Timing

Details from analysis on performance

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Timing distributions

Strategy for the time resolution.....

$$\Delta t = \frac{t_{top} + t_{bot}}{2} - t_{mid}$$

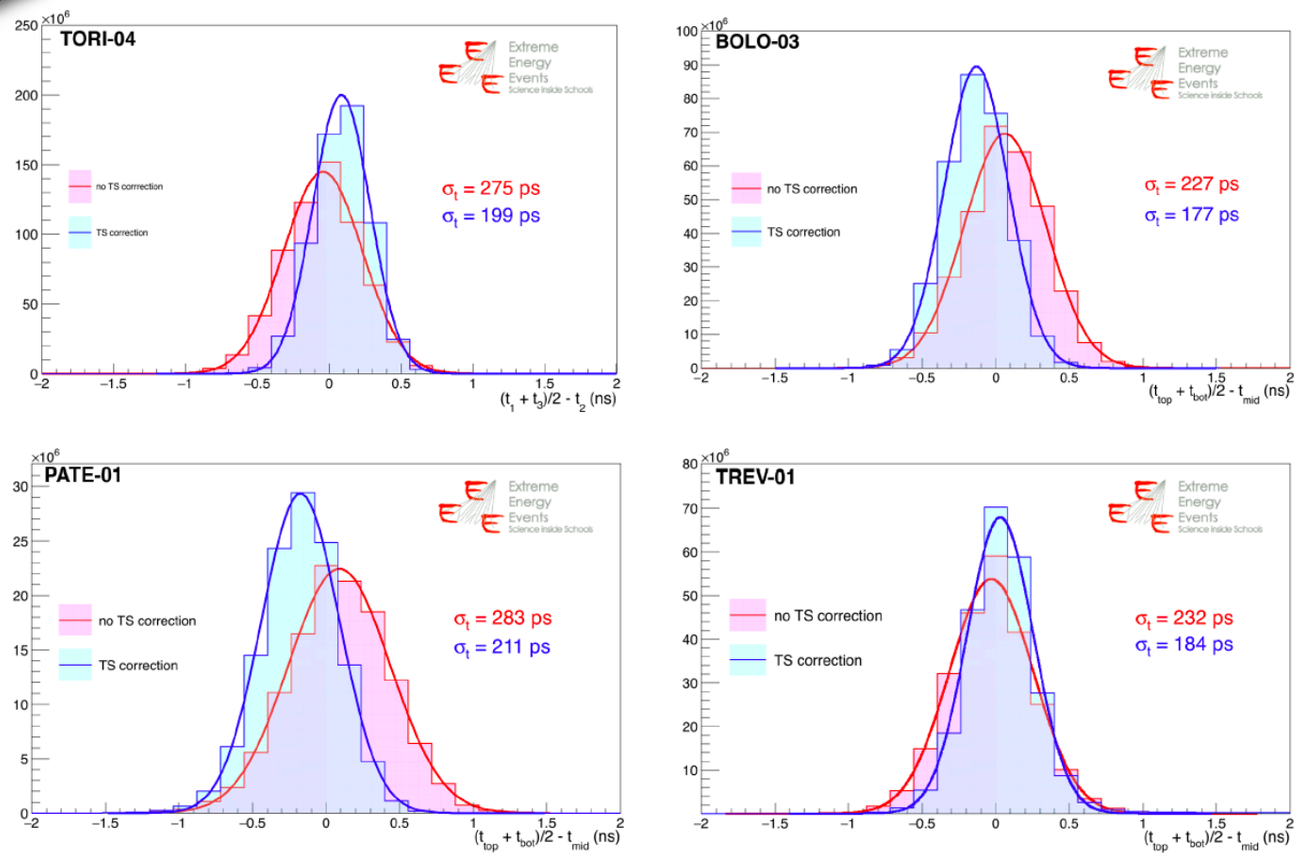


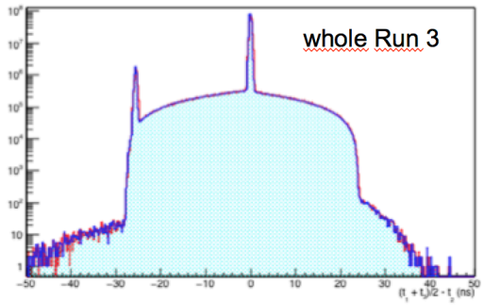
Figure 9: Time distributions for the telescopes: TORI-04, BOLO-03, PATE-01 and TREV-01 (respectively located in Piedmont, Emilia Romagna, Sicily and Veneto), measured with data taken in Run 3; the distribution and the time resolution before and after TS correction are shown. The displacement of the mean value of the distribution is due to residual systematic uncertainties (i.e. z displacement of the middle chamber, cables length, electromics delay) wich need to be corrected.

