

# Propagation Time and Time Resolution

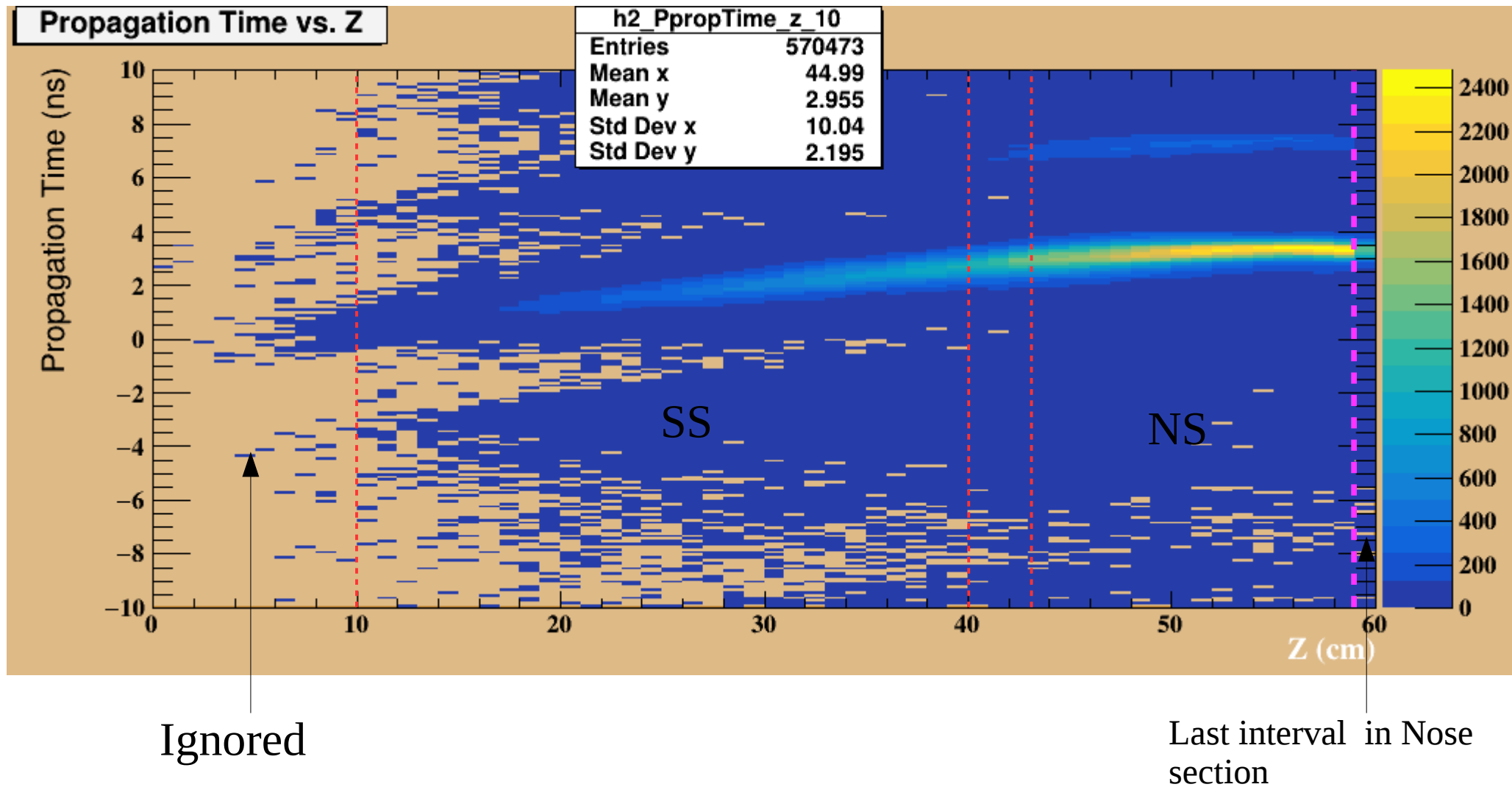
Mahmoud Kamel

## Propagation Time Corrections

- Find a good track matched to the TOF and not the SC. Determine the RF time based on this track.
- Find a good track matched to the start counter. Obtain the walk corrected sc time and the flight time.
- Calculate the propagation time  $PT = T_{wc}^{sc} - T_{ft}^{sc} - T^{rf}$
- Plot the PT vs the z (path length along the paddle).
- Ignore the first 10 cm upstream of the straight section and divide the rest of straight section to 6 intervals. Divide the bend section to 3 intervals and the nose section to 9 intervals
- In each interval get the PT and fit Gaussian.
- Plot the mean of the fit vs the central value of z interval.
- The plots shown are for Run 42241 sector 10

