

SPEAR3 Monument Network

November 13-15, 2003



Purpose: Assign new coordinate values to all ring monumentation to be used for the re-alignment of all magnets and vacuum chambers.

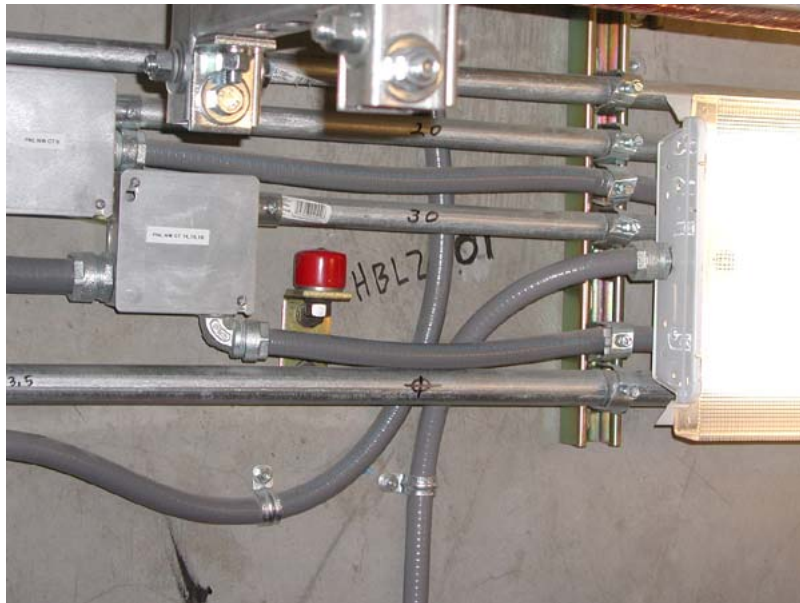
Network Description

- 368 points.
- 40 laser tracker stations
- 636 triplet observations:
 - Distances: $40 \mu\text{m}$
 - Horizontal angles: $40 \mu\text{m} / D$
 - Vertical angles: $50 \mu\text{m} / D$
- 303 height differences: $60 \mu\text{m}$

Points Analysis

- 167 monuments
 - 122 ring monuments:
 - 38 floor
 - 33 aisle (2 modified)
 - 50 wall (7 were extended to allow leveling shot, 1 modified)
 - 1 ceiling
 - 45 others:
 - 42 SSRL points for level observation only
 - 3 miscellaneous
- 201 magnet TBs (missed SC01SF13)

