Beams-doc-1535-v1
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Turn by Turn Measurements with the Tevatron BPM Production Electronics

Rob Kutschke, CD/EXP

Abstract

This document shows the same sorts of information as Beams-doc-1500. But the figures were made using data taken on January 19, 2005 in the mid-afternoohn, after some updates to the driver software.

1 Quick Comments

This document will be updated with a more complete text. For now the following comments will have to do. There are lots of things about this data which I do not yet understand. I don't think that we see either synchrotron or betatron oscillations. I do think that we might be seeing the stuff at 10 to 15 Hz which Vahid has talked about.

- The data was taken during an HEP store, 36 on 36 at 2 TeV.
- The problem with outliers every 13 or 14 points is gone.
- There are 8192 data points for each of VA33 and HA32.
- The Fourier transforms are shown in 8192 bins between 0 and half of the Tevatron rotation frequency.
- The resolution is much poorer and the sum signal is much smaller than in Beams-doc-1500. Because sum signal is so different I guess that the echotek programming is different.
- The resolution is around 50 or 60 microns, compared to 6 microns before. There is structure in the position that I don't yet understand. This structure will be shown in the next iteration of this document.
- You can see some sort of long wavelength oscillation in the time series of the H data but not in the V data.
- There are two strong, narrow lines in both the H and the V data.
- The lines are at 9542.5 Hz and 19085 Hz. I think that the lineshape is resolution limited - I will show a figure in the next iteration.
- The H and V lines are at the same frequency to within 1 Hz or so.

- The fits to the time series data don't really converge properly.
- There is power in the H data around 10 to 15 Hz which is not present in the V data.

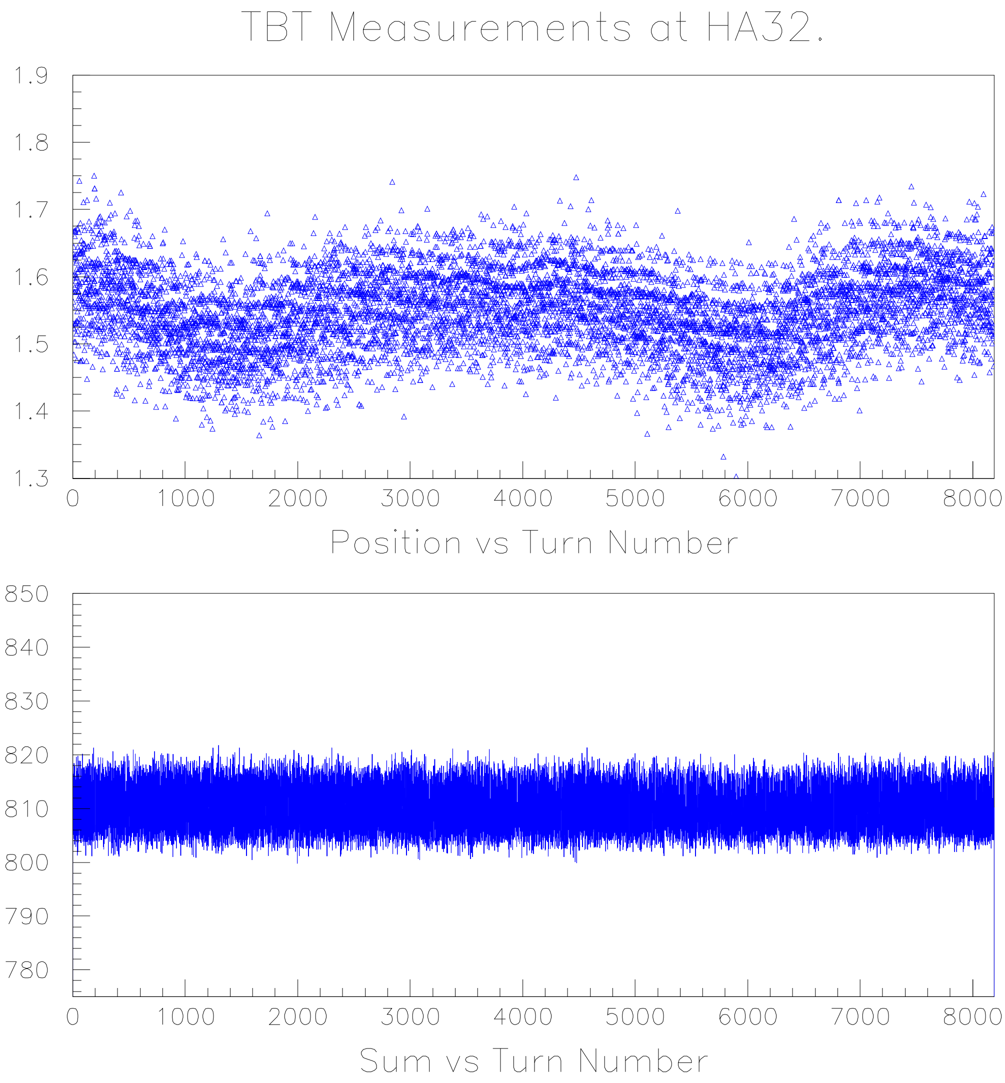
TBT Measurements at HA32.
1.9
1.8
1.7
1.6
1.5
1.4
1.3
0
1000
2000
3000
4000
5000
6000
7000
8000
Position vs Turn Number
850
840
830
820
810
800
790
780
0
1000
2000
3000
4000
5000
6000
7000
8000
Sum vs Turn Number

