

# Status of BPM Upgrade

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Tevatron Department Meeting

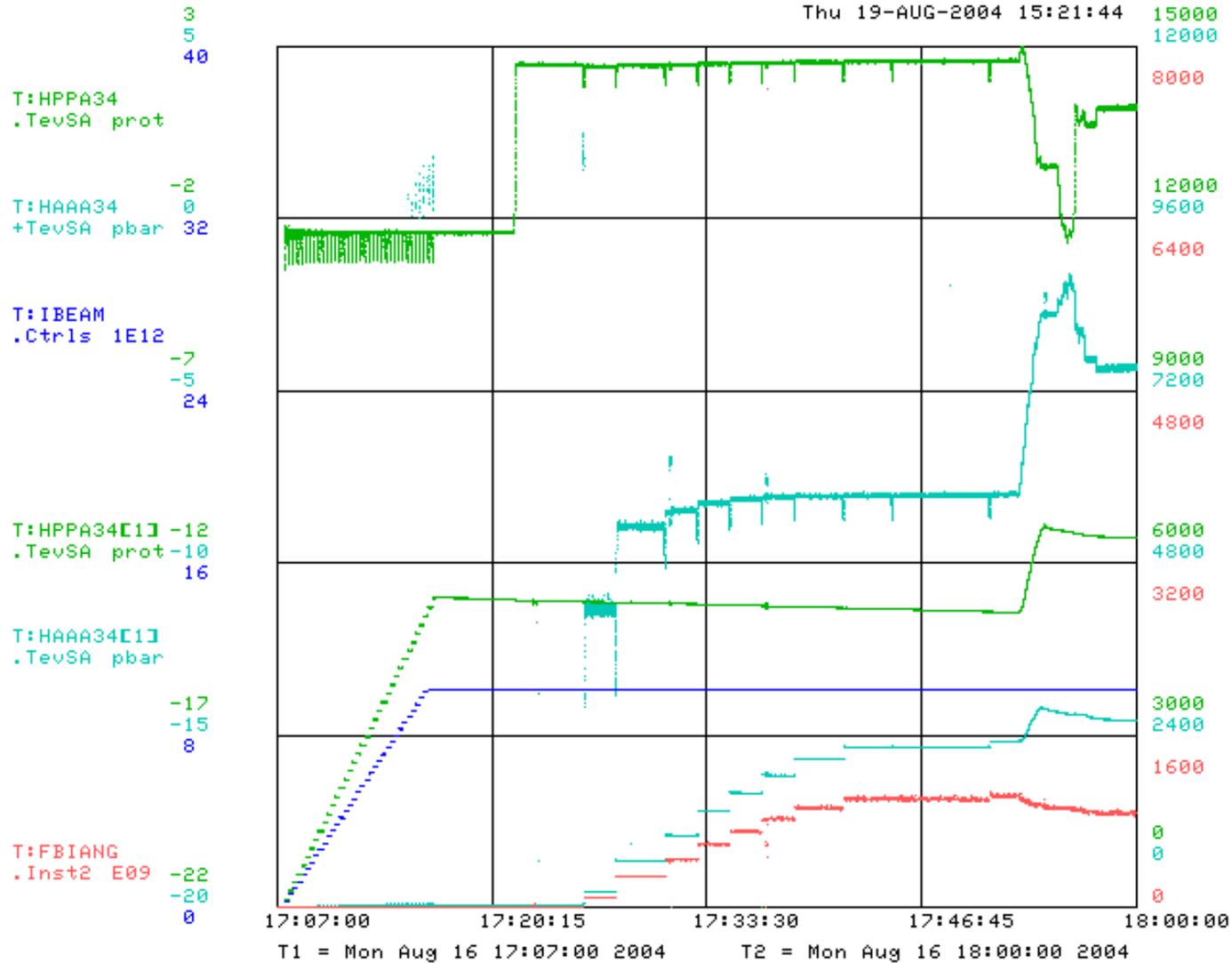
August 20, 2004

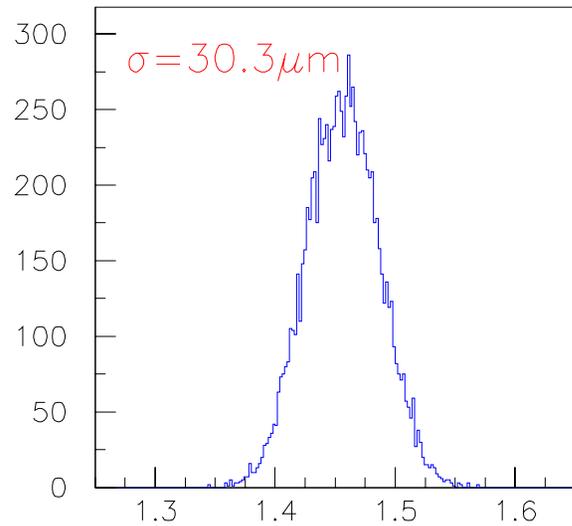
# Prototype System in A3

- Installed on HA34 and VA35.
- Uses evaluation board from Echotek.
- Uses new DAQ front end and updated online software.
- Has been working and logging data to Lumberjack since last week.
- Anti-proton data has been meaningful (semi-calibrated) since August 13 at about 5 PM.
- Not yet logging to SDA database.
- Except for SDA this is an end to end test.

