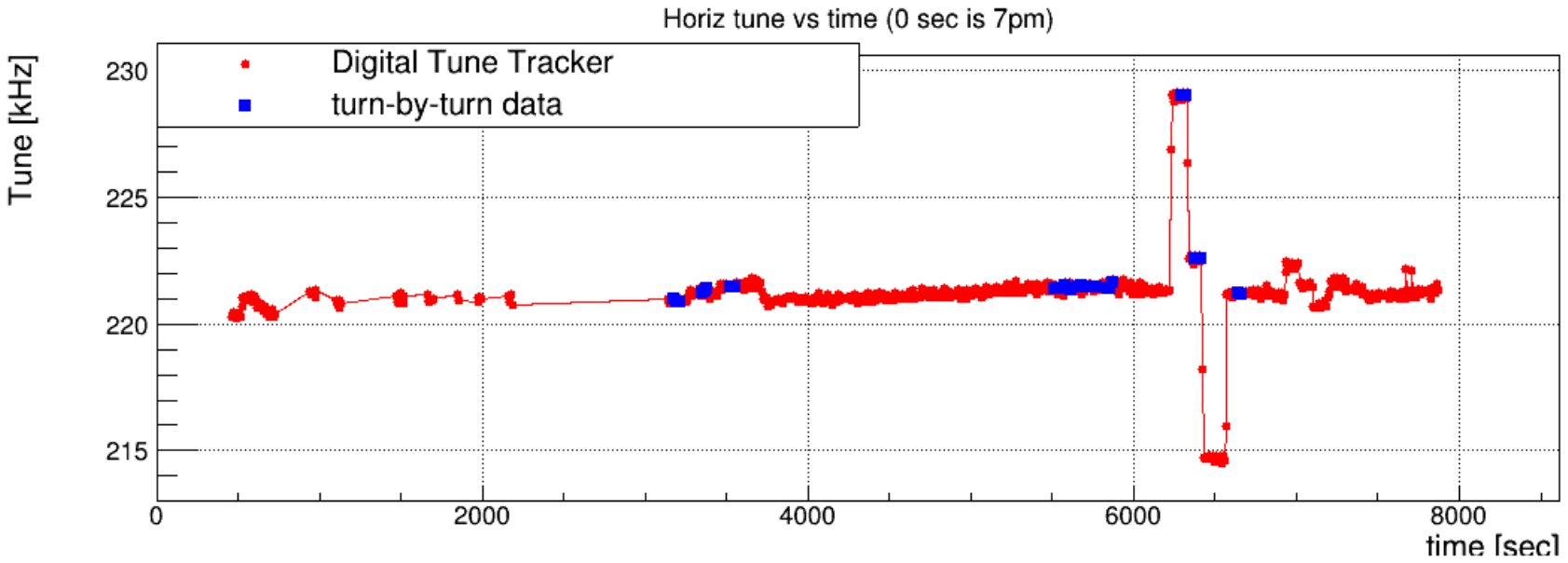
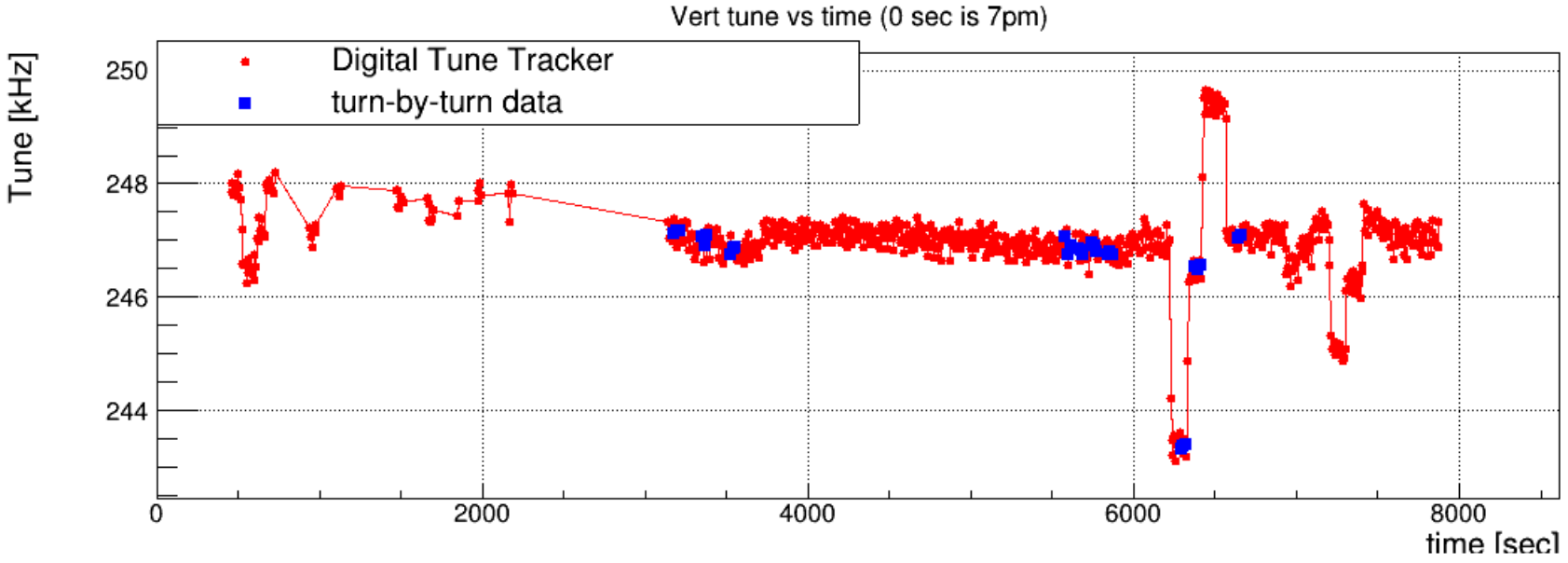
Comparison of DTT and TBT tunes from Friday (02.20.2021) shift

