

# Status Report #36

- ✓ Writing abstract for JPS
- ✓ Cosmic-ray measurement
  - Time walk correction
- ✓ About next plan

2020. 07. 17 (Fri)

Tohoku Univ. M1

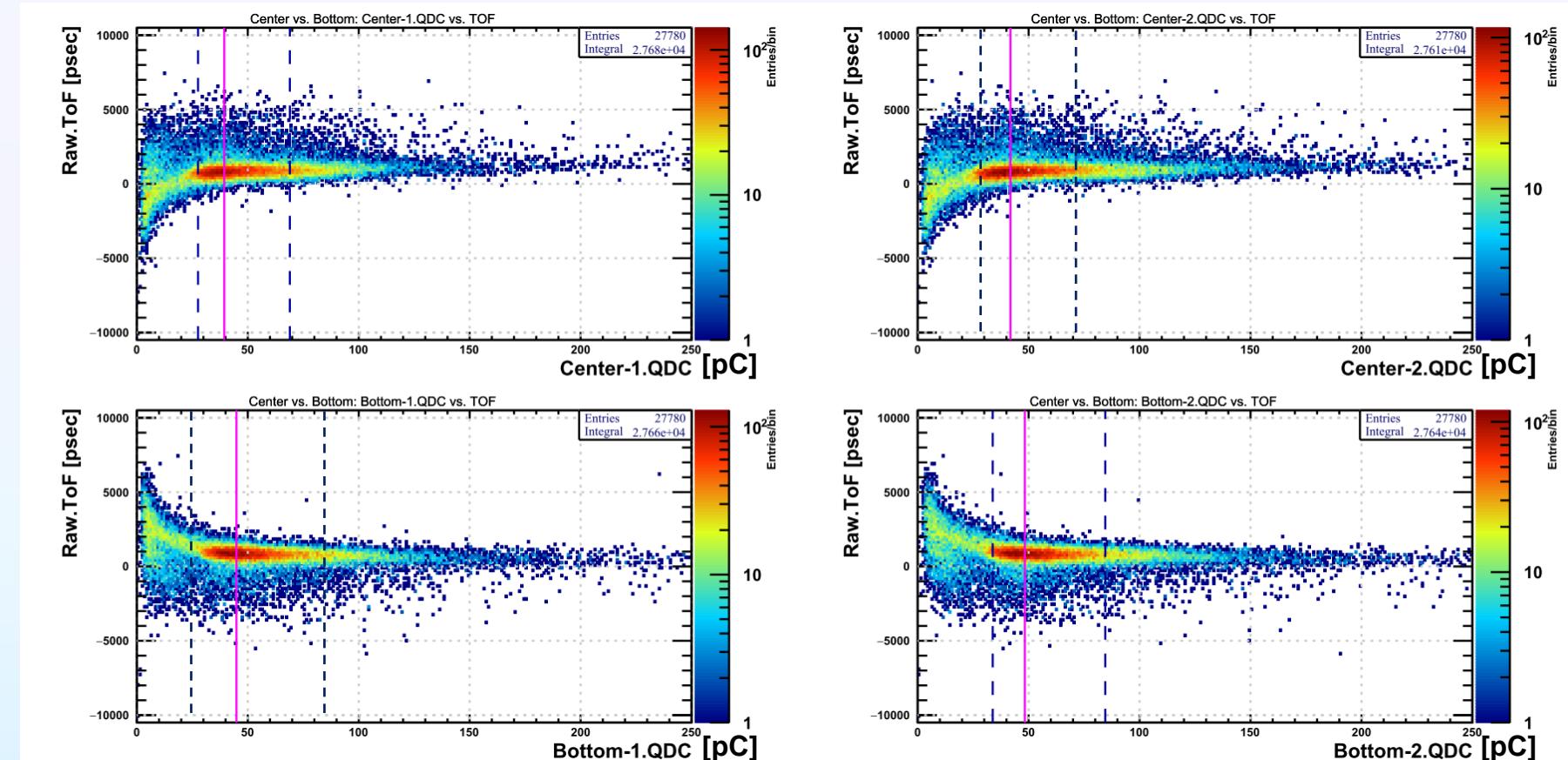
Tomomasa FUJIWARA



- 補正を行う方法を考えて、解析をやり直した

補正前の  
生のTOF vs. 各chでのQDC相関  
(但しペデスタル=0 pC)

