Tracker Alignment System (TAS)
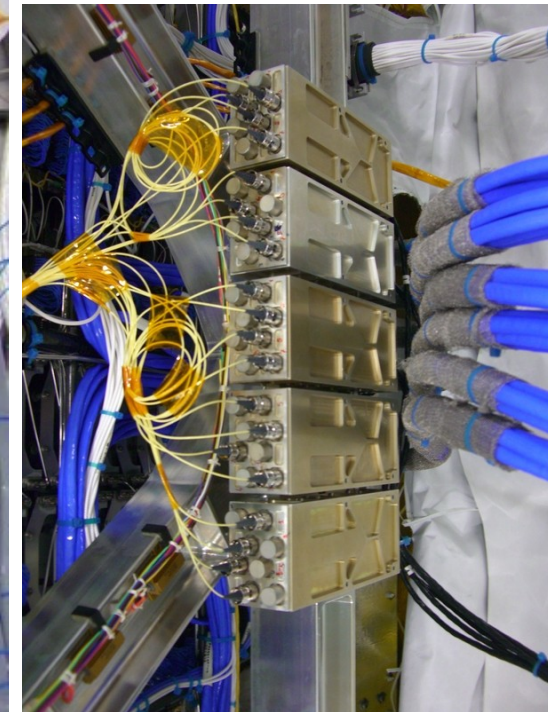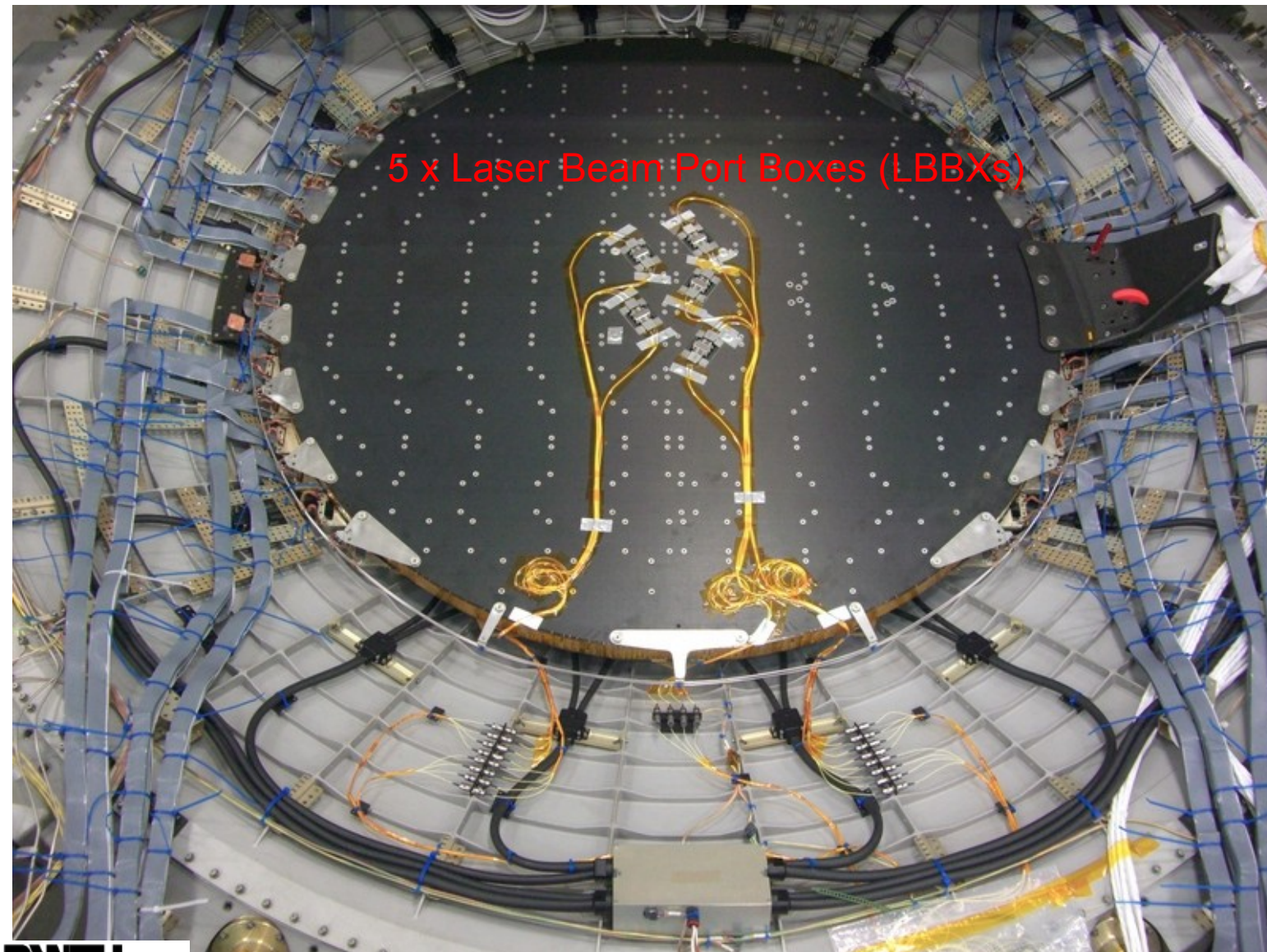
Chanhoon Chung

On behalf of TAS Group

RWTH Aachen University
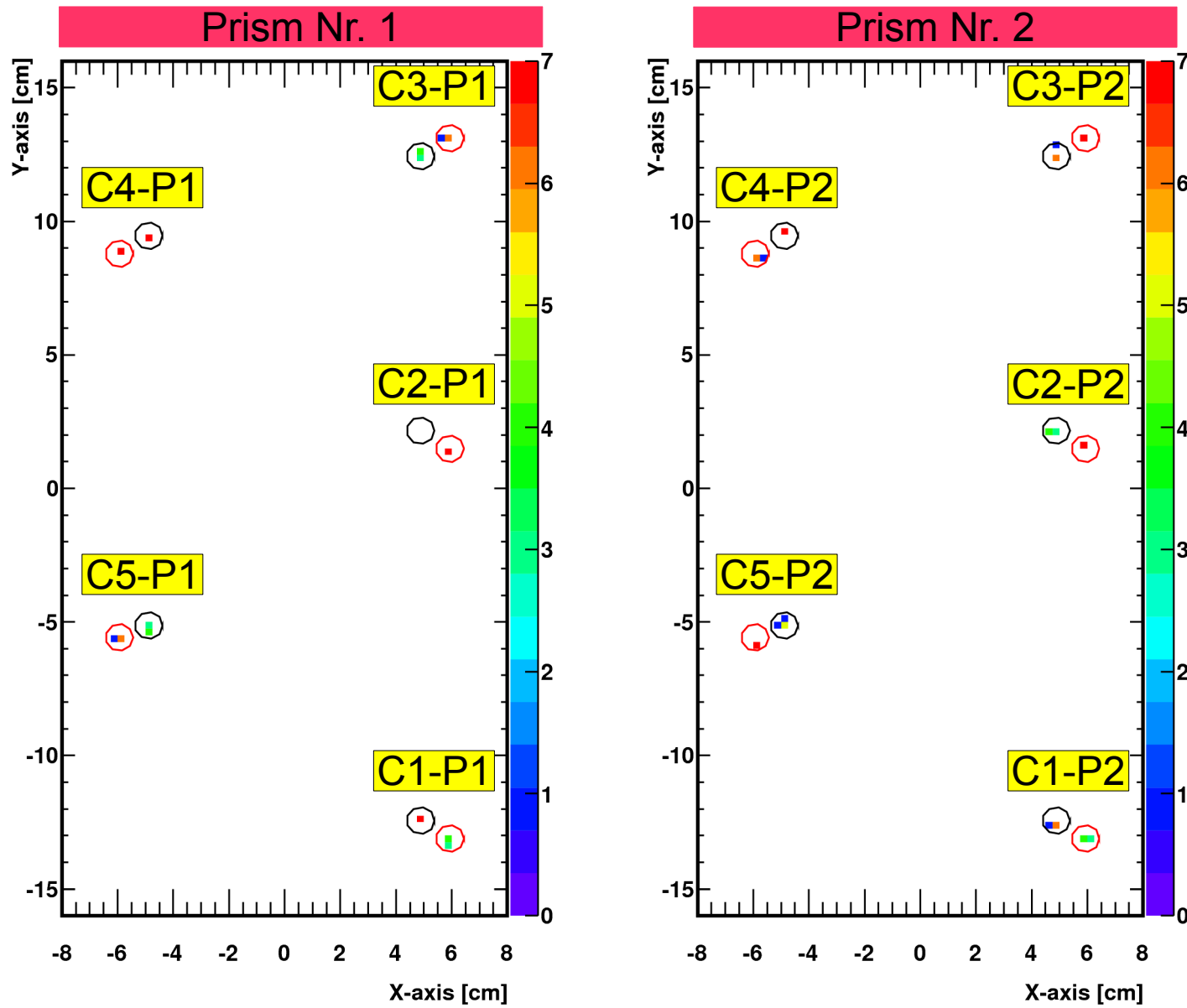
Oct. 11, 2010 @KSC (NASA)

Tracker Alignment System (TAS)

Goals of TAS: 1. Alignment for the Tracker
2. Monitoring Tracker Movement

5 x Laser Beam Port Boxes (LBBXs)

Laser Fiber Couplers (LFCRs)

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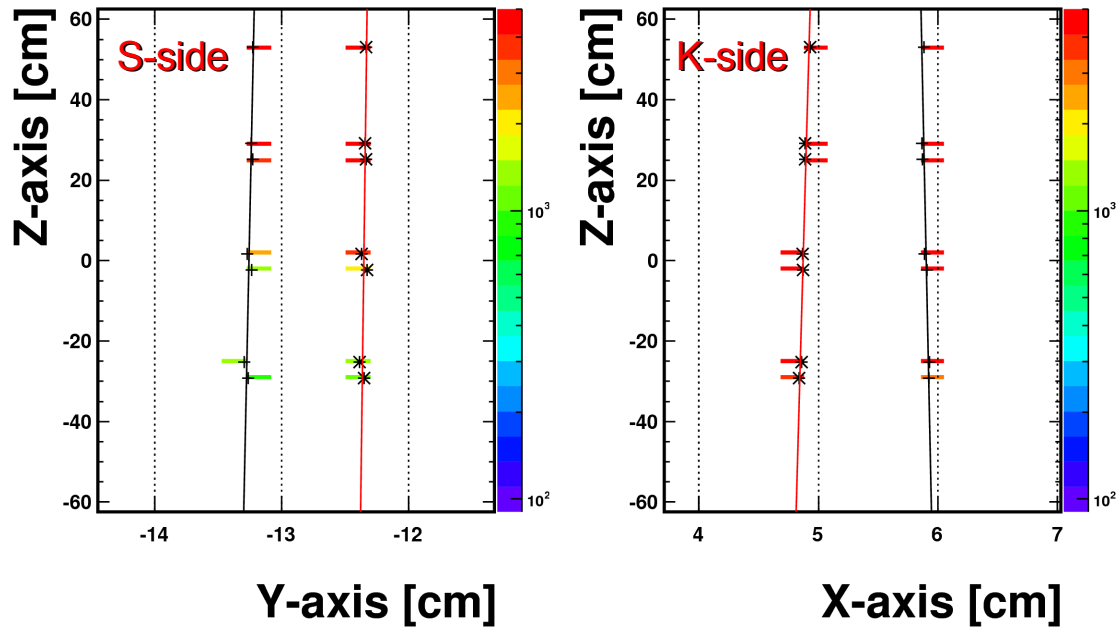
TAS Segmentation of Tracker Planes

Total Laser Beam Channels = 20 = (2 Beams / Diode) x (2 Diodes / LFCR) x (5 LFCRs)
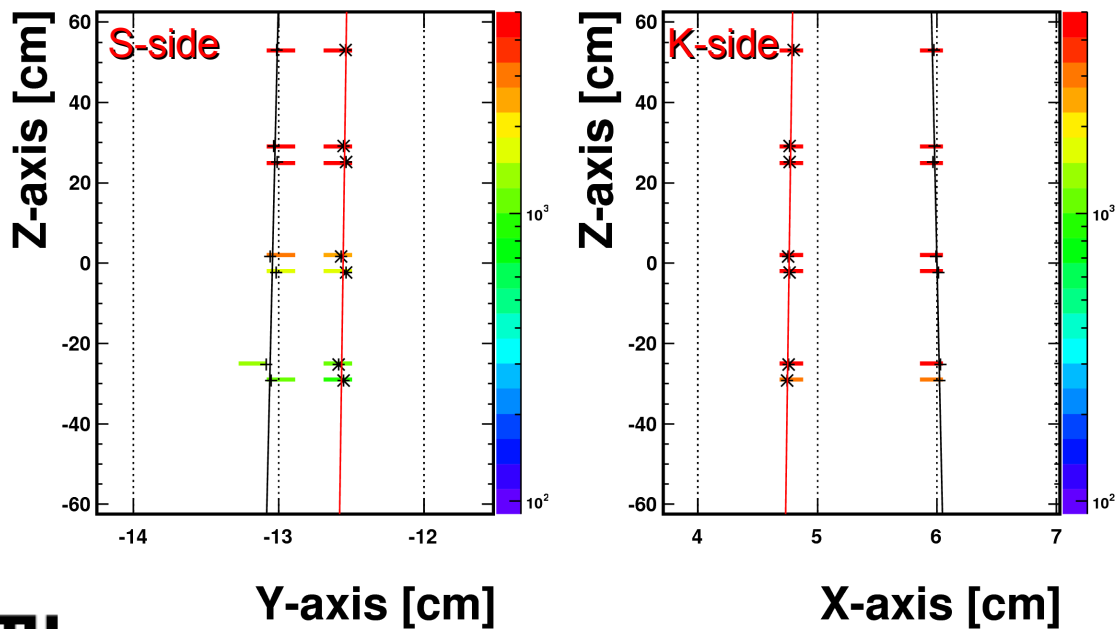
RWTH Physics AC-I

Laser Tracks in Global Coordinates

Laser Peaks in Sensor Coordinates : Projection to XY Plane

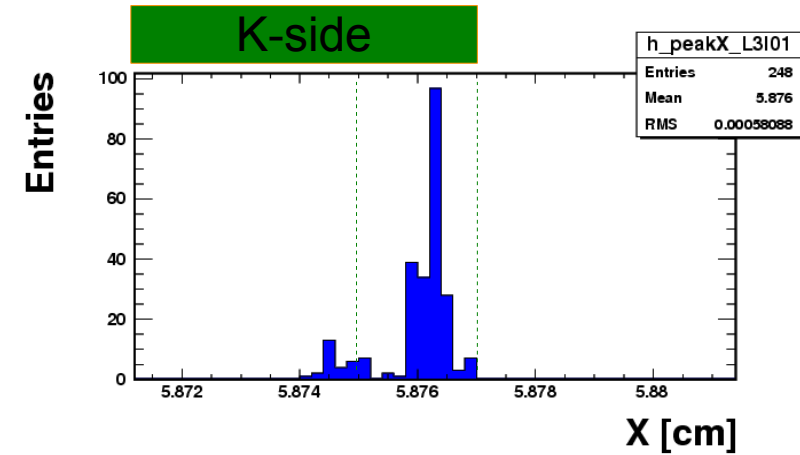## Column Nr. 1, Prism Nr. 1
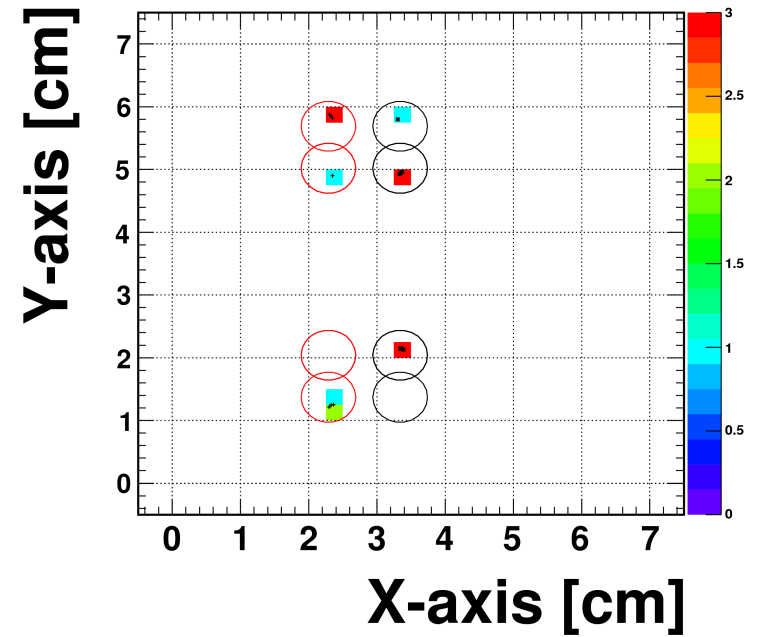
Column Nr. 1,   Prism Nr. 2

