Appendix A : et2, et3, es10 Reference Sensors

ISR 2000 EMU Alignment Test Results Using COCOA Reconstruction

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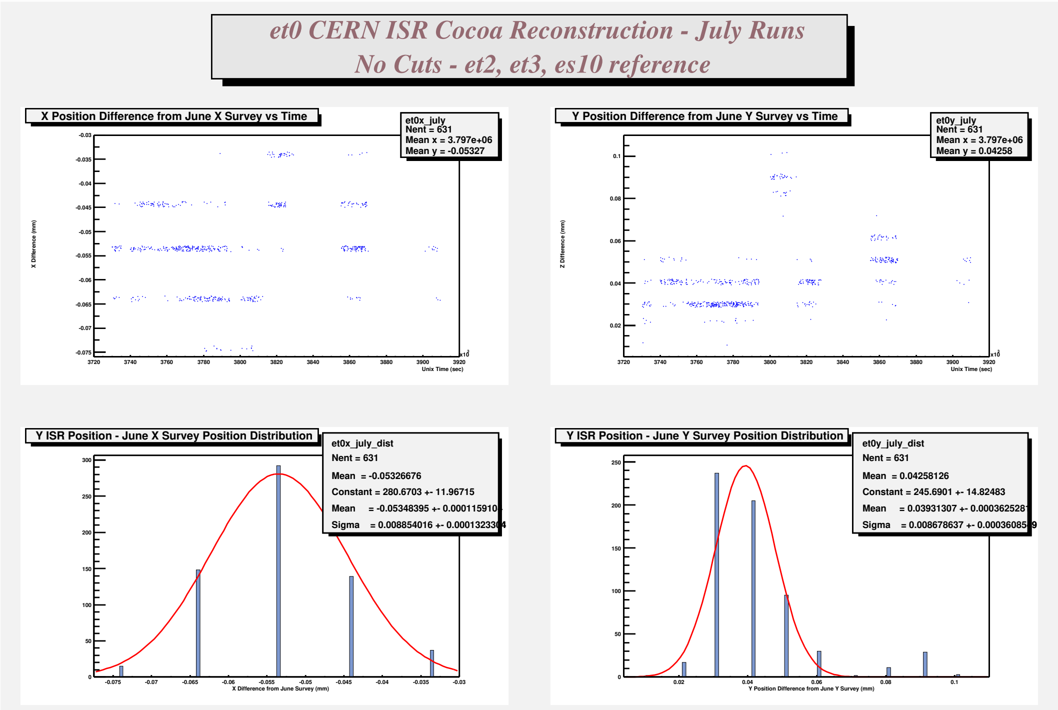


Figure 1: et0_july: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations. The series of plots show the reconstruction from Laser 301. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

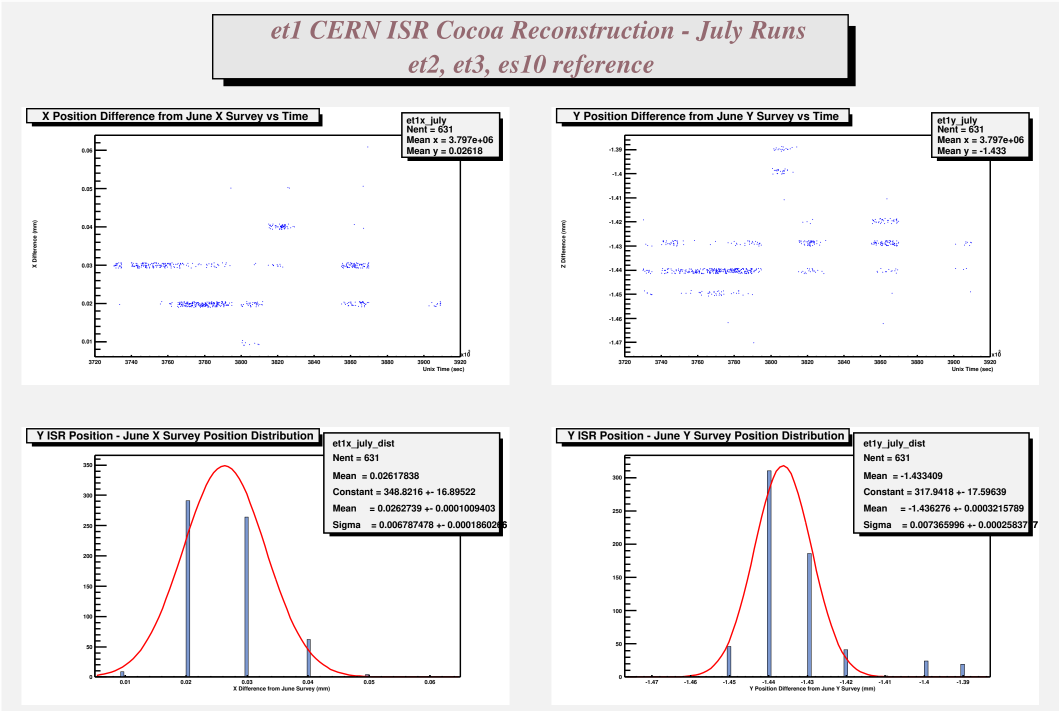


Figure 2: et1_july: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations. The series of plots show the reconstruction from Laser 301. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

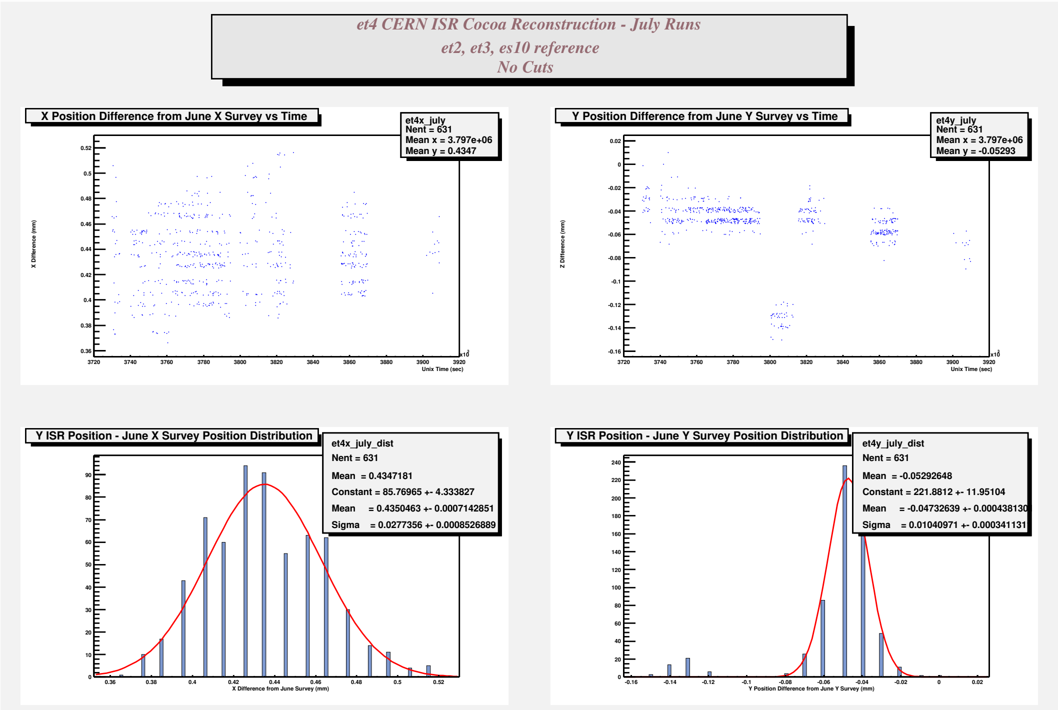


Figure 3: et4_july: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations. The series of plots show the reconstruction from Laser 301. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

