



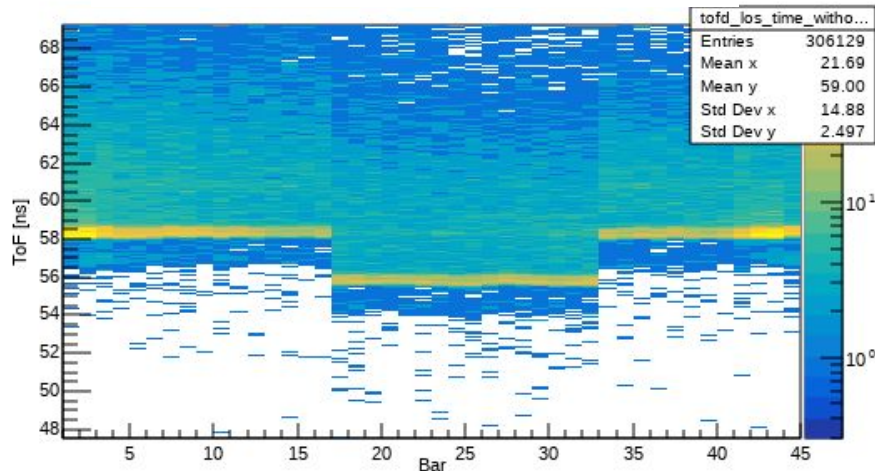
How to get rid of the 5ns time jumps

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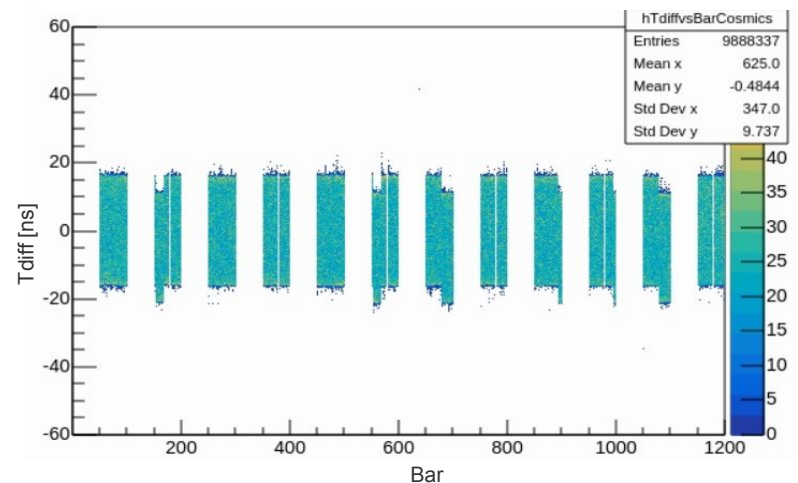
In the R3B cave we measure times relative to a common 200 MHz clock.

- In the past we observed 5 ns time jumps between TAMEX cards of one detector and between detectors which used TAMEX cards for the read-out.

ToF between LOS and ToFD



NeuLAND time difference left-right



How did we tackle the problem?

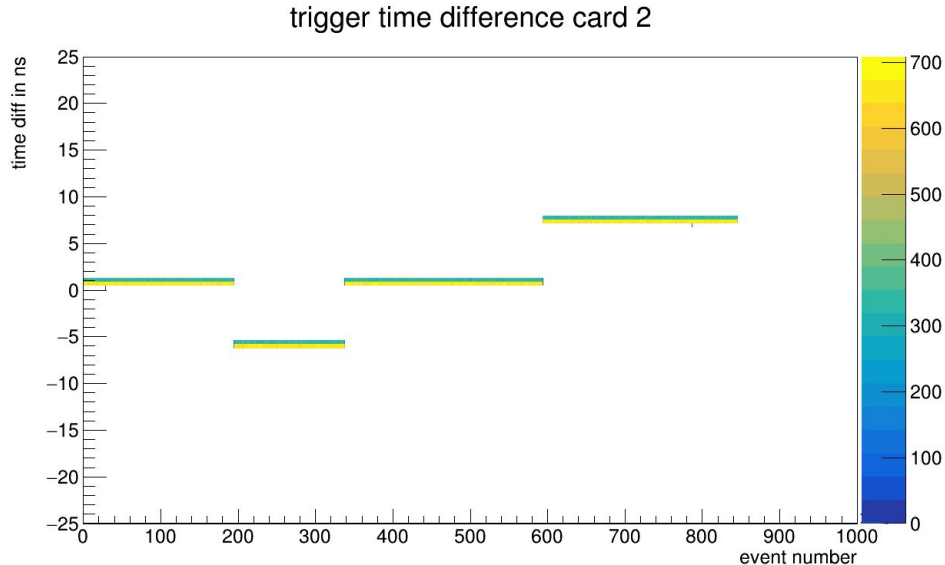


This was a long standing problem and also on the DAQ ToDo list.

- One work-around to that problem was the introduction of trigger times per board and to consider only time differences relative to the trigger time: $t - t_{\text{trigger}}$
But: For ToF between two detectors one loses a factor of $\sqrt{2}$ in time precision.
- Another solution is to introduce an absolute time in form of a T0 signal. This would allow to detect and correct the time jump.
But: In this case one needs extra channels.