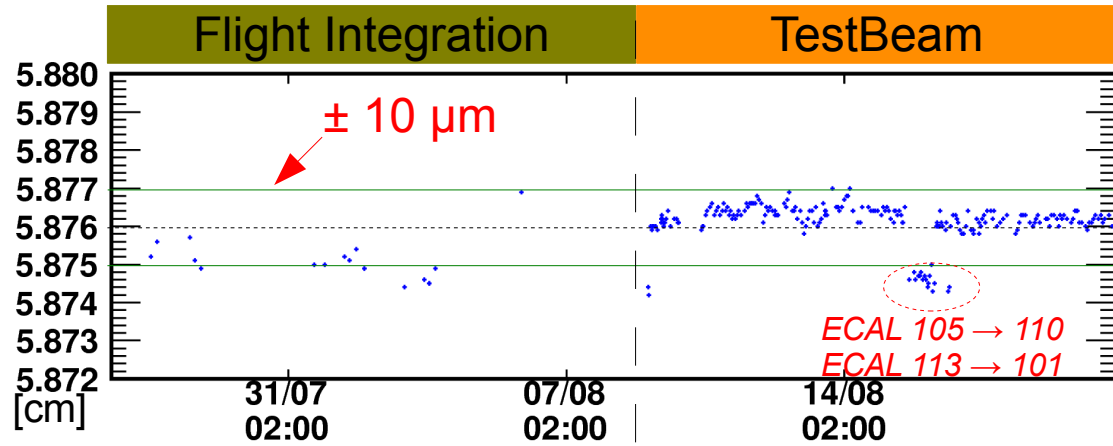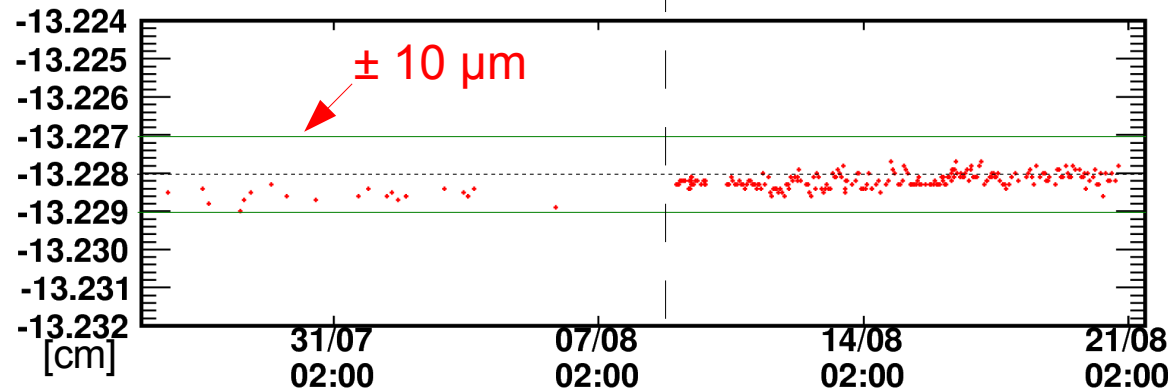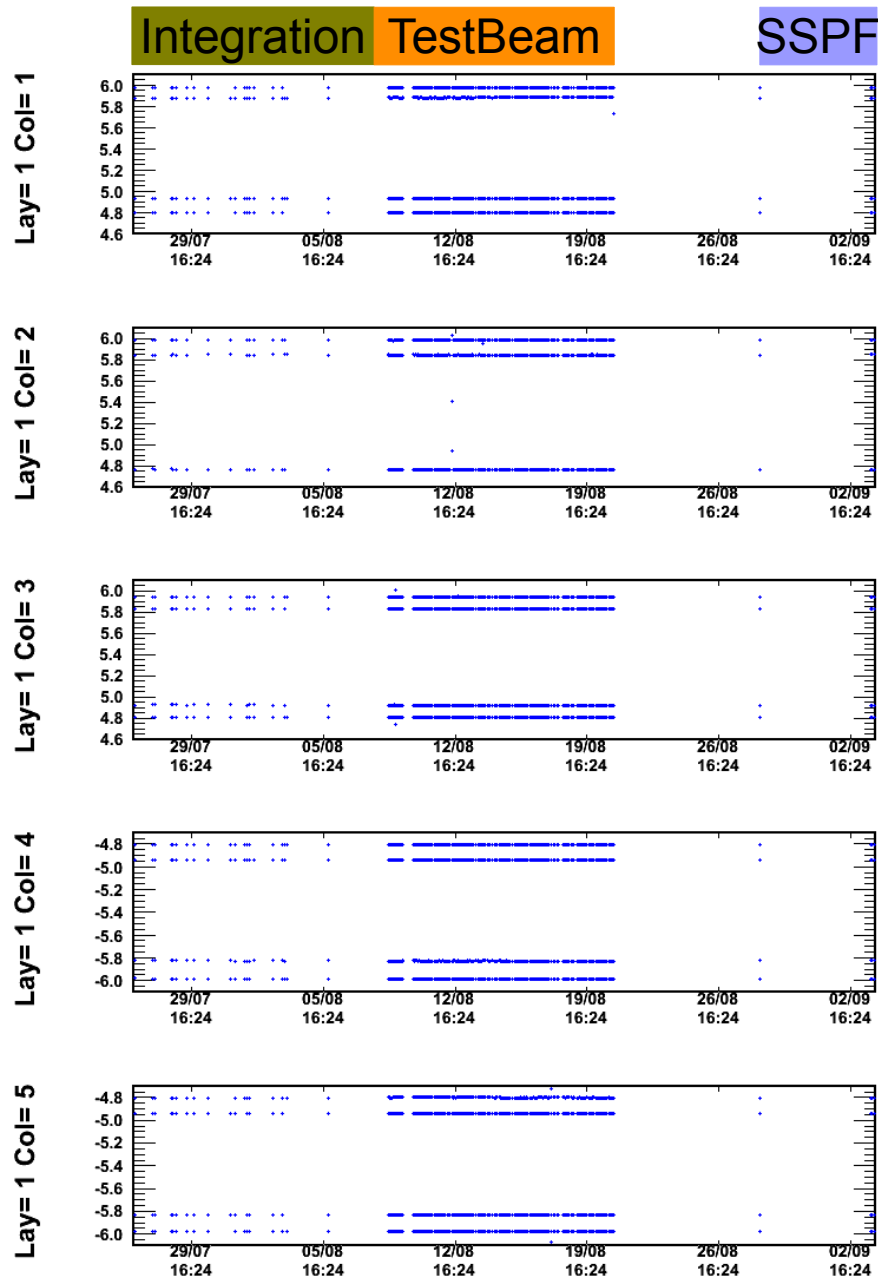## Beam is passing its route of AR hole
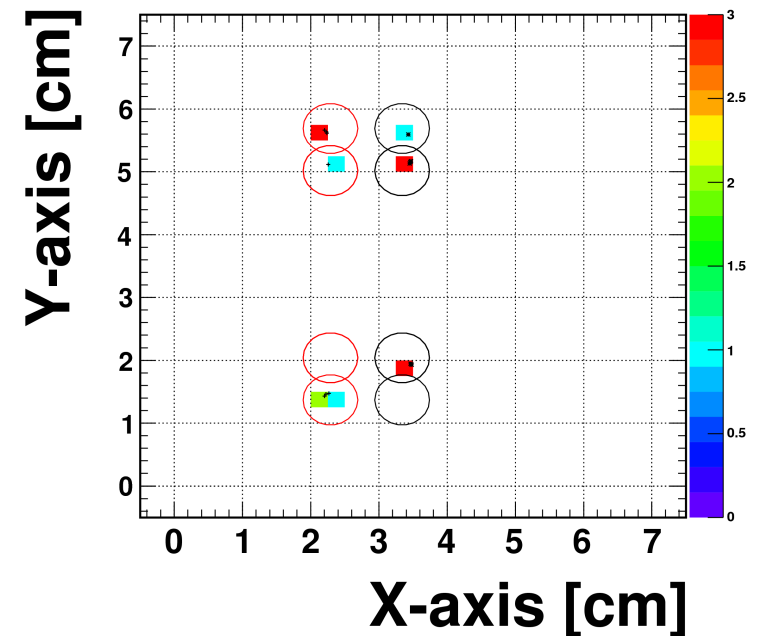
Sensitivity of Laser Beam Positions
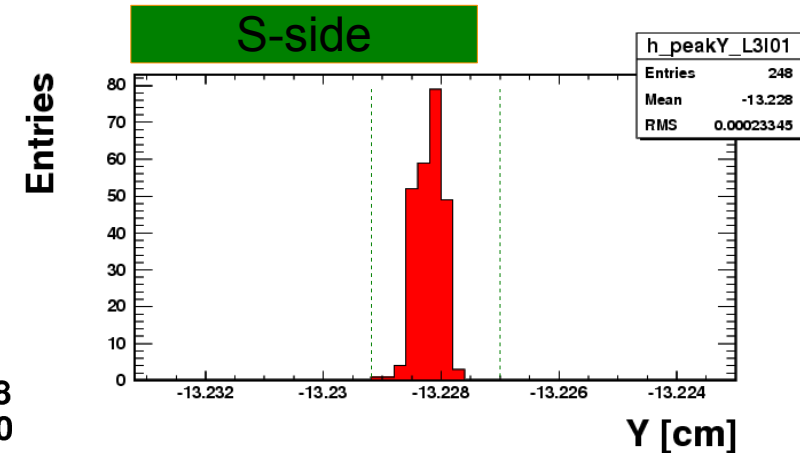
Position Sensitivity of Laser Beam < 1 µm

Position Monitoring of Tracker Layer Nr. 1 / 7
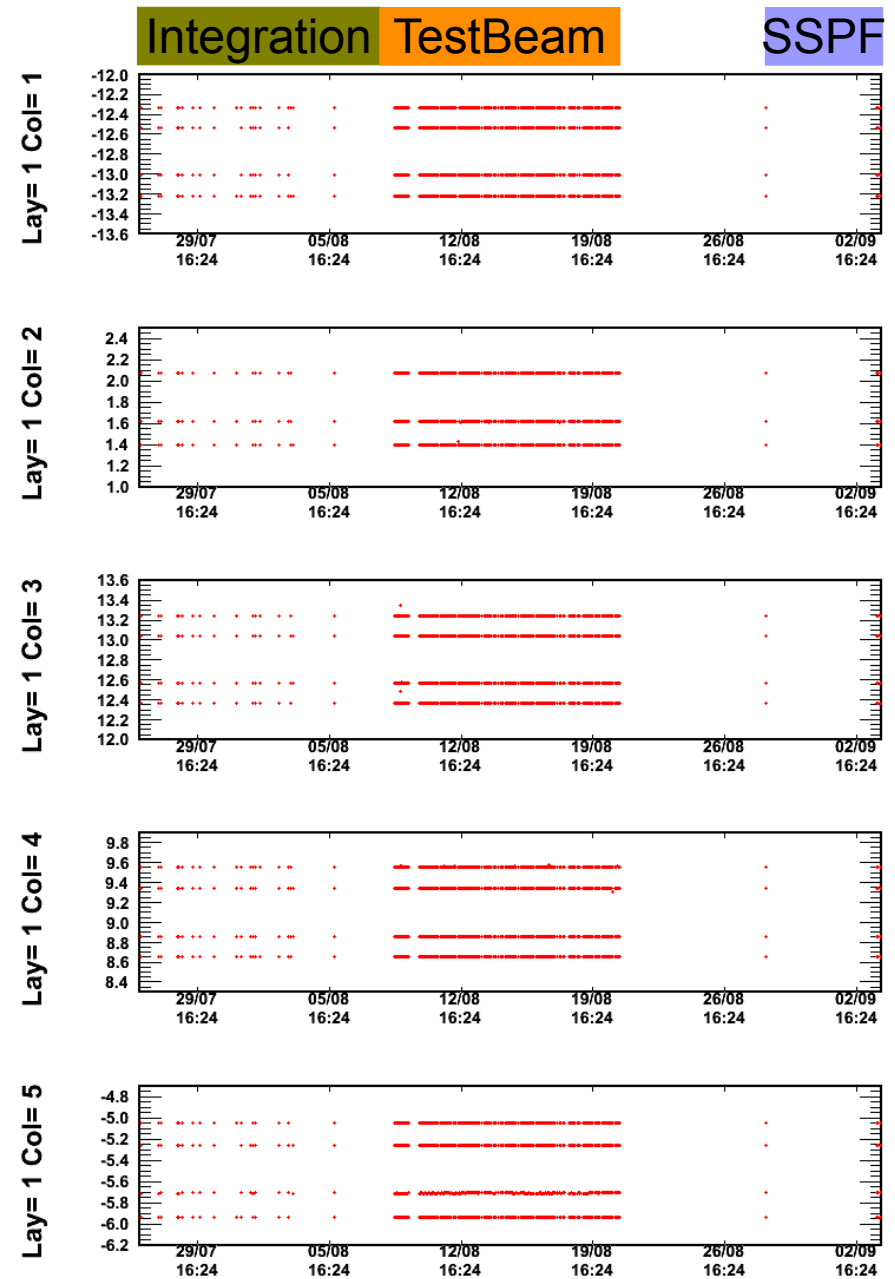
K-side (X-coord.)

S-side (Y-coord.)

Position Monitoring of Tracker Layer Nr. 2 / 7

K-side (X-coord.)

S-side (Y-coord.)

