Perfect Pulse Analysis for Pedestal Extraction

Algorithm for constructing perfect pulse to extract pedestal :

- **Construct average pulse** : Using Amplified 600 sequence (from DST) , take sum over all 600 pulses in that sequence. However divide the sum by 599 to get the average single pulse signal.
- **Construct the image (surrogate) pulse**: From each of the original 600 pulses subtract the average pulse signal. (Actually I did the opposite here i.e. $I_{ave} - I_i$ to get positive values)
- **Construct perfect pulse :** Wrap the image pulse (all 600 windows) to get the perfect pulse with pedestal already removed.
- **Fit perfect pulse to real data :**

  Fit each pulse from real data to the constructed perfect pulse according to :

  $$Y(tof) = a\,P(tof) + b$$

  Where Y(tof) is the signal from real data and P(tof) is the signal from perfect pulse.

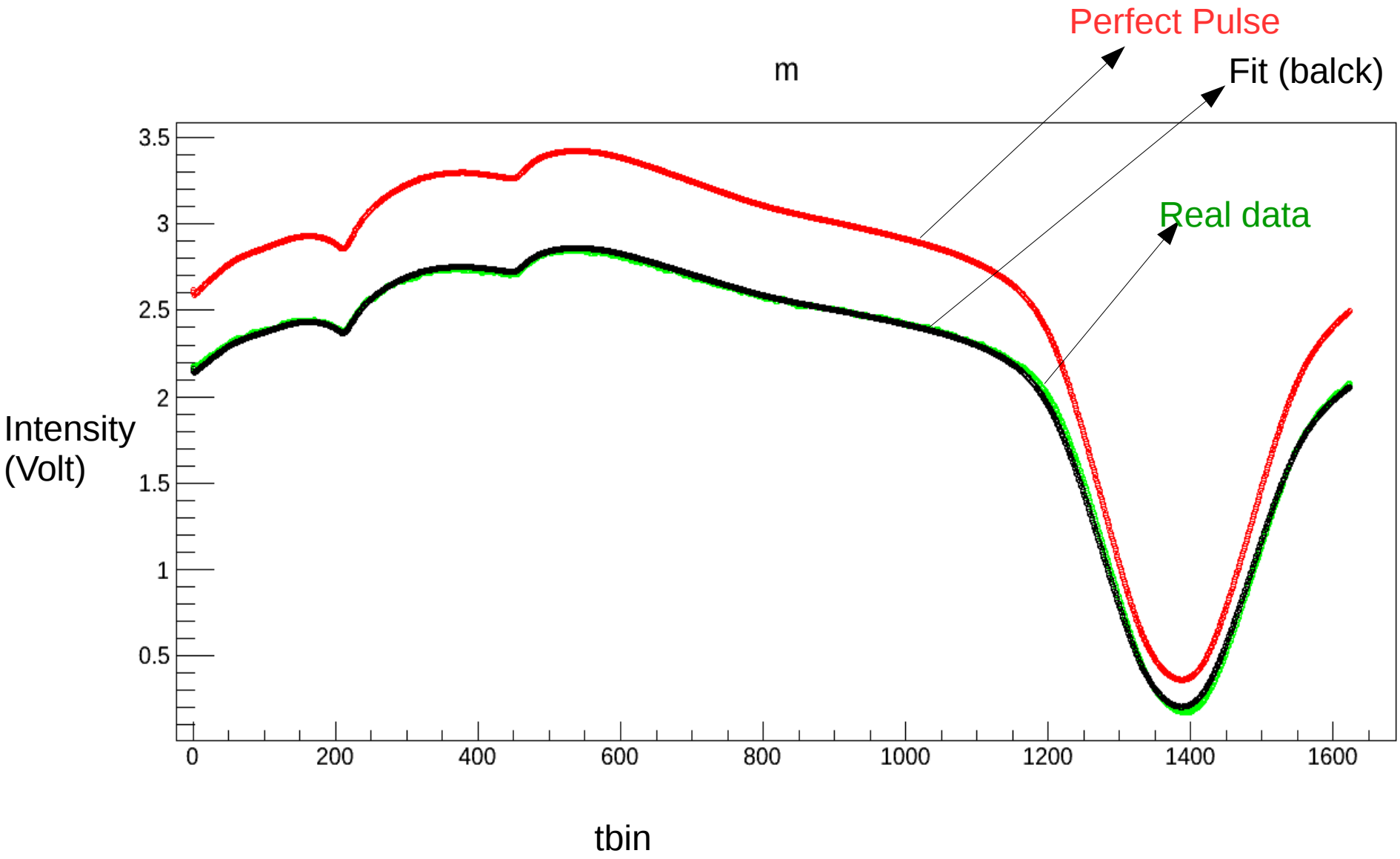
  From the fit a and b will give variation in beam intensity and pedestal respectively.

- I am using full UD data set. Today I am going to present the fit values.

How good is the fit ?

