Dec. 2001 SCT week at CERN
S. Terada; KEK

Mechanical Properties of the Latest Japanese Barrel Modules

Japanese SCT Group

Results of mechanical survey to the five Japanese barrel modules fabricated for the production site qualification

- In-plane (x, y) measurements

  Front-Back coordinate alignment; comparison of edge matching method and frame fiducial matching method

- Out-of-plane (z-profile) measurements

  Introducing new z-profile parameters

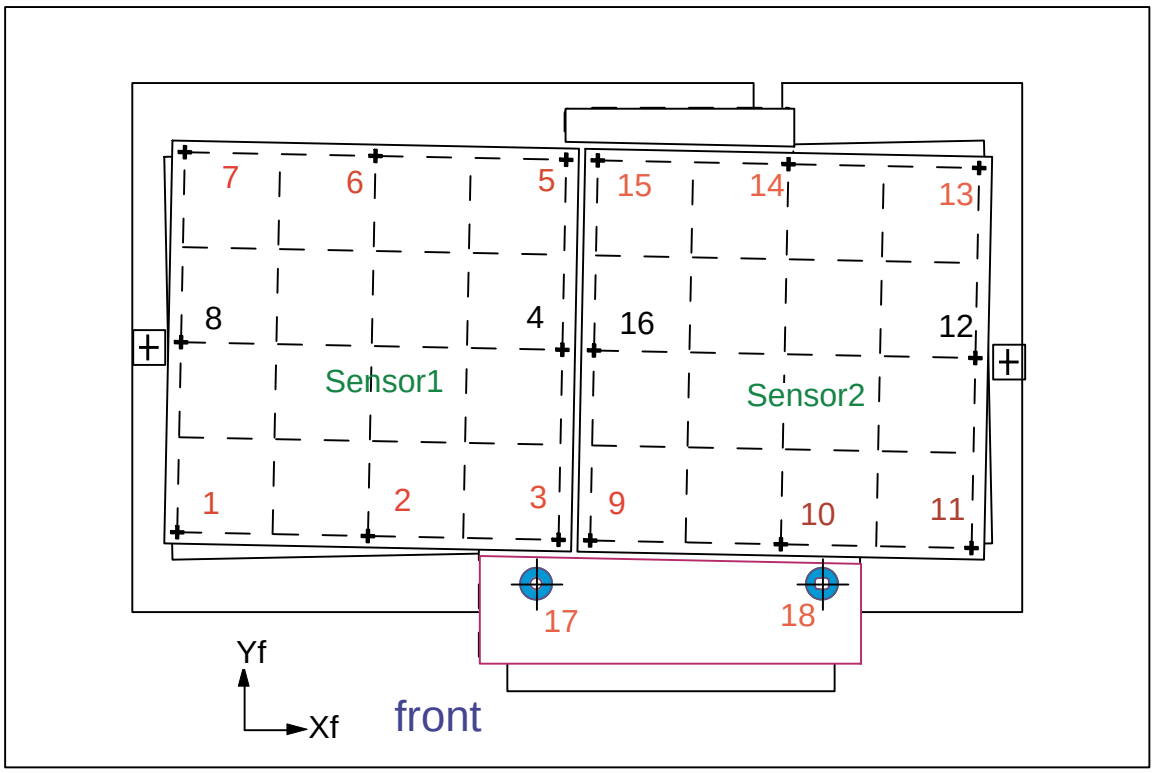
- Comparison of the methods to align front and back coordinates

1. Frame fiducial matching method; a set of fiducial marks fixed on a survey frame is measured from both front and back sides.

2. Edge matching method; eight detector corners are measured from both front and back sides.

Front and back coordinates are aligned using these measurements

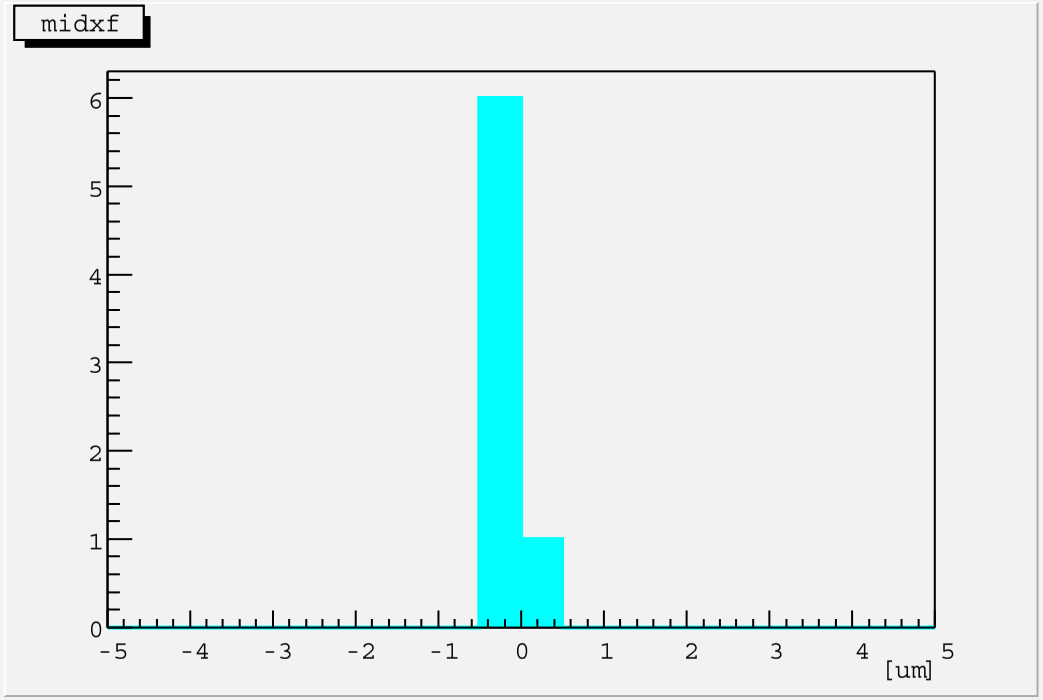
Same module is measured several times to see reliability of the matching methods.