- During the shift I put Suntao's program into a script and was recording DTT tunes.

- At the beginning the tunes were recorded during TBT (turn-by-turn) data taking only, later I made two separate scripts and started recording tunes continuously.
- Red markers are DTT tunes, blue markers are tunes reconstructed from TBT data. (see the



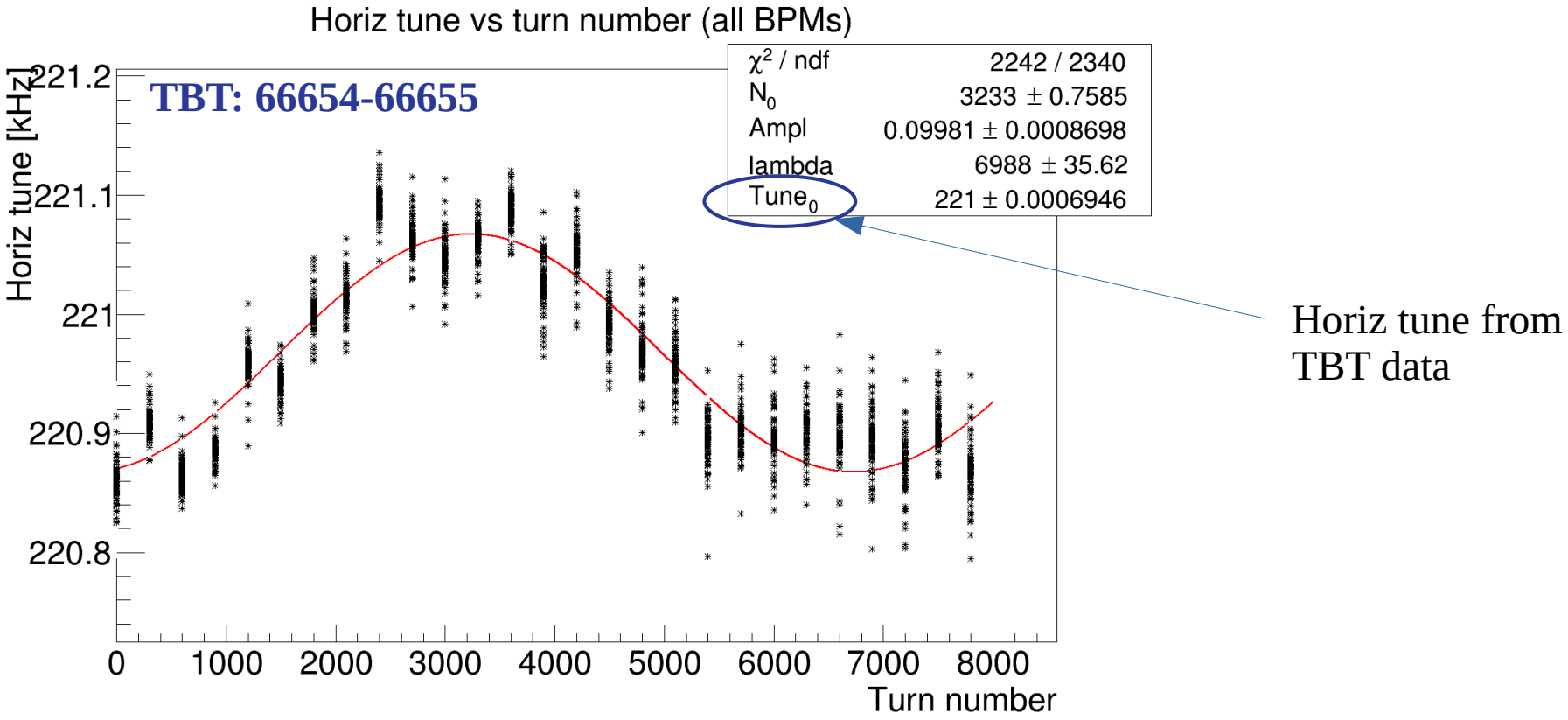


- For the tune calculations, the data are divided into 300-turn groups
- Each BPM used separately to calculate the tunes in these 300-turn groups. Each point on the plot corresponds to a tune calculated using only one BPM.
- To subtract the 60Hz tune modulation the final distribution is fitted with the following function

  $F(x)=Ampl*\cos((x-N_0)/lambda)+Tune_0$,

  where Ampl, N_0, lambda and $Tune_0$ are fit parameters

  (this is a very preliminary method, which should be improved for better results)



Horiz tune from TBT data

- For the tune calculations, the data are divided into 300-turn groups
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- To subtract the 60Hz tune modulation the final distribution is fitted with the following function