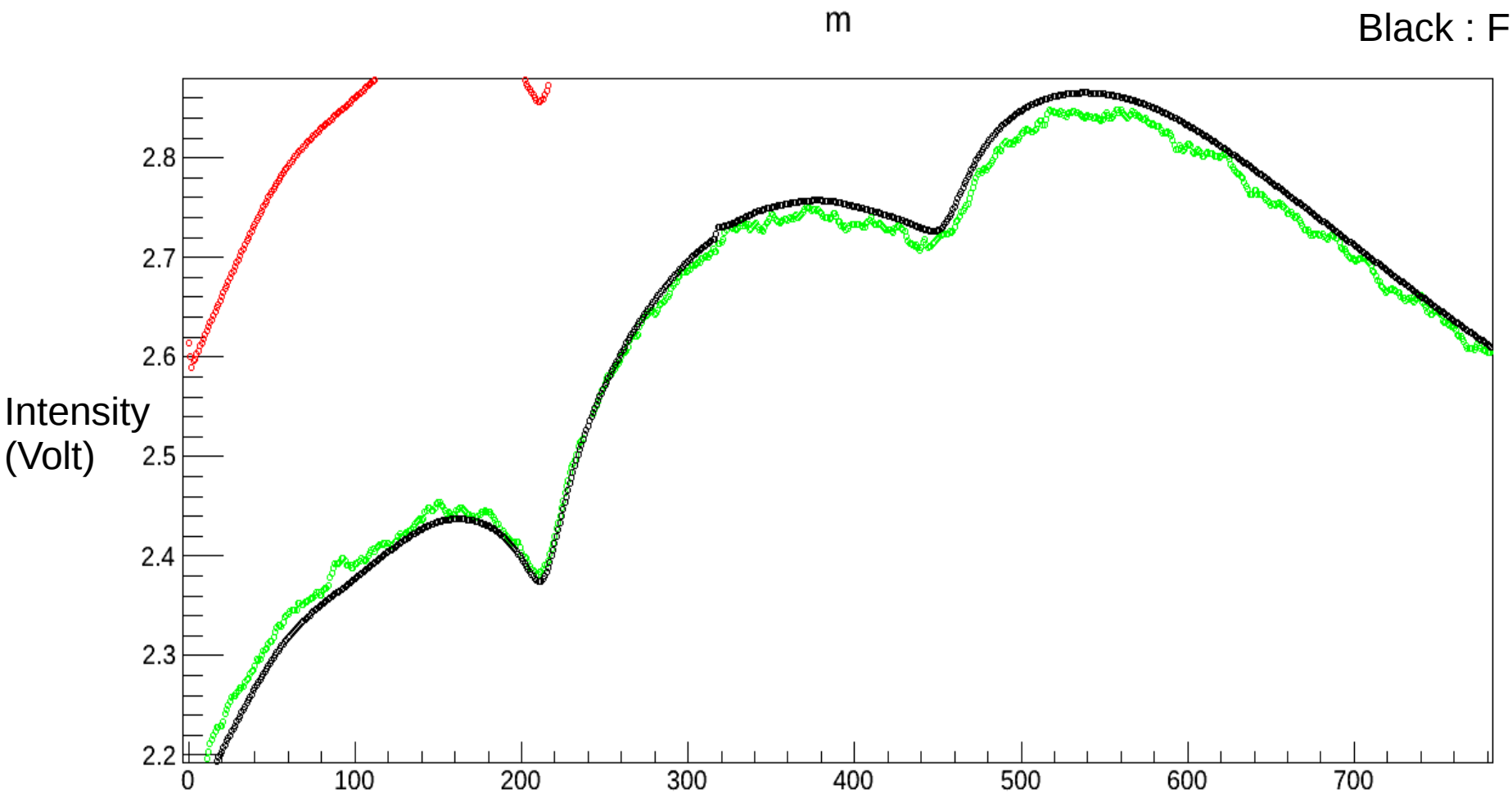
Fit for Typical M1 Pulse

Red : Perfect Pulse
Green: Real Data
Black : Fit



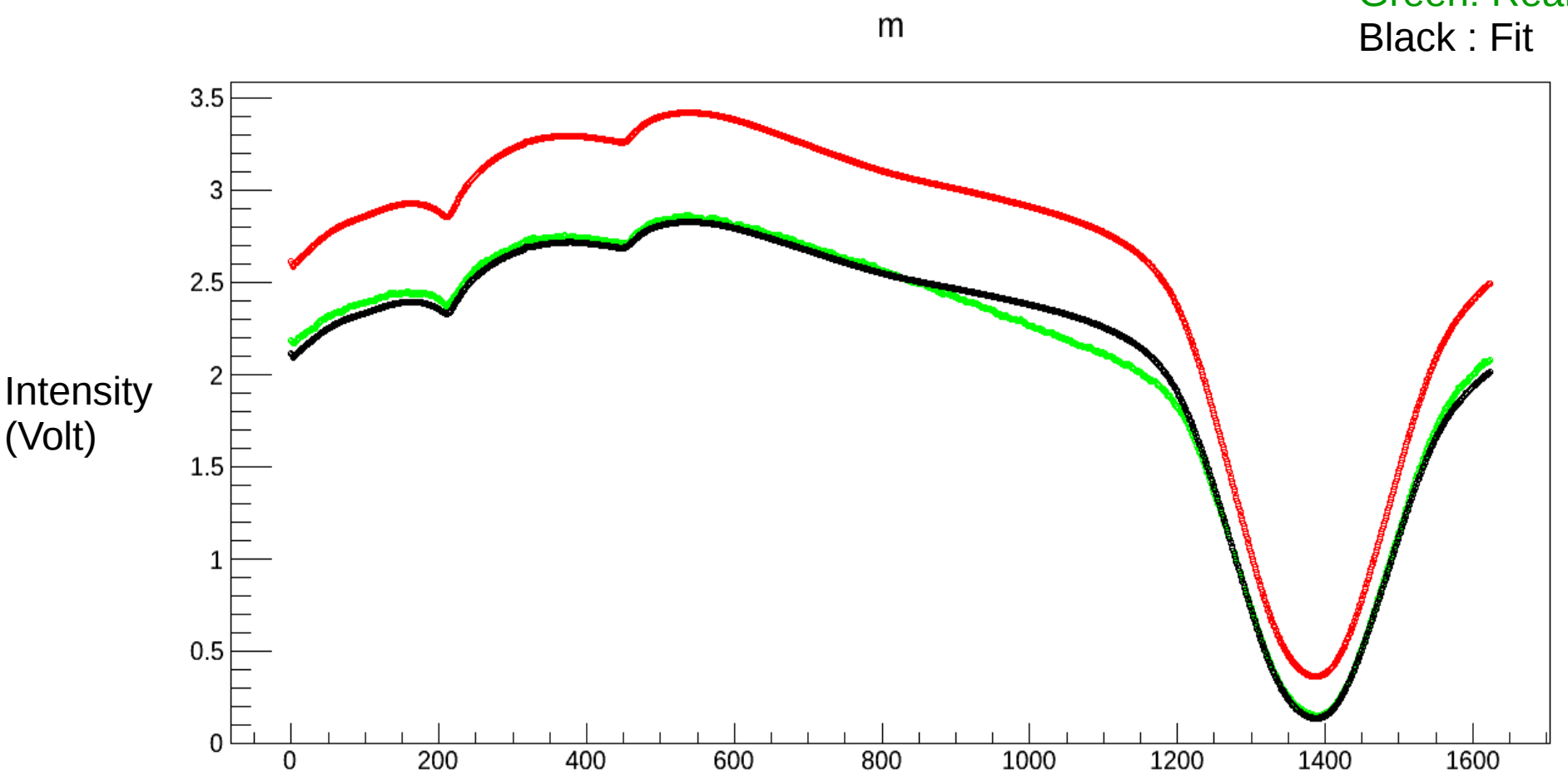
Fit for Typical M1 Pulse -Zoomed

Red : Perfect Pulse
Green: Real Data
Black : Fit



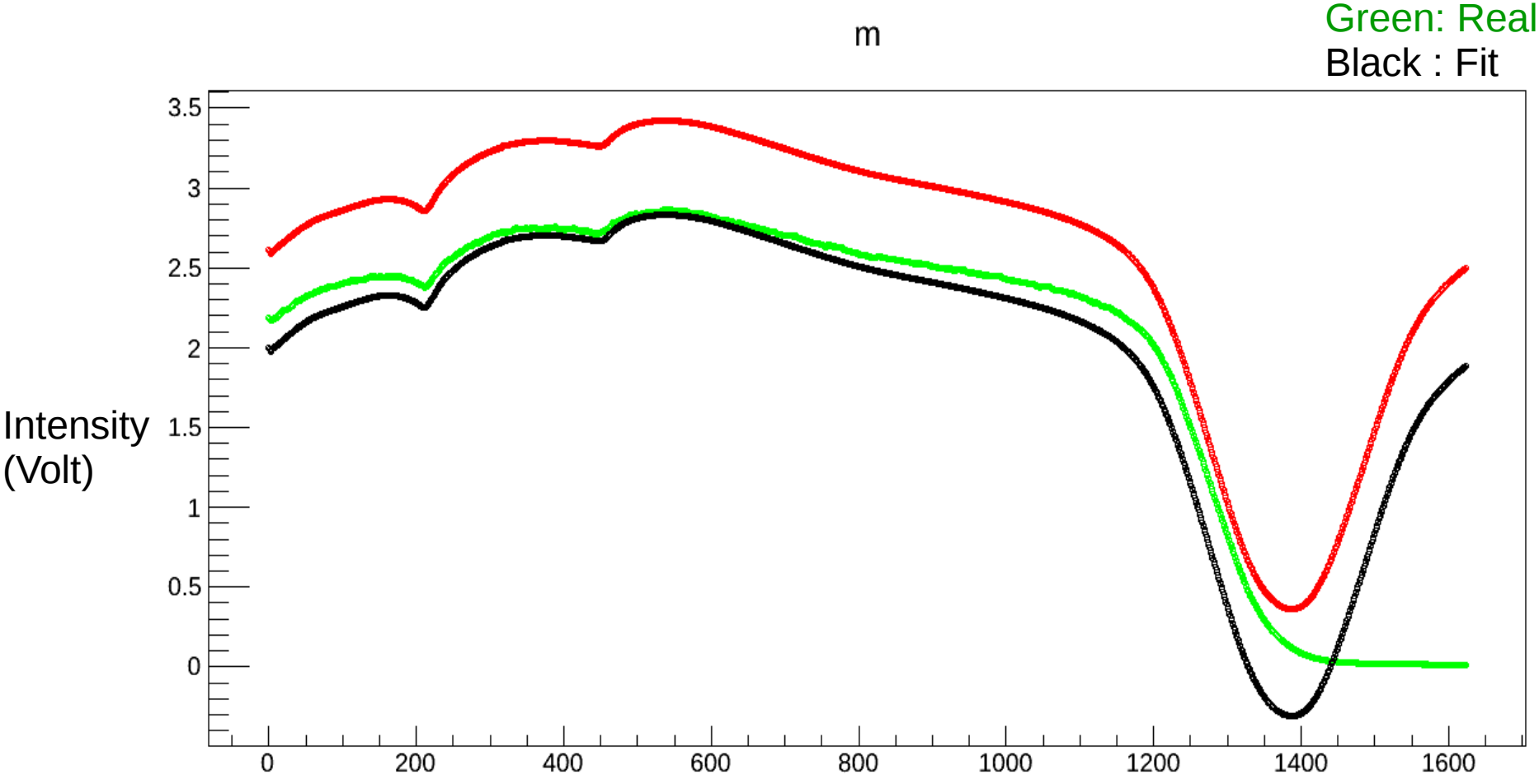
Fit for M1 pulse- pulse #2 from dropped

Red : Perfect Pulse
Green: Real Data
Black : Fit



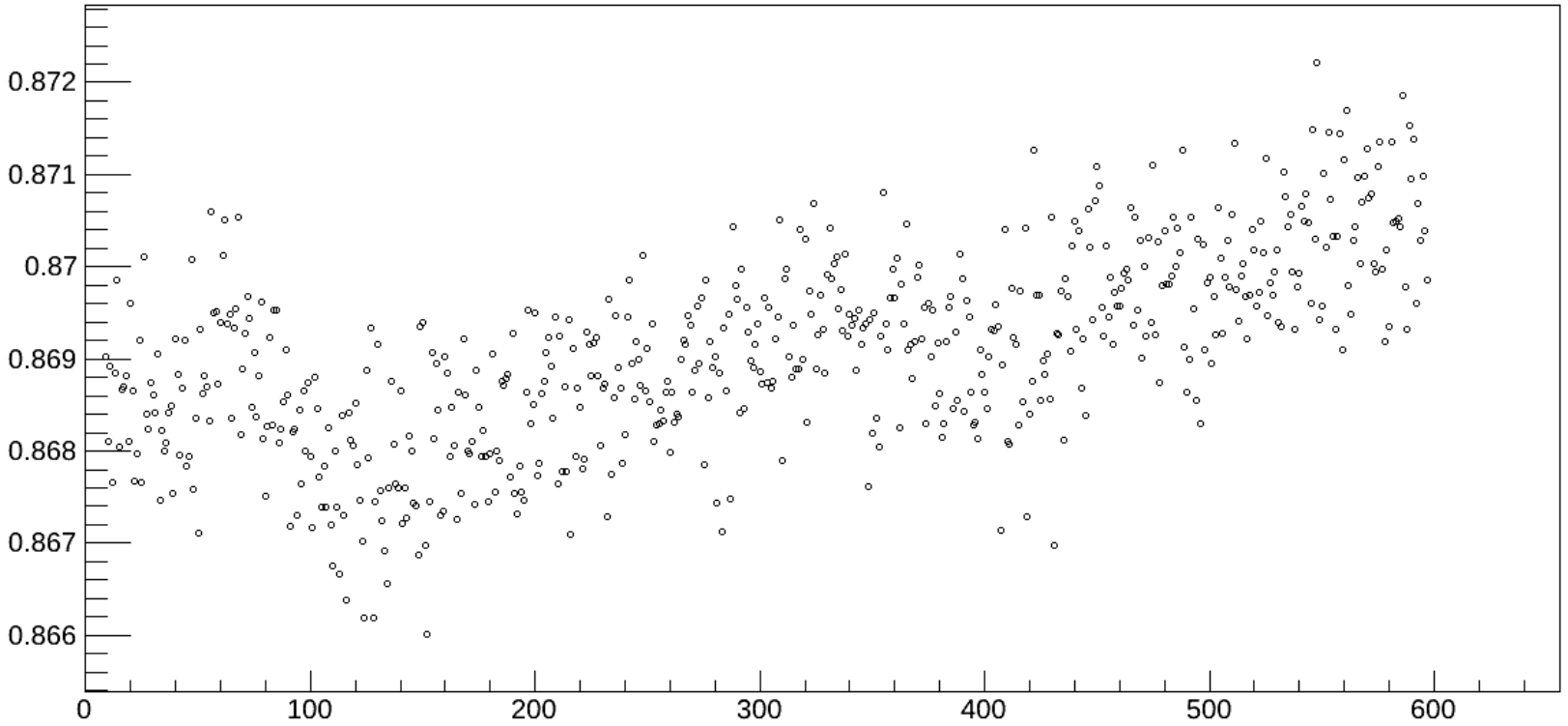
Fit for M1 pulse- pulse #599 from dropped