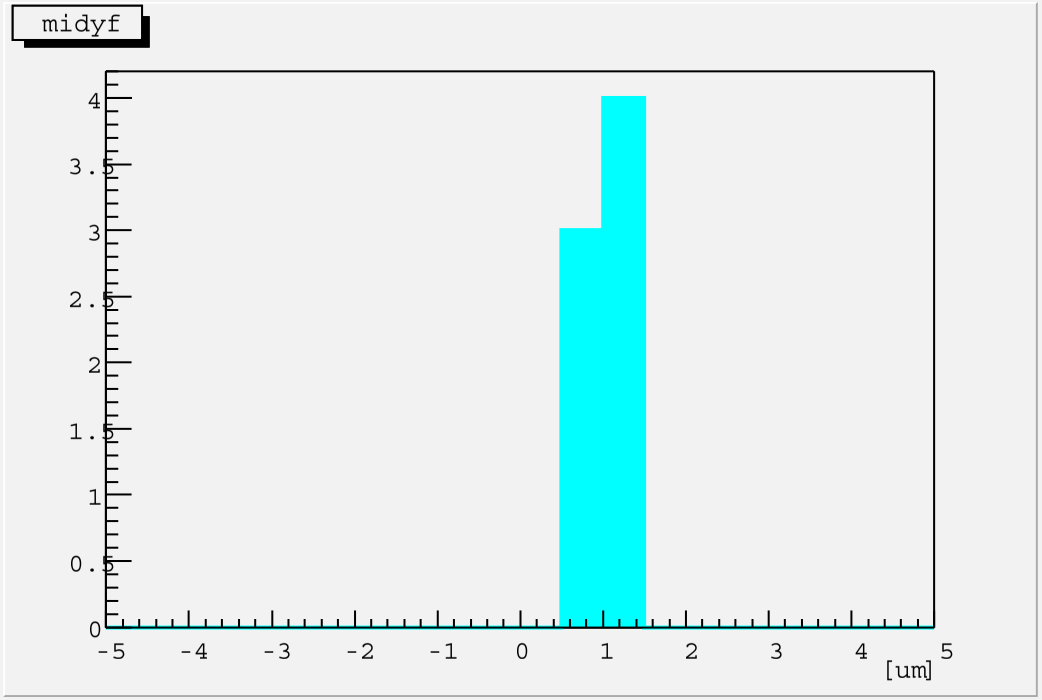


In-plane parameters

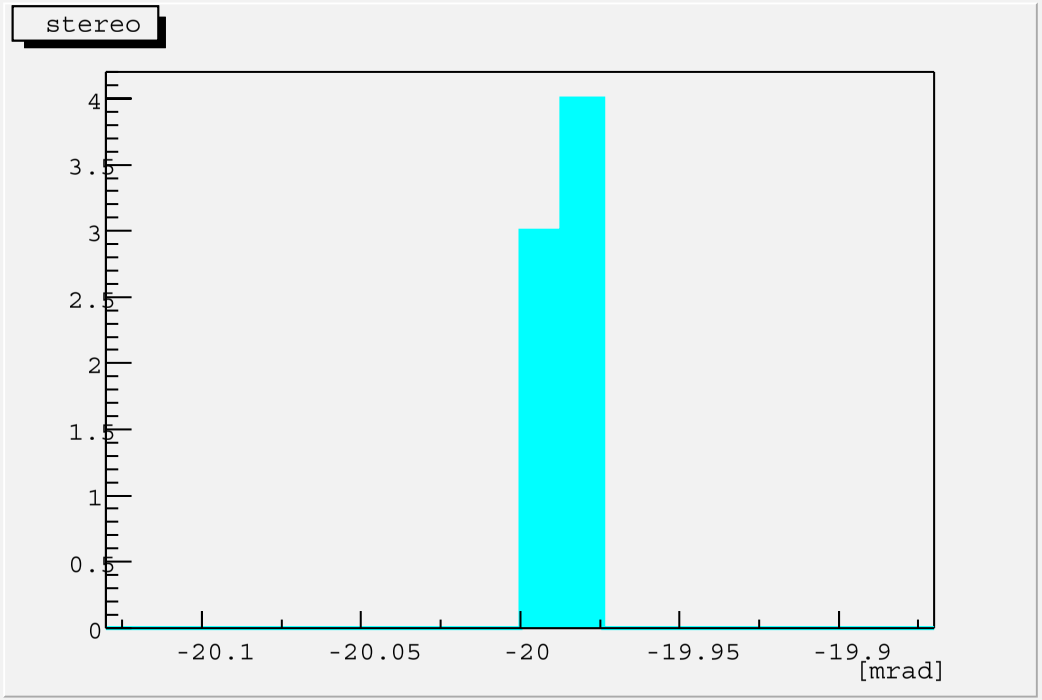
Parameters	Design Value	Tolerance
Dowel hole, mhx [um]	-6500	30
Dowel hole, mhy [um]	-37000	30
Dowel slot, msx [um]	38500	100
Dowel slot, msy [um]	-37000	30
Mid-point of front pair, midx [um]	0	10
Mid-point of front pair, midy [um]	0	5
Separation of front pair, sepf [um]	64090	10
Separation of back pair, sepb [um]	64090	10
Sensor 1 angle a1 [mrad]	0	0.13
Sensor 2 angle a2 [mrad]	0	0.13
Sensor 3 angle a3 [mrad]	0	0.13
Sensor 3 angle a3 [mrad]	0	0.13
Half stereo angle, half-stereo [mrad]	-20	0.13

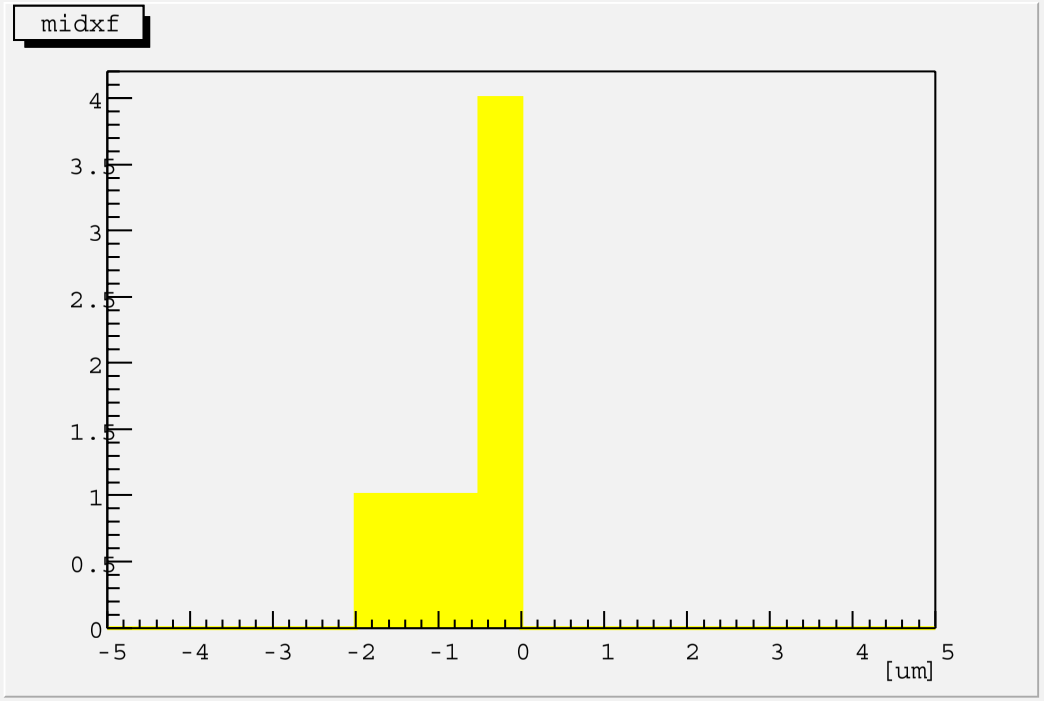
Mid-point of front pair and Half stereo angle are particularly sensitive to the front-back coordinate alignment.

