Cabling impact

Gabby Gelinas

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Here, we examine data before (run 906074), with (run 906075), and after reversal of (run 906076) a cabling change. Following run 906074, Konstantin changed the TDC cables, connecting the two lower bars to TDC 5678 opposed to the upper bars. The Bittele pre-amps were connected to TDC 1234.

All time difference plots were processed with an automated fitter, ensuring that all of the cuts to remove the tails were done with the same threshold (cut off tails at the point where they are less than 15 % of the peak). Fits are included on all plots to provide mean and standard deviation information, even if visually they clearly are not a good fit due to a large dip in the center of the plot.

Table 1: Run settings for each dataset presented here.

Run	Type	Bias (V)	Thr (mV)	Clamped?
906074	Cosmics	53.9	80	Yes
9060975	Cosmics	53.9	80	Yes
9060976	Cosmics	55.5	200	Yes

1 Time Difference

In this section time differences along a board are presented for all three runs, grouped by time difference of interest. Comparing the plots for each run within a given time difference we notice the general shape of the plot is preserved across all three runs. Though features may become more exaggerated, if there is a dip with the standard cabling for example, it remains present in run 906075 with the swapped configuration. This is a sign that the issue causing the non-ideal plot shapes is not due to the paddles because if the boards were the point of concern we would not see the same response on a given channel once it is connected to a different board. Examining the fit parameters for a given time difference, we do consistently notice a better agreement between the standard deviations of the plots from run 906075 and 906076 than either with 906074, though the reason for this effect is not immediately obvious. One possibility is seen in Table 1, run 906076 used different voltage settings than the other two runs which may have influenced the change in behaviour compared to the other run with that cabling. There is no apparent trend in the means.

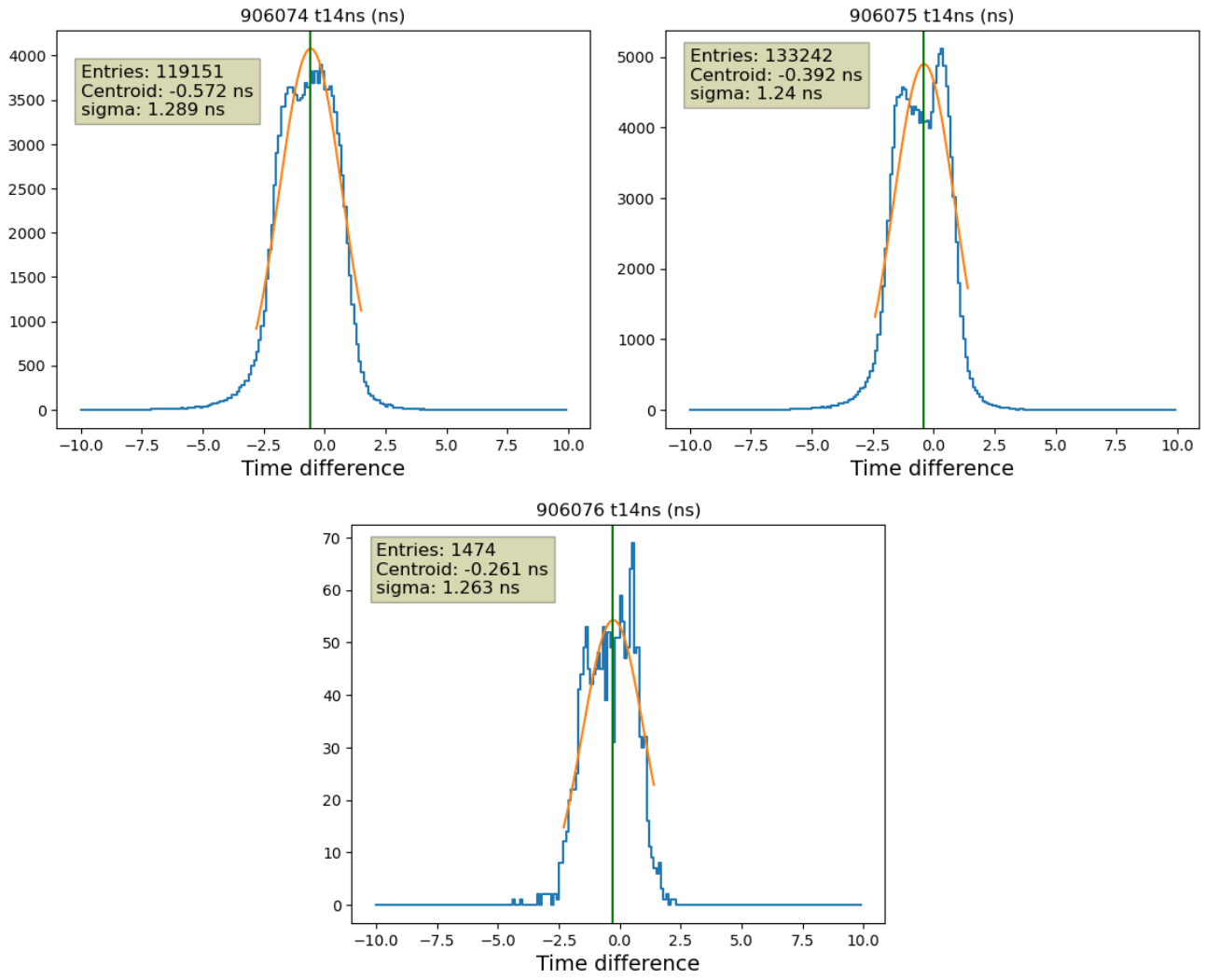

Figure 1: Time difference along a paddle between board 1 and 4 for run 906074 (top left), 906075 (top right), and 906076 (bottom).

