Configuration Management

CM focuses on **controlling outcomes**.

CM controls **change**, making sure that its impact is assessed and that every effort is made to prevent erosion of functionality or safety.

Applies to any complex system, but we will concentrate today on Tevatron magnet alignment and stability.

Organization

Update on events since the last talk:

a. MAD profile for Tev,

b. condition of magnets stands,

c. added elevation data,

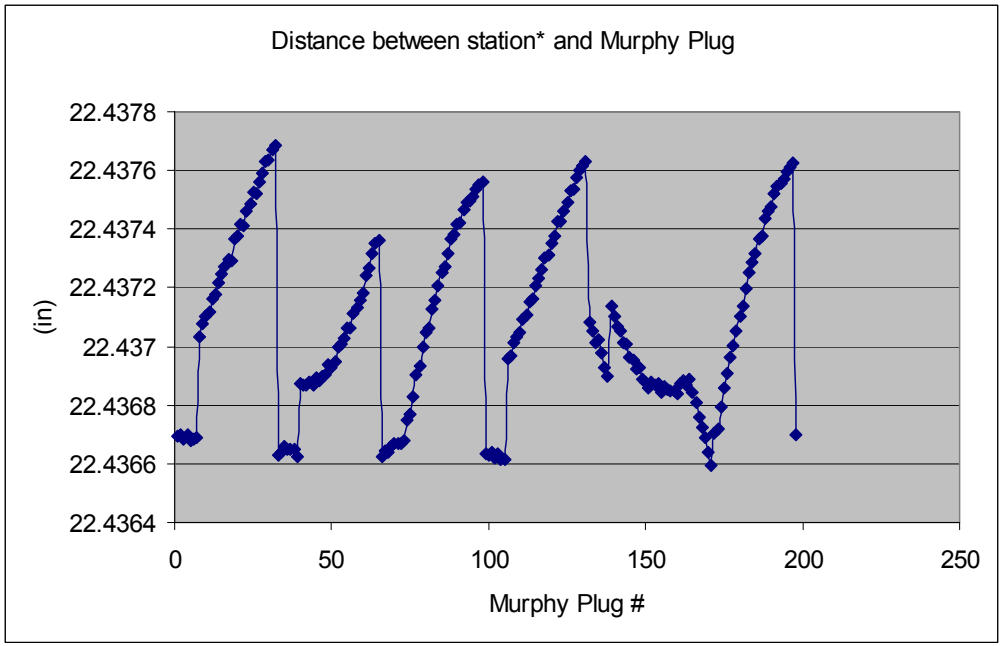
d. roll data - comparison with survey,

e. condition of Tev based on alignment

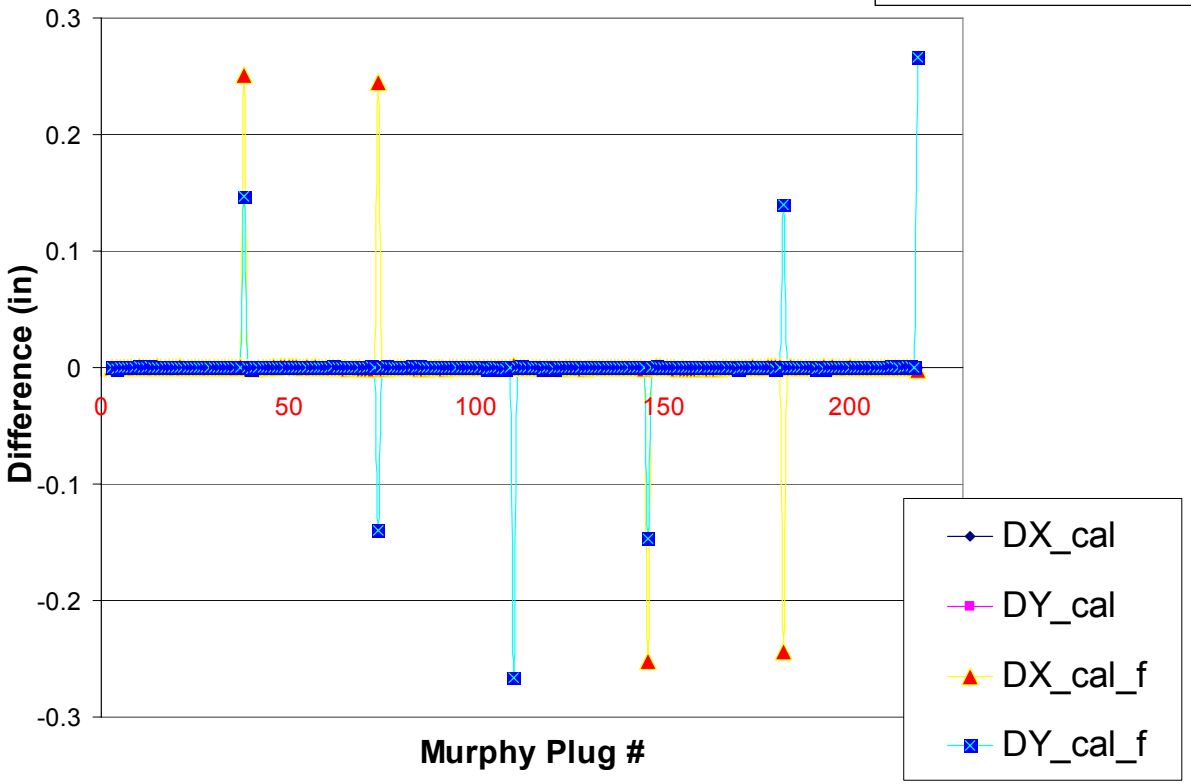
What do we do next!

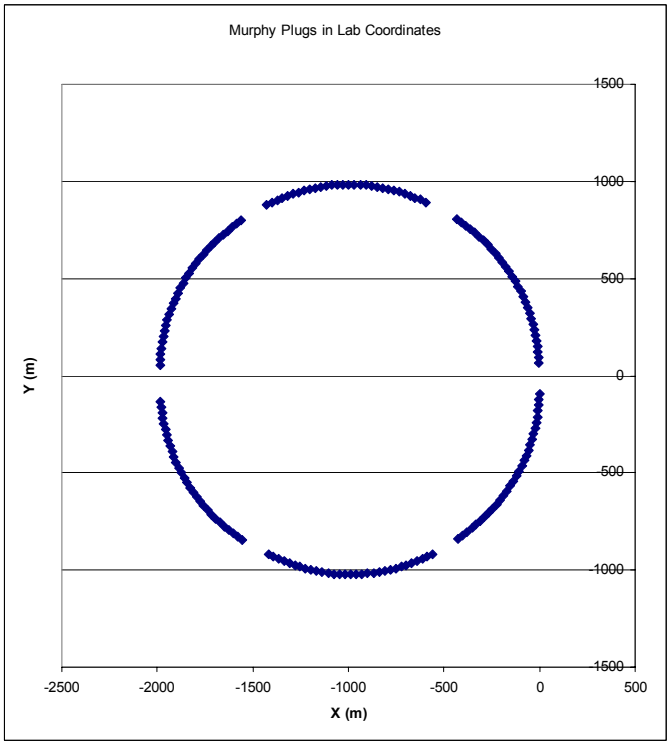
Computer works

The Murphy-line differs from the “ideal.”
At each station, the difference is about 10 mils.
The accumulated beam-offset after one sector is >250 mils.
We might take this seriously, if we knew where the Murphy-line was.



Configuration of Tevatron





- **Dipole correctors - 110 V, 112 H**
  1. at the beginning of the store, just before first p injection - new case that lasts a long time
  2. scalars - 2 tables of numbers
     a. energy(10) - all 222 devices- (ramp)
     b. squeeze(23) - ~50 subset of 222 devices
- **Tunes - quad circuits**
  1. QH = 13 devices, QV = 13 devices
     a .can be modified "on the fly" so want to record actual settings,
     b. record 26 devices at every case/set
        I. FTP - inject protons, inject pbars, acceleration, squeeze
        II. scalar - all other cases/sets
- **Coupling - skew quads 6 devices**
  1. FTP - acceleration, squeeze
  2. scalar - all other cases/sets
- **Chromoticity - sextapoles 2 devices**
  1. FTP - accleration, squeeze
  2. scalars - all other cases/sets
- **Separators 12 devices**
  1. FTP - acceleration, squeeze
  2. scalars - all other cases/sets
- **Feeddowns 30 devices (form 8 settings)**
  1. FTP - accleration, squeeze
  2. scalars - all other cases/sets
- **kickers - ?**