Position Monitoring of Tracker Layer Nr. 3 / 7
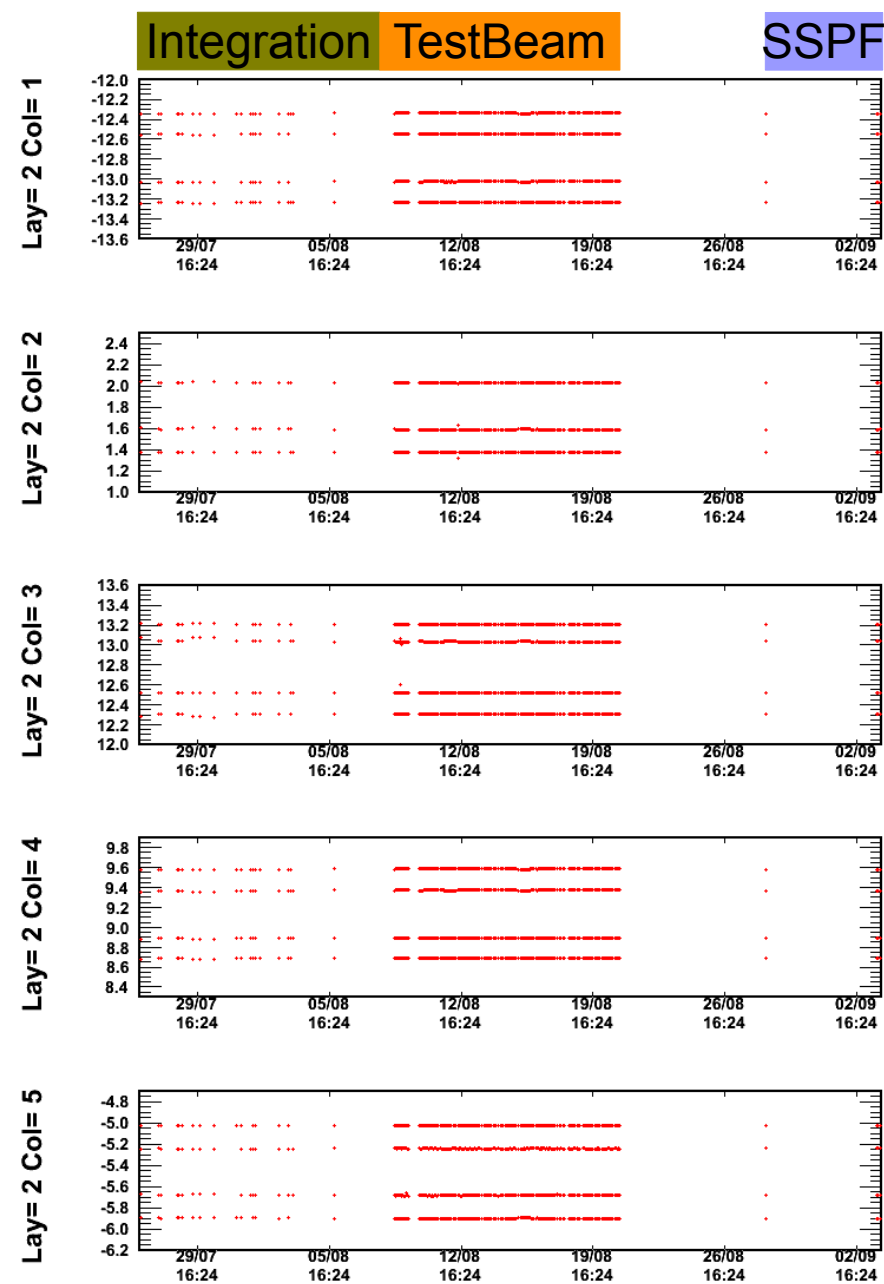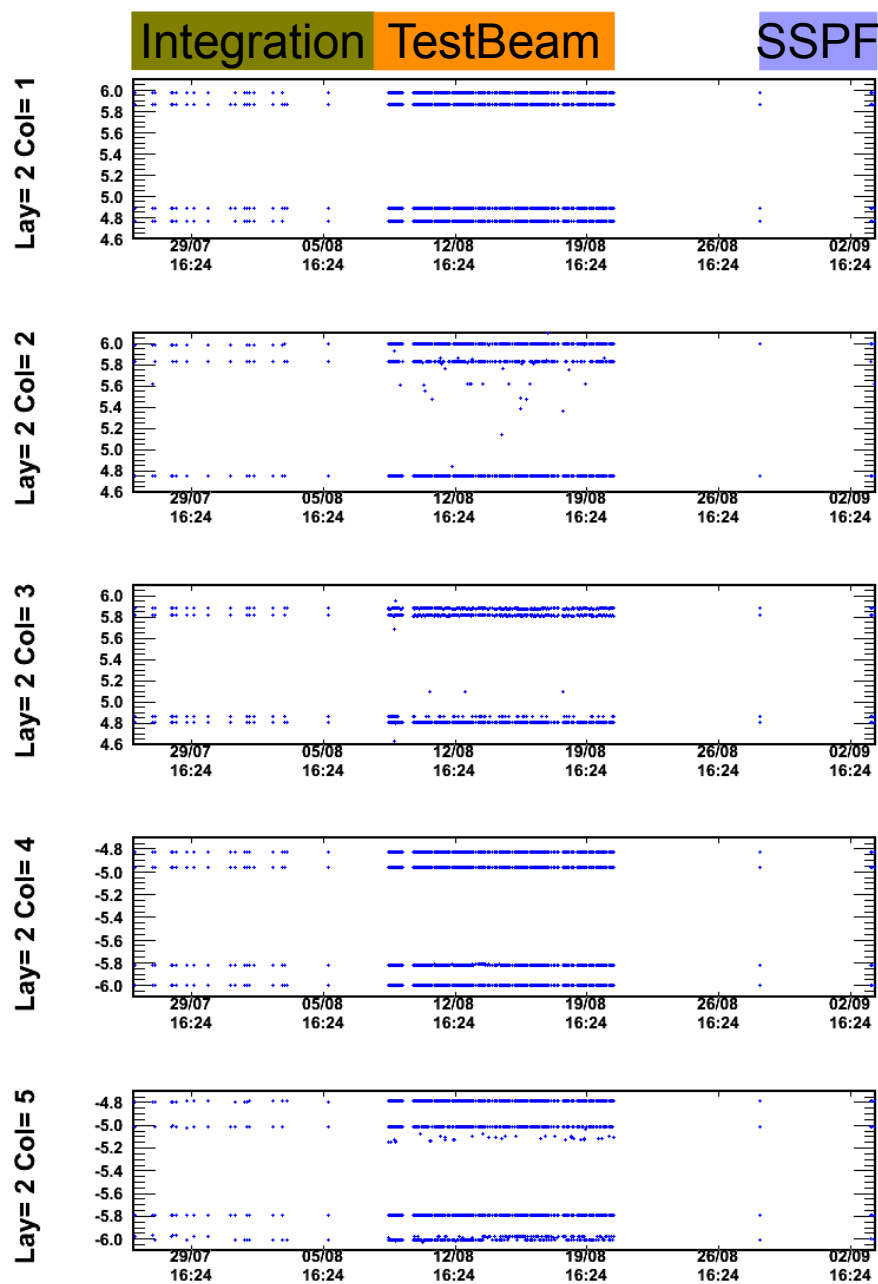
K-side (X-coord.)   S-side (Y-coord.)
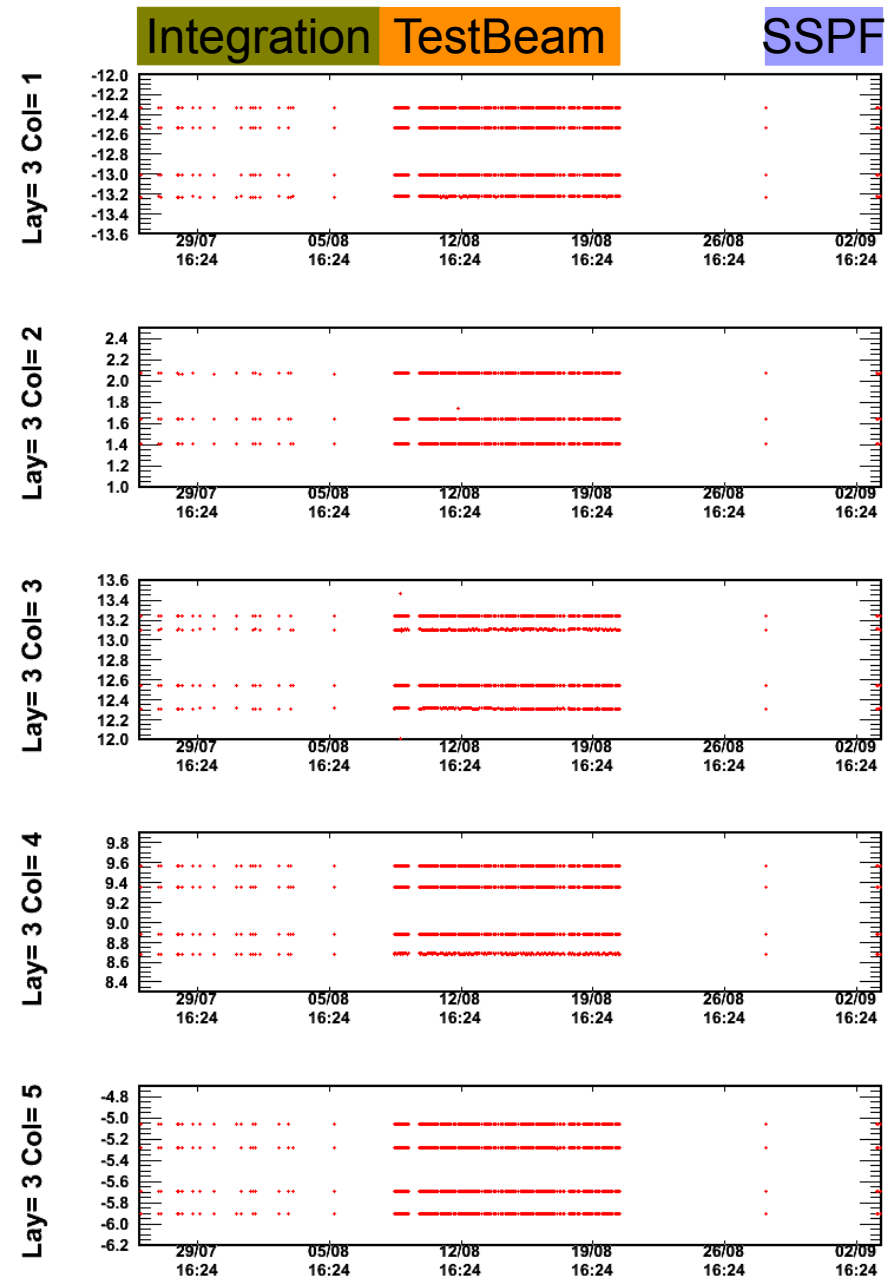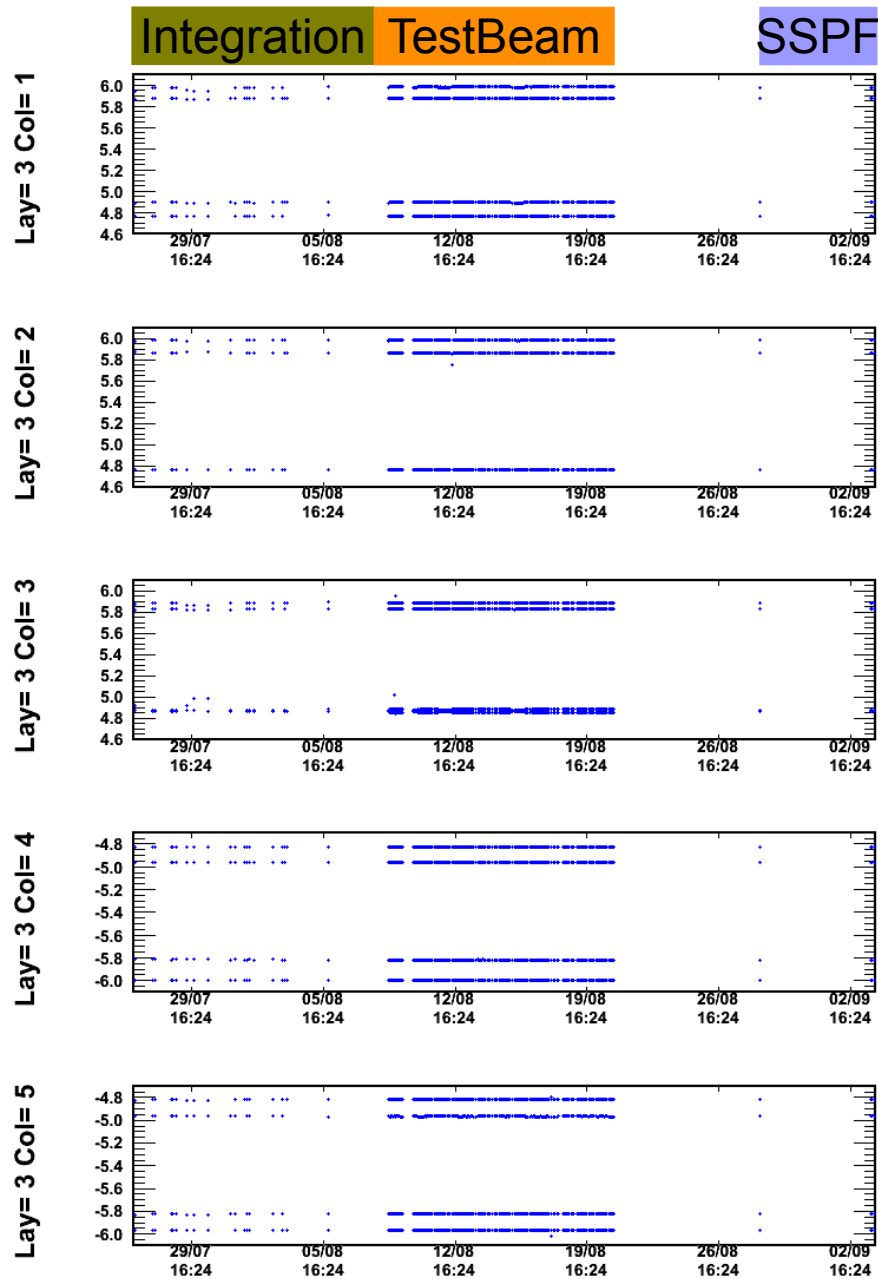
Position Monitoring of Tracker Layer Nr. 4 / 7

K-side (X-coord.)

S-side (Y-coord.)

Tracker 280
Pos96 →105
$\Delta\Theta(Y) = 30°$

Position Monitoring of Tracker Layer Nr. 5 / 7

Tracker 280
Pos96 →105
$\Delta\Theta(Y) = 30°$

K-side (X-coord.)

S-side (Y-coord.)

Position Monitoring of Tracker Layer Nr. 6 / 7

K-side (X-coord.)

S-side (Y-coord.)