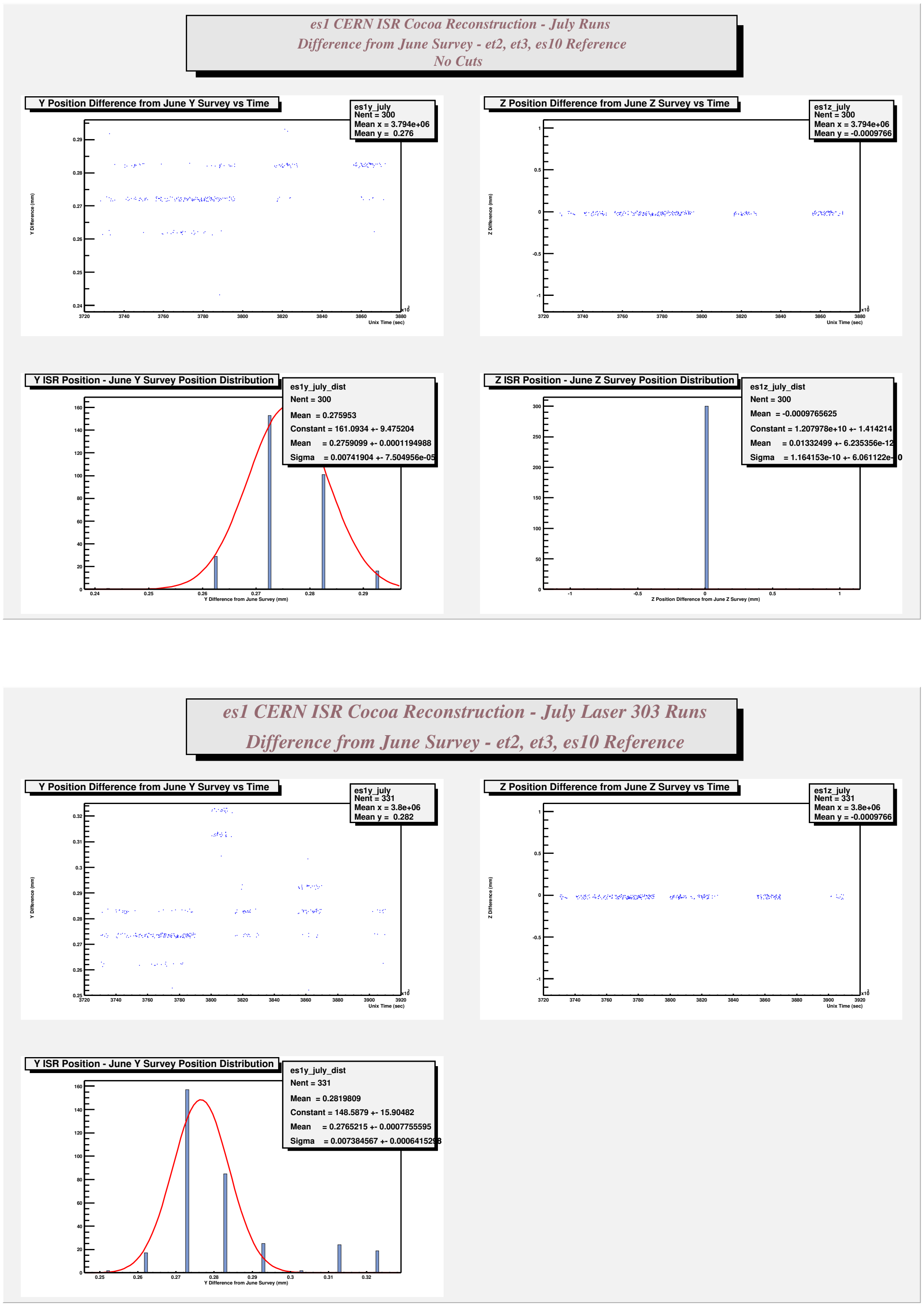


Figure 4: es1_july: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

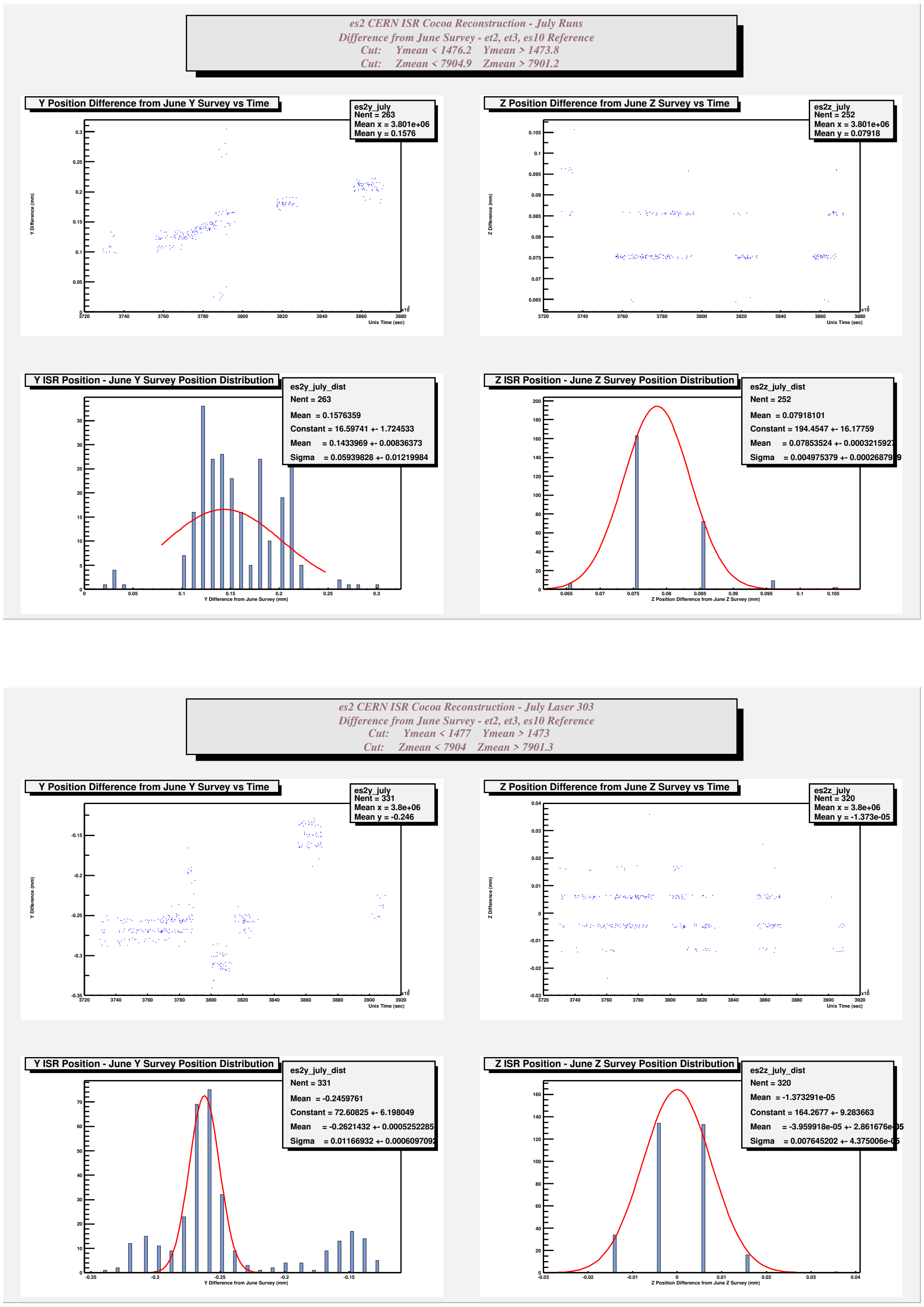
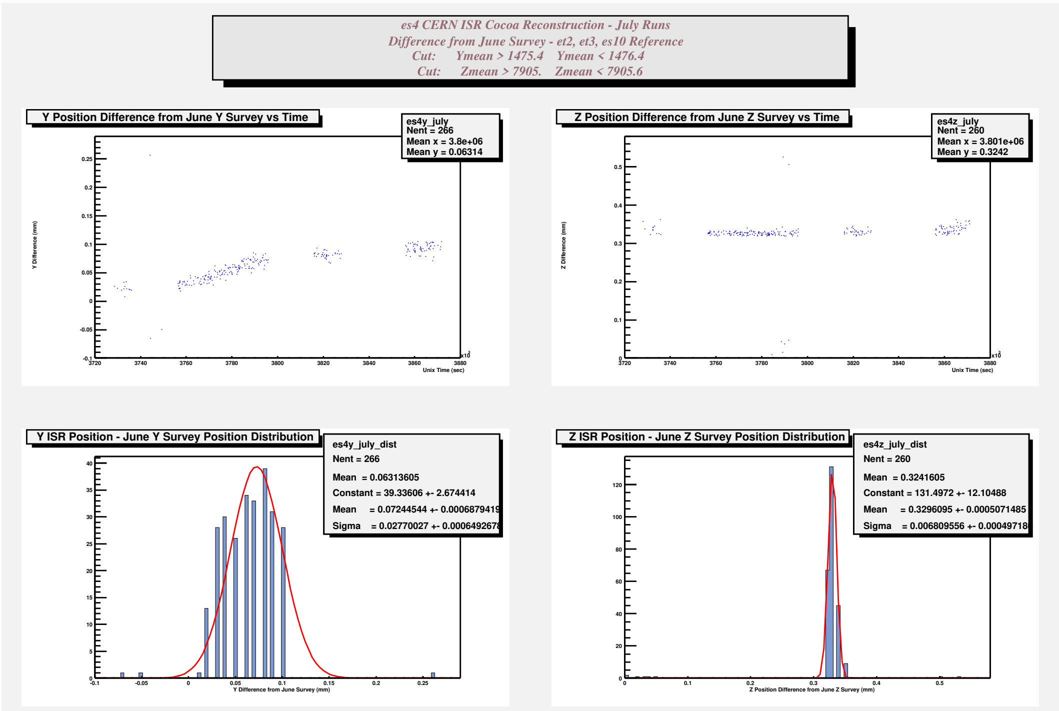


Figure 5: es2_july: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.