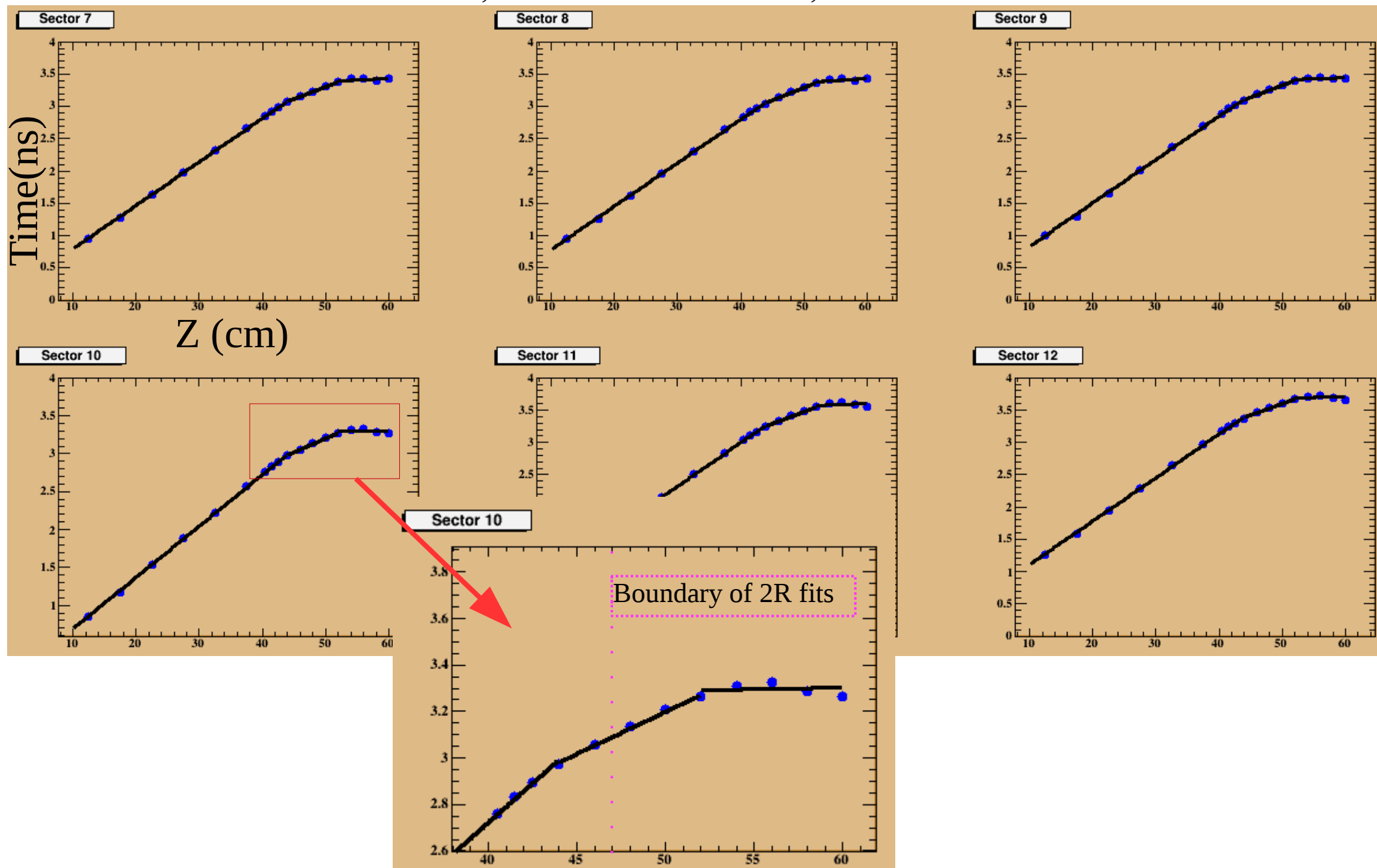
# SC time vs Z before Applying the PTC

## Full Run 42241, Sector 10



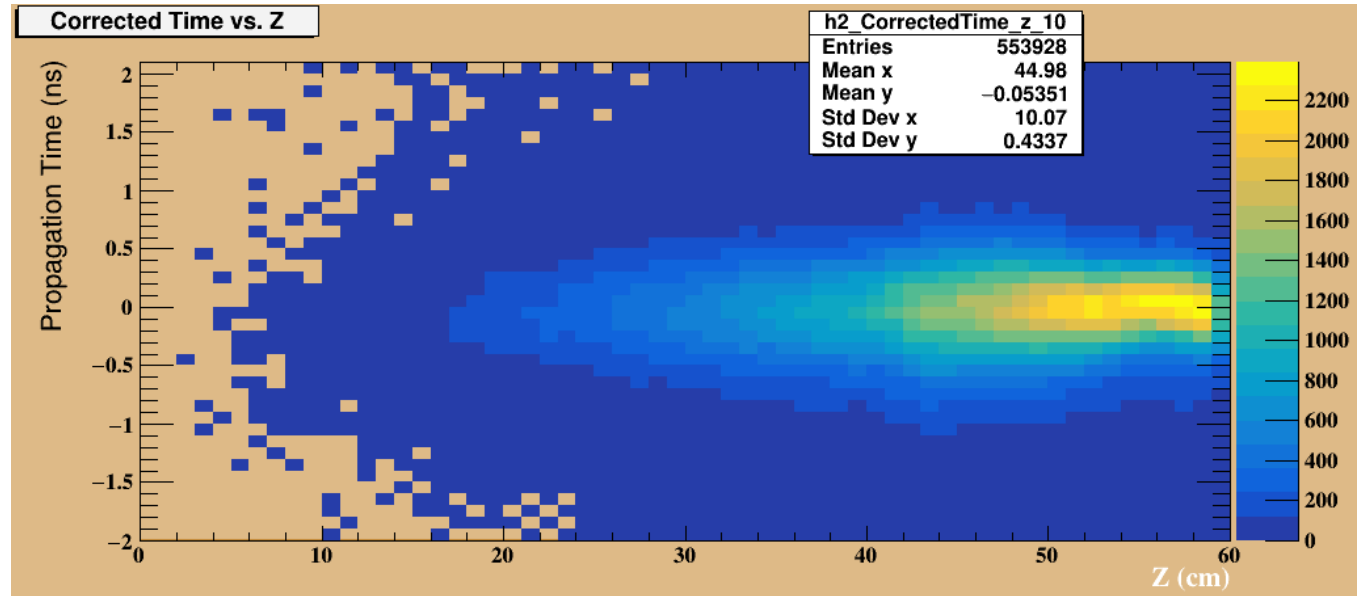
# 1D fits for SC\_time vs Z using three distinct regions (3R fits).