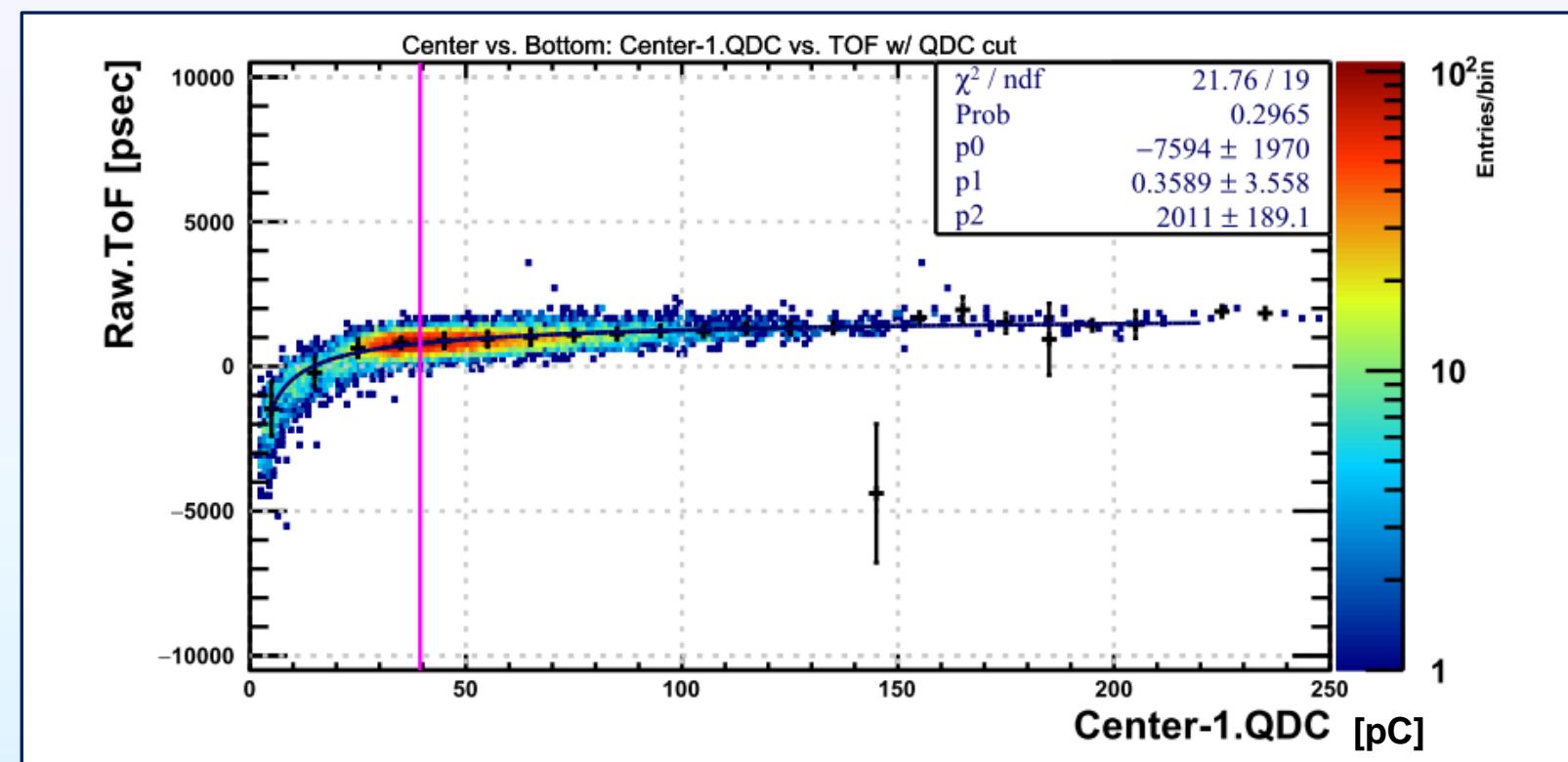
緑色の線で挟んだ範囲を選択する



- 横軸(QDC)に対して10pCずつの範囲に分割し、縦軸(ToF)に射影
- その分布にGaussianをフィット
- 得られるmeanを点、  
sigmaを誤差棒としたグラフを作る
- このグラフに補正関数をフィット
- 補正関数は以下の式:

$$f(x) = \frac{p_0}{\sqrt{x - p_1}} + p_2$$

- あるシンチレータ2本の組合せを考えるとき、  
MPPCは全4ch  
⇒ 4ch分の関数が得られる。



- 得られた補正関数4本と生のTOFから以下のようにして補正を行う

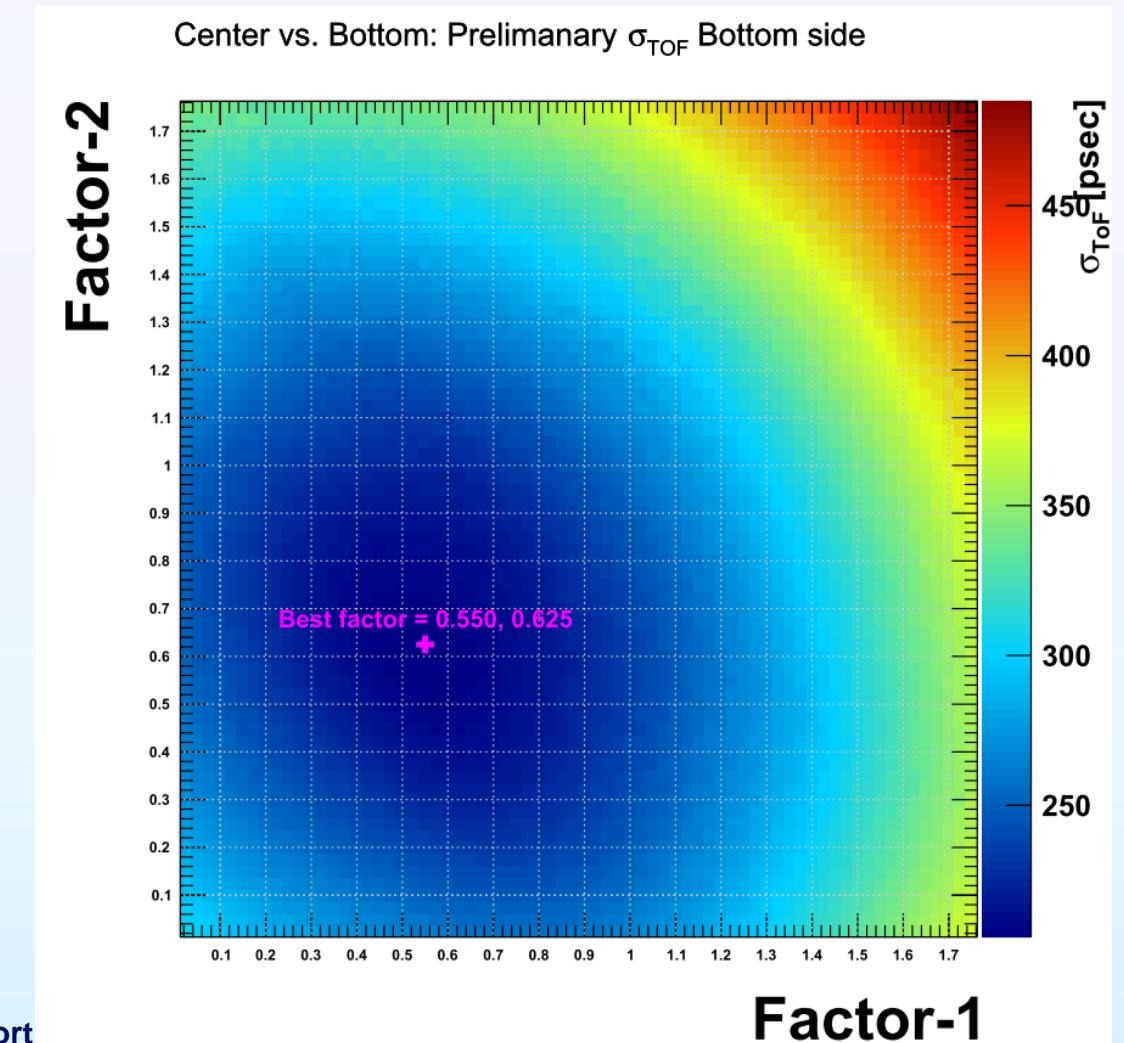
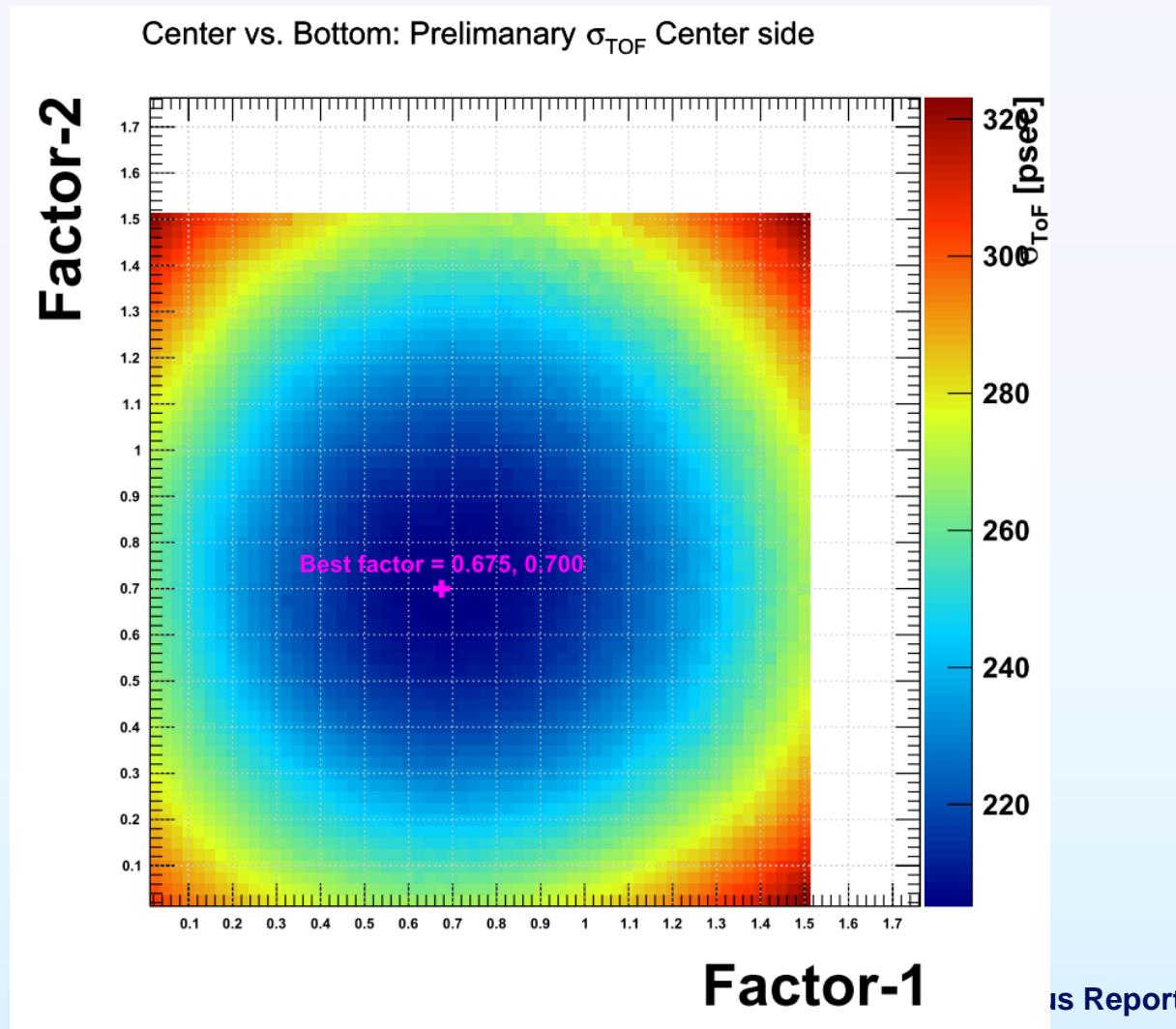
$$\text{dec. TOF} = \text{raw. TOF} - \sum_{i=1}^4 c_i f_i(QDC_i)$$