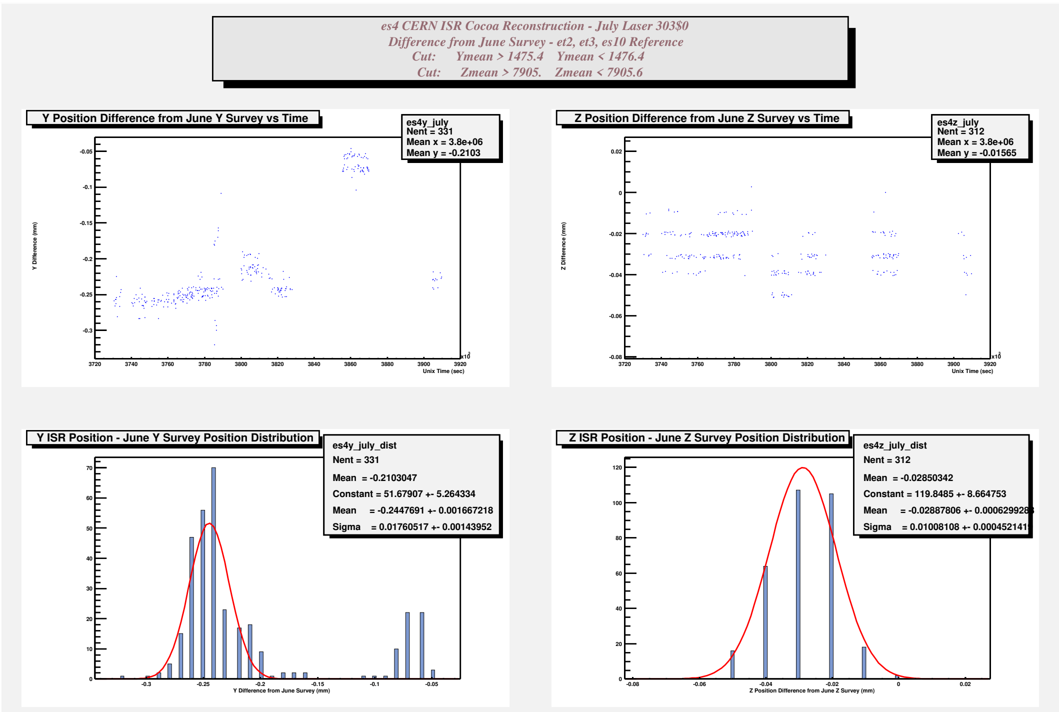


Figure 6: es4_july: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

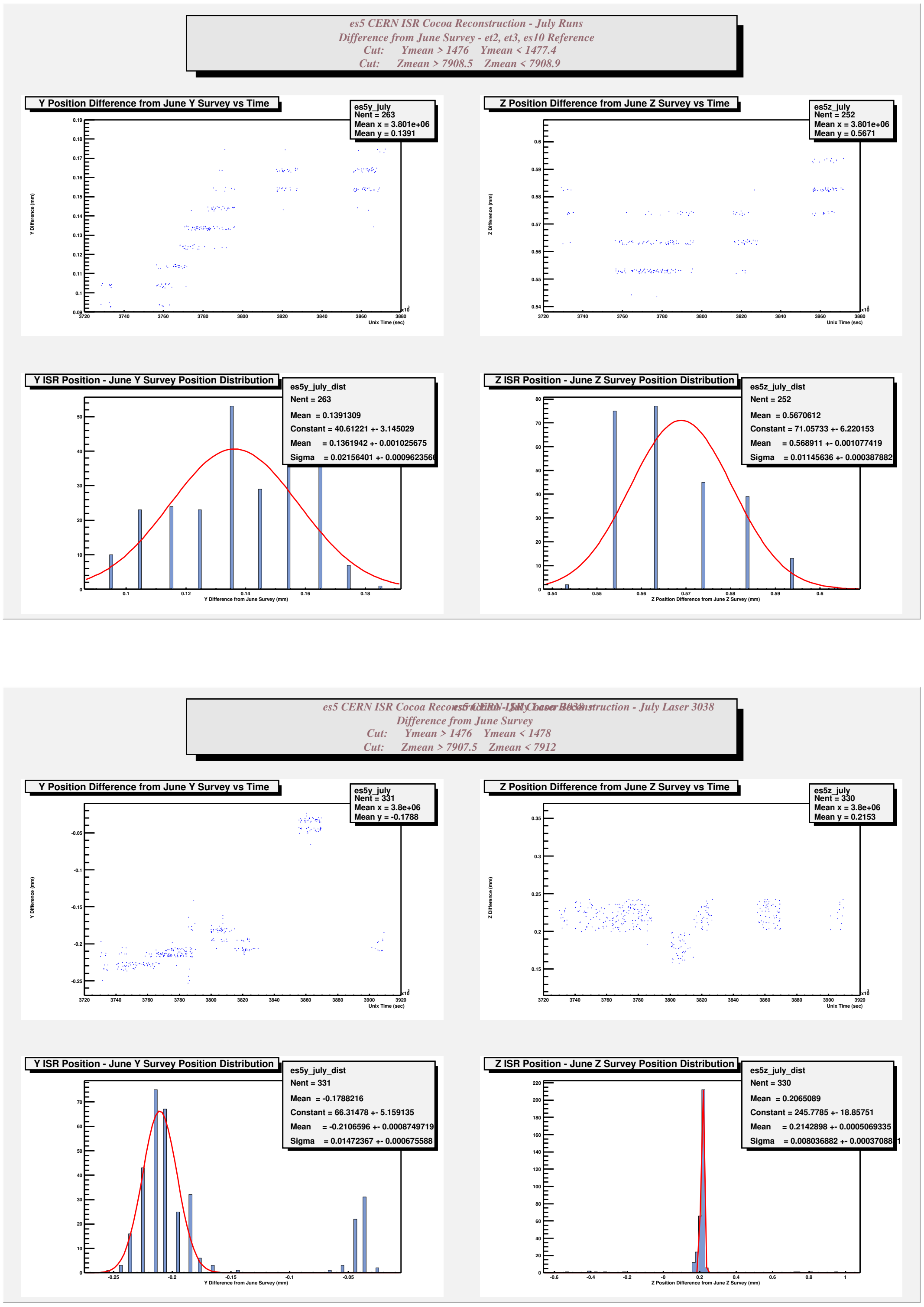


Figure 7: es5_july: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

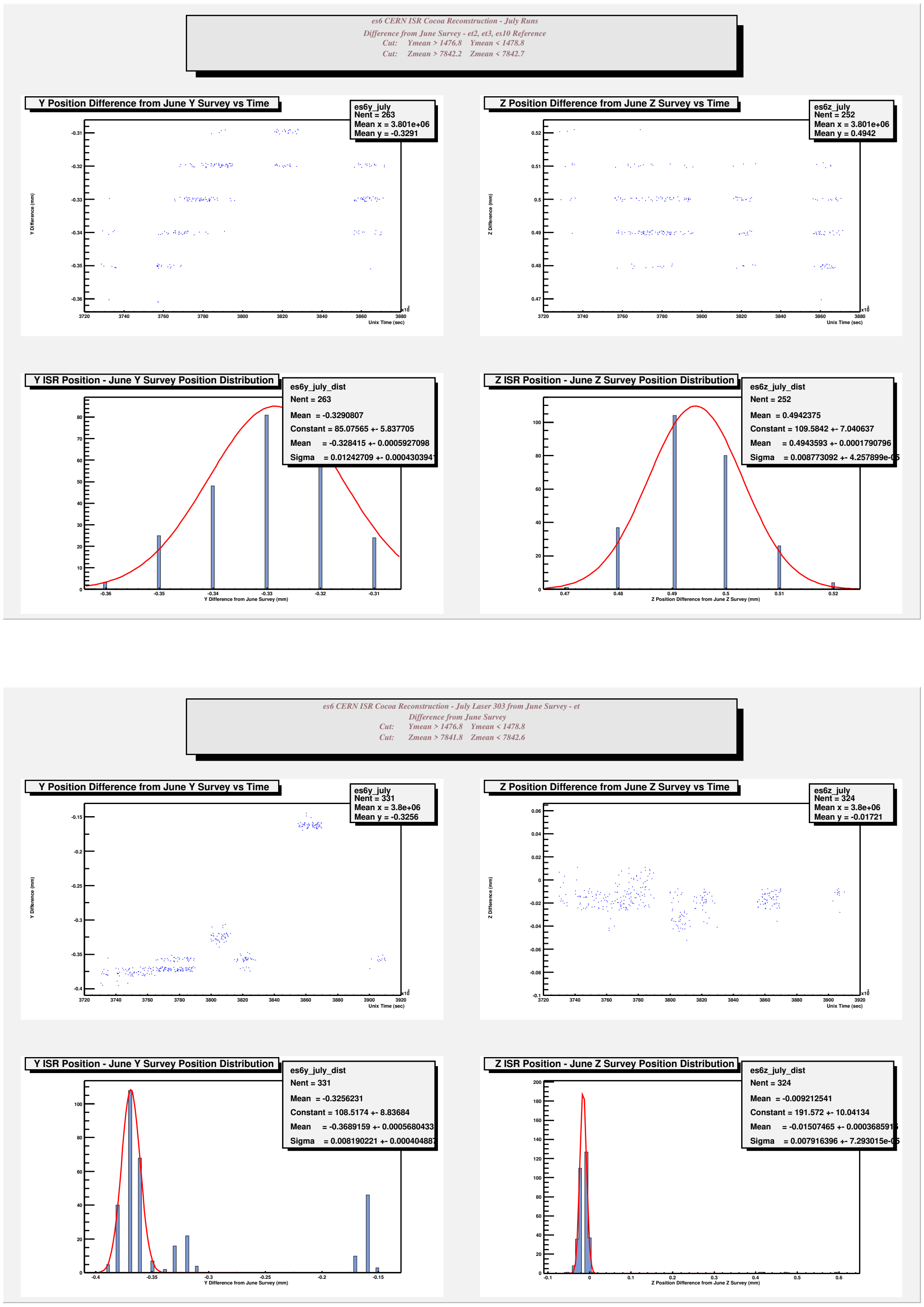


Figure 8: es6_july: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

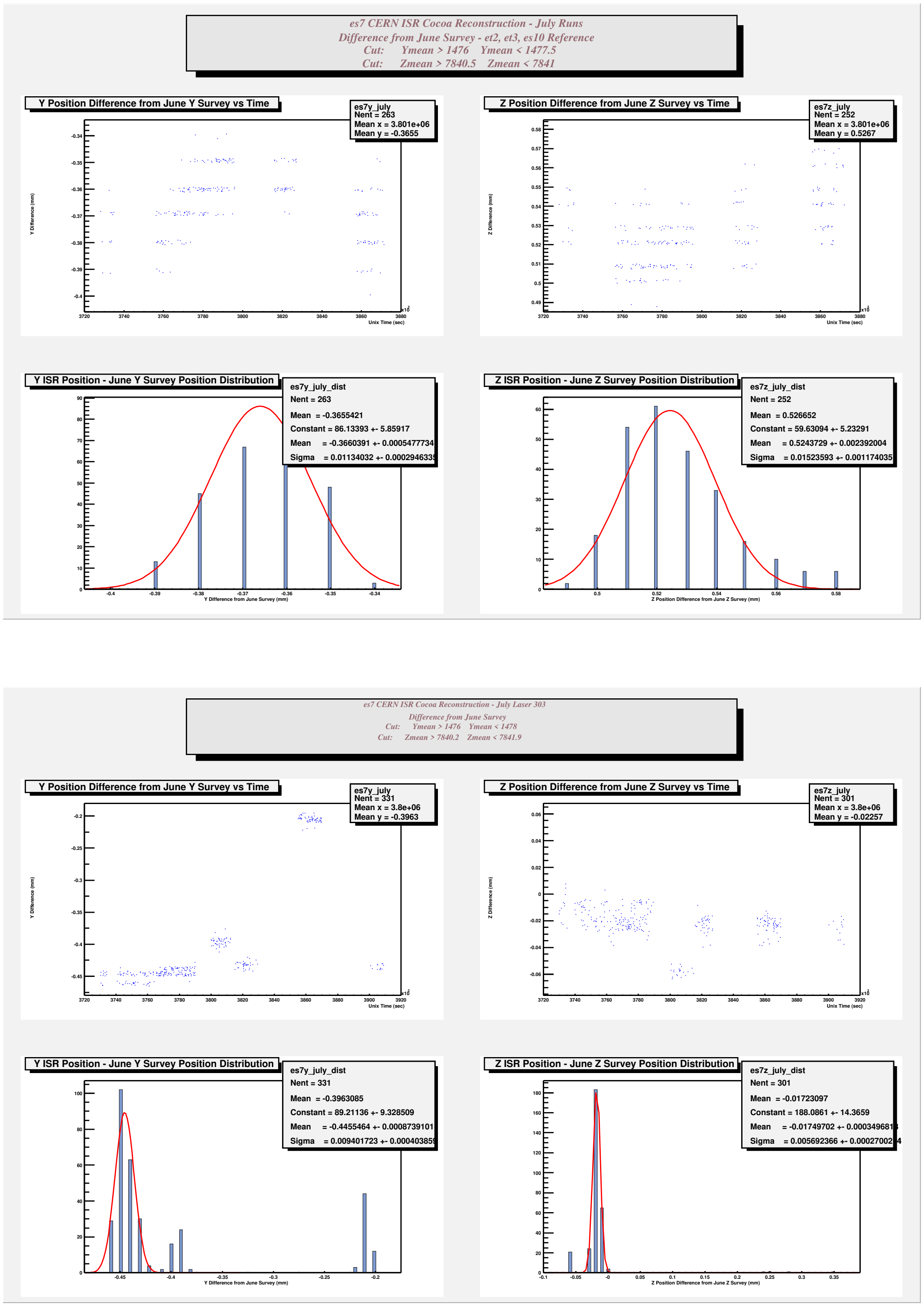


Figure 9: es7_july: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

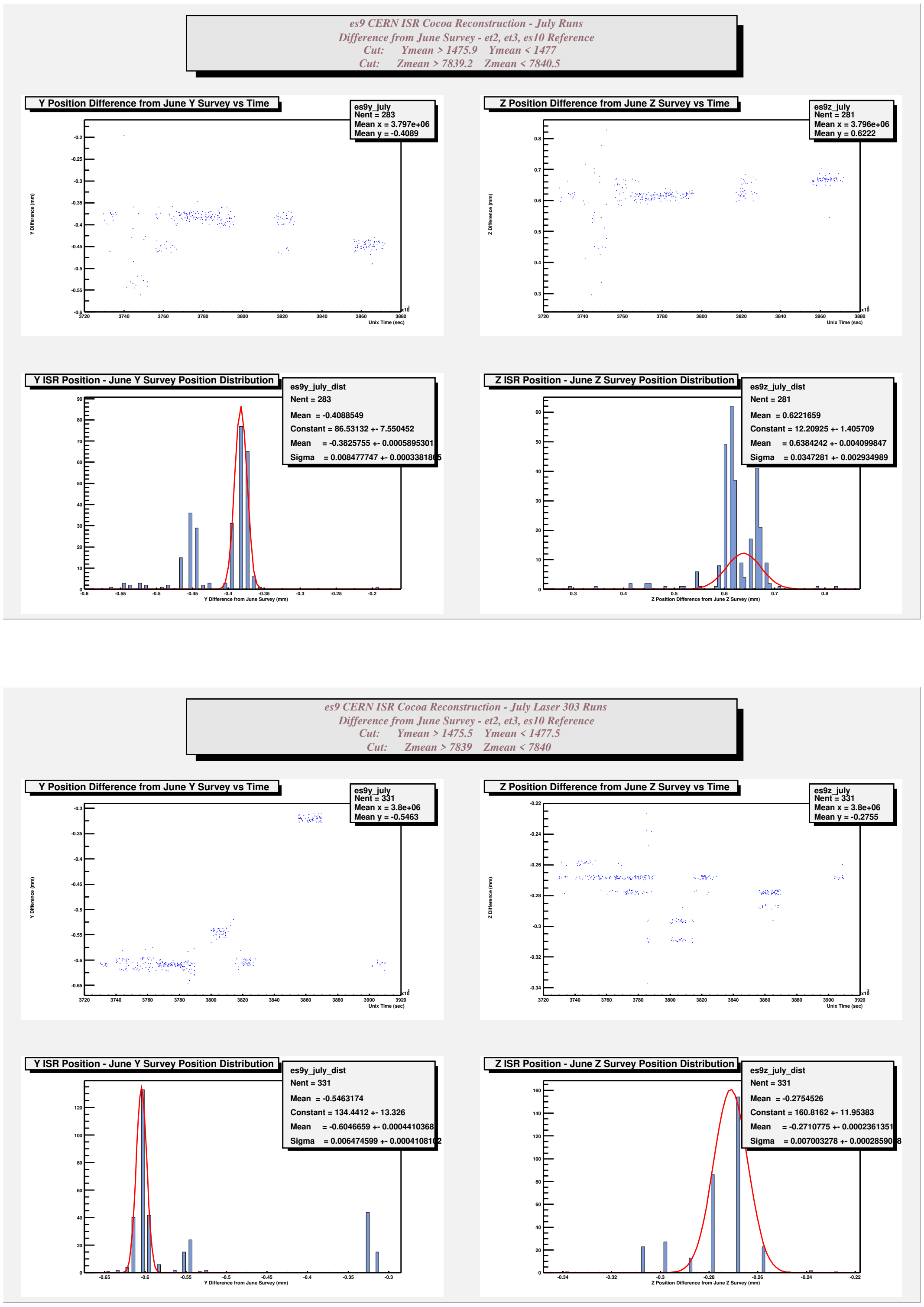


Figure 10: es10_july: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

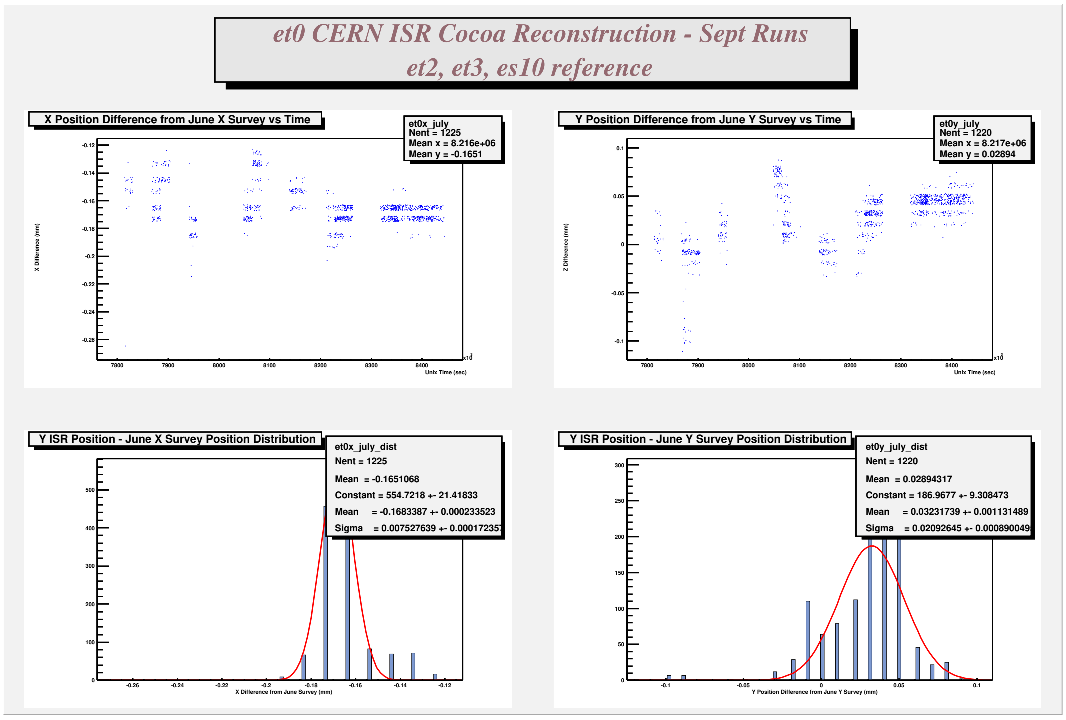


Figure 11: et0_sept: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted Sept CCD centroids and the surveyed dowel locations. The series of plots show the reconstruction from Laser 301. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