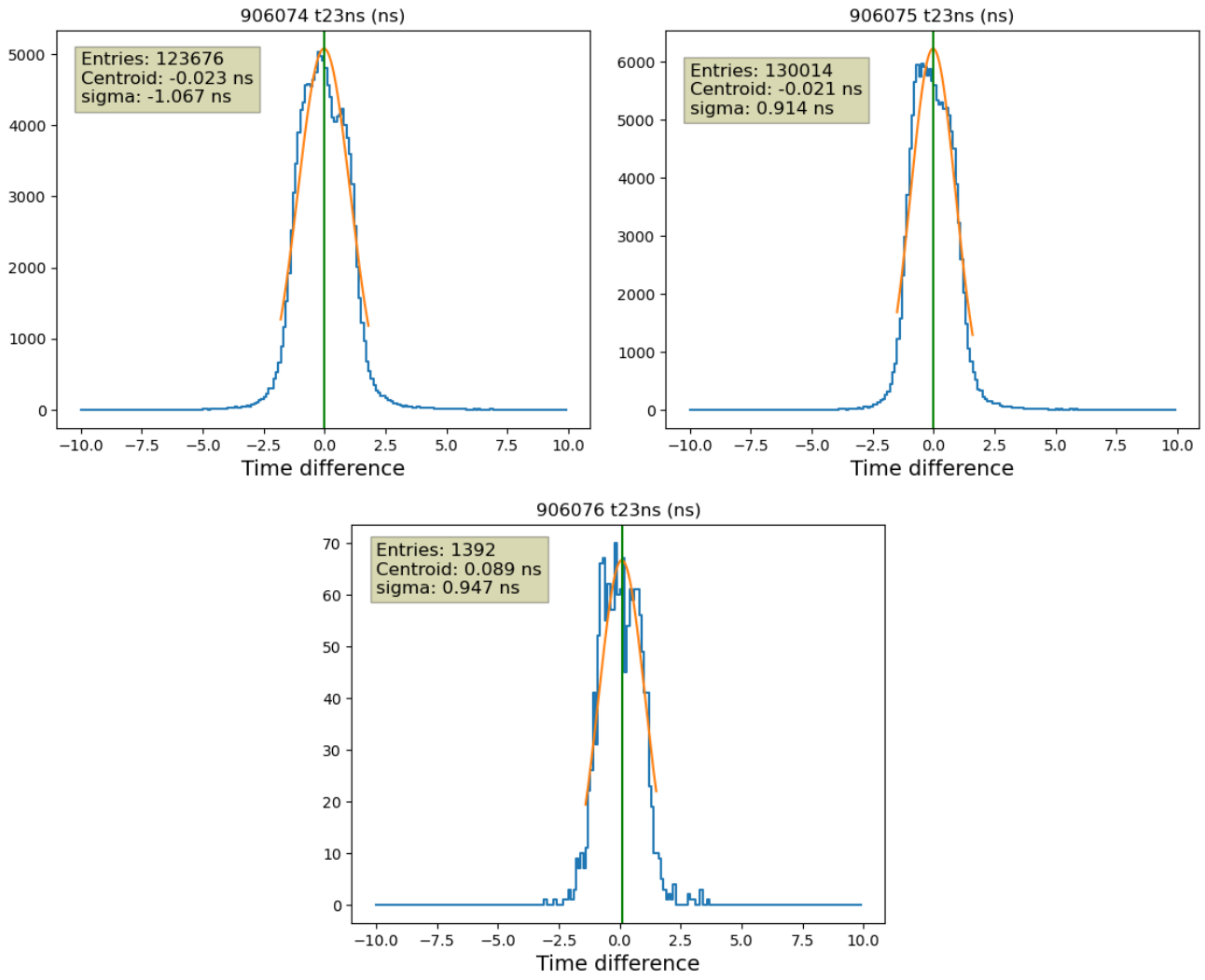

Figure 2: Time difference along a paddle between board 2 and 3 for run 906074 (top left), 906075 (top right), and 906076 (bottom).

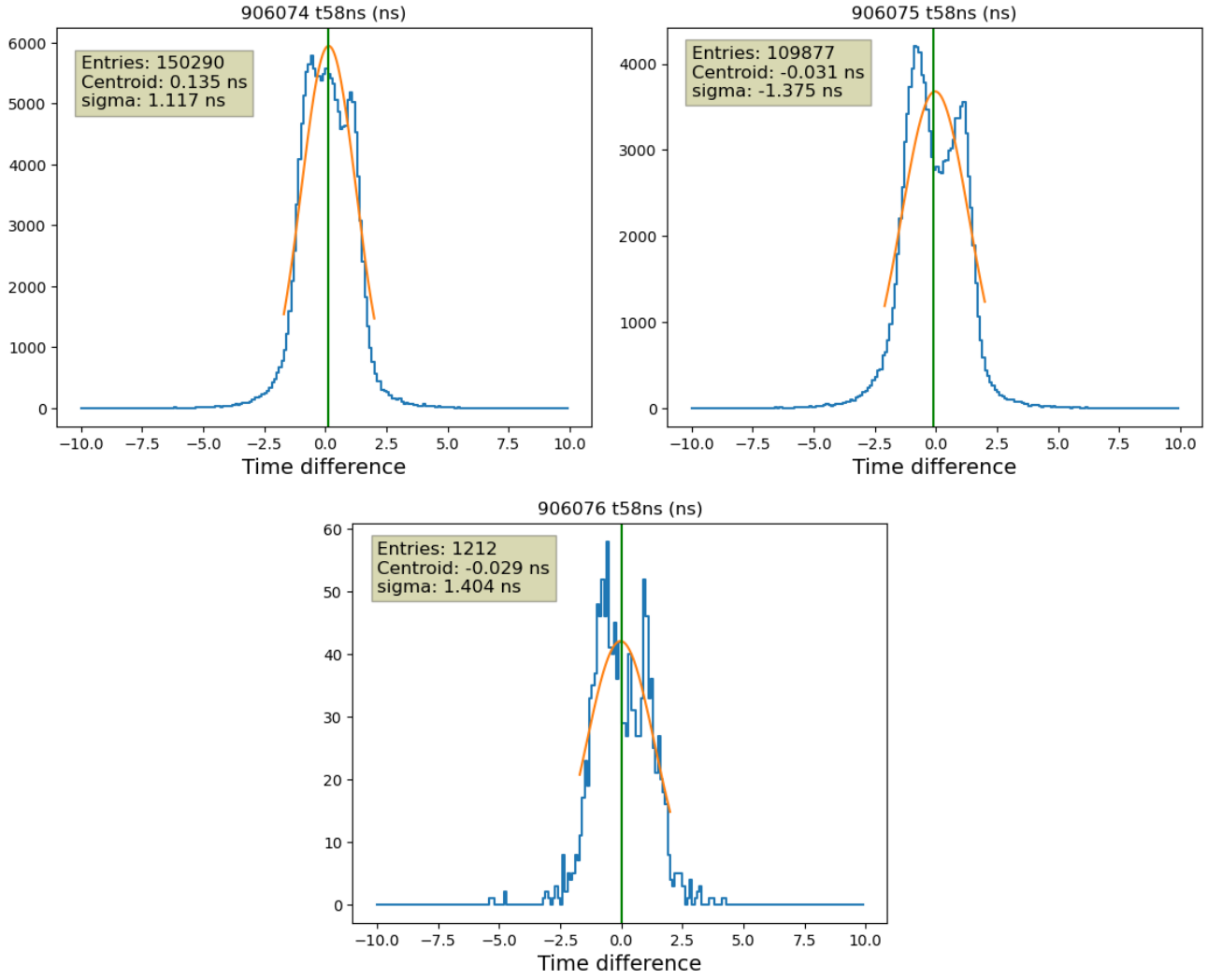

Figure 3: Time difference along a paddle between board 5 and 8 for run 906074 (top left), 906075 (top right), and 906076 (bottom).