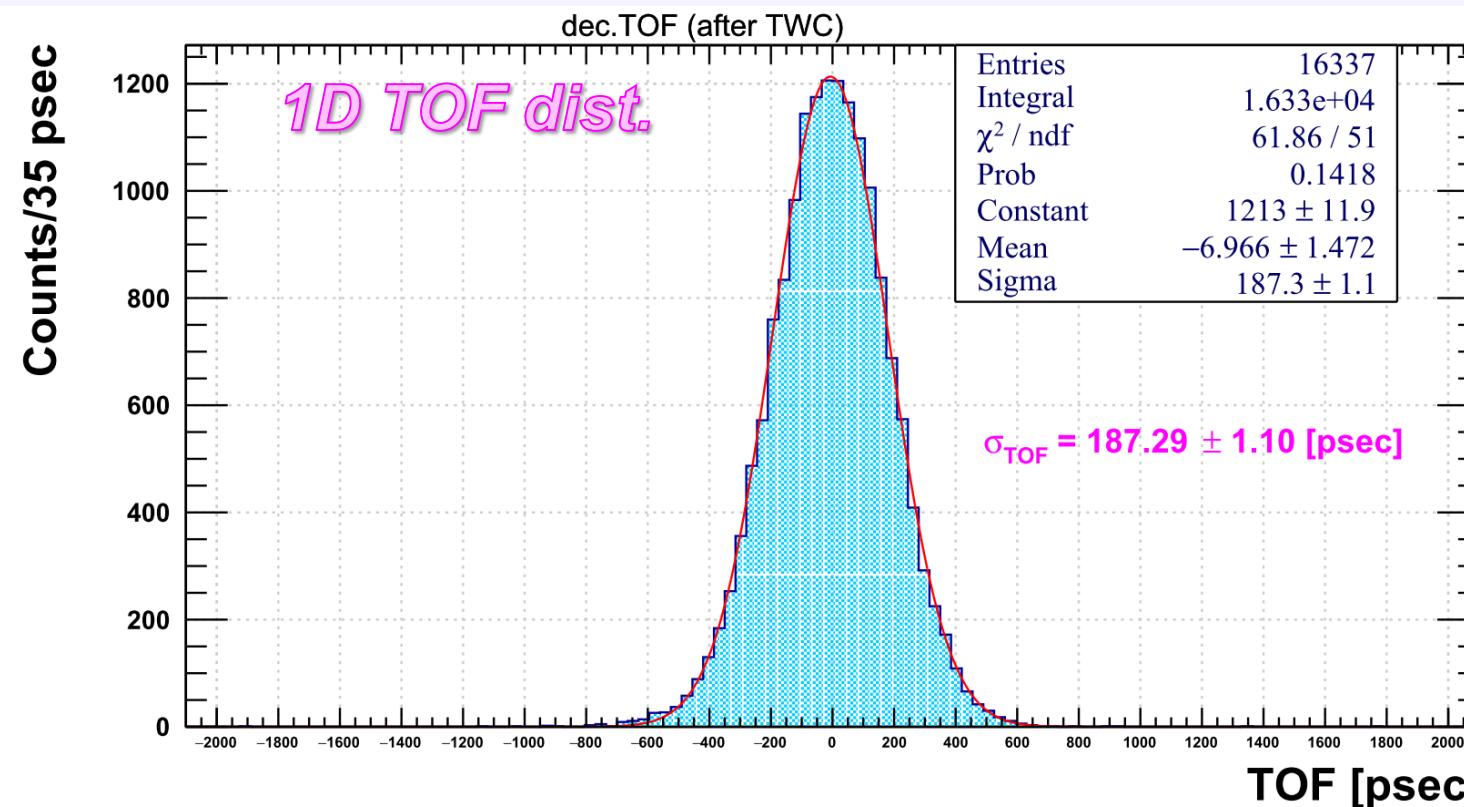
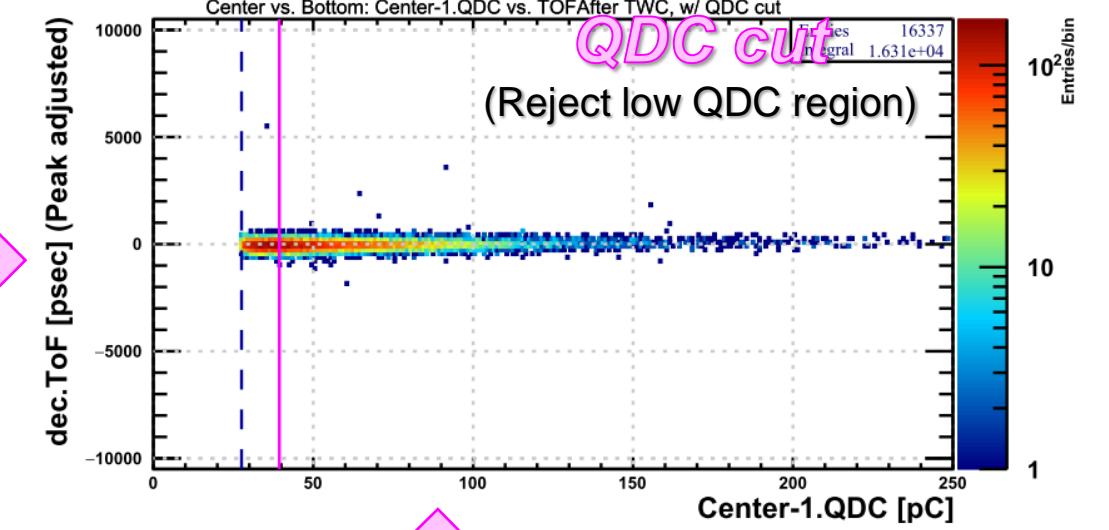
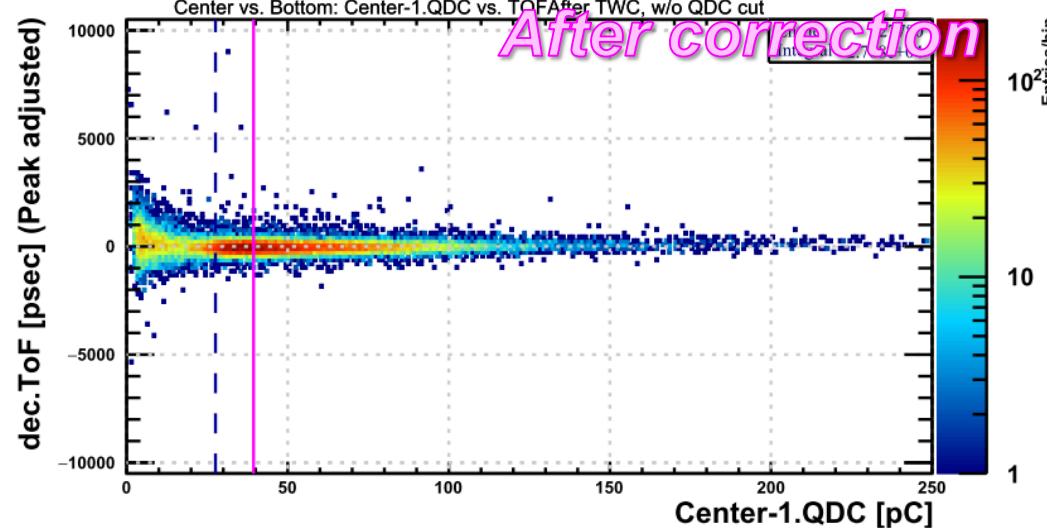
- $c_i$ : 各chに対する係数. Time walk には全チャンネルが寄与を持つ  
⇒ 各chの寄与の大きさをバランスさせるようなもの(のつもりで入れた)
- 最終的なTOFの幅(Gaussian をフィットした際の $\sigma$ )を最小にするような係数  $c$  の組合せを探す