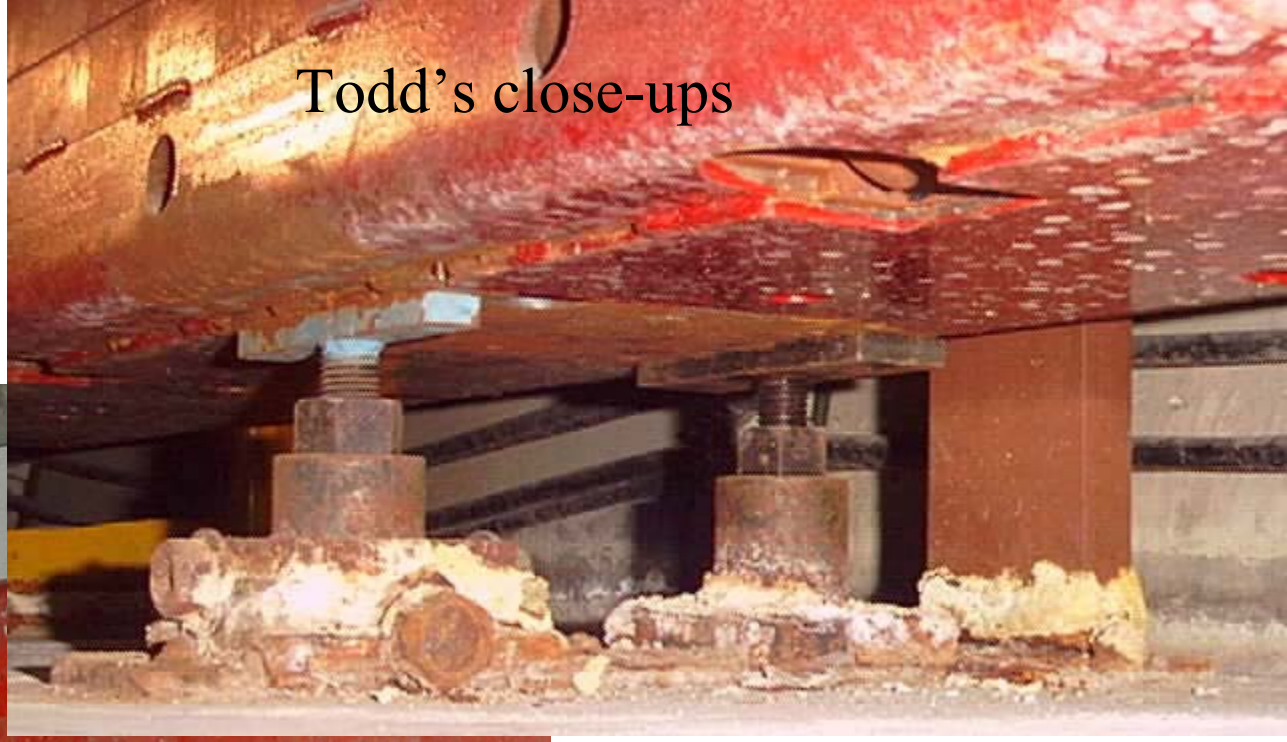
Things to record in SDA for defining state of the Tev

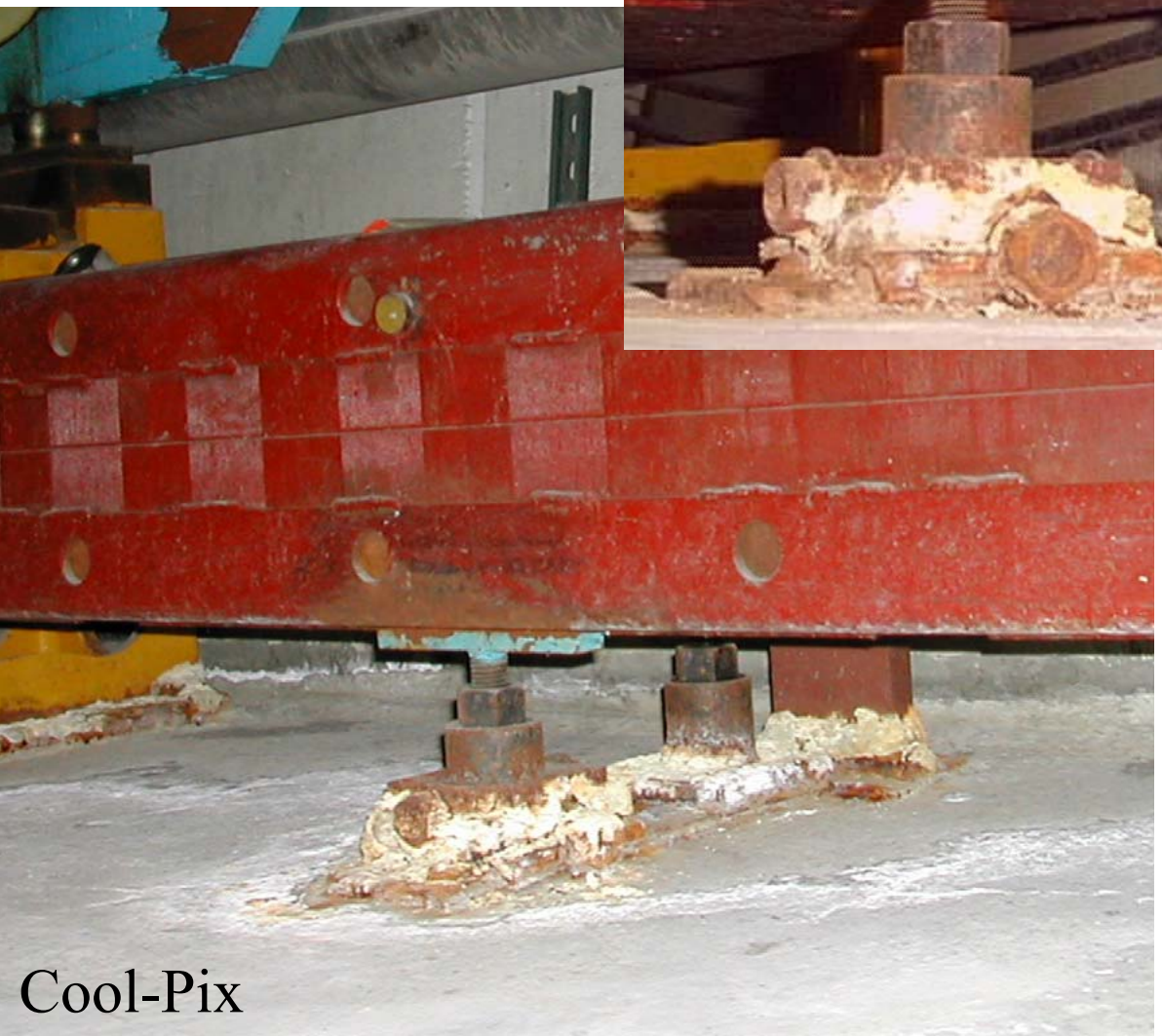
This requires close work with survey group.

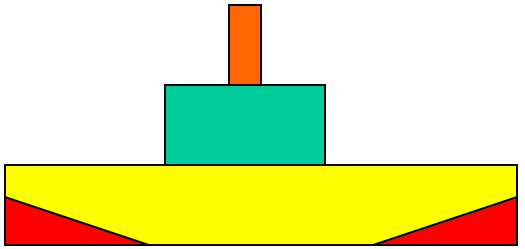
Capture TeV magnet DB, and combine with survey DB.

Photos
A16-3

Before stand replacement.

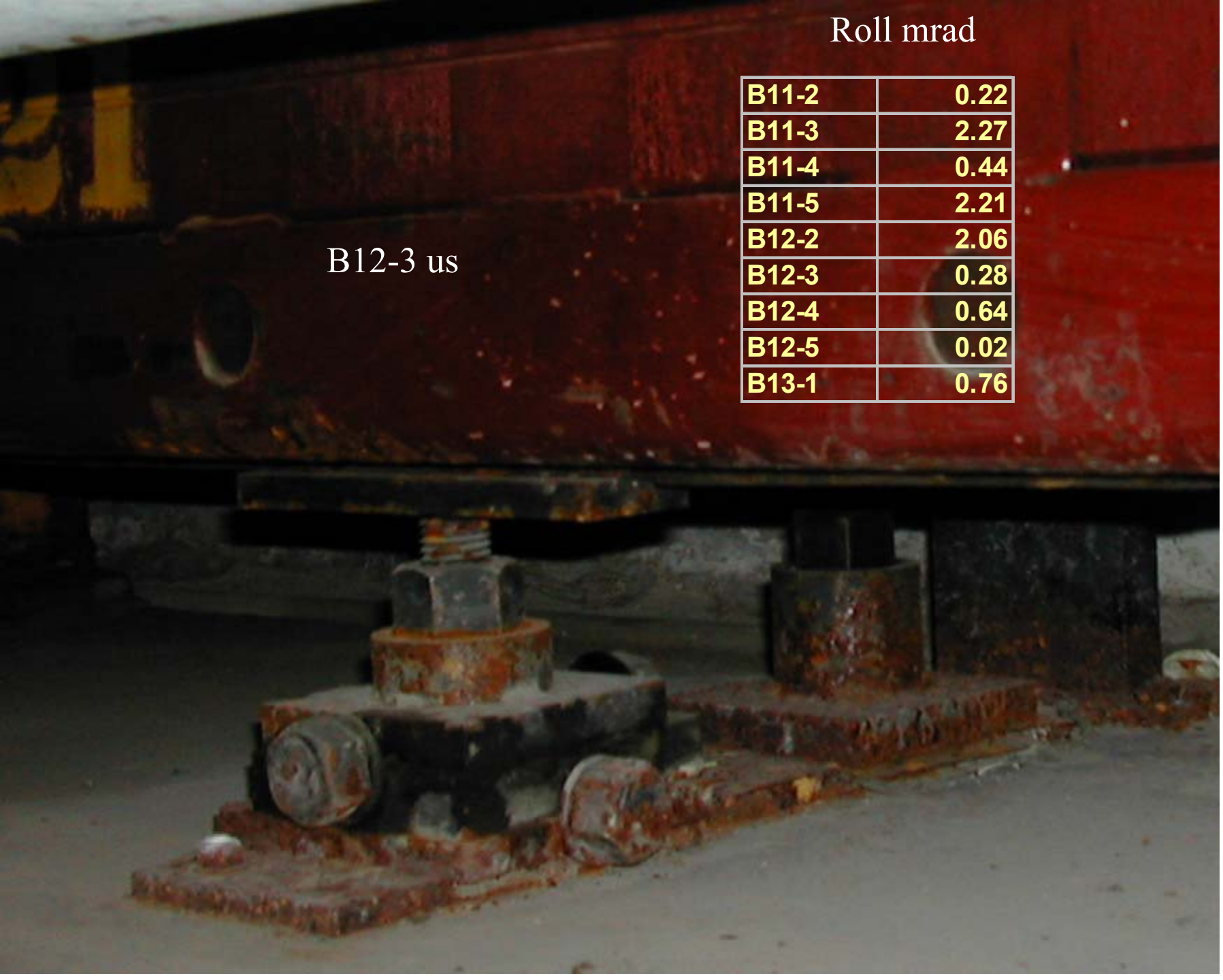






Rust has degraded the corners of the plate beneath the stand.

