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# Global alignment update

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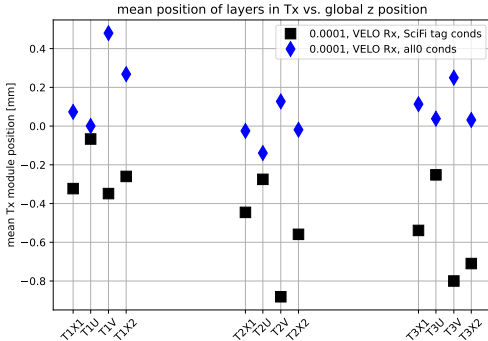
## Configuration:

- Using 2023 data
- Align SciFi HalfModules in TxRz, TxRxRz, or TxRxRyRz
- Align global VELO in Rx
- Fix SciFi back layer
- open MR for the configuration

Alignment!468

## Performing checks on:

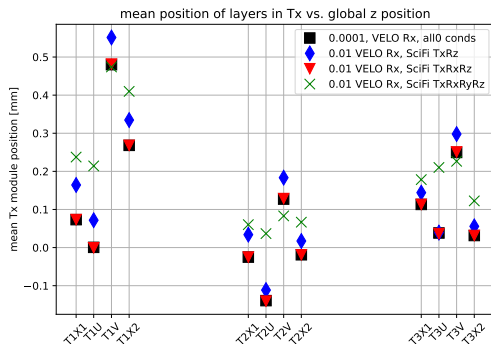
- Different starting positions (Alignment tag + nominal)
- Variations of global VELO Rx uncertainty



- SciFi halfmodules: TxRxRz
- Full VELO Rx
- fixing SciFi backlayer
- Black: SciFi alignment tag starting conditions, blue: nominal starting conditions
- Global alignment seems to working a bit better with blue configuration (→layers closer to 0)

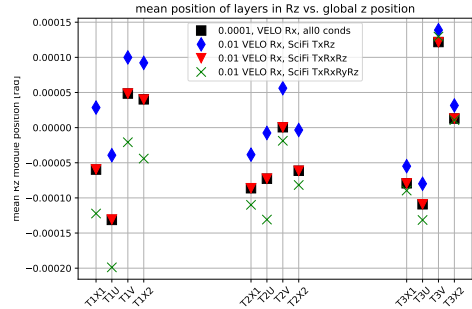
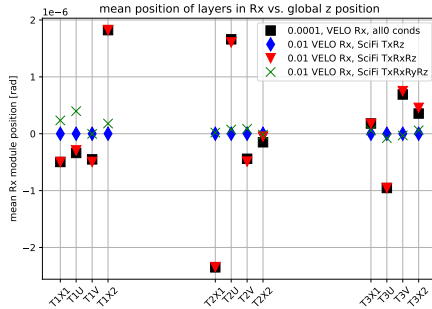
→Zig-zag smaller in T2

After aligning TxRxRz → alignment wants the  
Halfmodules in Ry aligned



VELO Rx	residual misalignment global VELO
0.0001	-493.2 $\mu$ rad
0.0002	-505.4 $\mu$ rad
0.001	-506.1 $\mu$ rad
0.01	-389 $\mu$ rad

- Adding Ry alignment improves zig-zag in T2, slightly worse in T1
- Tx movement somewhat absorbed in Rz
- VELO Rx does not seem to make a big difference regarding zig-zag pattern



- For global alignment, starting from all 0 positions works better
- Adding Ry reduces T2 zig-zag pattern.
- VELO Rx has a small impact but not the reason for zig-zag pattern
- We will check this configuration next on 2024 MC

Most important dofs, including survey:

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0 FT/T2/X1/HL0/Q0/M1 dof=4 active=0 chi2= 47539.2 delta= -0.00330105 +/- 1.514e-05
1 FT/T3/X1/HL0/Q2/M0 dof=4 active=0 chi2= 42203.8 delta= 0.00566875 +/- 2.75938e-05
2 VP dof=2 active=0 chi2= 24444.3 delta= 3.38096 +/- 0.0216248
3 FT/T2/X1/HL0/Q2/M0 dof=4 active=0 chi2= 21568.5 delta= 0.00387037 +/- 2.63537e-05
4 FT/T2/U/HL0/Q0/M1 dof=4 active=0 chi2= 21084.7 delta= 0.00239133 +/- 1.64686e-05
5 FT/T3/X1/HL0/Q0/M2 dof=4 active=0 chi2= 15869.2 delta= 0.00218756 +/- 1.73653e-05
6 FT/T1/V/HL0/Q0/M1 dof=4 active=0 chi2= 12799.9 delta= 0.00183429 +/- 1.6213e-05
7 FT/T2/X2/HL1/Q1/M1 dof=4 active=0 chi2= 12570.6 delta= 0.00300355 +/- 2.67891e-05
8 FT/T2/V/HL1/Q3/M1 dof=4 active=0 chi2= 12084.9 delta= 0.00193816 +/- 1.76306e-05
9 FT/T2/X1/HL1/Q3/M2 dof=4 active=0 chi2= 10964.7 delta= 0.00145841 +/- 1.39277e-05
10 FT/T3/X2/HL1/Q3/M3 dof=4 active=0 chi2= 10926.2 delta= -0.00195542 +/- 1.87071e-05
11 FT/T3/X1/HL1/Q1/M0 dof=4 active=0 chi2= 10219.7 delta= 0.00255689 +/- 2.52926e-05
12 FT/T2/V/HL0/Q2/M0 dof=4 active=0 chi2= 10012.8 delta= -0.00313169 +/- 3.12969e-05
13 FT/T2/X1/HL1/Q3/M1 dof=4 active=0 chi2= 9742.56 delta= -0.00158724 +/- 1.60807e-05
14 FT/T1/V/HL1/Q3/M0 dof=4 active=0 chi2= 9599.06 delta= 0.0028144 +/- 2.87258e-05
15 FT/T2/V/HL1/Q1/M1 dof=4 active=0 chi2= 8968.4 delta= -0.0029404 +/- 3.10491e-05
16 FT/T3/U/HL0/Q0/M2 dof=4 active=0 chi2= 8744.83 delta= -0.00165892 +/- 1.77398e-05
17 FT/T3/V/HL0/Q0/M2 dof=4 active=0 chi2= 8736.07 delta= -0.0015717 +/- 1.68156e-05
18 FT/T3/X2/HL0/Q2/M2 dof=4 active=0 chi2= 8257.96 delta= 0.00273931 +/- 3.01442e-05
19 FT/T3/X2/HL0/Q0/M1 dof=4 active=0 chi2= 7931.62 delta= 0.00175173 +/- 1.96691e-05
20 FT/T3/X2/HL0/Q2/M0 dof=4 active=0 chi2= 7238.12 delta= -0.00241161 +/- 2.83462e-05
21 FT/T2/X1/HL0/Q0/M0 dof=4 active=0 chi2= 7231.57 delta= -0.00238743 +/- 2.80747e-05
22 FT/T3/X2/HL1/Q1/M0 dof=4 active=0 chi2= 6972.88 delta= -0.00234073 +/- 2.80314e-05
23 FT/T1/X2/HL0/Q0/M0 dof=4 active=0 chi2= 6770 delta= 0.00234363 +/- 2.84836e-05
24 FT/T2/X1/HL1/Q1/M2 dof=4 active=0 chi2= 6627.46 delta= -0.00179827 +/- 2.20893e-05

```