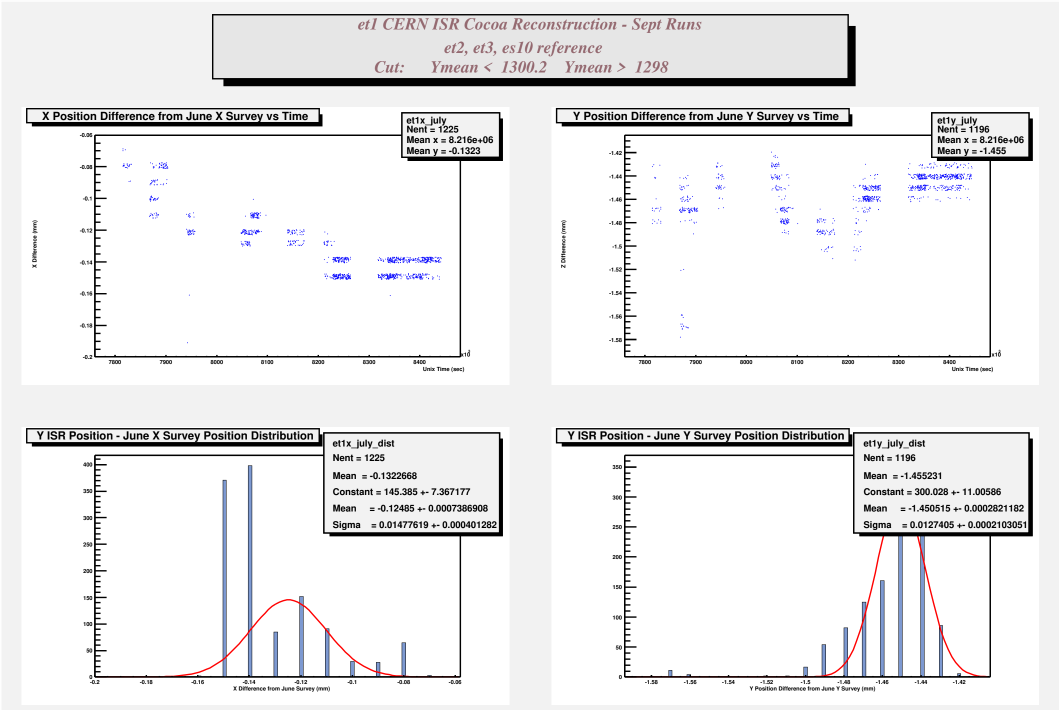


Figure 12: et1_sept: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted Sept CCD centroids and the surveyed dowel locations. The series of plots show the reconstruction from Laser 301. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

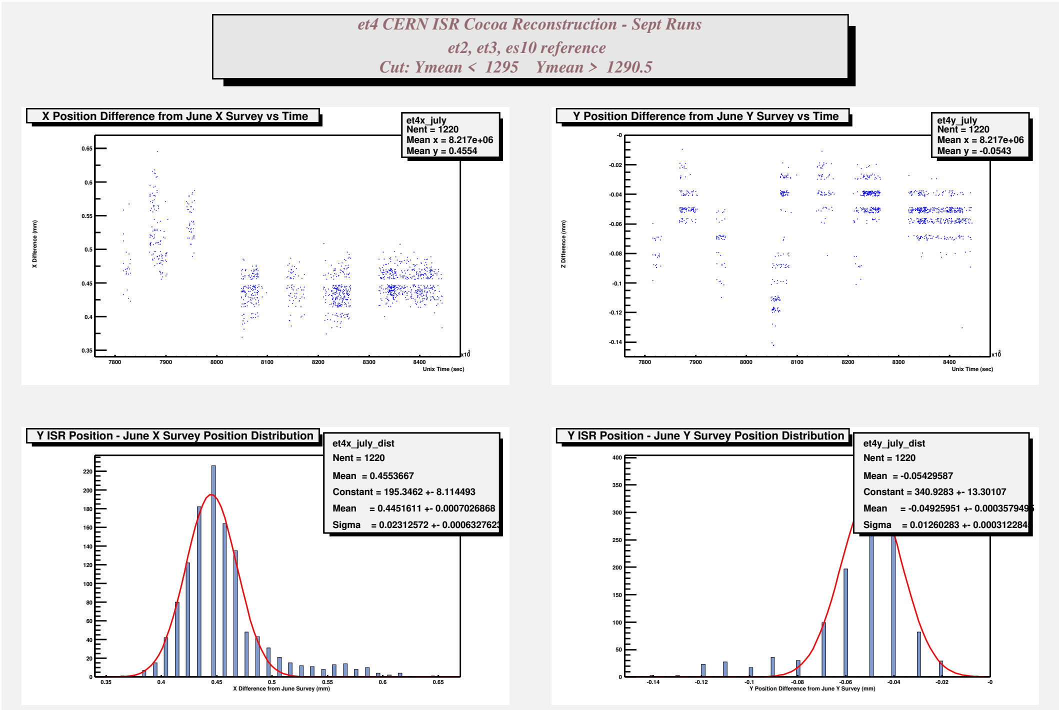


Figure 13: et4_sept: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted Sept CCD centroids and the surveyed dowel locations. The series of plots show the reconstruction from Laser 301. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

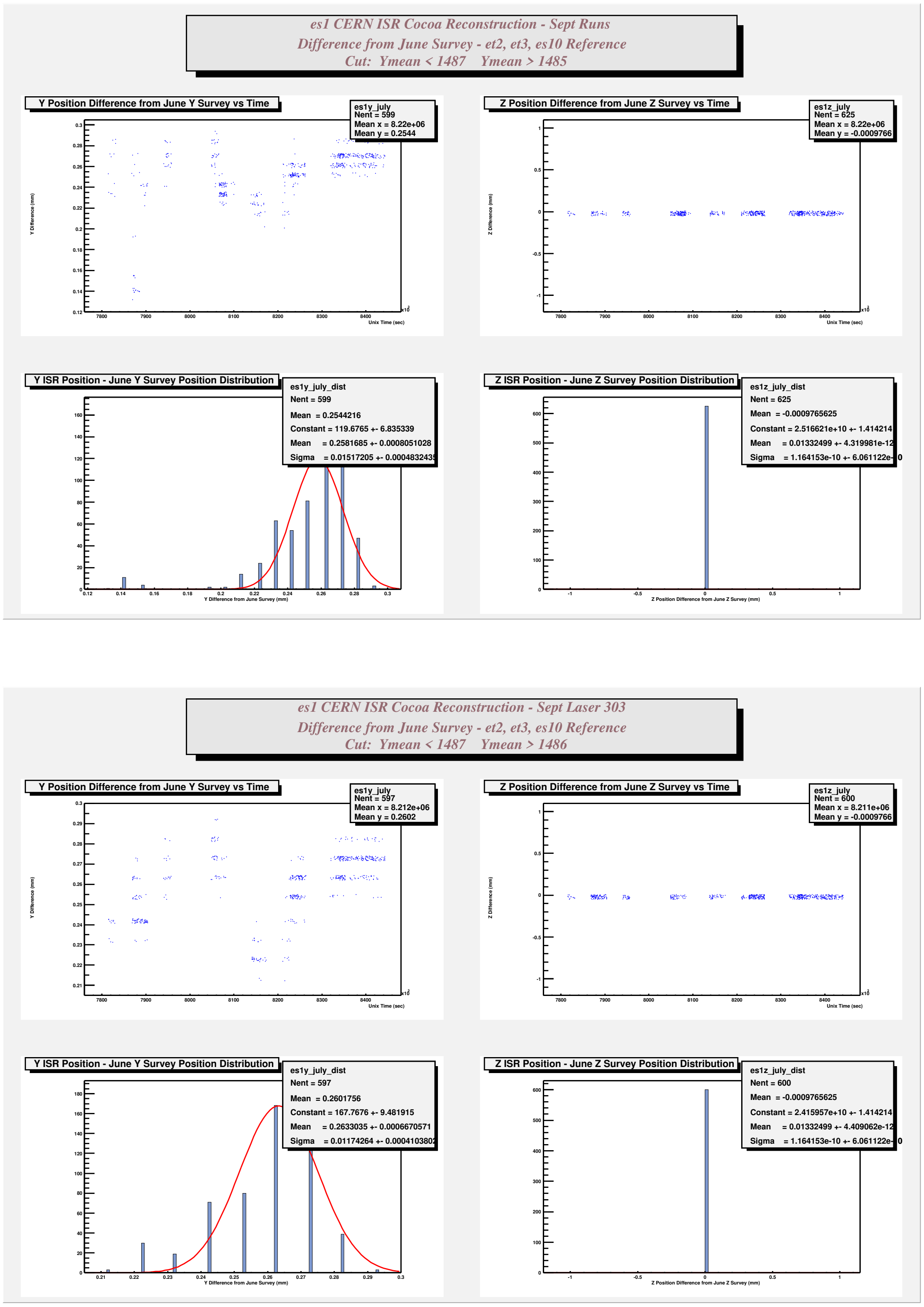


Figure 14: es1_sept: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted Sept CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