Tracker 280
Pos96.→105
$\Delta\Theta(Y) = 30°$

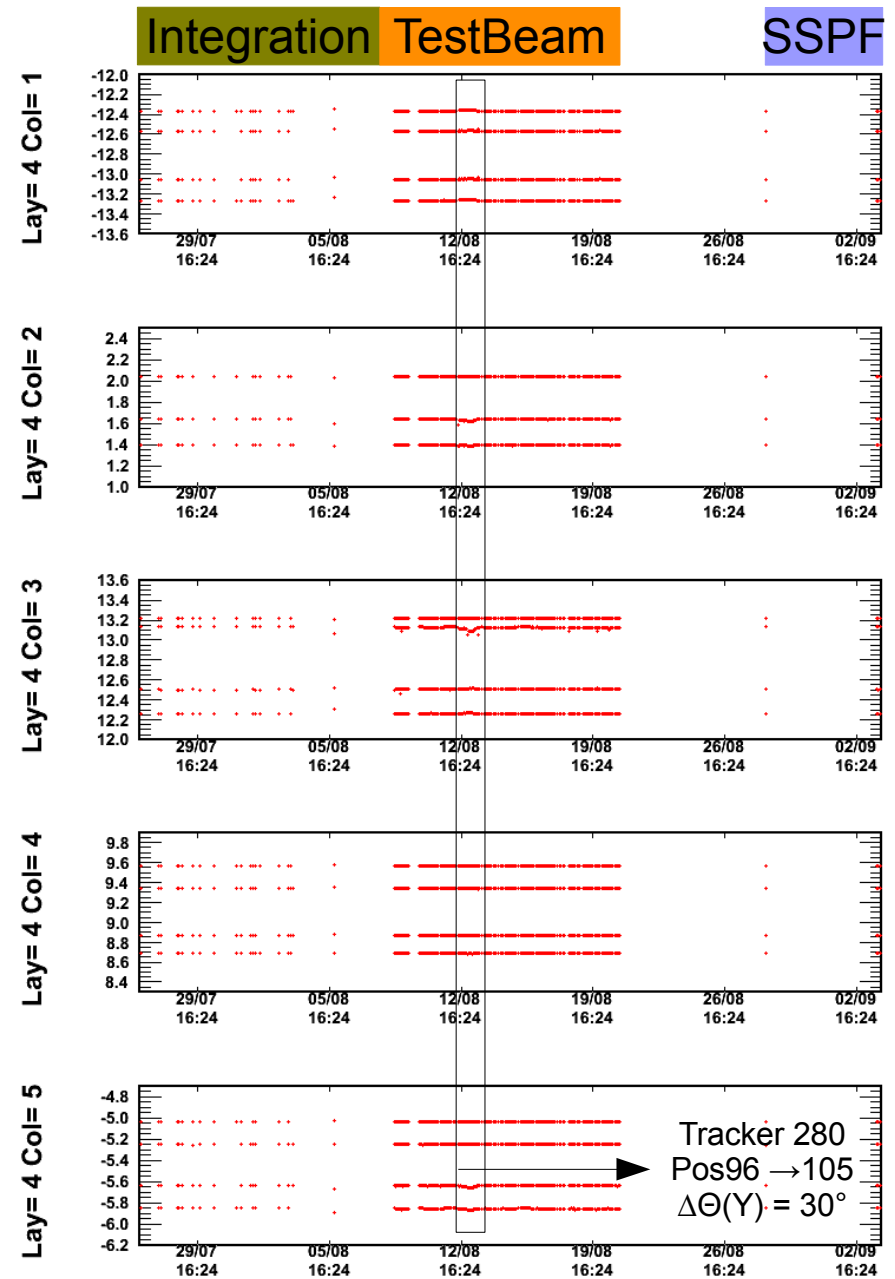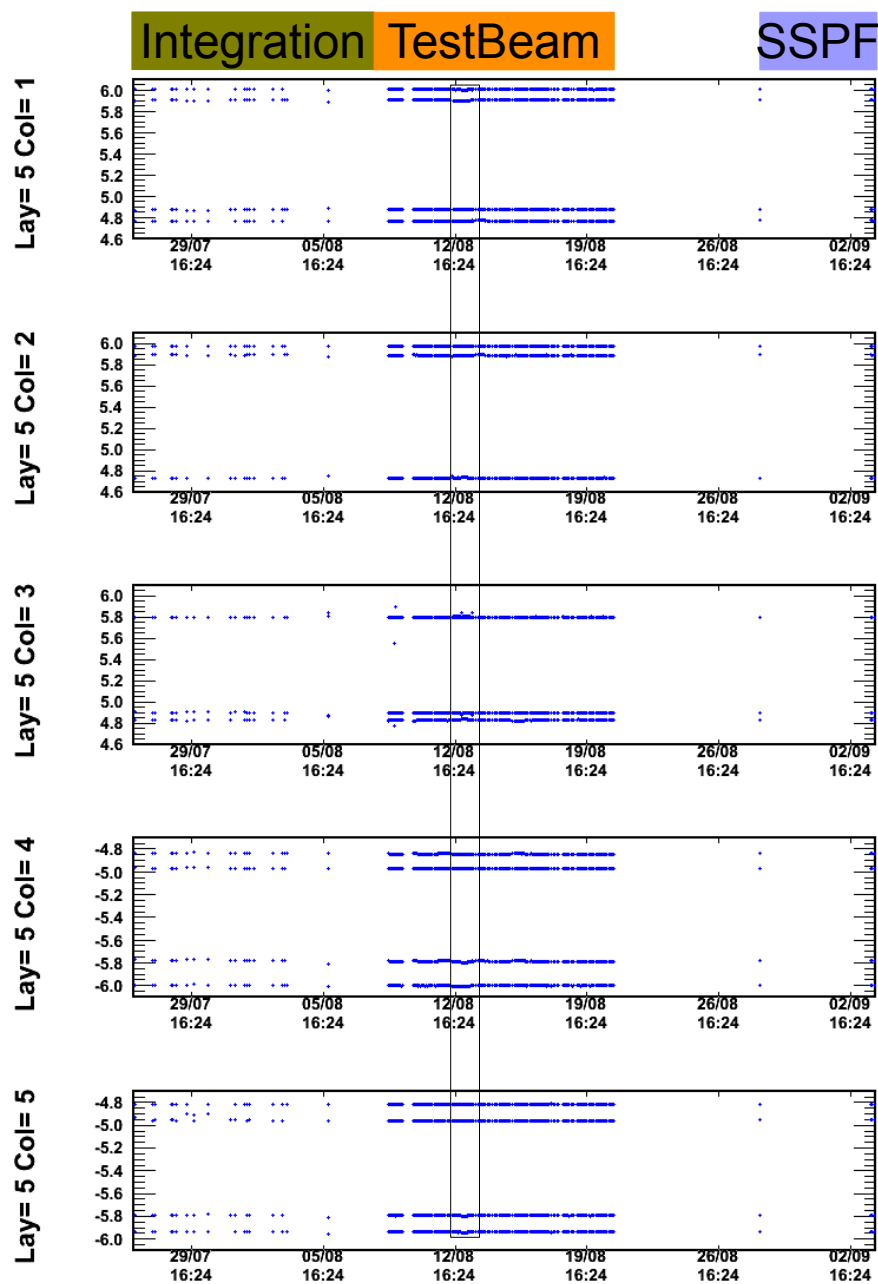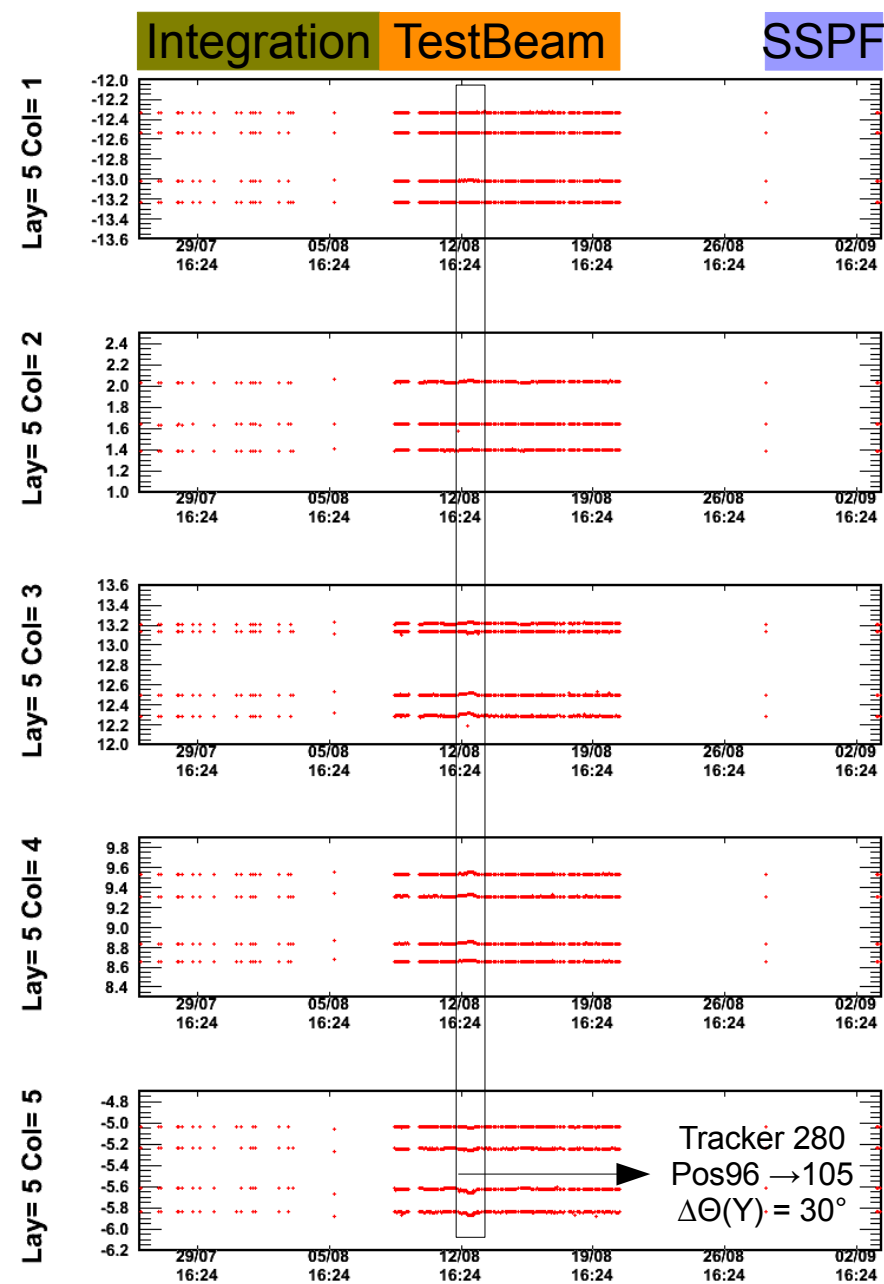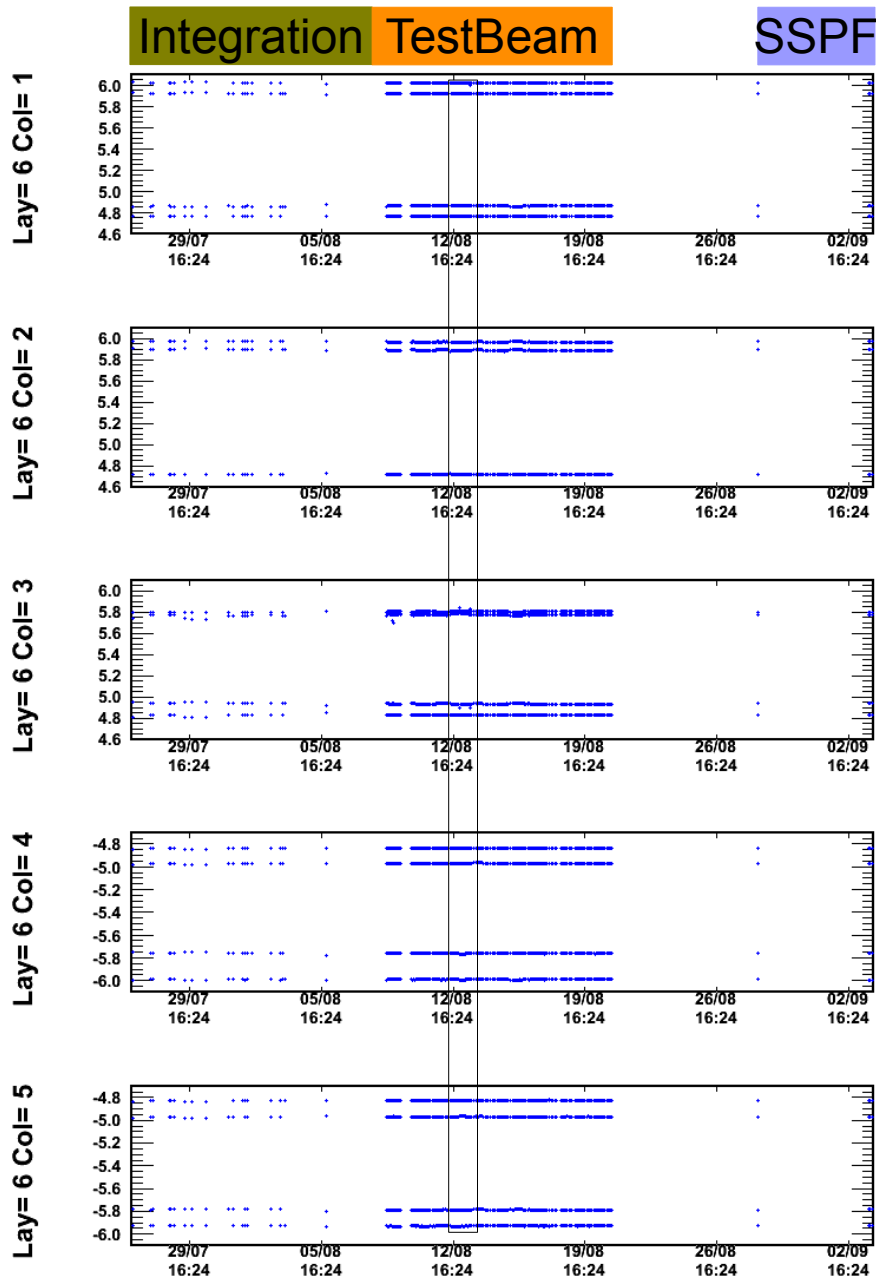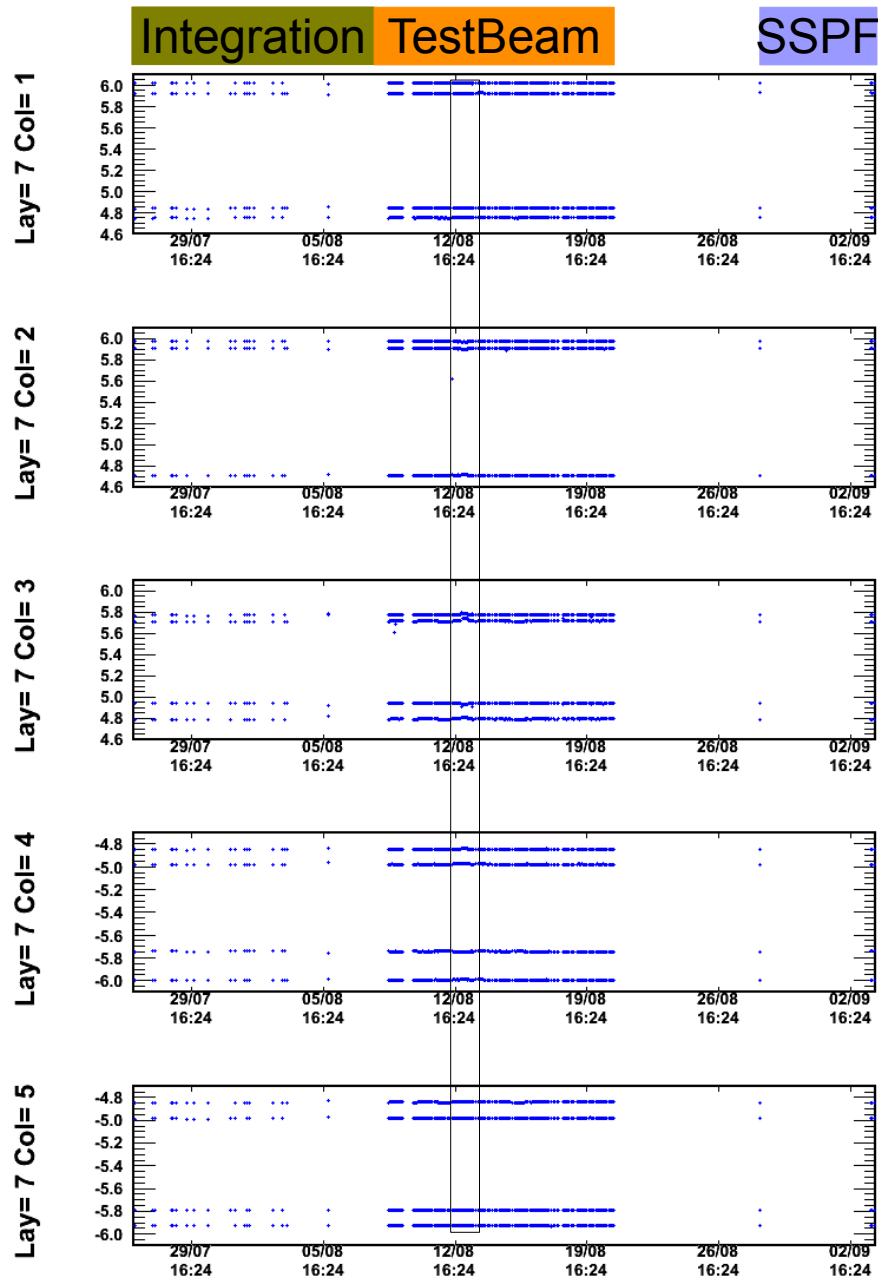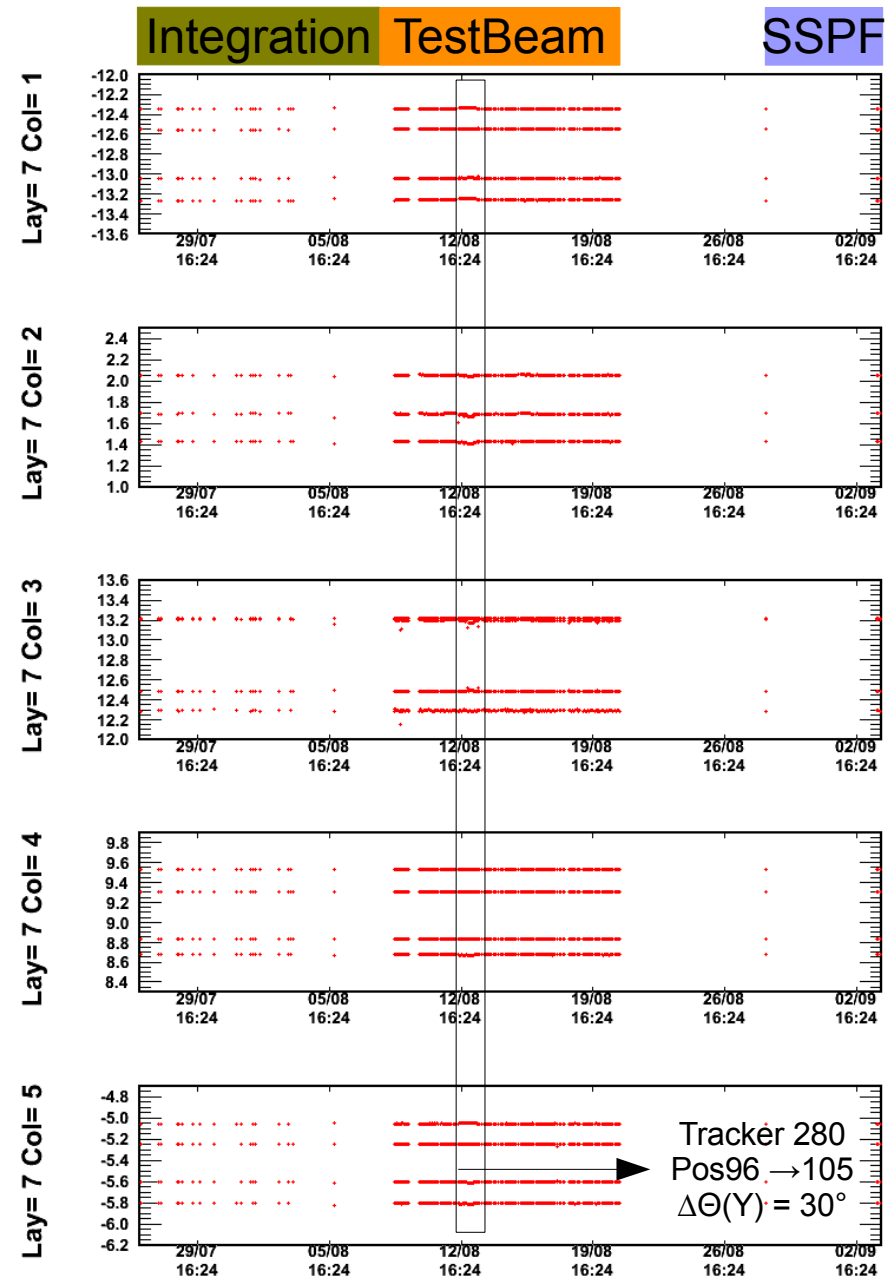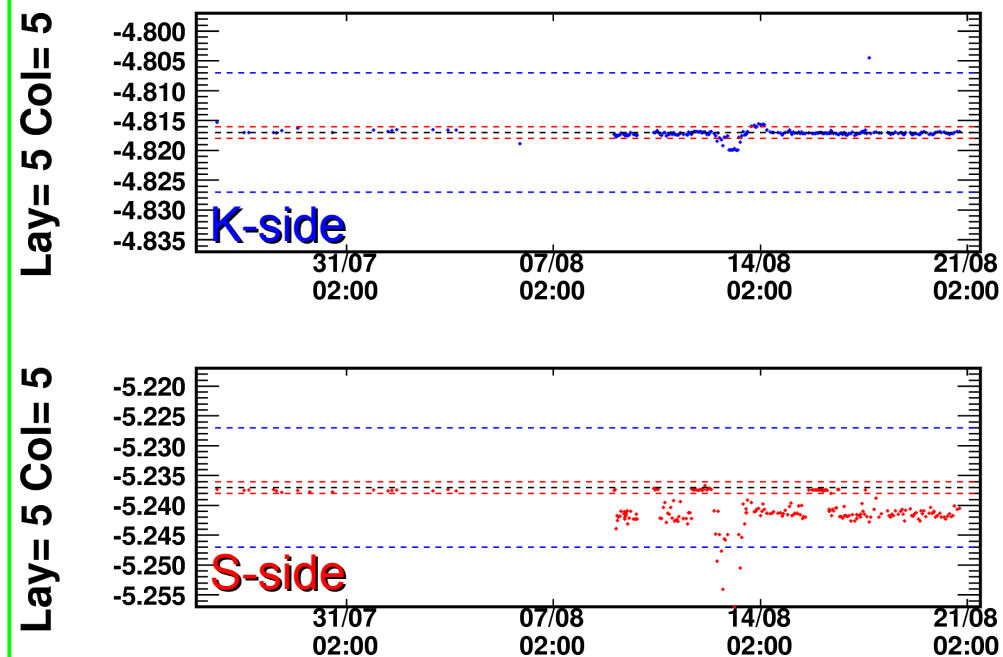RWTH Physics AC-I
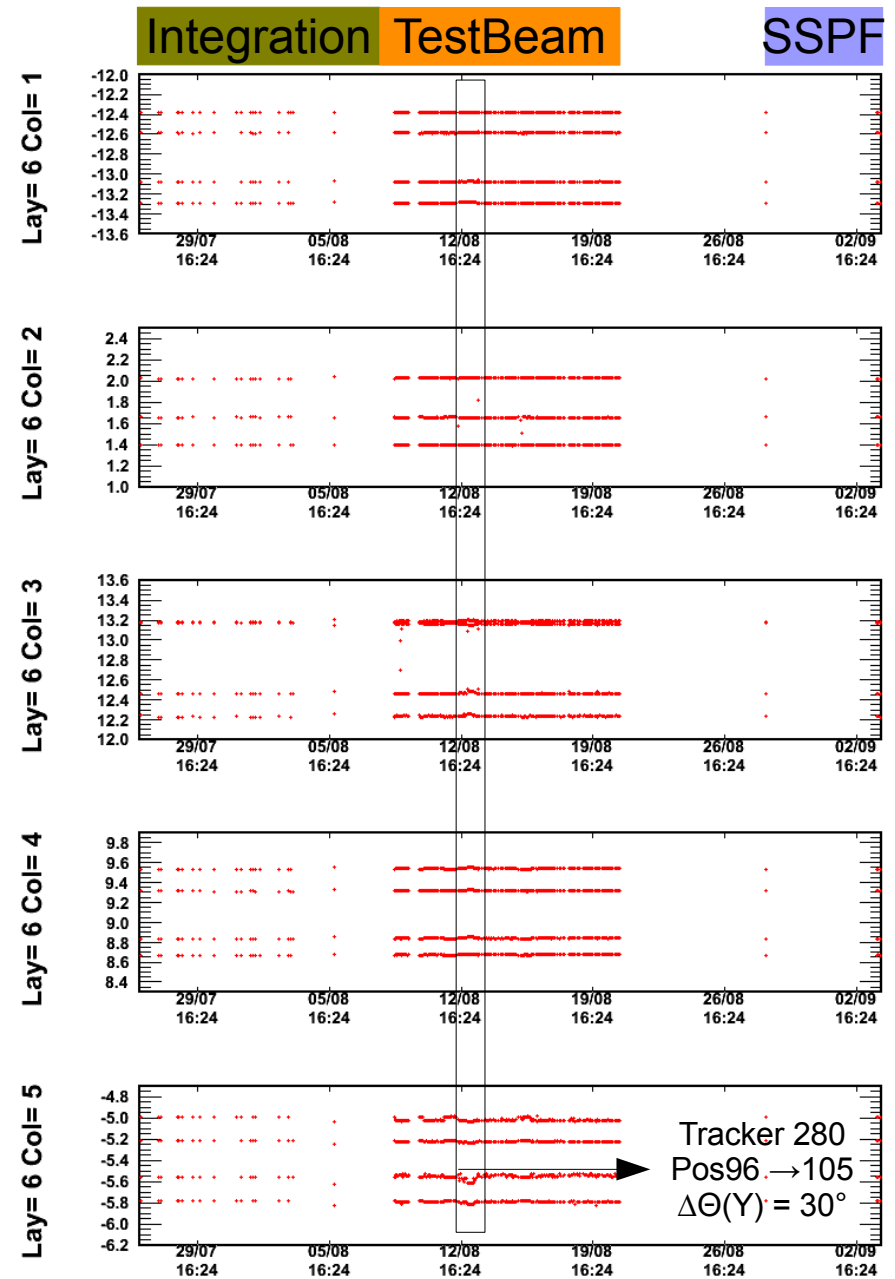
Position Monitoring of Tracker Layer Nr. 7 / 7