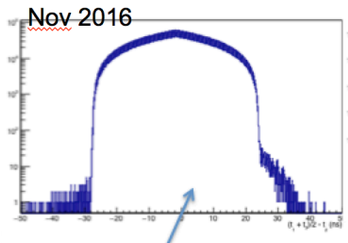
- Check calibrations, cable length, distance between chambers to understand the mean values different from 0
- This is not the topic of this talk
- Secondary peaks were visible and discussed in a collaboration meeting in 2017

Secondary peaks

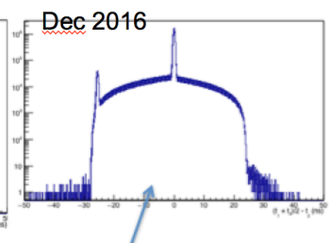
Collaboration meeting 10 May 2017

BOLO-03 (log y scale)

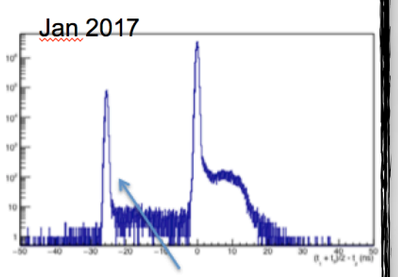




no clock card here



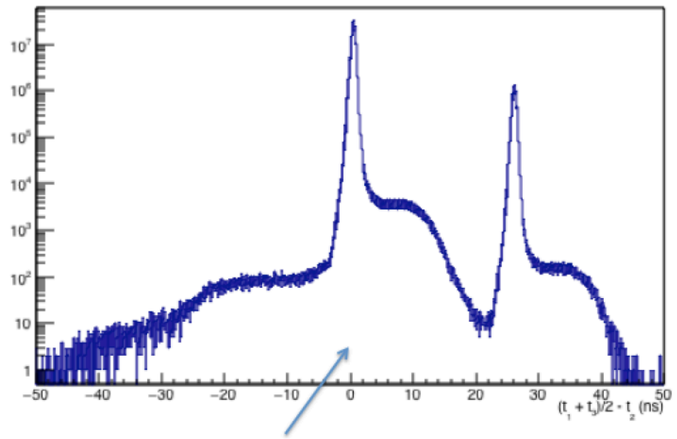
no clock card here
in part of this period



clock card ok
but what is the other peak? →
→ trigger arriving at the next clock?
→ reflections?

TORI-03 (log y scale)

whole Run 3



clock card ok
but what is the other peak? →
→ trigger arriving at the next clock?
→ reflections?

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Secondary peaks

✓ if they are due to reflections, in principle we could correct them

✓ for some analysis this could maybe be important (?)

Ref. Nuclear Instruments and Methods in Physics Research A 593 (2008) 263– 268

chambers was encoded into the width of the LVDS pulse sent to the TDCs. The TDCs measured the time of both edges of the pulse (leading and trailing) and thus the width could be used to correct for slewing. The variation of the time measured by the MRPC as a function of the width of the signal (i.e. input charge) arriving at the TDC is shown in Fig. 9. This plot shows the problem that we had with this device. The input impedance of these cards was set at 50 Ω adjusted to match the impedance of the readout pads of the ALICE-TOF MRPCs for which the card was designed; the strips in this chamber have a characteristic impedance around 100 Ω. This mismatch resulted in reflection of the signal. This had the effect of generating a long tail of long pulses; all the widths greater than 18 ns shown in Fig. 10 are produced by these reflecte pulses. In some positions along the strips, this tail becam dominant and it was difficult to make slewing correc thus the time resolution was worse than expected shown later. The time distribution after this sle is