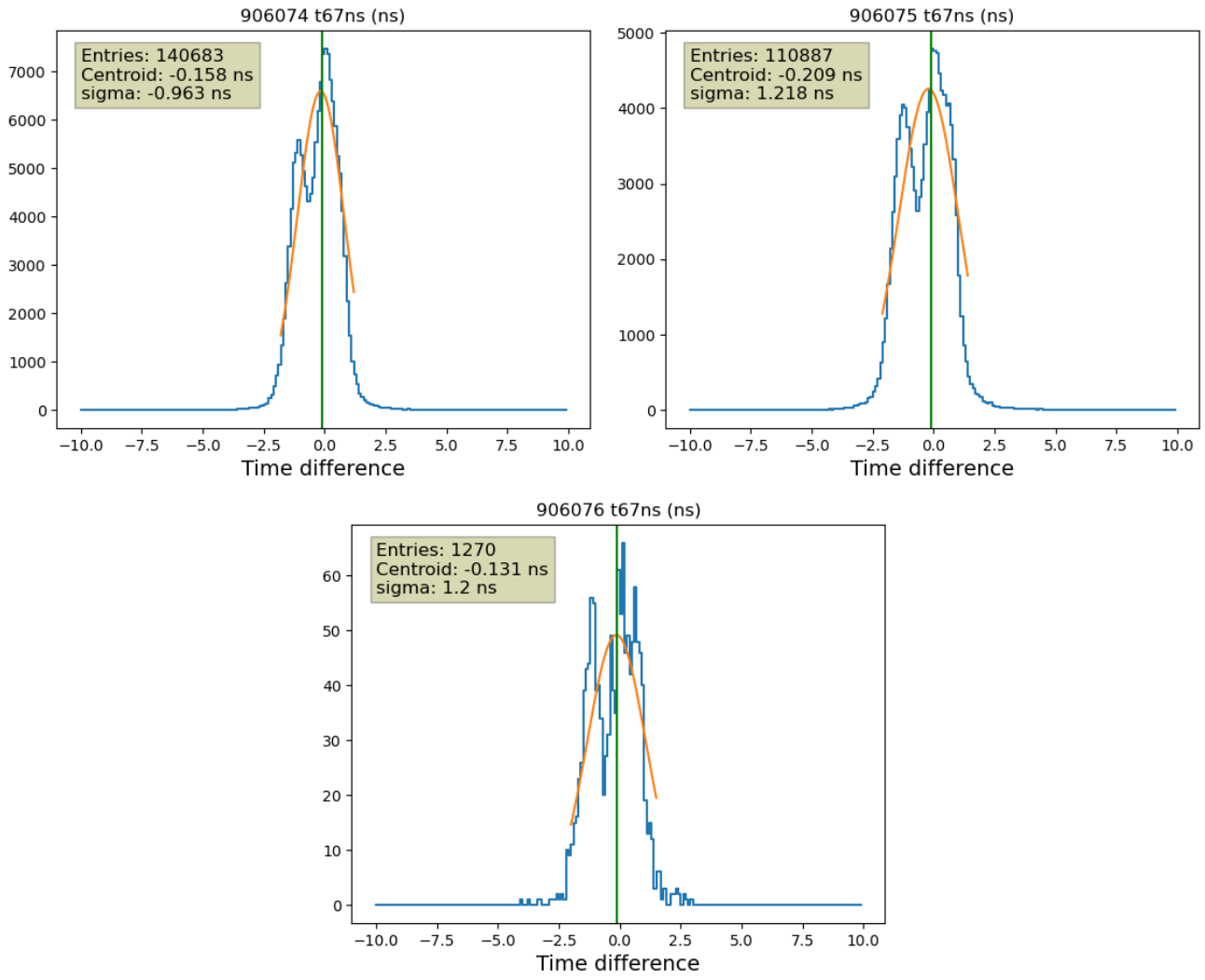

Figure 4: Time difference along a paddle between board 6 and 7 for run 906074 (top left), 906075 (top right), and 906076 (bottom).

2 Time Difference vs Width

A meaningful comparison between all three runs cannot be done here due to the low number of counts in run 907076. The appropriate plots for this run are included for completeness sake, however they will not be discussed here. Again, we see consistent trends between runs when examining plots within a given time difference. The most significant difference when the cabling is changed is seen in the resolution of the two bright spots, where is it higher in run 906074 than run 906075. In Figures 5 and 6 we also observe a swapping shape of the bright spot between runs 906074 and 906075 where in Figure 5 we observe the two bright spots diagonally oriented in run 906074 and vertically aligned in run 906075, and the reverse in Figure 6.