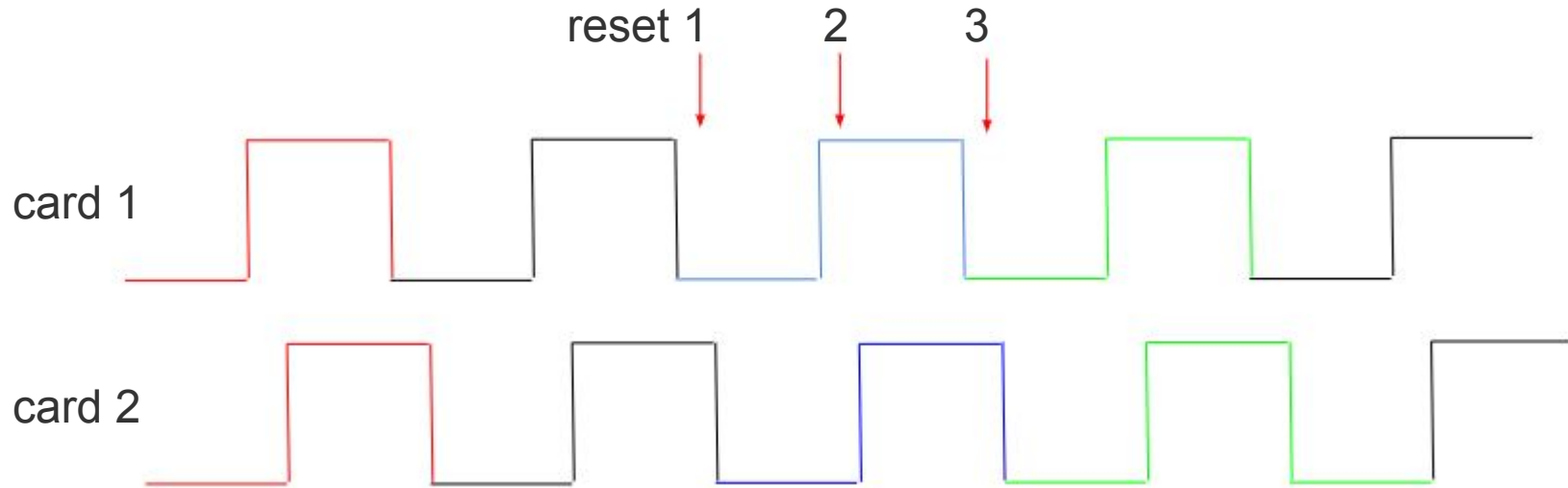
New electronics, same feature

- New electronics e.g. MPPC_ROB3 showed the same feature.
- Since the common clock here is 150 MHz we observe time jumps of 6.67 ns.
- The trigger time difference is a good observable to detect time jumps.



The reason for the time jumps

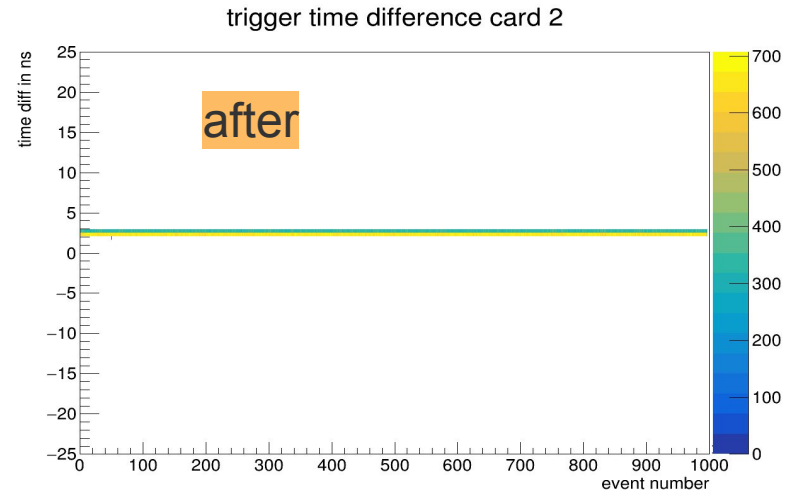
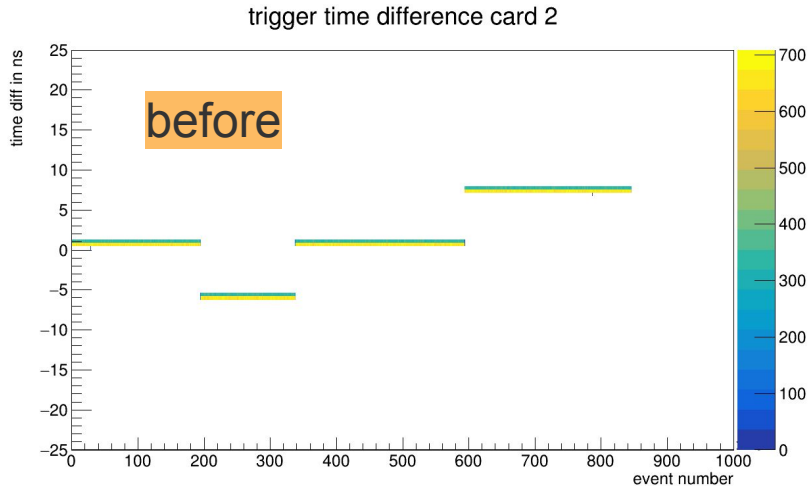
After DAQ start or reset we do a “coarse counter reset on first trigger”.
 But read-out errors cause a reset of the electronics and for every reset there is a change that the first trigger falls in different clock cycles:



The solution

New firmware by Shizu Minami (EEL) which does the “coarse counter reset on first trigger” only if requested.

The solution was tested with a fiber detector (8 MPPC_ROB3 cards) and mbs, but is not yet included in nurdlib.



Conclusion

- In the past we observed time jumps of the coarse counter between electronic cards.
- The reason for this was the “course counter reset after first trigger” which was executed after DAQ starts and after error resets.
- A new firmware from EEL (Shizu Minami) solves the problem.

The next experiment will show if there are remaining other causes for time jumps.