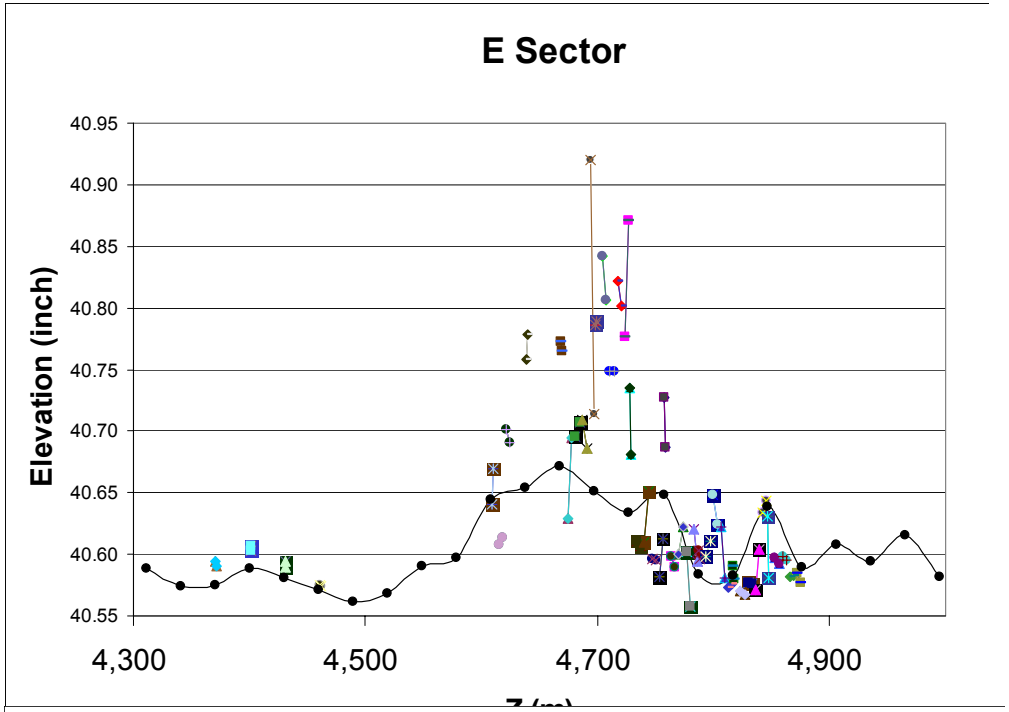
The stand looked fairly good, all considered. The concrete was in good shape, and the screw jack was functional. The base plate was the weak link.

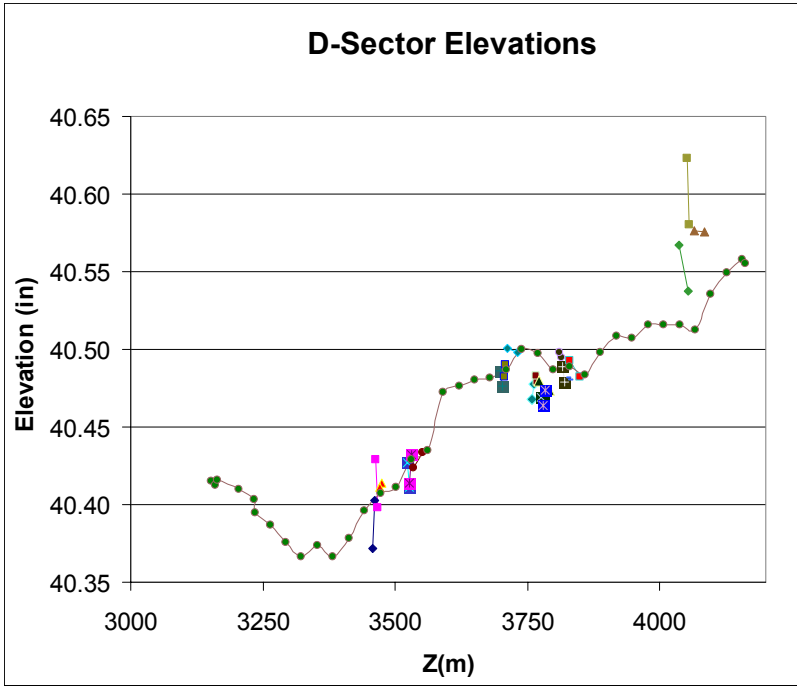


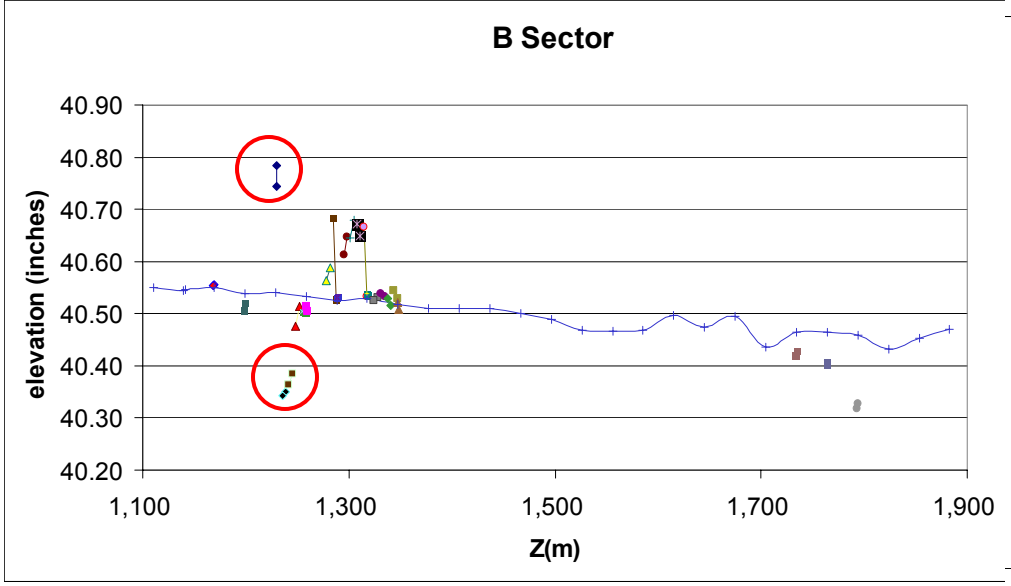
Roll mrad

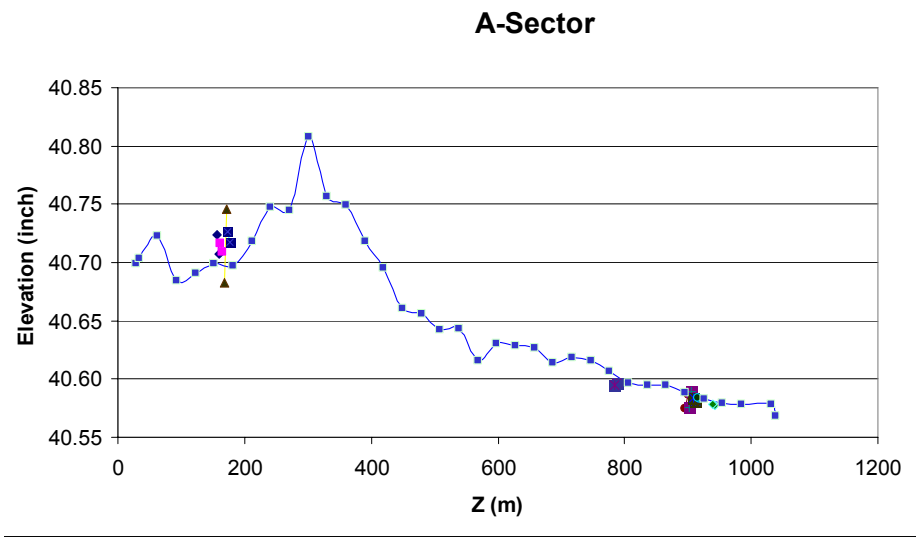
B11-2	0.22
B11-3	2.27
B11-4	0.44
B11-5	2.21
B12-2	2.06
B12-3	0.28
B12-4	0.64
B12-5	0.02
B13-1	0.76


