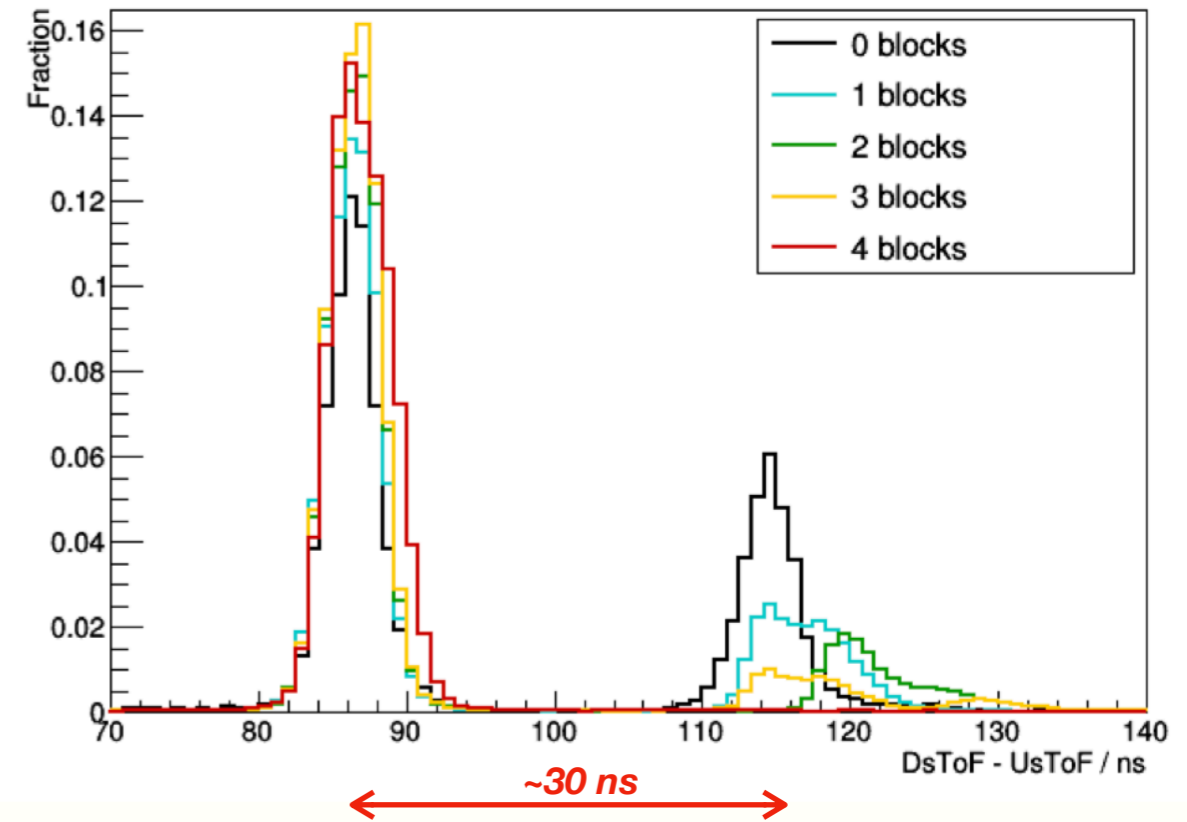
Momentum of protons is wrong

Momentum of e, μ, π is wrong

$P/(\pi + \mu)$ spatial distribution

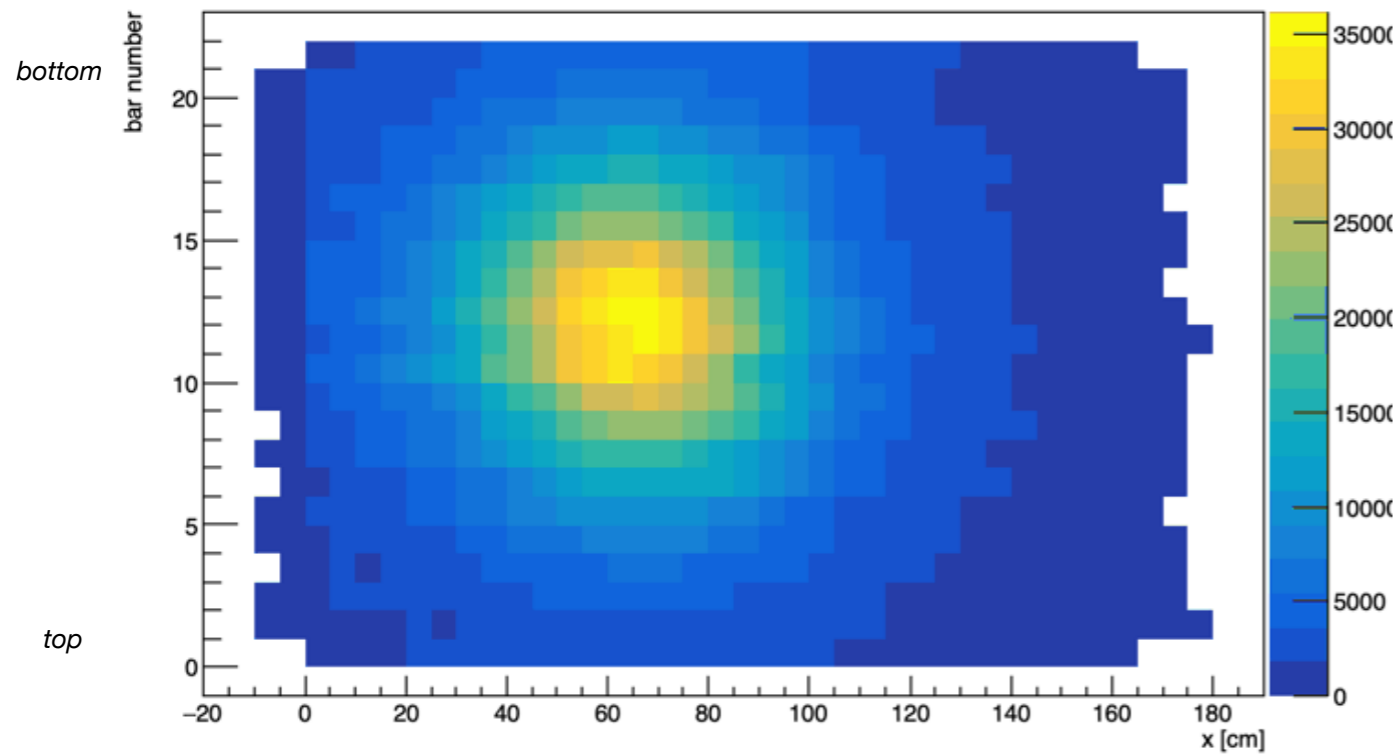
- Looked at the spatial distribution of protons and π, μ across $S4$
- Did this for 0, 1, 2, 3 moderator blocks