$Z \leq 44.0$  cm,  $44.0$  cm  $< Z \leq 52.0$  cm, and  $Z > 52.0$  cm

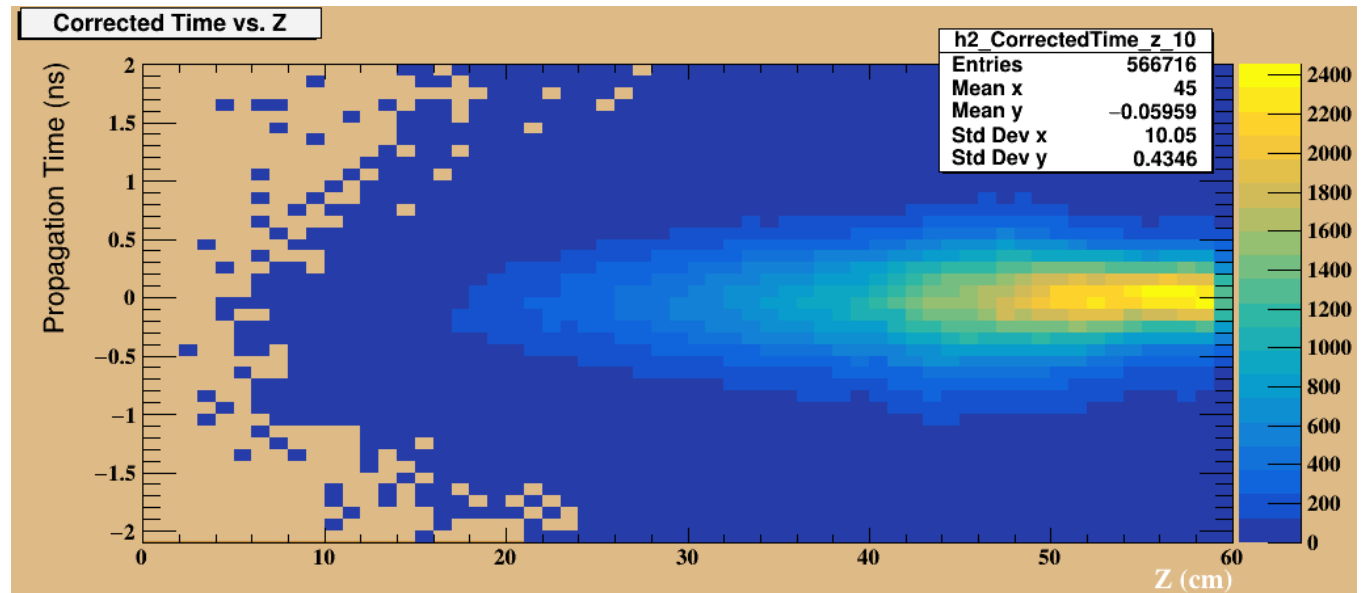


# SC time after PTC for sector 10 of run 42241

3R fit constants

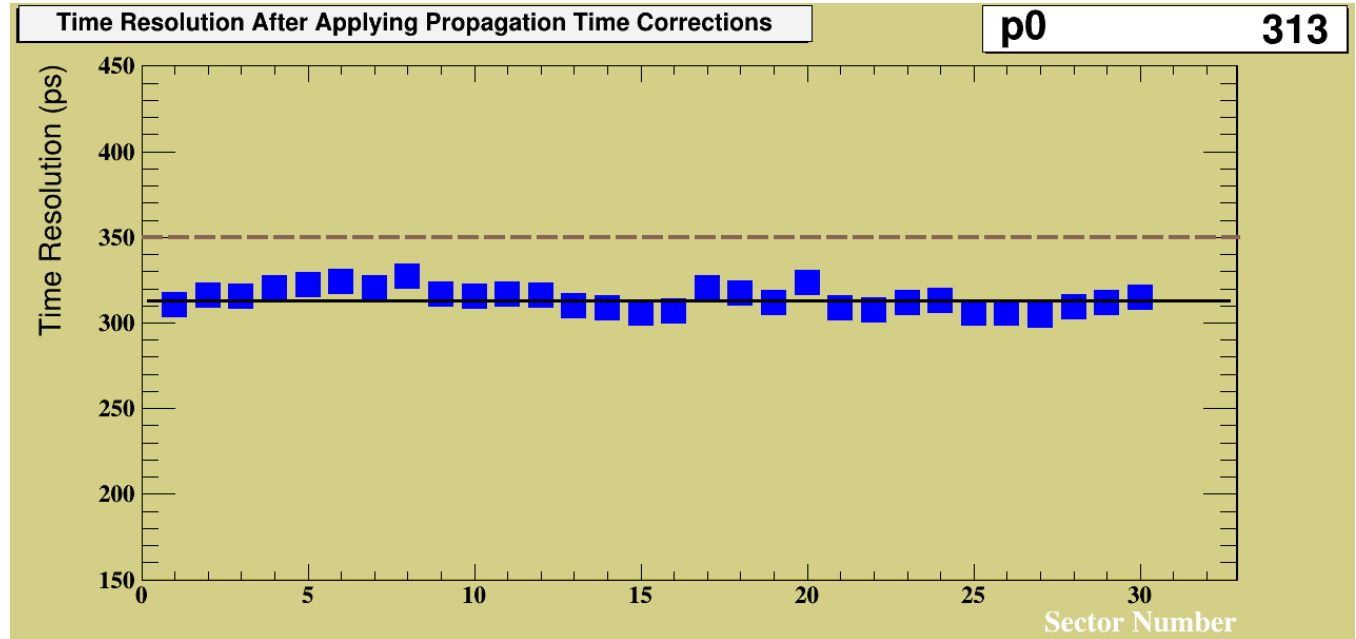


4R fit constants and variable vertices