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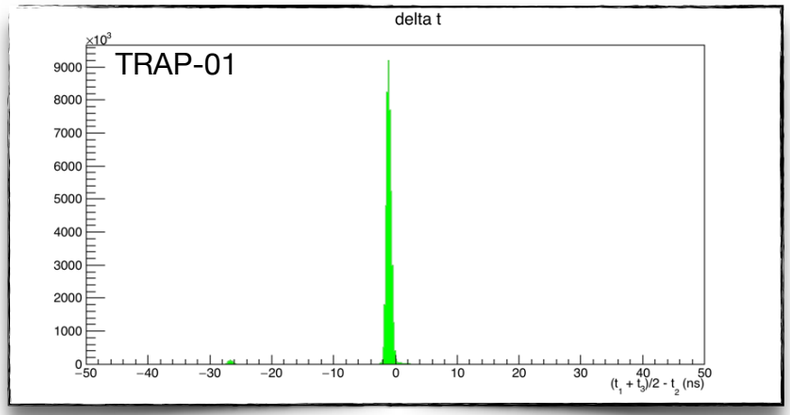
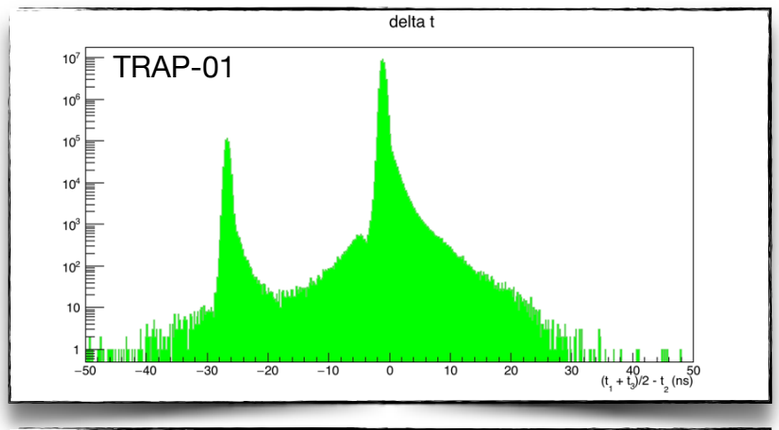
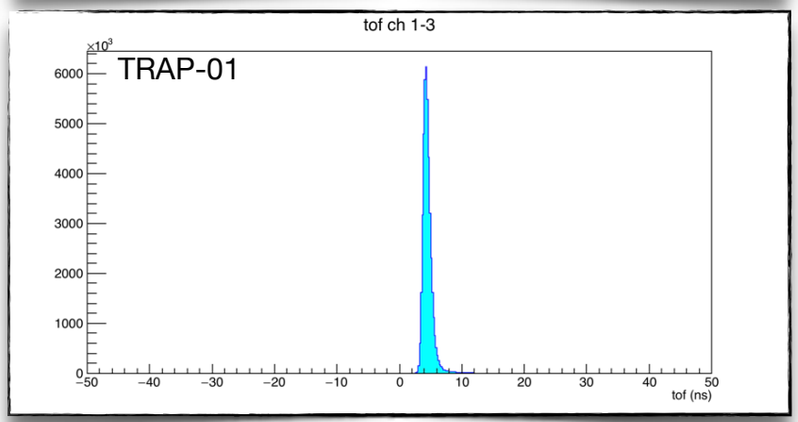
- Secondary peaks in the timing distribution
- Proposed explanations at that time:
  - one clock pulse lost
  - reflections
- Further investigation was needed
- Preliminary checks in the next slides