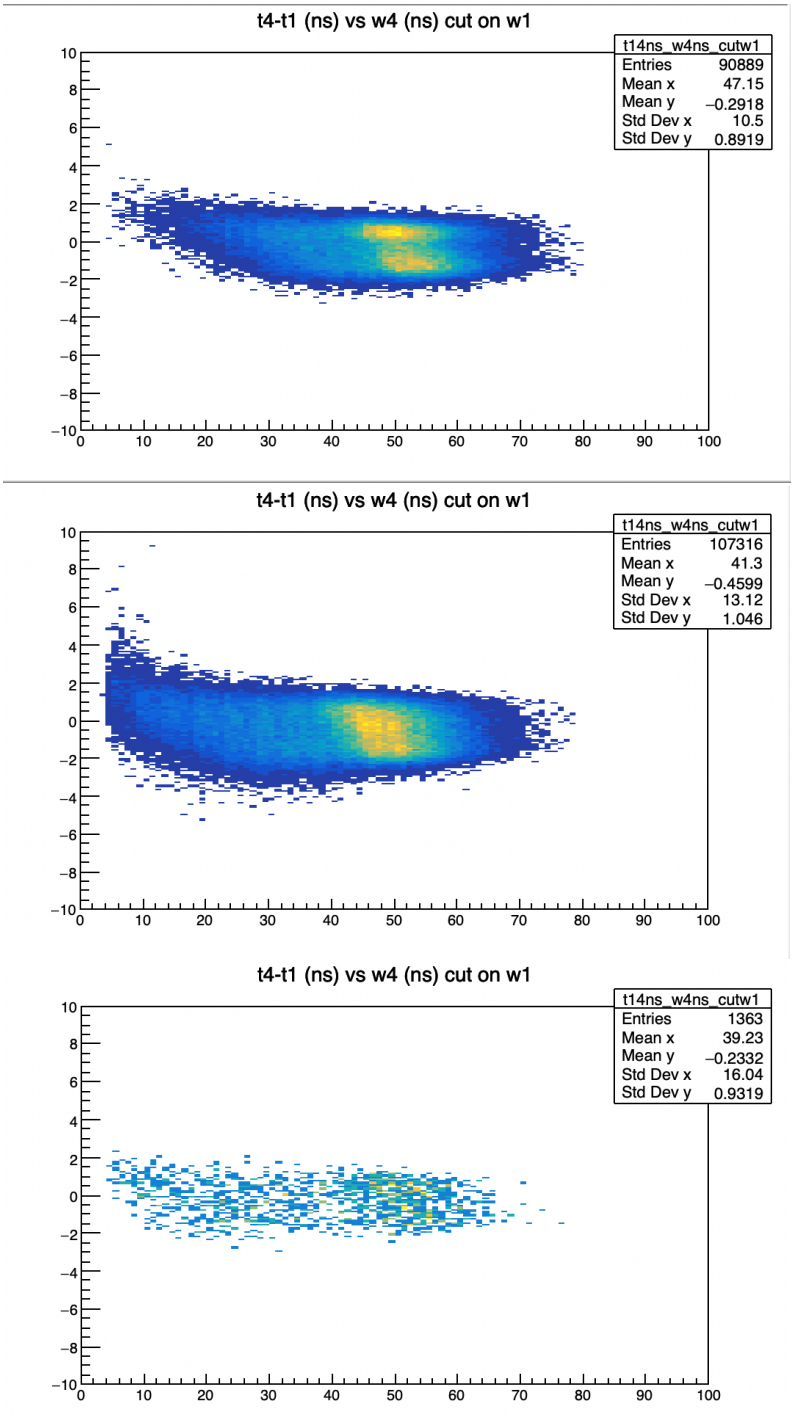

Figure 5: Time difference along the paddle between boards 1 and 4 versus the width on board 4 with a cut on w1. From top to bottom: run 906074, 906075, 906076.

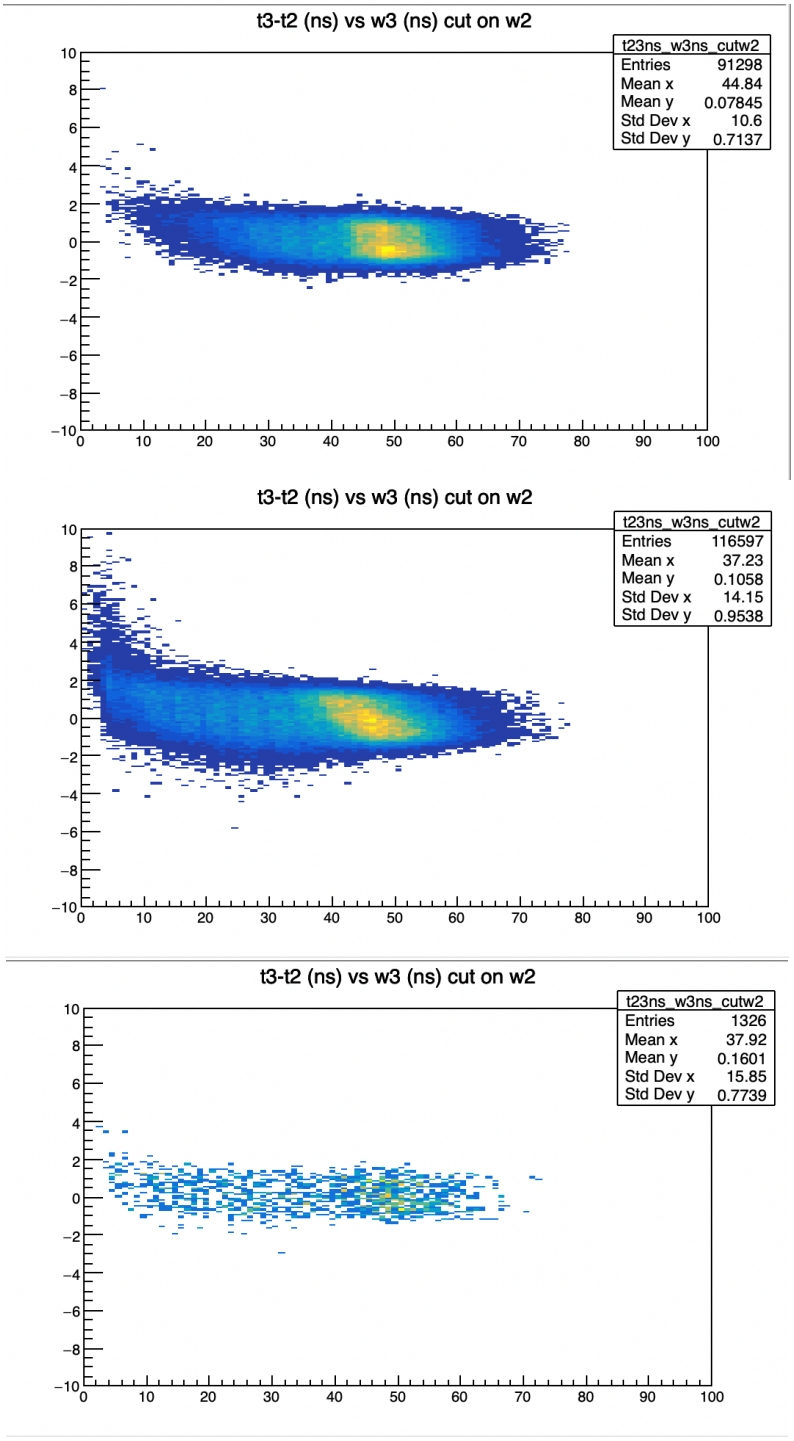

Figure 6: Time difference along the paddle between boards 2 and 3 versus the width on board 3 with a cut on w2. From top to bottom: run 906074, 906075, 906076.