B12-2 ds



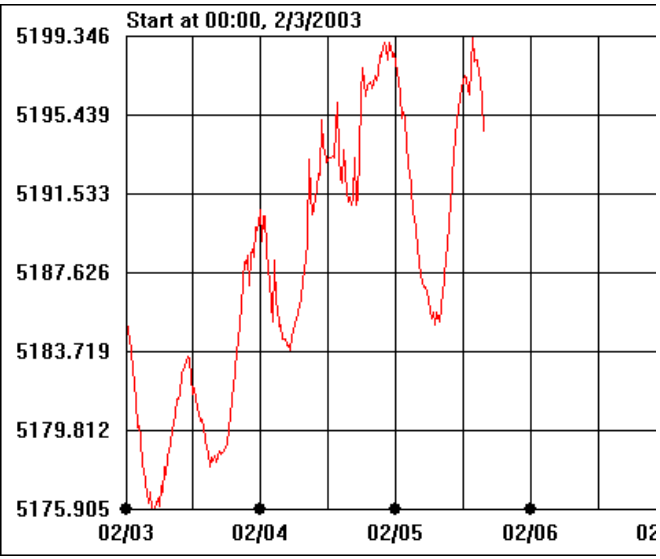


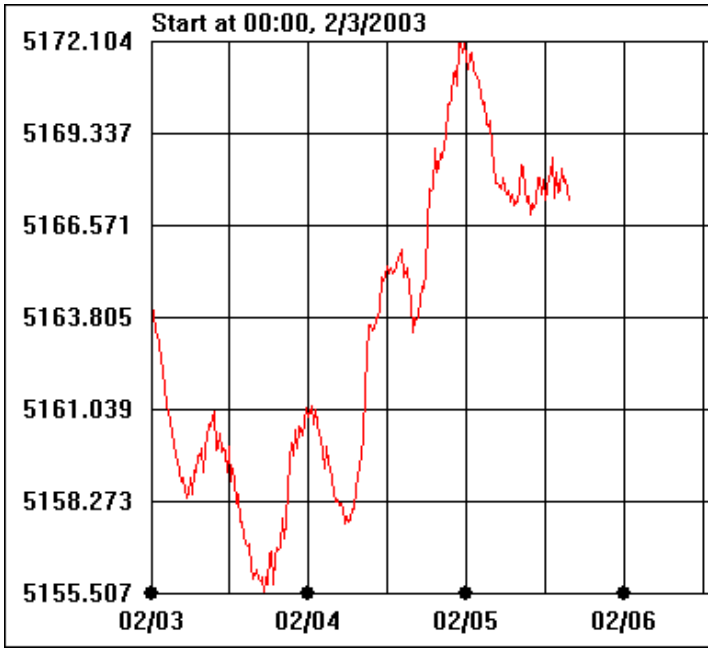


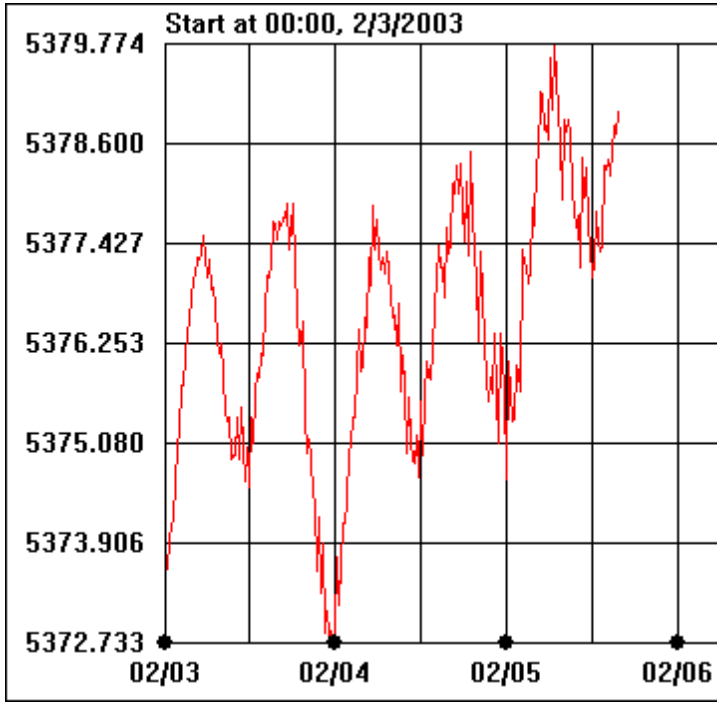


The Tevatron now has a vertical network, tied to the Lab coordinates.

Level Meters in the Tev

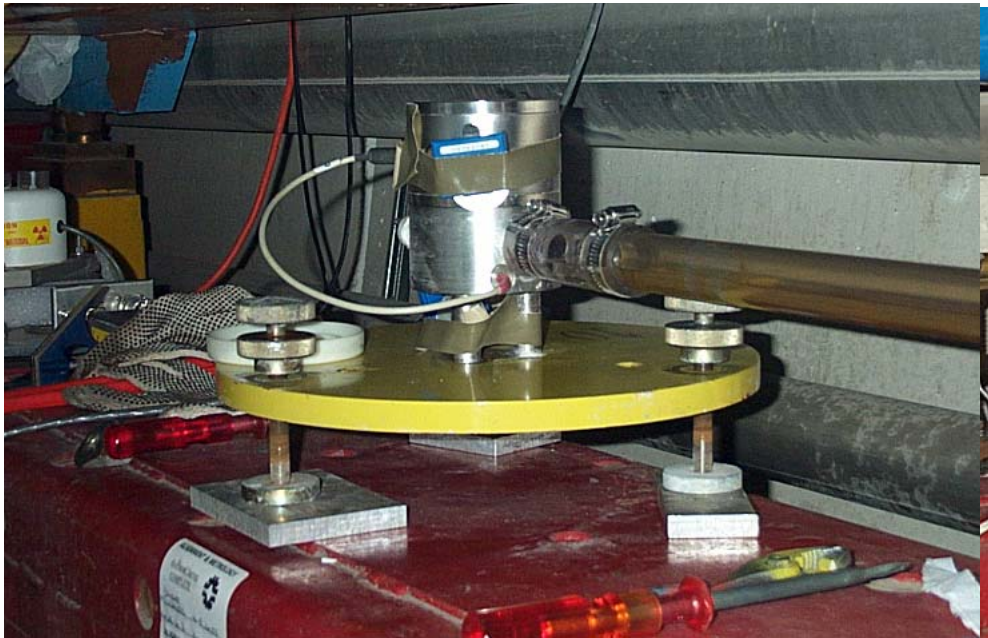


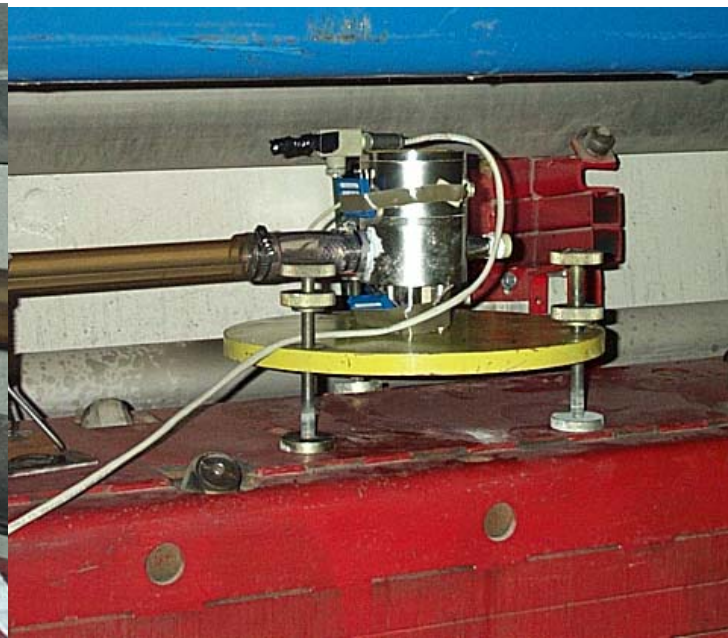




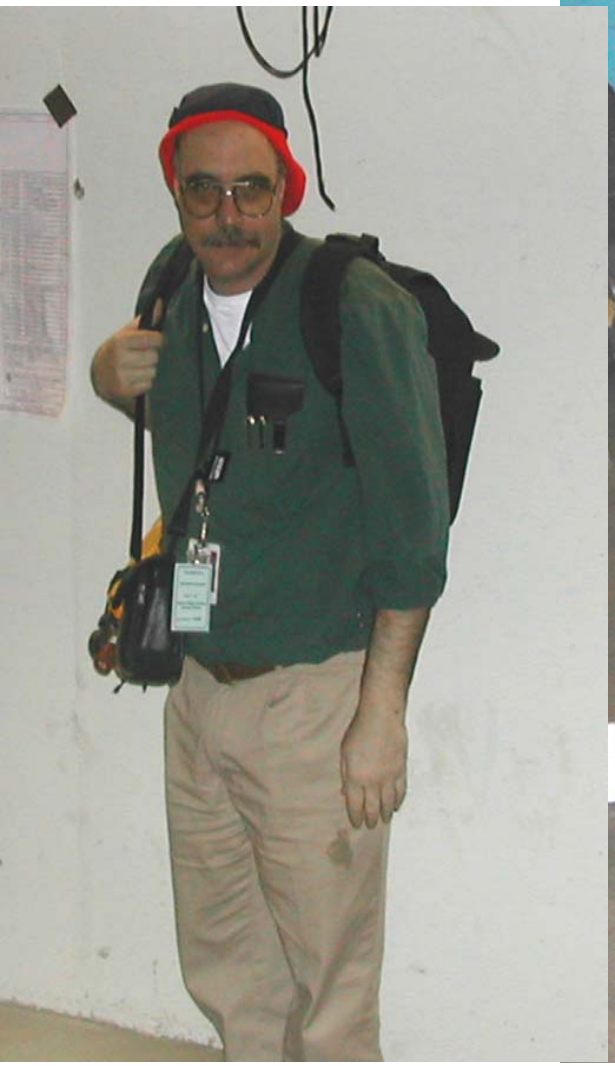
Duane Plant,
Todd Johnson,
Jim Volk,
Andrey Chupyra.