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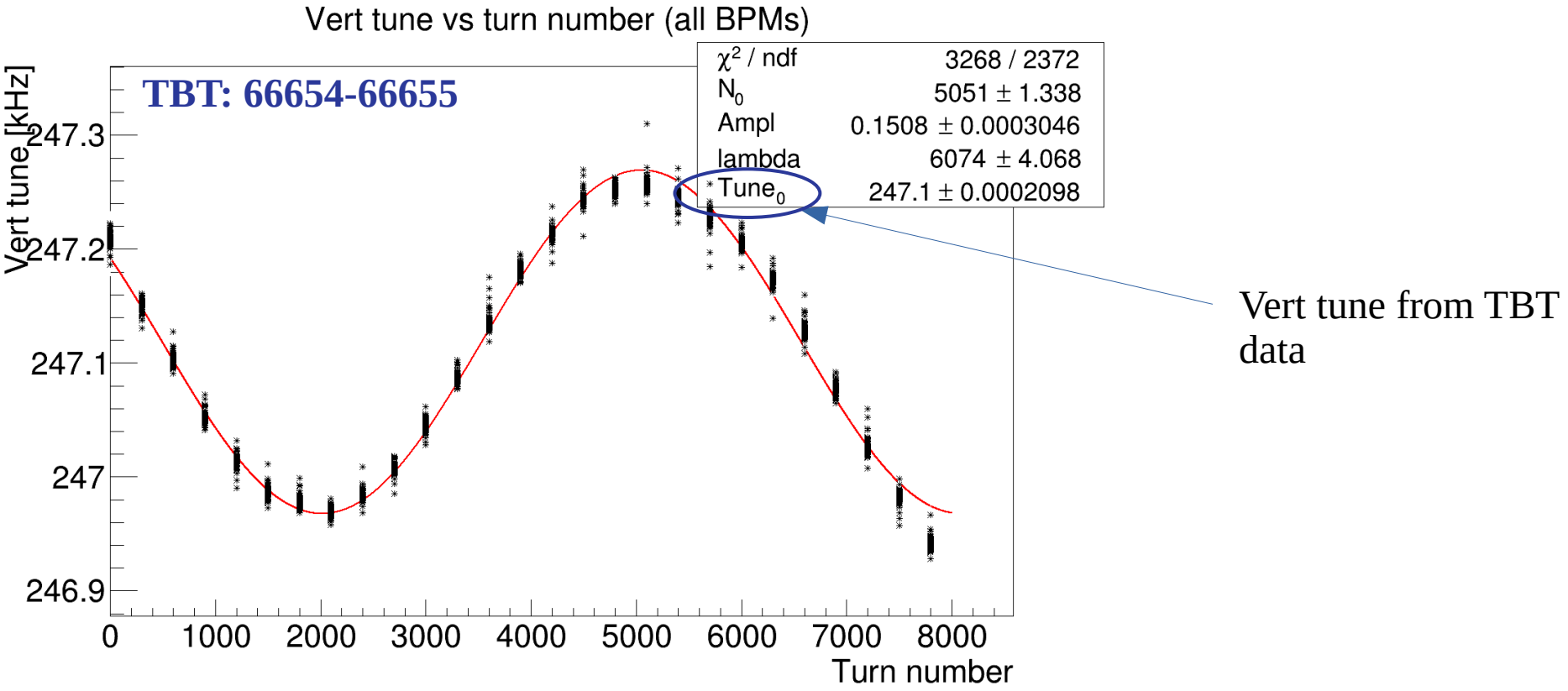
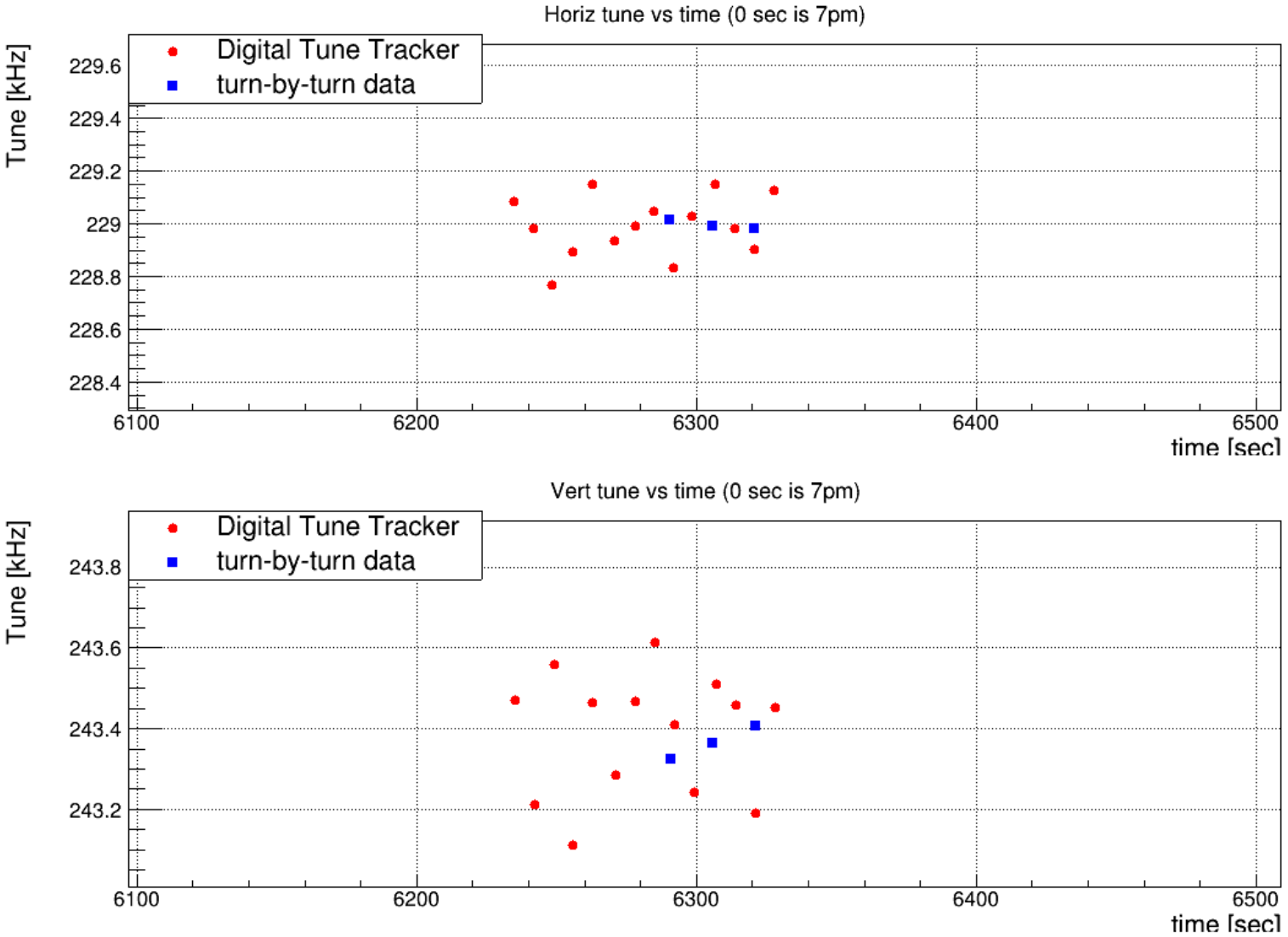