# Time walk correction

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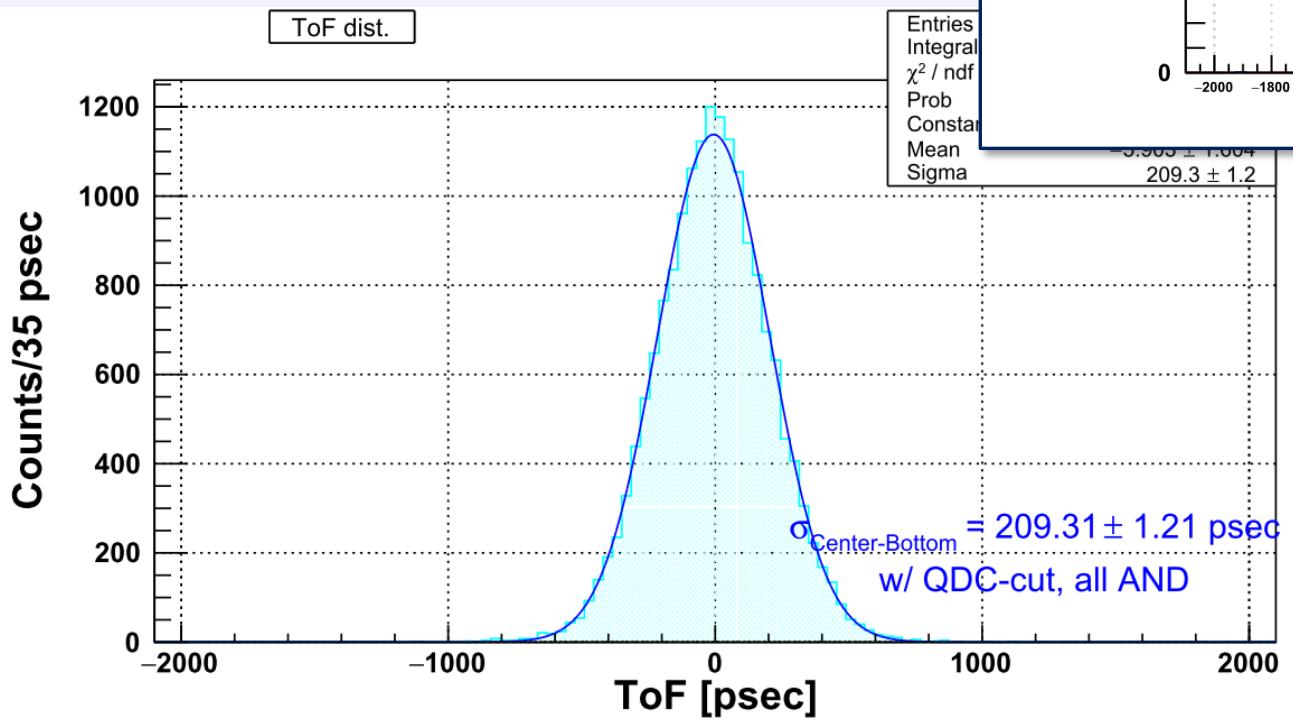
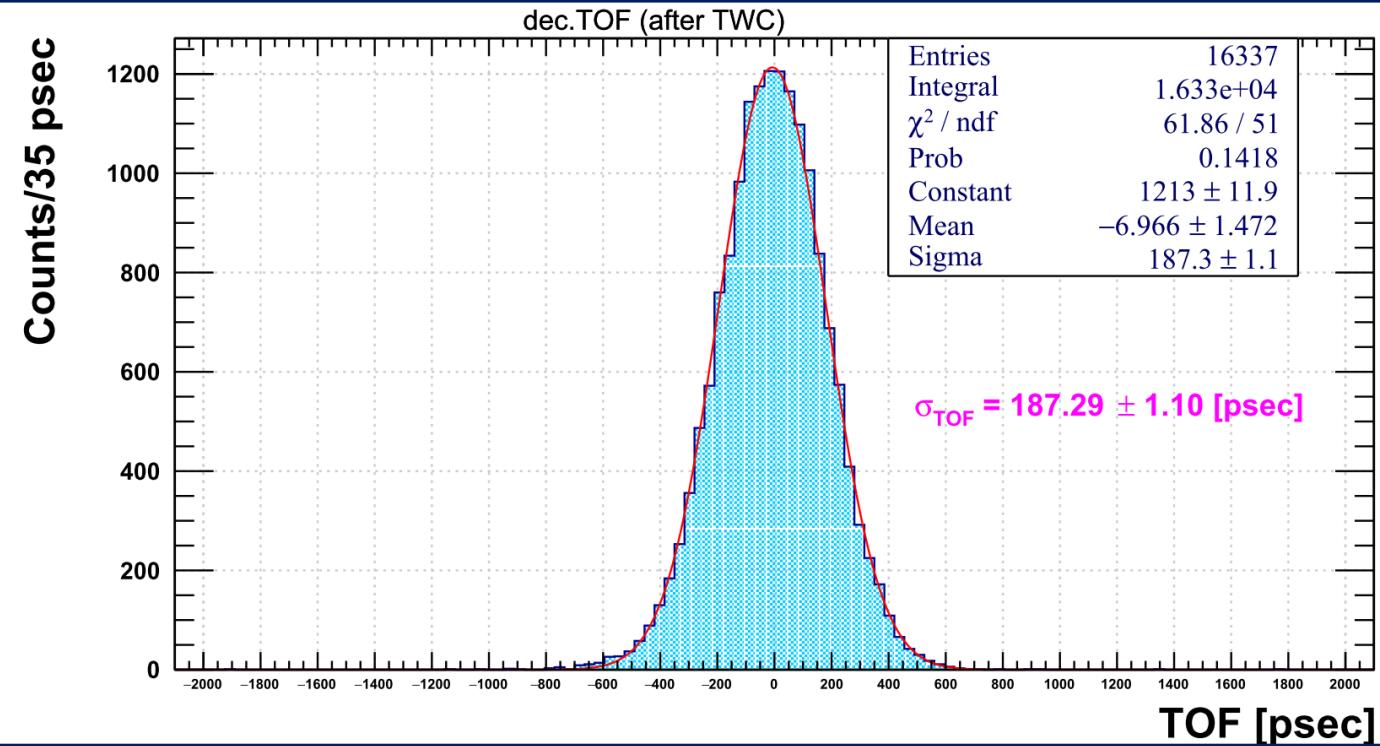
- Search best parameters
- 細かく刻んでみたが、かかる時間(~40 min.)に対してそこまで意味はなかった