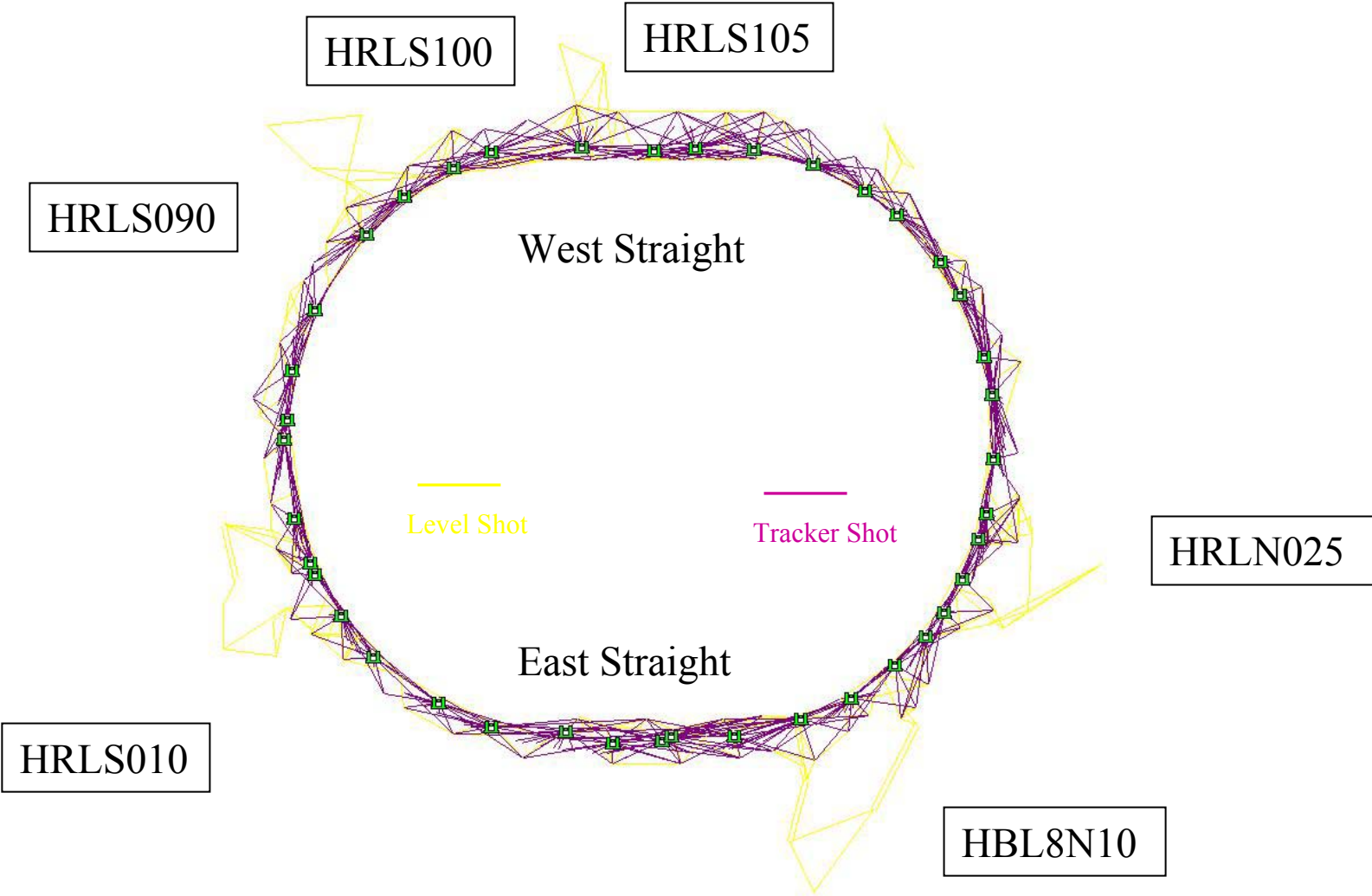
Wall Monument Extenders



Datum Choice

- In the adjustment stage:
 - Minimally constrained in the horizontal plane:
 - SM05F5 fixed in Z and X
 - SM14F5 fixed in X
 - Over constrained for the vertical axis:
 - 6 SSRL points fixed in height
- After the adjustment:
 - Best fit the 38 floor points:
 - shift in Z : $-38 \mu\text{m}$
 - shift in X : $-187 \mu\text{m}$
 - rotation around Y : 0.0735 mrad

