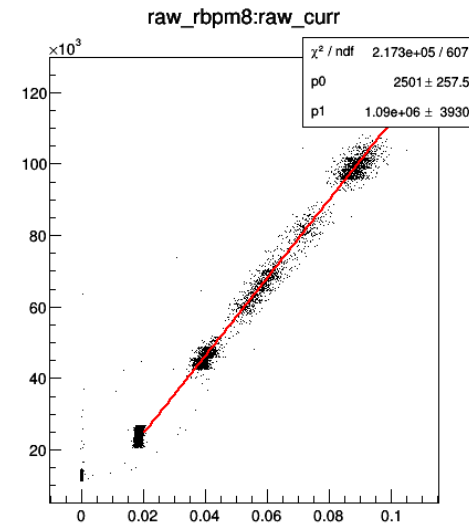
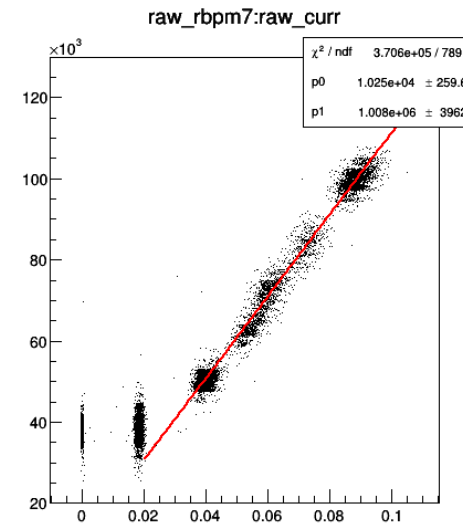
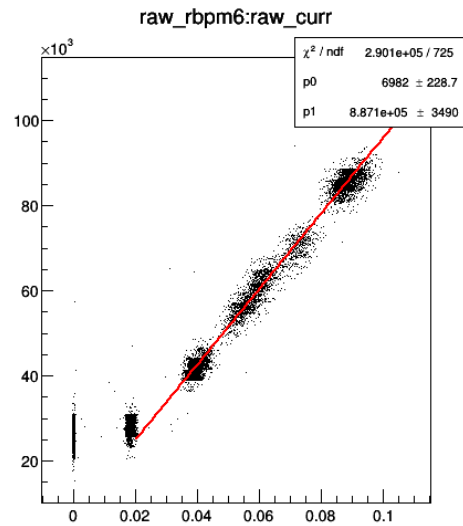
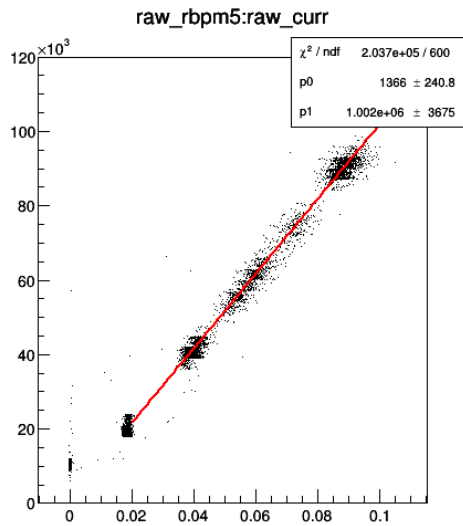
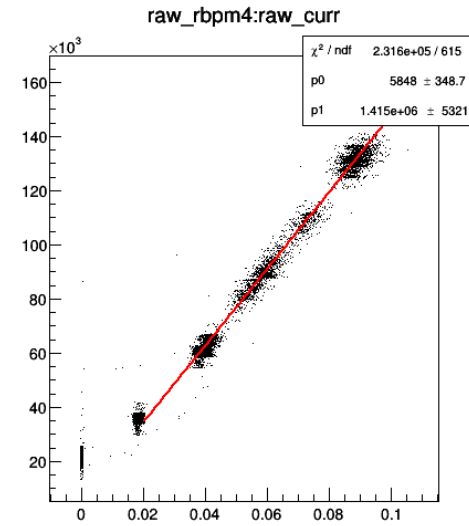
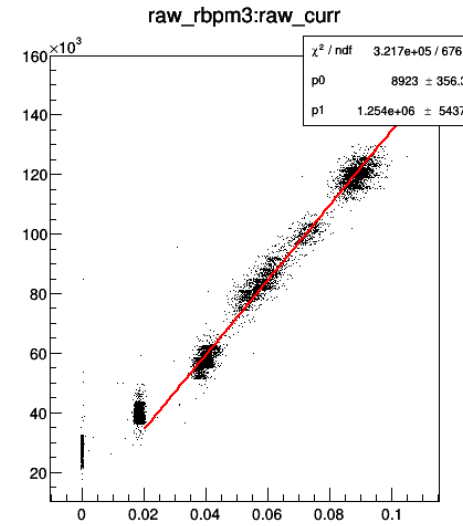
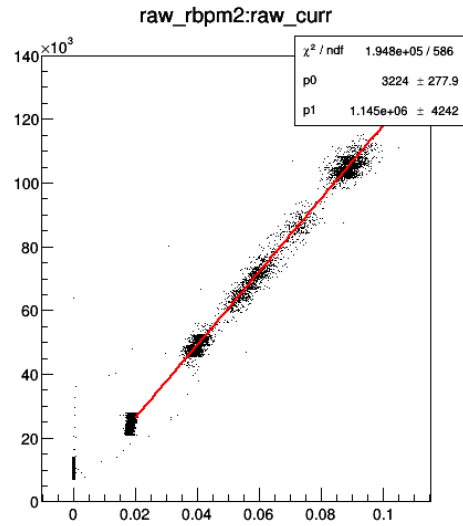
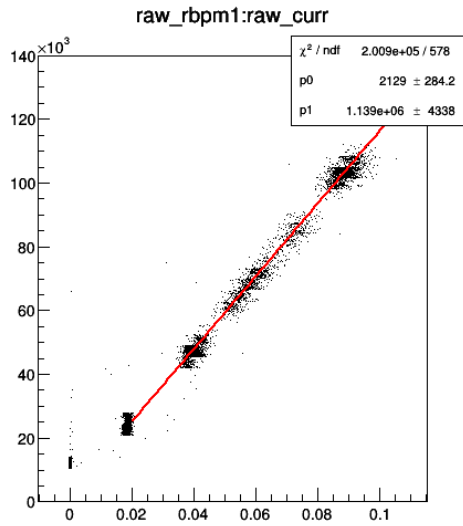


