TTS Measurement in container 1

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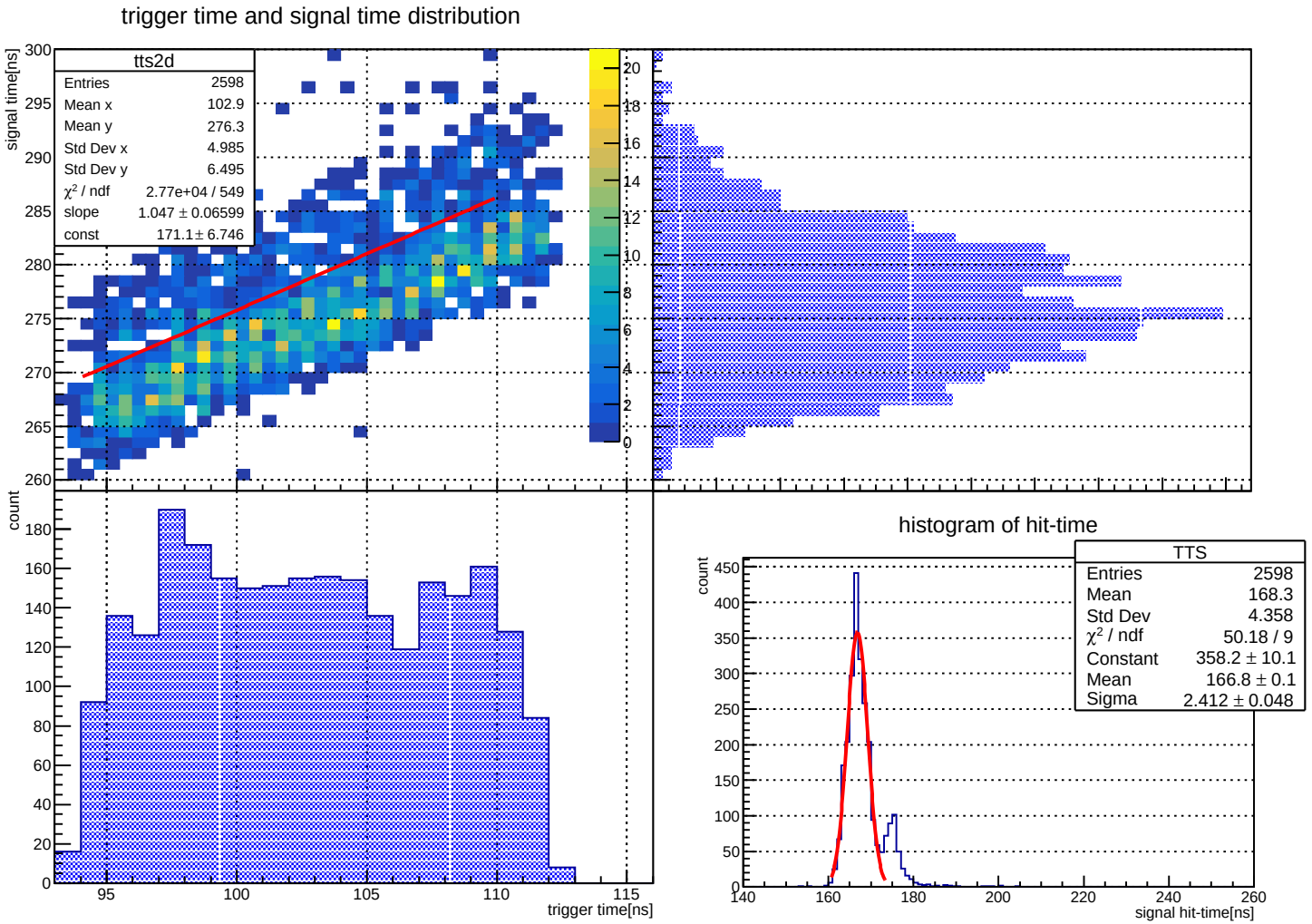
Trigger Time and Signal Time

Below is a typical trigger time — signal time correlation histogram.