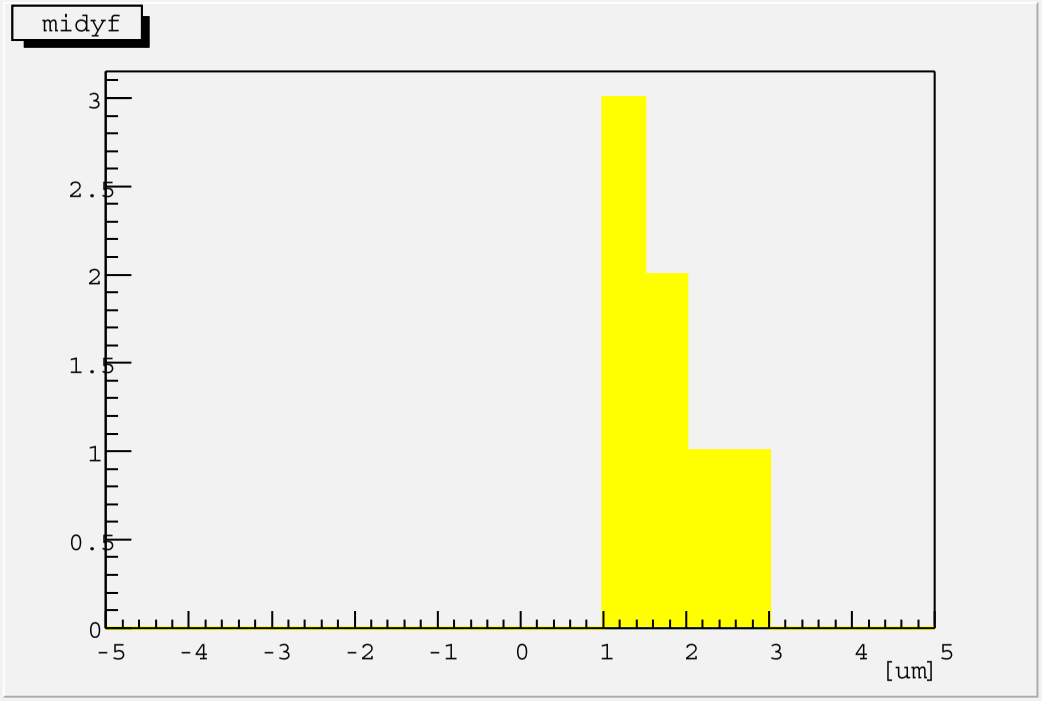




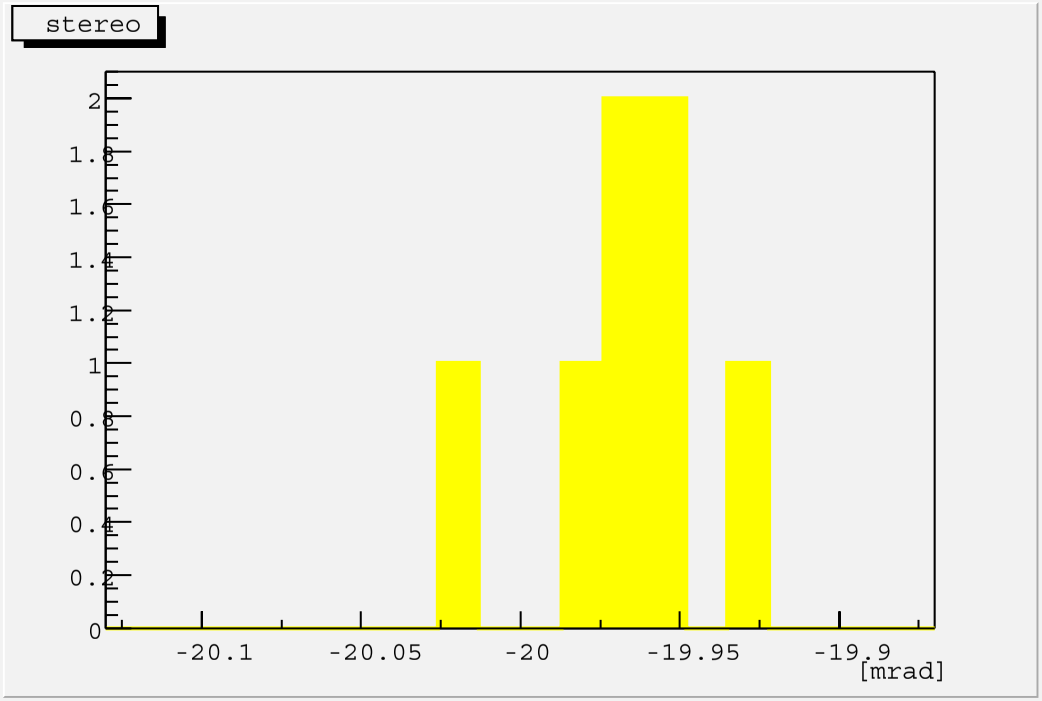
Test XY survey with edge

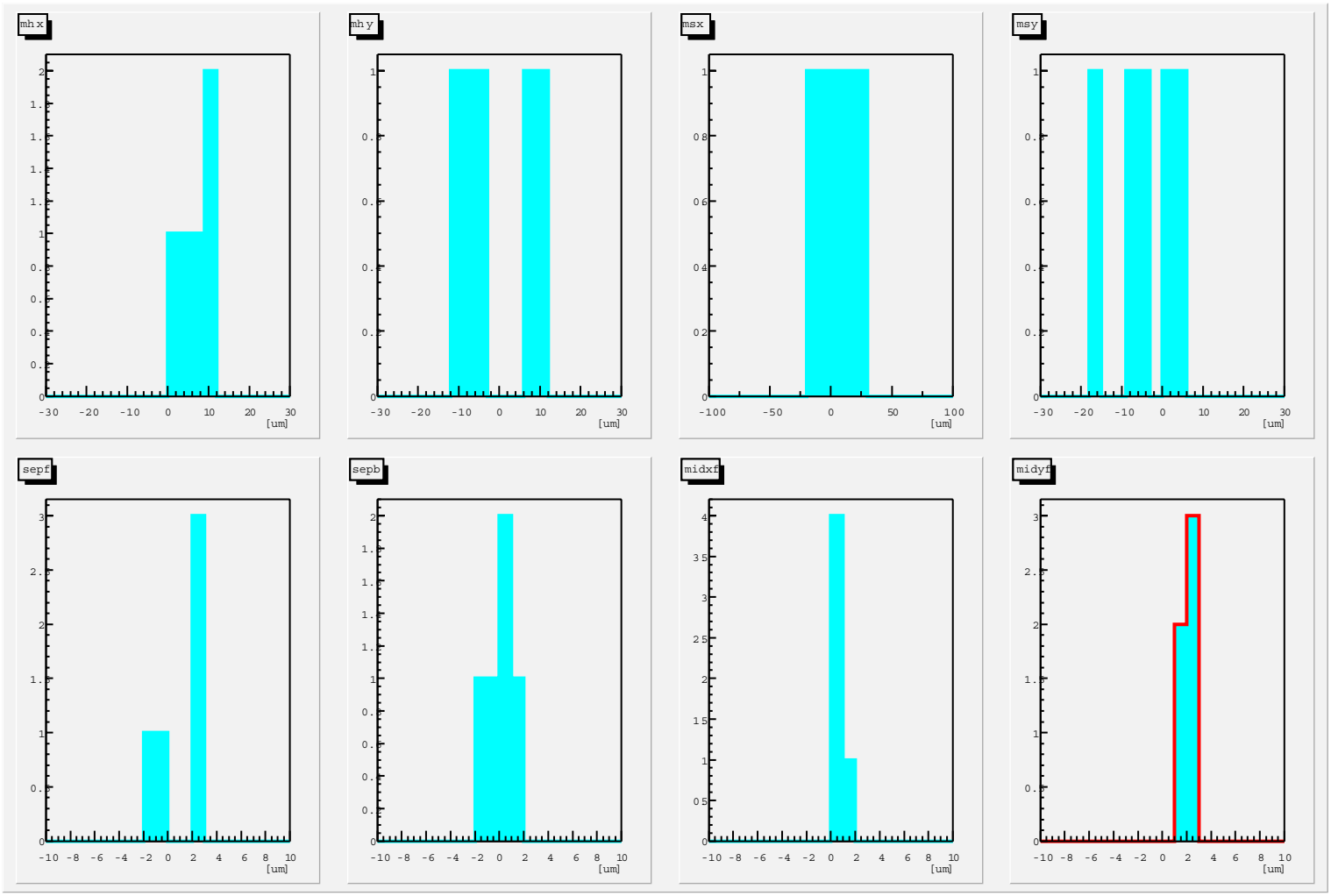




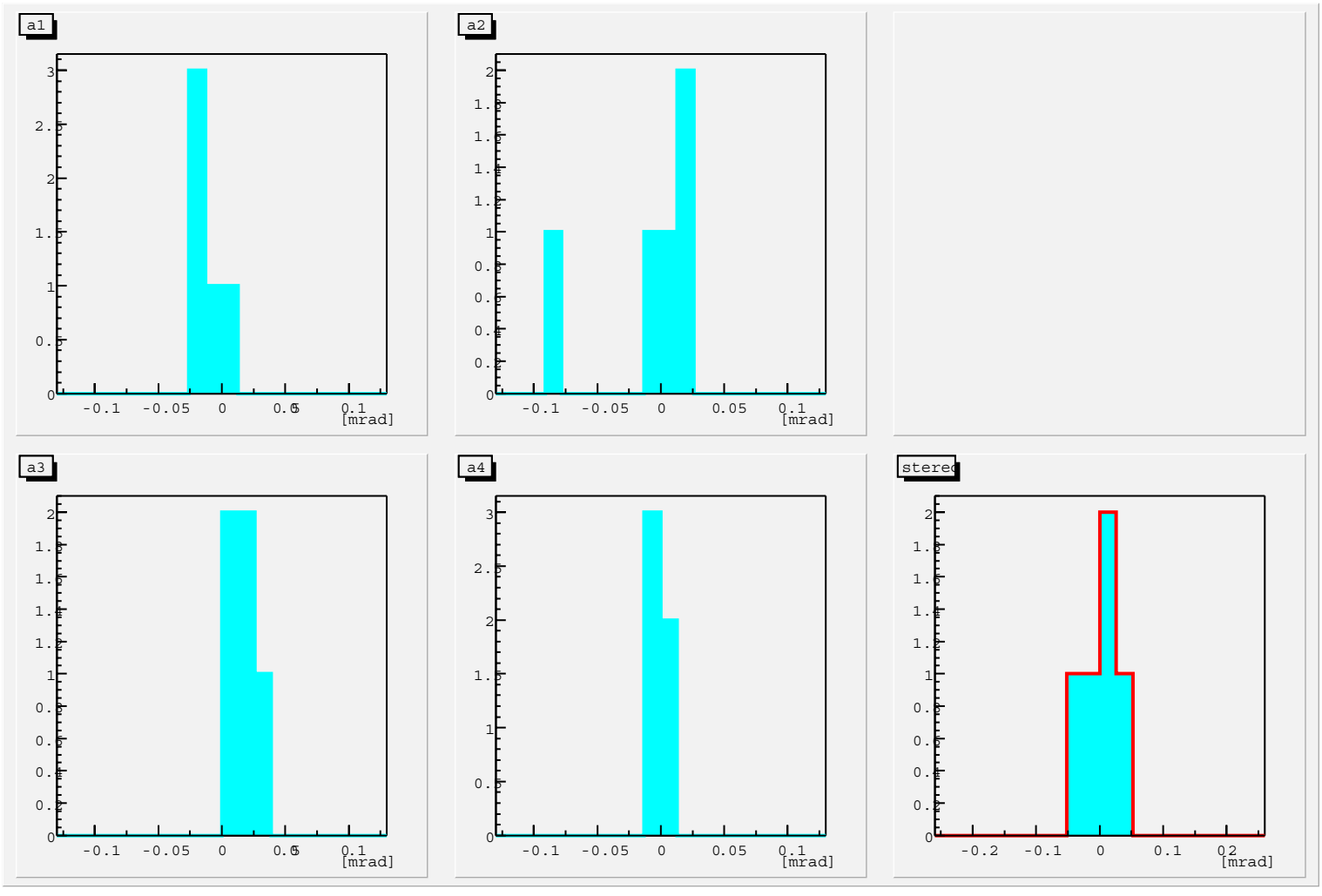


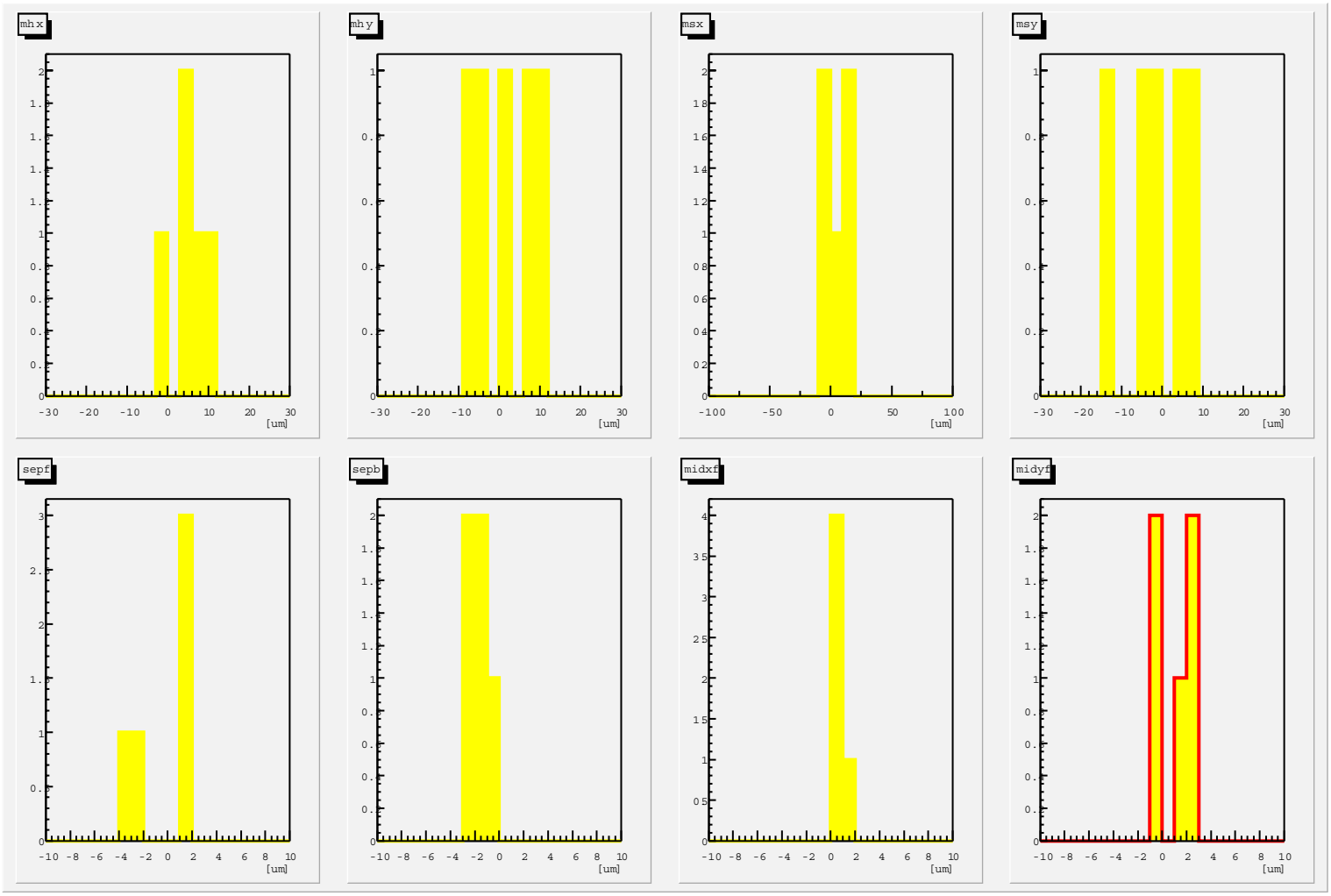
Test Survey with frame fiducials



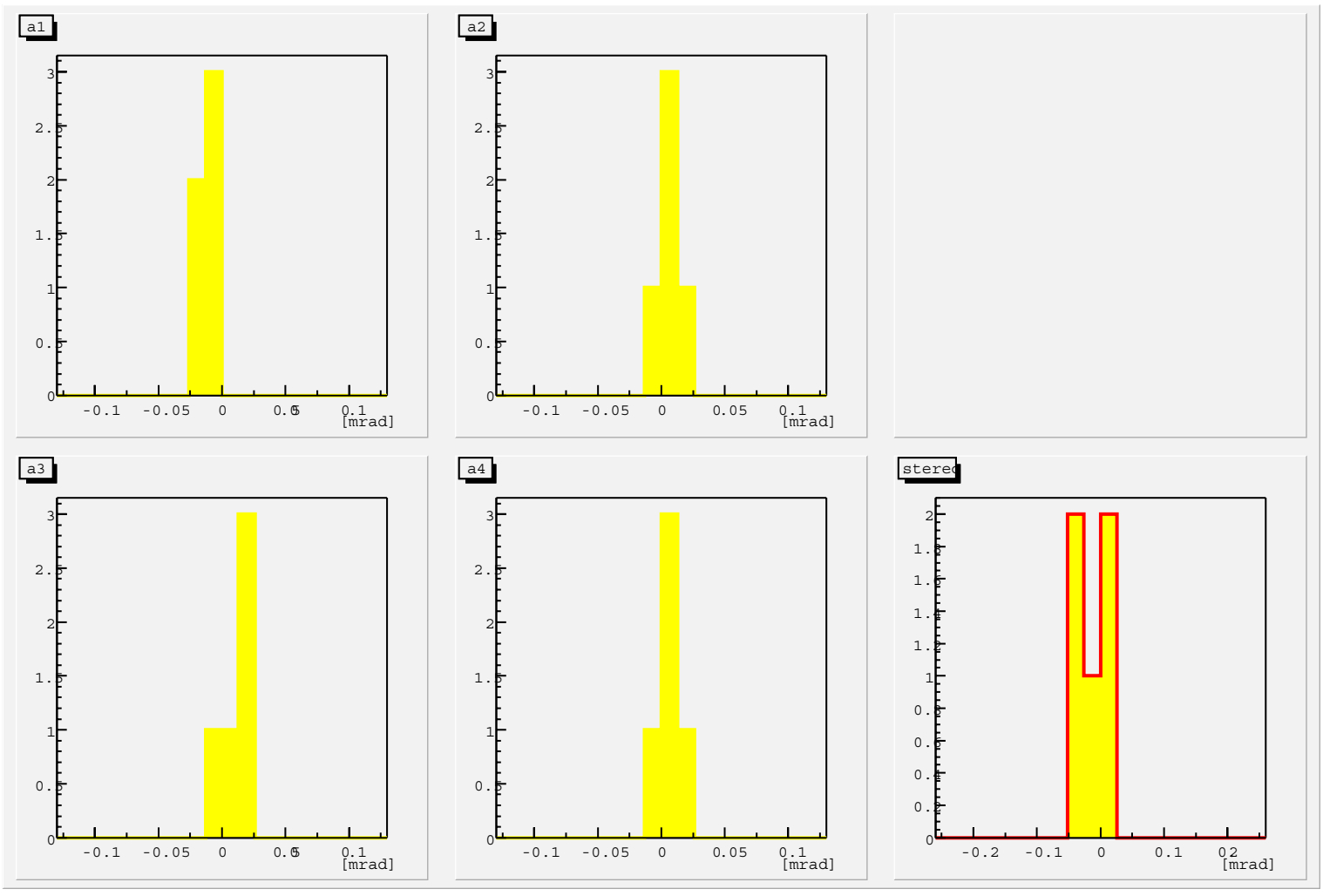


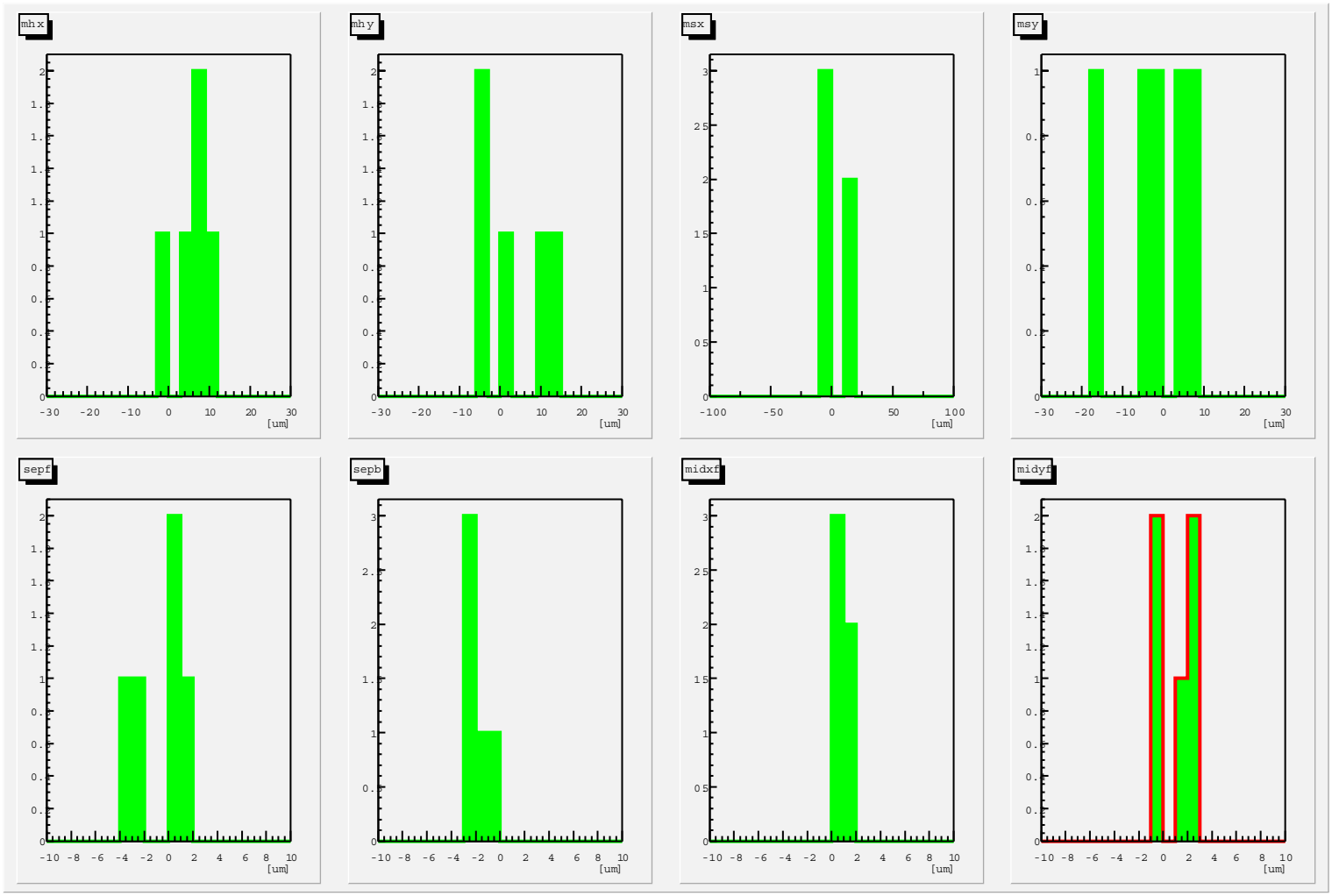