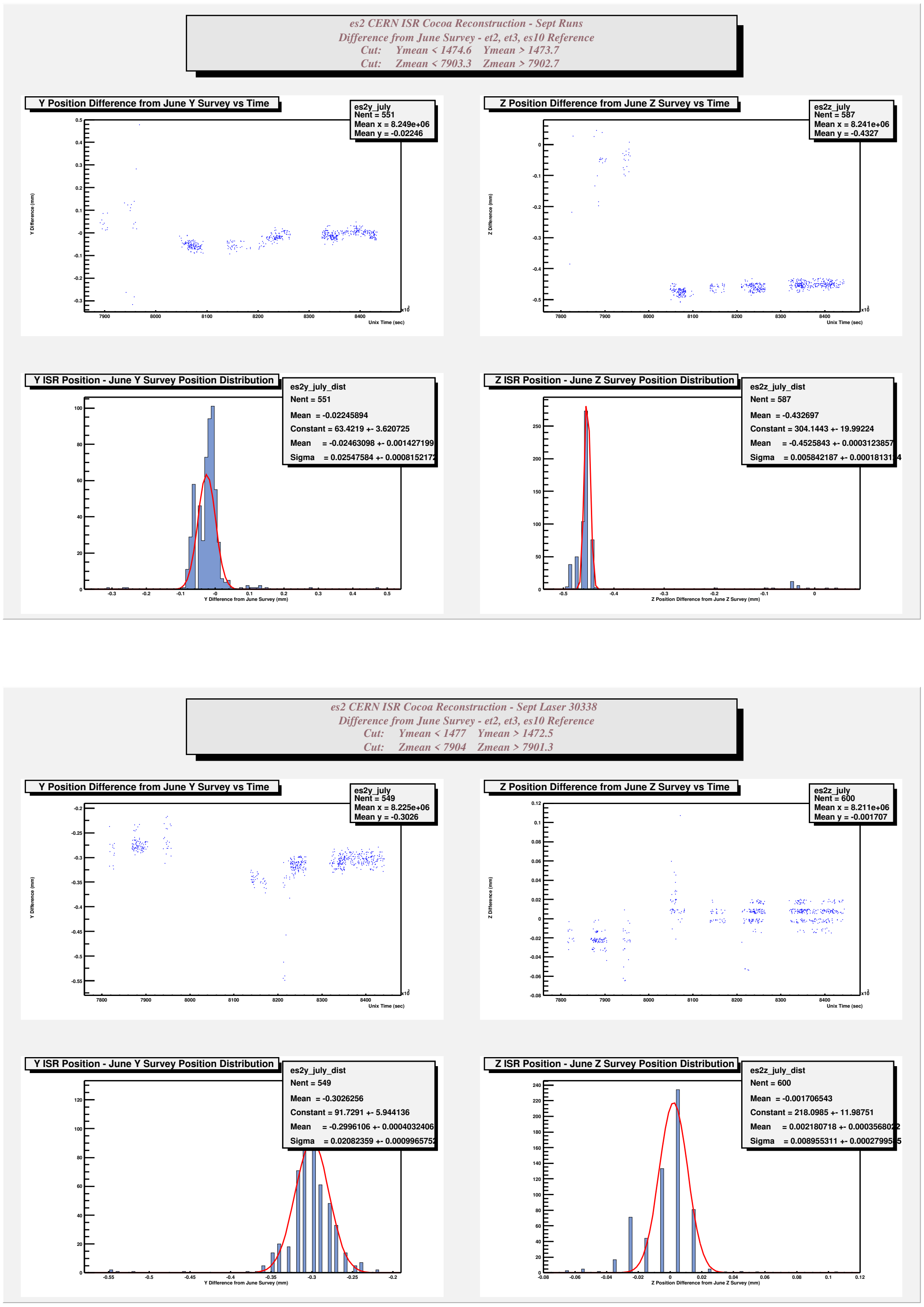
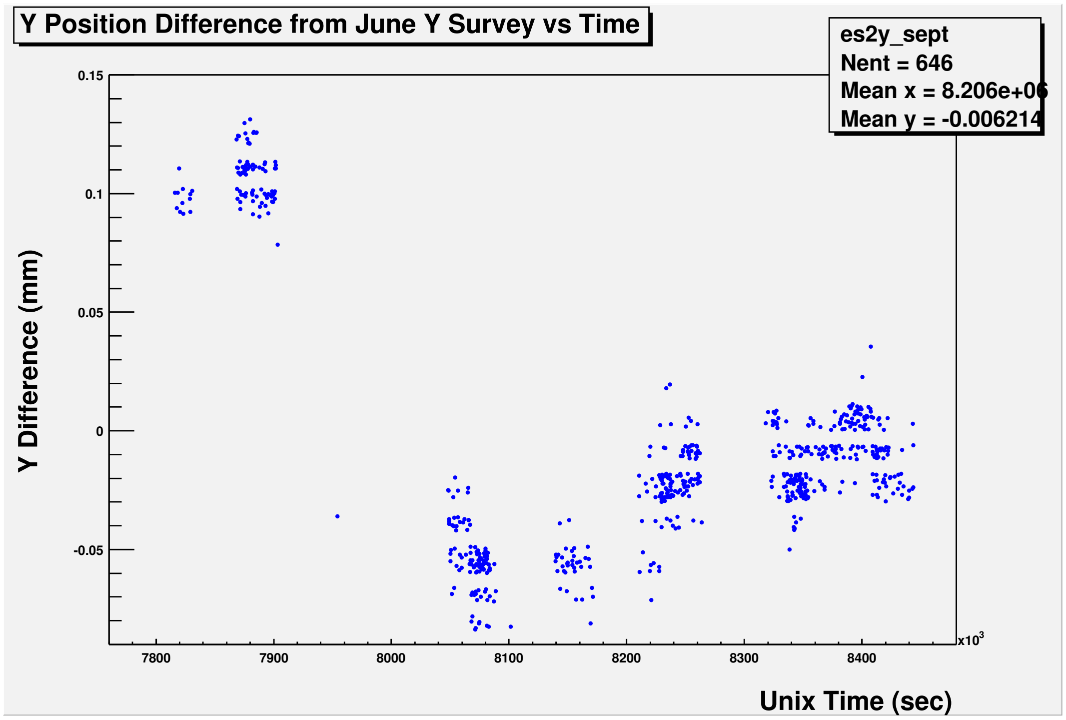


Figure 15: es2_sept: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted Sept CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.



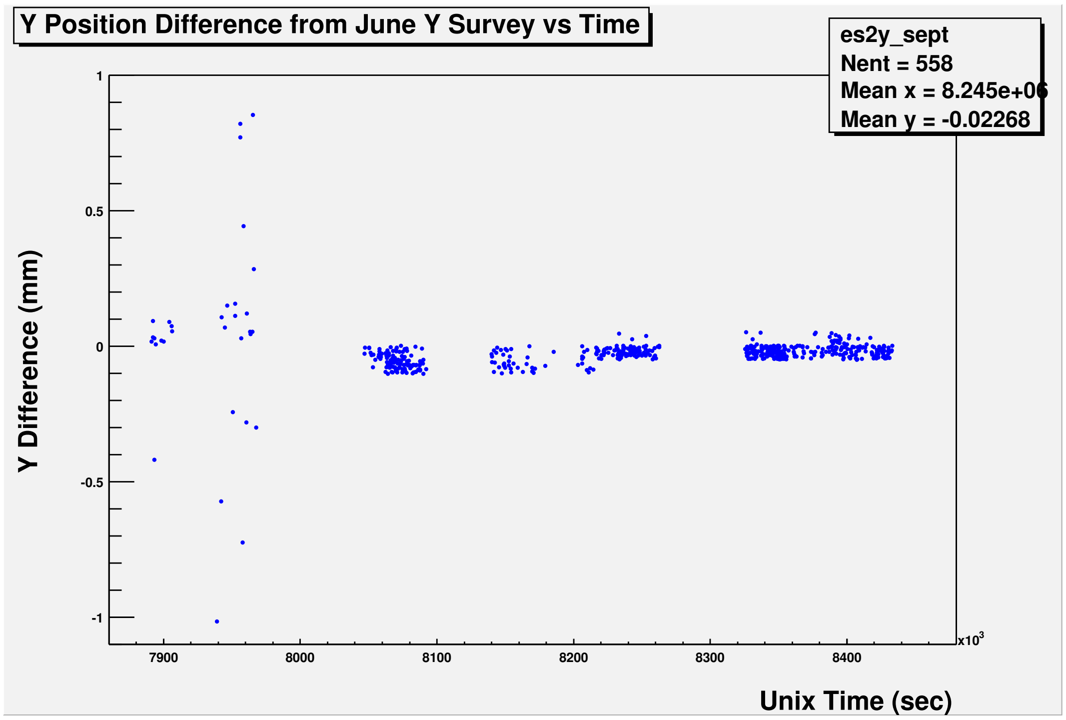
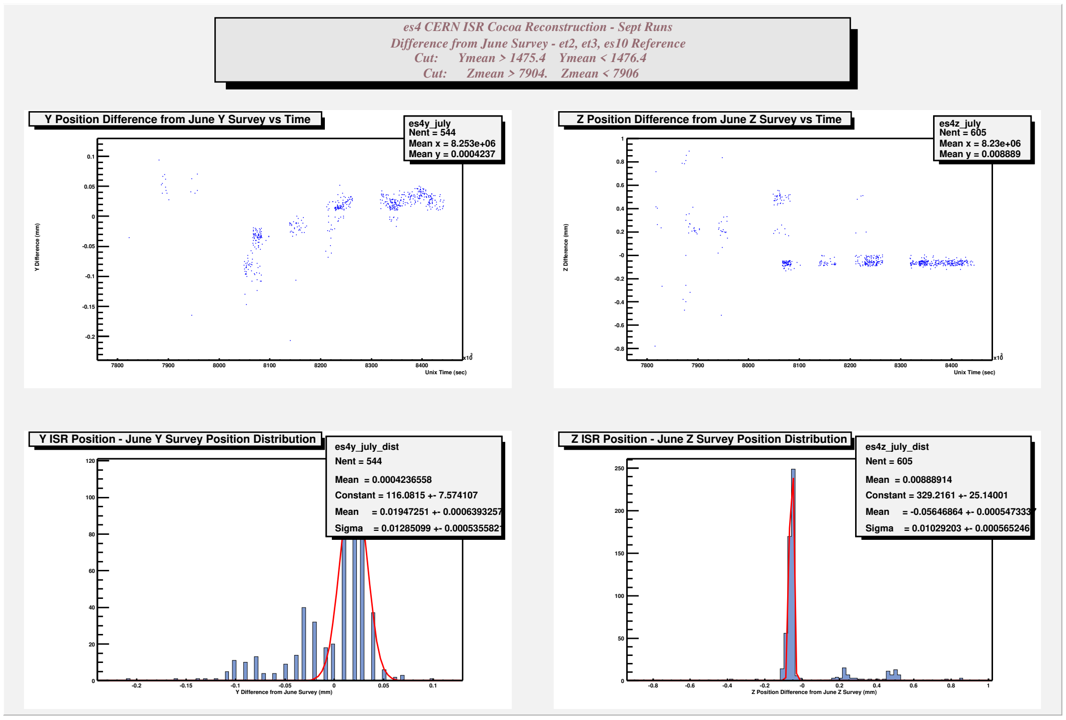


Figure 16: es2_sept_jump: The plots show the distributions of differences between the Laser 302 COCOA reconstructed Y dowel position from the fitted Sept CCD centroids and the surveyed dowel locations. The plots show how this sensor appears to 'jump' Y positions when Reconstruction is done with es9 (upper plot) as the final reference, but appears as a random distribution when Reconstructed with es10 (lower plot).



