
The Laser Alignment System in Track-based Alignment

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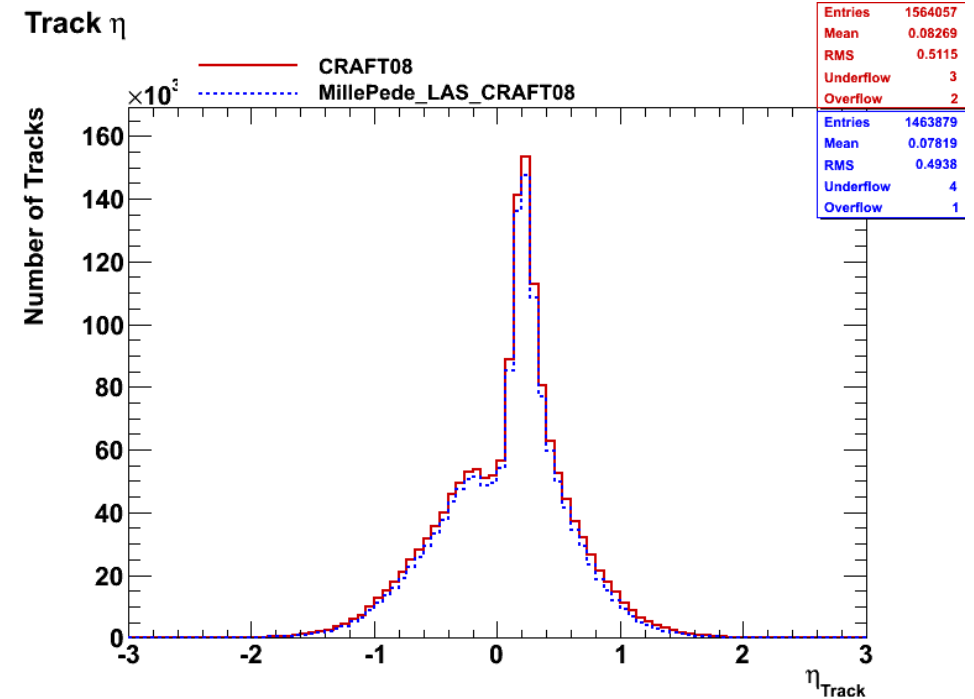
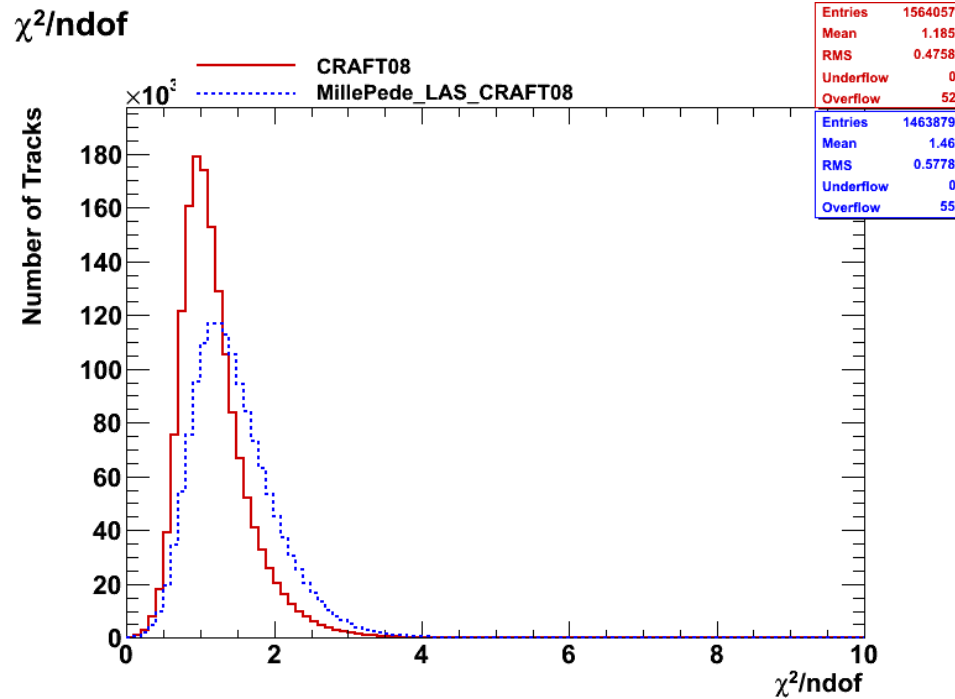