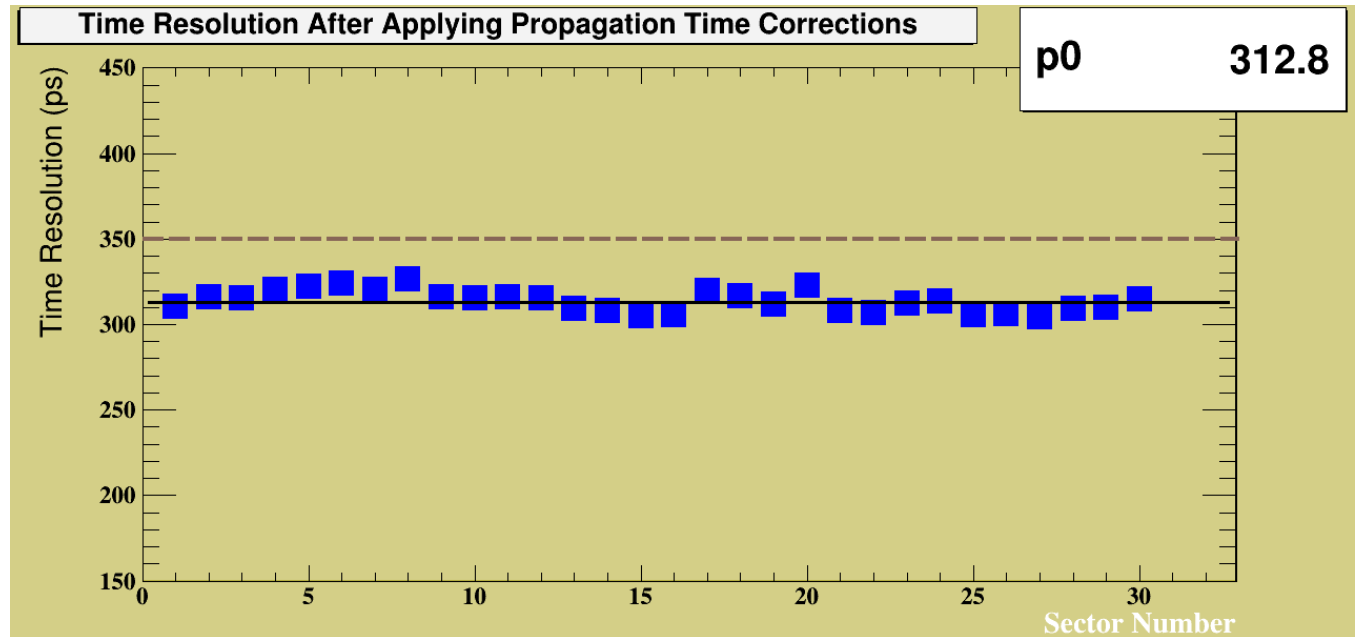


# Time resolution from the PT plugin

3R fit constants



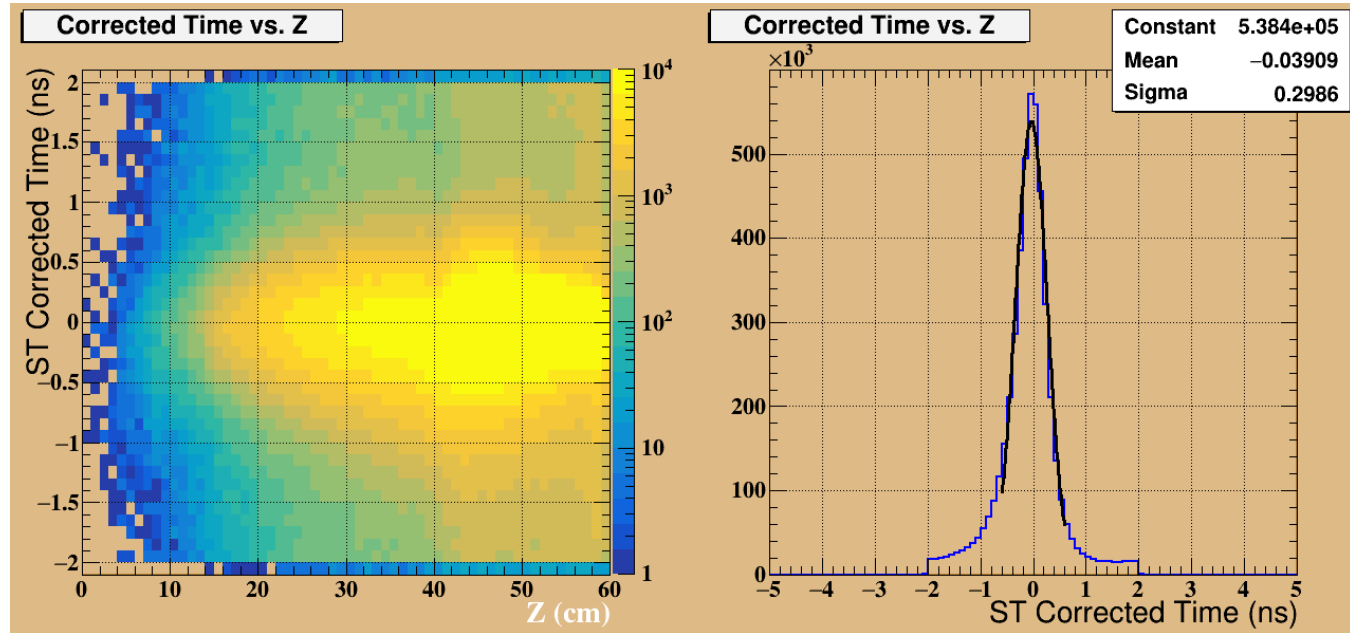
4R fit constants and variable vertices



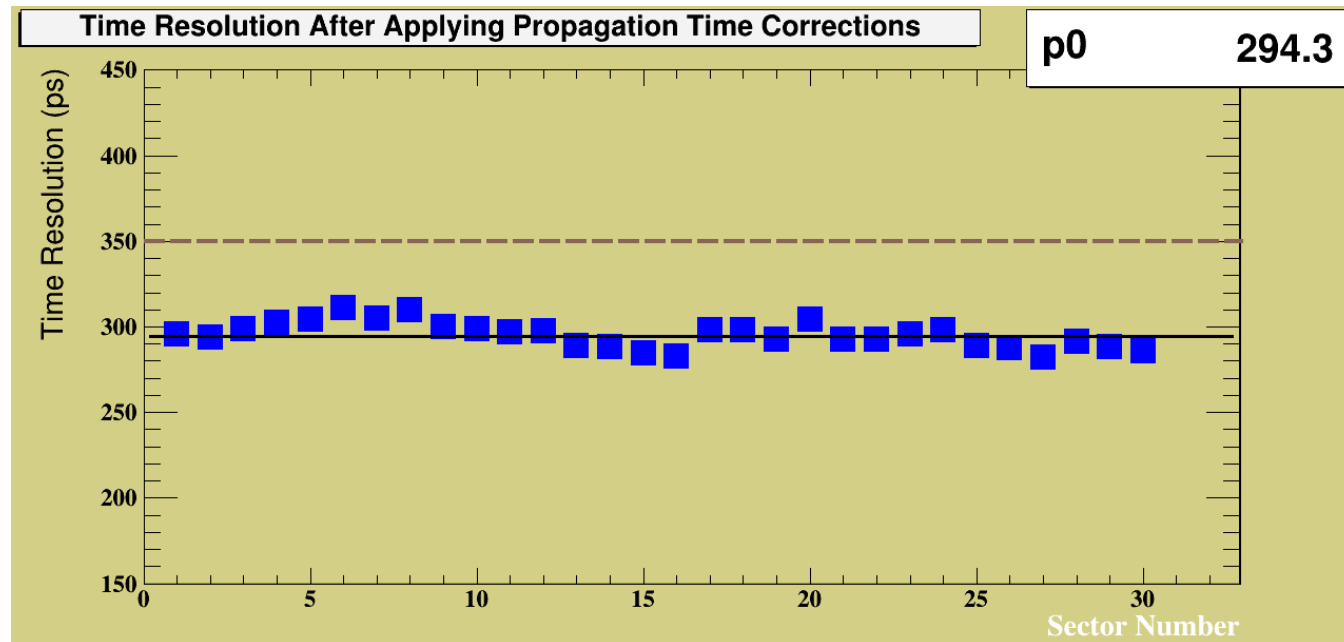
## Time Resolution Plugin

- Find a good track matched to the SC. Determine the RF time based on this track.
- Obtain the walk corrected sc time and the flight time.
- Calculate the SC corrected time  $T = T_{wc}^{sc} - T_{ft}^{sc} - T^{rf} - PTC$
- Plot the T vs the z (path length along the paddle).