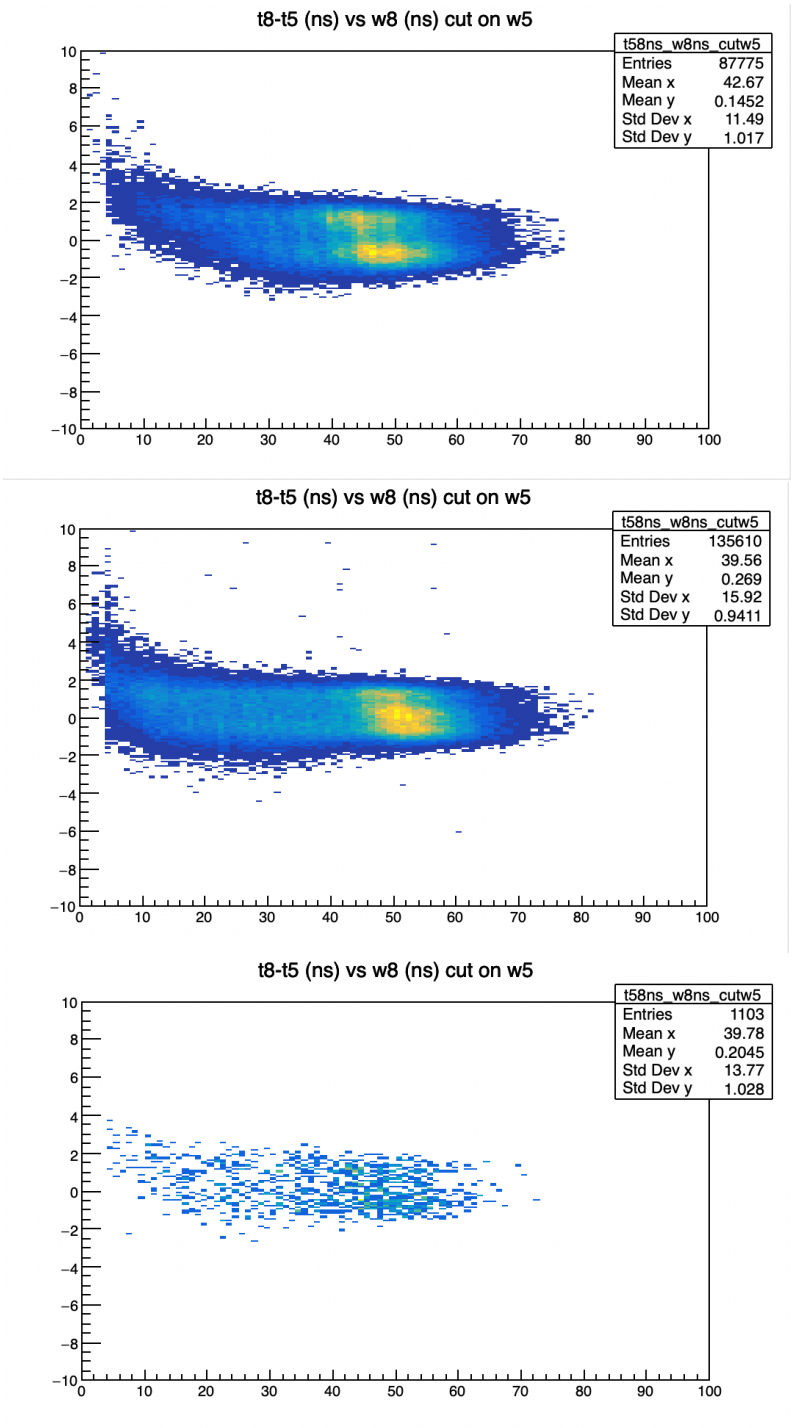

Figure 7: Time difference along the paddle between boards 5 and 8 versus the width on board 8 with a cut on w5. From top to bottom: run 906074, 906075, 906076.

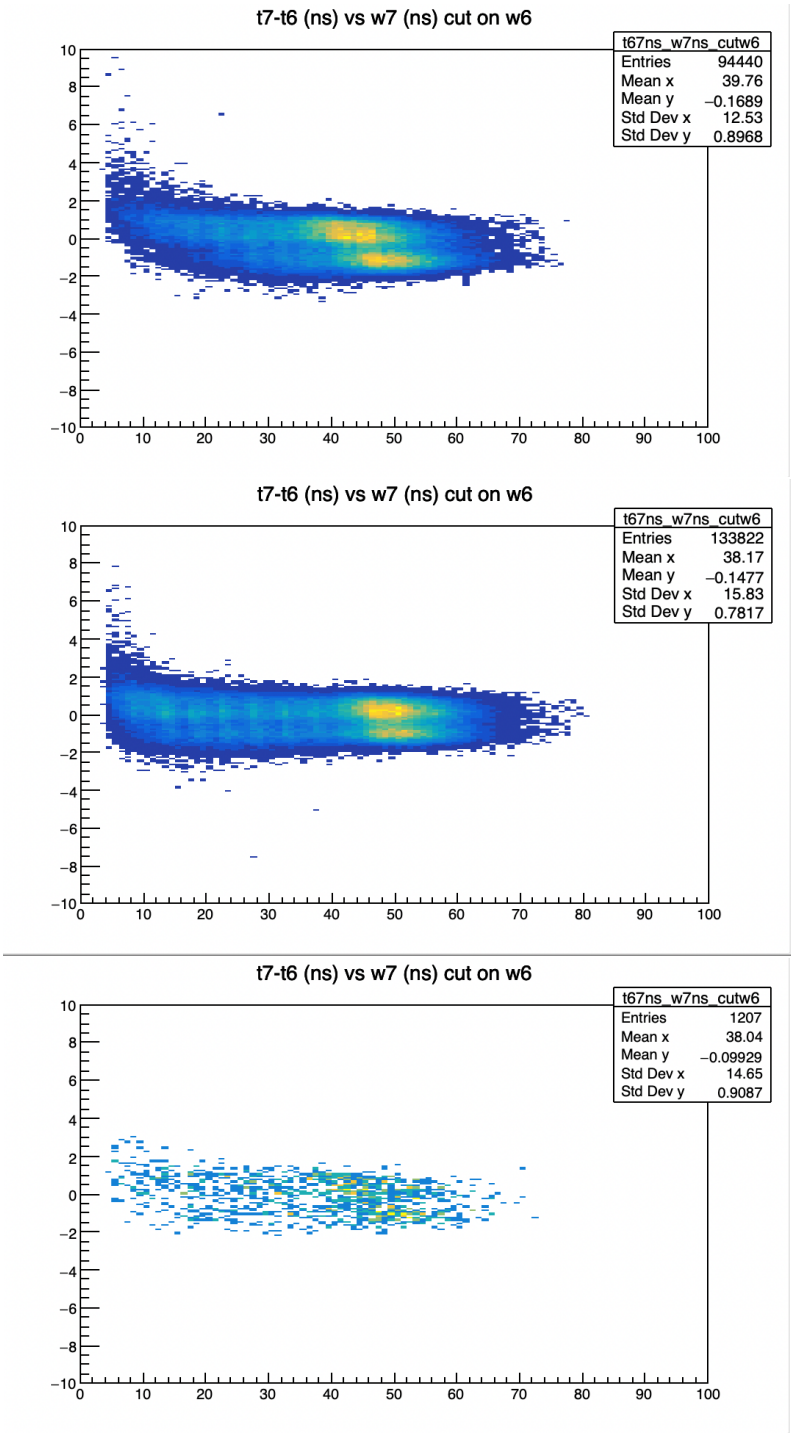

Figure 8: Time difference along the paddle between boards 6 and 7 versus the width on board 7 with a cut on w6. From top to bottom: run 906074, 906075, 906076.

3 Time Difference with Average vs Width

The plots for run 906076 had so few counts after cuts that they are of no use to include here. Comparing runs 906074 and 906075 the primary difference seen is the greater spreading (both in the left tail and center hot spot) in run 906074 compared to 906075.