# Comparison to previous method

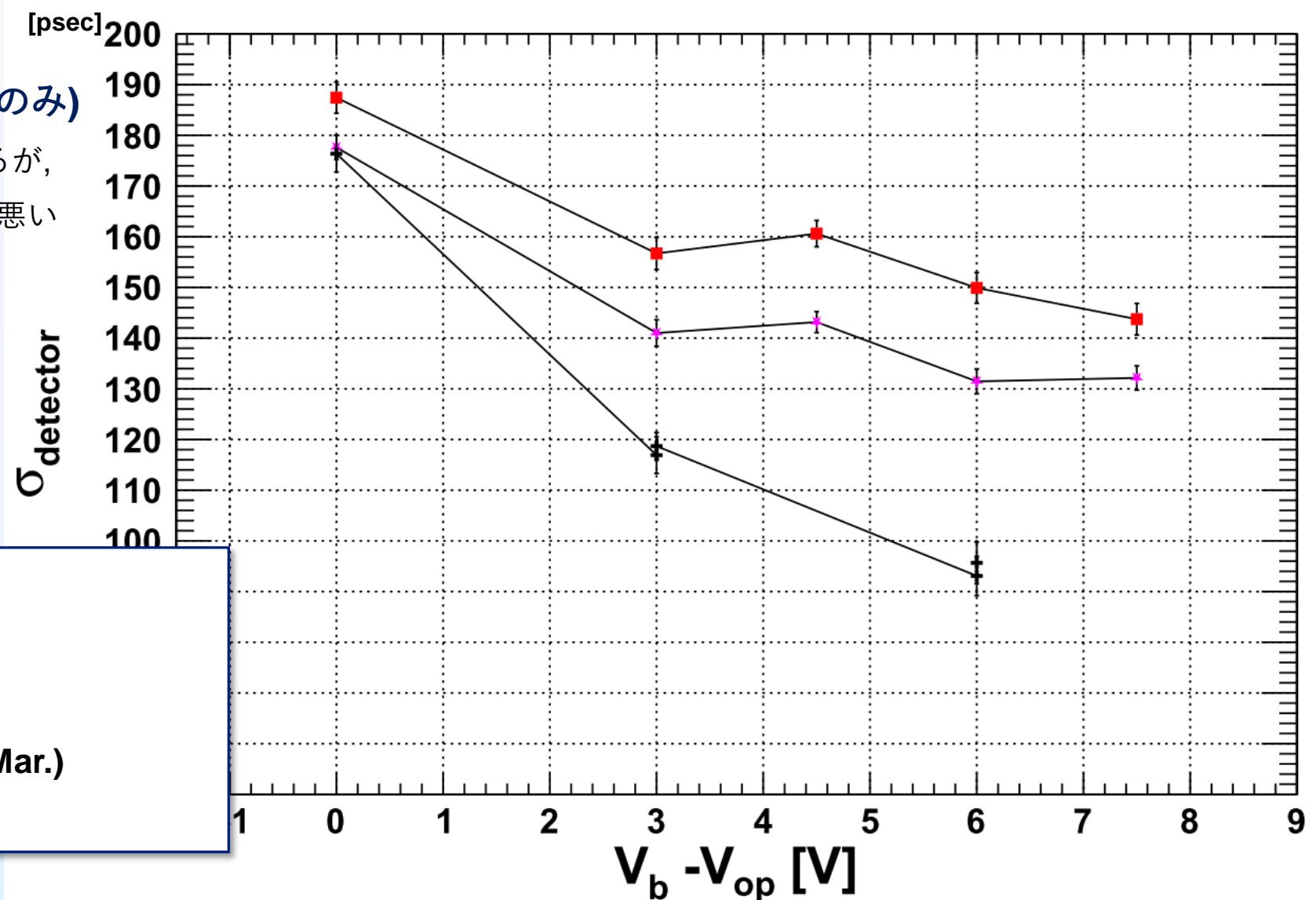
7



QDCカットは基本的には同じ条件。  
QDC>(分布QDCのピーク)×0.5

✓ 結果( $5^t \times 11^w$ のシンチレータのみ)

- 各点~15-20 psecの改善がみられるが、やはり、3月のデータより明らかに悪い
- 基盤を変えたことによる影響?