Continuous relative elevation monitor.

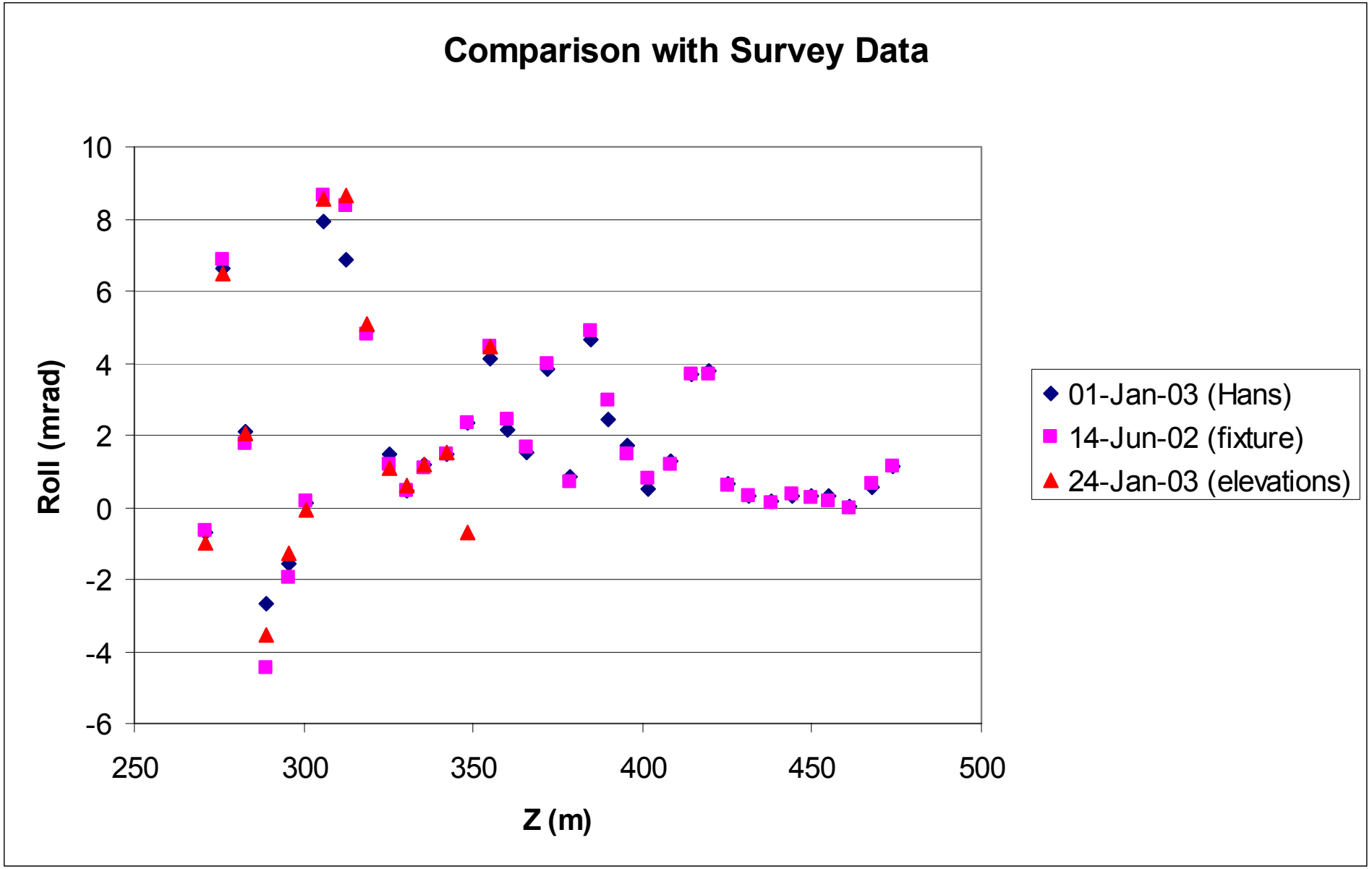




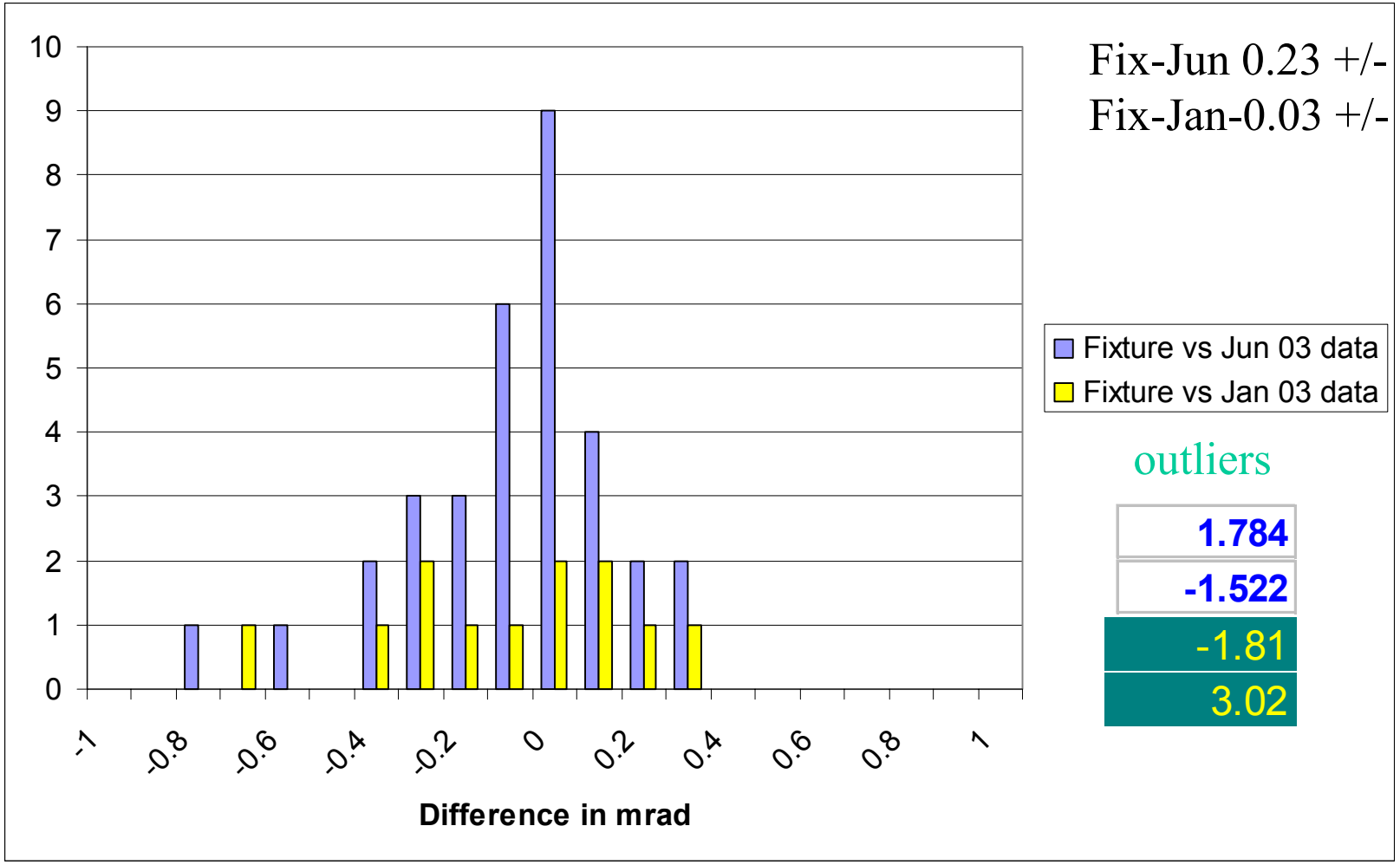
Roll Fixture



953 more to go!