K-side (X-coord.)

S-side (Y-coord.)

Tracker 280
Pos96 →105
$\Delta\Theta(Y) = 30°$

RWTH
Physics AC-I
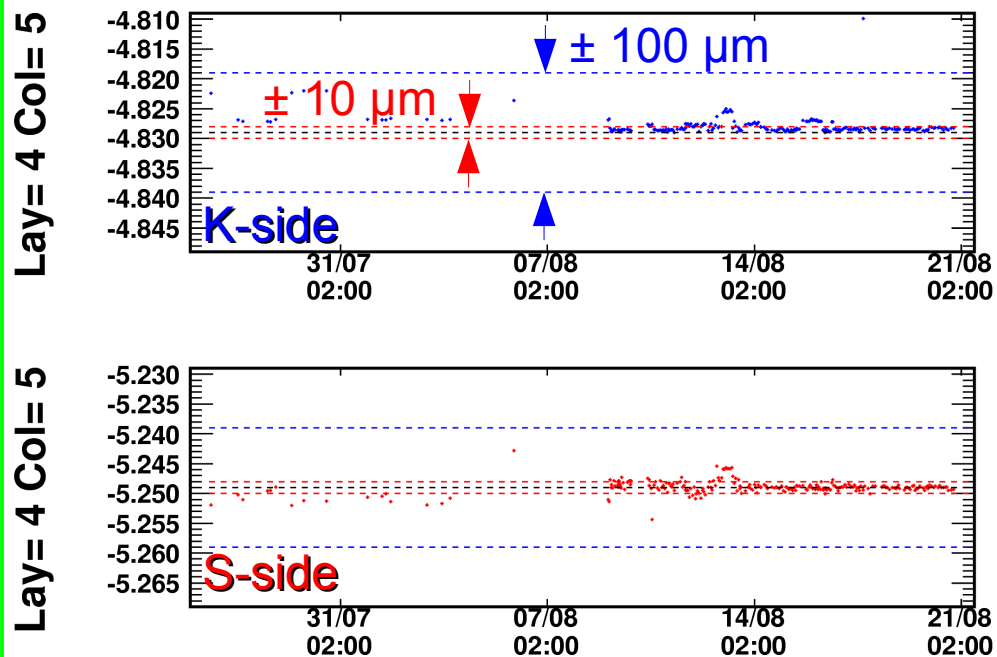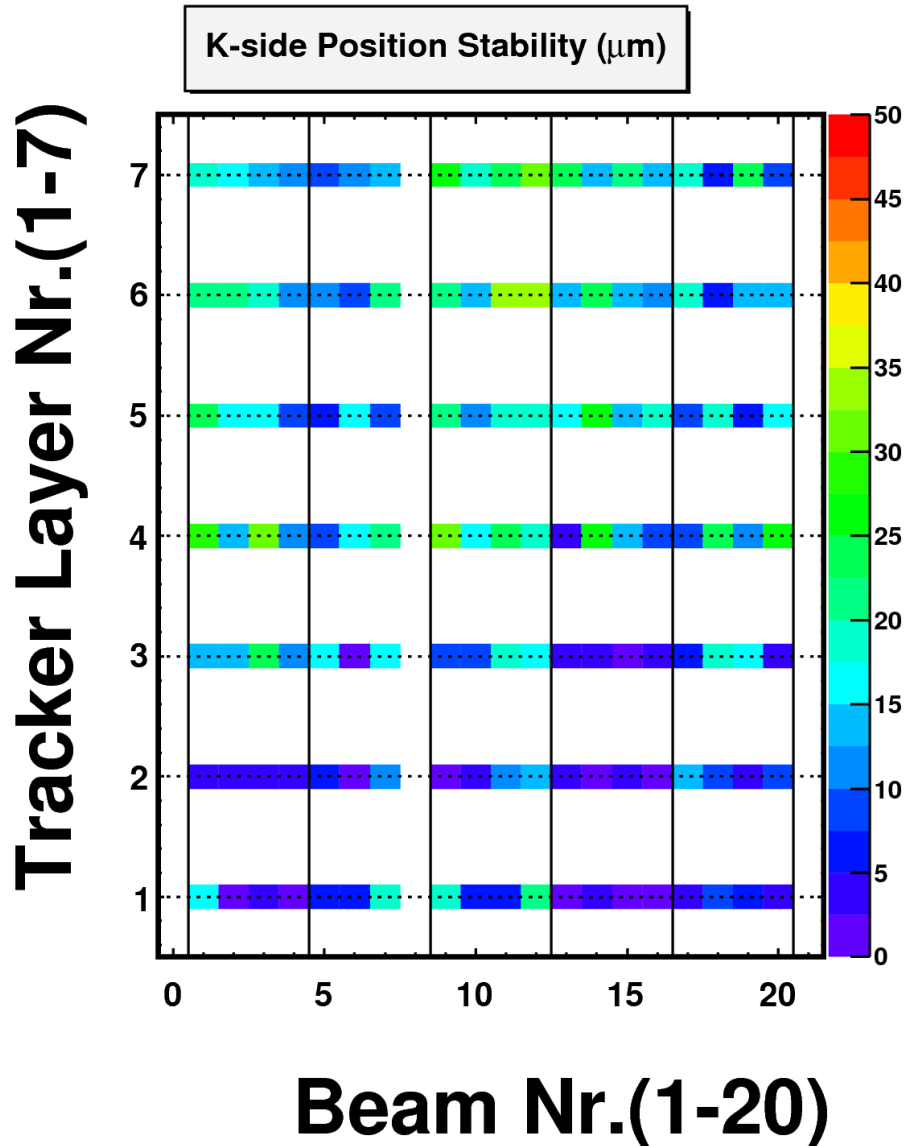
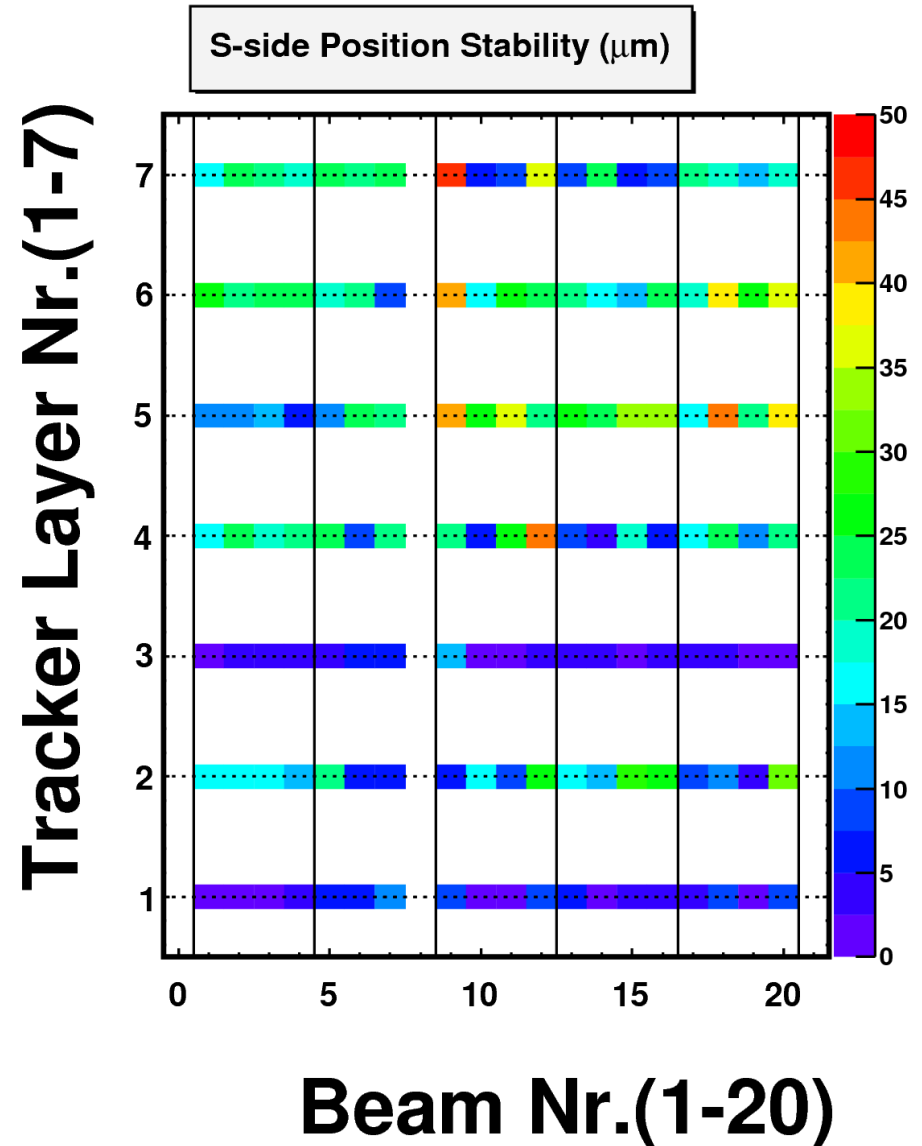# Tracker Layer Nr. 4 – 7 in Column Nr. 5
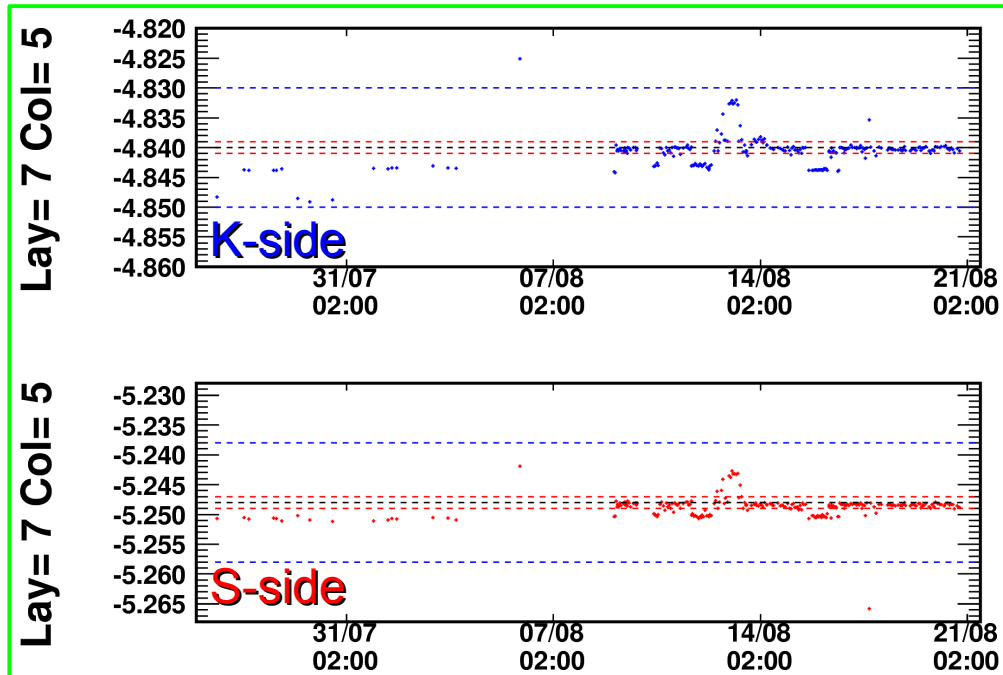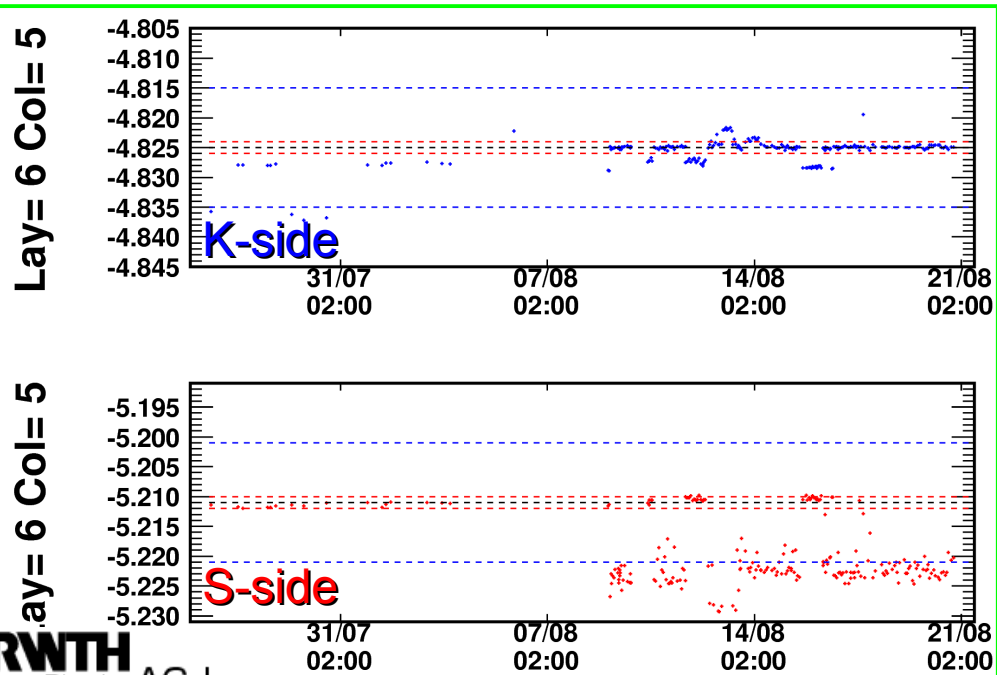
Ladder Position Stability vs. Tracker Layer