BPM status

Pengjia Zhu

Current VS raw bpm ADC value

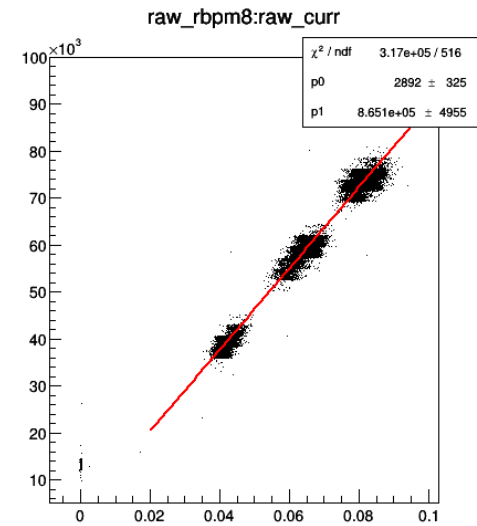
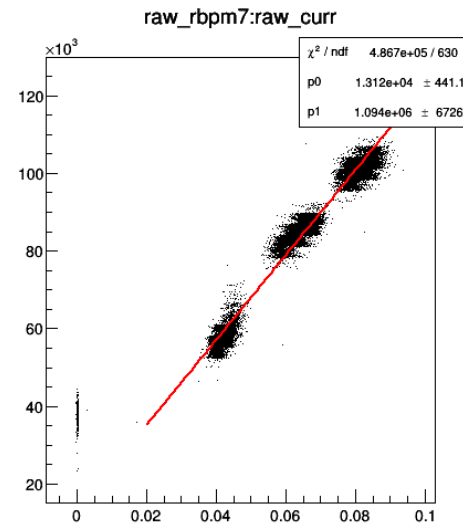
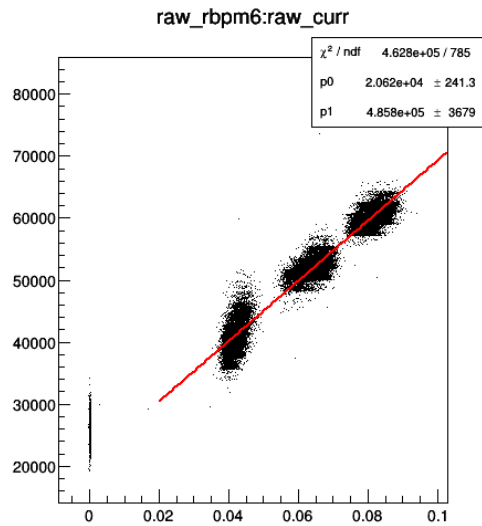
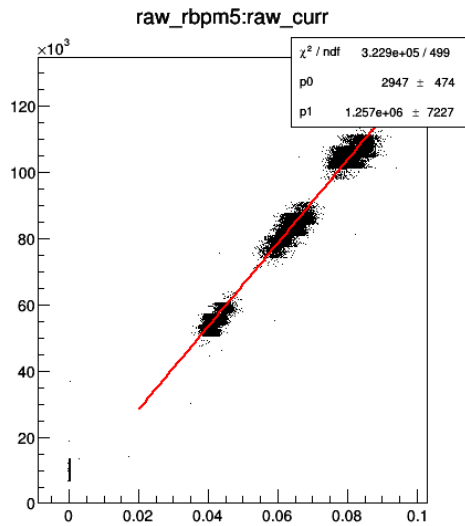
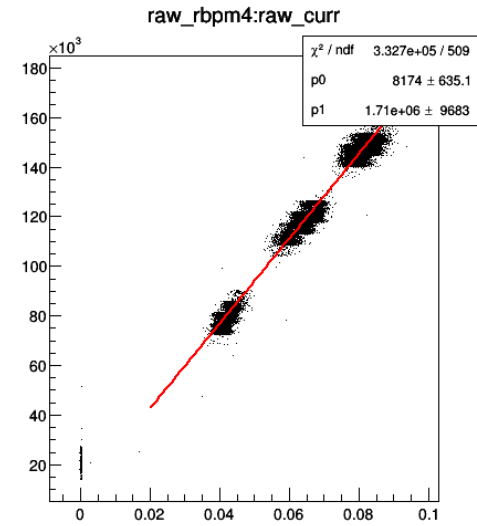
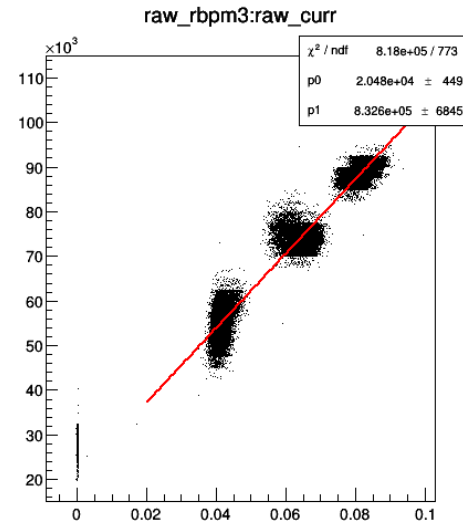
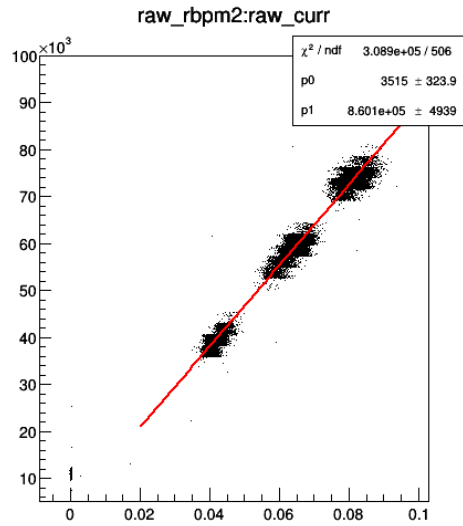
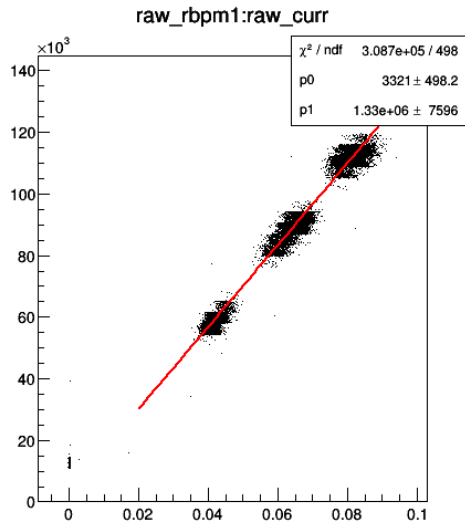
Position [1,0][1,0]