Comparison with Survey Data
Roll (mrad)
10
8
6
4
2
0
-2
-4
-6
250
300
350
400
450
500
Z (m)
01-Jan-03 (Hans)
14-Jun-02 (fixture)
24-Jan-03 (elevations)

A19 to A 26



Fix-Jun 0.23 +/- 0.13

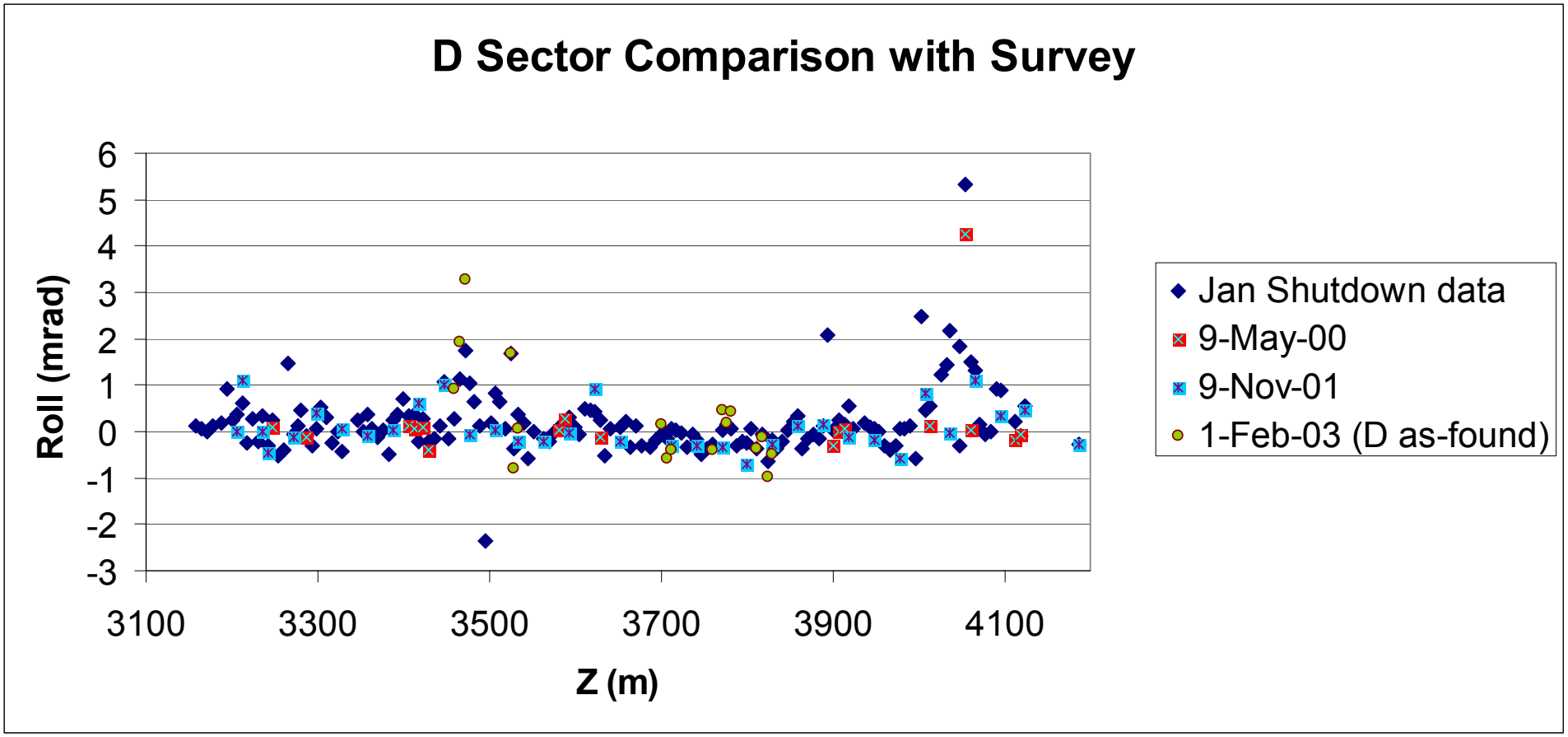
Fix-Jan-0.03 +/- 0.21

outliers