discuss about the results

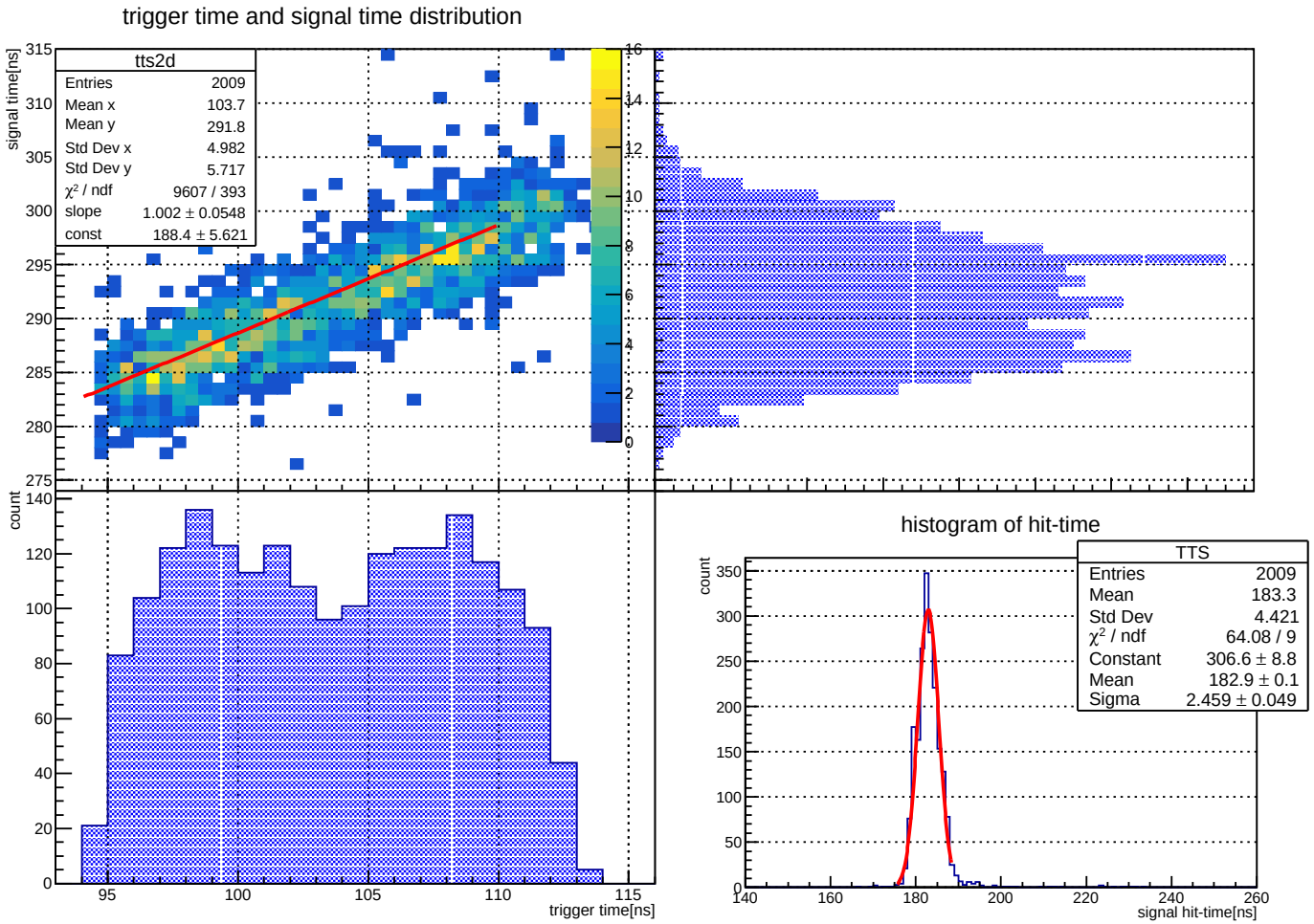
The data of this plot is from container 1, mass274, drawer 113, SN=EA1578, one of the reference tubes.
”time-amplitude” correction is applied.

We can see from the above figure that:

- The PMT signal time is proportional to trigger time as we expected.
- Trigger time follow a uniform distribution
- PMT signal time, which is the convolution of PMT-TTS and system response, is gaussian like.
- In the 2-D histogram, two adjoining linear bands exist corrsponding to the small peak in the ”hit-time” histogram.

same PMT another drawer

"but when the same PMT was tested in another drawer" , we see only one peak in the hit-time distribution histogram.