Red : Perfect Pulse
Green: Real Data
Black : Fit

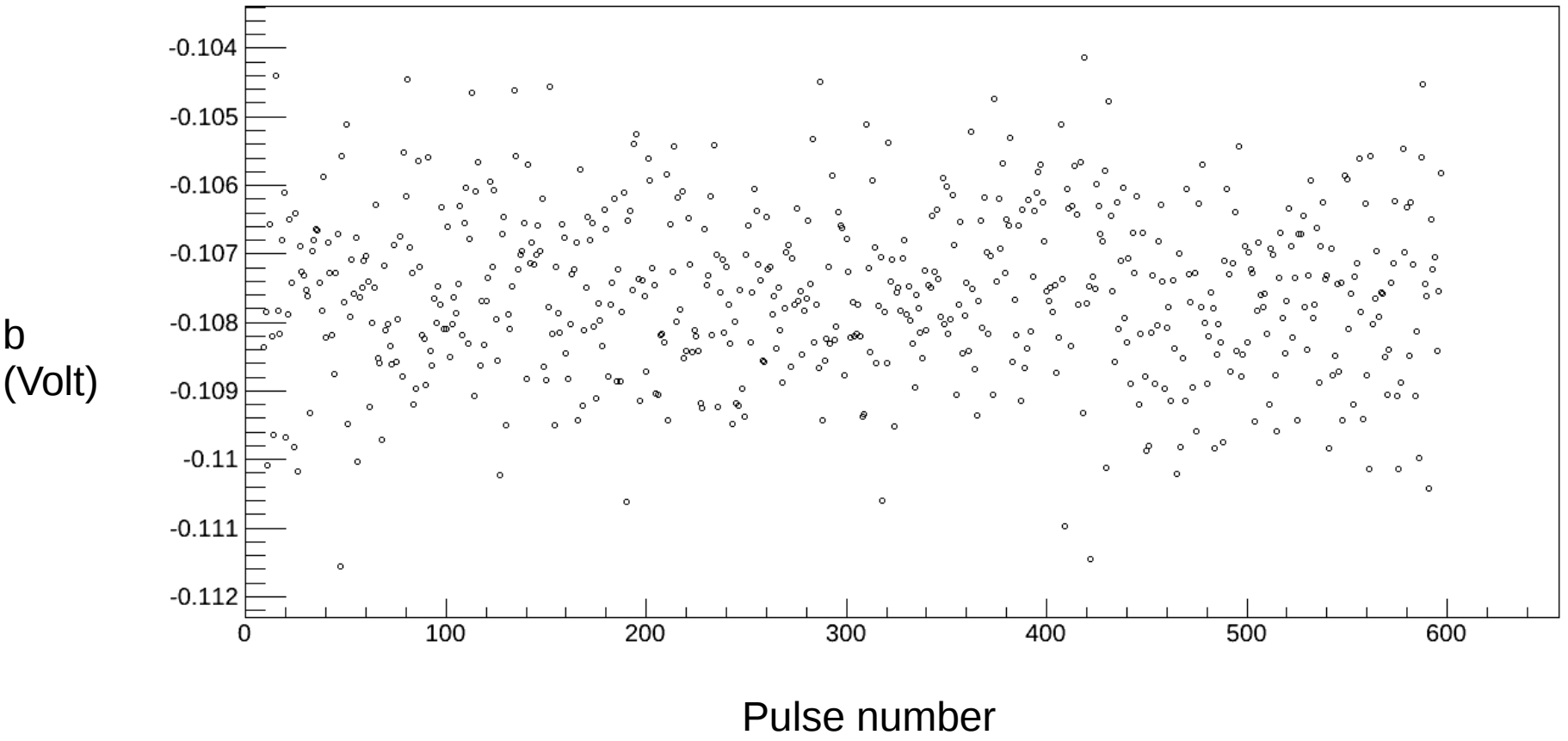


Conclusion : Fit is presumably good for pulses outside standard cut. Which is what we care about.

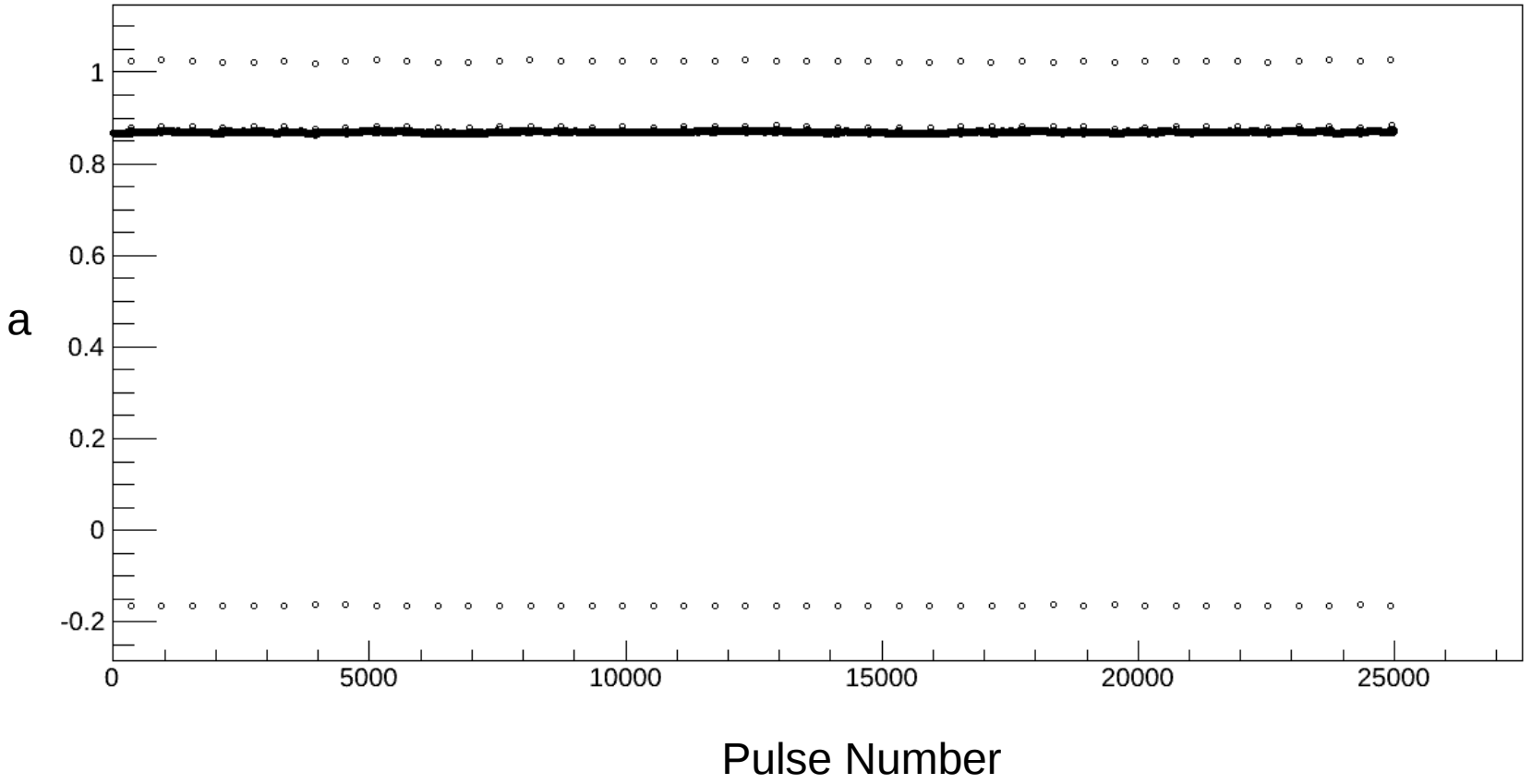
Fit parameter 'a' values for one 600 sequence



