SPEAR3 2004 Summer/Fall Downtime Alignment Schedule

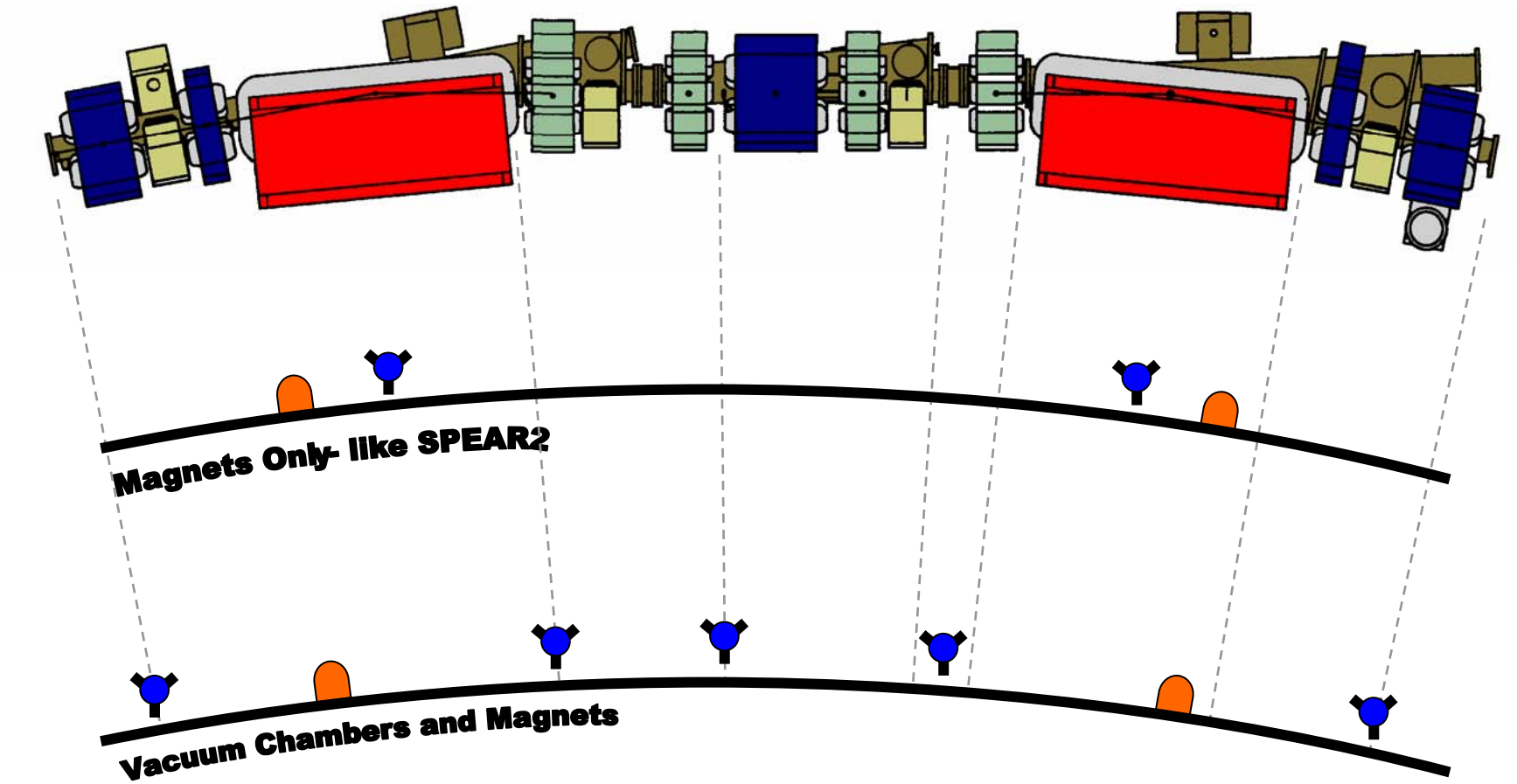
Recap of 2003 results

- Discussion Items:
  - Mapping Options
  - Sensitive Area Identification
- Scheduled Period:
  - September 7-21, 2004
  - 2 crews per day