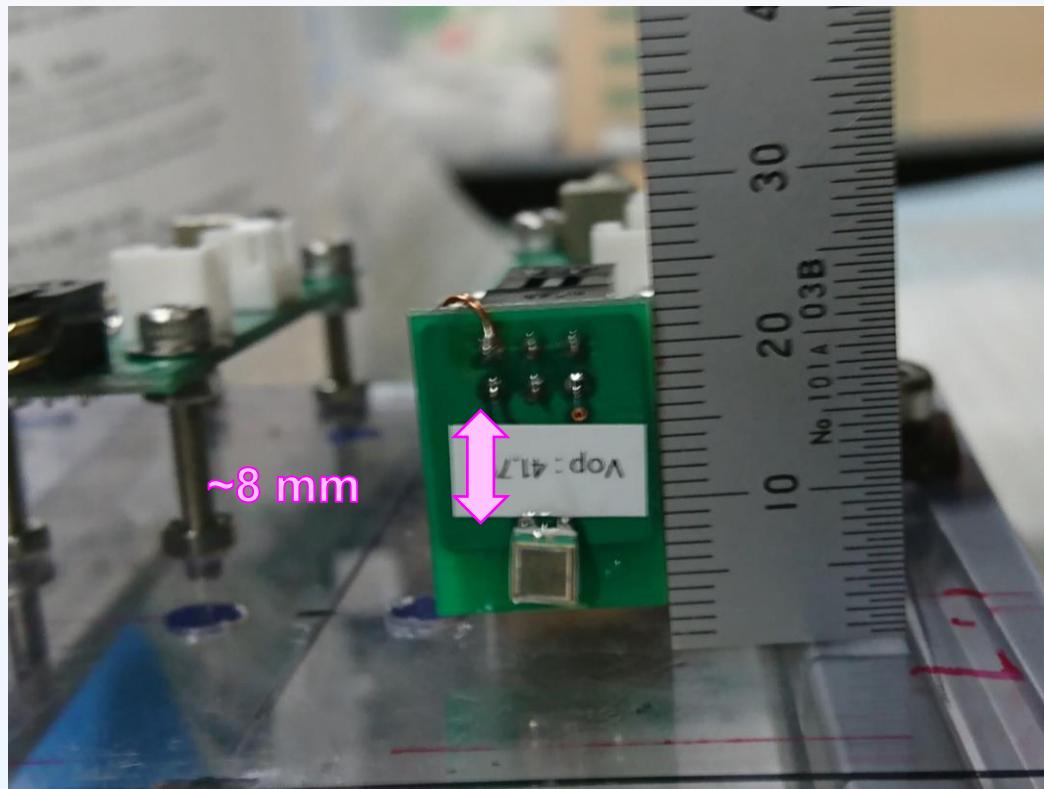


■ : Old method, New board

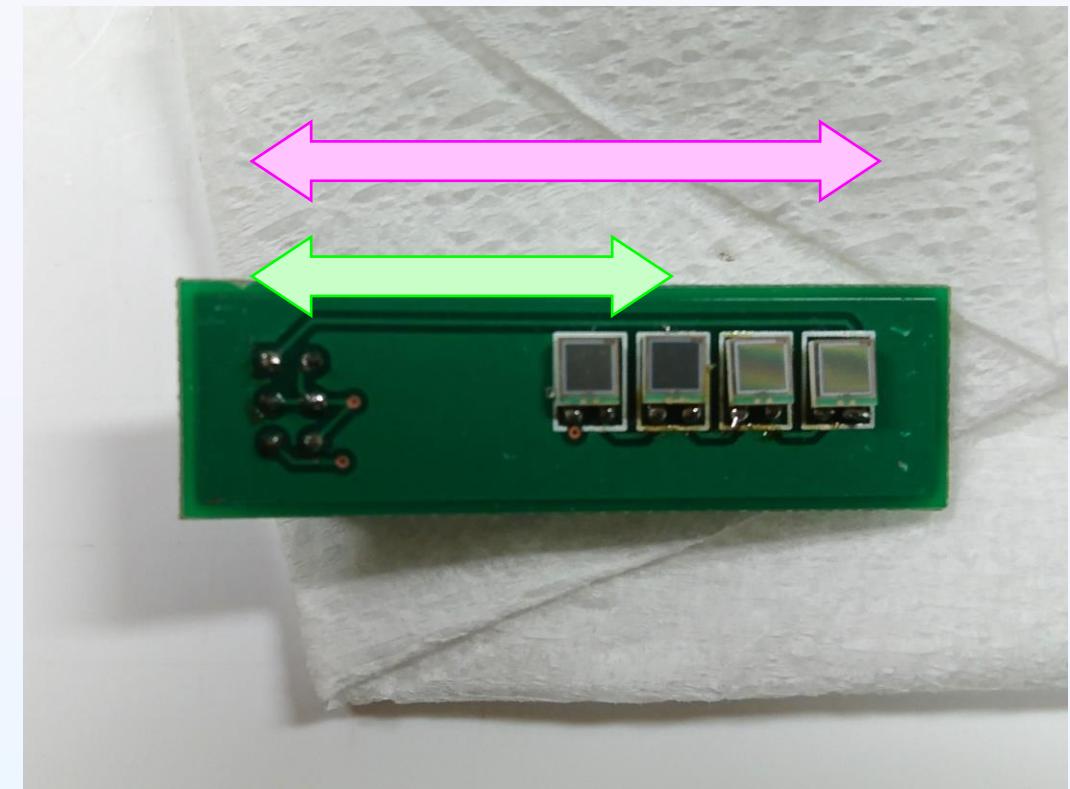
★ : New method, New board

+ : previous board (Taken at Mar.)

