New Bipolar Shaping for PMT Pulses

- Due to the possible conflict between:
  - Large pulse heights (hundreds or even thousands of PEs) from muons
  - Desire to see small pulse heights (few PEs)

  ⇒ One should possibly worry about baseline restoration time associated with the shaper.

- Idea (from Bill Sippach) is to use bi-polar shaping
  - used very often in high rate environments.
  - In some sense, we have a high rate environment with 3kHz of muons which have many slow component pulses that can go out to 10 microsec; 3kHz*10usec=3% randoms.

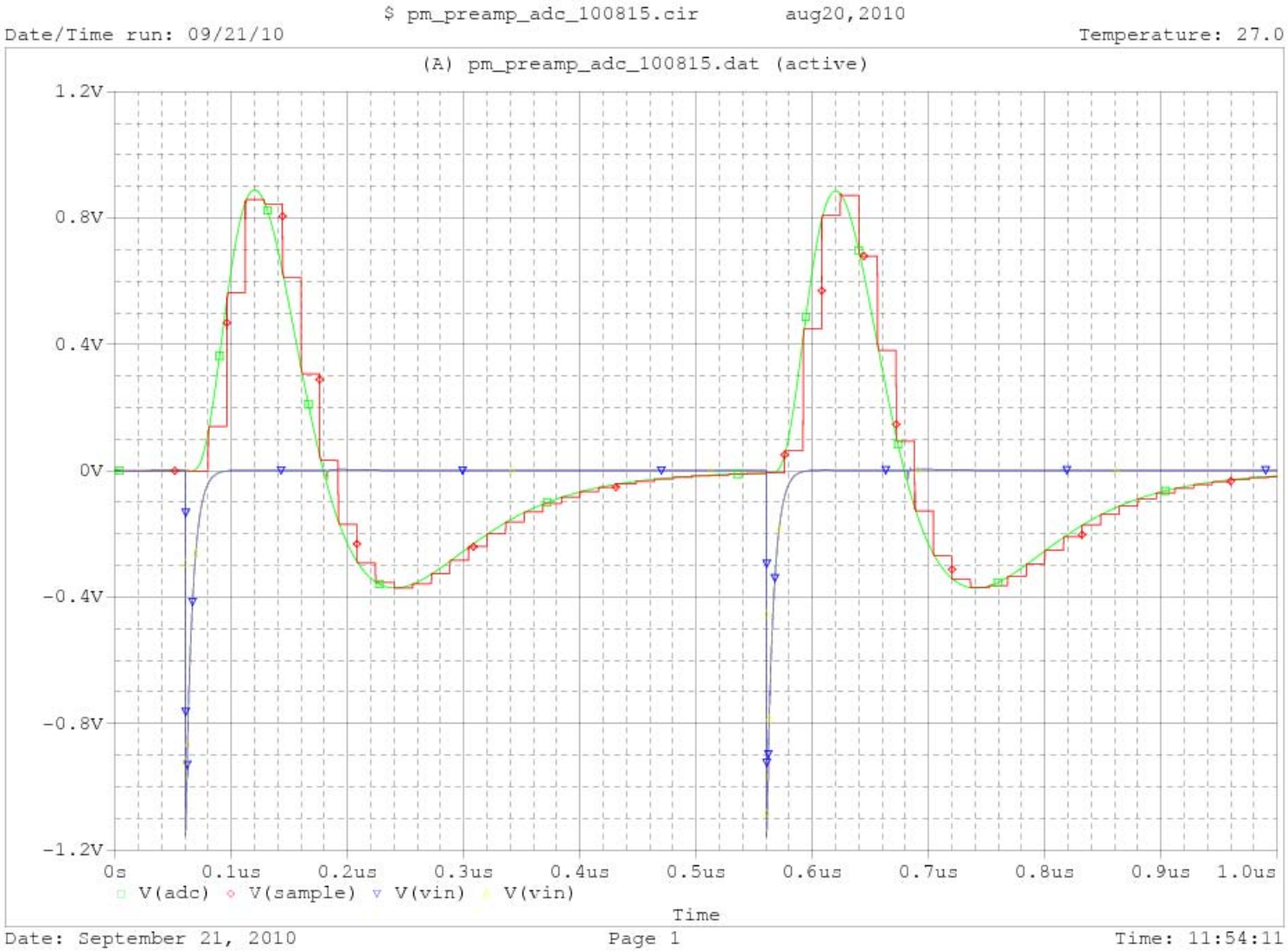
- Bipolar shaping:
  - definite advantages, probably no disadvantages and can be simply implemented with a small change to the existing shaper/amplifier.
  - It restores the baseline quickly and thus minimizes deadtime or charge buildup effects.
  - Noise is reduced by differential signal (low freq) and shaping (high freq)

- The system should provide linear charge/energy measurements up to 100 PE pulses when 1PE is put in channel 20 and it then starts saturating after that.
  - Even with the saturation, one should still get good timing from the leading edge even for pulses up to 1000 PE.