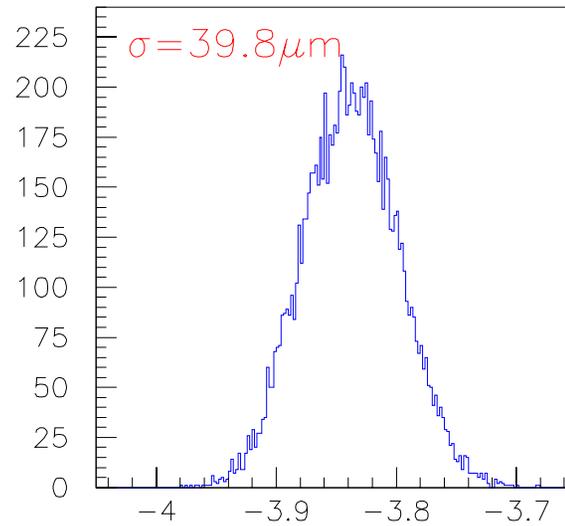
# Beams-doc-1310

From  
TevSA  
(15 Hz)



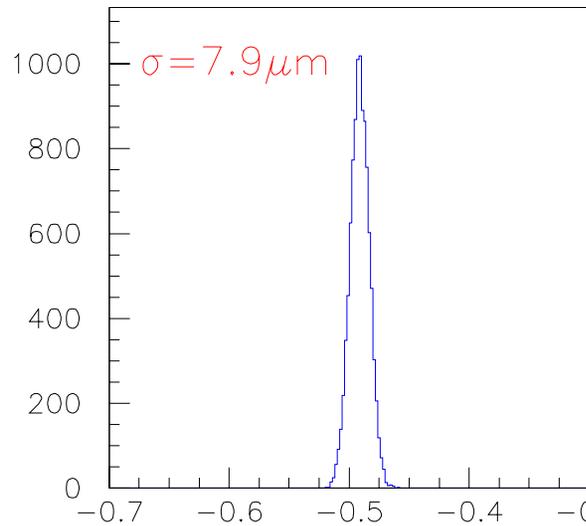


HA34 Proton Resolution (mm)

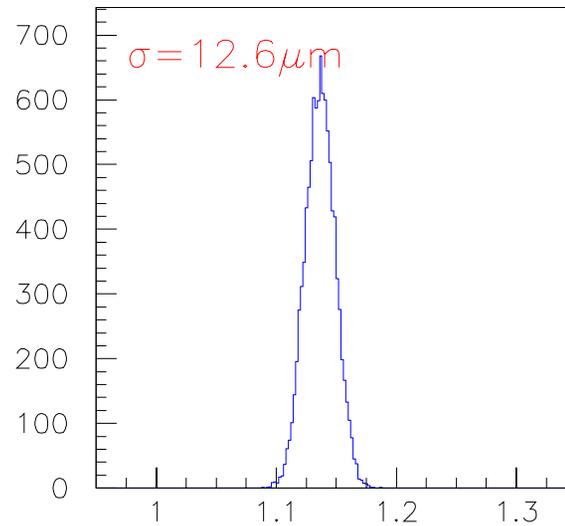


HA34 Pbar Resolution (mm)

**Resolution  
over 11  
minutes.**



VA35 Proton Resolution (mm)



VA35 Pbar Resolution (mm)

Thu 19-AUG-2004 15:52:57

All 3mm  
full scale.