Laser Tracker Mapping Options as presented on 11/04/2003

- Monuments + Magnets + Vacuum Chambers
  - 75 tracker set ups
- Monuments + Magnets
  - 40 tracker set ups
- Monuments only
  - 30 tracker set ups

Final Mapping Instrument Position Study as presented on 11/04/2003



2003 Monument Mapping Network Description

217 Field Work Man Hour: 163 MH leveling, 64 MH laser tracker

- 40 laser tracker stations
- 368 points:
  - 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)

- 636 triplet observations in 2 days (November 13&14, 2003):
  - Distances: 40 µm
  - Horizontal angles: 40 µm / D
  - Vertical angles: 50 µm / D
- 303 height differences: 60 µm

2003 Magnet Placement

- TC2002 local set-ups with the following details:
  - Resection is based on a minimum of 5 points from which at least 2 are floor.
  - Check with each “mapped” tooling ball.
- Goals:
  - 5 mil in X and Y direction
  - 15 mil along beamline
- Field Work ManPower:
  - 6 days: November 17-22, 2003
  - 360 MH

Example of Magnet Results

SC04QF11	6036.58951	3015.42930	576.20259
SC04QF12	6036.75753	3015.15708	576.20271
SC04QF13	6036.10347	3015.12877	576.20281
SC04QF14	6036.27275	3014.85514	576.20270

SC04QF1M	(Z,X,Y)	6036.430843	3015.142623	575.791222
	(Tz,Tx,Ty)	0.000093	0.000003	0.000002
	(Rz,Rx,Ry)	-0.015955	0.007223	-0.000608
	Vz	Vx	Vy	
1	0.000072	0.000084	-0.000053	
2	0.000015	0.000016	0.000053	
3	-0.000035	-0.000011	0.000052	
4	-0.000052	-0.000089	-0.000052	

Name					Found					as built	dz (inch)	dx (inch)	dy (inch)
SC04QF1	QUAD	QF	34Q-037		SC04QF1M	6036.43084	3015.14262	575.79122		SC04QF1M	0.002	0.003	0.000
SC04QD1	QUAD	QD	15Q-020		SC04QD1M	6036.76786	3014.59833	575.79119		SC04QD1M	0.009	0.003	-0.001
SC04BM1	SBEN	B	145D-04		SC04BM1M	6037.27677	3013.68051	575.79120		SC04BM1M	0.002	-0.001	-0.001
SC04SD1	SEXT	SD	25S-65		SC04SD1M	6037.71341	3012.69329	575.79130		SC04SD1M	-0.004	0.005	0.003
SC04SF1	SEXT	SF	21S-35		SC04SF1M	6038.01389	3011.91759	575.79128		SC04SF1M	-0.008	0.005	0.002
SC04QFC	QUAD	QFC	50Q-087		SC04QFCM	6038.20718	3011.41834	575.79125		SC04QFCM	0.006	0.000	0.001
SC04SF2	SEXT	SF	21S-07		SC04SF2M	6038.40046	3010.91945	575.79134		SC04SF2M	0.007	0.000	0.004
SC04SD2	SEXT	SD	25S-50		SC04SD2M	6038.70093	3010.14398	575.79135		SC04SD2M	-0.006	0.002	0.005
SC04BM2	SBEN	B	145D-25		SC04BM2M	6039.04340	3009.12020	575.79128		SC04BM2M	-0.009	-0.002	0.002

2003 Vacuum Chamber Placement

- Rough elevation set during the TC2002 set-ups for magnet placement.
- Special laser tracker local set-ups using an arcing technique with a 20” long extension arm for final set.
- Goals:
  - 15 mil in X direction
  - 10 mil in Y direction
  - 30 mil along beamline when possible
- Field Work ManPower:
  - 2 days: November 21 &22, 2003
  - 40 MH