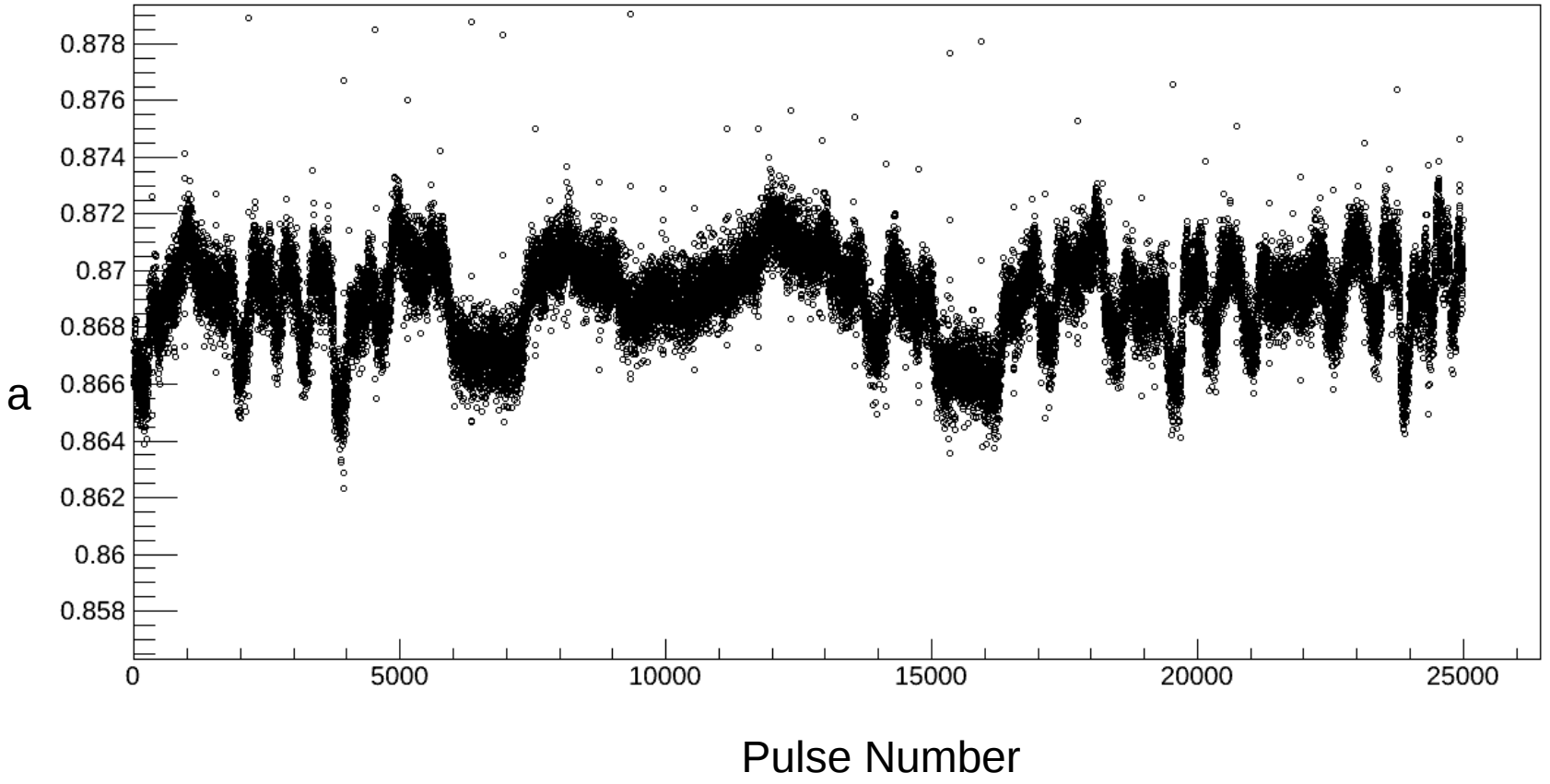
Fit parameter 'b' values for one 600 sequence



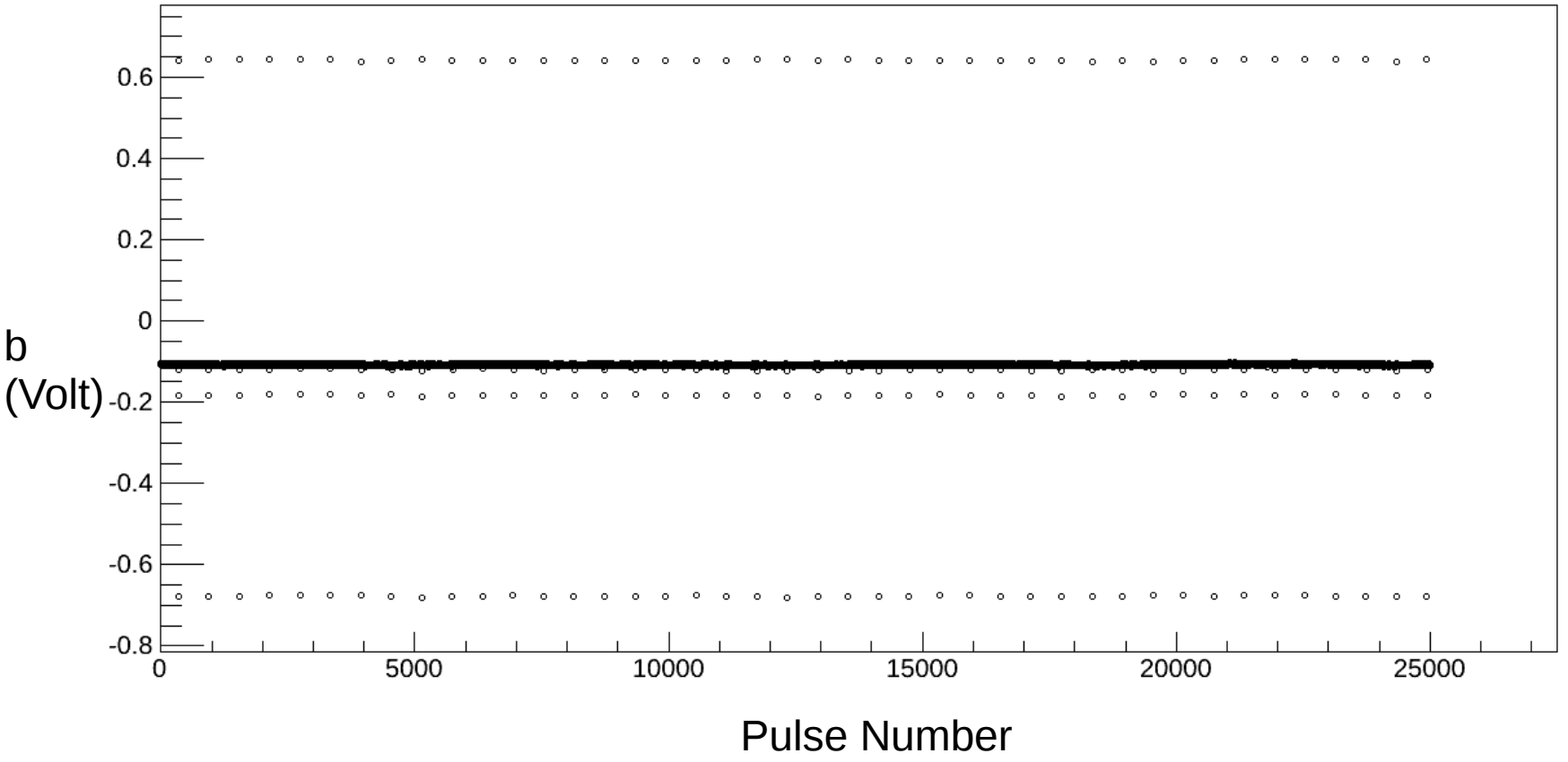
Fit parameter 'a' values for a single run (run#20100)