1.8  
-3  
T:HPPA34  
.TeVSA prot

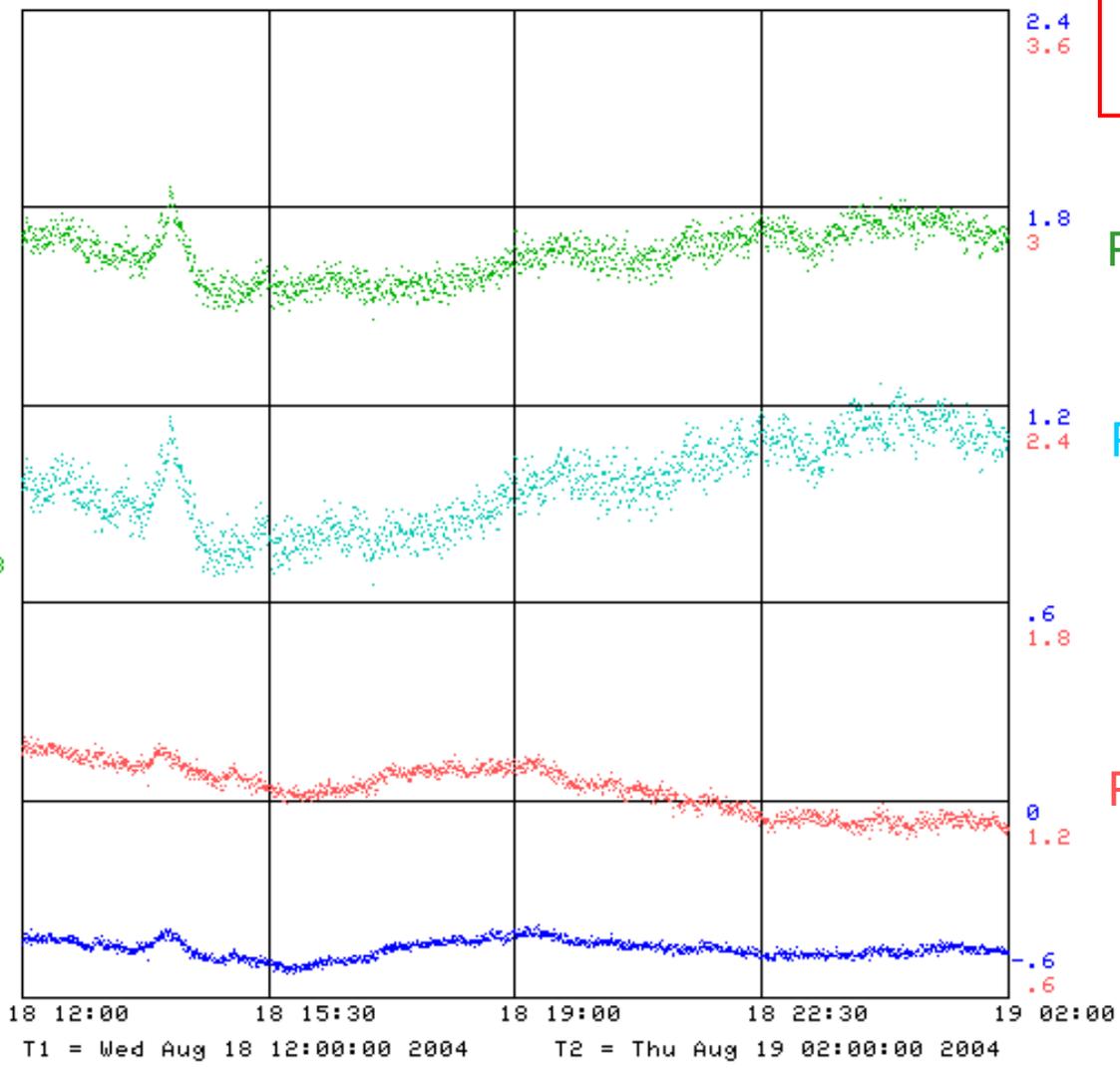
1.2  
-3.6  
T:HAAA34  
+TeVSA pbar

.6  
-4.2

-4.8E-8  
-4.8

-6  
-5.4  
T:VPPA35  
.TeVSA prot

-1.2  
-6  
T:VAAA35  
.TeVSA pbar



Proton HA34

Pbar HA34

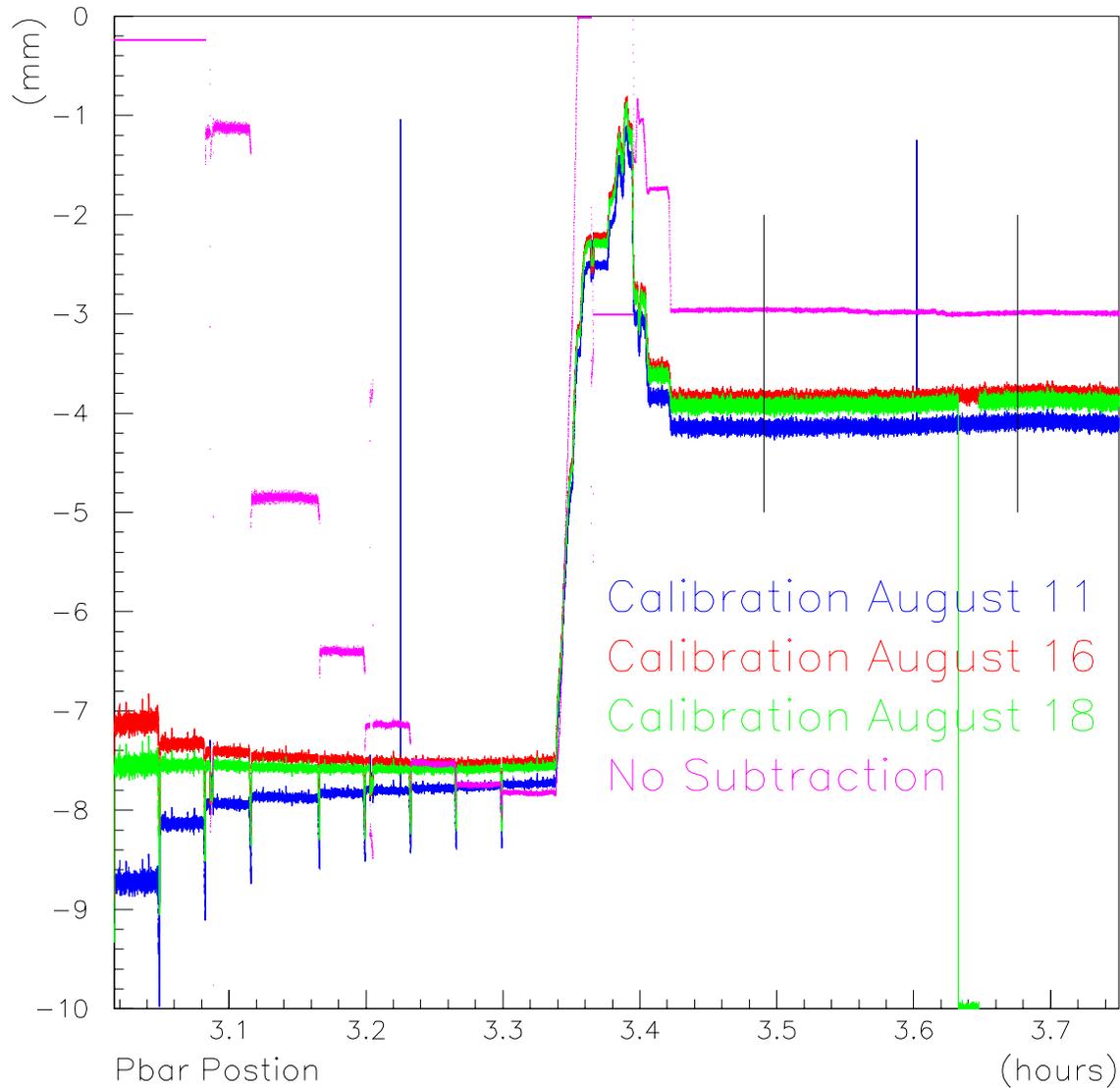
Proton VA35

Pbar VA35

# Notes

- V Resolution better than H resolution.
  - Also seen with Recycler Echotek VA14/HA15.
  - I presume that this is due to real beam motion.
- The system can see lots of motion at the few hundred micron level over the course of a few hours.

HA34 Shot August 18, 2004



- Subtraction of proton from pbar has time dependent calibration.
- Studying options to improve current algorithms.

# Mike Martens' Bump Study

- There are some bumps in the tune-up procedures whose purpose is to test for working BPMs.
- The new BPMs see these bumps.
  - Measured magnitude agrees within the error on the prediction  $O(10\%)$ .
  - Need to fix a sign error in our code.

# Work in Progress

- There are some outliers in online data that are not in the offline data.
- Data does not have the expected phase structure.
  - Not yet understood. Could be a real board problem or just firmware. Working with the vendor.
- Need improved algorithms for canceling the proton contamination on the pbar cables.