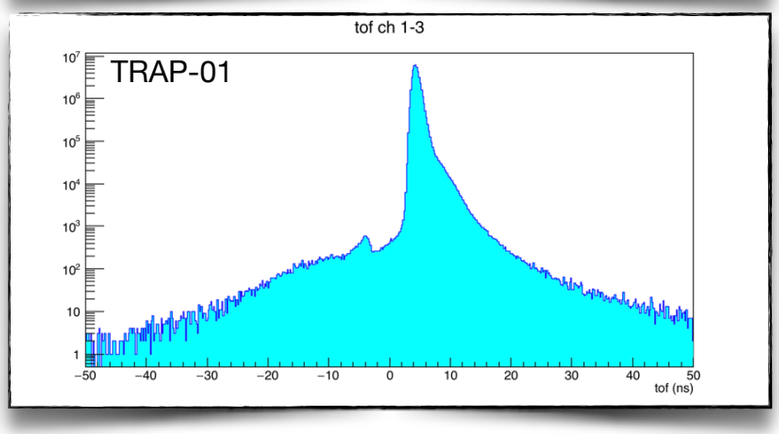
Secondary peak and time of flight



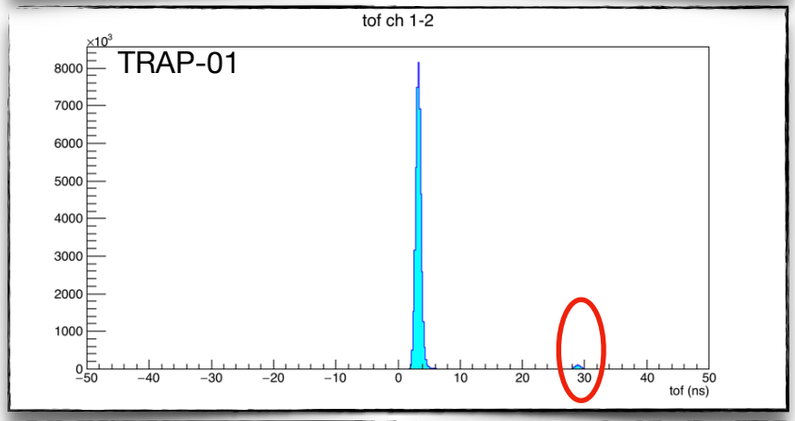


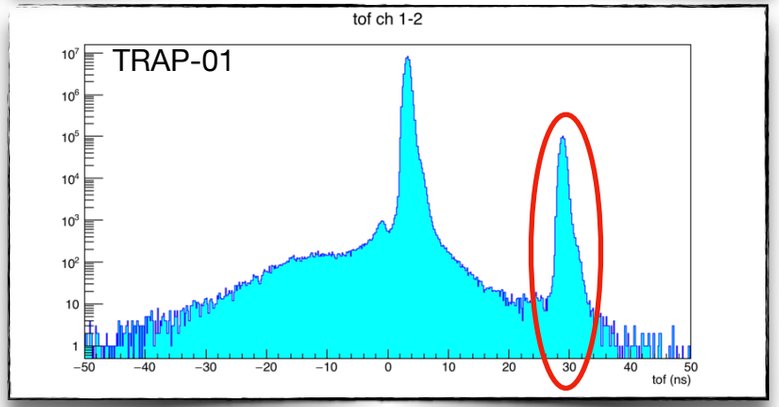
- $t_{expected}$ - $t_{meausred}$ on chamber 2 to measure σ_t
- Secondary peak at 25 ns



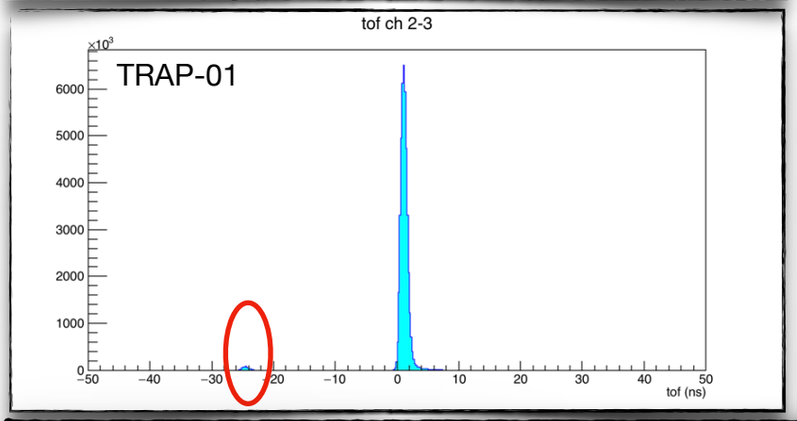


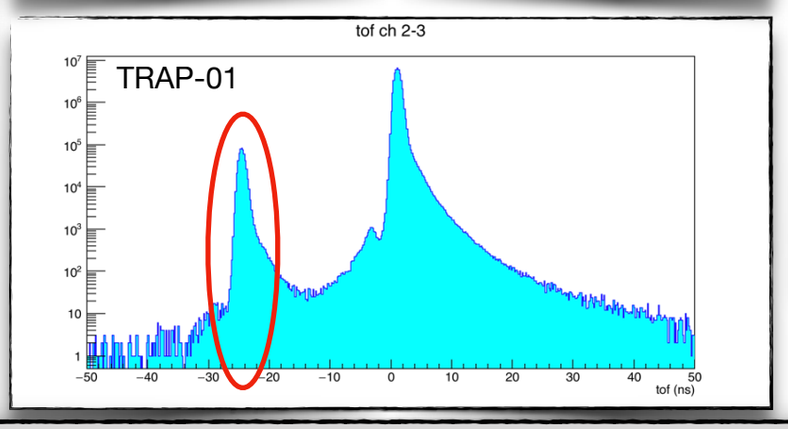
- Time of flight between chamber 1 and 3
- No secondary peaks





- Time of flight between chamber 1 and 2
- Secondary peak at 25 ns





- Time of flight between chamber 2 and 3
- Secondary peak at 25 ns

Conclusions

- The same behavior is visible on other telescopes (further check soon)
- **Peaks appear when using middle chamber in the measurement**
- Secondary peak at 25 ns (clock frequency)
- Is the offset introduced by the clock card?

- Next:
  - check data from telescopes with new trigger card (VICE-01)
  - study correlation with other quantities