Signal should be propotional to current

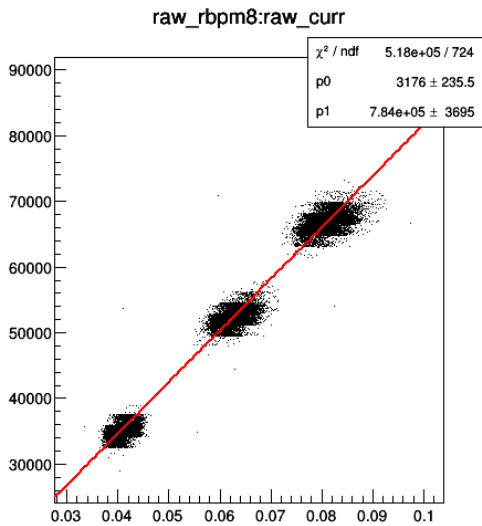
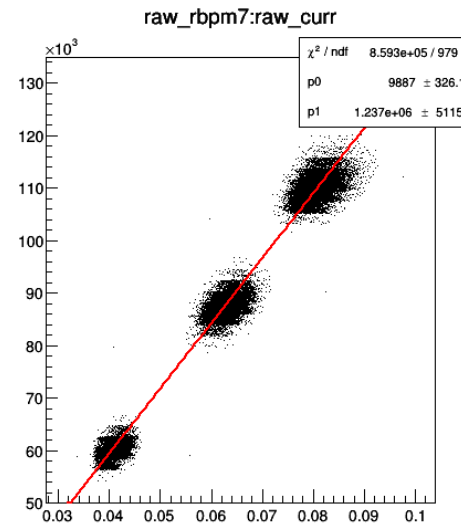
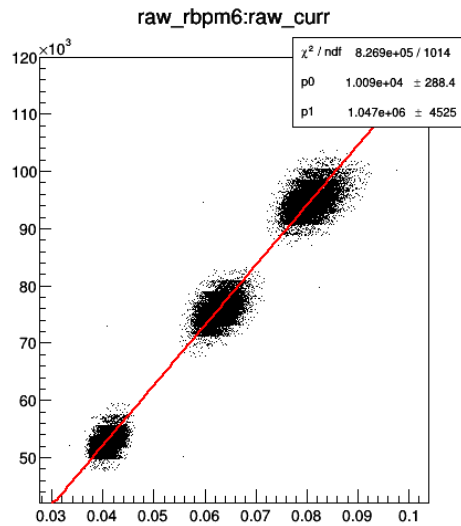
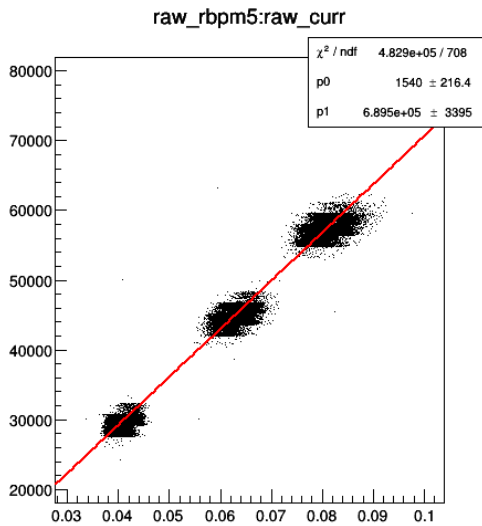
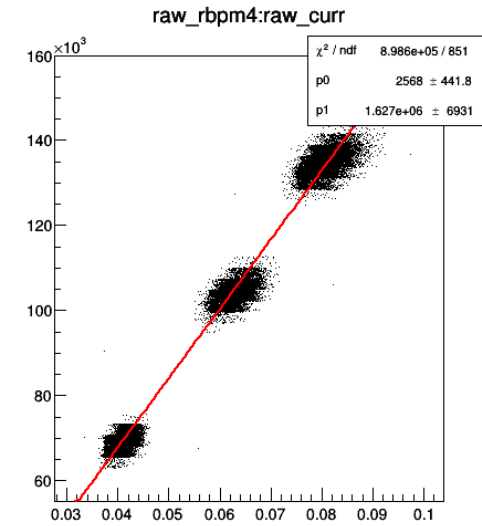
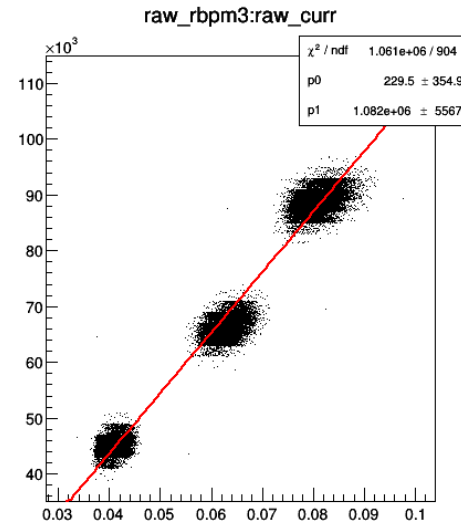
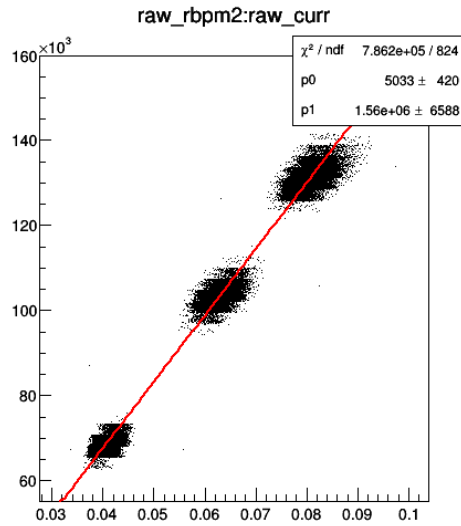
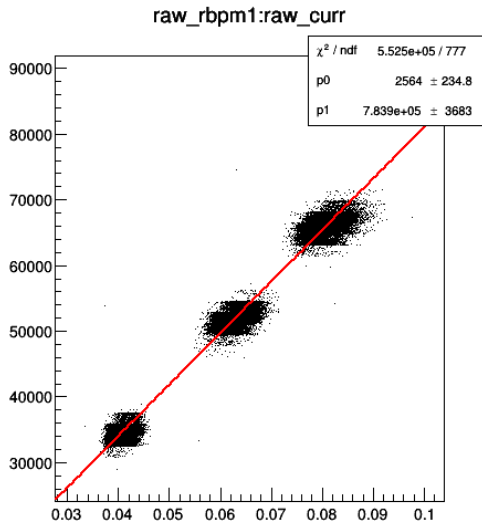
Current VS raw bpm ADC value

Position [5,4][4,5]



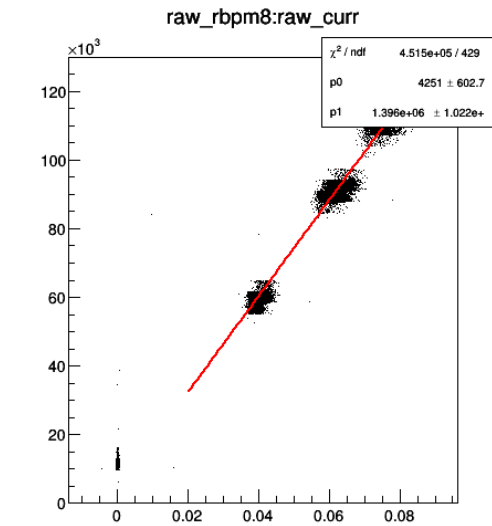
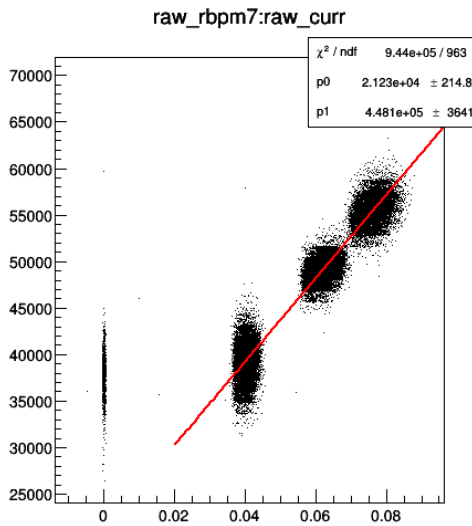
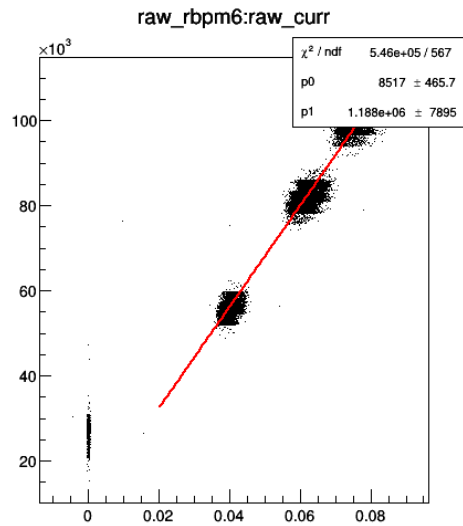
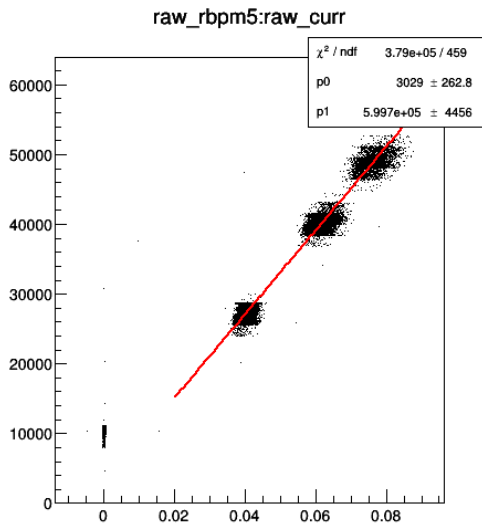
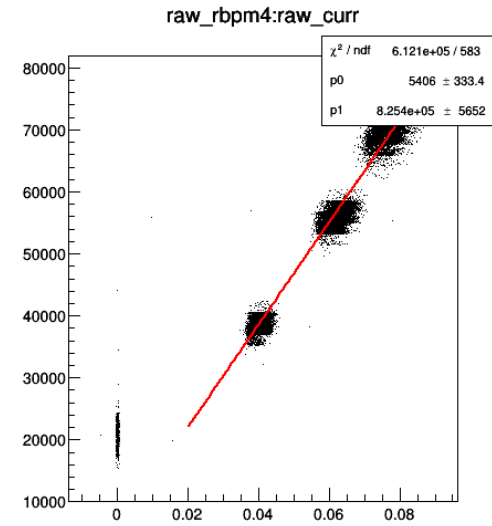
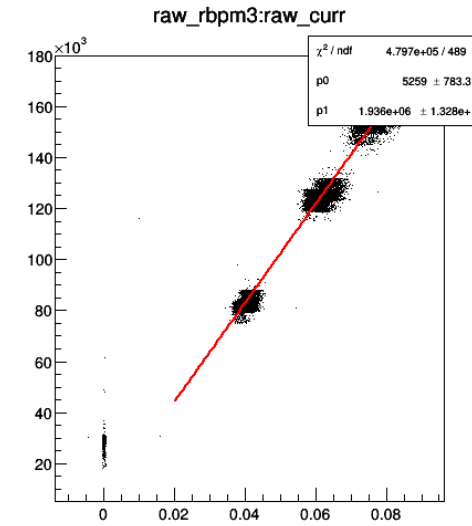
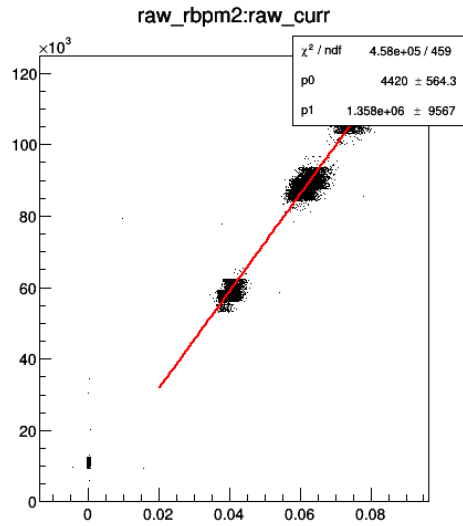
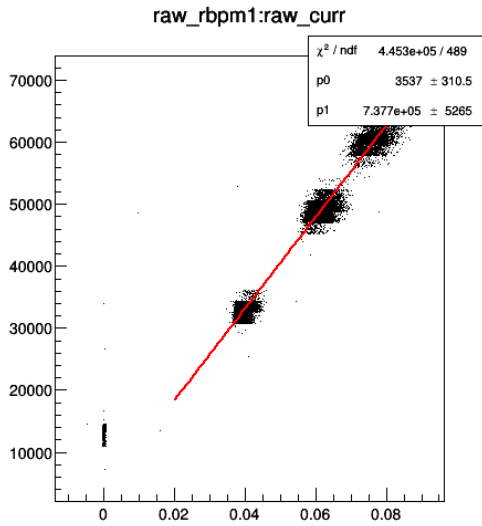
Current VS raw bpm ADC value