Hamburg Alignment Meeting

January 5, 2010

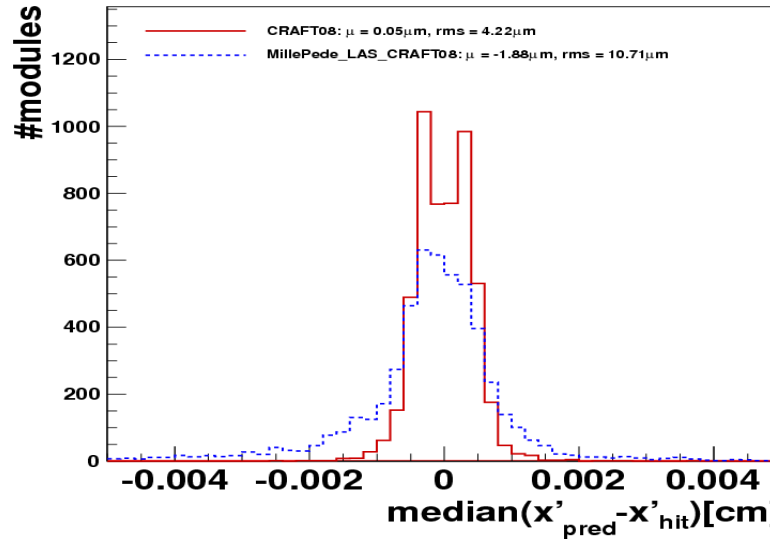
Alignment with CRAFT08 LAS data and Millepede

- ♦ Starting geometry: CRAFT0831X_V4
- ♦ Data: one LAS 'snapshot' from CRAFT08
- ♦ LAS beams fitted with TkLasBeamFitter.cc
- ♦ Millepede alignment setup:
 - TrackerTIBHalfBarrel, 110111,
 - TrackerTOBHalfBarrel, 110111,
 - TrackerTECDiskLayers11, ff000f,
 - TrackerTECDiskLayers28, 110001,
 - TrackerTECDiskLayers99, ff000f
- ♦ Offline validation: 2,000,000 cosmics from CRAFT08
- ♦ Next slides: **CRAFT08**, **MP_LAS_Alignment**