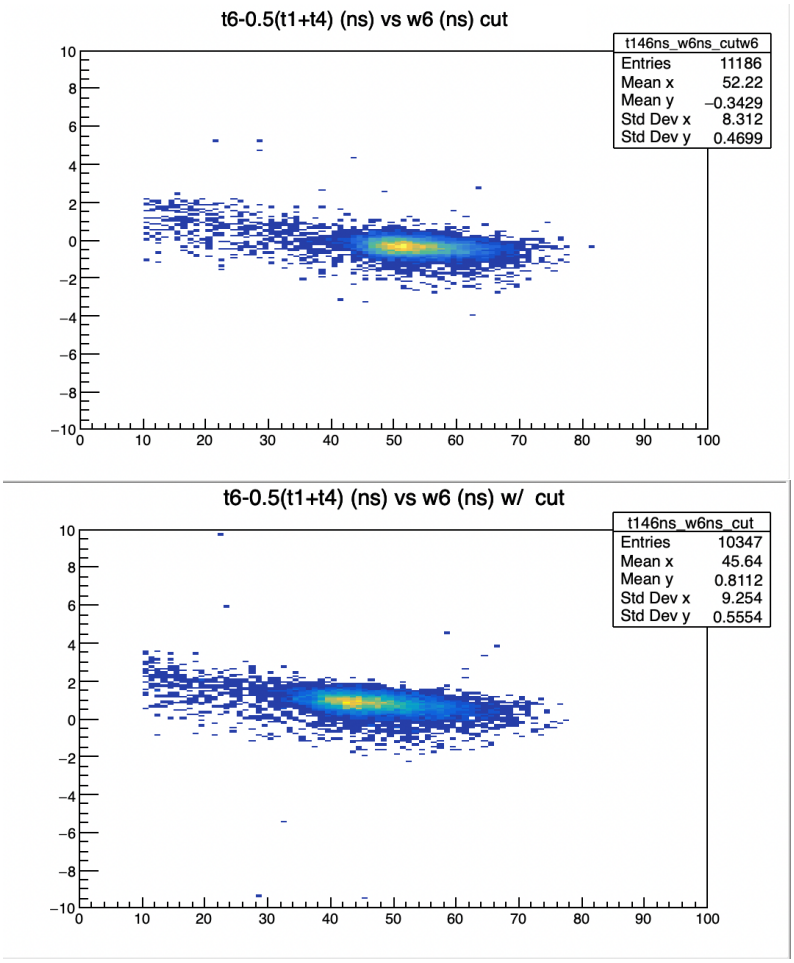

Figure 9: Time difference of $t_6 - \frac{1}{2}(t_1 + t_4)$ versus pulse width (ns). Run 906074 is on the top and 906075 on the bottom.

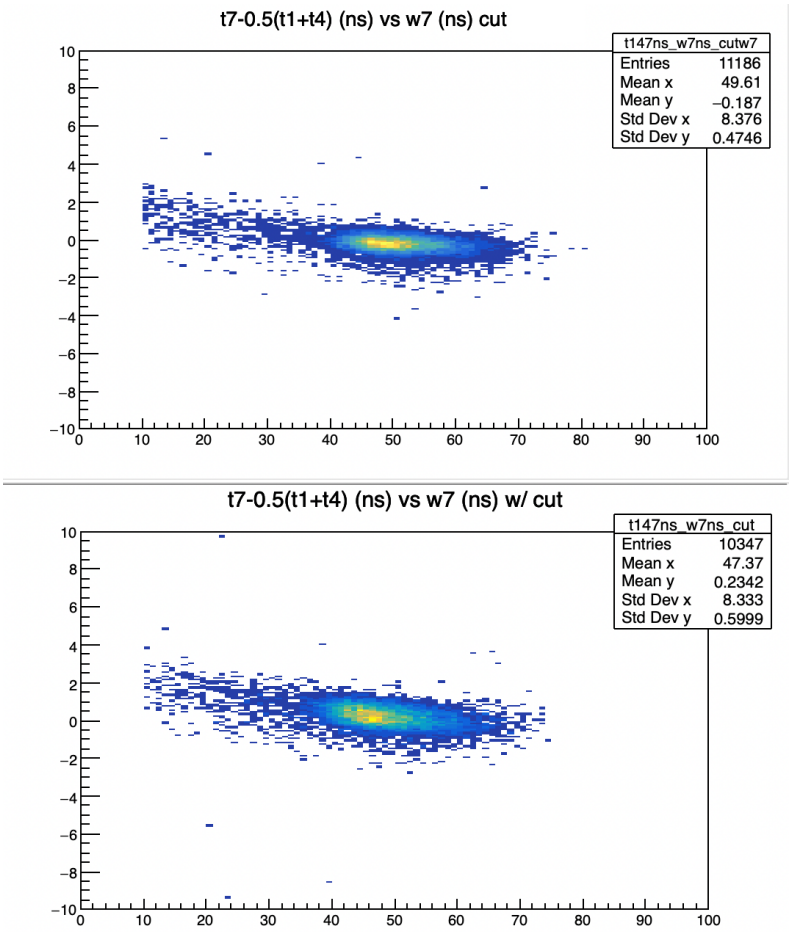

Figure 10: Time difference of $t_7 - \frac{1}{2}(t_1 + t_4)$ versus pulse width (ns). Run 906074 is on the top and 906075 on the bottom.

4 Time-of-Flight

All time-of-flight plots formed a smooth Gaussian with no major deformities. There is no obvious consistent visual difference between the plots for each run when examining across time differences. One way these results differs from those presented in section 1 is here we commonly see a closer agreement in standard deviation of the fit between the two runs with the same cabling (runs 906074 and 906076) than we see with run 906075 and either of the two plots. The centroid of each plot shows little deviation within a given time-of-flight calculation, though there is no consistent run pairing that best agree with each other.