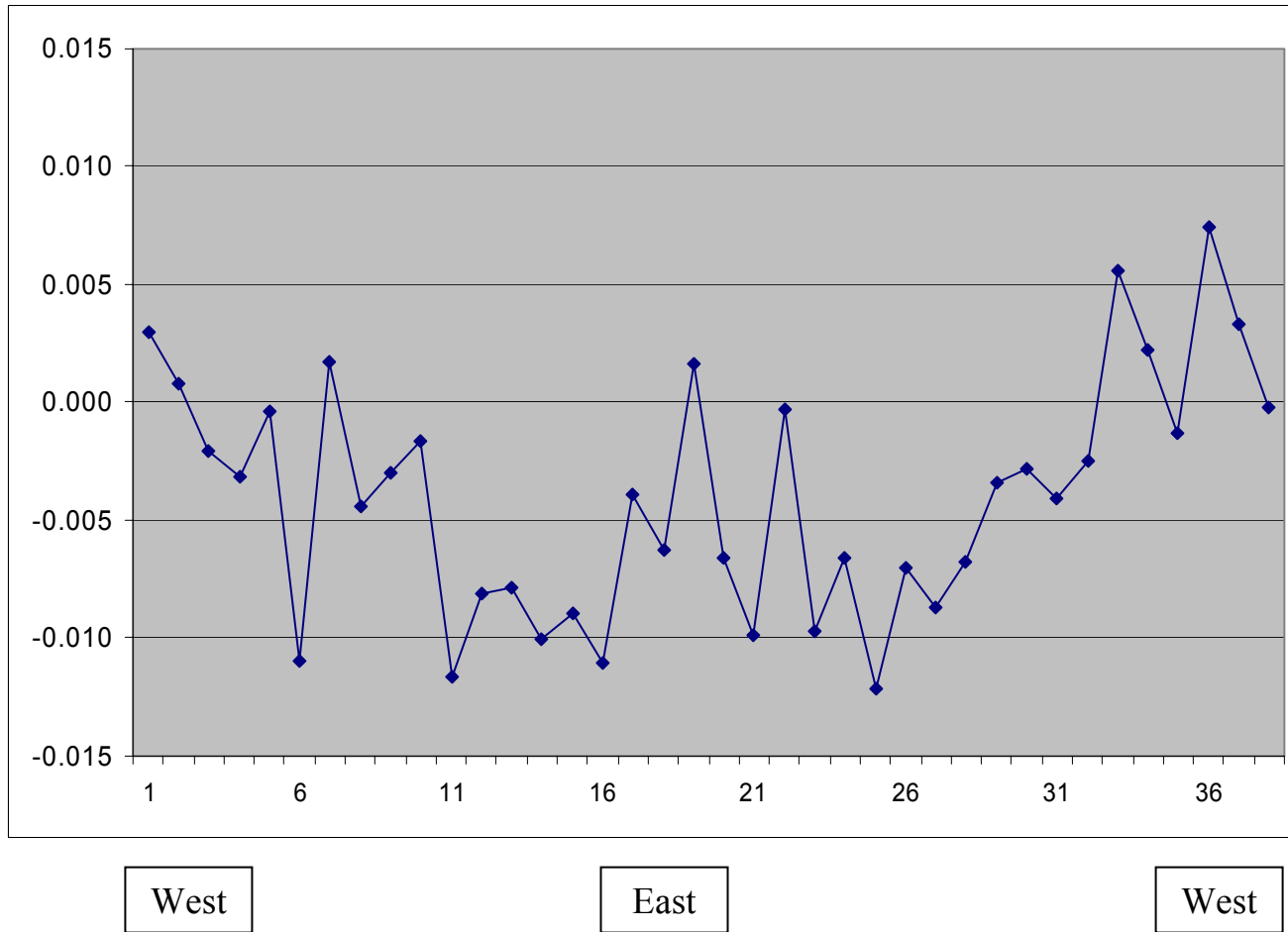
SSRL Points Controlling Ring Heights



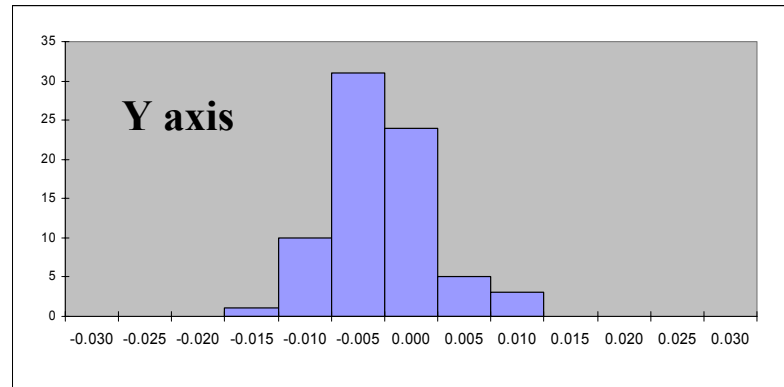
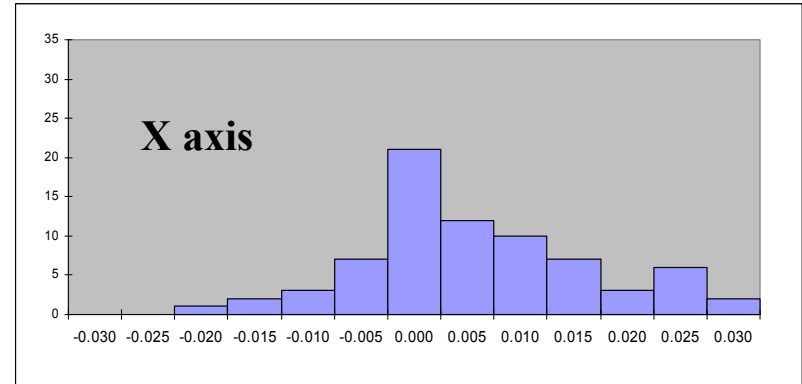
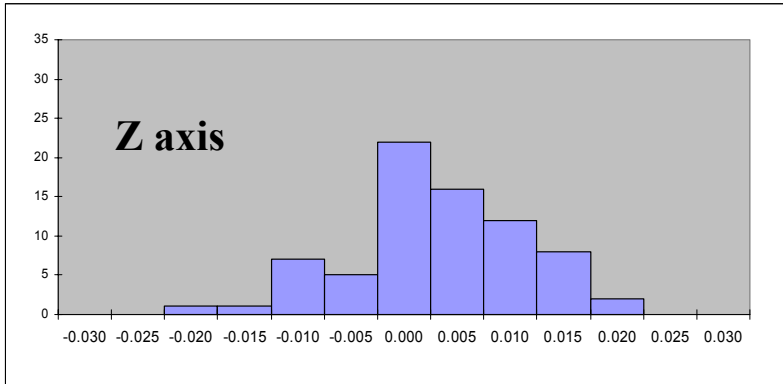
Network Results

- Variance Analysis
 - degree of freedom 966
 - sigma a posteriori 1.046304
(distance: 0.891794, horizontal angle: 0.802313,
vertical angle: 1.206194, height difference: 1.245124)
- Residuals Analysis
 - All 4 types of observation pass the Chi2 goodness of fit test individually as well as the whole observation distribution.

Floor Monument Elevation Changes since the control network results in July 2003 (mil)



Wall and Aisle Monument Coordinate Changes (mil)



Manpower

- Because the leveling observations do not require exclusive access to the ring, they were gathered in advance between October 16 and October 31:
 - 163 Man hours
- The quasi totality of the tracker observations (39 set-ups) was collected in the first 2 days using 2 trackers:
 - 64 Man hours
- To get a complete account of the manpower necessary the time for preparation, processing, clean up and documentation should be reported:
 - 32 Man hours

Conclusion

- All the ring monument coordinates have been updated in the database at the end of this analysis.
- All the SSRL monuments have been left unchanged.
- The survey and re-alignment of all the magnets and vacuum chambers will start on Monday November 17th. The recorded coordinate values of the 201 TB3s will be as a check to the total station set-ups.