discuss about the results

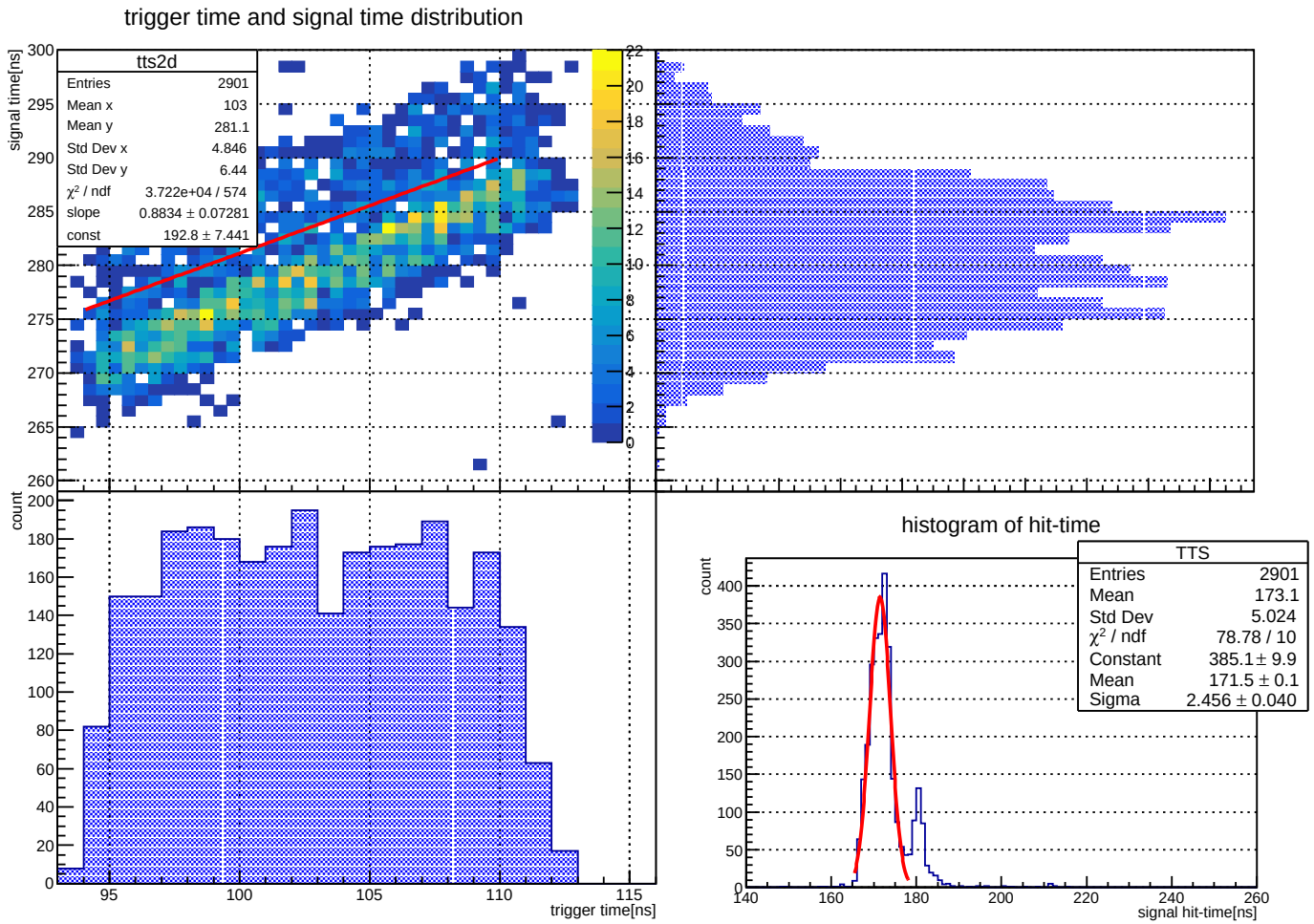
The data of this plot is from container 1, mass283, SN=EA1578,drawer124.

The hit-time performance of EA1578 is quite different in two drawers, and then I guess the small peak in the ”hit-time” histogram may not caused by PMT itself.

Then I focus on the two drawers 124 and 113 , and extract the data when another referencre tube ”EA0419” was tested in these drawers.