Figure 1: cc

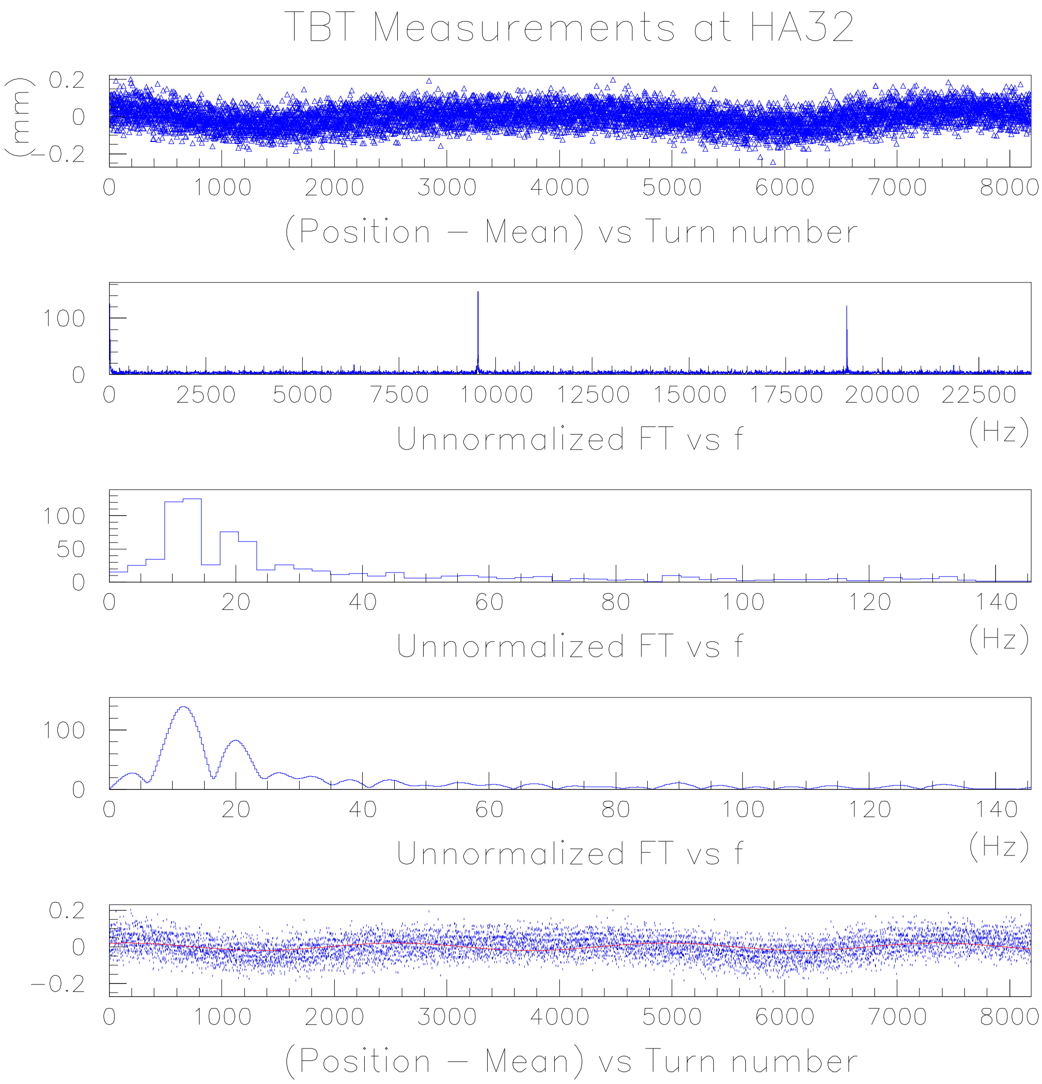
TBT Measurements at HA32
(mm)
0.2
0
−0.2
0
1000
2000
3000
4000
5000
6000
7000
8000
(Position − Mean) vs Turn number
100
0
0
2500
5000
7500
10000
12500
15000
17500
20000
22500
Unnormalized FT vs f
(Hz)
100
50
0
0
20
40
60
80
100
120
140
Unnormalized FT vs f
(Hz)
100
0
0
20
40
60
80
100
120
140
Unnormalized FT vs f
(Hz)
0.2
0
−0.2
0
1000
2000
3000
4000
5000
6000
7000
8000
(Position − Mean) vs Turn number

