Update: joint constraint tuning

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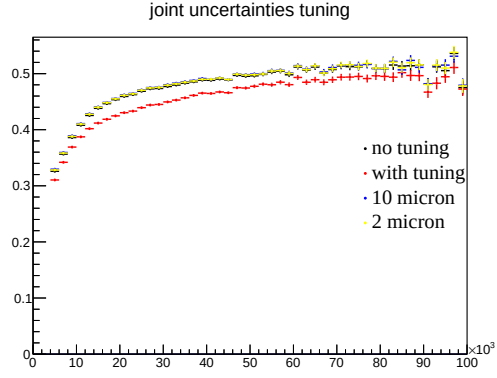
loosen the Tx uncertainty (old ($1\mu m$), $2\mu m$, $10\mu m$)

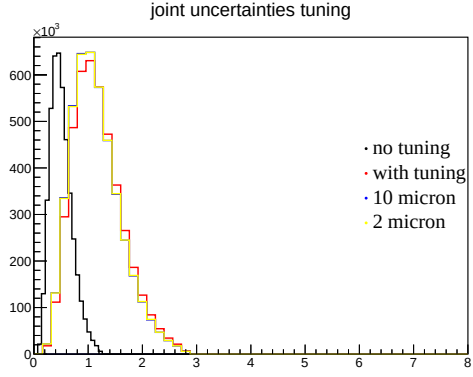
500k events, loose particle selection

0.01 0.0012 0.0019 0.0004 0.00000047 0.00017 [mm, rad]

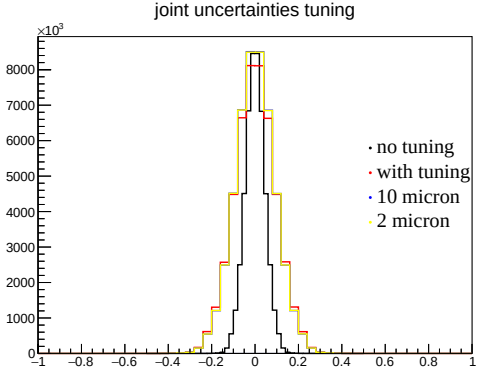
tuned: $\mu m, \chi^2$/dof: 1.02
old: 1 $\mu m, \chi^2$/dof: 914.09
10 $\mu m, \chi^2$/dof: 55.49
2 $\mu m, \chi^2$/dof: 492.67



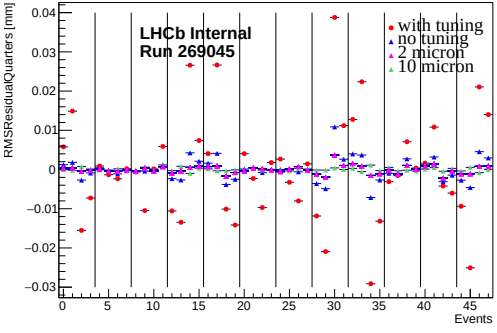
χ^2/dof



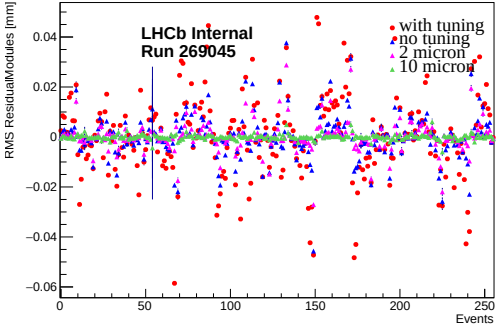
FTResidual



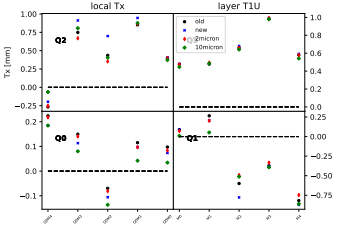
Mean Residual (rms-unbiased) in each quarter

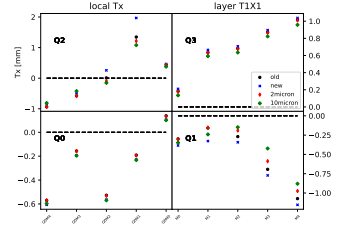


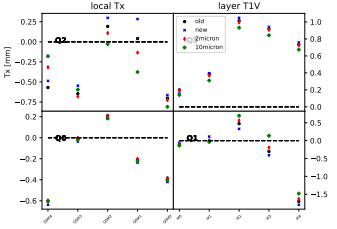
Mean Residual (rms-unbiased) in each module