- Working on turn by turn and first turn modes.
- Have not yet demonstrated short gate mode with the new system.

# Work in Progress

- Working to understand how the Grey chip in the Echotek is programmed. Can we improve it?
- Expect second set of evaluation boards today.

# Backup Slides

# Proton Data

- Ignore anti-proton contamination on the proton cables.  
Proton position and intensity given by:

$$\textit{Intensity} = |A| + |B|$$

$$\textit{Position} = 26 \frac{|B| - |A|}{|A| + |B|}$$

- Position is in mm. Intensity is also known as “sum”.
- Here A and B are complex numbers  $(I_A, Q_A)$  and  $(I_B, Q_B)$  computed by the Echotek board.
- Units of A and B are “Echotek Units”.
- Sum signal depends on energy of the Tevatron.

# Anti-Proton Data

- Must cancel the proton contamination on the anti-proton cables:

$$A_{PbarCalibrated} = A_{Pbar} - aA_P - bB_P$$

$$B_{PbarCalibrated} = B_{Pbar} - cB_P - dA_P$$

- a,b,c,d are complex constants
  - For now they are determined offline.
  - They may vary from BPM to BPM and from store to store.
  - We are working on more robust algorithms to remove this contamination.
- Position and intensity then given by the previous formulae, using the calibrated values of A and B.