Position [4,-7][6,-6]



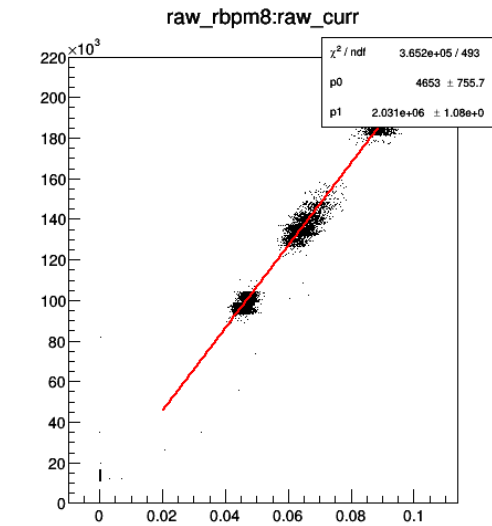
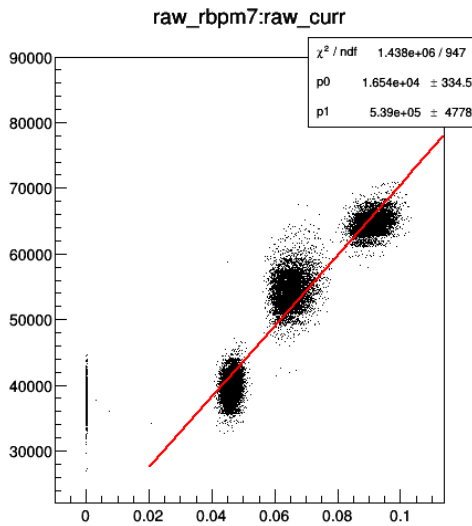
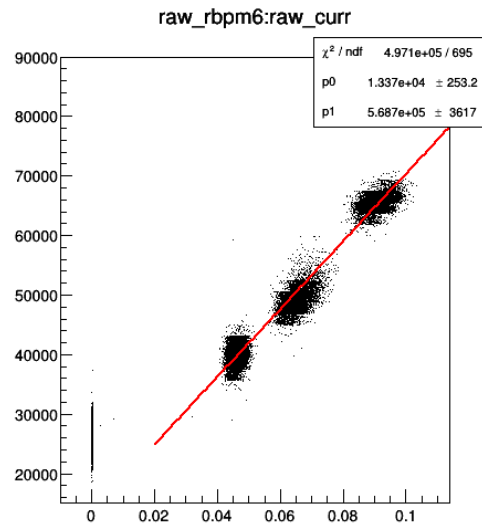
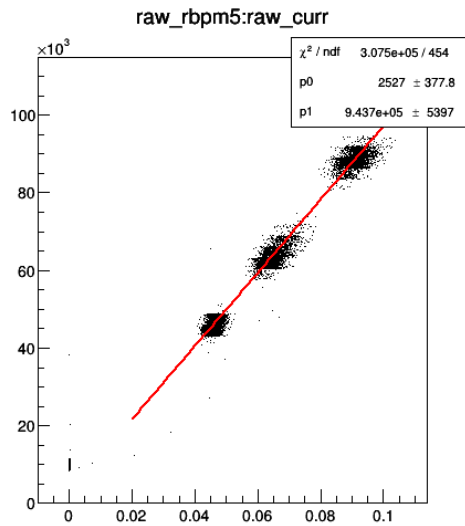
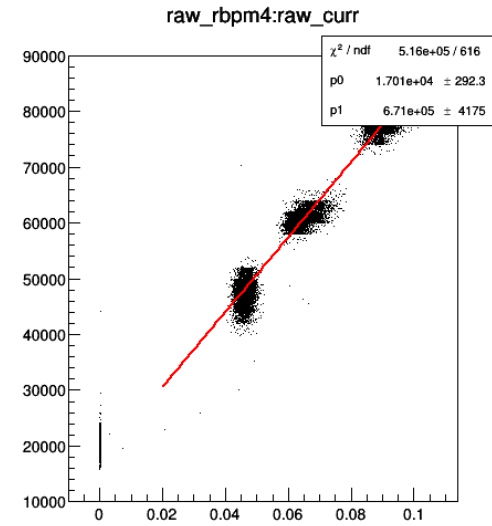
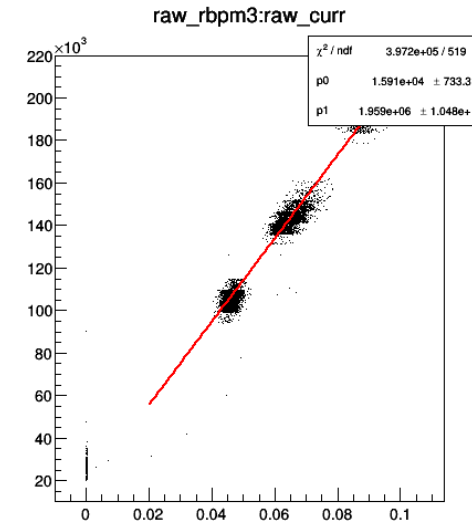
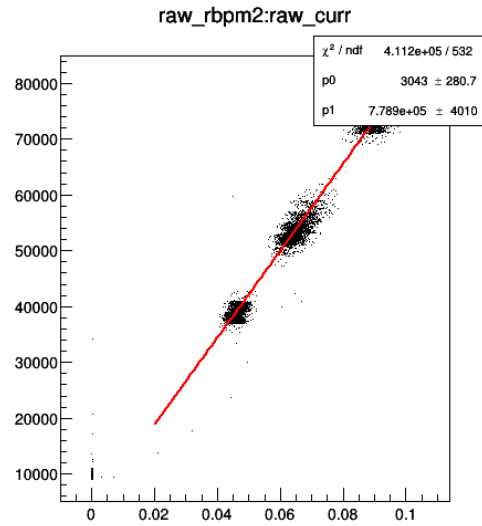
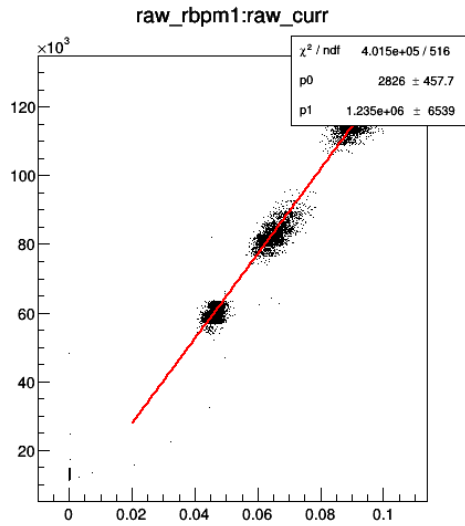
Current VS raw bpm ADC value