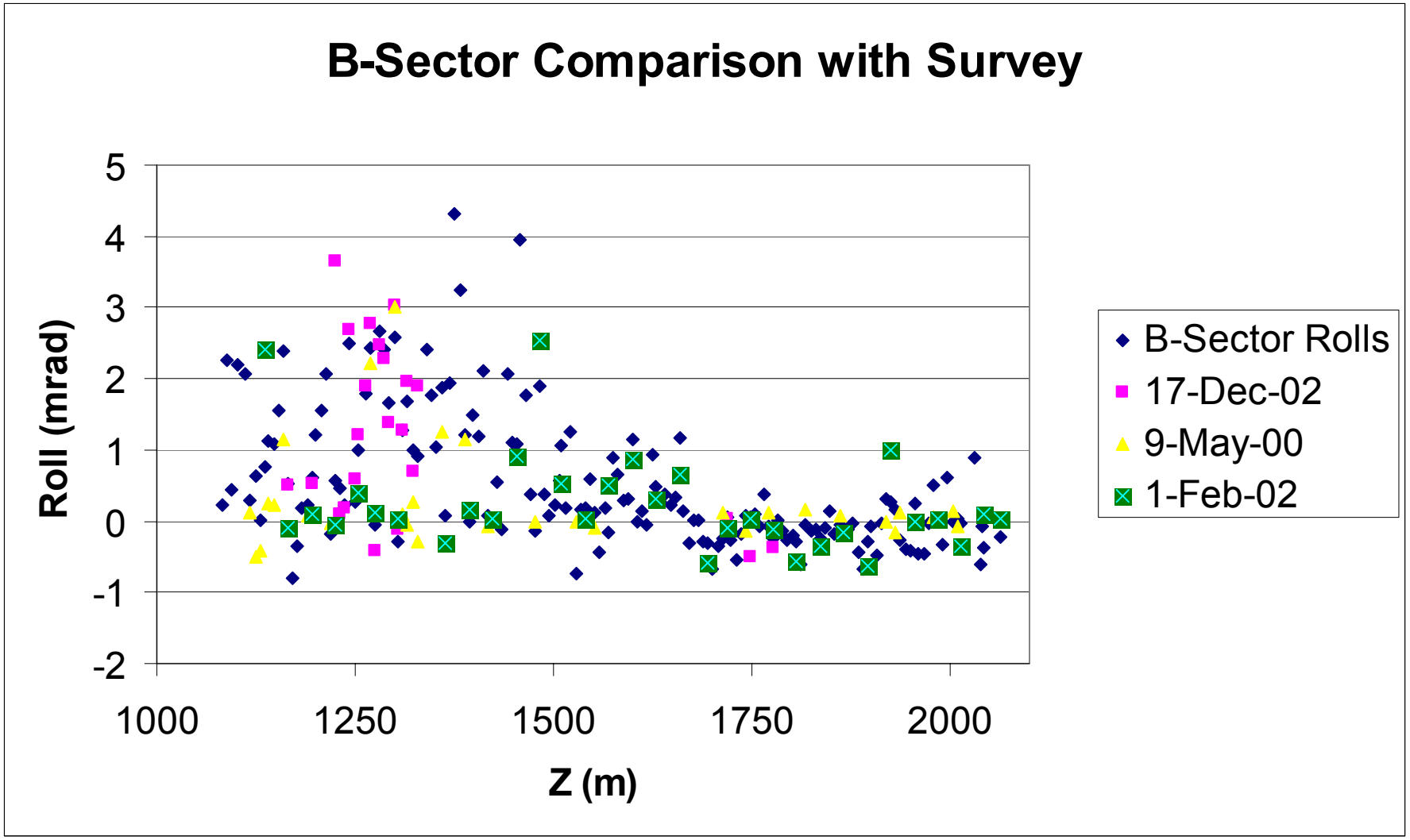
1.784
-1.522
-1.81
3.02

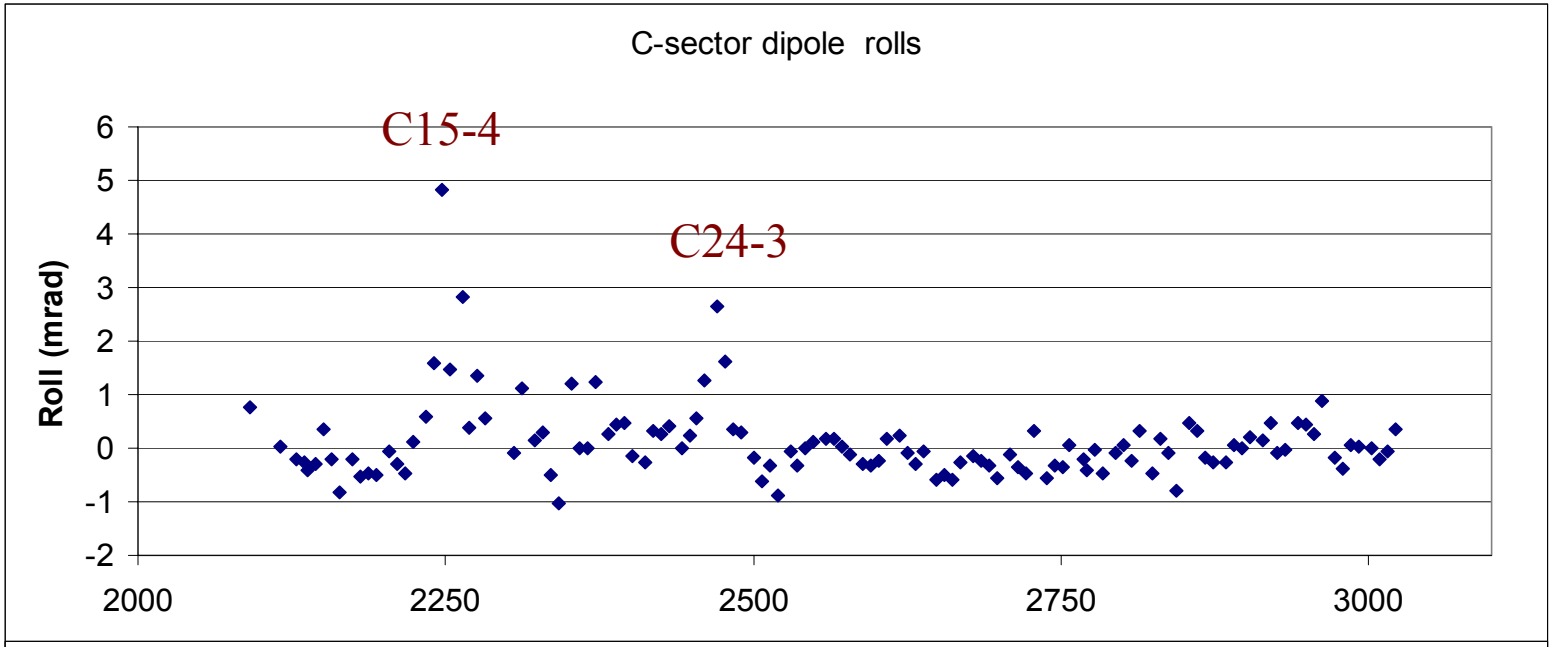
D-Sector Rolls/Comparison w Survey

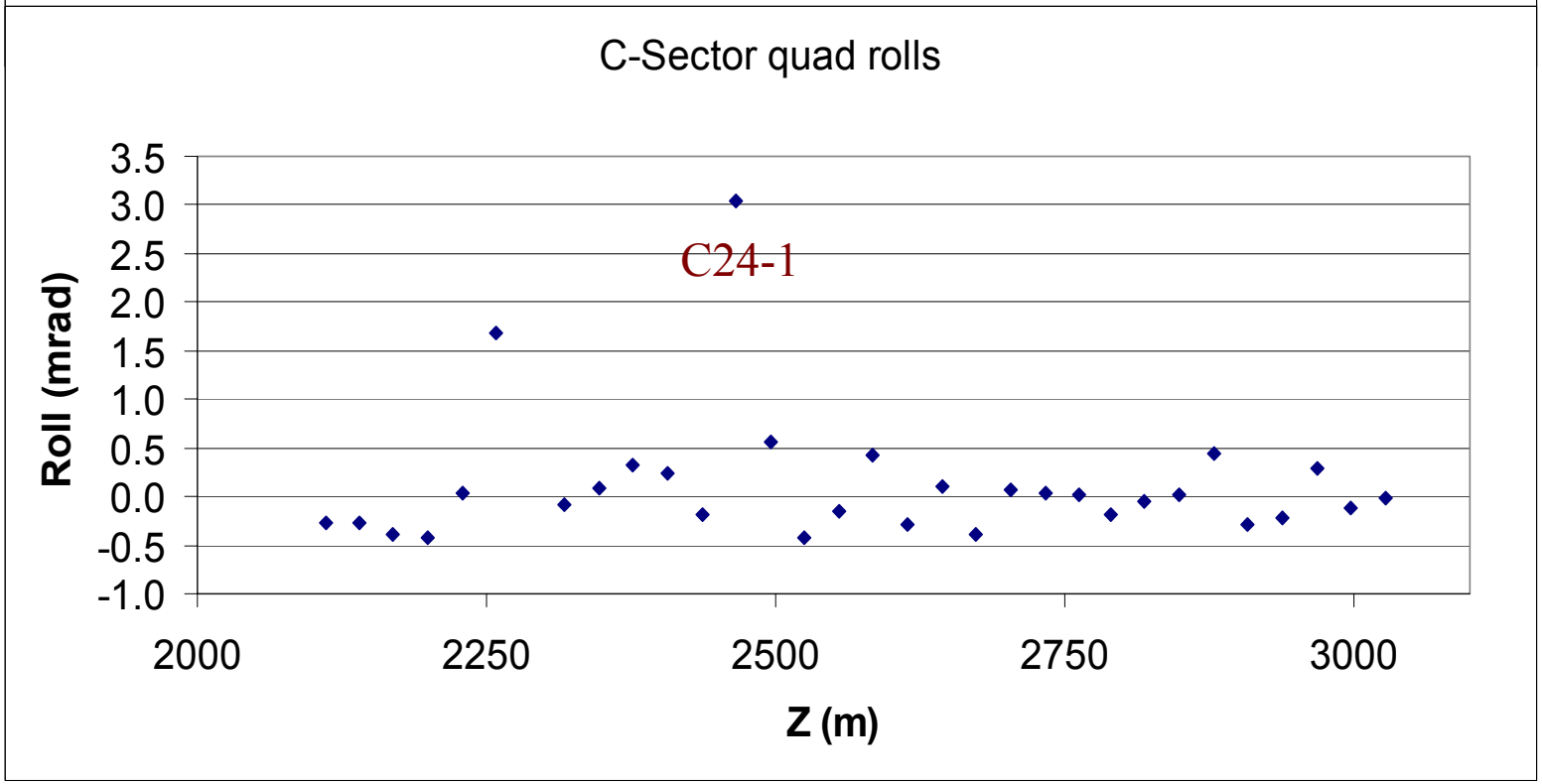
Δ2000 = -0.32 +/- 0.12mrad
Δ2001 = -0.23 +/- 0.10mrad
Δ2003 = 0.09 +/- 0.13 mrad