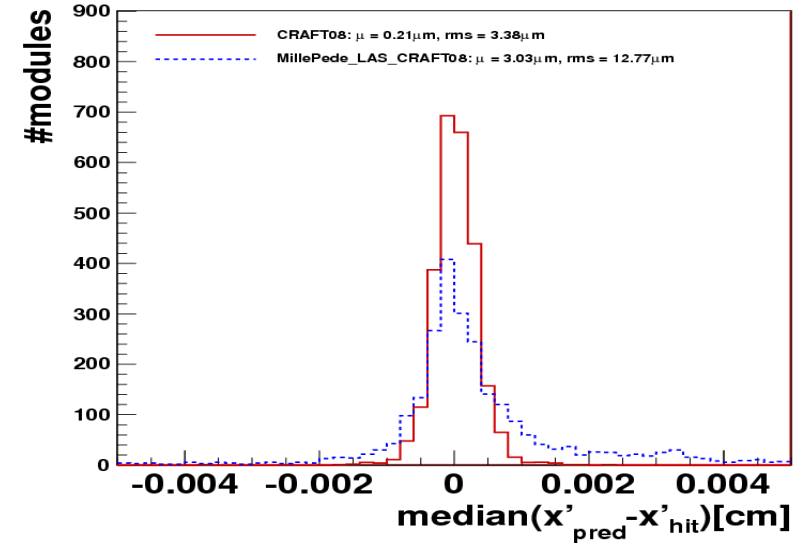


Worsening of track reconstruction after LAS alignment

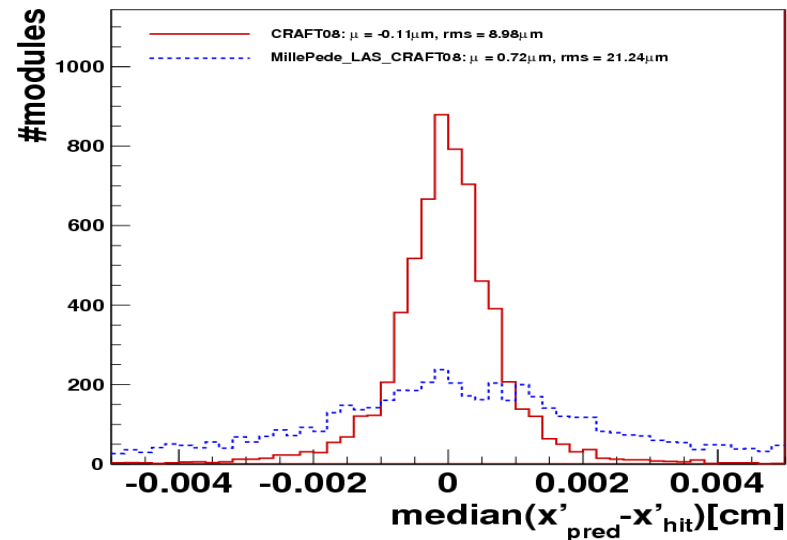
Distribution of the median of the residuals in TOB



Distribution of the median of the residuals in TIB



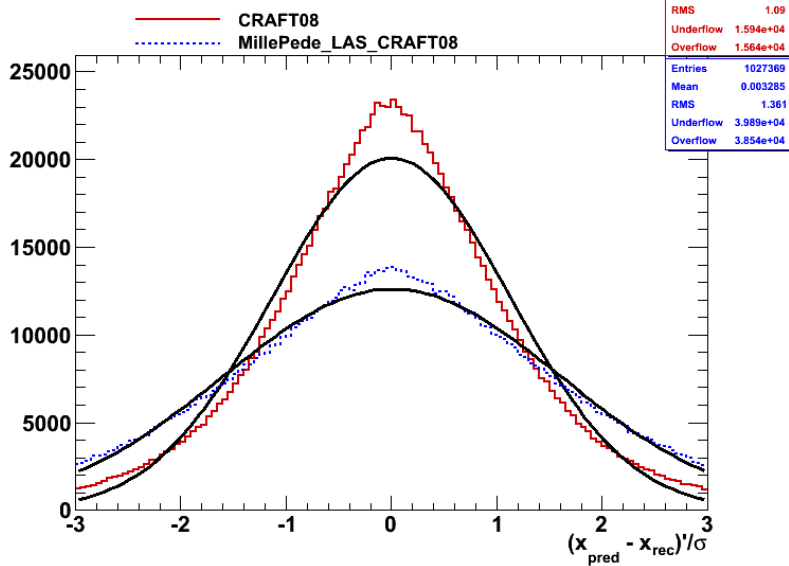
Distribution of the median of the residuals in TEC