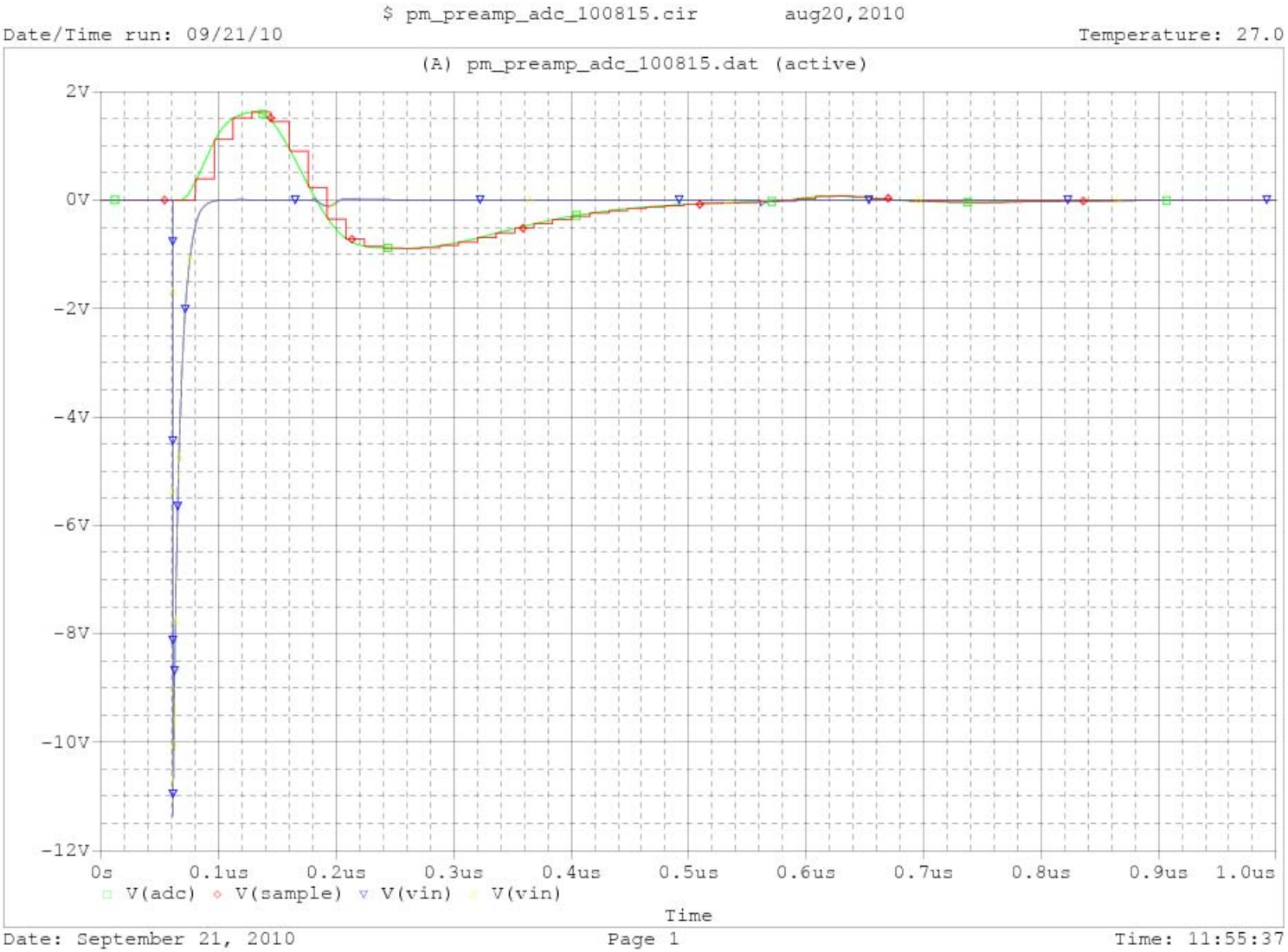
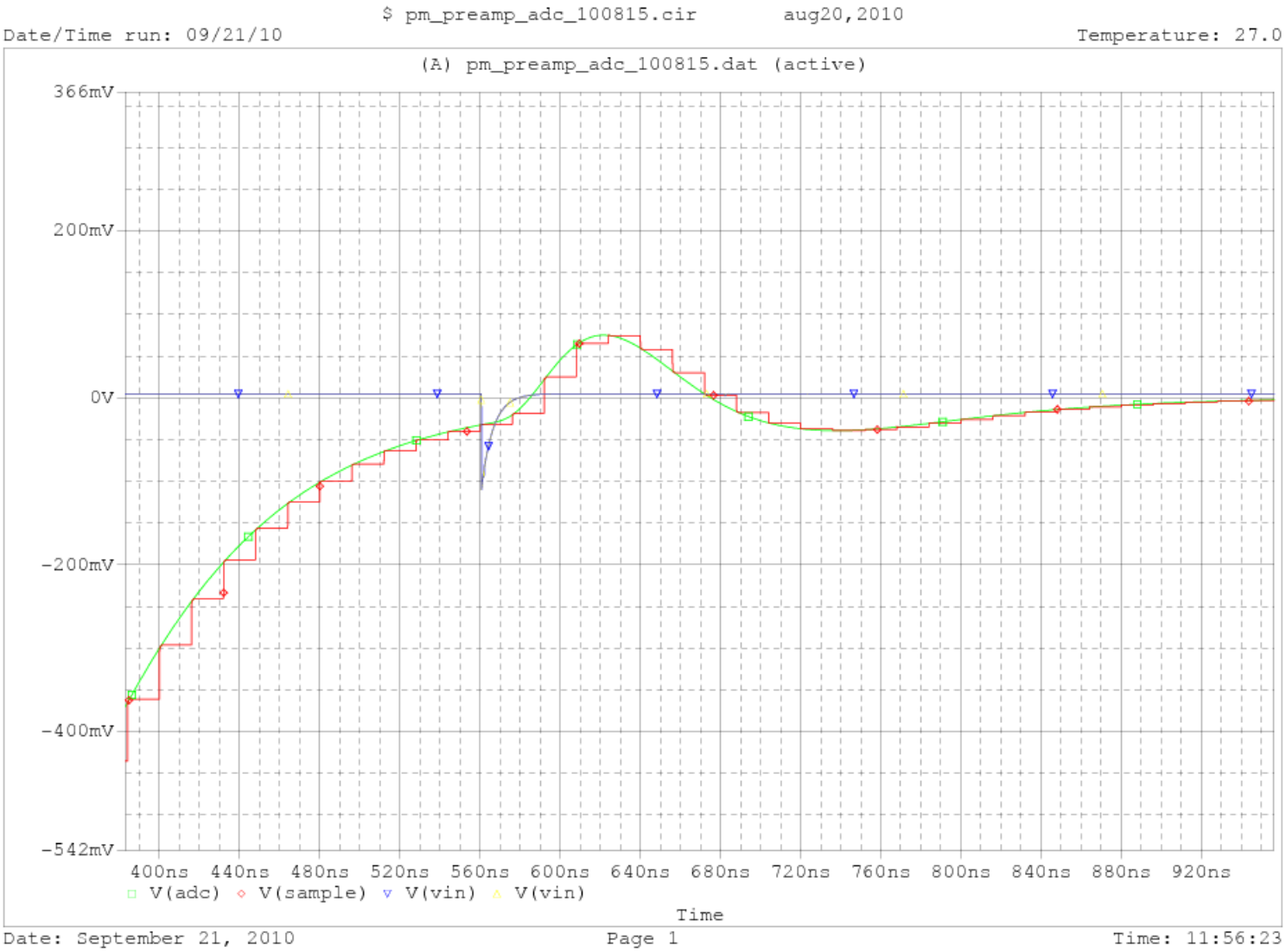
- Some simulation results:
  - Two 100PE pulses
  - A 1000PE pulse followed by a 10 PE pulse.

- Bill and company will do some more investigations but this seems like the way to go.
  - We also will make some prototypes to send to MIT and Fermilab and to use here at Nevis with Georgia's electronics test set up. Let me know if you have any comments or questions.

100PE + 100PE


$ pm_preamp_adc_100815.cir aug20,2010
Date/Time run: 09/21/10
Temperature: 27.0
(A) pm_preamp_adc_100815.dat (active)
1.2V
0.8V
0.4V
0V
-0.4V
-0.8V
-1.2V
0s
0.1us
0.2us
0.3us
0.4us
0.5us
0.6us
0.7us
0.8us
0.9us
1.0us
V(adc)
V(sample)
V(vin)
V(vin)
Time
Date: September 21, 2010
Page 1
Time: 11:54:11

1000PE followed by 10 PE



1000 PE followed by 10PE (zoomed)