Position [-7,-5][-6,-7]



Current VS raw bpm ADC value

Position [-8,5][-9,4]



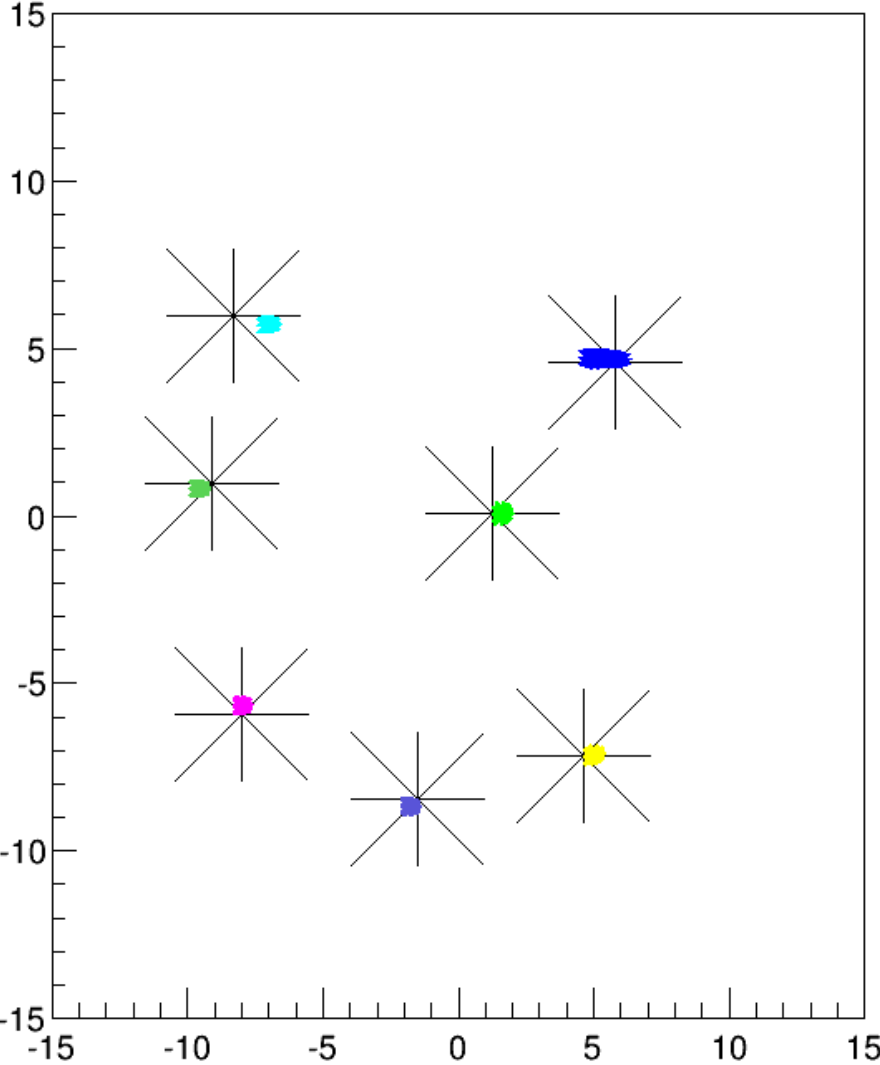
Different ped calculated by current fit for different beam position

| bpmpos | bpmachan1 | bpmachan2 | bpmachan3 | bpmachan4 |
|----------------|---------------|---------------|---------------|---------------|
| [1,0][1,0] | 2129.47615087 | 3223.58064006 | 8923.17271613 | 5848.18324197 |
| [-8,5][-9,4] | 2826.2677894 | 3042.90417431 | 15914.446024 | 17006.3645931 |
| [4,-7][6,-6] | 2564.22455041 | 5033.0917324 | 229.467170995 | 2567.66412589 |
| [-7,-5][-6,-7] | 3536.54474966 | 4419.69464257 | 5258.65494234 | 5405.71818267 |
| [5,4][4,5] | 3320.94377801 | 3514.67488799 | 20479.8202547 | 8173.7383332 |