Figure 2: cc

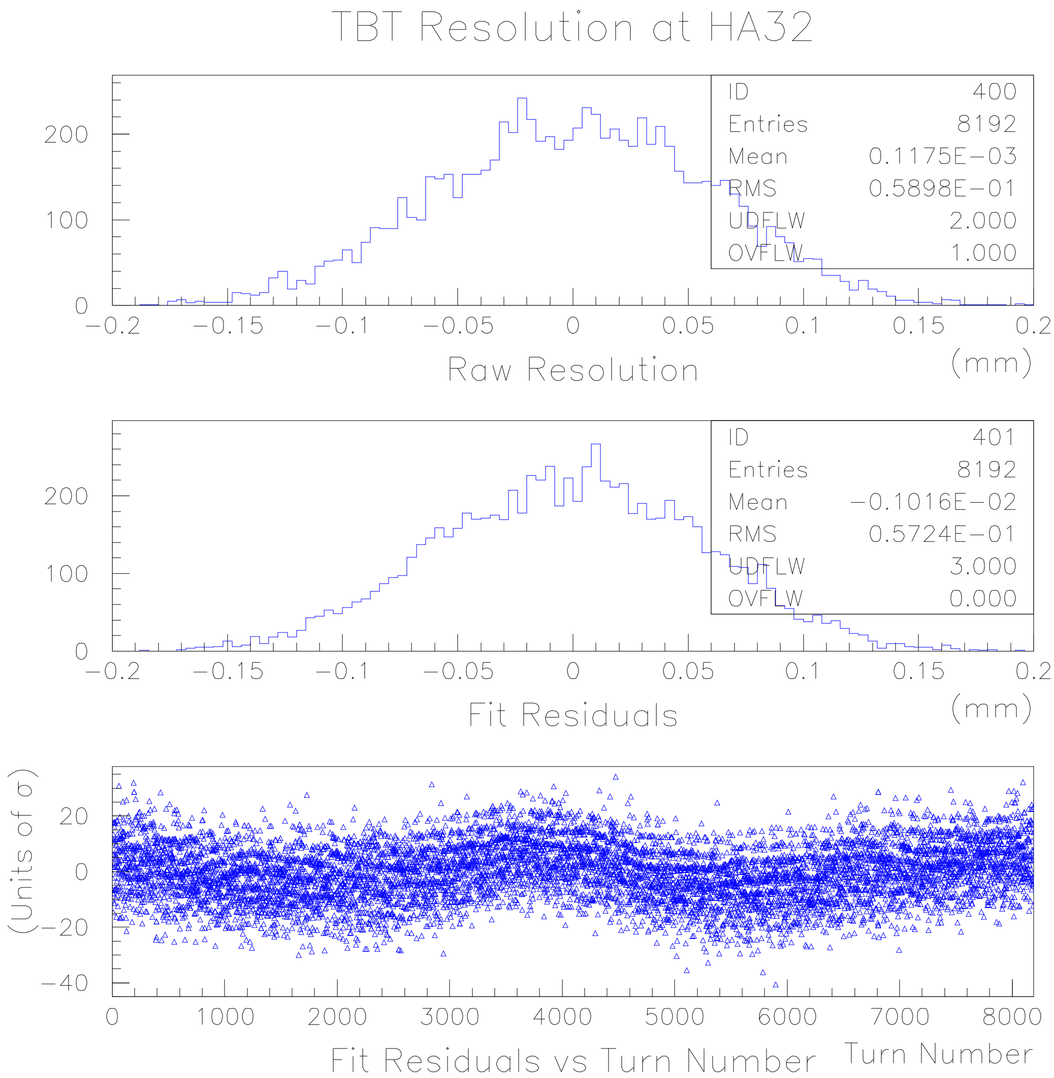
TBT Resolution at HA32
ID 400
Entries 8192
Mean 0.1175E−03
RMS 0.5898E−01
UDFLW 2.000
OVFLW 1.000
Raw Resolution
(mm)
ID 401
Entries 8192
Mean −0.1016E−02
RMS 0.5724E−01
UDFLW 3.000
OVFLW 0.000
Fit Residuals
(mm)
(Units of σ)
Fit Residuals vs Turn Number
Turn Number