DsToF - UsToF (for different moderator blocks)



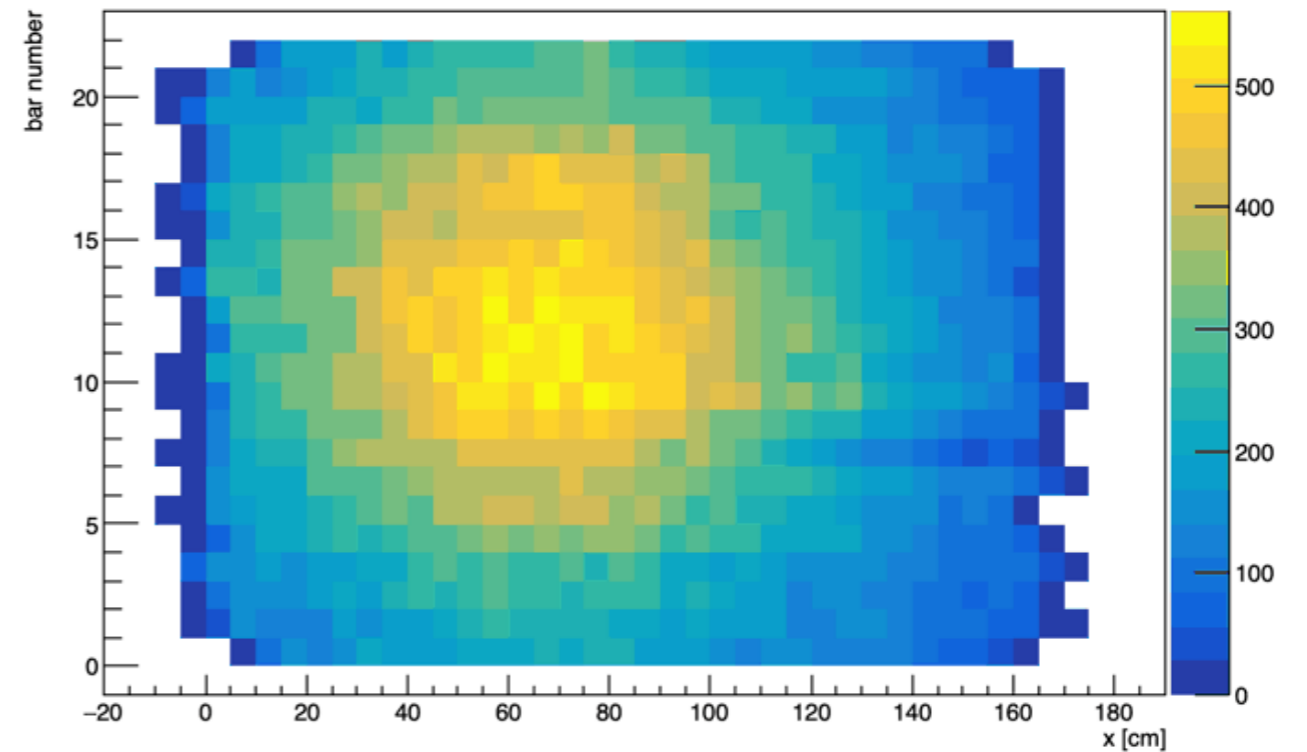
- **Note:** Slightly strange 2 peak structure in 1, 2, 3 block proton peak
 - Seems to be present across all the bars

XY distribution for different mass cuts



- Time cut around e, μ, π peak
- Data_2018_9_16_b1.root

- Time cut around proton peak
- Amplitude $> 0.25V$



Outlook

- **Procedure for time-walk corrections is ready**
 - **Looks stable in time**
- **Finish calibration (process all data) within 1-2 weeks**
- **No manpower for SHIP => no plans for the analysis**