# Time resolution from the Time Resolution plugin using 3R fit constants

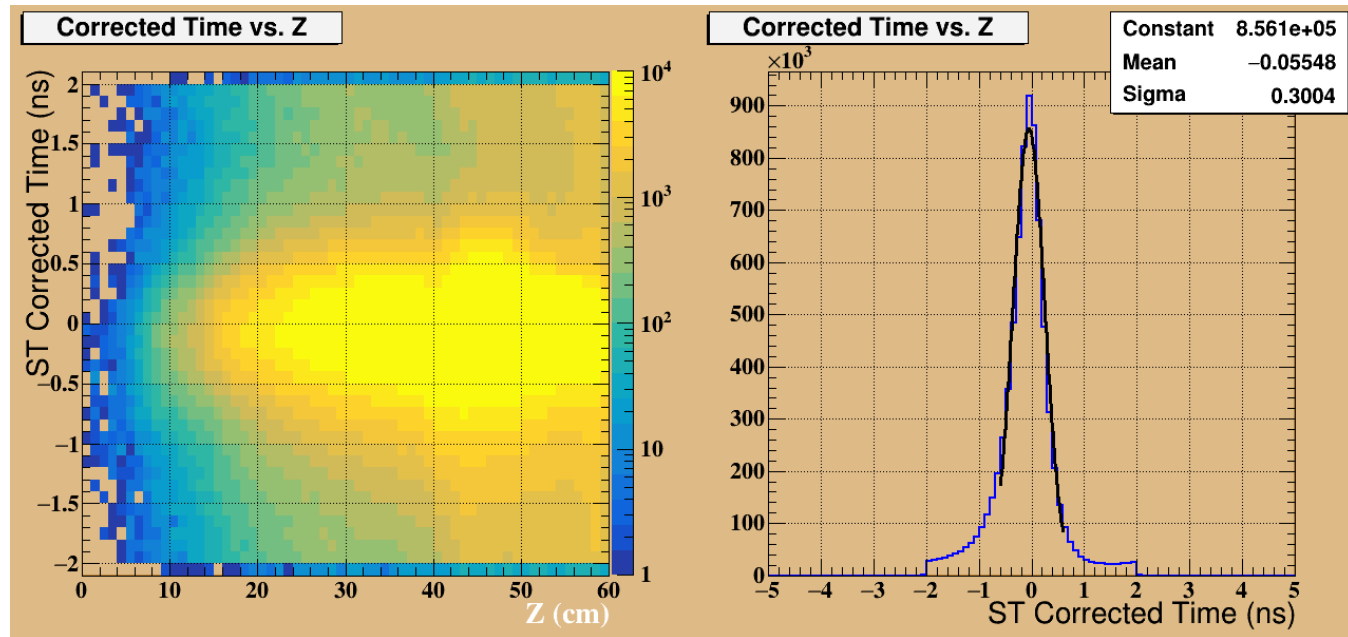


Run 42241

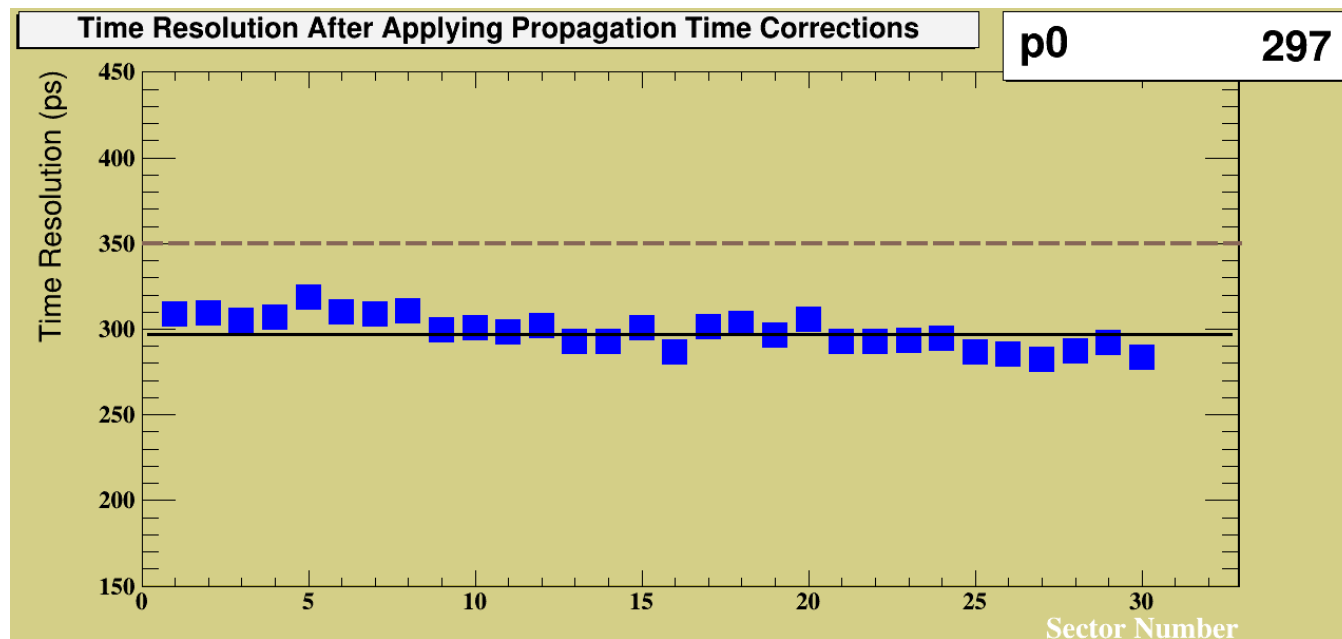




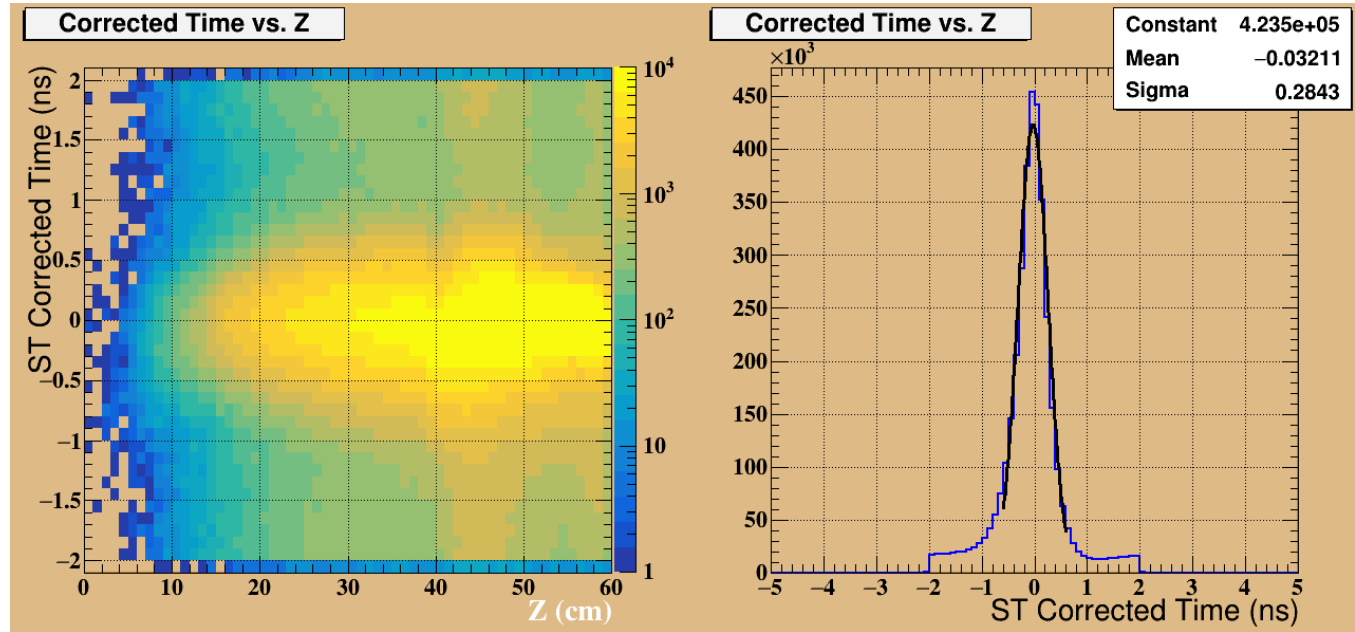
# Time resolution from the Time Resolution plugin using 3R fit constants