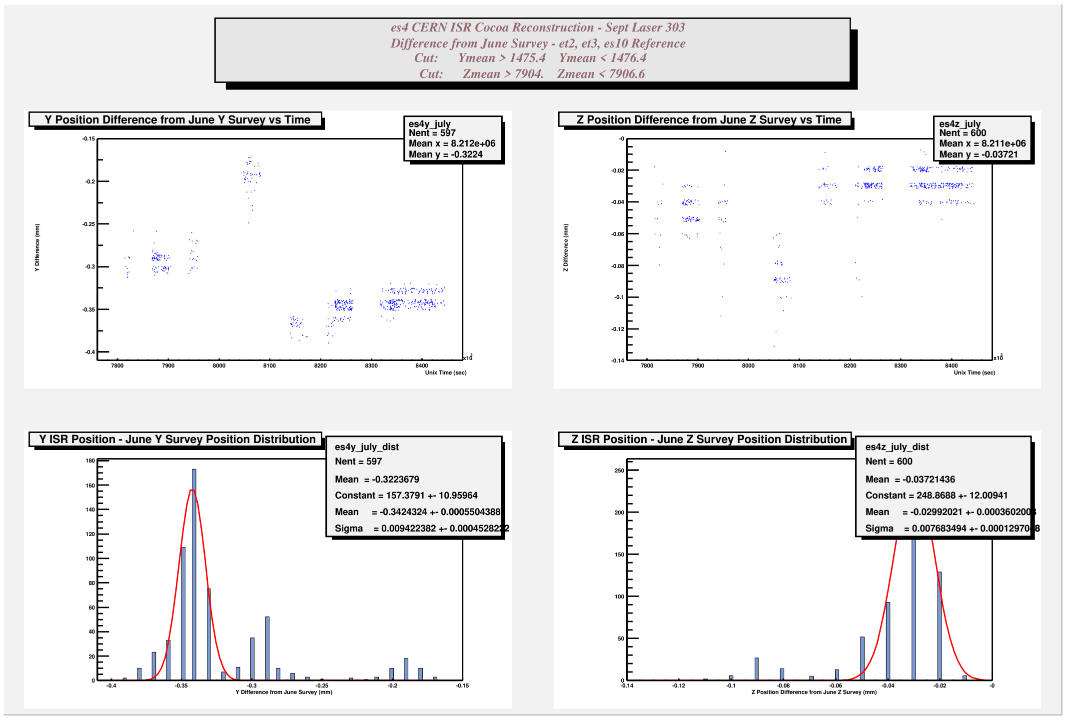


Figure 17: es4_sept: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted Sept CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

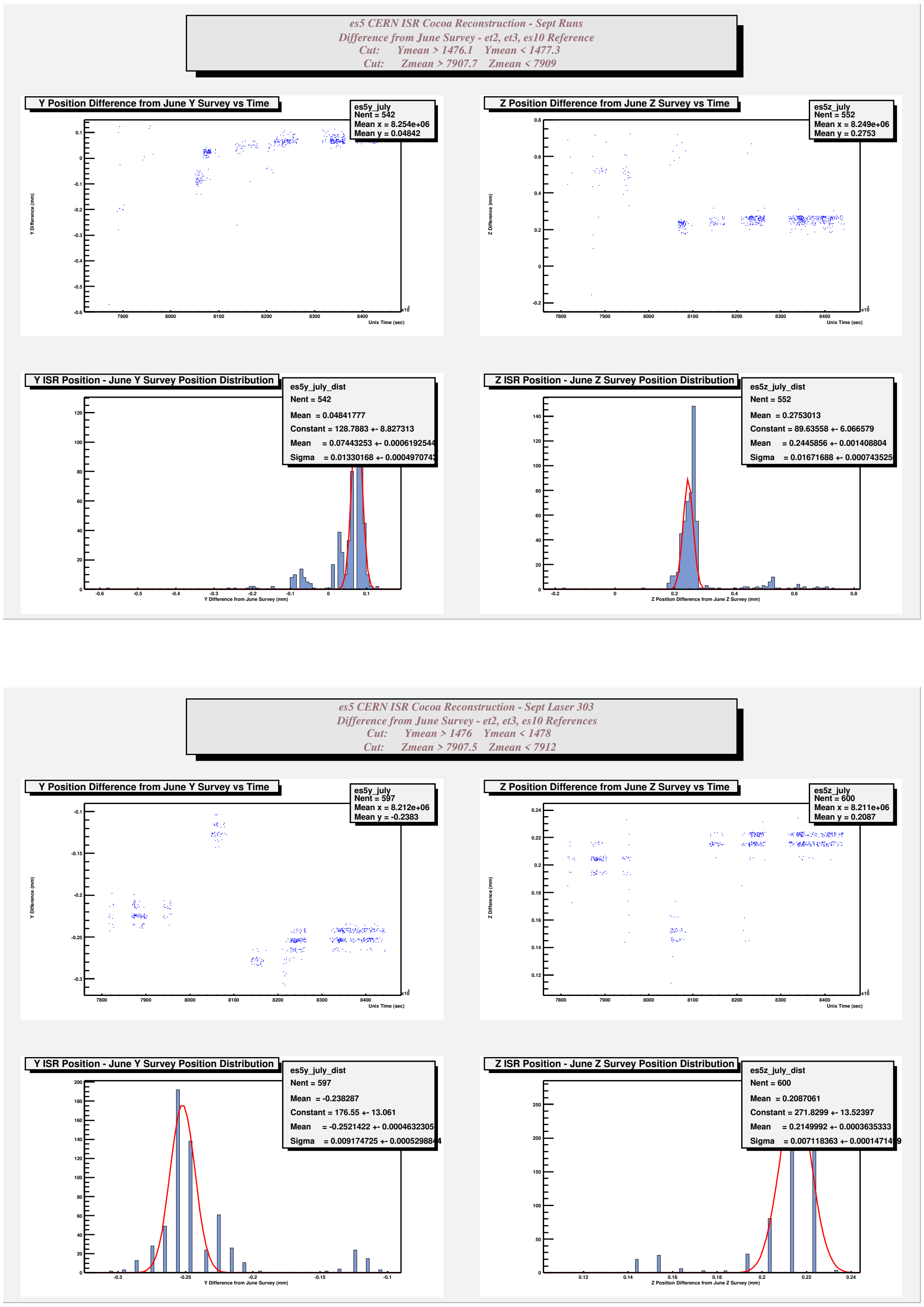
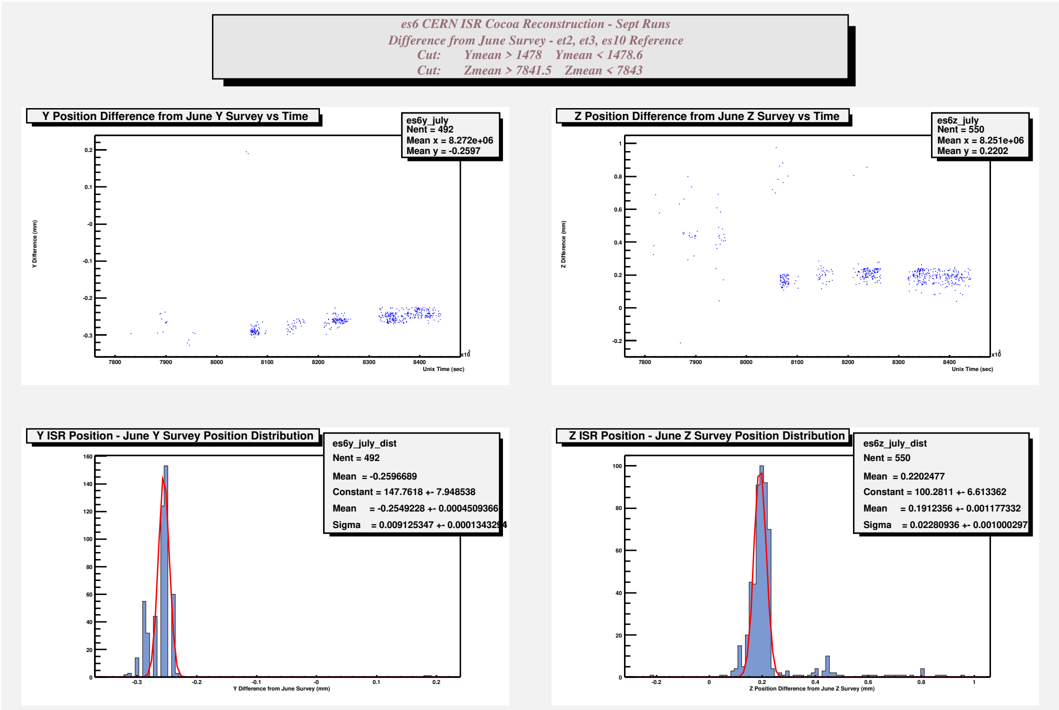


Figure 18: es5_sept: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted Sept CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.



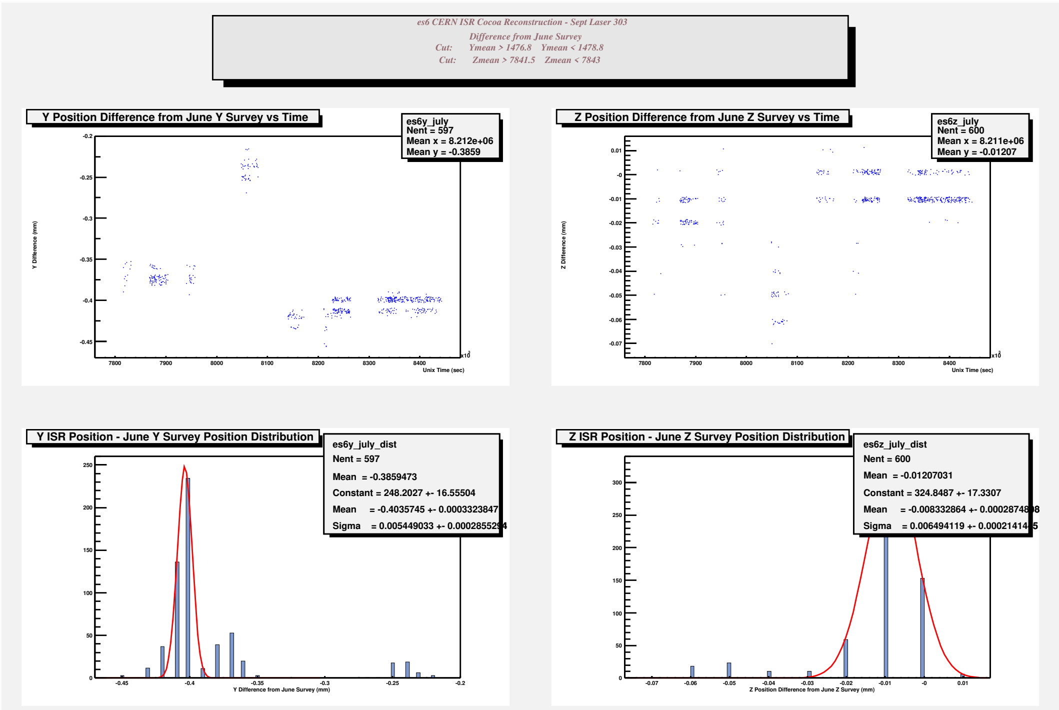


Figure 19: es6_sept: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted Sept CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