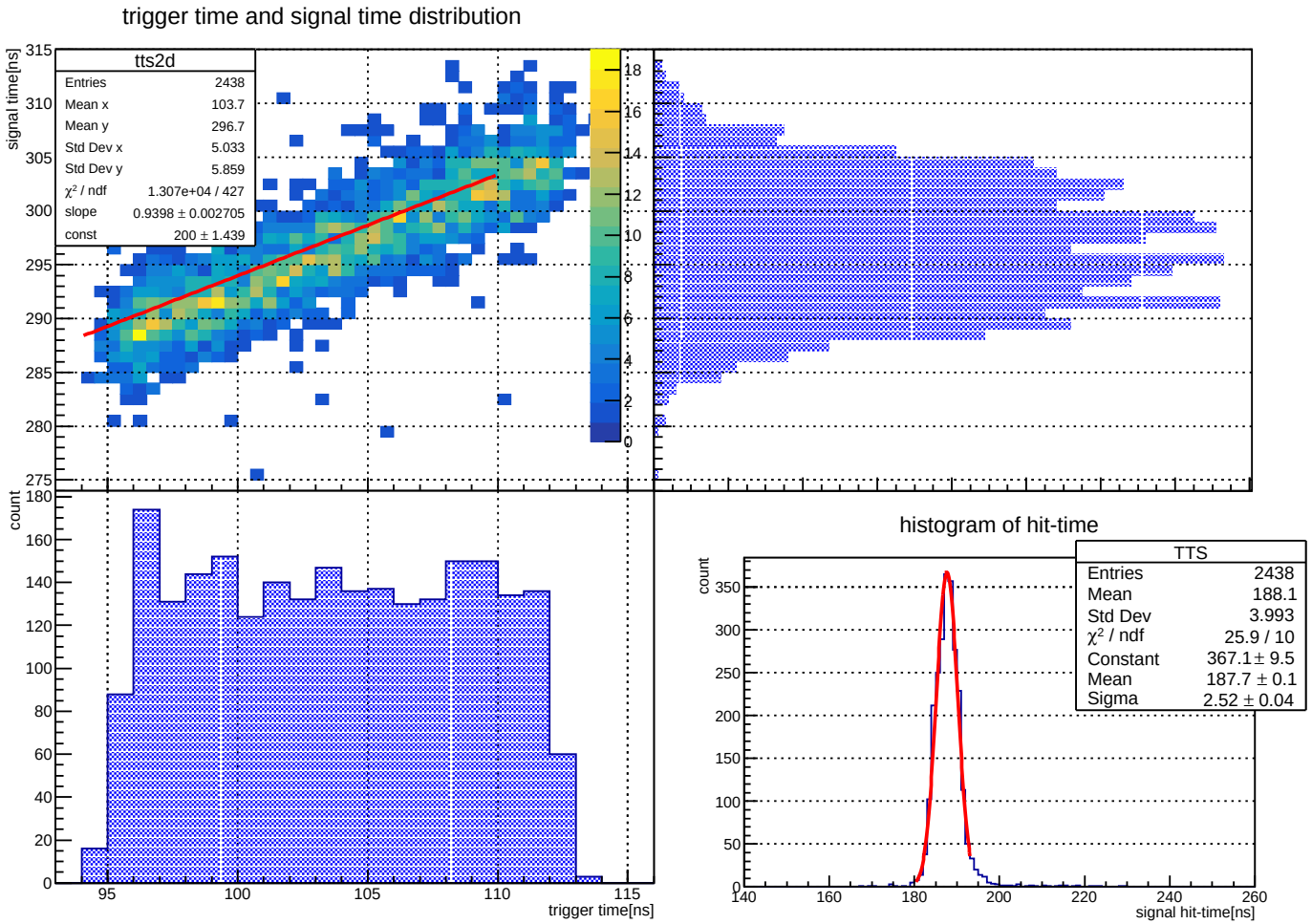
EA0419

when EA0419 was tested in drawer 113 and mass 282, the ”small peak” appeared again.



EA0419

when EA0419 was tested in drawer 124 and mass 273, the ”small peak” disappeared.