Vert tune from TBT data

A few sub-ranges are zoomed to be able to compare the graphs

- Red markers are DTT tunes, blue markers are tunes reconstructed from TBT data. (see the next pages)



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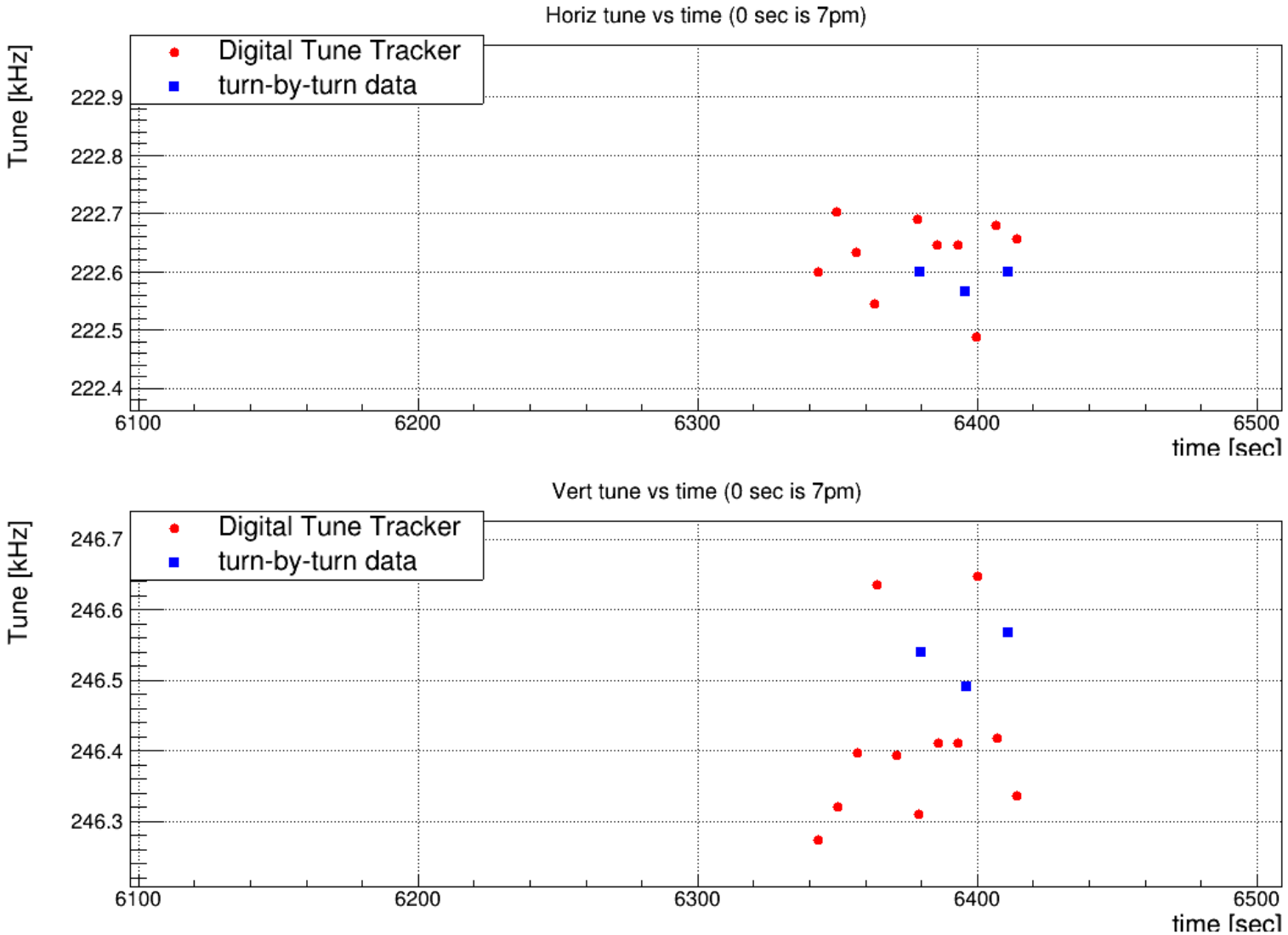