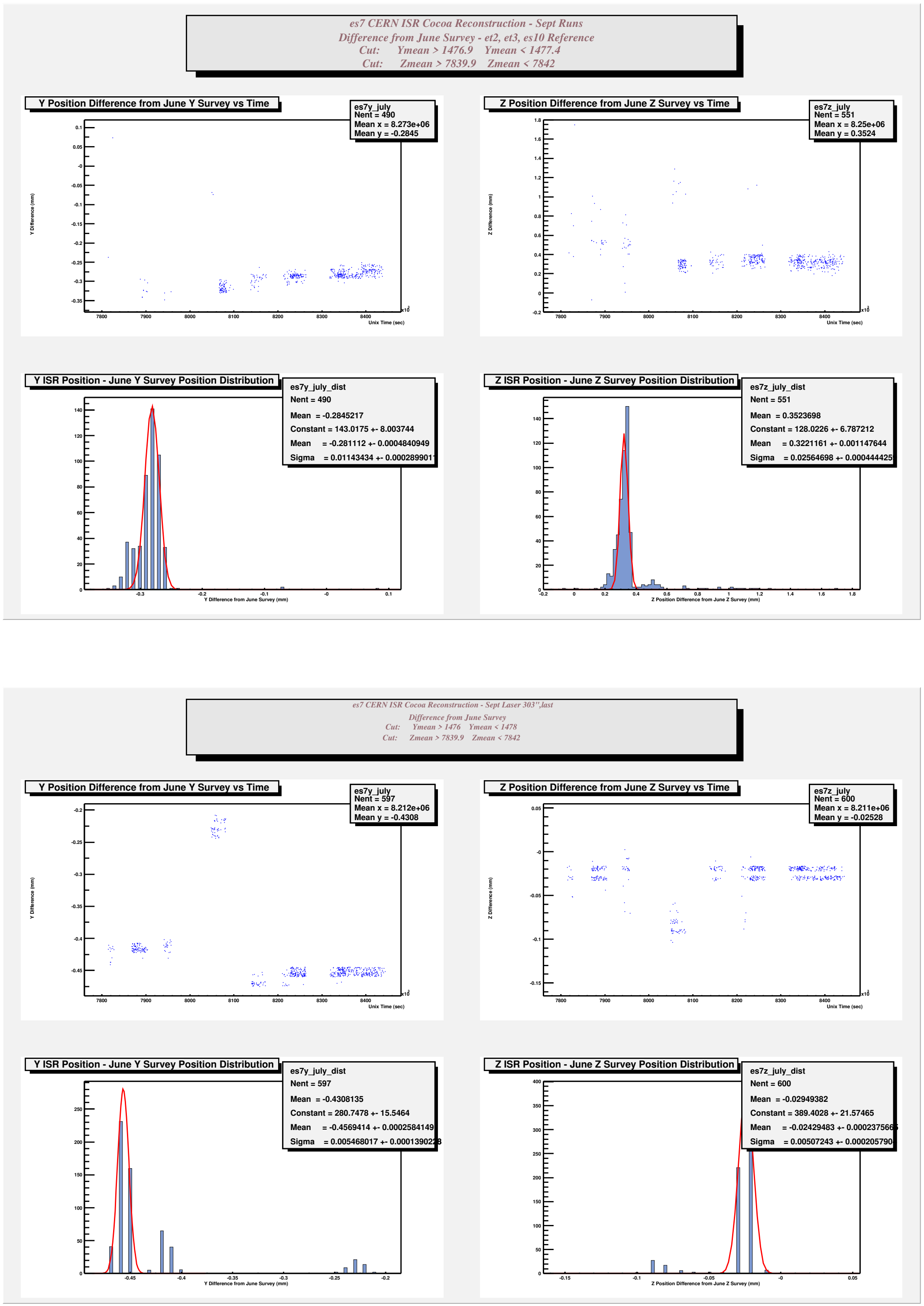


Figure 20: es7_sept: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted Sept CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

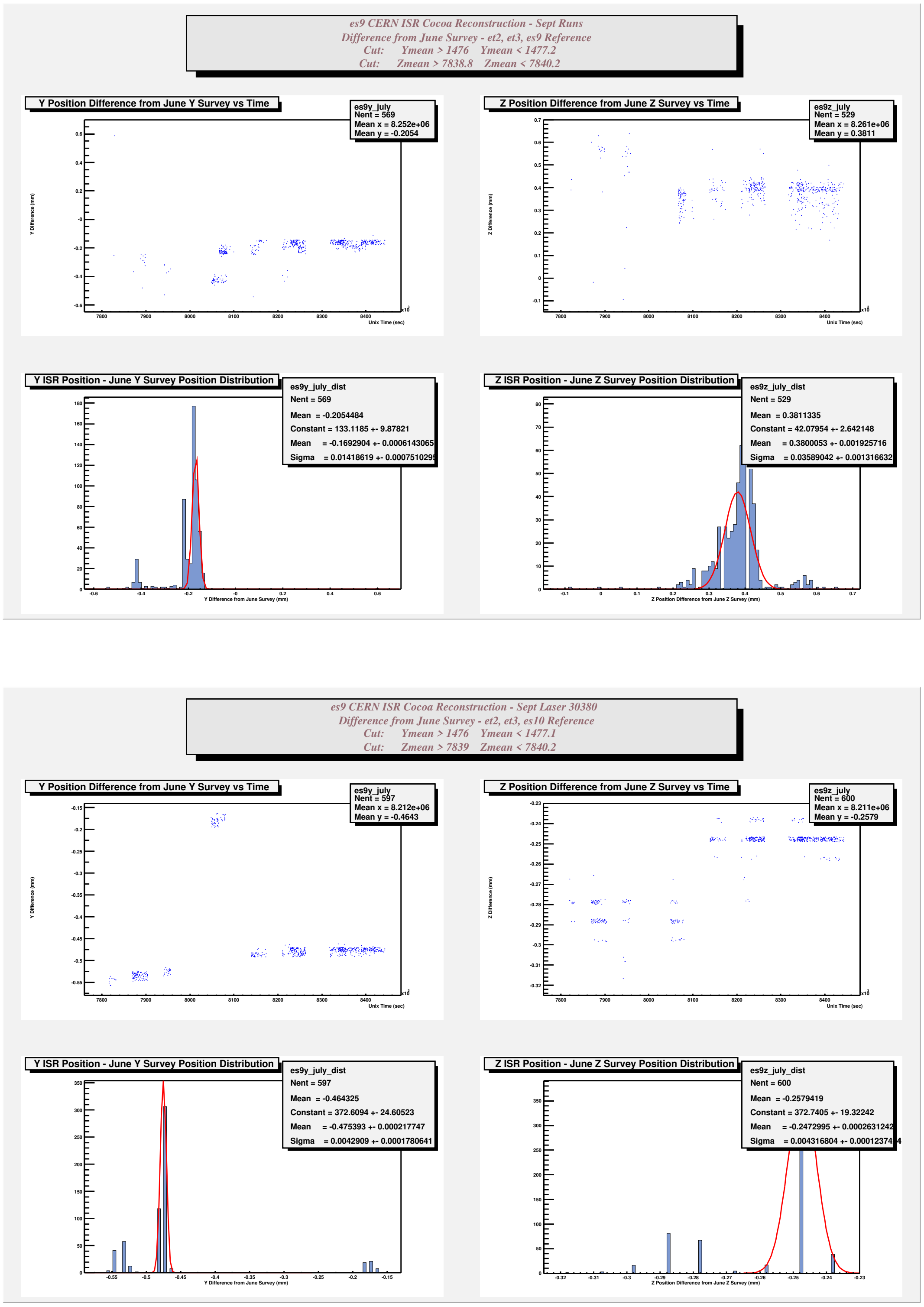


Figure 21: es10_sept: The plots show the distributions of differences between the COCOA reconstructed dowels positions from the fitted Sept CCD centroids and the surveyed dowel locations. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

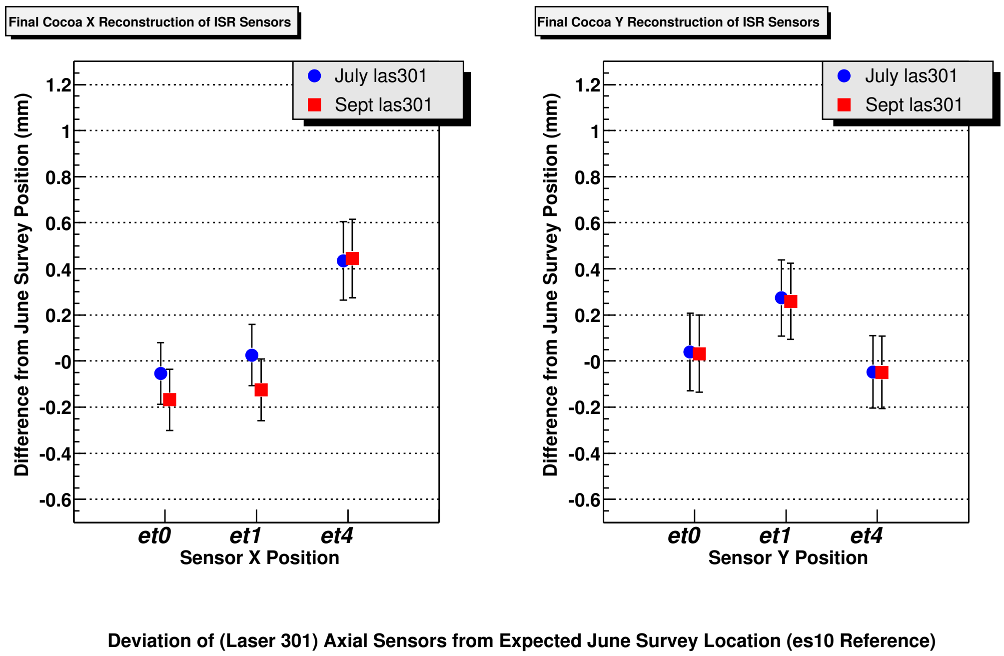
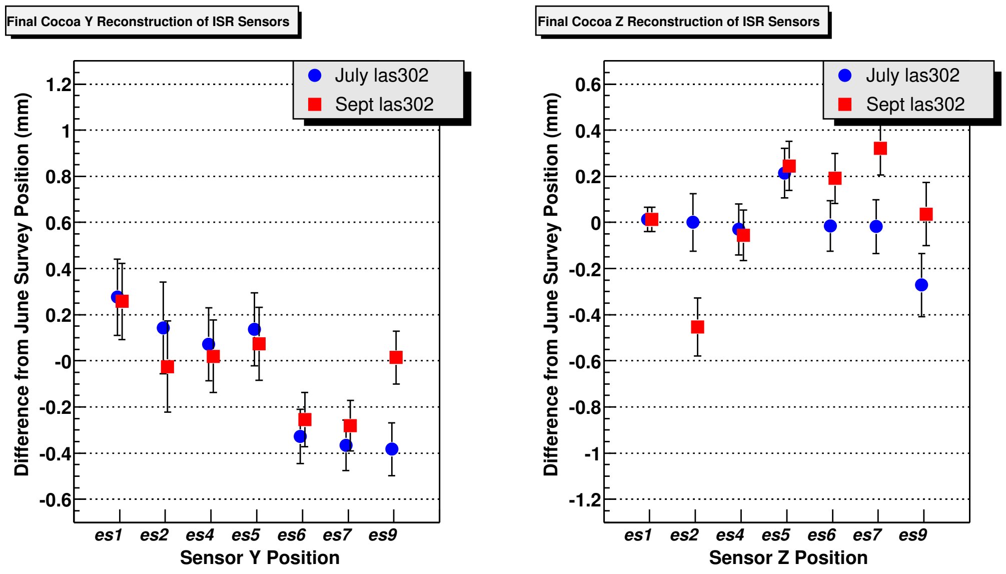
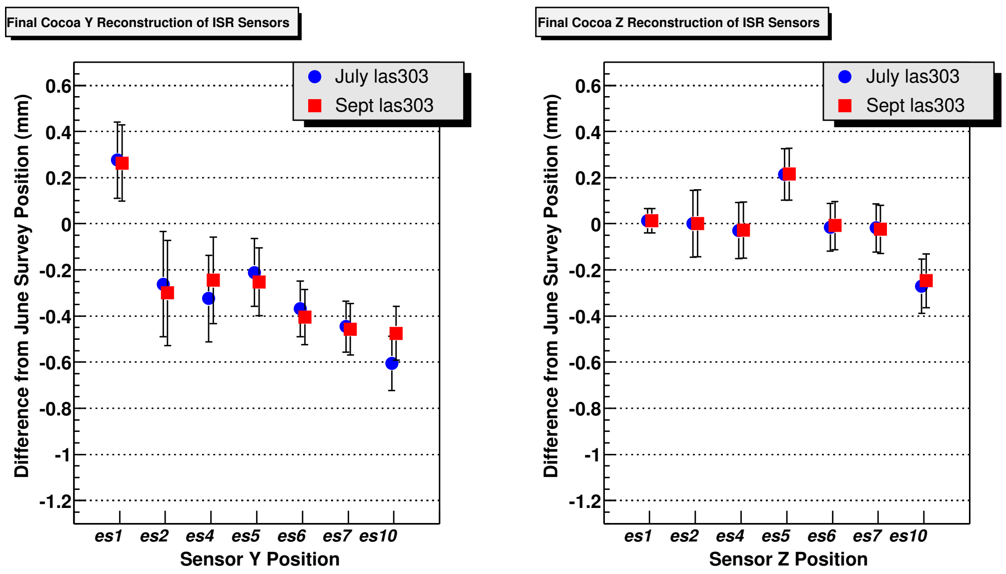