If we allow AMS-02 to move (July 14 – Aug. 21: Including testbeam period)
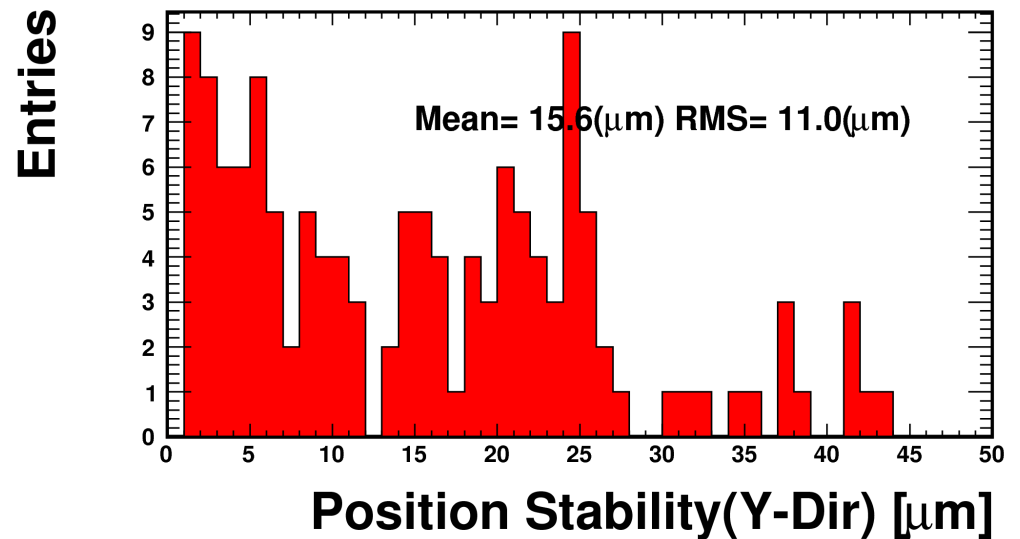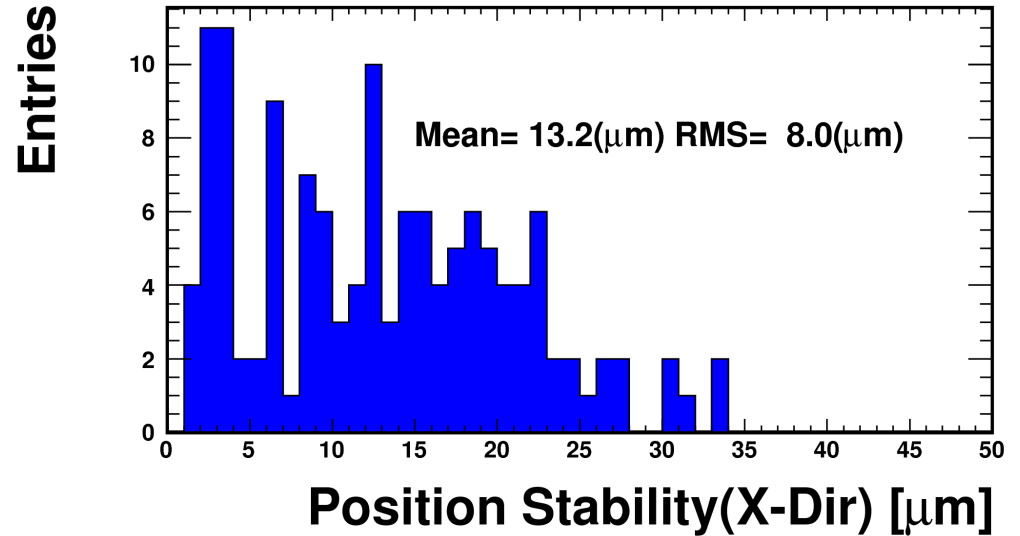

Spread of (K-side) = 13.2 ± 8.0 μm

Spread of (S-side) = 15.6 ± 11.0 μm

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Position Stability of Tracker in Complete Period

If we allow AMS-02 to move (July 14 – Aug. 21: Including testbeam period)
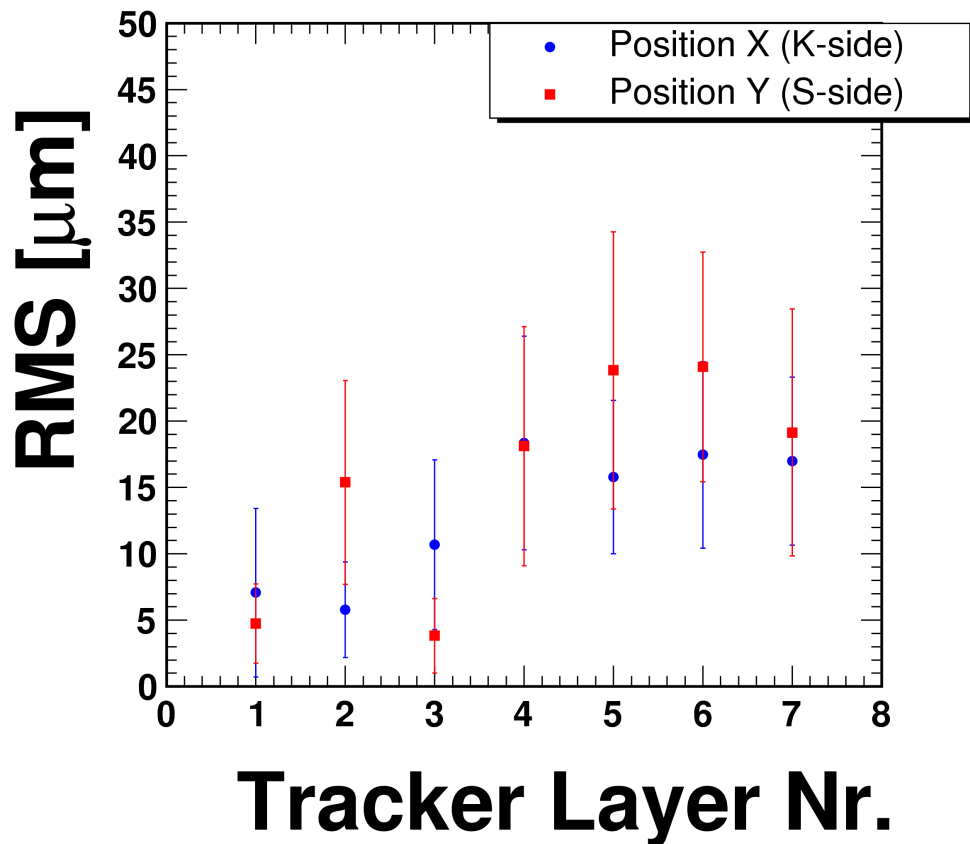
Ladder Position Stability vs. Tracker Layer

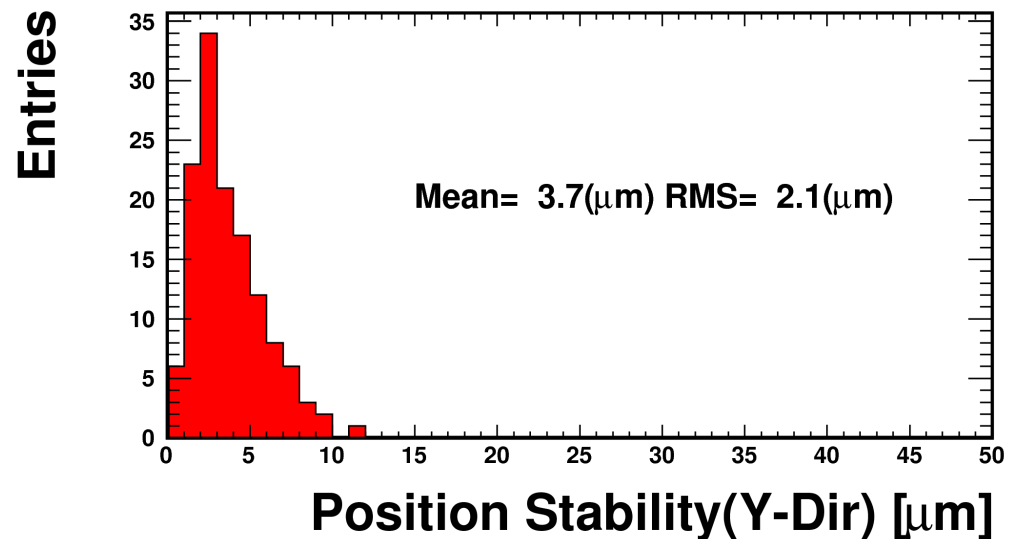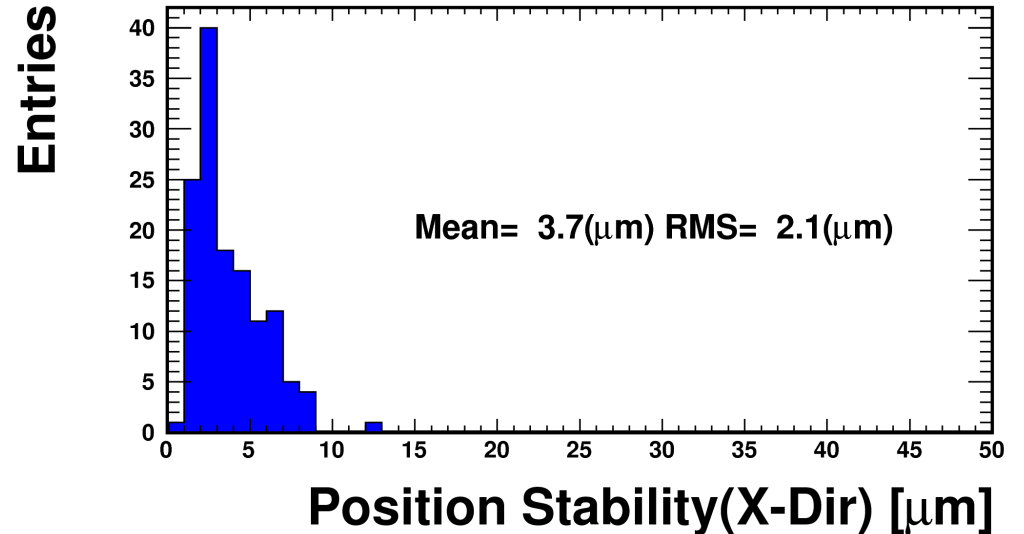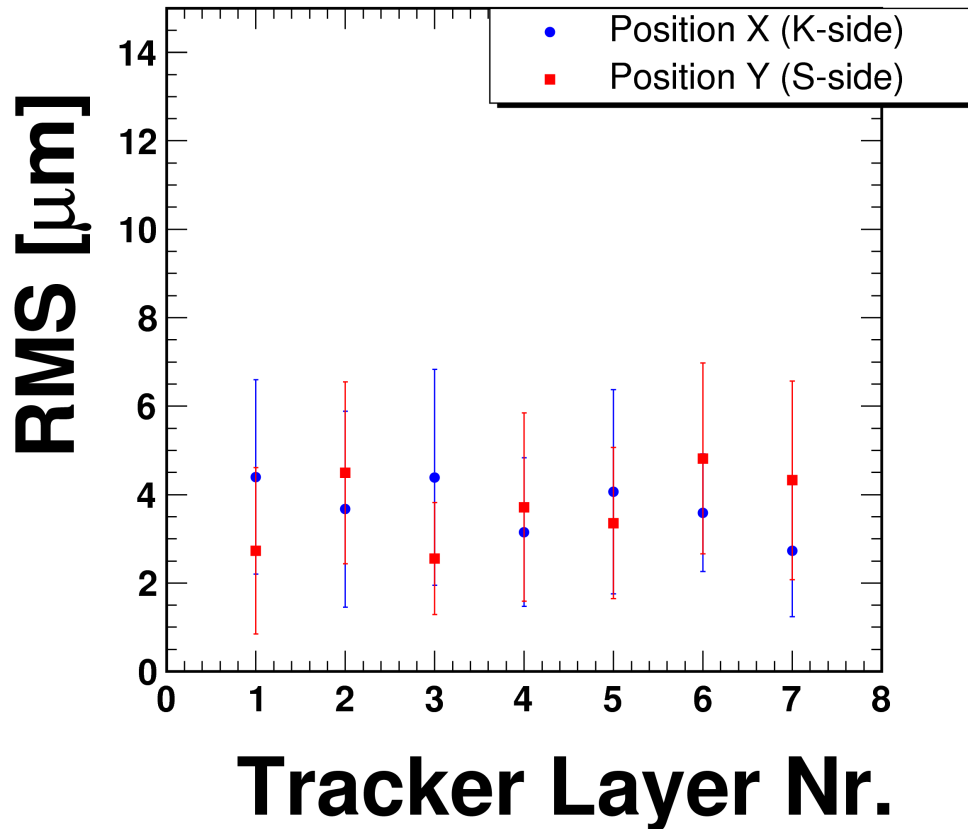**If we consider only silent period (July 14 – Aug. 8)**
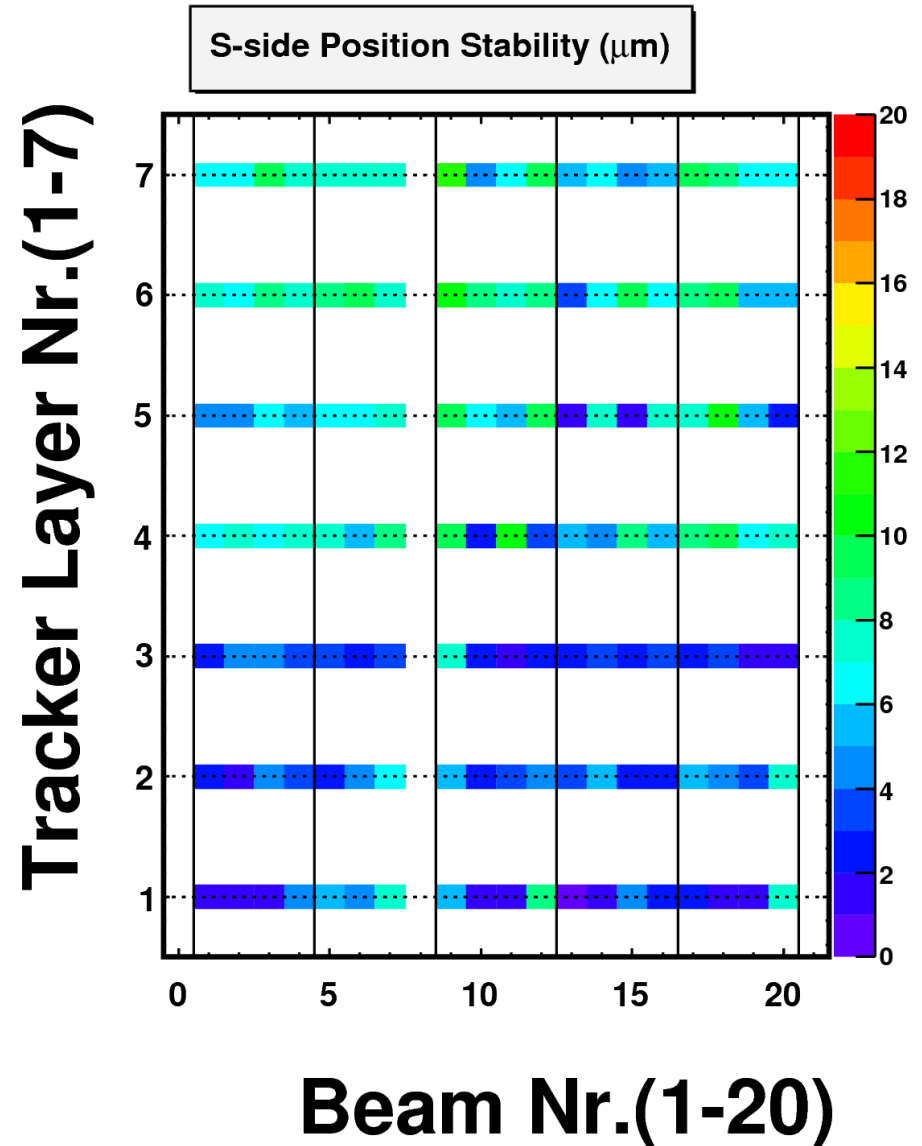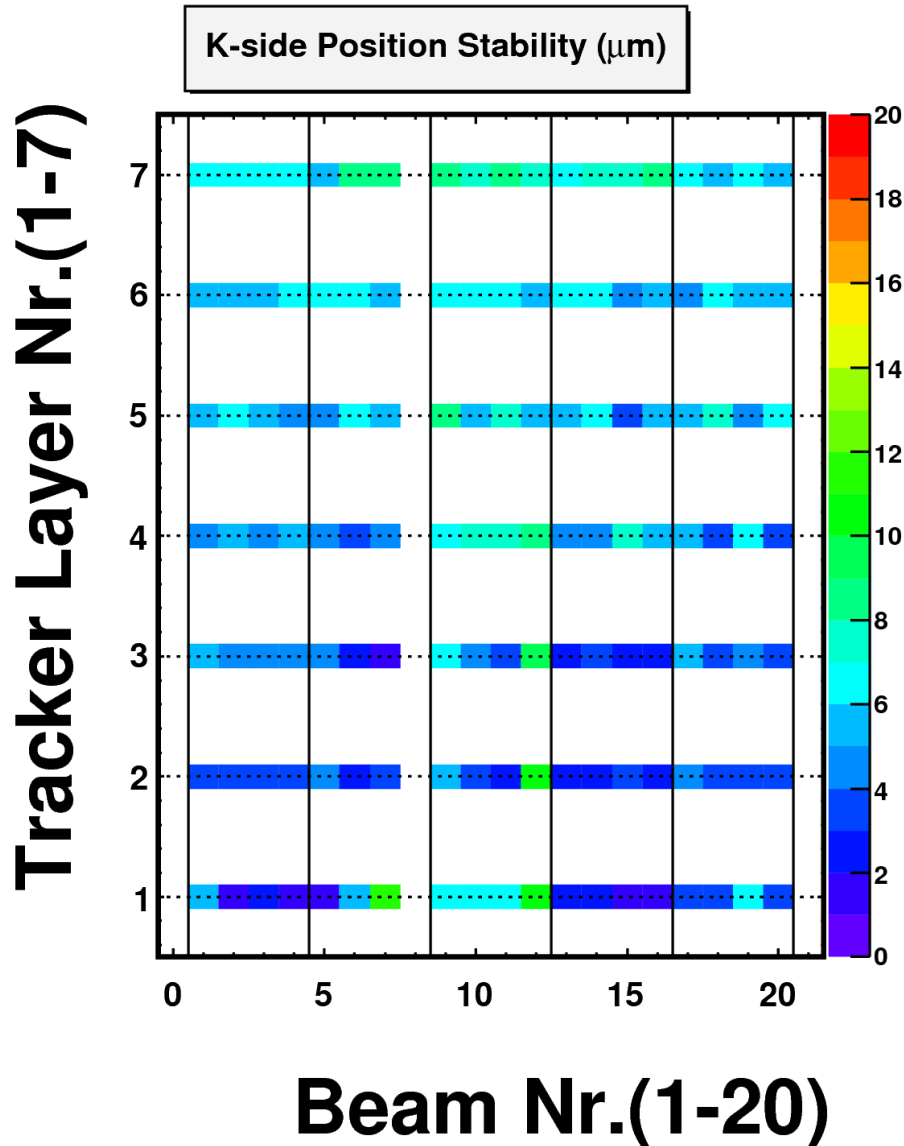
Spread of (K-side) = 3.7 ± 2.1 μm

Spread of (S-side) = 3.7 ± 2.1 μm

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Position Stability of Tracker in Silent Period

If we consider only silent period (July 14 – Aug. 8)

Summary / Milestone

Since flight integration we have investigated the position stability of tracker with laser beams.