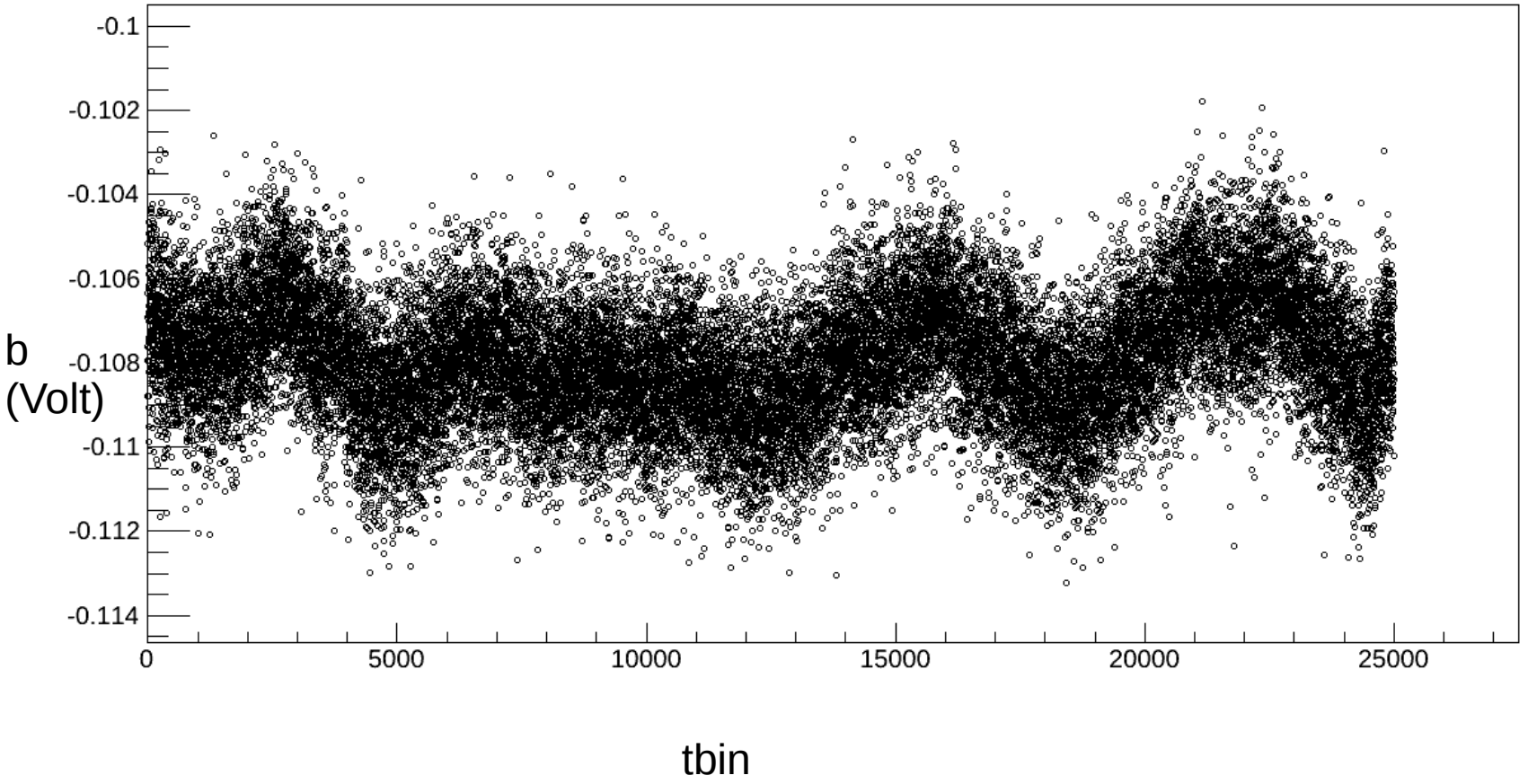
Fit parameter 'a' values for a single run (run#20100) -Zoomed



Fit parameter 'b' values for a single run (run#20100)



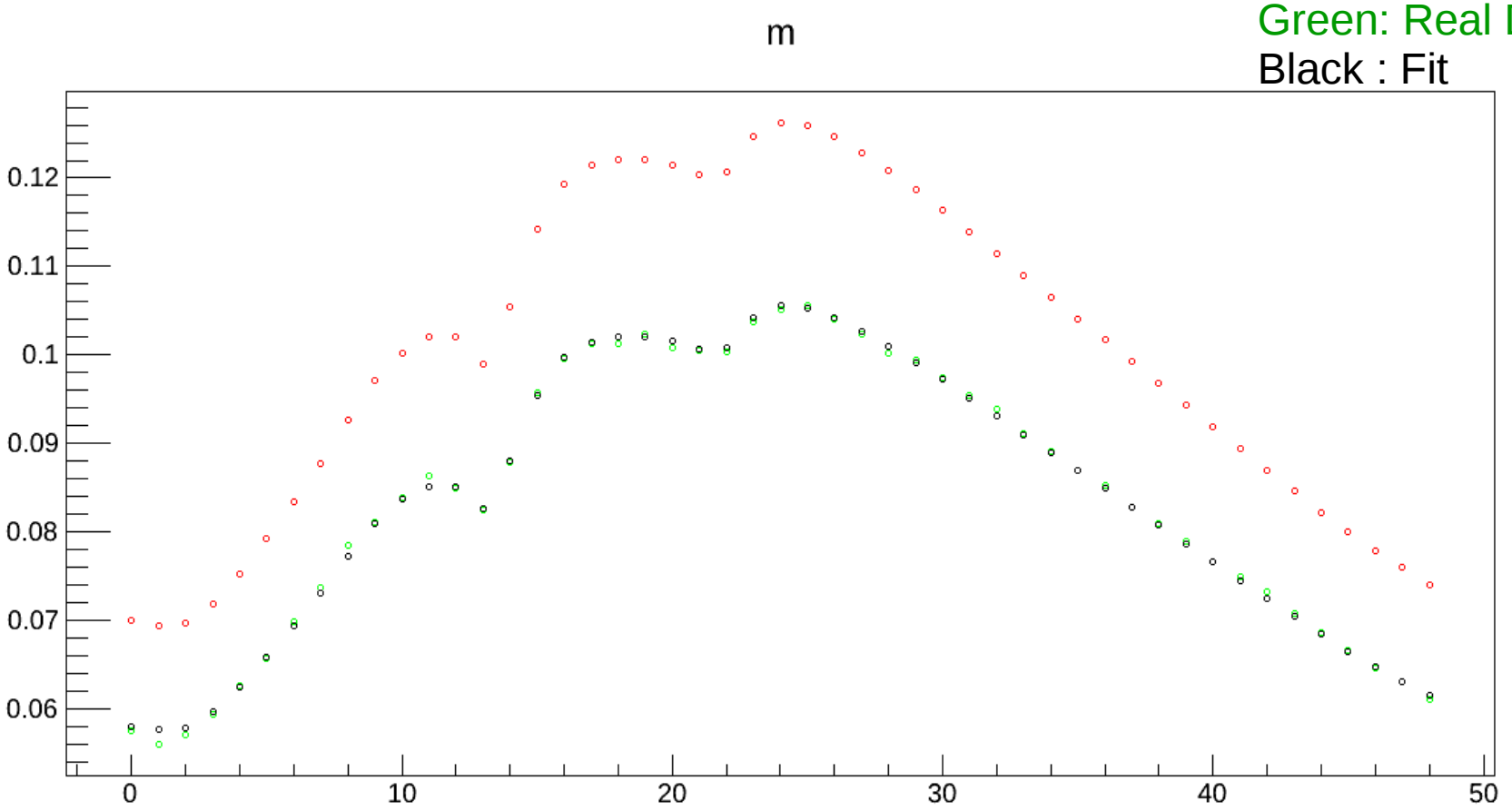
Fit parameter 'b' values for a single run (run#20100) -Zoomed



- Next few slides the same fitting for detector signals.