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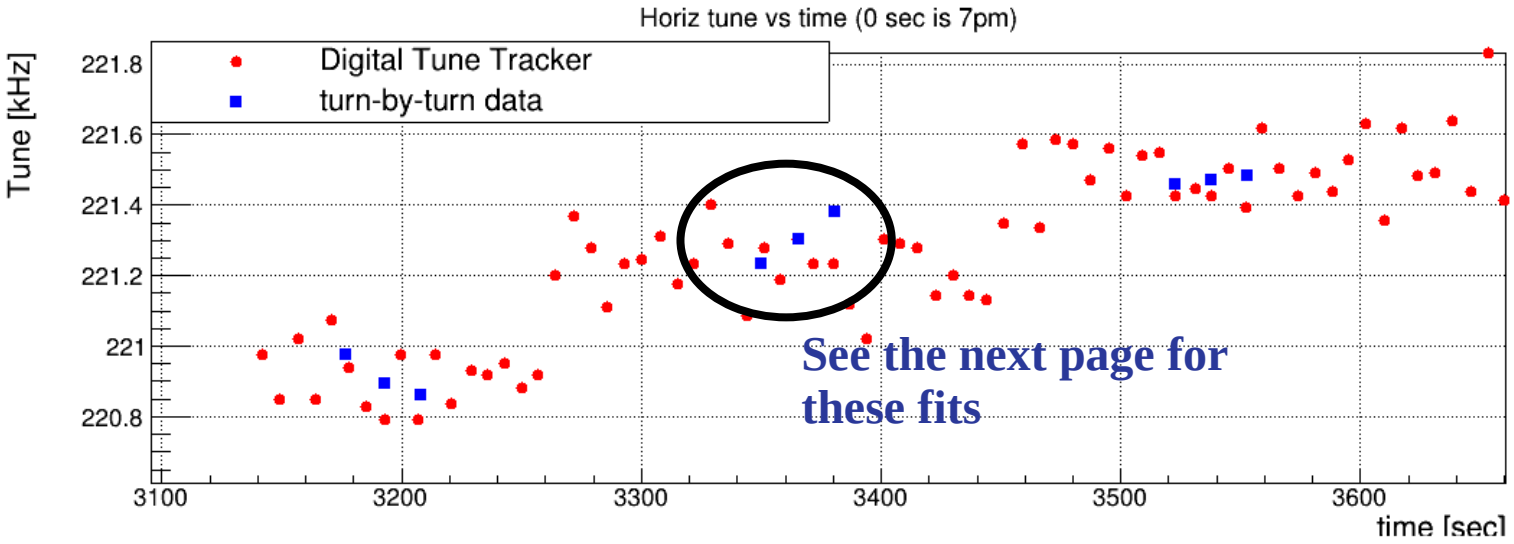