- Laser beam ports installed to generate 20 laser beams for the tracker alignment and 19 beams are passing through anti-reflective coated holes.

- Position stability during complete period = 15 ± 10 (µm)
  Tracker layer nr. 1-3 are more stable than layer nr. 4-7 (?)

- Position stability during silent period   =   4 ± 2   (µm)

Special thanks to DAQ people for the successful running of TAS up to now.

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Backup Slides

Laser Tracks in Global Coordinates

Column Nr. 2, Prism Nr. 1

S-side

K-side

Column Nr. 2, Prism Nr. 2

S-side

K-side
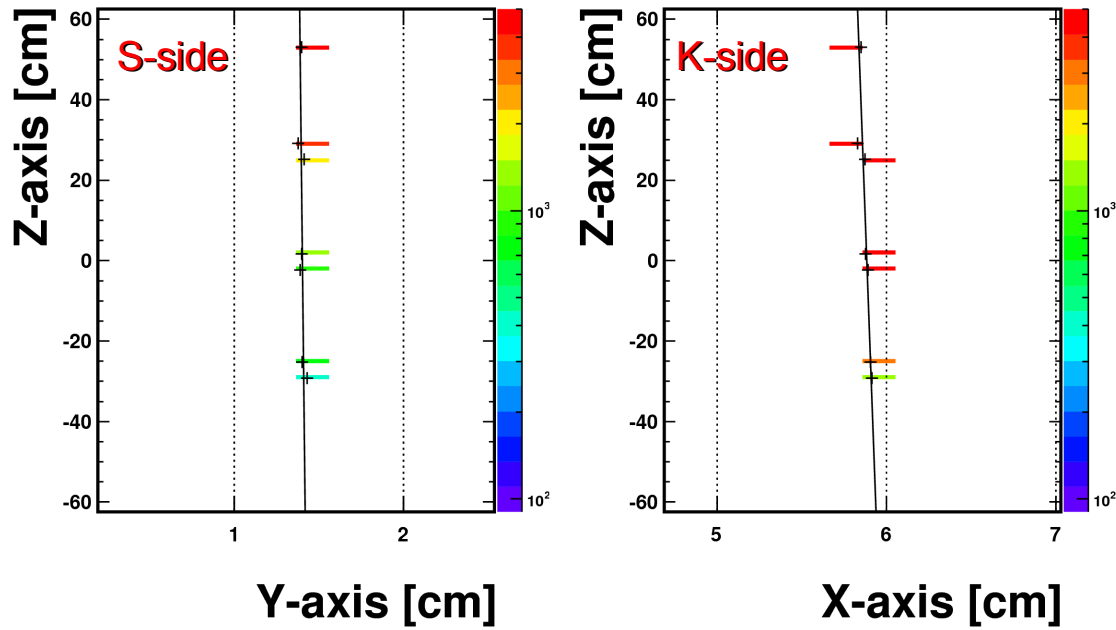
Laser Peaks in Sensor Coordinates : Projection to XY Plane

LDDR-1 Diode-0 Current=20 [mA] RUN=1279095271

LDDR-0 Diode-1 Current=20 [mA] RUN=1279095263

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Laser Tracks in Global Coordinates

Column Nr. 3, Prism Nr. 1

S-side

K-side

Column Nr. 3, Prism Nr. 2

S-side

K-side

Laser Peaks in Sensor Coordinates : Projection to XY Plane

LDDR-2 Diode-0 Current=20 [mA] RUN=1279095288
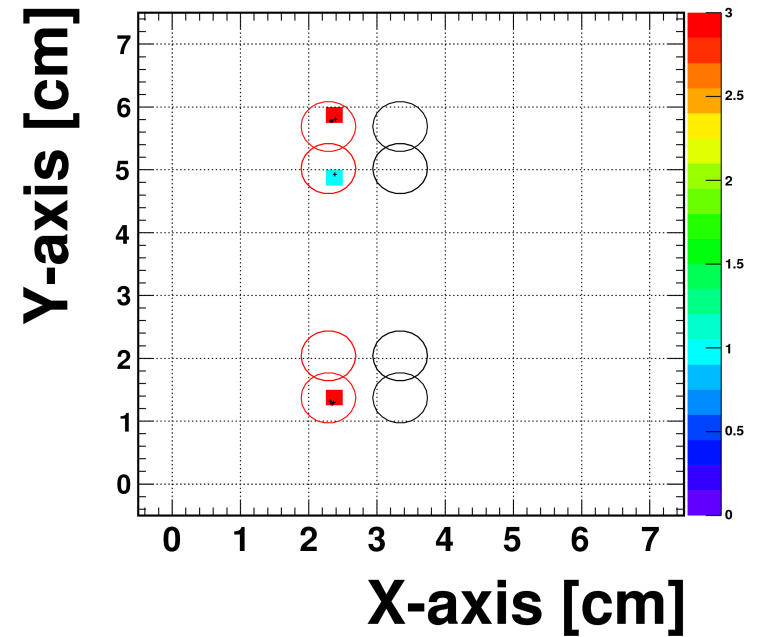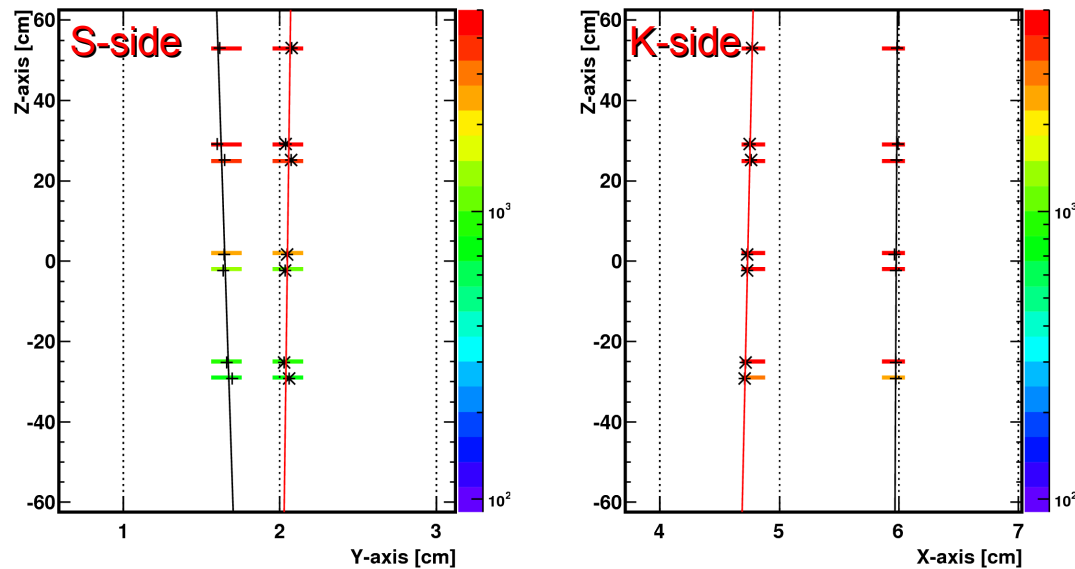
LDDR-1 Diode-1 Current=20 [mA] RUN=1279095280
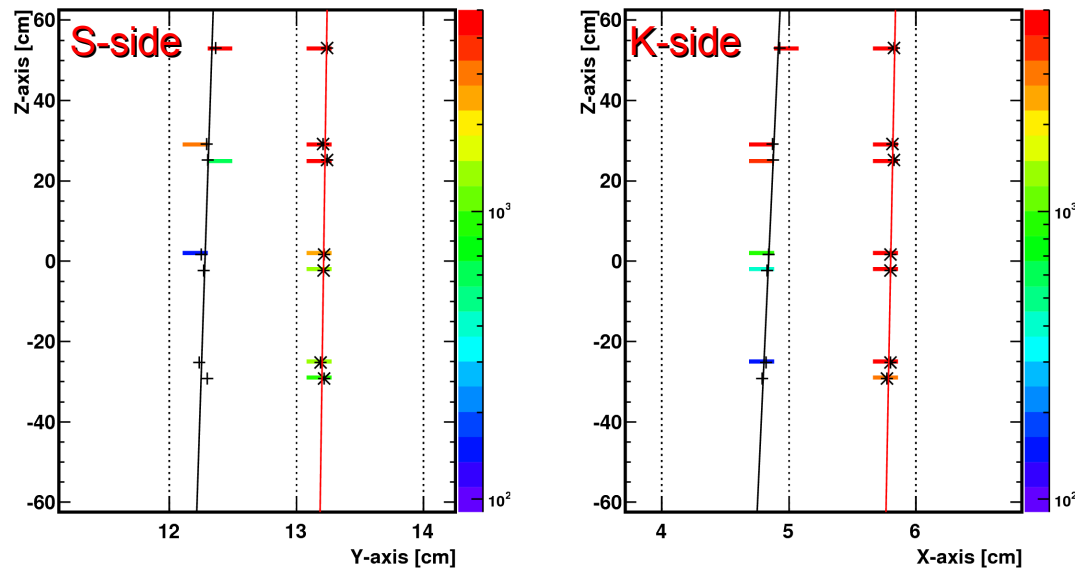
Laser Tracks in Global Coordinates

Column Nr. 4, Prism Nr. 1

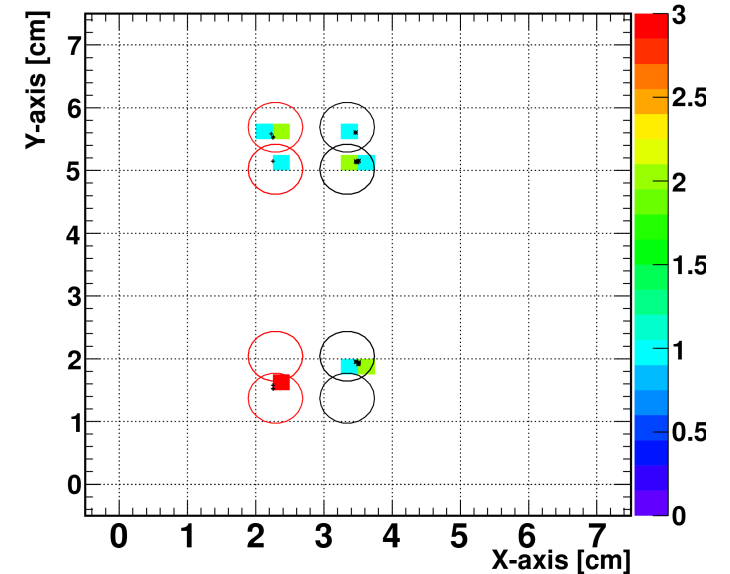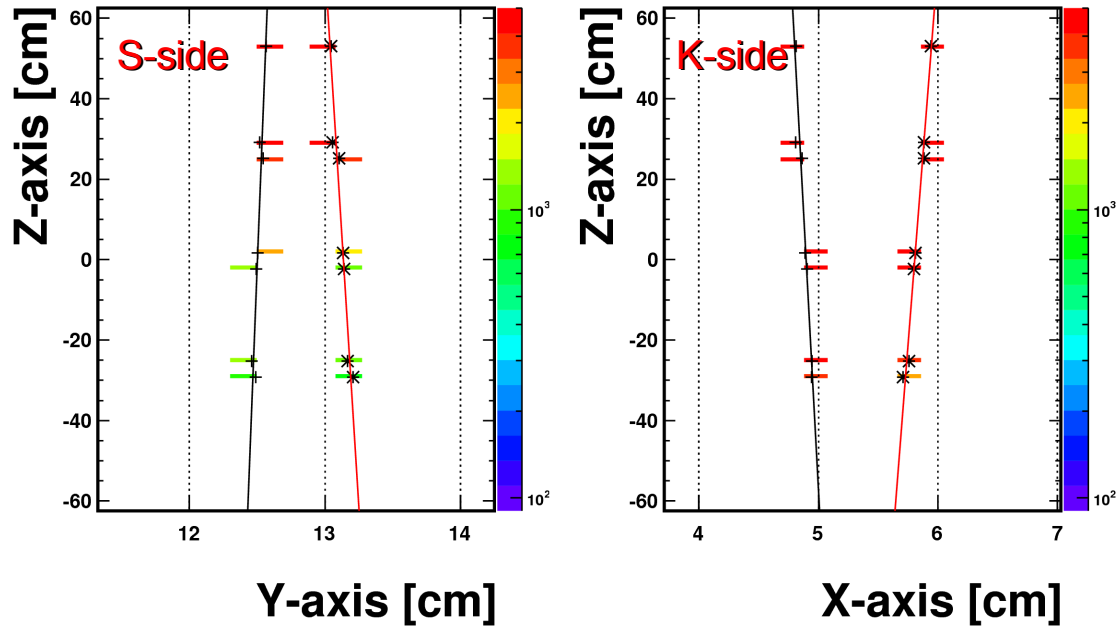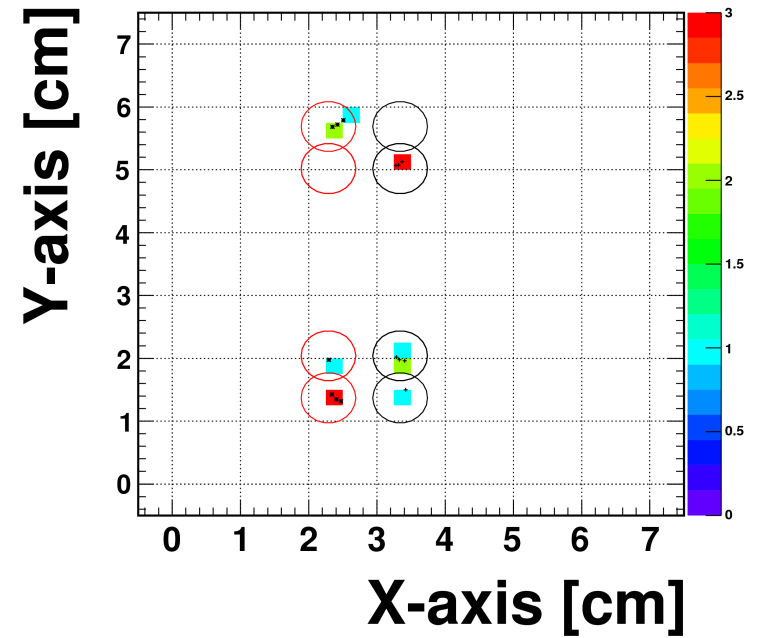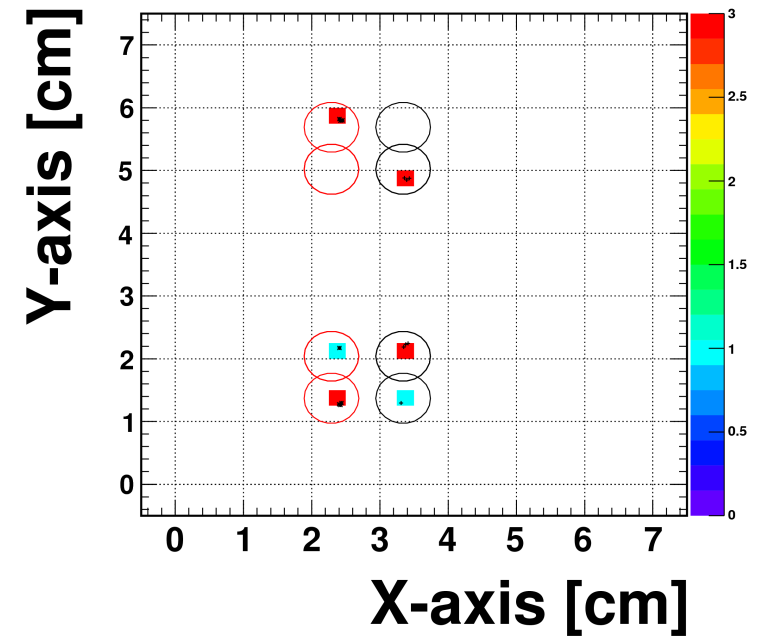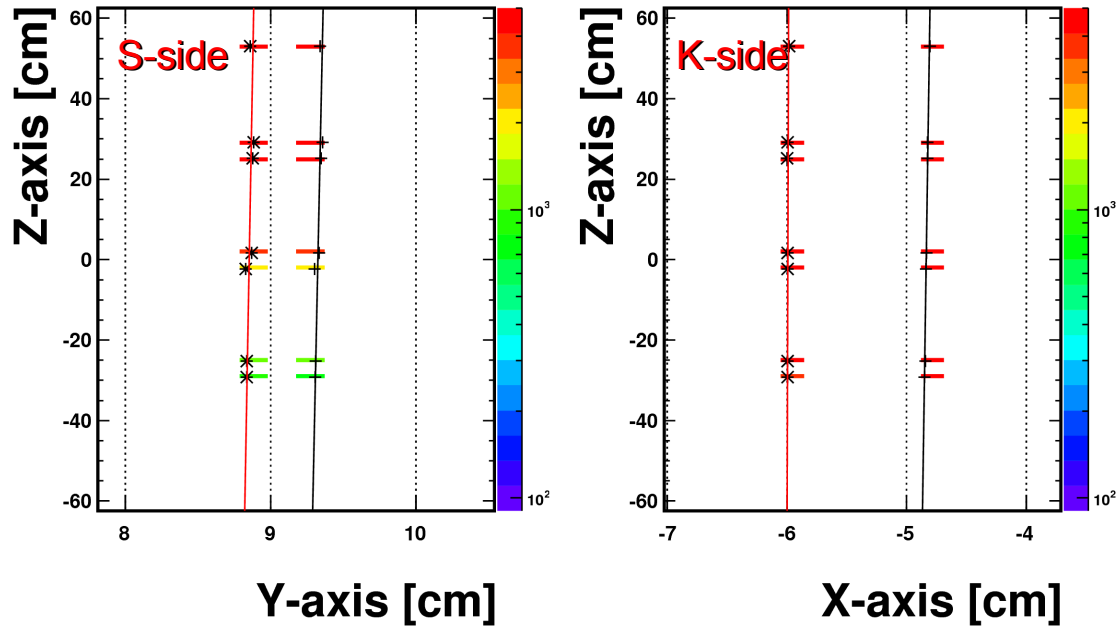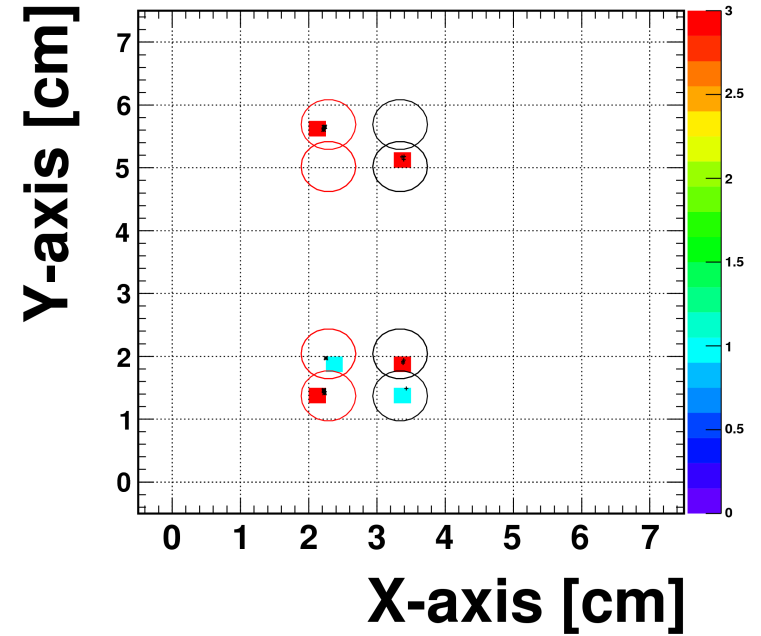# Laser Peaks in Sensor Coordinates :
Projection to XY Plane