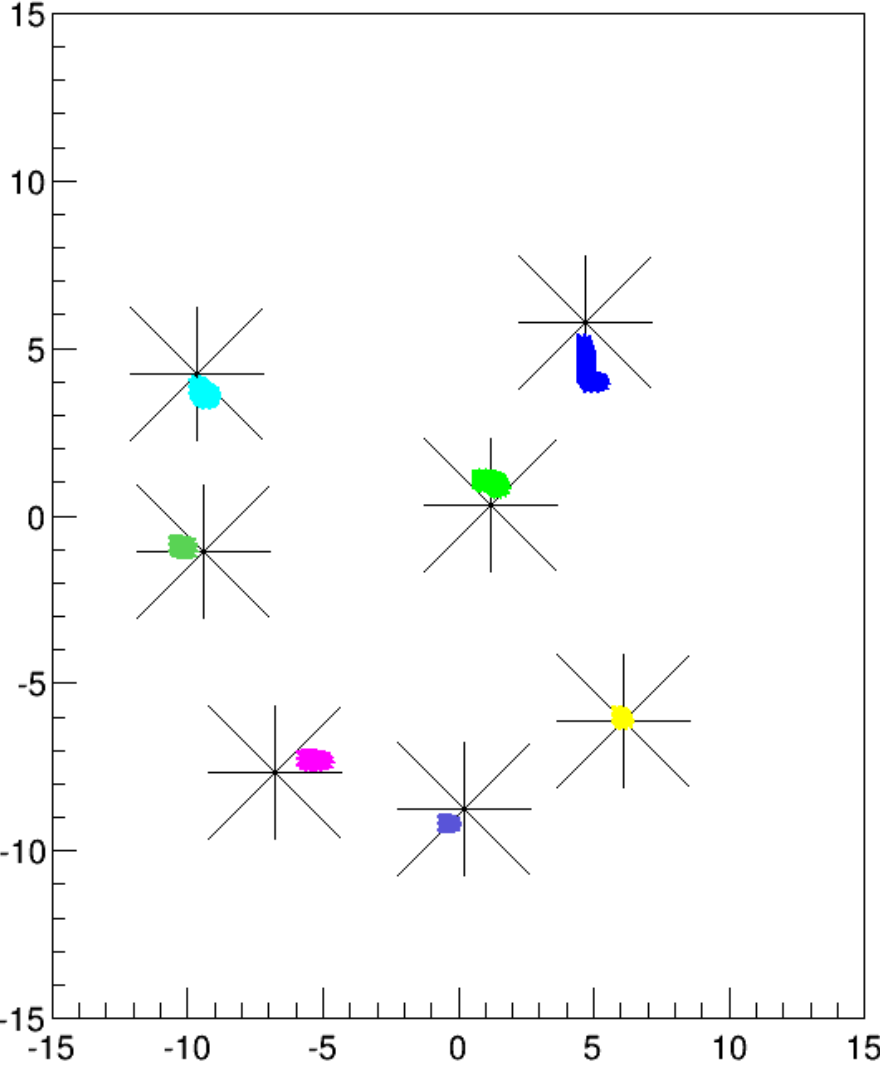
| bpmpos | bpmbchan1 | bpmbchan2 | bpmbchan3 | bpmbchan4 |
|----------------|---------------|---------------|---------------|---------------|
| [1,0][1,0] | 1365.83402926 | 6981.51670063 | 10249.7948502 | 2501.10584004 |
| [-8,5][-9,4] | 2527.35060936 | 13369.723759 | 16537.7006168 | 4652.90071211 |
| [4,-7][6,-6] | 1539.81226746 | 10090.4852376 | 9887.00451064 | 3175.53950969 |
| [-7,-5][-6,-7] | 3028.75550714 | 8516.97961566 | 21230.0960905 | 4251.32182552 |
| [5,4][4,5] | 2947.37915424 | 20622.3265791 | 13121.1982386 | 2892.41817999 |

Using pedestal(calculated by current fit) subtract (without nonlinear fitting of calibration data)

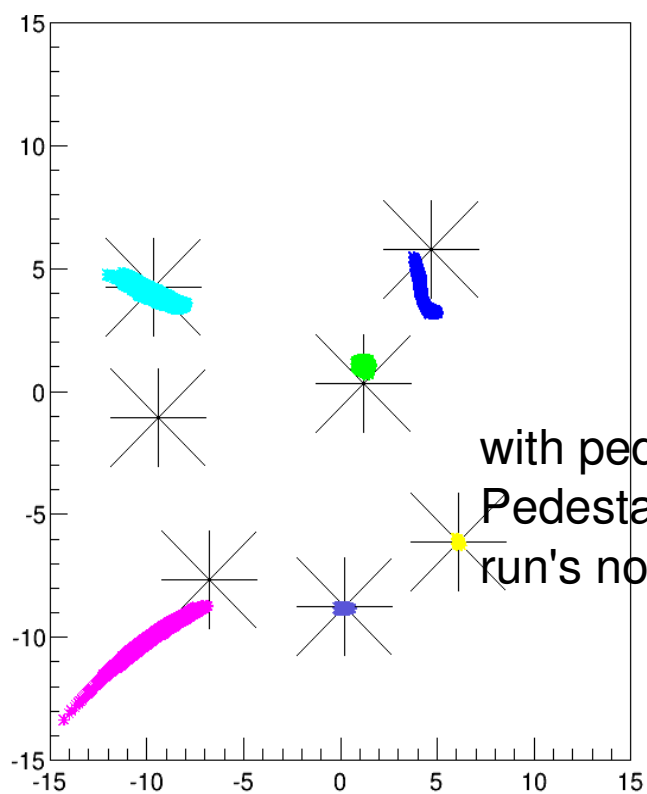
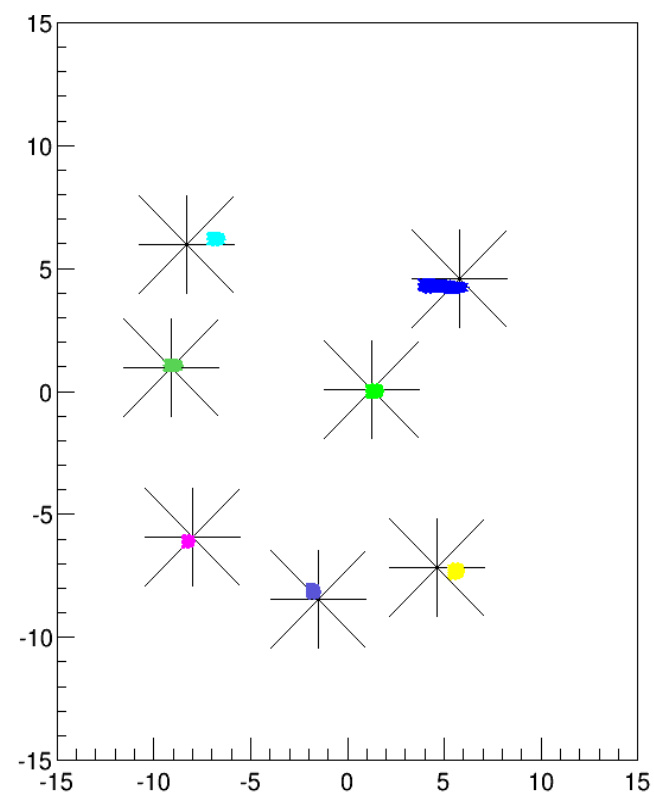
bpm calibration



bpm calibration

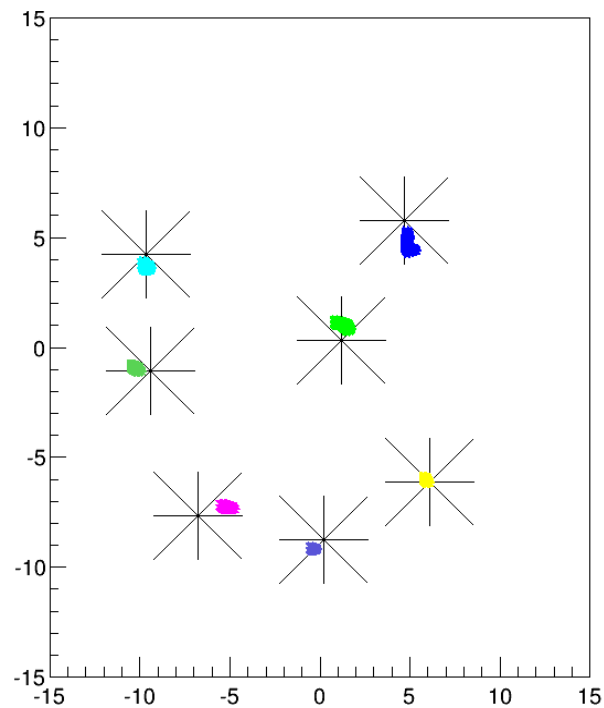
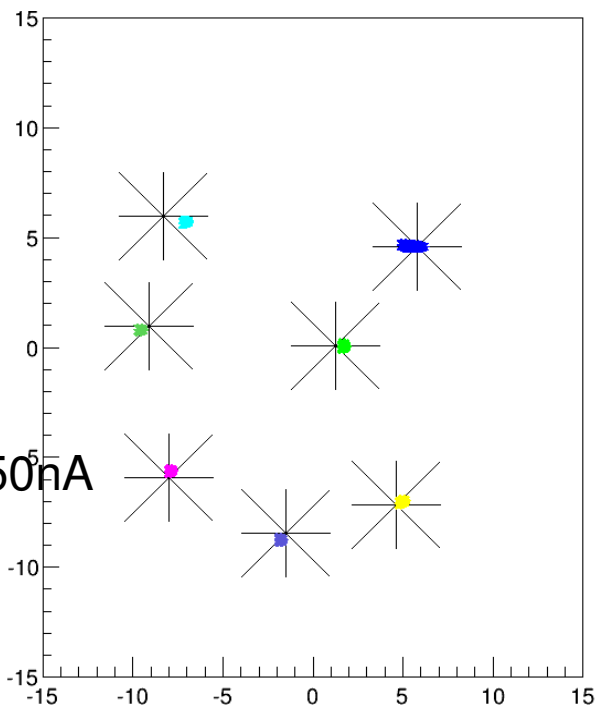