Δ2000 = -0.32 +/- 0.11mrad
ΔFeb = -0.03 +/- 0.08 mrad
ΔDec = 0.16 +/- 0.15mrad

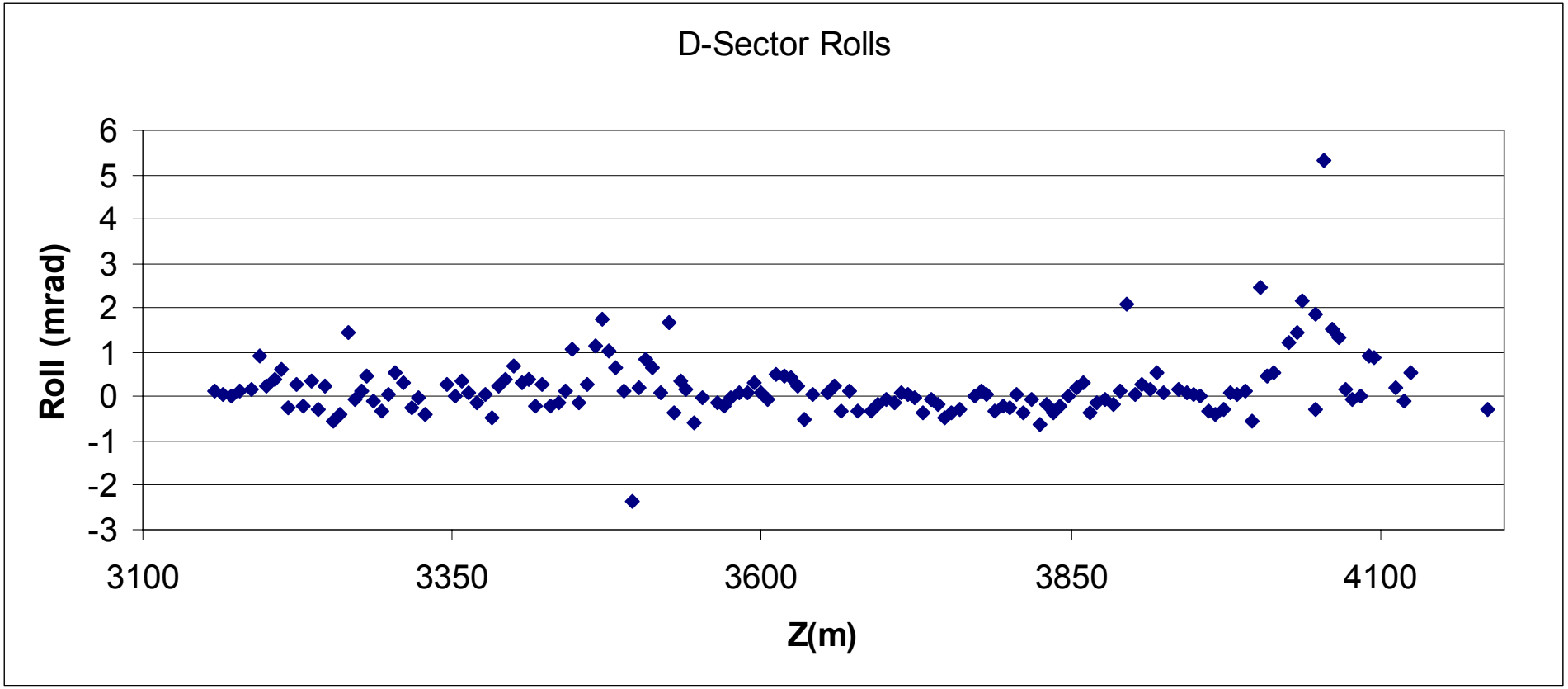




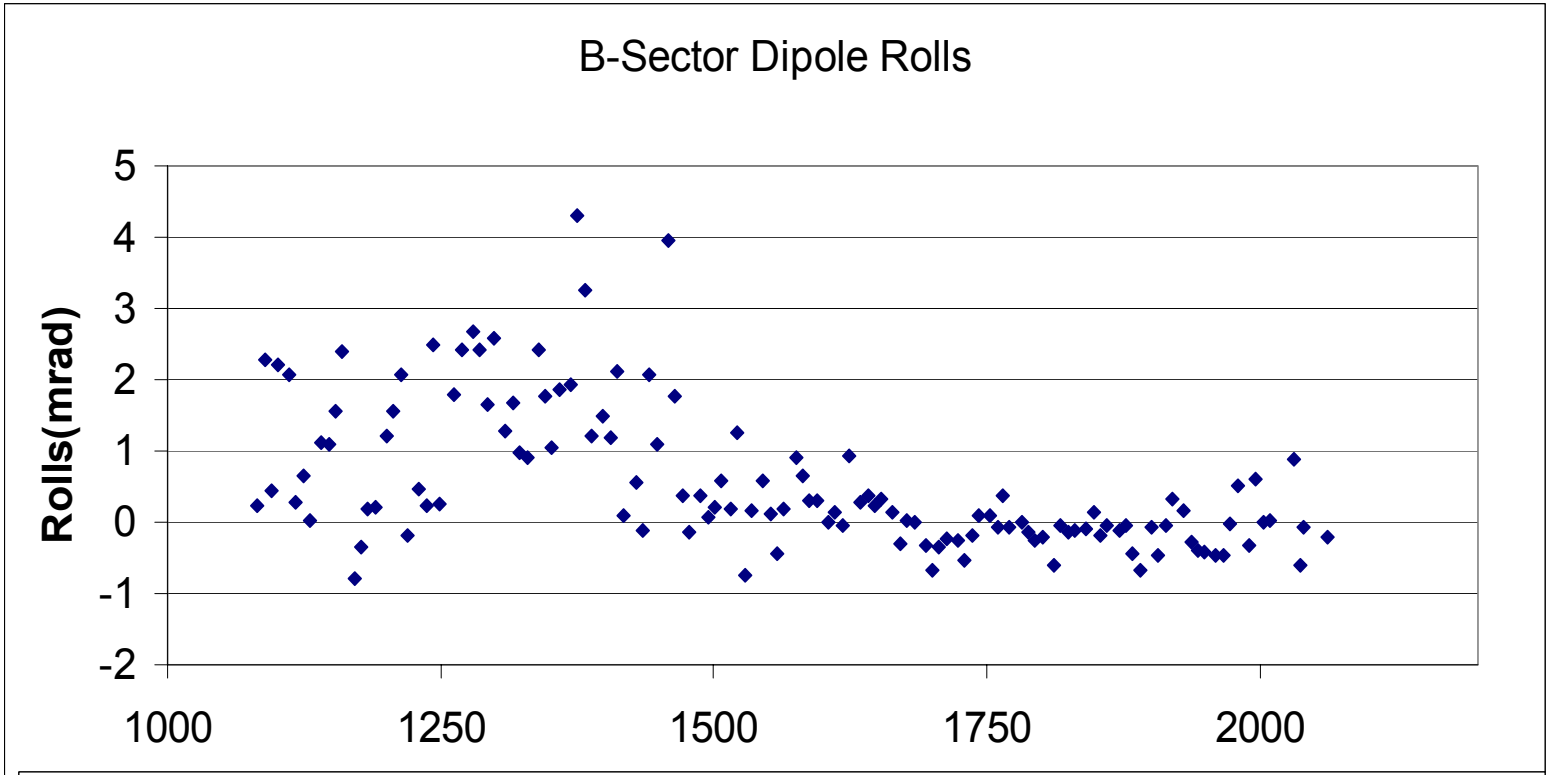


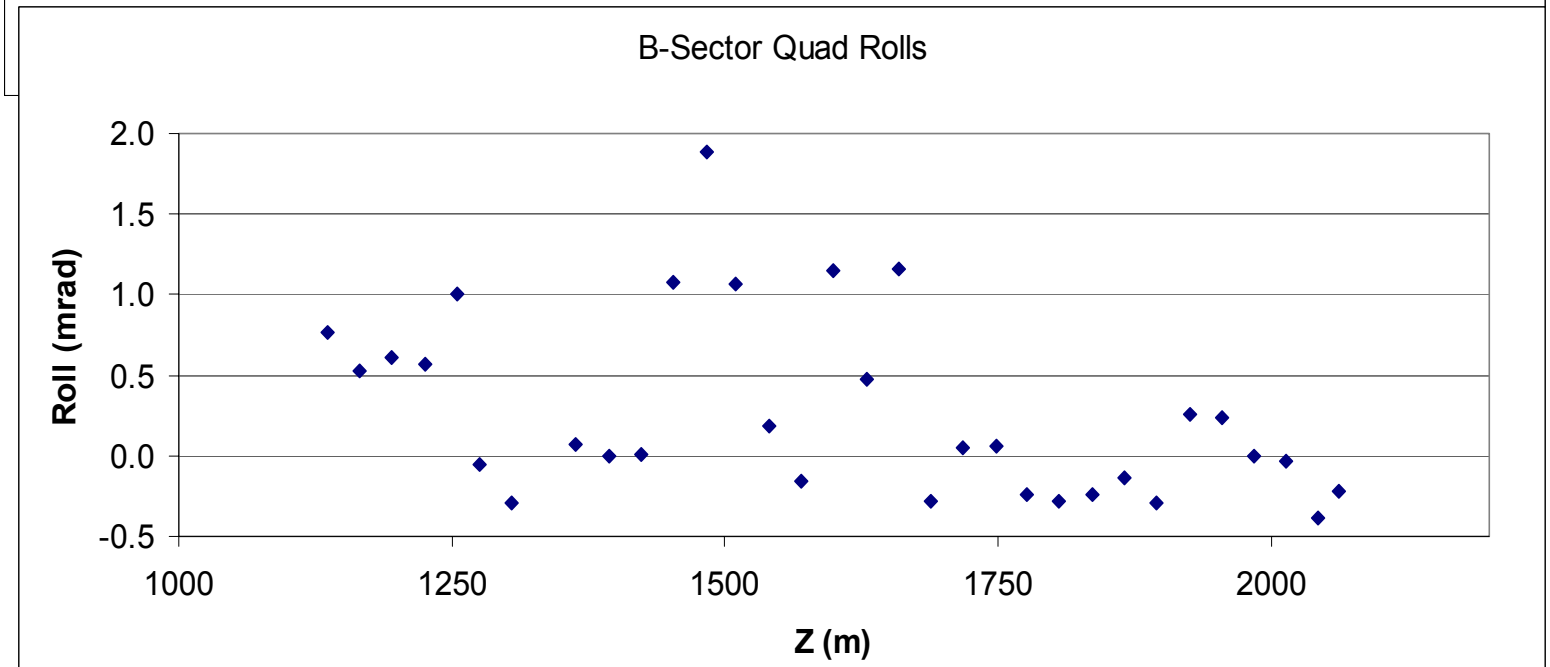
C-sector rolls

D-Sector Rolls



B-Sector Rolls





Quads with Large Rolls

				9-Nov	14-Jun	19-Nov
				2001	2002	2002
		Hans	Shim	survey	survey	
		Fxtre	mils	pilation	2003	
	A15-1	4.18	60	1.28		4.19
	A16-1	2.75	0	2.75		
	A23-1	2.16	0	4.12	2.41	
	A24-1	2.44	0	3.62	2.98	
	A25-1	3.80	60	2.53	3.68	
	C24-1	3.04				
	D46-1	2.17	0	-0.03	none	
	E32-1	2.97	0	4.91	none	
	E39-1	2.56	0	4.06	none	
	E43-1	2.59	0	2.09	none	
	Many of the Yr 2000 results were corrected. Corrected data will be					
	The acceptable limit is 3.0 mrad.					

Pockets of Interest

A15-1	4.176279	
A15-4	5.689188	
A18-3	4.100939	
A19-2	6.638064	
A21-2	7.931061	
A21-3	6.858994	
A214	4.875719	
A22-5	4.131482	
A23-3	3.835213	
A23-5	4.634428	
A24-5	3.668243	
A25-1	3.803651	
B22-3	4.311687	3 SHIM RI
B22-4	3.249801	3 SHIM RI
B25-2	3.957386	3 SHIM RI
C15-4	4.827868	3 SHIM RI
C24-1	3.04007	3 SHIM RI
D46-4	5.31656	REPEAT WITH 1/8 INCH S

Sector	Roll Angle > N mrad							Number o Magnets Measured in sector.
	>1	>2	>3	>4	>5	>6	>7	
A	42	24	12	9	4	3	1	163
B	41	16	3	1				161
C	14	4	2	1				154
D	16	5	1	1	1			156
E	47	18						163
F	6							156
Total > N	166	67	18	12	5	3	1	953

17.4% have rolls > 1 mrad.

Distribution of larger rolls in the Tevatron.

Sector	Roll Angle > N mrad							No. of Magnets Measured in sector.
	>1	>2	>3	>4	>5	>6	>7	
A	25.3%	35.8%	66.7%	75.0%	80.0%	100.0%	100.0%	163
B	24.7%	23.9%	16.7%	8.3%				161
C	8.4%	6.0%	11.1%	8.3%				154
D	9.6%	7.5%	5.6%	8.3%	20.0%			156
E	28.3%	26.9%	0.0%	0.0%				163
F	3.6%	0.0%	0.0%	0.0%				156
	17.4%	7.0%	1.9%	1.3%	0.5%	0.3%	0.1%	1
	166	67	18	12	5	3	1	953

Have the Tev magnet coils moved in the ensuing years?

We measure significant differences in roll between
the us and ds ends of many magnets. The alignment
lugs were originally set to account for any magnet twist:
Both ends of the magnet should have the same roll.
Twist may be induced by 4-point stands.

There are several things we can do:

a. Measure smart bolt settings (will be done tomorrow
on a select set of magnets in the tunnel).

b. Use the Kaiser coil to check for magnet coil alignment.

c. There are about 24 magnets in storage that could be
put on a stand and checked.

What do we do now??

1. Develop a plan to install a laser tracker network into MR tunnel.
2. Develop a more expedient way to measure rolls, pitch and off-sets.
3. Develop software tools needed to manage and analyze TeV survey.