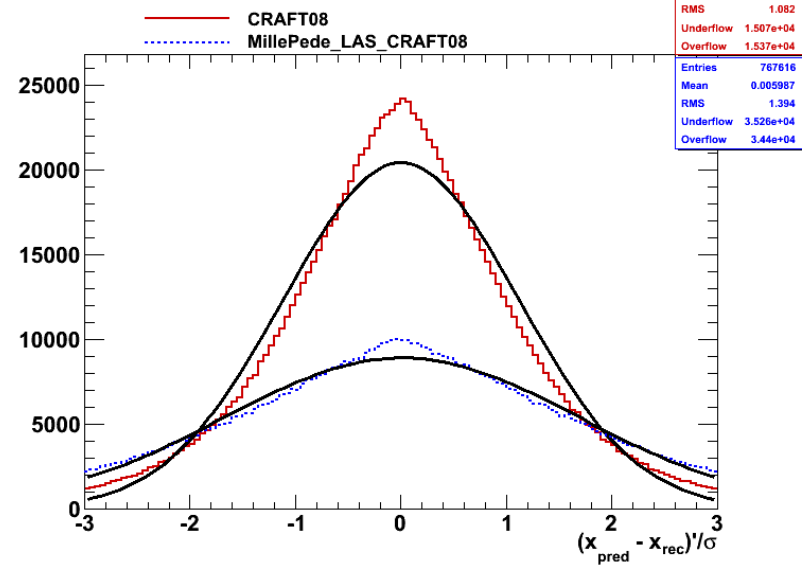
**DMRs much broader for
LAS alignment**

NORMALIZED RESIDUALS

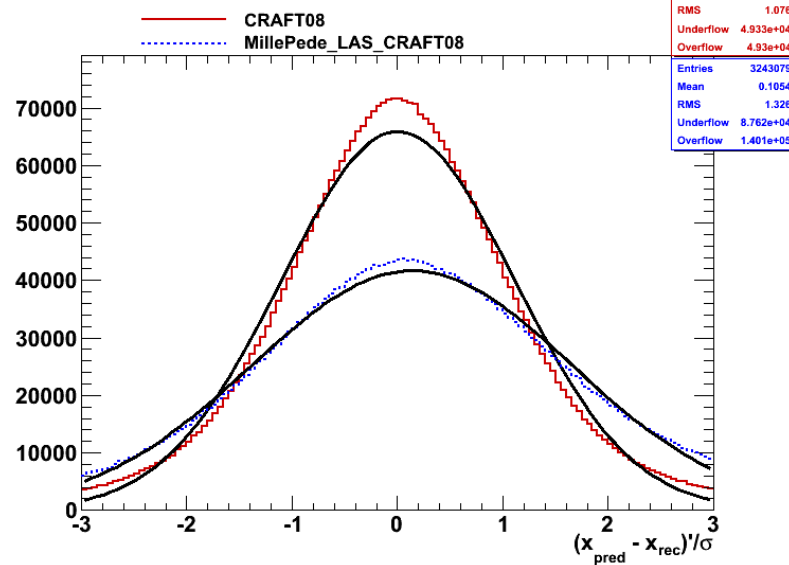
Residual for TECEndcap 5 in Strip



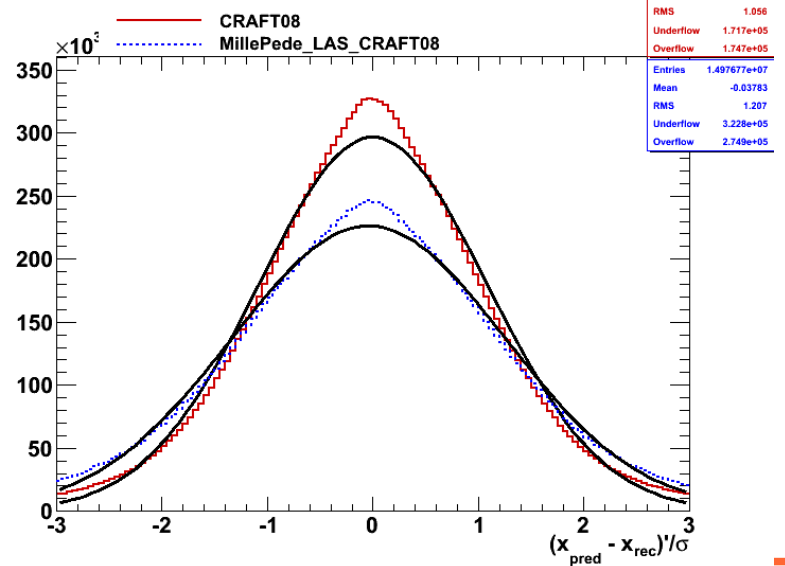
Residual for TECEndcap 6 in Strip



Residual for TIBBarrel 1 in Strip



Residual for TOBBarrel 4 in Strip

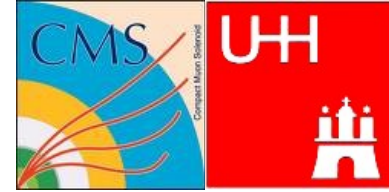


CONCLUSION



- ◆ First validation of Millepede alignment with LAS data (CRAFT08)
- ◆ Reconstruction of cosmic tracks gets worse after alignment with LAS data
- ◆ Pede result: corrections for Beam Splitter kinks much too large (up to 0.1 rad)
- ◆ Alignment parameter results of reasonable size
- ◆ LAS Beam Fits: Alignment Tube beam fits not good ($\chi^2/\text{ndof} \sim 10 - 30$)