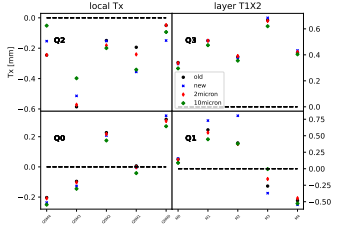


T1 constants

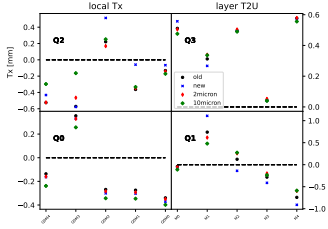


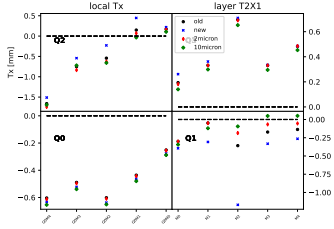


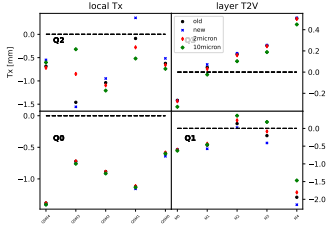


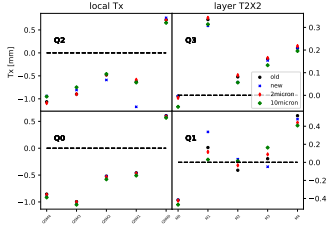


T2 constants

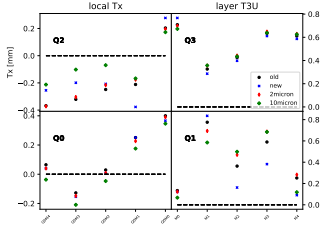


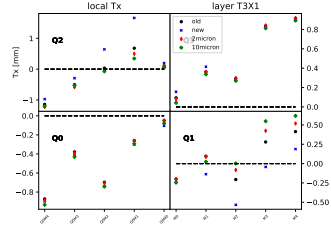


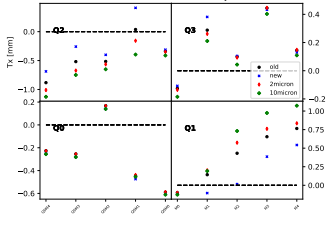


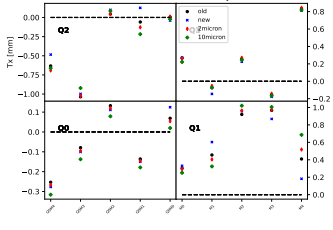


T3 constants









chi2 contribution

change in χ^2 of 21000, this would be change of 0.02 % from total χ^2

worth trying to align for Tz Rx after Tx Rz

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Most important dofs, including survey:   Almost always M0!
  0 FT/T3/X1/HL0/Q2/M0 dof=2 active=0  chi2= 24052.7 delta= -0.200169 +/- 0.00129067
  1 FT/T3/X1/HL0/Q2/M0 dof=3 active=0  chi2= 19565 delta= 0.000179412 +/- 1.28266e-06
  2 FT/T3/X2/HL0/Q2/M0 dof=2 active=0  chi2= 11332.5 delta= -0.14629 +/- 0.00137421
  3 FT/T1/X2/HL0/Q2/M0 dof=2 active=0  chi2= 10361 delta= -0.134096 +/- 0.00131739
  4 FT/T1/X2/HL0/Q2/M0 dof=3 active=0  chi2= 9924.24 delta= 0.000126803 +/- 1.27286e-06
  5 FT/T2/X1/HL1/Q1/M0 dof=2 active=0  chi2= 9768.02 delta= -0.108604 +/- 0.00109886
  6 FT/T3/X1/HL1/Q1/M0 dof=2 active=0  chi2= 9694.81 delta= -0.114461 +/- 0.00116249
  7 FT/T3/X2/HL1/Q1/M0 dof=3 active=0  chi2= 9476.84 delta= 0.000123117 +/- 1.2647e-06
  8 FT/T3/X2/HL0/Q2/M0 dof=3 active=0  chi2= 9475.71 delta= 0.000129783 +/- 1.33325e-06
  9 FT/T3/X2/HL1/Q1/M0 dof=2 active=0  chi2= 9145.24 delta= -0.120359 +/- 0.00125858
 10 FT/T1/X2/HL1/Q1/M0 dof=2 active=0  chi2= 8942.05 delta= -0.105182 +/- 0.00111231
 11 FT/T3/X1/HL1/Q1/M0 dof=3 active=0  chi2= 8718.37 delta= 0.000111385 +/- 1.19291e-06
 12 FT/T2/V/HL0/Q0/M0 dof=2 active=0  chi2= 8349.1 delta= -0.14255 +/- 0.00156008
 13 FT/T1/X2/HL1/Q1/M0 dof=3 active=0  chi2= 8156.17 delta= 0.000102234 +/- 1.13202e-06
 14 FT/T3/X2/HL1/Q3/M0 dof=2 active=0  chi2= 8130.97 delta= 0.136511 +/- 0.0015139
 15 FT/T2/X1/HL1/Q1/M0 dof=3 active=0  chi2= 7696.56 delta= 9.96733e-05 +/- 1.13614e-06
 16 FT/T3/X1/HL0/Q0/M0 dof=3 active=0  chi2= 7669.98 delta= -0.000123094 +/- 1.40553e-06
 17 FT/T3/U/HL0/Q0/M0 dof=2 active=0  chi2= 7246.97 delta= 0.139832 +/- 0.00164258
 18 FT/T3/X1/HL0/Q0/M0 dof=2 active=0  chi2= 6554.4 delta= 0.126188 +/- 0.00155866
 19 FT/T2/V/HL0/Q0/M0 dof=3 active=0  chi2= 5953.97 delta= 0.000108552 +/- 1.40681e-06
 20 FT/T3/X2/HL0/Q0/M1 dof=2 active=0  chi2= 5662.13 delta= -0.0780676 +/- 0.00103748
 21 FT/T2/U/HL1/Q1/M0 dof=2 active=0  chi2= 5383.99 delta= -0.0871348 +/- 0.00118752