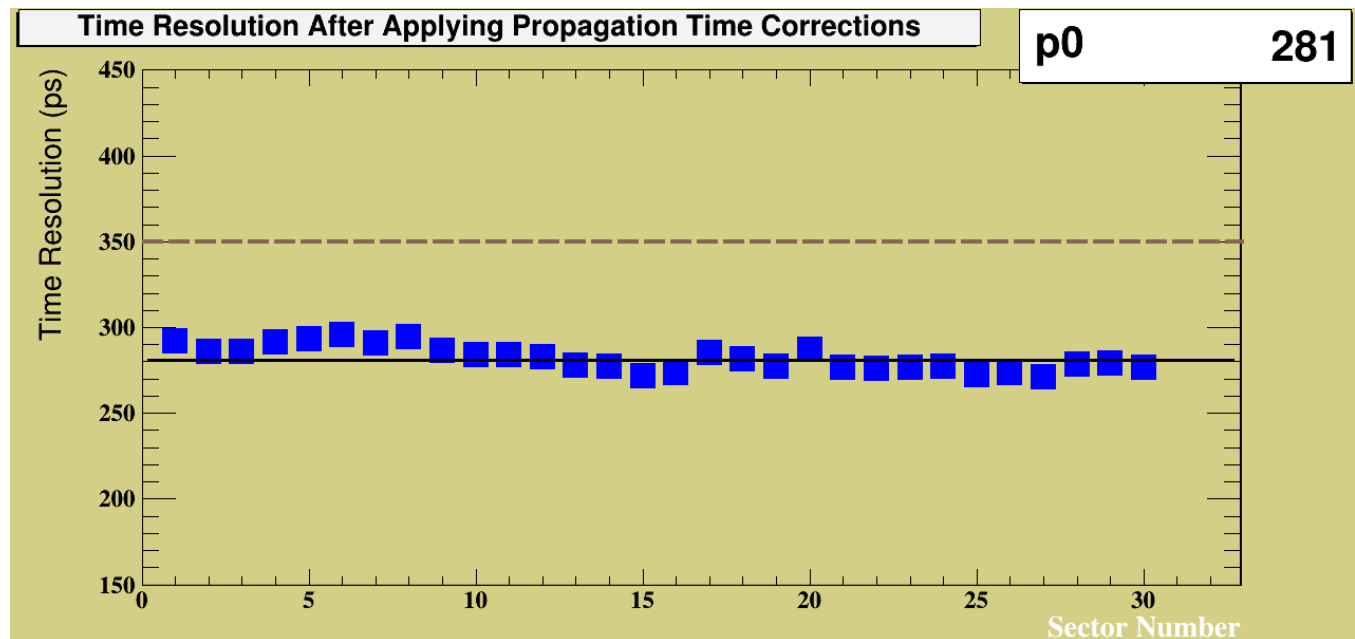
Run 41106



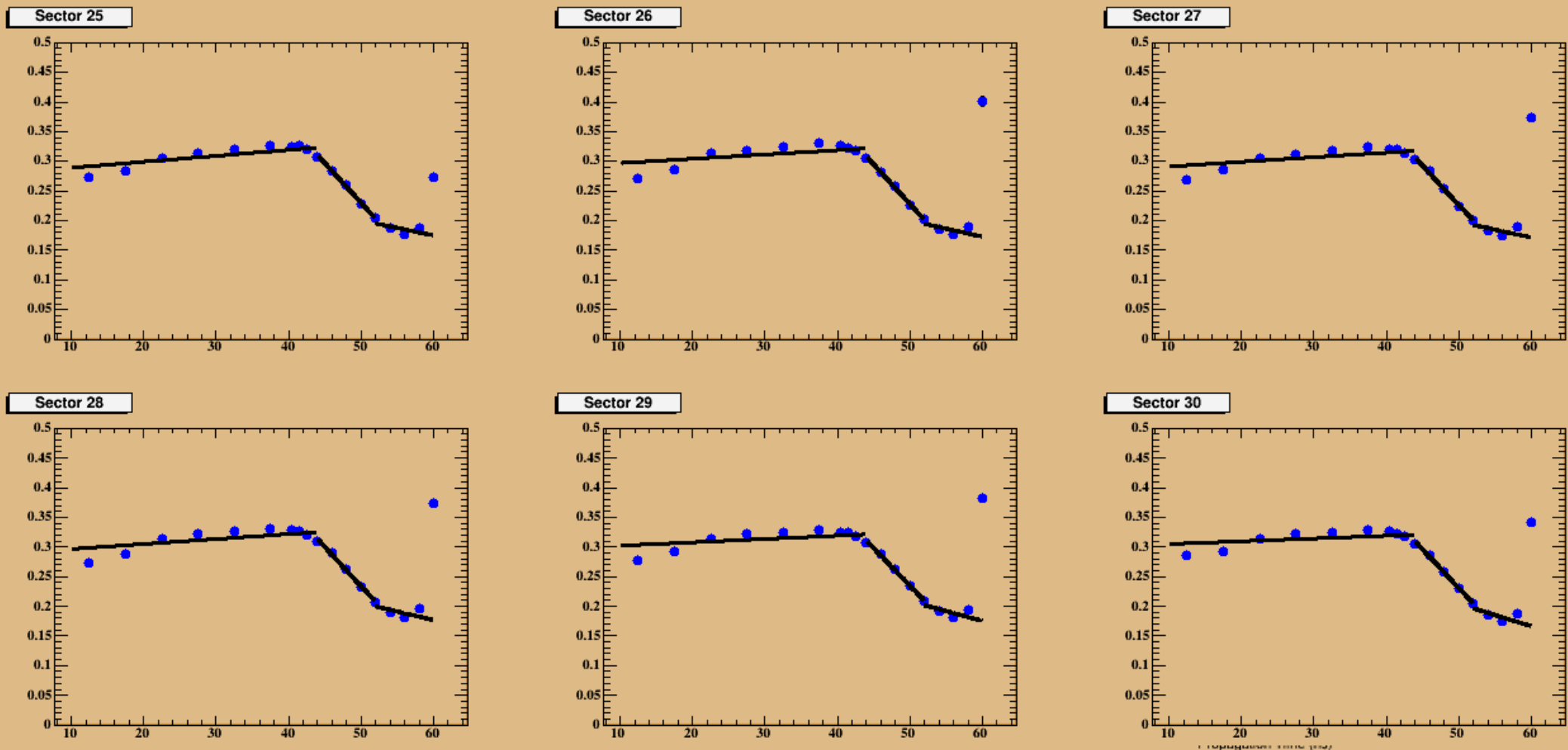
# Time resolution from the Time Resolution plugin using 3R fit constants