XY Before Thermal Cycle



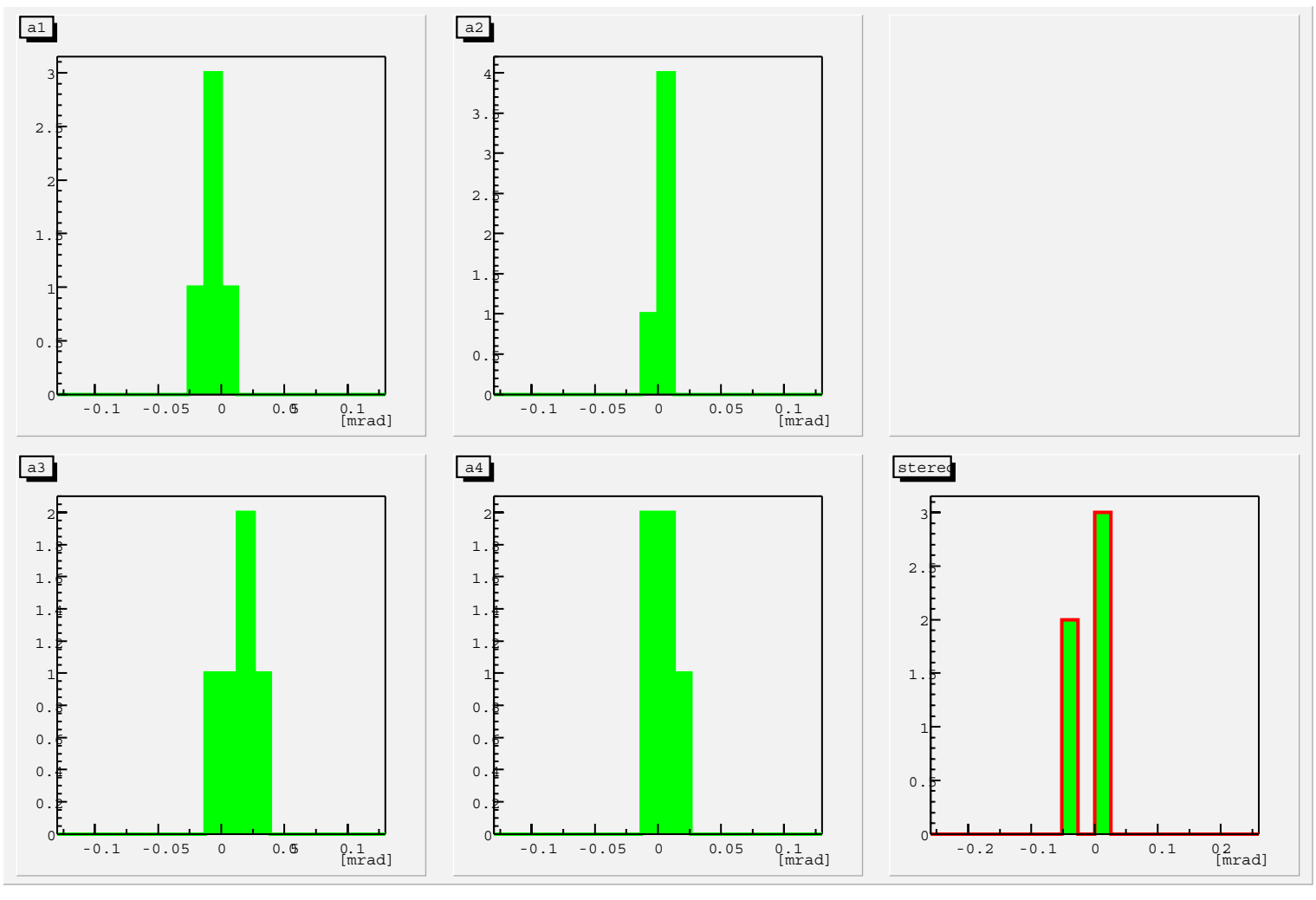


XY After Thermal Cycle



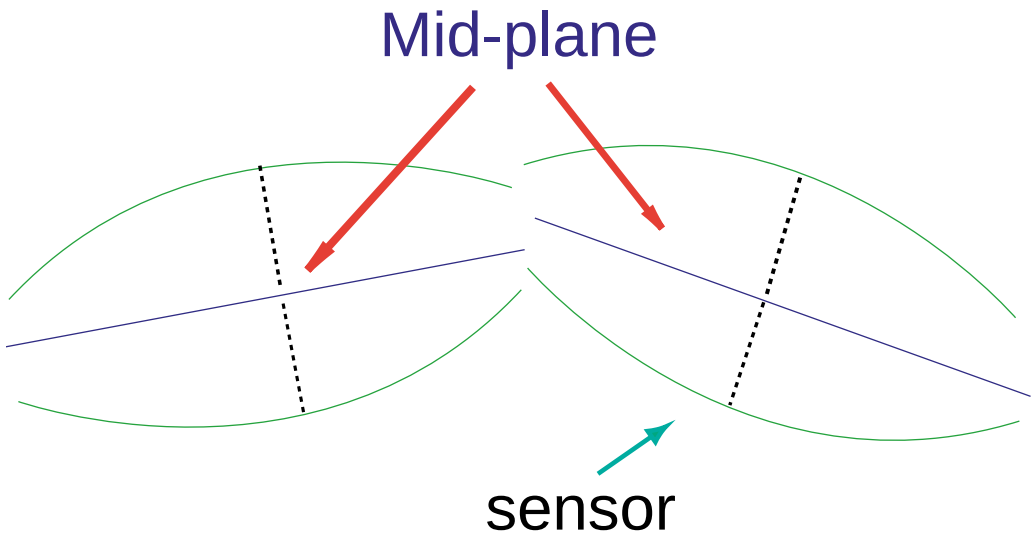


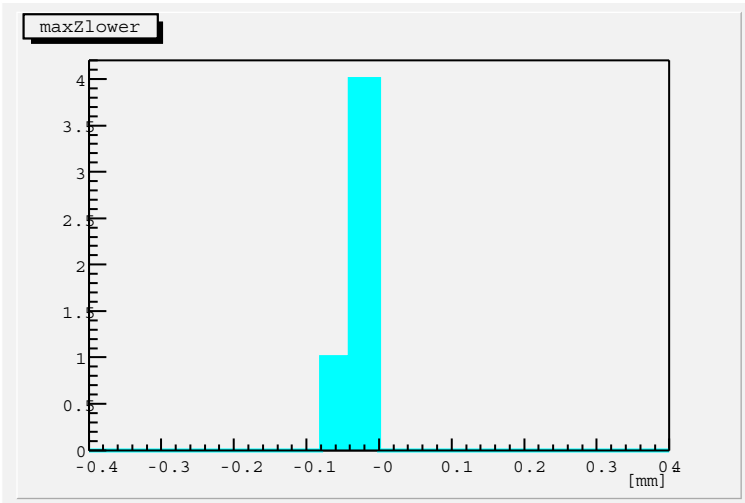
XY After Long Term

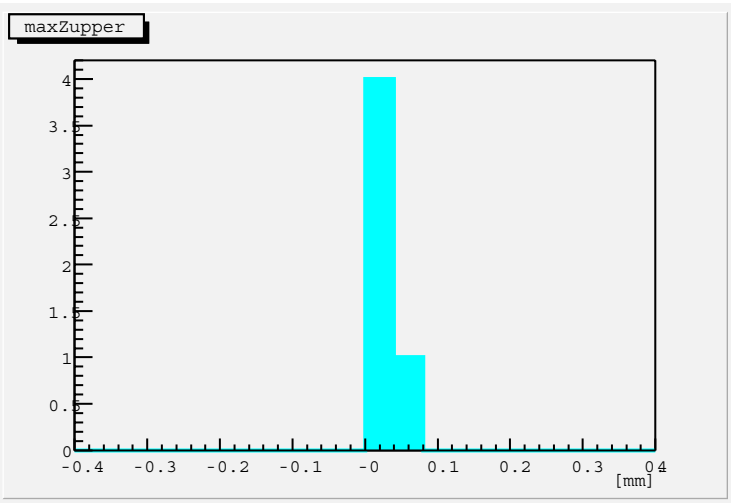


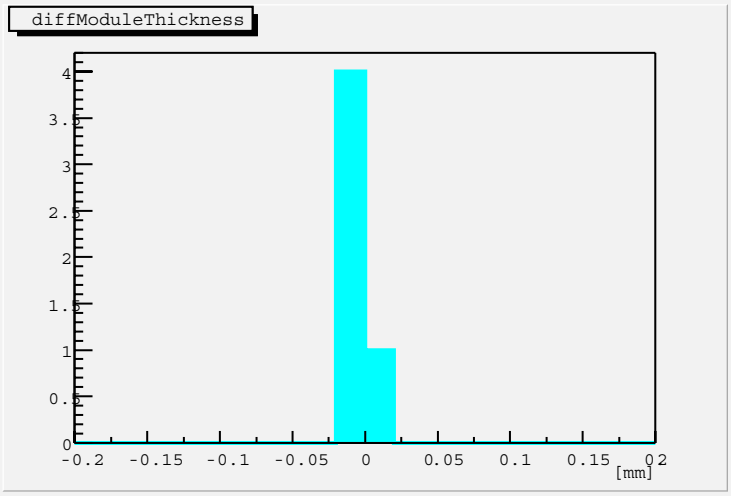
- Out-of-plane (z-profile) parameters

Parameters	Design values	Tolerance
maxZlower [mm]	0	-0.2
maxZupper [mm]	0	0.2
diffModuleThickness [mm]	0	0.1
optimalMaxZerrorLower [mm]	0	-0.05
optimalMaxZerrorUpper [mm]	0	0.05
optimalRMSZerrorLower [mm]	0	0.025
optimalRMSZerrorUpper [mm]	0	0.025
loCoolingFacing a [mrad]	0	0.5
loCoolingFacing b [mrad]	0	3
loCoolingFacingConcavity [mm]	0	0.03