Figure 3: cc

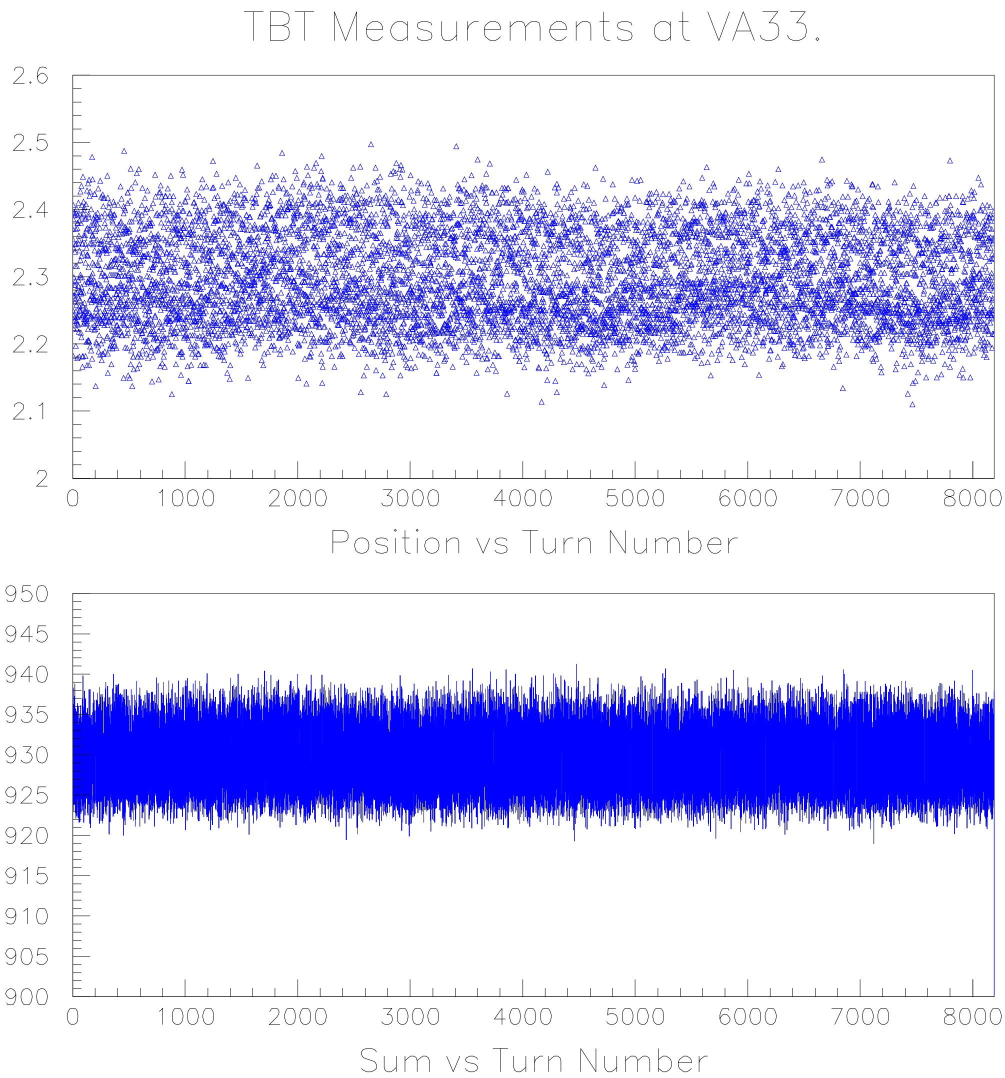
TBT Measurements at VA33.
2.6
2.5
2.4
2.3
2.2
2.1
2
0
1000
2000
3000
4000
5000
6000
7000
8000
Position vs Turn Number
950
945
940
935
930
925
920
915
910
905
900
0
1000
2000
3000
4000
5000
6000
7000
8000
Sum vs Turn Number