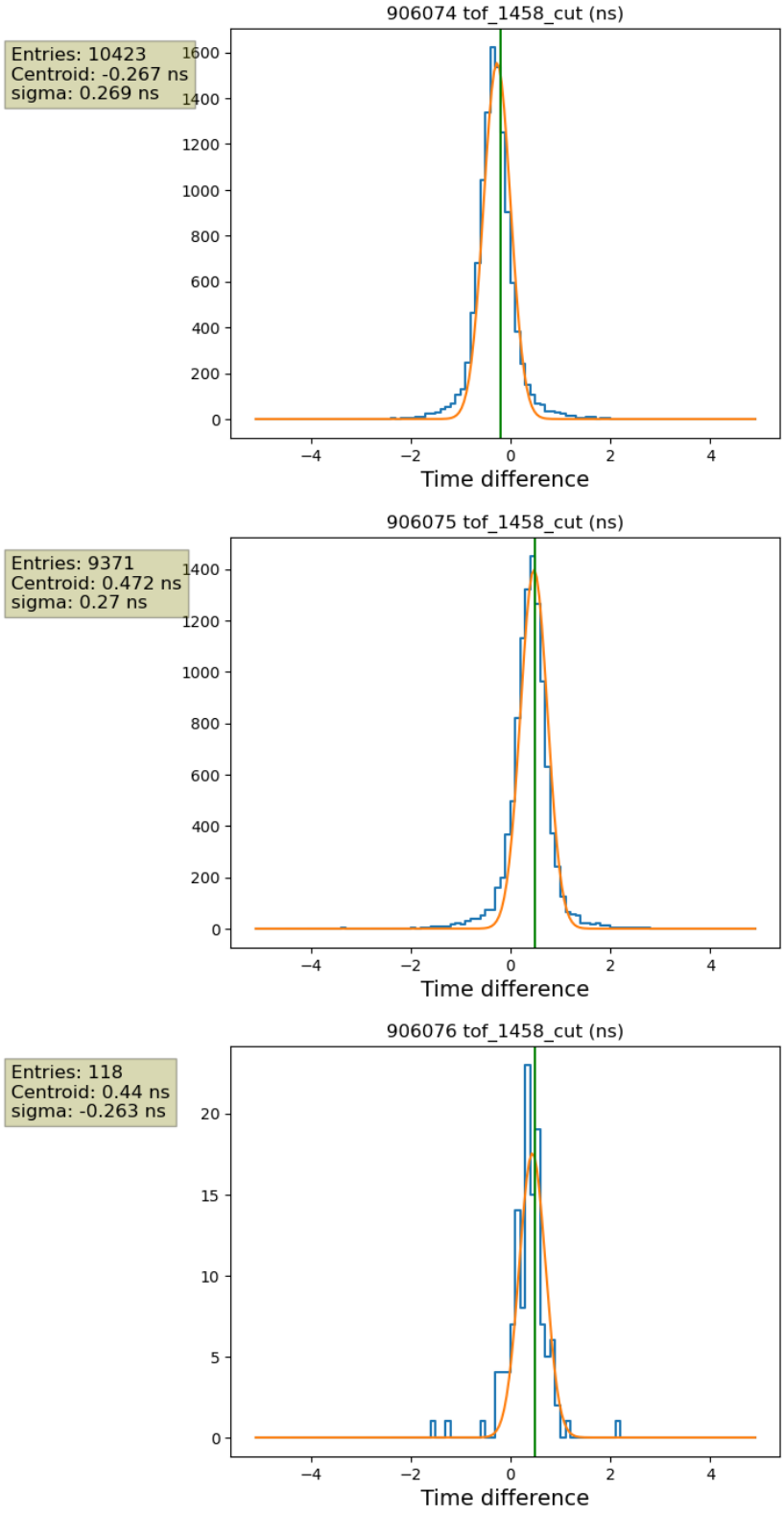

Figure 11: Time-of-flight between top and bottom board for a coincidence on 14 and 58 for run 906074 (top left), 906075 (top right), and 906076 (bottom).

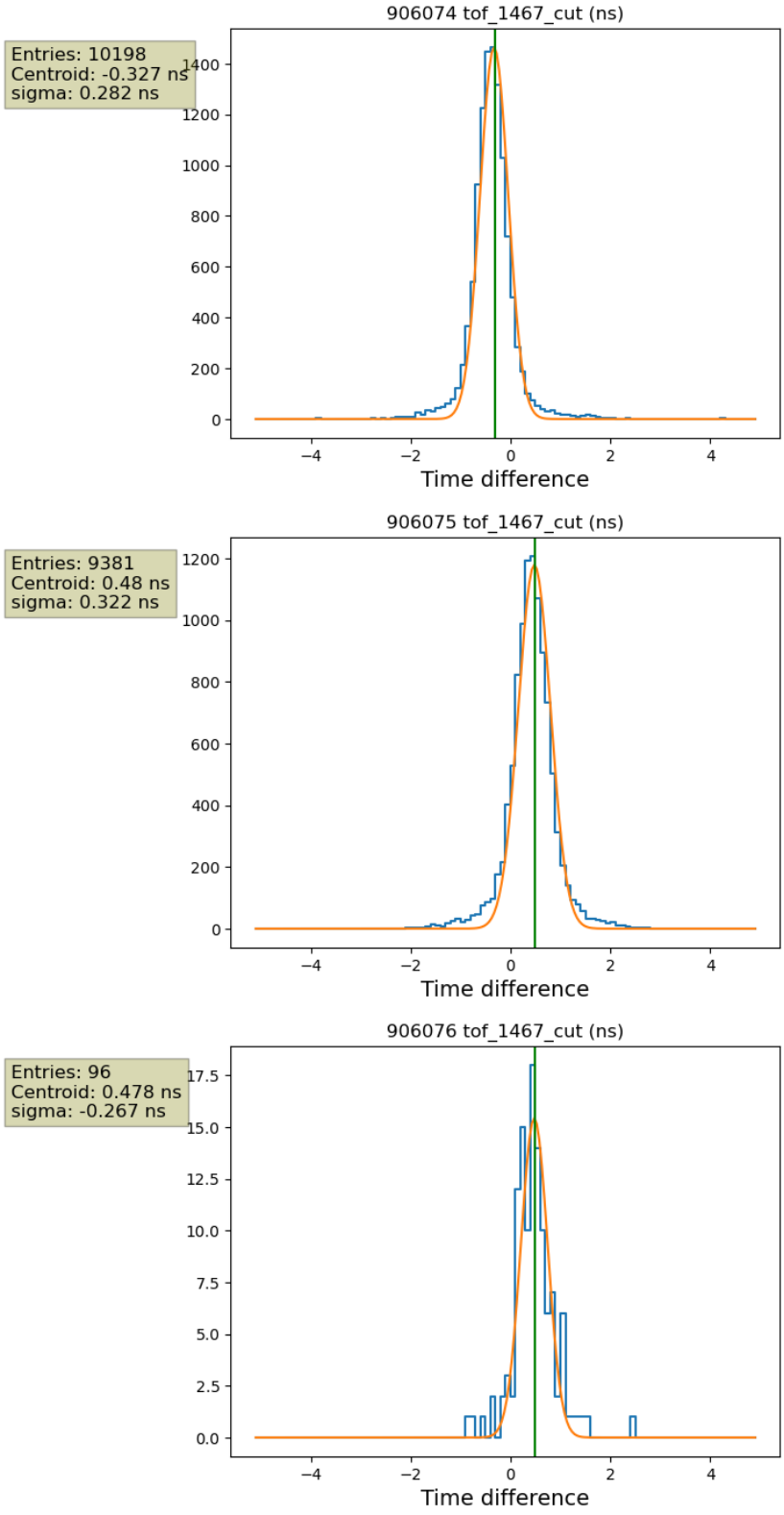

Figure 12: Time-of-flight between top and bottom board for a coincidence on 14 and 67 for run 906074 (top left), 906075 (top right), and 906076 (bottom).