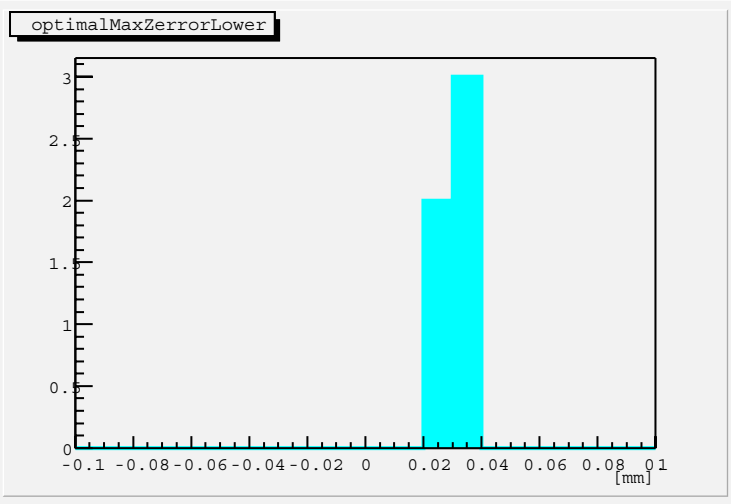


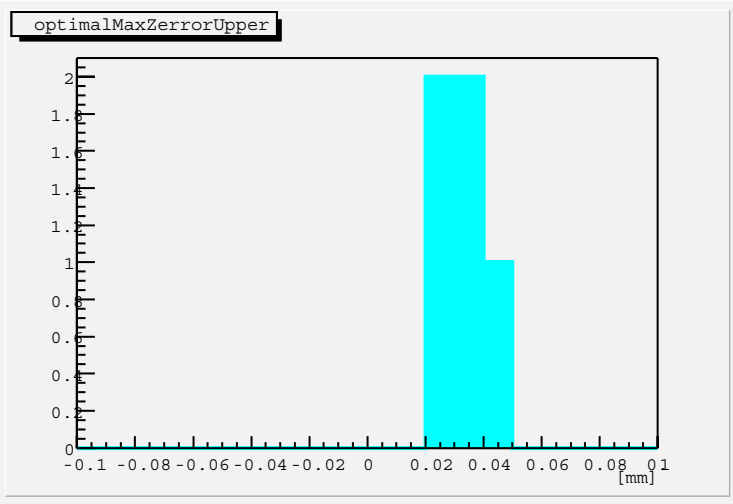


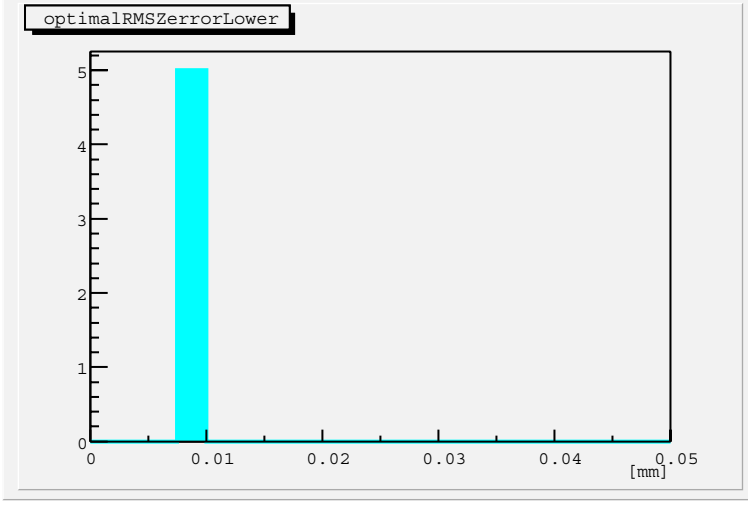


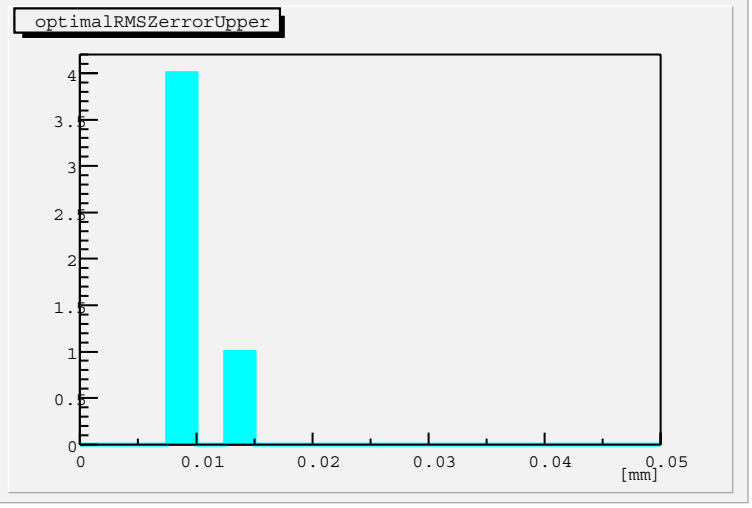


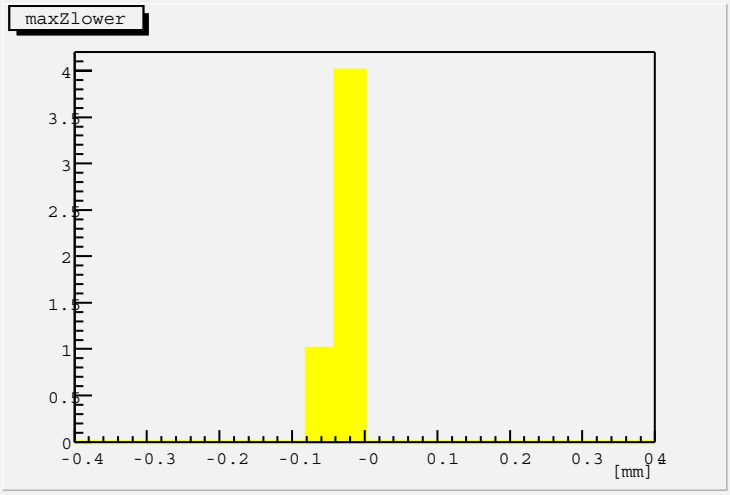
Z Before Thermal Cycle

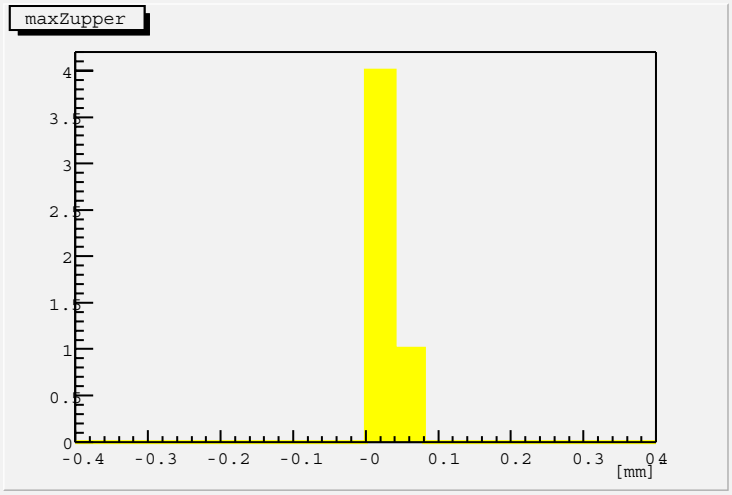


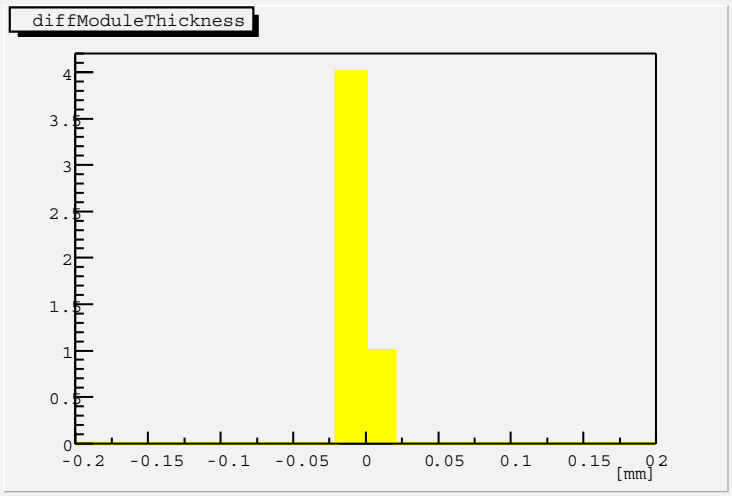




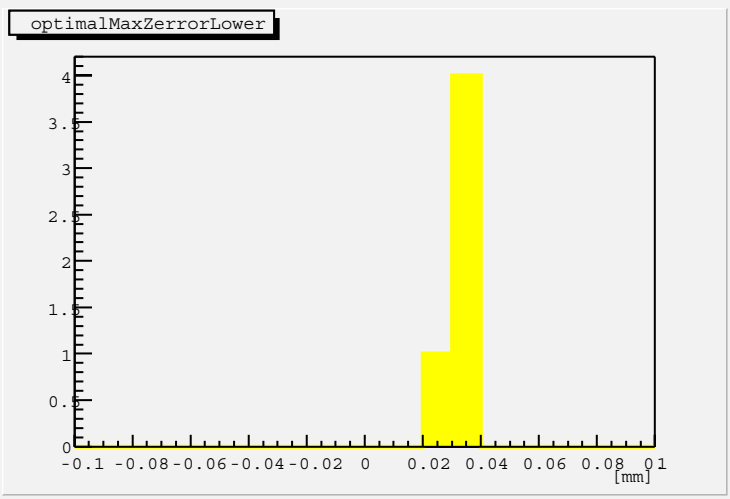


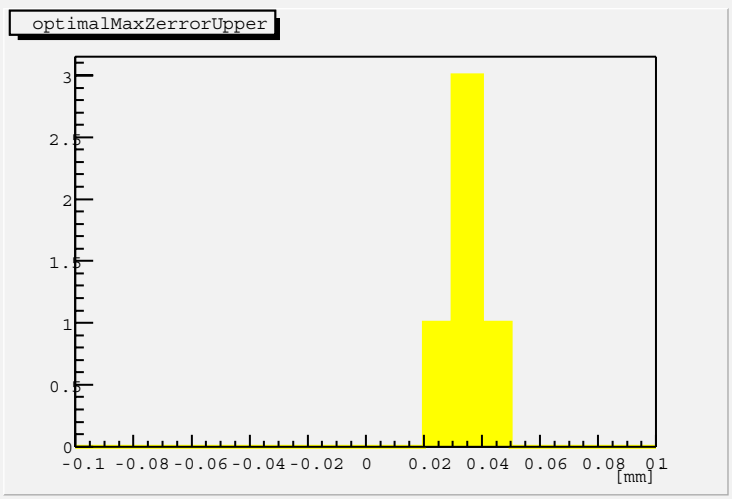


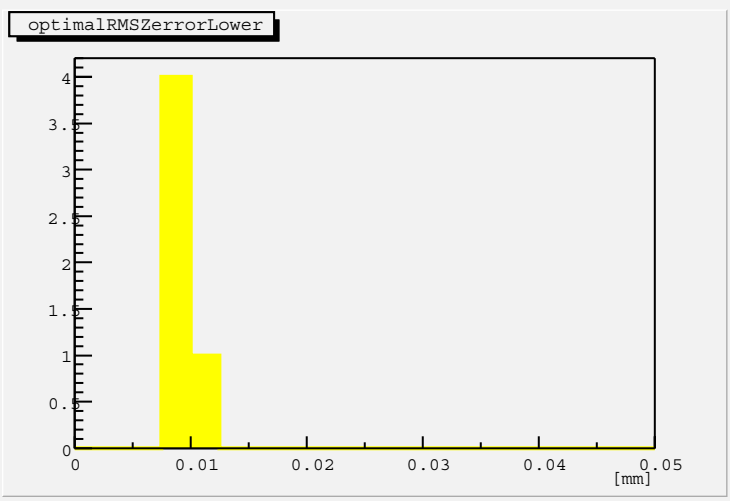