Example of Vacuum Chambers Results

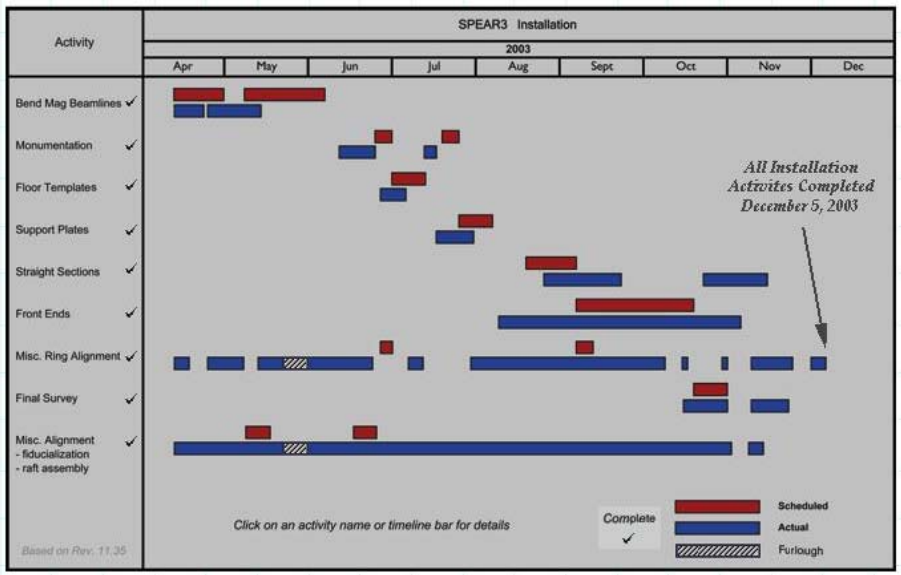
	DZ (inch)	DX (inch)	DY (inch)	Adjustment	Ave Z (in)
SC04CM11	0.019	-0.009	0.005	X & Y	0.034
SC04CM12	0.019	-0.008	0.002	X & Y	
SC04CM13	0.037	-0.009	0.010	Y Only	
SC04CM15	0.047	-0.007	-0.004	X & Y	
SC04CM16	0.047	-0.007	-0.004	X & Y	
SC04CMC1	0.000	-0.007	0.002	X & Y	-0.001
SC04CMC2	-0.008	-0.005	0.001	X & Y	
SC04CMC3	0.003	0.000	-0.004	X & Y	
SC04CMC4	0.001	0.000	0.002	X & Y	
SC04CM21	-0.053	0.011	0.002	X & Y	-0.044
SC04CM22	-0.060	0.013	0.002	X & Y	
SC04CM24	-0.040	0.008	0.000	Y Only	
SC04CM25	-0.036	0.005	0.005	Y Only	
SC04CM29	-0.035	0.006	-0.003	X & Y	
SC04CM20	-0.037	0.007	0.003	X & Y	

http://www-group.slac.stanford.edu/met/Align/Spear3/Spear3.html

Alignment Engineering Group — Metrology

SPEAR3 Installation Activities (2003)

(Click on Activity Name or Timeline Bar for Details)



SPEAR3 General Notes | Fiducialization Results | Raft Assembly Results

Chamber Results 11-2003 | Magnet Results 11-2003 | Summer 2004 Downtime

For technical results, check for the link on the Alignment Engineering Group home page or click here.

Conclusion

- The 2003 Final Alignment Campaign was complete:
  - The SPEAR3 monuments were adjusted and used.
  - All magnets and vacuum chambers were measured: the coordinates of TBs are archived.
- The 2004 Summer/Fall Downtime should solve the following questions:
  - Are the SPEAR3 monuments stable?
  - In light of the latest run, are there any ring components that could use new measurements?

Ring Floor Height Changes in meters
from November 2003 to August 2004
based on level only