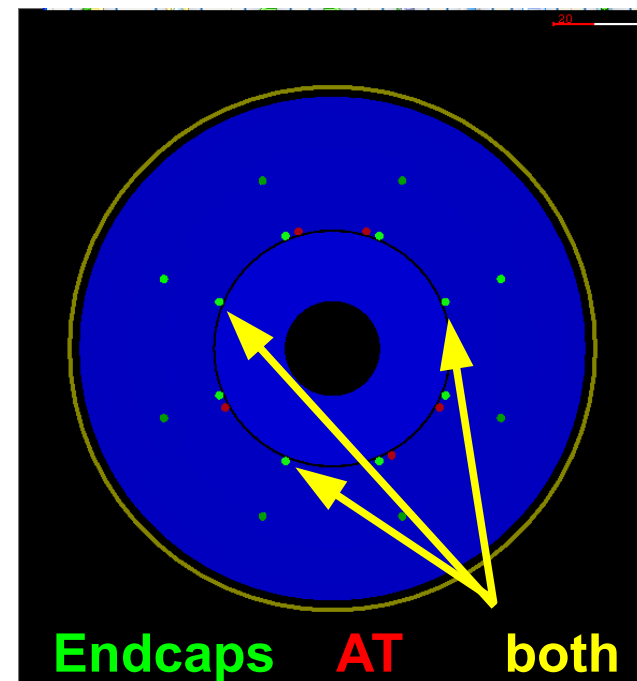
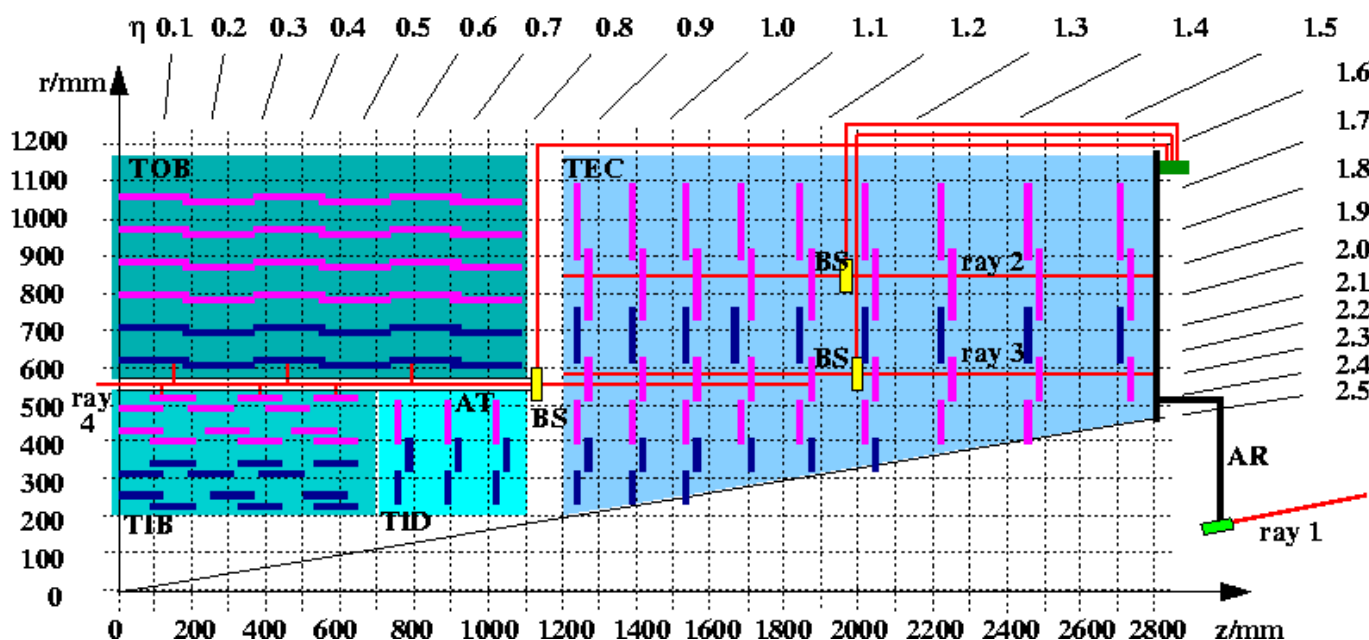
BACKUP



LASER ALIGNMENT SYSTEM

40 fixed infrared laser beams, 16 per Endcap, 8 Alignment Tubes

- directed perpendicularly onto 434 Si-Strip-modules via Beam Splitters (BS)
- position measurements (in local x) with accuracy $< 100 \mu\text{m}$



- Laser beams are measured by Si-Strip sensors
- Endcap modules are semi-transparent to the lasers
- 8 Alignment Tube (AT) beams are directed onto barrel modules via semi-transparent mirrors