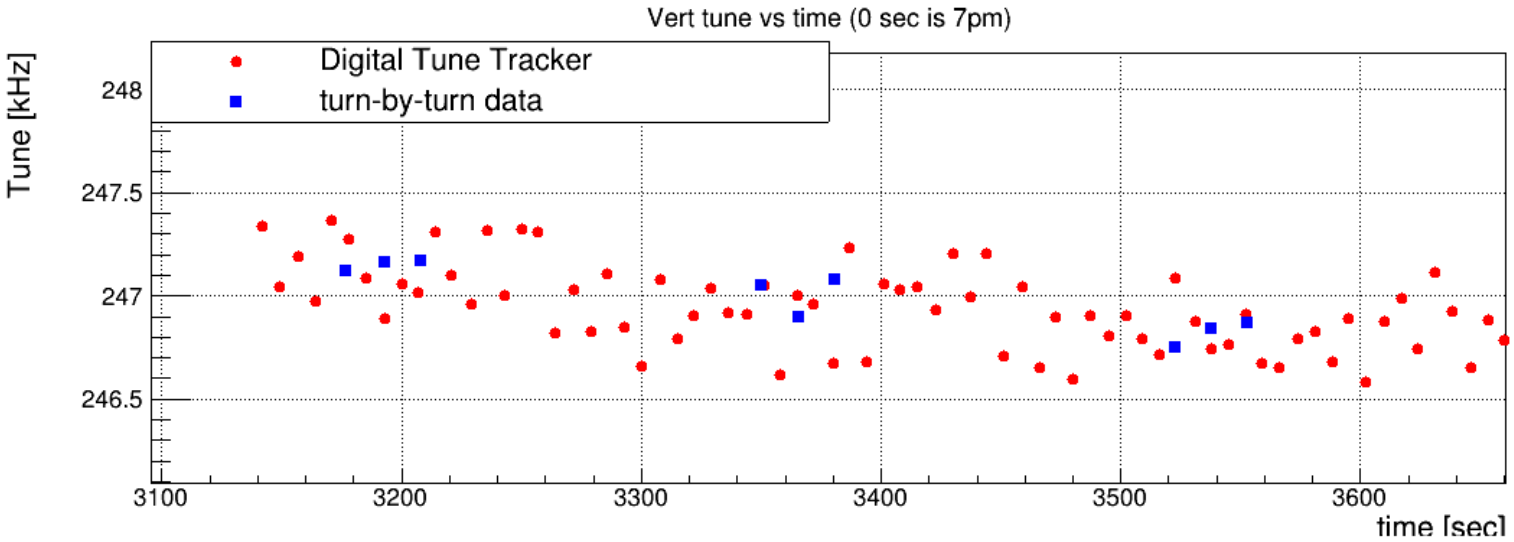

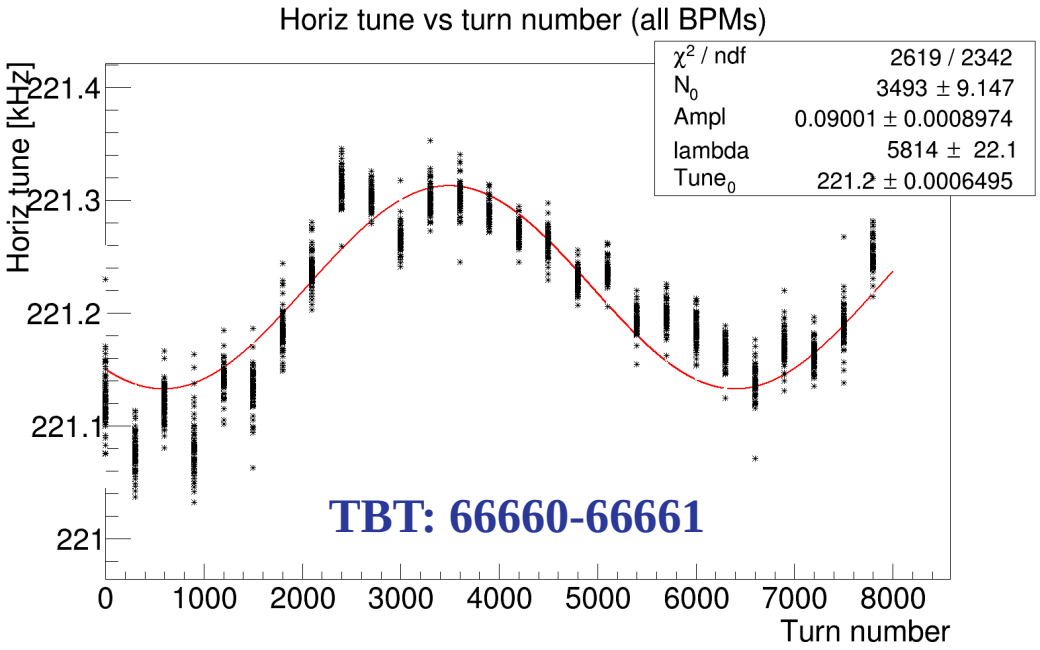

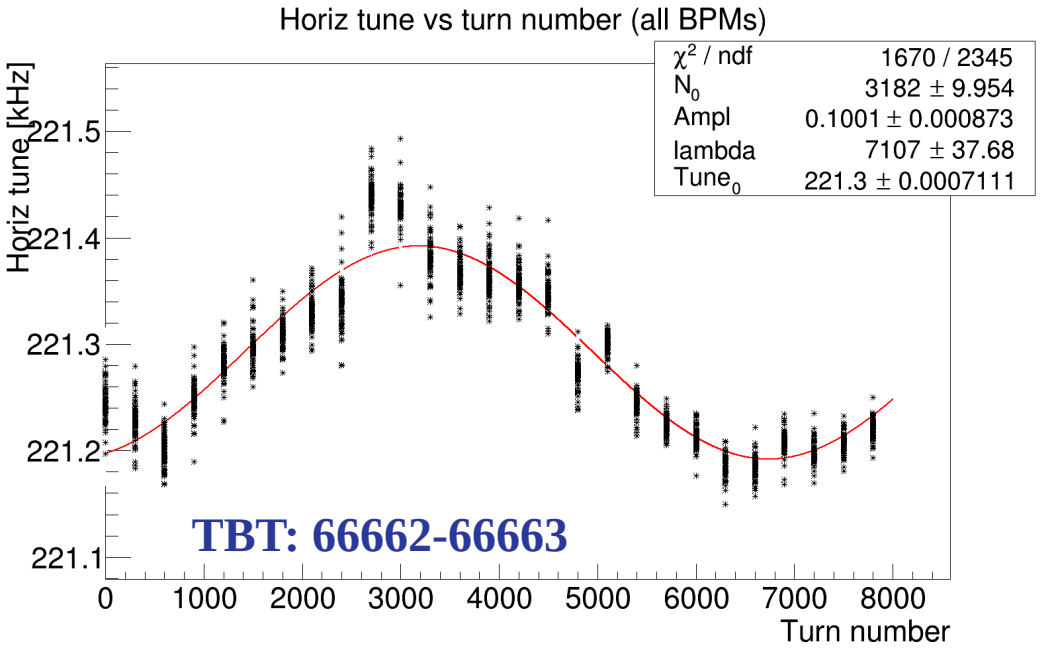

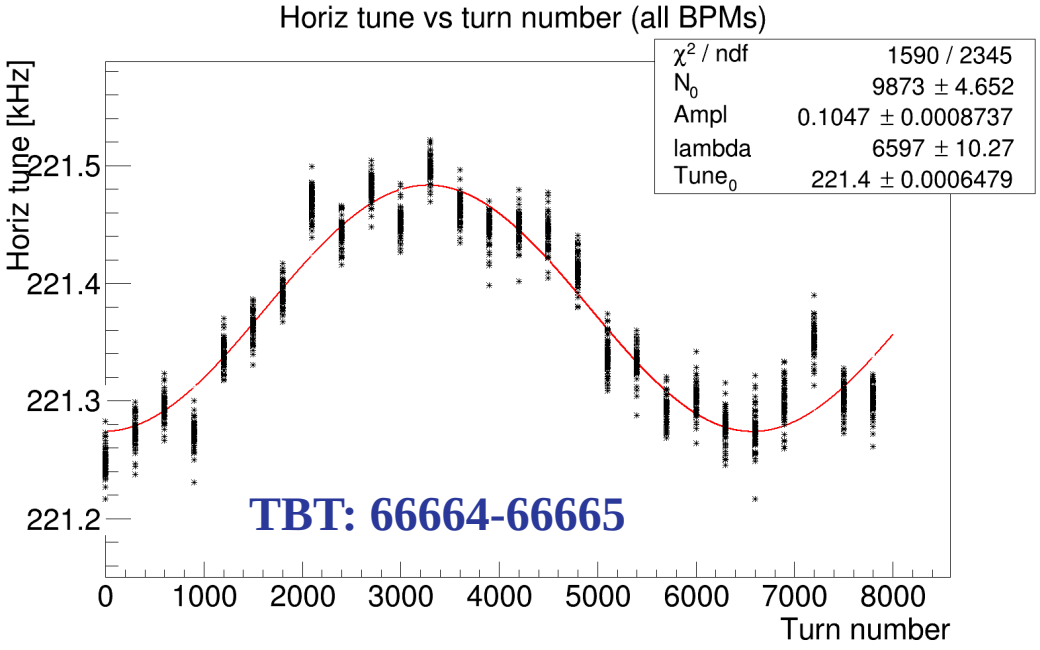

The tune was not stable during these three TBT data taking.

Which means that the magnets/beam was not settled during data taking or, tune was drifting for some other reasons (not reproducible?).

TBT tunes look more stable than DTT tune, but it is also doesn’t seem ideal?

Suggestions for the next shift

1. Keep the DTT tunes recording all the time to have decent statistics for averaging the tune data. This data can be taken after each few seconds, which is faster than TBT data taking.

2. Try to increase the number of turns in TBT data to 16k or may be 32k?