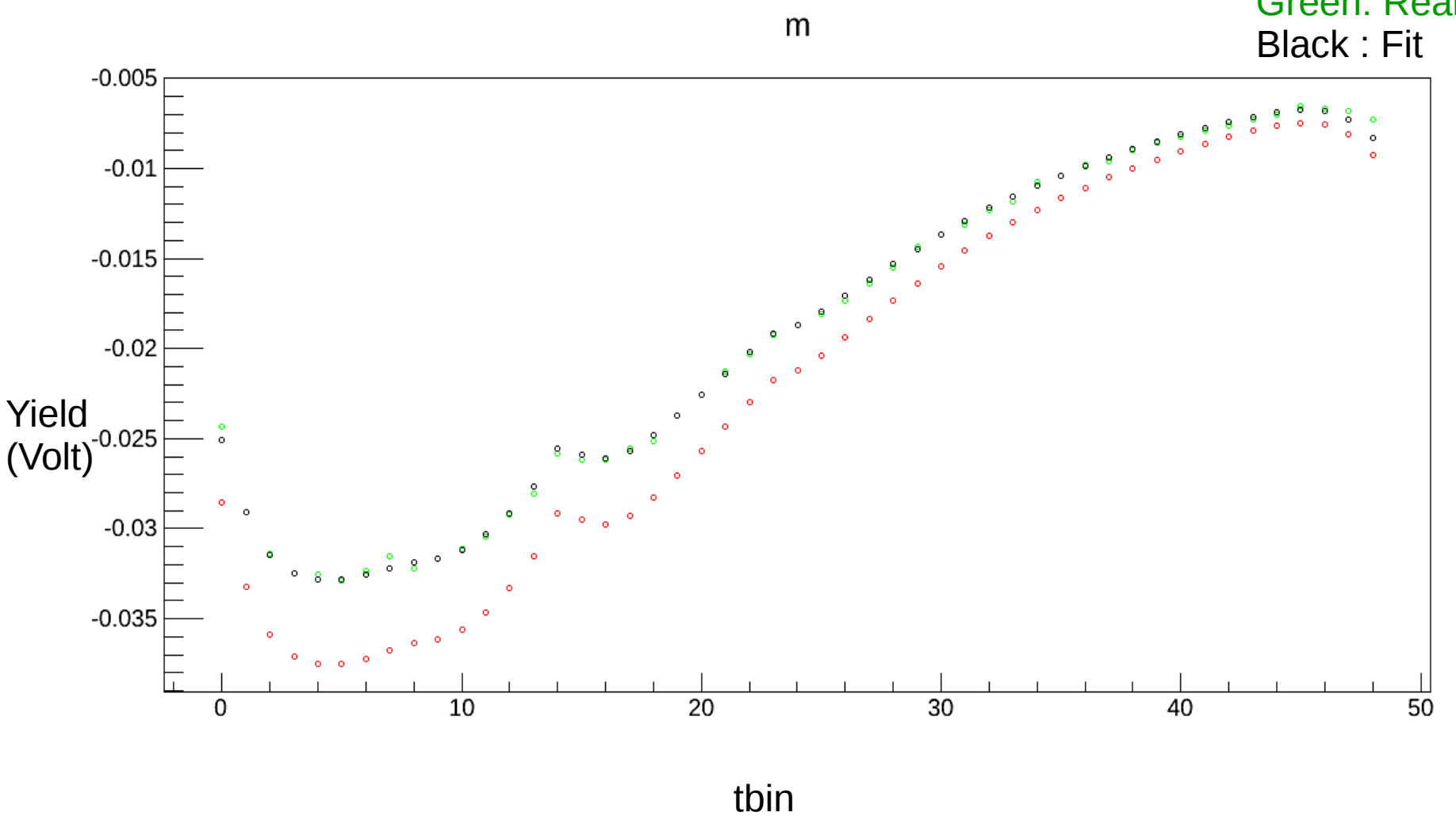
Fit for Layer 0 Wire 0 Signal

Red : Perfect Pulse
Green: Real Data
Black : Fit

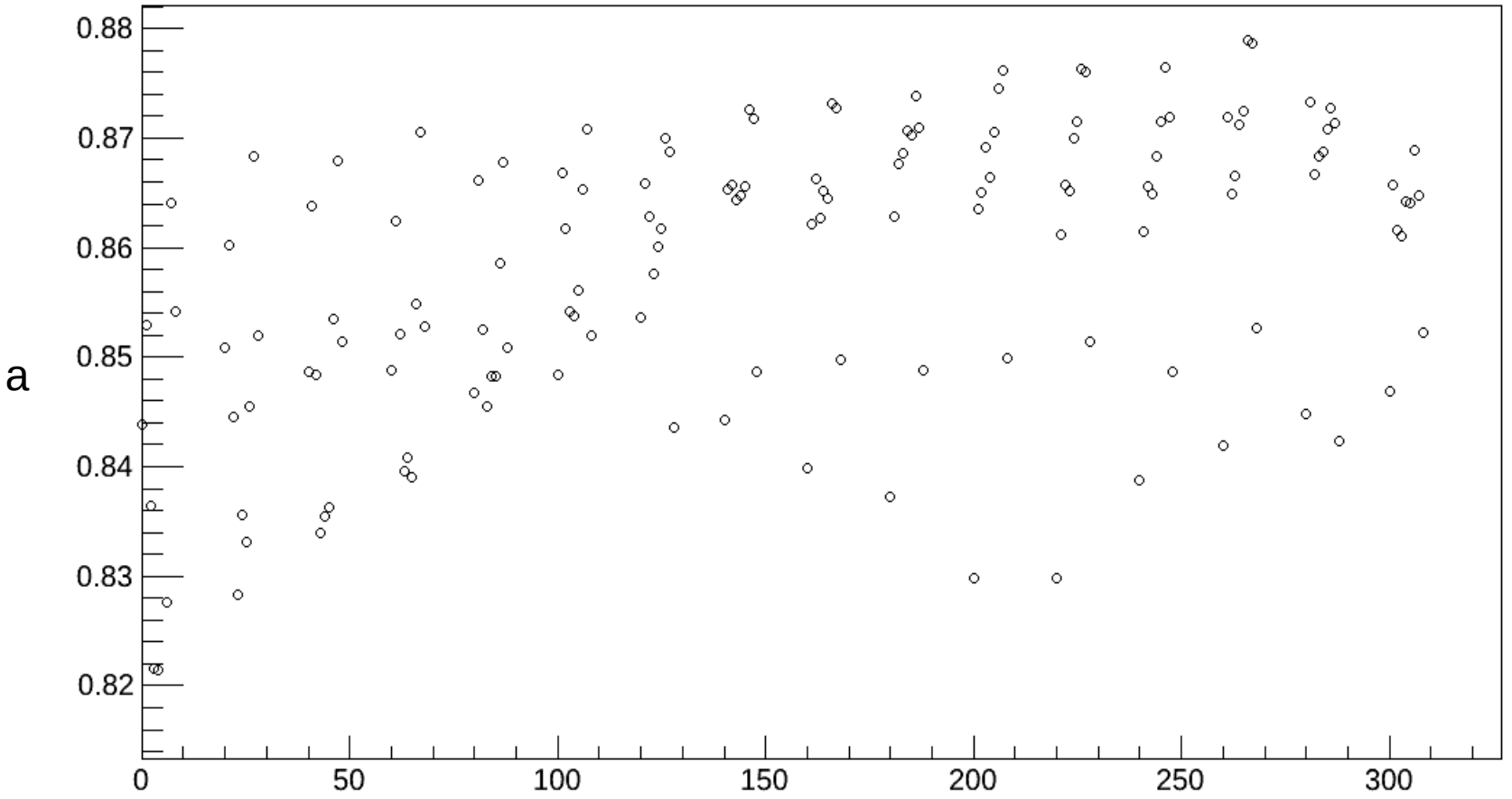


Fit for Layer 15 Wire 6 Signal

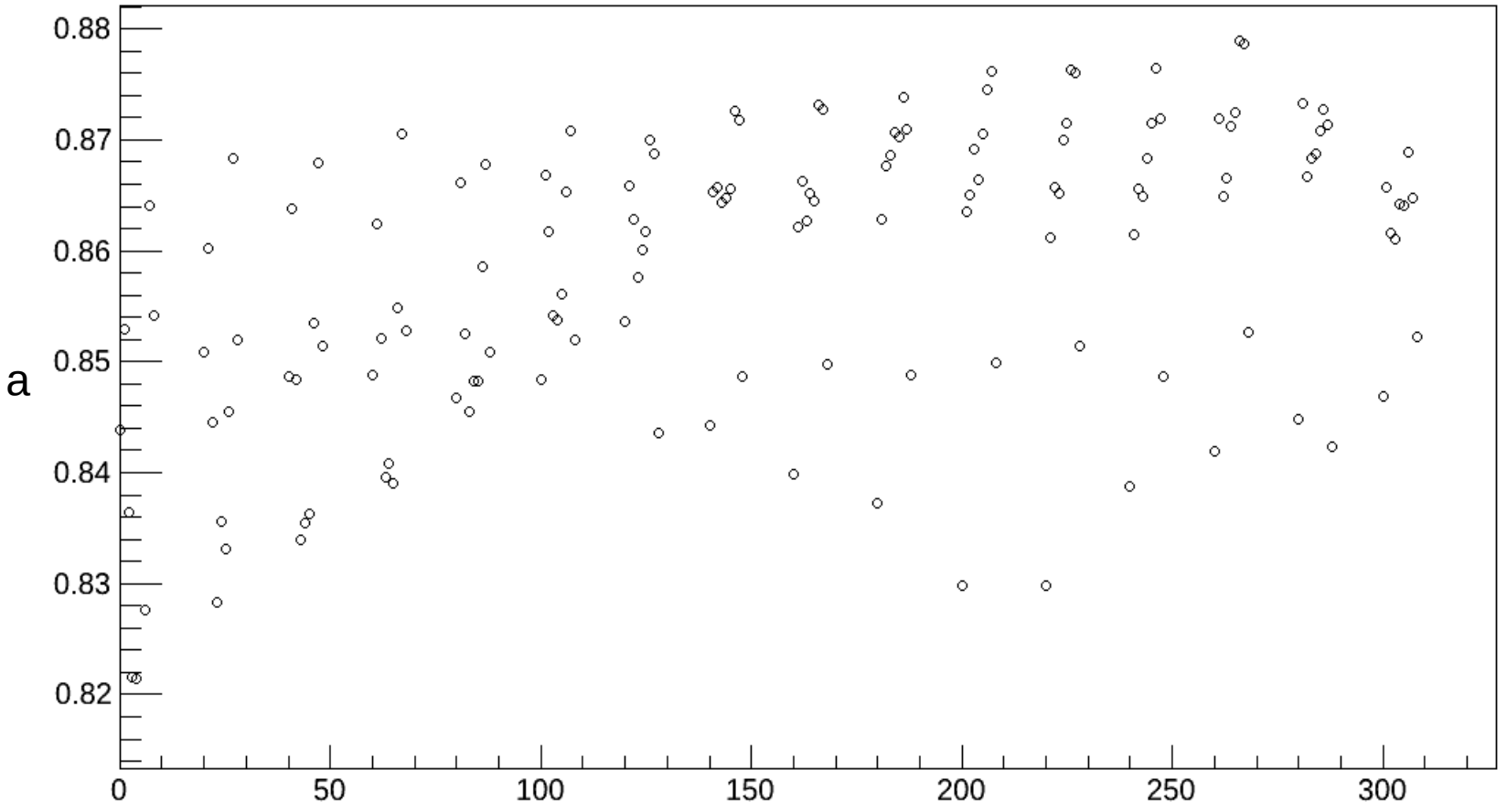
Red : Perfect Pulse
Green: Real Data
Black : Fit