Run 30780  
Constants  
extracted from  
2017 data

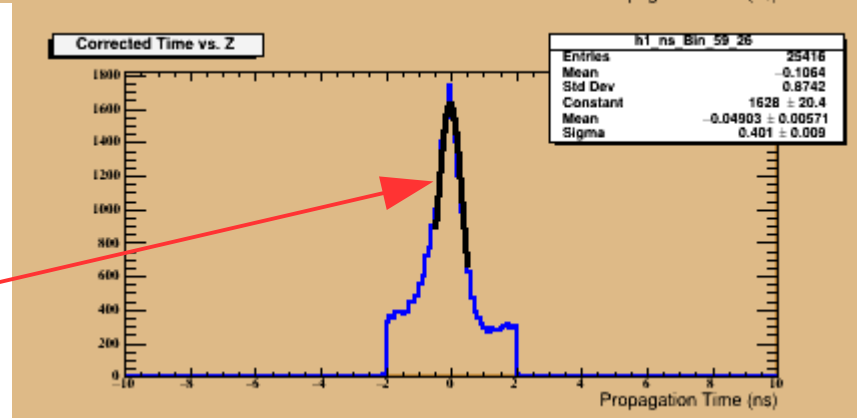


# Time resolution from the Time Resolution plugin vs Z

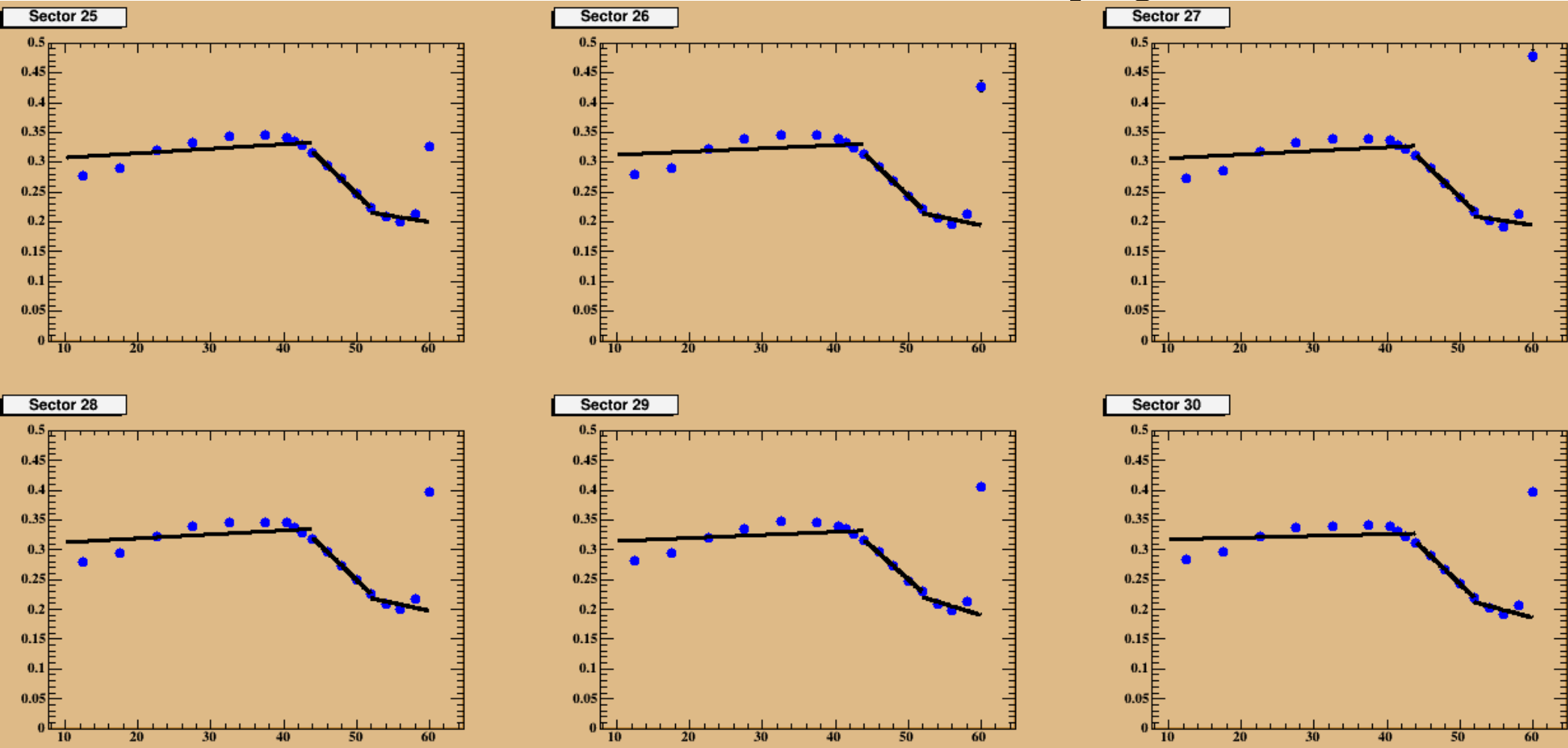


Run30780

Last interval for nose section  
sector 26

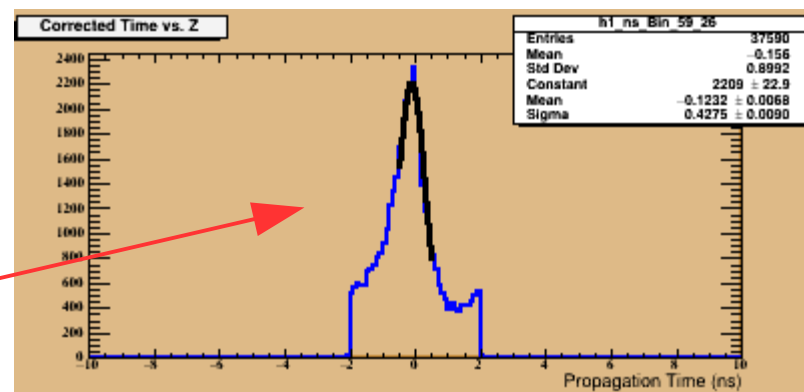


# Time resolution from the Time Resolution plugin vs Z



Run42241

Last interval for nose section  
sector 26



## Summary

- New propagation time constants is obtained using one dimensional fits (3R constants) for 2017 & 2018 run periods.
- 3R and 4R (with variable vertices) fits were tested. There is no significant difference.
- The time resolution from ST\_Tresolution plugin, where the RF time is determined based on the hit to the SC, is calculated. This time resolution is better by  $\sim 20$ ps than that calculated from the PT plugin.
- Coming soon: Push the changes to github and the constants to CCDB.

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