Column Nr. 4,   Prism Nr. 2

RWTH Physics AC-I
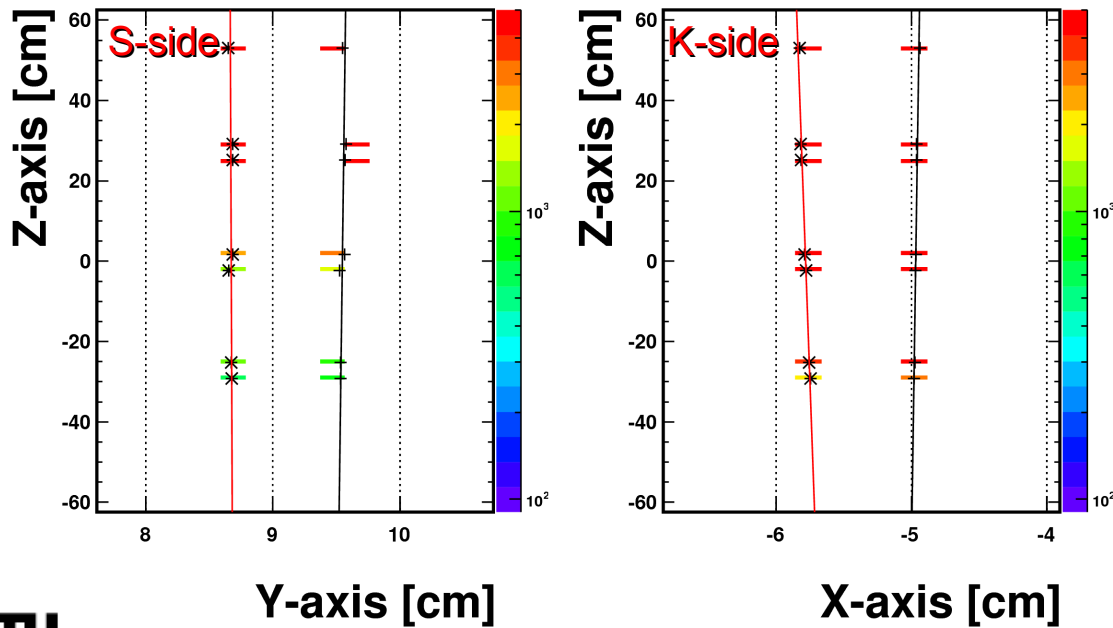
Laser Tracks in Global Coordinates
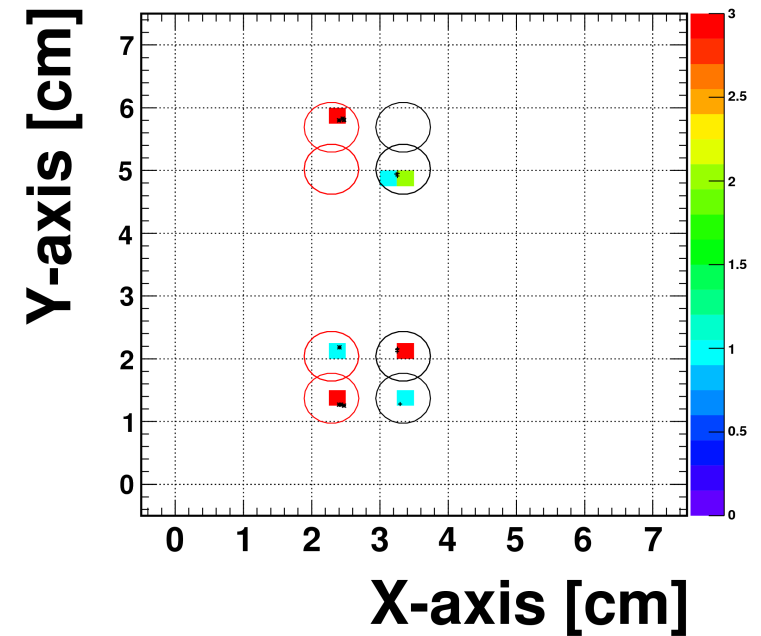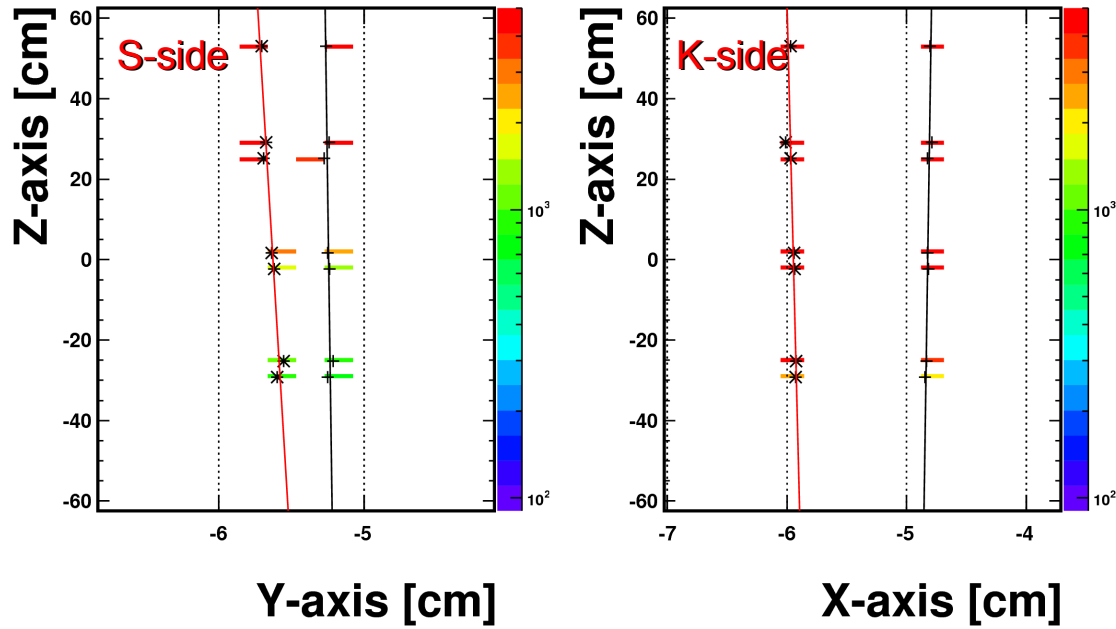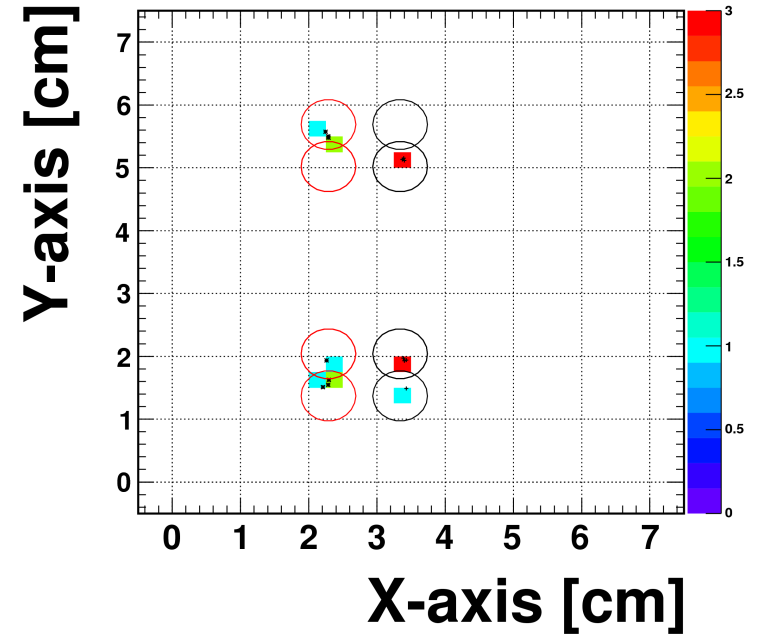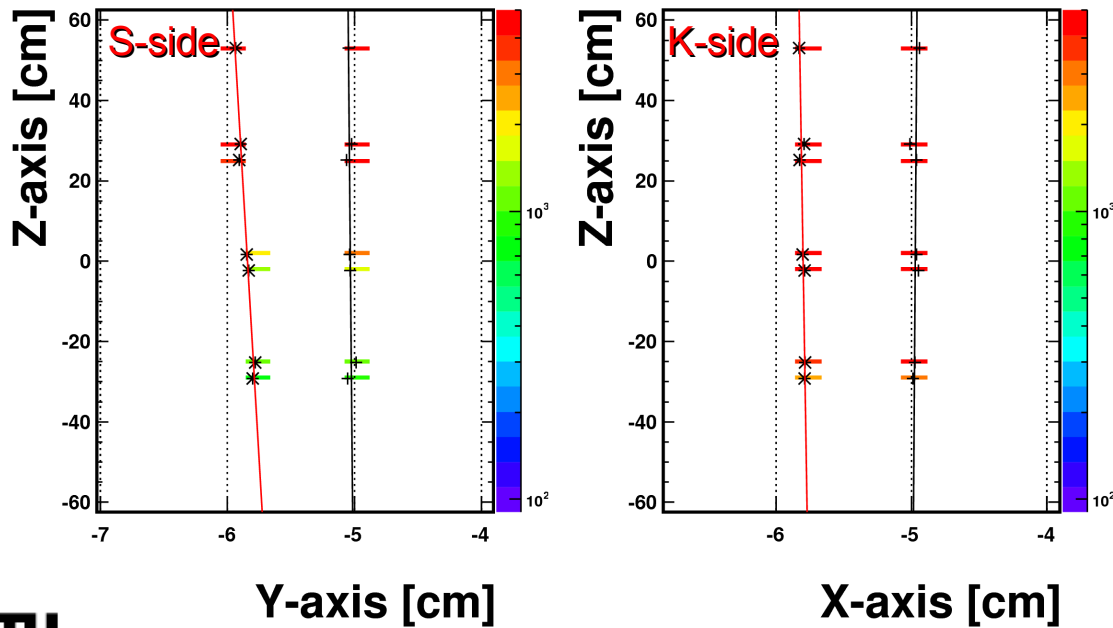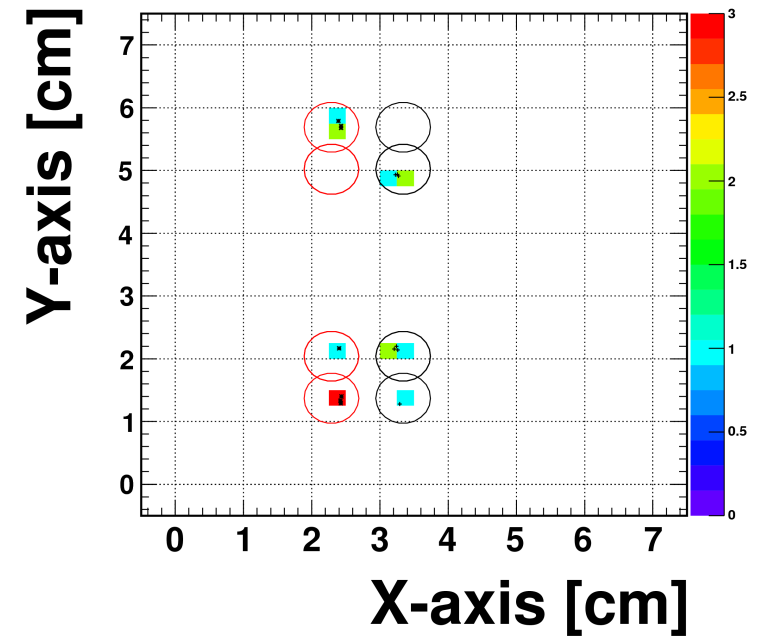
Column Nr. 5, Prism Nr. 1

S-side

K-side

Z-axis [cm]

Y-axis [cm]

X-axis [cm]

Laser Peaks in Sensor Coordinates : Projection to XY Plane

LDDR-4 Diode-0 Current=20 [mA] RUN=1279095321

Y-axis [cm]

X-axis [cm]

Column Nr. 5,   Prism Nr. 2

S-side

K-side

Z-axis [cm]

Y-axis [cm]

X-axis [cm]

LDDR-3 Diode-1 Current=20 [mA] RUN=1279095313

Y-axis [cm]

X-axis [cm]

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Physics AC-I

Position Stability of Tracker

Movement   vs. No movement