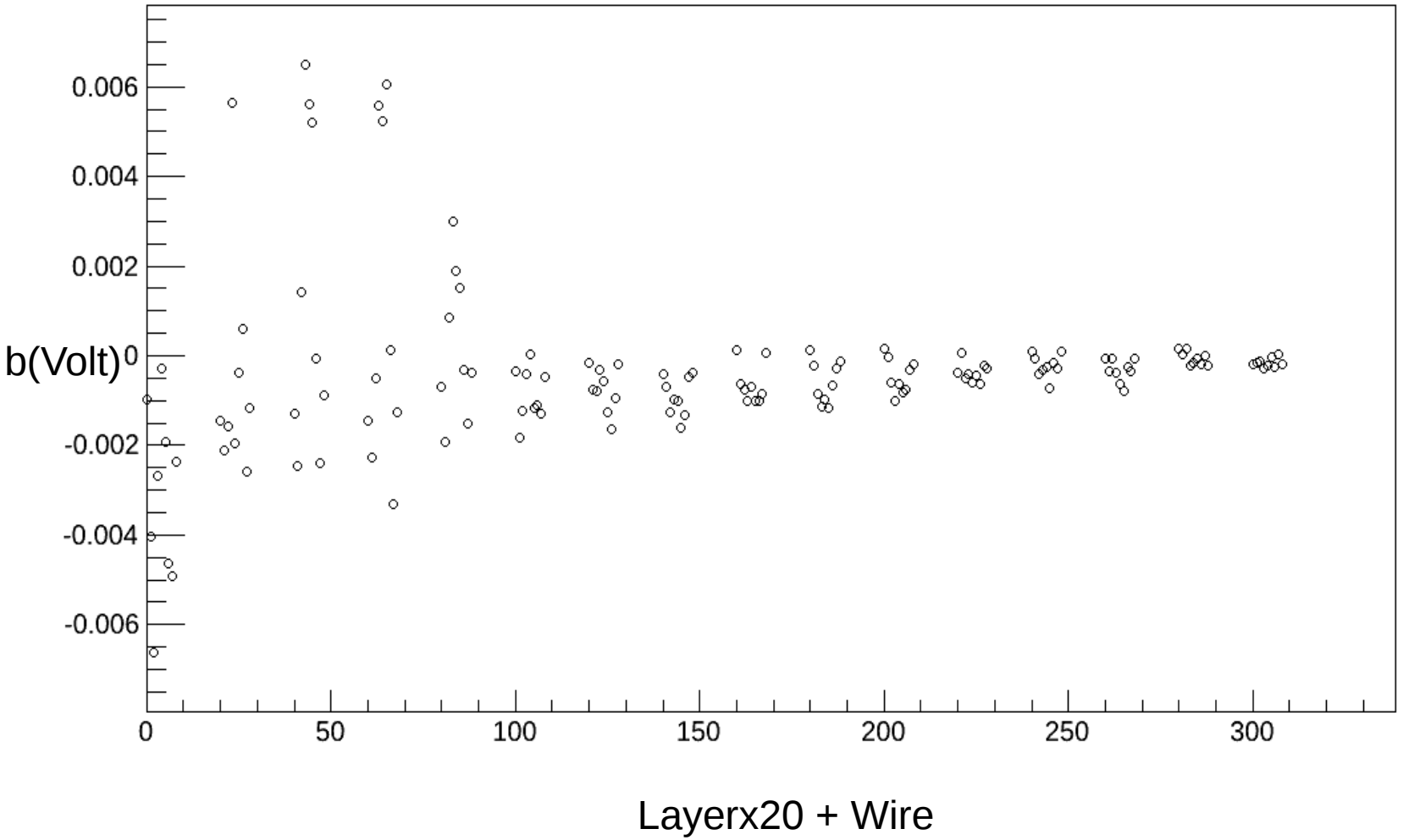
Fit parameter 'a' values for a single pulse (run#20100) for all detectors



Fit parameter 'a' values for a single pulse (run#20100) for all detectors

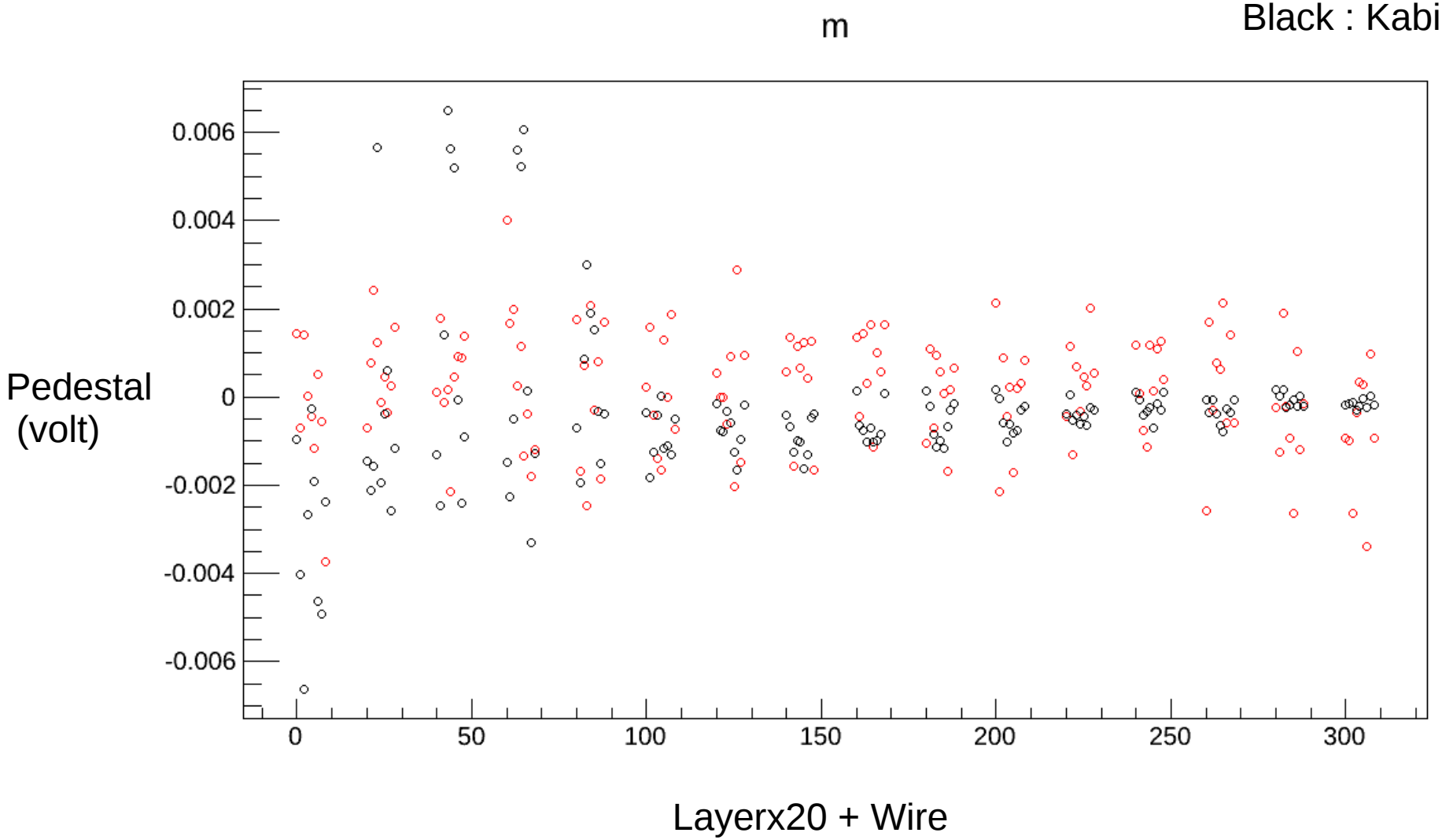


Fit parameter 'b' values (pedestal) for a single pulse (run#20100) for all detectors