Figure 4: cc

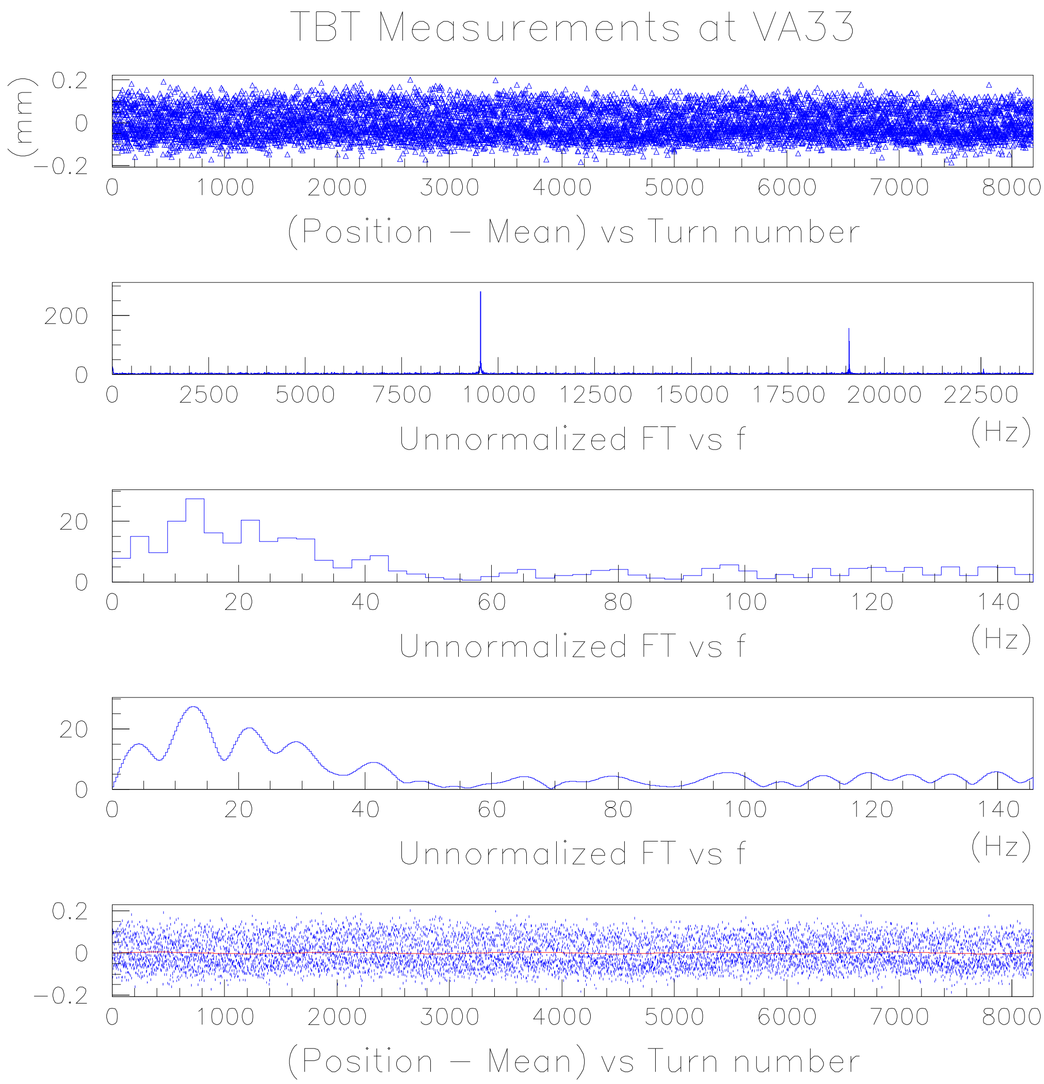
TBT Measurements at VA33
(mm)
0.2
0
−0.2
0
1000
2000
3000
4000
5000
6000
7000
8000
(Position − Mean) vs Turn number
200
0
0
2500
5000
7500
10000
12500
15000
17500
20000
22500
Unnormalized FT vs f
(Hz)
20
0
0
20
40
60
80
100
120
140
Unnormalized FT vs f
(Hz)
20
0
0
20
40
60
80
100
120
140
Unnormalized FT vs f
(Hz)
0.2
0
−0.2
0
1000
2000
3000
4000
5000
6000
7000
8000
(Position − Mean) vs Turn number