conclusion

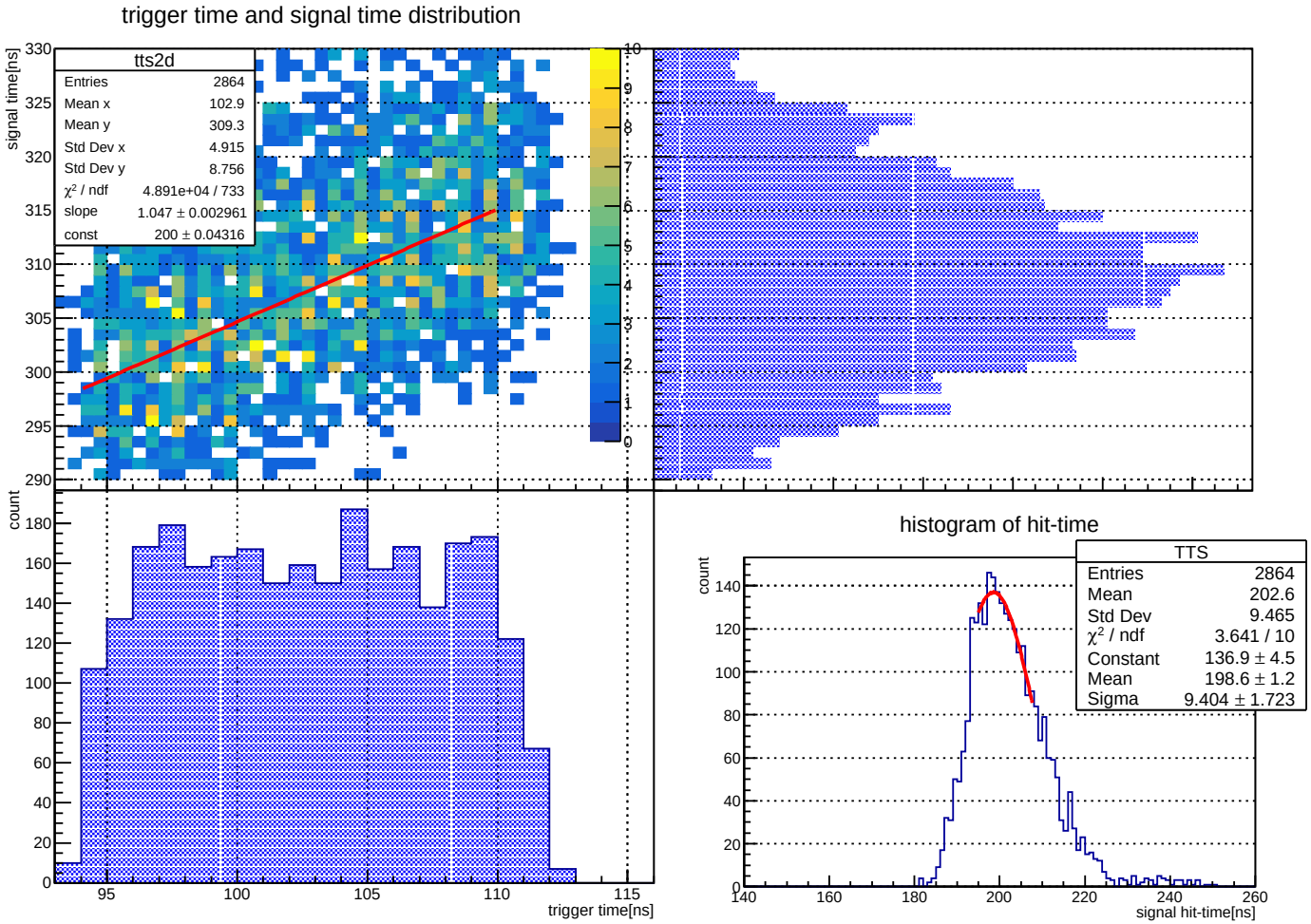
It seems that the hit-time distribution is drawer related.

Then I randomly selected several HAMAMATSU PMTS tested in drawer 113, their hit-time histograms all have ”small foollowing peak”; While those PMTs tested in drawer 124 still only have one peak.

So, it can be confirmed that the final hit-time distribution is drawer related rather than PMT related, and the measurement data need to be refined to meet our requirement.

MCP-PMT

For MCP-PMT the hit-time distribution is quite bad.



discuss about the MCP results

The data of this plot is from container 1, mass277, drawer 113, SN=PA1703-1645, MCP-PMT.

We can see from the above figure that:

- The PMT signal time is proportional to trigger time but worse than HAMAMATSU PMTs.
- Trigger time also follow a uniform distribution
- PMT signal time, has a larger spread than HAMAMATSU PMTs.
- In the 2-D histogram, the ”small peak” in hit-time histogram become unclear but still recognizable.
- Since the bad time performance of MCP tubes, they are not appropriate for system noise study.
- The hittime of MCP PMT is slower($\sim$20ns) than HAMAMATSU PMT.

improvements

- Firstly, we need to evaluate the iternal time variation of electronics in each drawer.(one possible way is to replace the PMT output signal with corresponding synchronized TTS signal as the input of FADC).
- Then, check and ensure the electronics time response meet our resolution requirement.

Thank You