compare

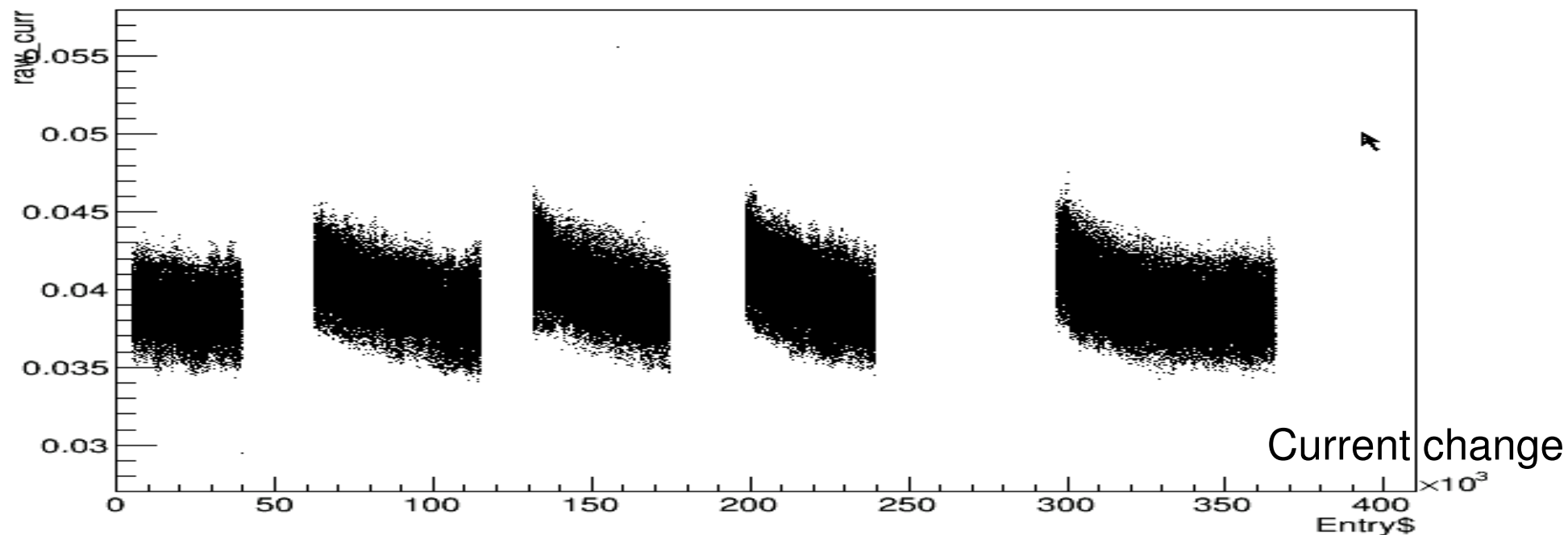


with pedestal(no curr) subtract - 50nA
Pedestal use 5494(one of calibration
run's no current part