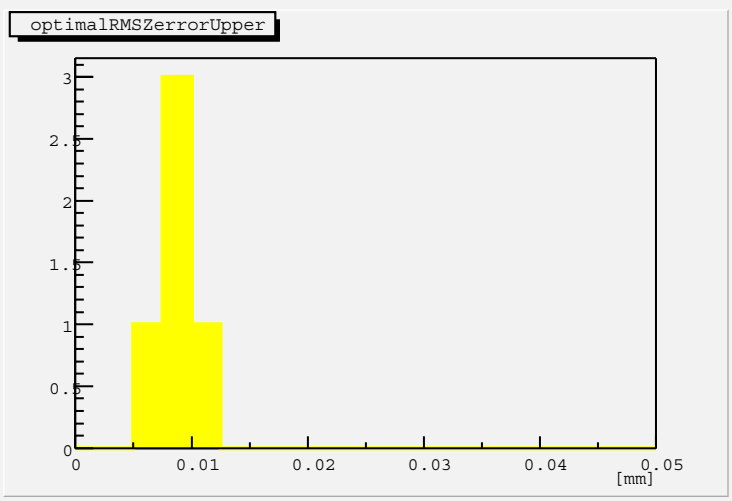


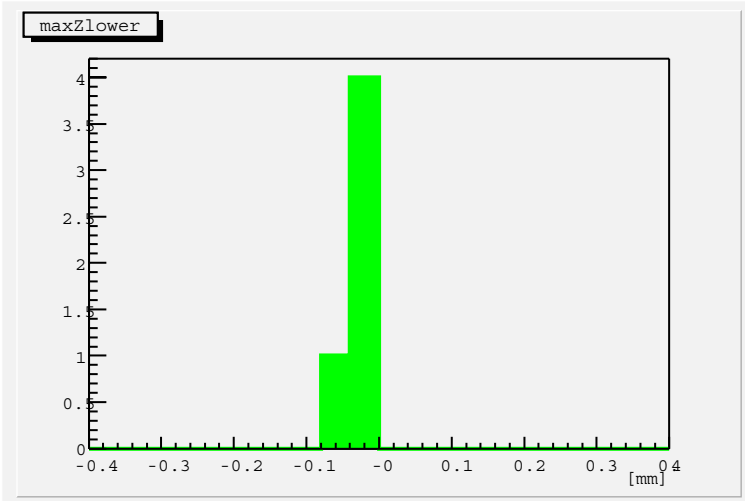
Z After Thermal Cycle

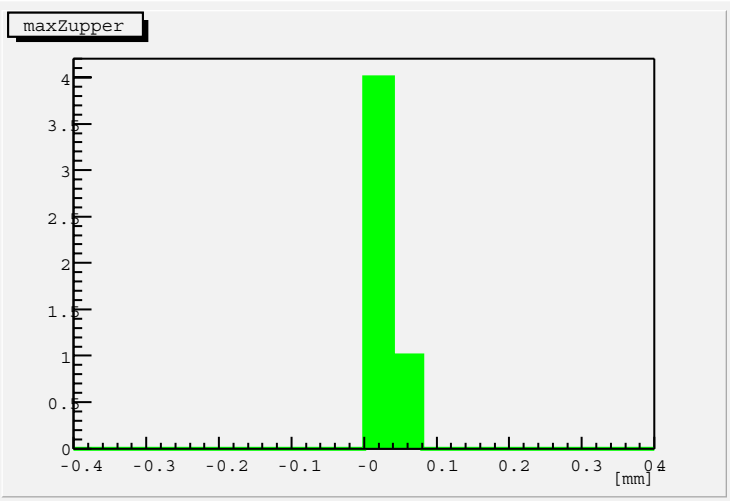


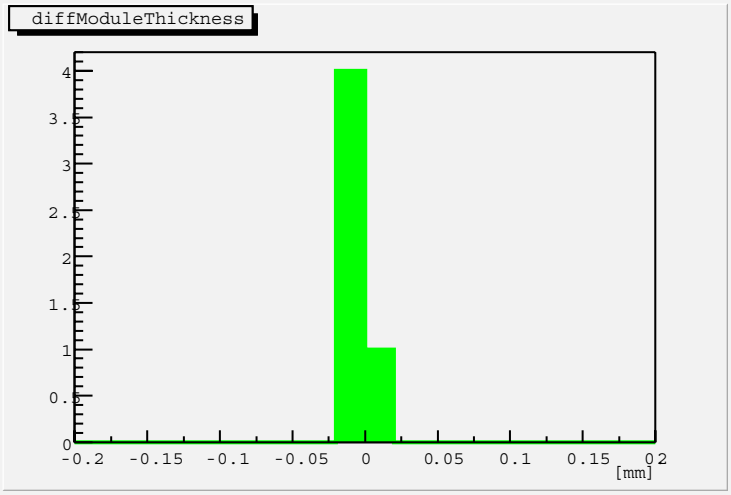




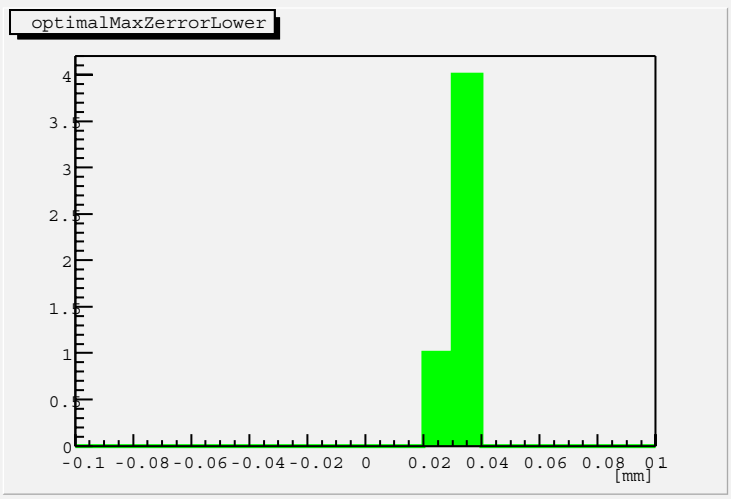


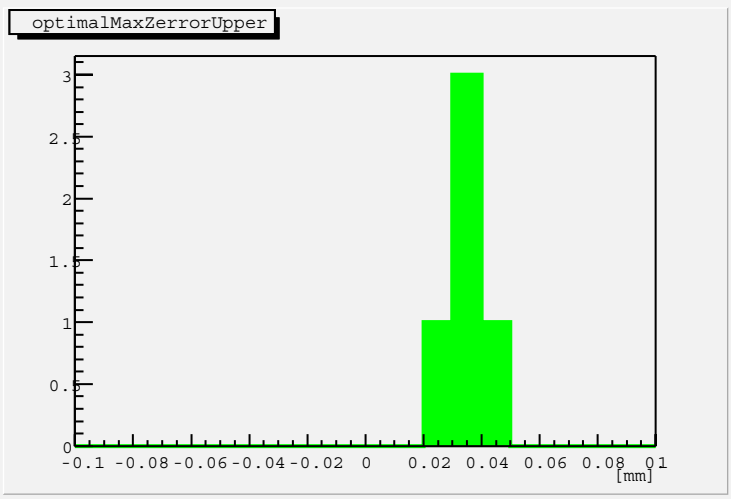


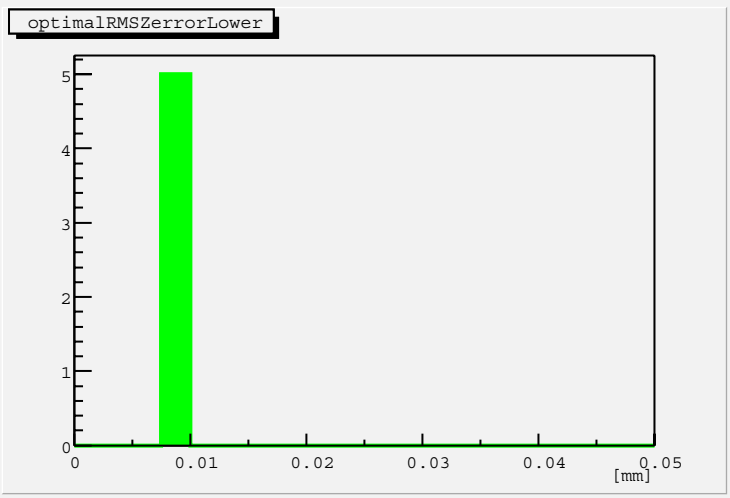


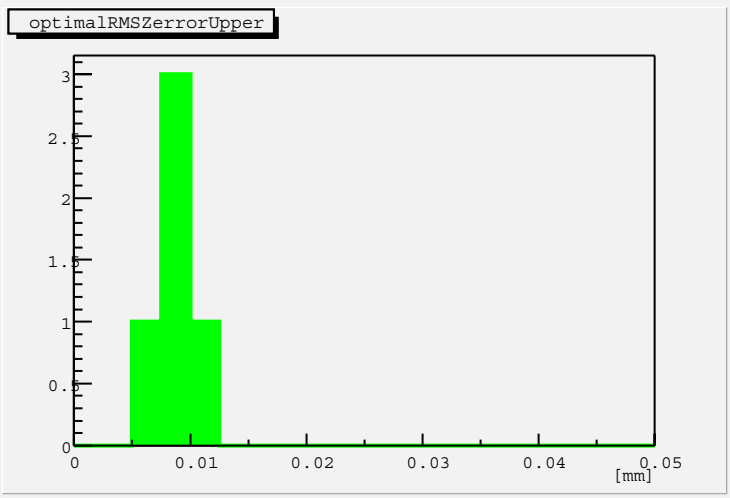


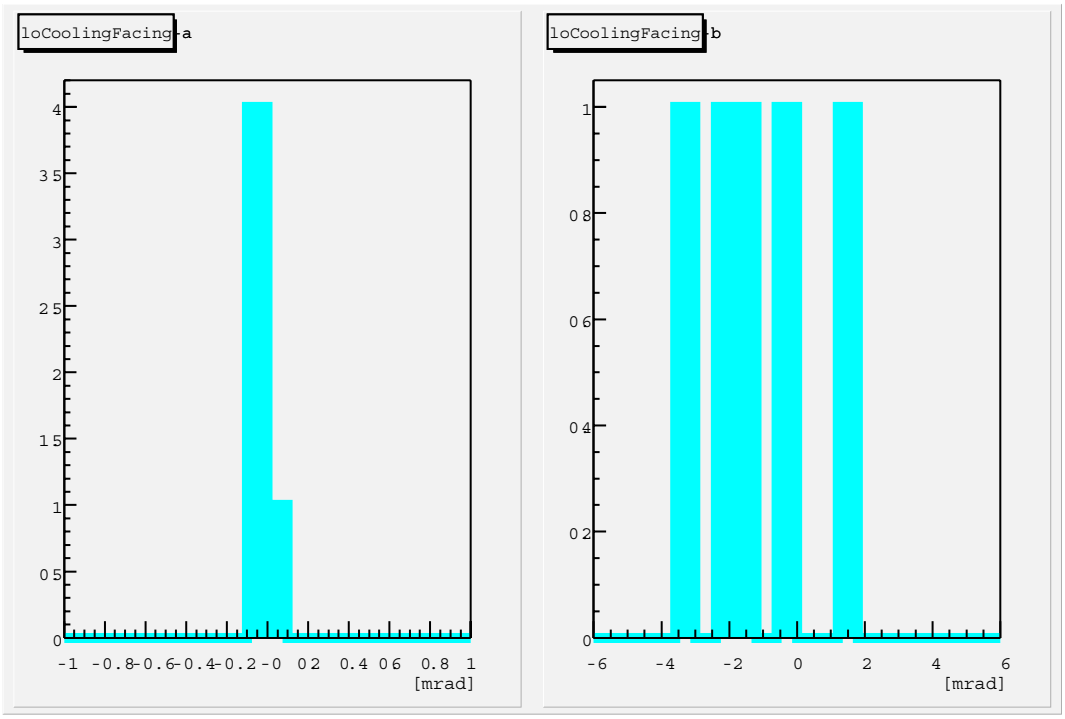
Z After Long Term