 22 FT/T2/X1/HL0/Q0/M0 dof=2 active=0  chi2= 5201.76 delta= 0.106257 +/- 0.00147327
 23 FT/T1/X2/HL1/Q3/M0 dof=2 active=0  chi2= 4970.47 delta= -0.0901646 +/- 0.0012789
 24 FT/T2/V/HL0/Q2/M1 dof=2 active=0  chi2= 4912.53 delta= -0.0978442 +/- 0.00139599
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Most important dofs, including survey:   dof=2,3 -> Tz, Rx
  0 FT/T2/X2/HL0/Q2/M0 dof=3 active=0  chi2= 25109.3 delta= -0.000161313 +/- 1.01801e-06
  1 FT/T1/X2/HL1/Q1/M2 dof=3 active=0  chi2= 24466.9 delta= -0.000168 +/- 1.07404e-06
  2 FT/T2/X2/HL0/Q2/M2 dof=2 active=0  chi2= 24229.4 delta= 0.175457 +/- 0.0011272
  3 FT/T2/X1/HL1/Q3/M1 dof=2 active=0  chi2= 23884.2 delta= -0.128021 +/- 0.00082837
  4 FT/T3/X2/HL1/Q1/M2 dof=3 active=0  chi2= 23163.2 delta= -0.000155243 +/- 1.02003e-06
  5 FT/T2/X2/HL1/Q1/M2 dof=2 active=0  chi2= 22351.2 delta= 0.168785 +/- 0.00112897
  6 FT/T1/X2/HL1/Q1/M2 dof=2 active=0  chi2= 22105.5 delta= 0.176654 +/- 0.00118816
  7 FT/T2/X1/HL1/Q1/M1 dof=3 active=0  chi2= 21931.2 delta= -0.00016657 +/- 1.1247e-06
  8 FT/T2/X1/HL1/Q1/M1 dof=2 active=0  chi2= 21830.6 delta= 0.187403 +/- 0.00126836
  9 FT/T1/X2/HL1/Q3/M2 dof=3 active=0  chi2= 21495.9 delta= 0.000131163 +/- 8.94607e-07
 10 FT/T2/X1/HL1/Q1/M2 dof=3 active=0  chi2= 21160.7 delta= -0.000149164 +/- 1.02541e-06
 11 FT/T2/X1/HL1/Q3/M1 dof=3 active=0  chi2= 20150 delta= 0.000126125 +/- 8.88511e-07
 12 FT/T3/X1/HL0/Q0/M1 dof=2 active=0  chi2= 19992.6 delta= -0.129633 +/- 0.000916813
 13 FT/T2/X1/HL1/Q1/M2 dof=2 active=0  chi2= 19921.4 delta= 0.160314 +/- 0.00113583
 14 FT/T3/X2/HL1/Q3/M1 dof=2 active=0  chi2= 19804.1 delta= -0.158627 +/- 0.00112719
 15 FT/T3/X2/HL1/Q3/M1 dof=3 active=0  chi2= 19248.6 delta= 0.000157931 +/- 1.13833e-06
 16 FT/T2/X2/HL1/Q3/M1 dof=2 active=0  chi2= 18921.9 delta= -0.118245 +/- 0.000859612
 17 FT/T2/X2/HL1/Q1/M1 dof=3 active=0  chi2= 17897.3 delta= -0.000152845 +/- 1.1425e-06
 18 FT/T2/X2/HL1/Q1/M1 dof=2 active=0  chi2= 17281 delta= 0.167453 +/- 0.00127382
 19 FT/T2/X2/HL0/Q0/M2 dof=3 active=0  chi2= 17092.1 delta= 0.000110834 +/- 8.47766e-07
 20 FT/T3/X1/HL1/Q3/M1 dof=3 active=0  chi2= 17019 delta= 0.000132603 +/- 1.01645e-06
 21 FT/T1/X2/HL0/Q0/M1 dof=3 active=0  chi2= 16254 delta= 0.000100144 +/- 7.85499e-07
 22 FT/T3/X1/HL0/Q2/M2 dof=3 active=0  chi2= 16026.4 delta= -0.000133528 +/- 1.05476e-06
 23 FT/T1/X2/HL0/Q0/M1 dof=2 active=0  chi2= 15795.8 delta= -0.0906258 +/- 0.000721076
 24 FT/T3/X1/HL0/Q2/M2 dof=2 active=0  chi2= 14859.7 delta= 0.143148 +/- 0.0011743
```