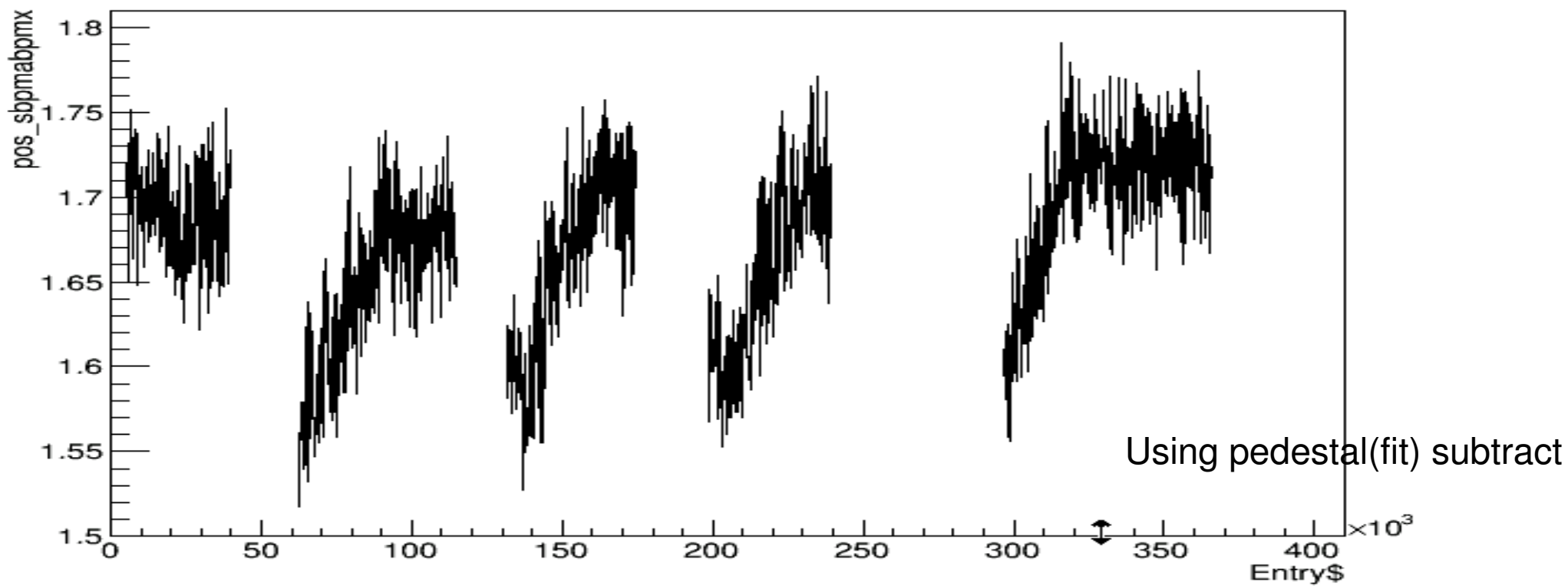
without pedestal subtract - 50nA



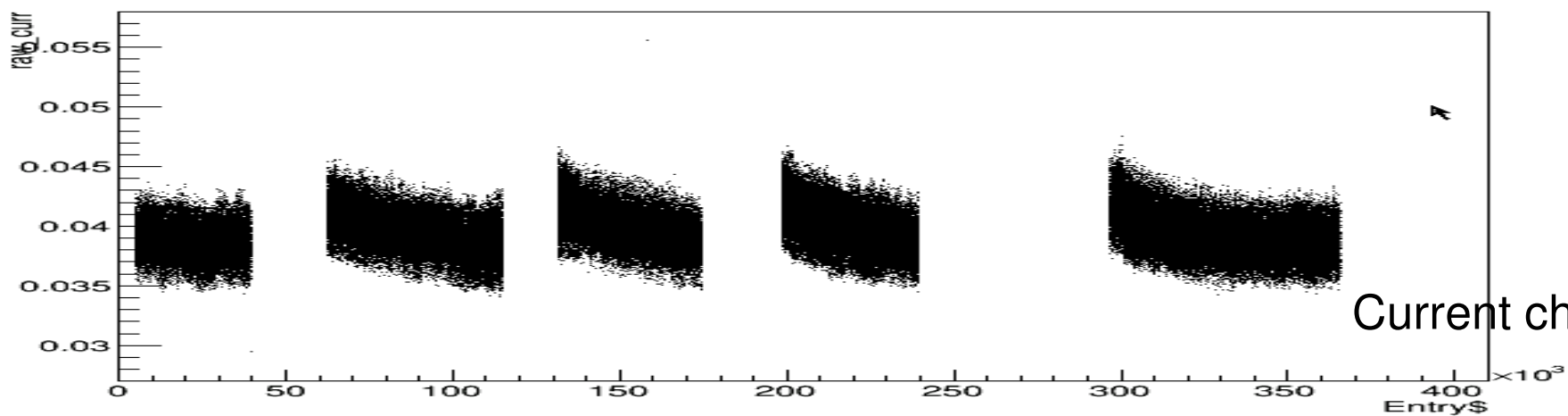
raw_curr:Entry\$ {raw_sbpmavail>0.5}



pos_sbpmabpmx:Entry\$ {raw_sbpmavail>0.5}



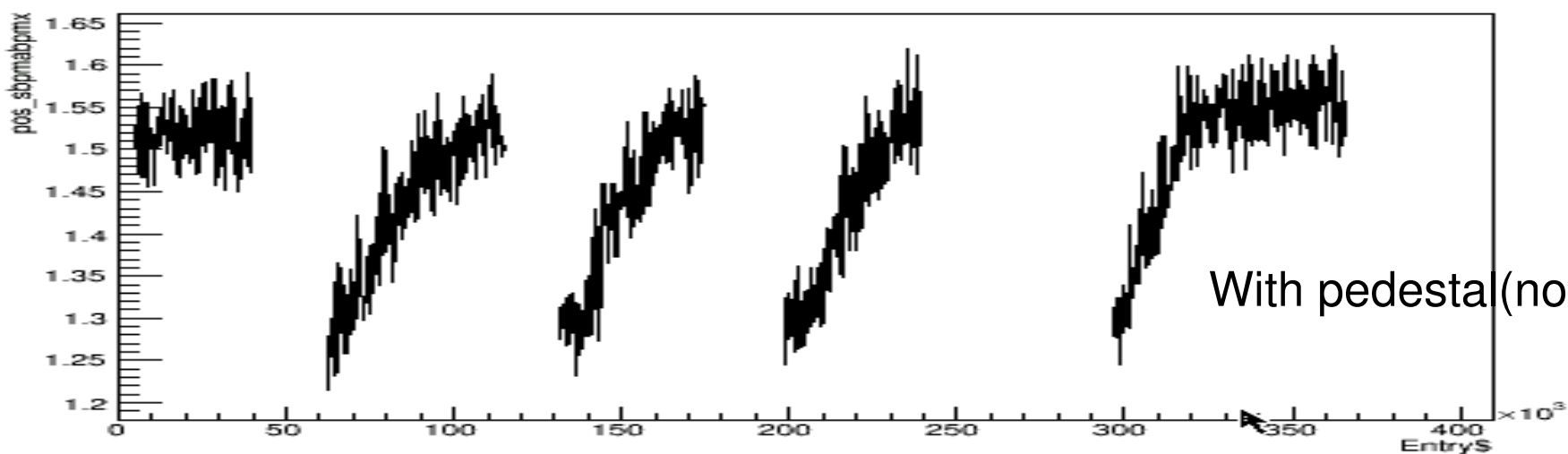
raw_curr:Entry\$ {raw_sbpmaavail>0.5}



compare

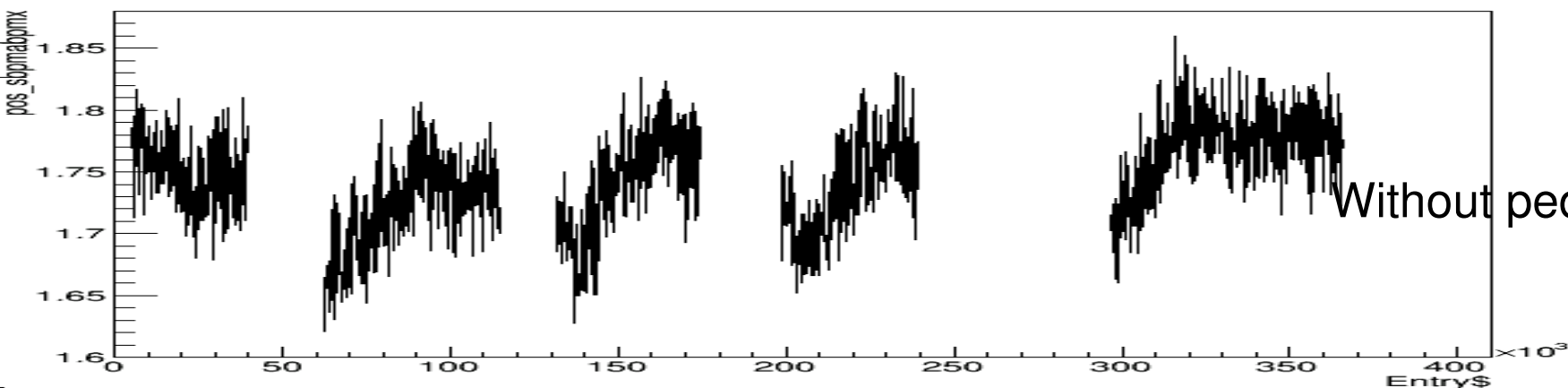
Current change

pos_sbpmaabpmx:Entry\$ {raw_sbpmaavail>0/5}



With pedesta (no curr) subtract

pos_sbpmaabpmx:Entry\$ {raw_sbpmaavail>0/5}



Without pedestal subtract

Another trying:

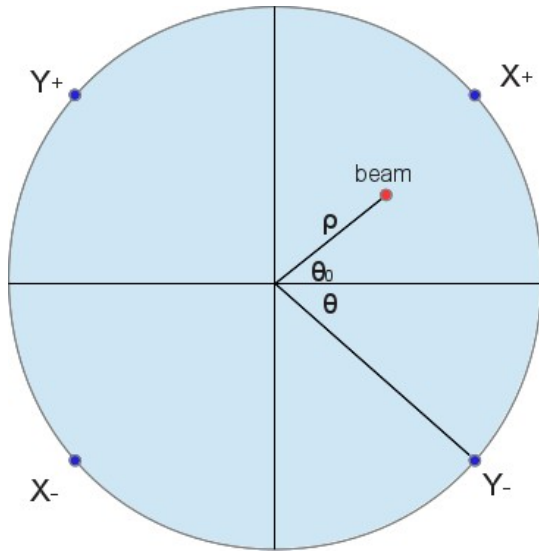
- Use g_x, g_y fit to minimize current dependent --- without success
 - Will do more job to minimize current dependent
- Try to use non linear fitting of calibration data --- without success
 - Will do again

Todo:

- Take more current fit to see if it is stable during experiment

backup

BPM calibration method



A-A_{ped}

$$x_b = \frac{A_+ - g_x A_-}{A_+ + g_x A_-}$$

$$x = r x_b \left(\frac{1}{x_b^2 + y_b^2} - \frac{1}{\sqrt{x_b^2 + y_b^2} \sqrt{x_b^2 + y_b^2 - 1}} \right)$$

Signal for each antenna:

$$\varphi = \varphi_0 \frac{r^2 - \rho^2}{r^2 + \rho^2 - 2r\rho \cos(\theta - \theta_0)}$$

$$\theta = \frac{\pi}{4} \quad \frac{3\pi}{4} \quad -\frac{3\pi}{4} \quad -\frac{\pi}{4} \quad \text{angle for 4 antennas}$$

r : BPM vacuum chamber radius (17.3mm)

ρ : radial position of beam

θ_0 : angle position of beam

$$\begin{bmatrix} x_{harp1} \\ x_{harp2} \\ x_{harp3} \end{bmatrix} = \begin{bmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$