Figure 22: Axial Summary: The plots show the mean of the final distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations for all 1300+ event reconstructed. The series of plots show the reconstruction from Laser 301. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.



Deviation of (Laser 302) SLM Sensors from Expected June Survey Location (es1 and es10 References)



Deviation of (Laser 303) SLM Sensors from Expected June Survey Location (es1 and es9 References)

Figure 23: SLM Summary: The plots show the mean of the final differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations for all 1300+ events reconstructed. Both July and September data are shown as separate series on the plots. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

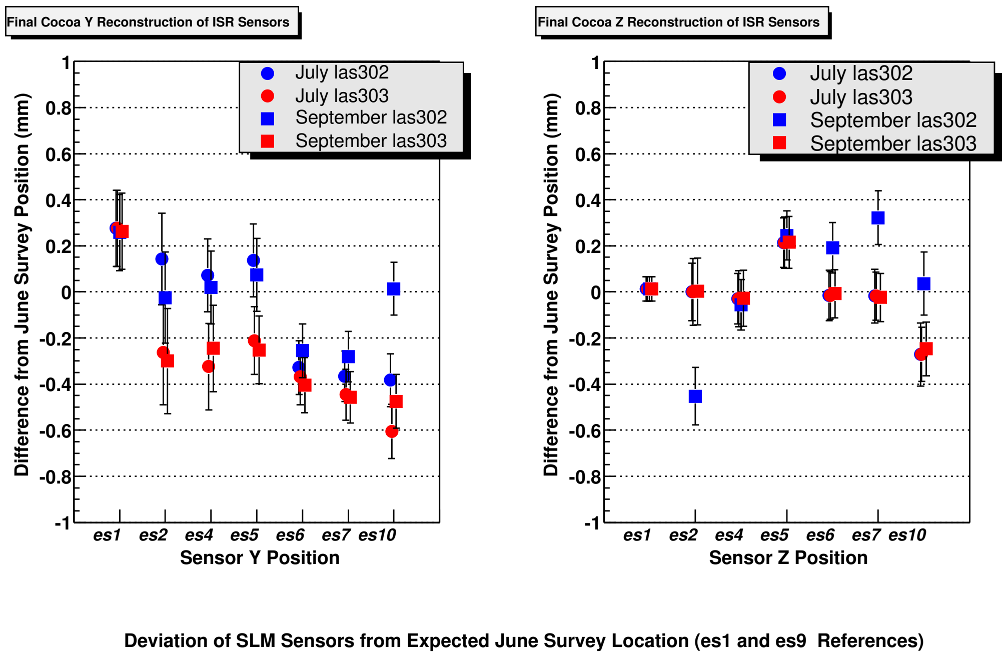
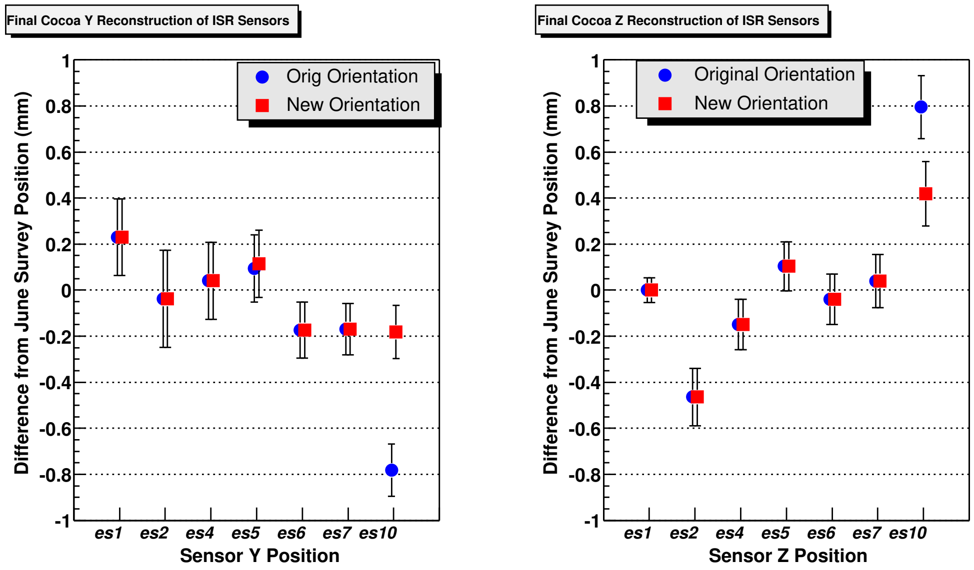
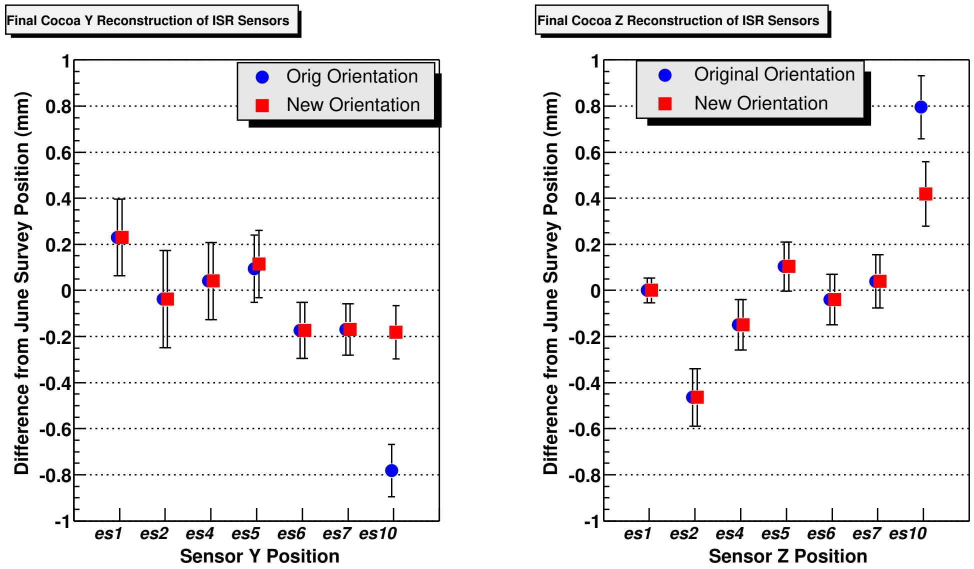


Figure 24: SLM Laser302/303 Summary: The plot shows the mean of the final distributions of differences between the COCOA reconstructed dowels positions from the fitted July CCD centroids and the surveyed dowel locations for all 1300+ event reconstructed. The series of plots show the reconstruction from Laser 302 and 303. Ideally, the Laser 302 and 303 points should overlap for each test period. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.



Deviation of (Laser 302) SLM Sensors from Expected June Survey Location (es1 and es9 References)



Deviation of (Laser 302) SLM Sensors from Expected June Survey Location (es1 and es9 References)

Figure 25: es10 Orientation: The series of plots indicates the importance in the definition of angular orientations. The 'Original' es10 orientation was initially calculated by COCOA as successive rotations around the X, Y, and Z axes of (-86.4321, 0.8420, 89.6325). A second calculation was performed to get the 'New' es10 Orientation of (-89.6478,-.0558, 89.6782). The only difference in the calculation is the initial starting point to begin the fit. Only the sensor orientation of es10 is shown in the plots. The top series of plots show the reconstruction from Laser 302. The bottom series of plots show the reconstruction from Laser 303. COCOA Reconstruction was done with reference sensors et2, et3, es10, and defined (by CERN PG) transfer plate.

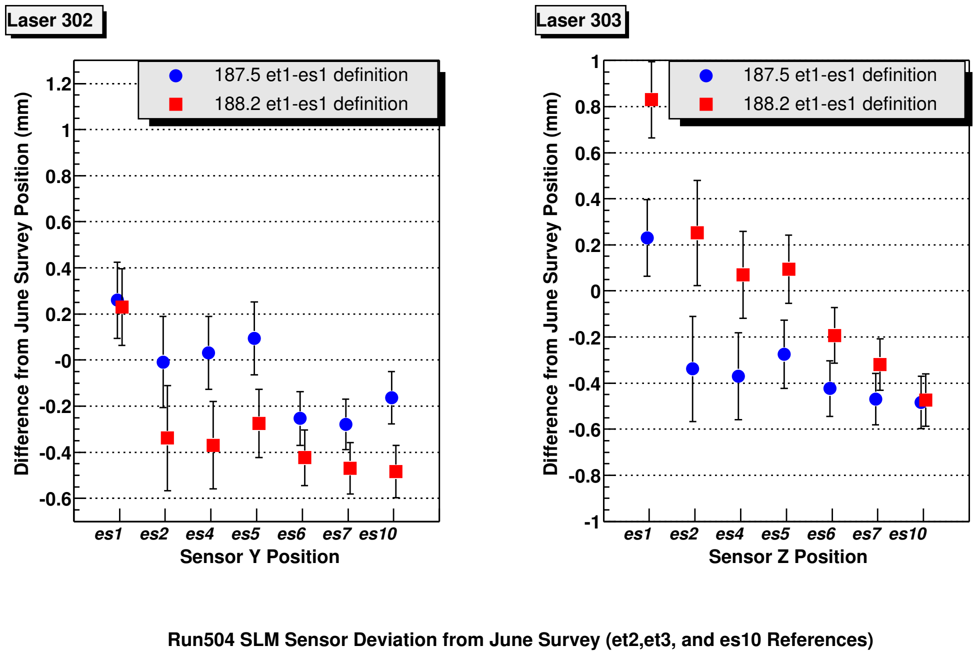


Figure 26: Transfer Plate Defintion: The series of plots indicates the importance in the definition of the transfer plate in Reconstruction. The high-precision CMM measurements giving the relationship between es1-et1 was destroyed during the installation of the system in the ISR hall. The plot shows the results of reconstruction using the es1-et1 relationship as mechanically measured in the ISR hall (187.517 +/- .5 mm) and the relationship mechanically measureed upon return to FNAL (188.12 +/- .5 mm).