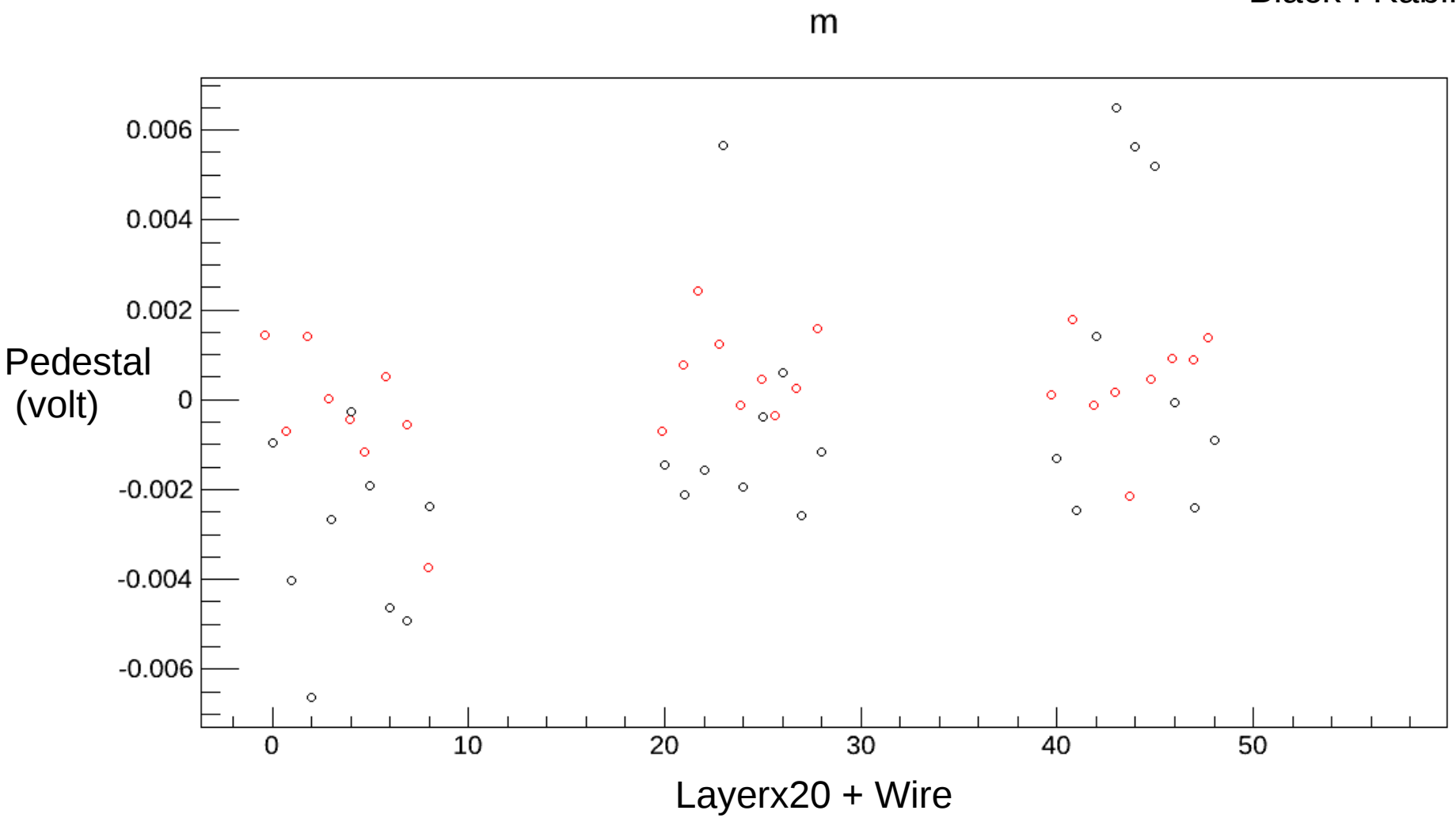
Pedestal values Kabir vs Vince

Red : Vince
Black : Kabir



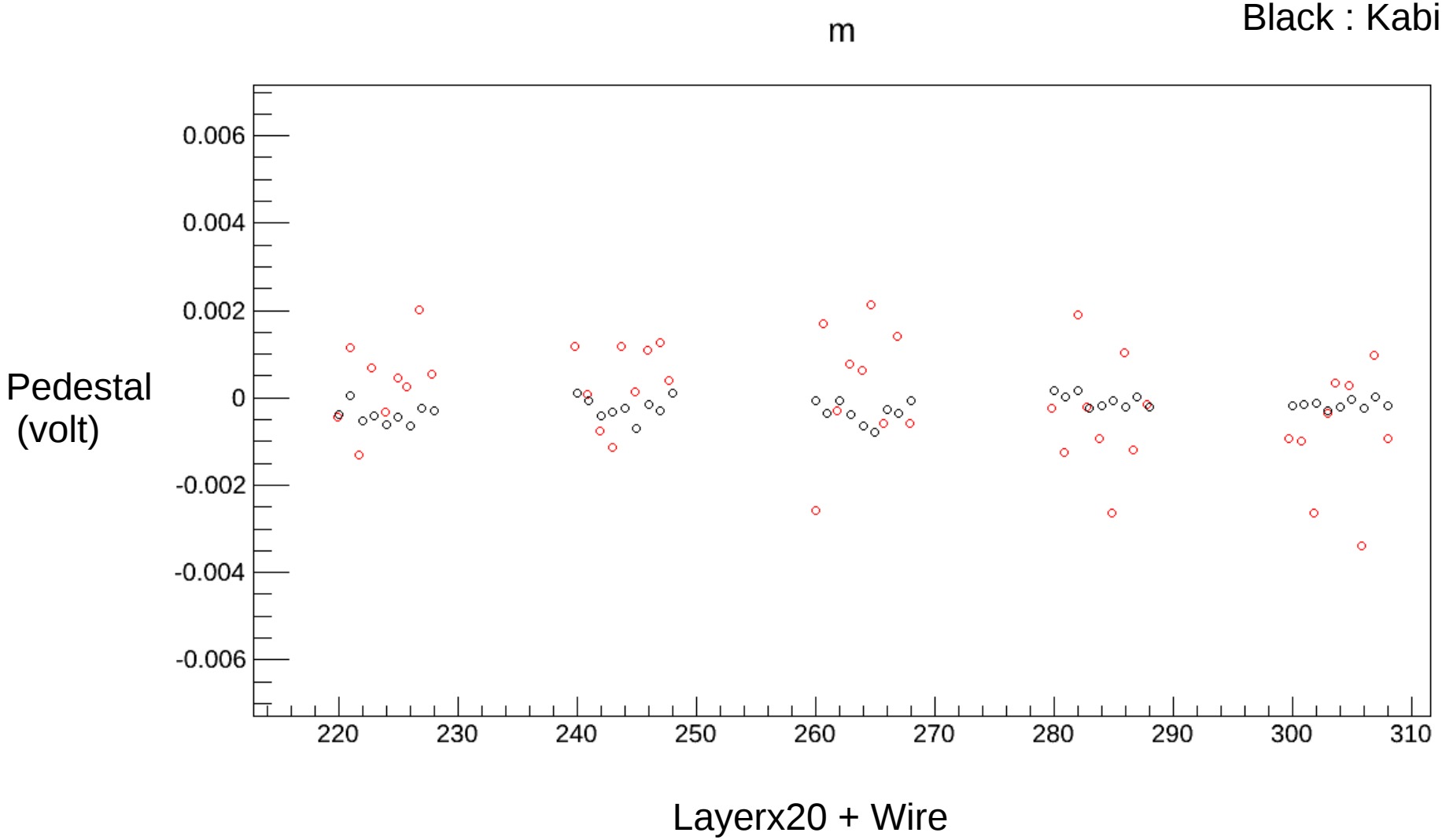
Pedestal values Kabir vs Vince -Front layers

Red : Vince
Black : Kabir



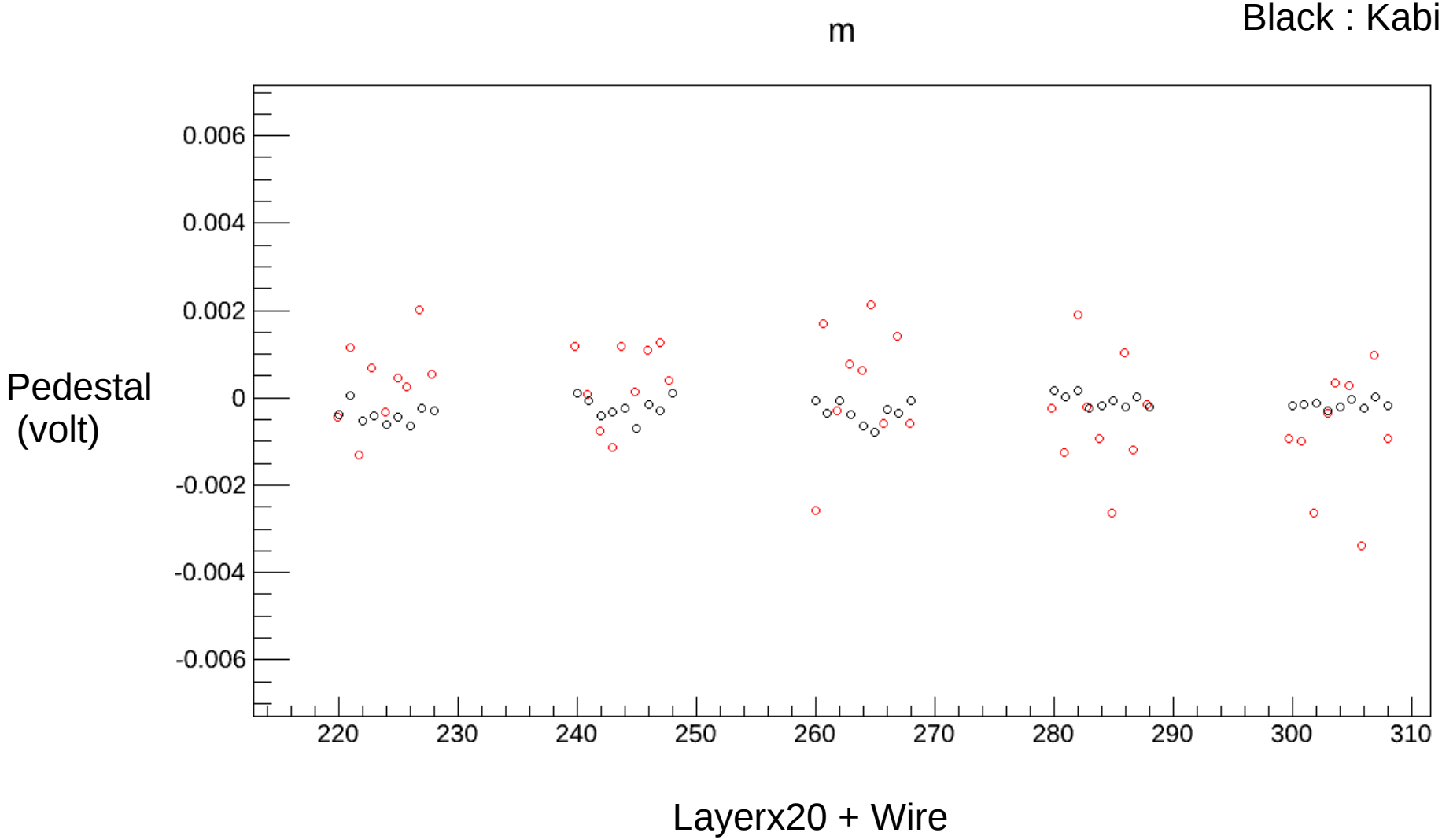
Pedestal values (Kabir vs Vince) -Back layers

Red : Vince
Black : Kabir



Pedestal values (Kabir vs Vince) -Back layers

Red : Vince
Black : Kabir



Open Question

- For the calculation of asymmetry, whether to use dynamic (pulse by pulse) pedestal or a constant pedestal ?
- A dynamic pedestal subtraction will be very process and time consuming.