# Stability measurement for SciFi modules alignment

Nils Breer

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TU Dortmund, AG Albrecht

## Dataset and motivation

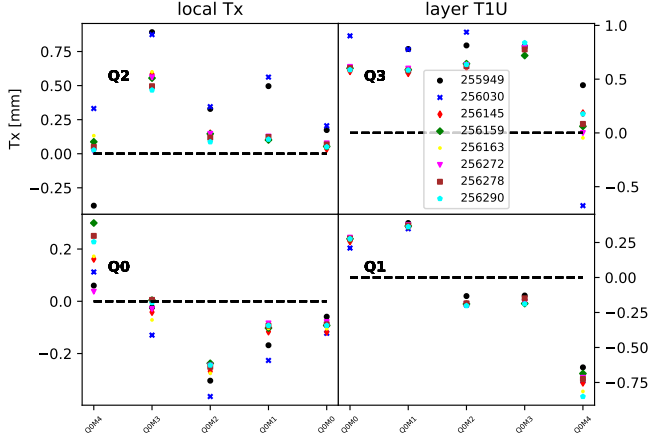
- Dataset contains magUp and magDown sample from 2022 labeled as ”good” from EMTF
- Good: > 90% of datalinks are good
- runs from fills: 8489, 8491, 8496
- V10 Alignment from tag (loose tracking, half module alignment TxRz + Mats, back layer fixed)

Motivation:

- How much does the SciFi move between runs?
  - compare the position of adjecent runs in ascending order from my list of runs
    list of randomly chosen runs: 255949, 256030, 256145, 256159, 256163, 256272, 256278, 256290
- check where the half modules are in their local frame
- V10 Alignment (loose tracking, half module alignment TxRz + Mats, back layer fixed)

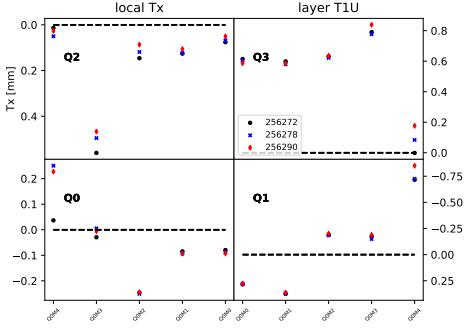
## Module Positions in local half module frame

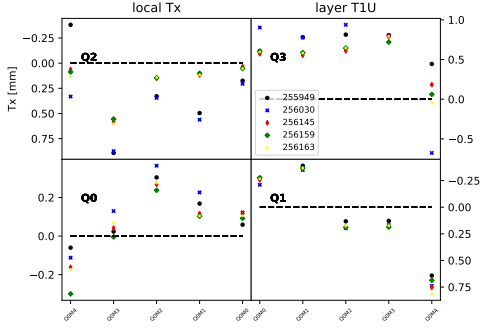
- Runs 255949 + 256030 were from fill 8489
- Optimal fine timing implemented in 256145 (afterwards)
- Positions of other runs compatible (here: MU and MD mixed)



## Module positions: magUp and magDown in x-direction

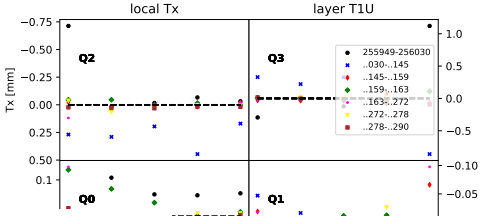
- magUp (left) and magDown (right) runs are compatible respectively
- black, blue: worse timing than other runs
- When introducing a different timing: shift of 1 $\mu m$ expected



## Difference between runs: Tx

- Outer module (M4) always worse than the inner modules (a lot less events)
- Largest movement: T1VQ1M4
- other layers move a maximum of 200 ***μm*** in M4, less than 100 ***μm*** in M0-M3




- removed blue + black for plotting.
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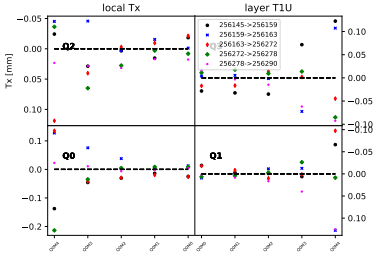


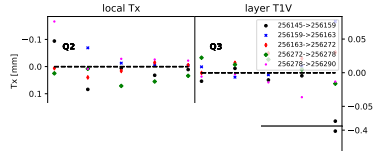

## Difference between runs: Tz

- Tz a little worse in performance as expected
- similar picture as for Tx
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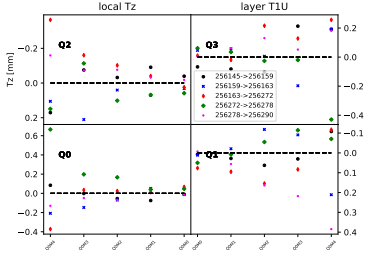
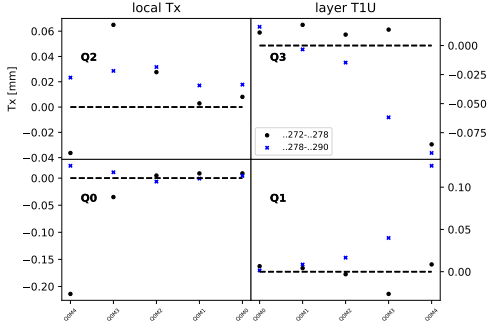
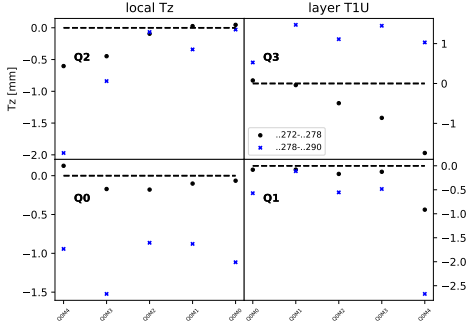


- The change in module position from run to run is a maximum of 100 $\mu m$ for the modules M0 →M3 in Tx
- This is for runs from the same fill, or if there are no big changes between fills
- M4 moves at max 400 $\mu m$
- there is no visible difference between magUp and magDown polarity

# Backup

## MagUp Tx and Tz module position comparisons



# Backup

## MagDown Tx and Tz module position comparisons