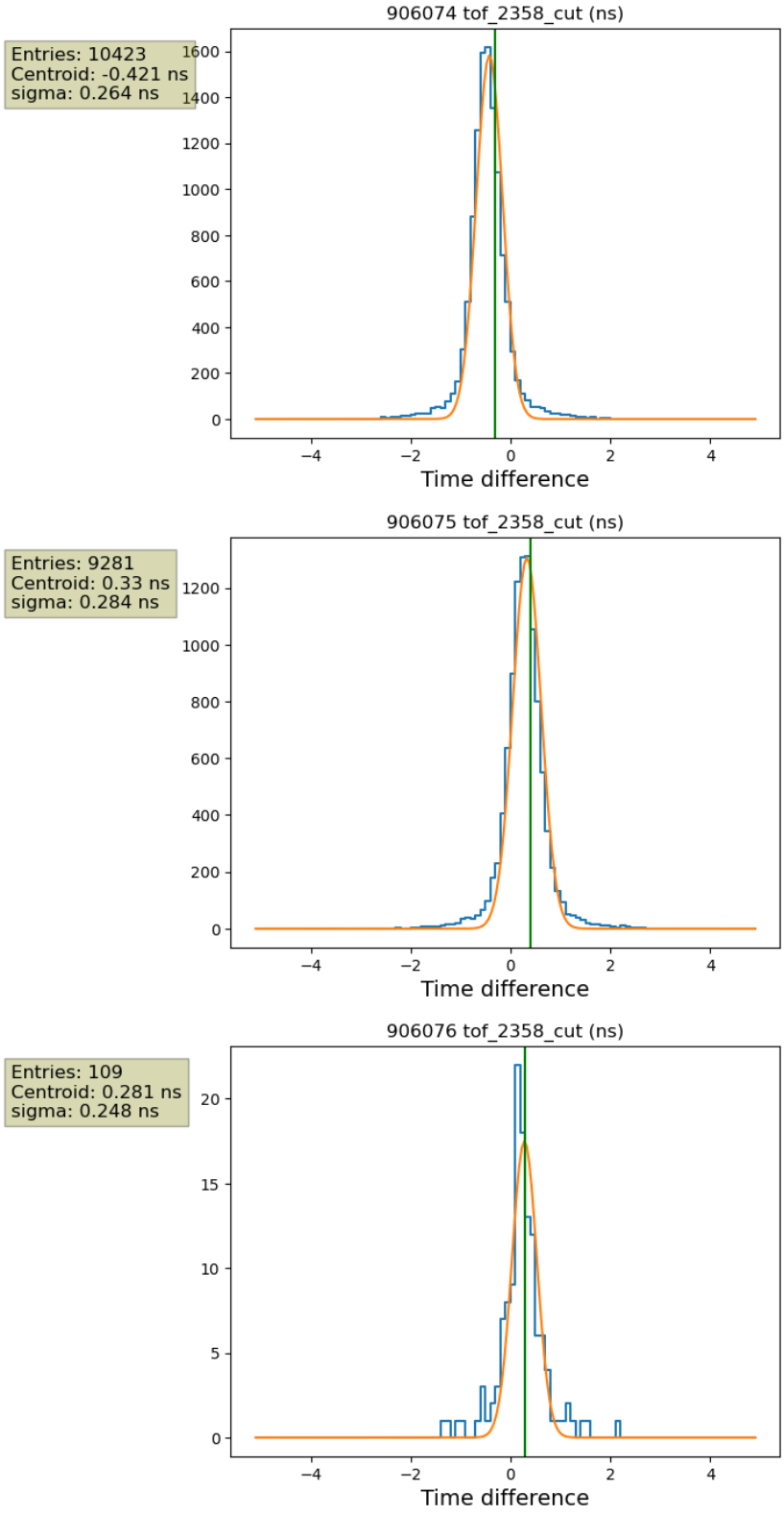

Figure 13: Time-of-flight between top and bottom board for a coincidence on 23 and 58 for run 906074 (top left), 906075 (top right), and 906076 (bottom).

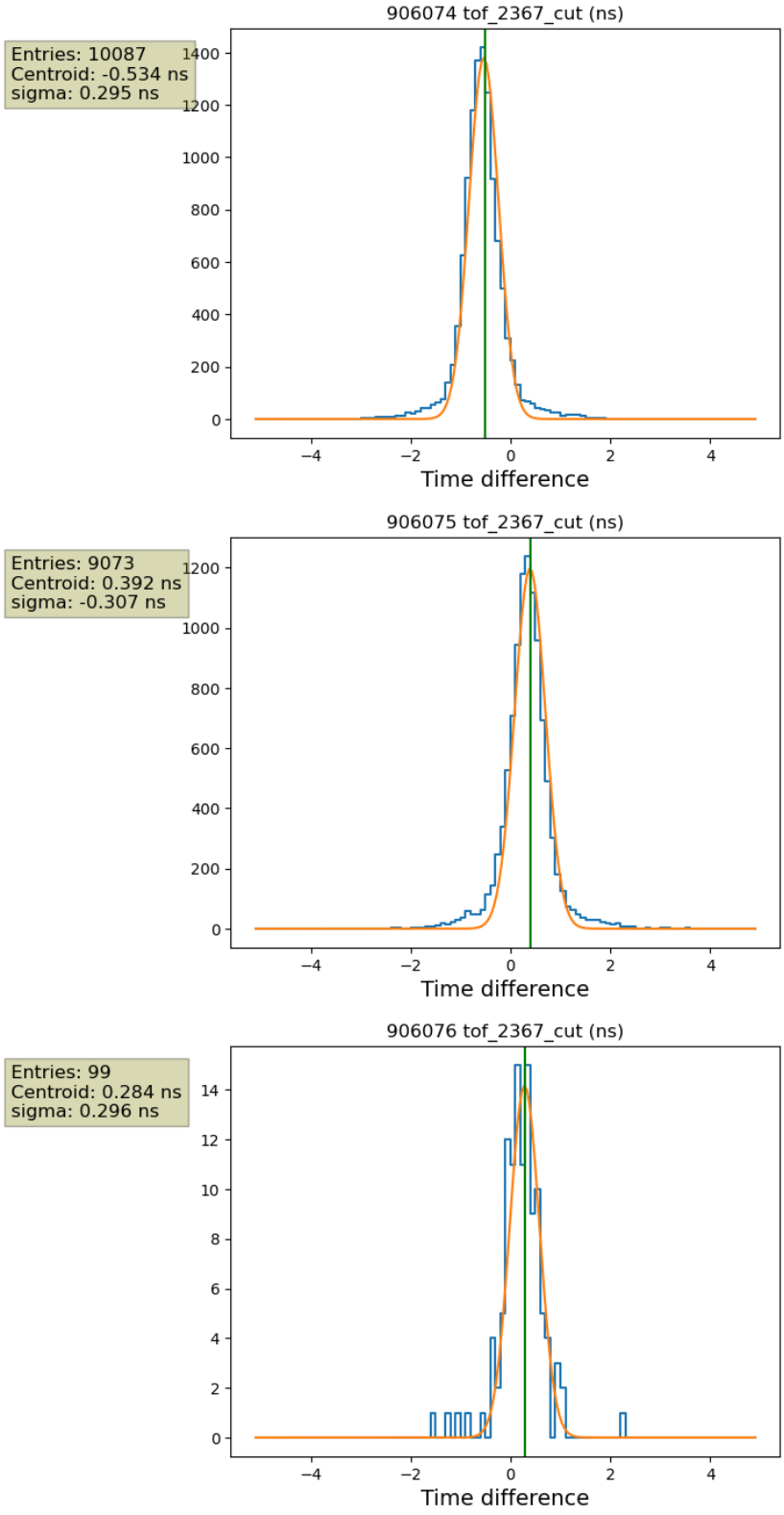

Figure 14: Time-of-flight between top and bottom board for a coincidence on 23 and 67 for run 906074 (top left), 906075 (top right), and 906076 (bottom).