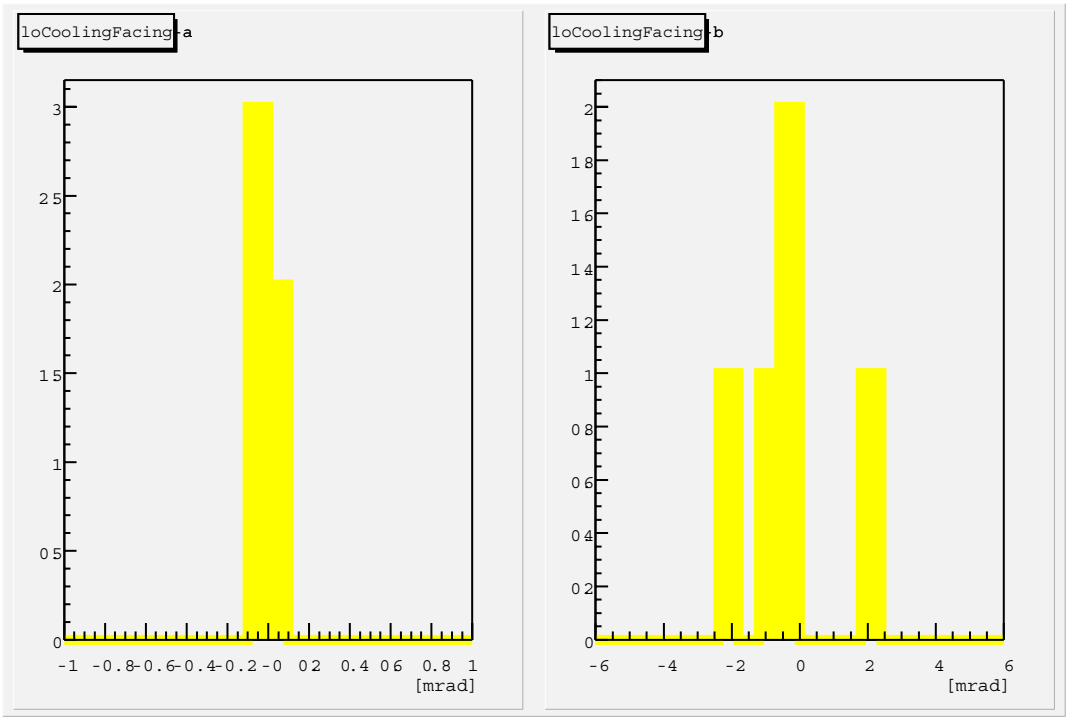


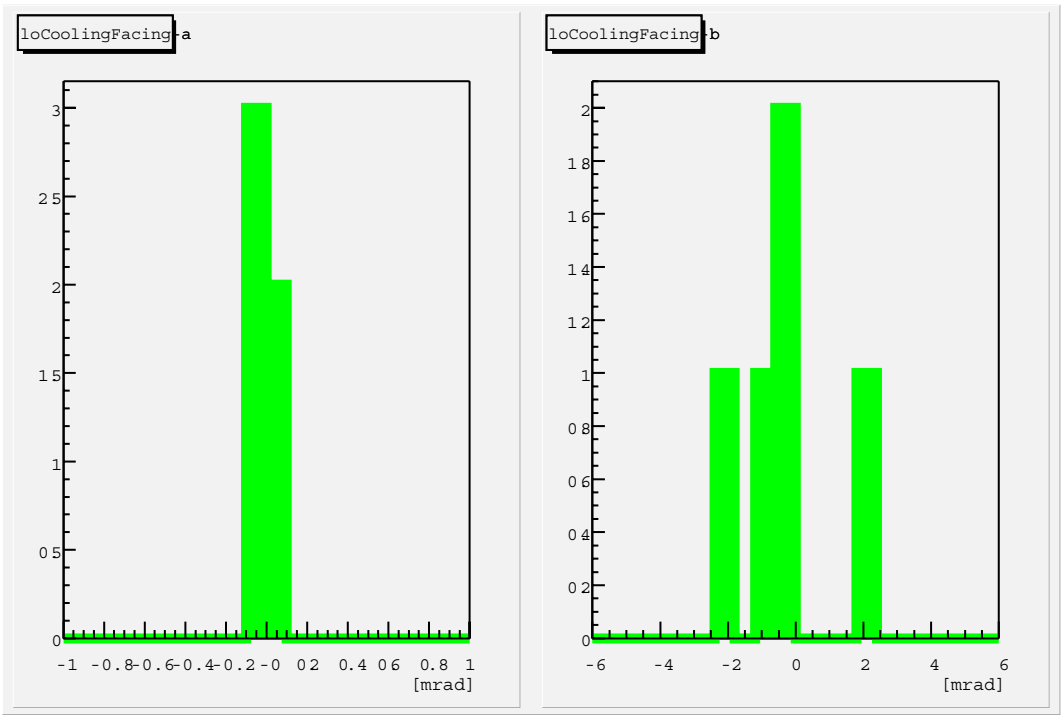




Before Thermal Cycle

After Thermal Cycle





After Long Term

Summary

- All five modules satisfied whole mechanical criteria with comfortable margin.

- Concerning front-back coordinate matching, the edge matching method is found to be more stable than the frame fiducial matching method.

- New parameters to represent z-profile are used.