Figure 5: cc

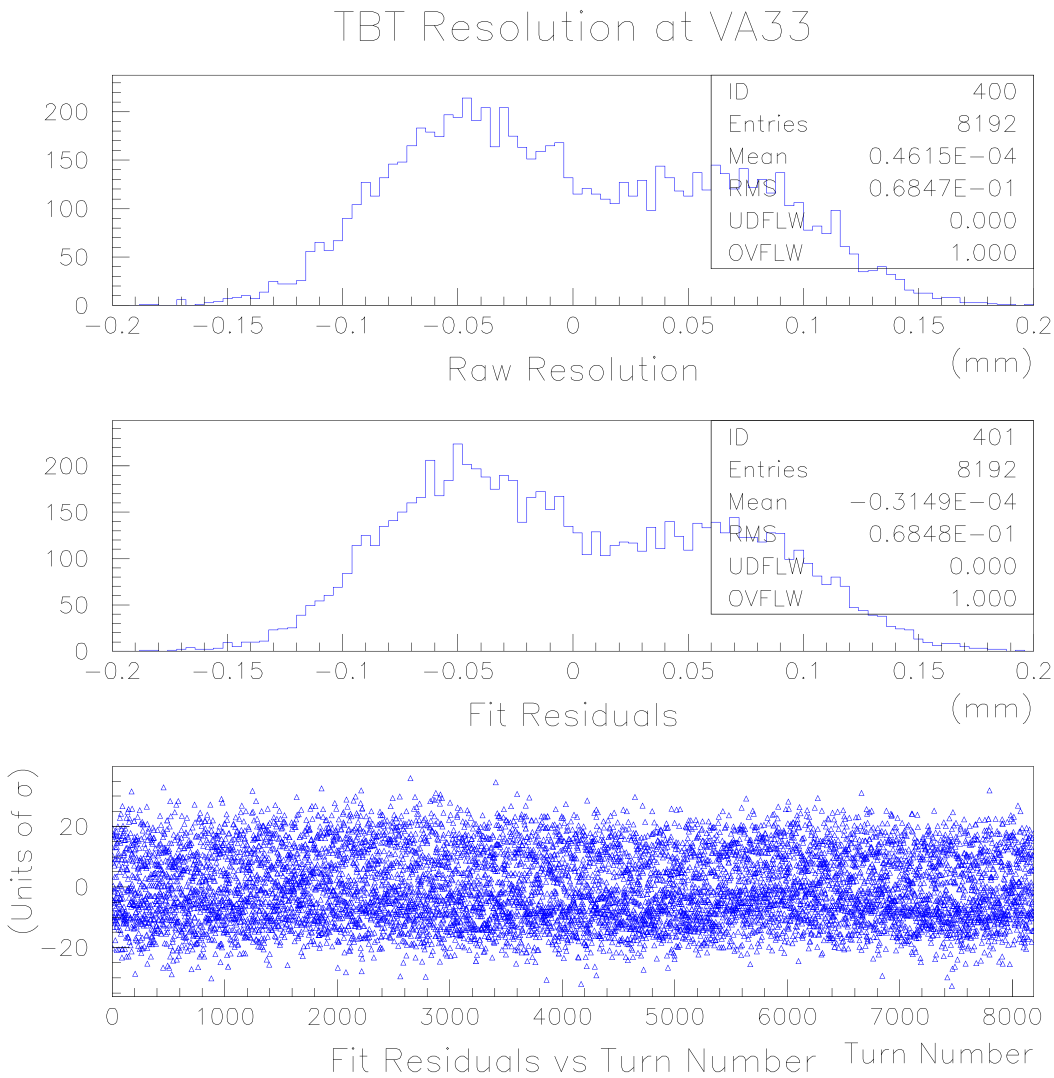
TBT Resolution at VA33
ID 400
Entries 8192
Mean 0.4615E−04
RMS 0.6847E−01
UDFLW 0.000
OVFLW 1.000
Raw Resolution
(mm)
ID 401
Entries 8192
Mean −0.3149E−04
RMS 0.6848E−01
UDFLW 0.000
OVFLW 1.000
Fit Residuals
(mm)
(Units of σ)
Fit Residuals vs Turn Number
Turn Number

Figure 6: cc