☆Previous board

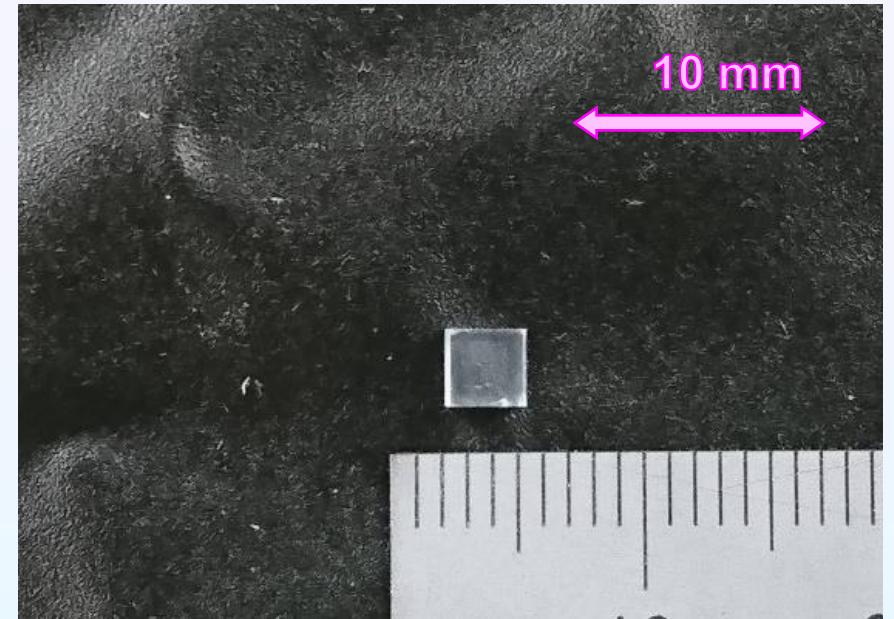


☆New board (2020. Mar. ver)



↑ MPPC – コネクタの距離が長すぎる??

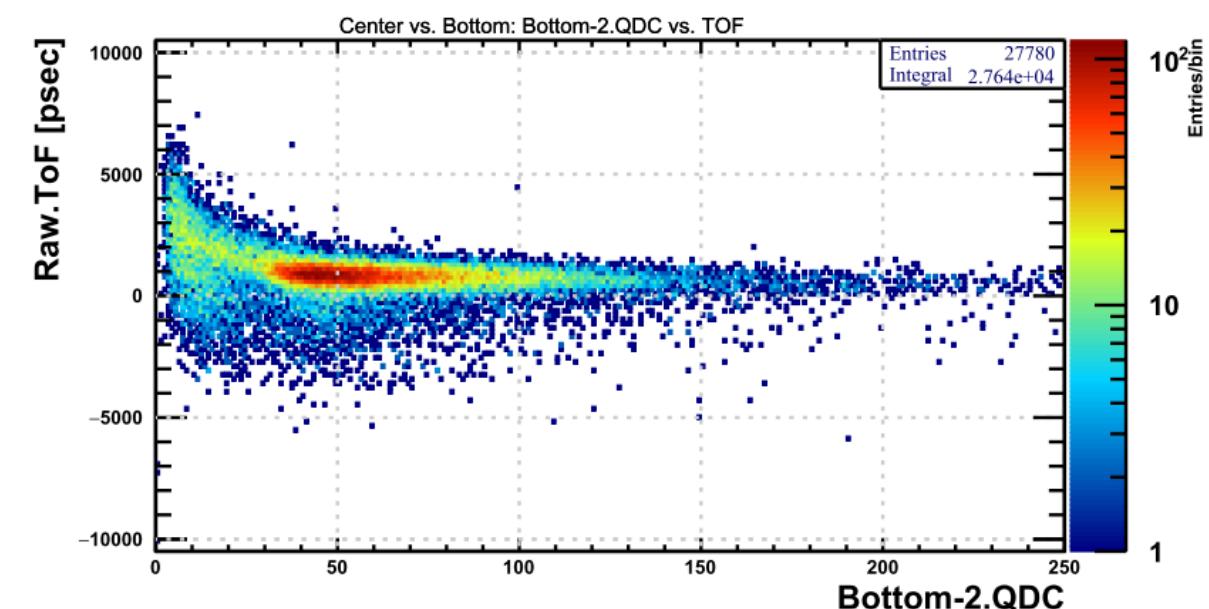
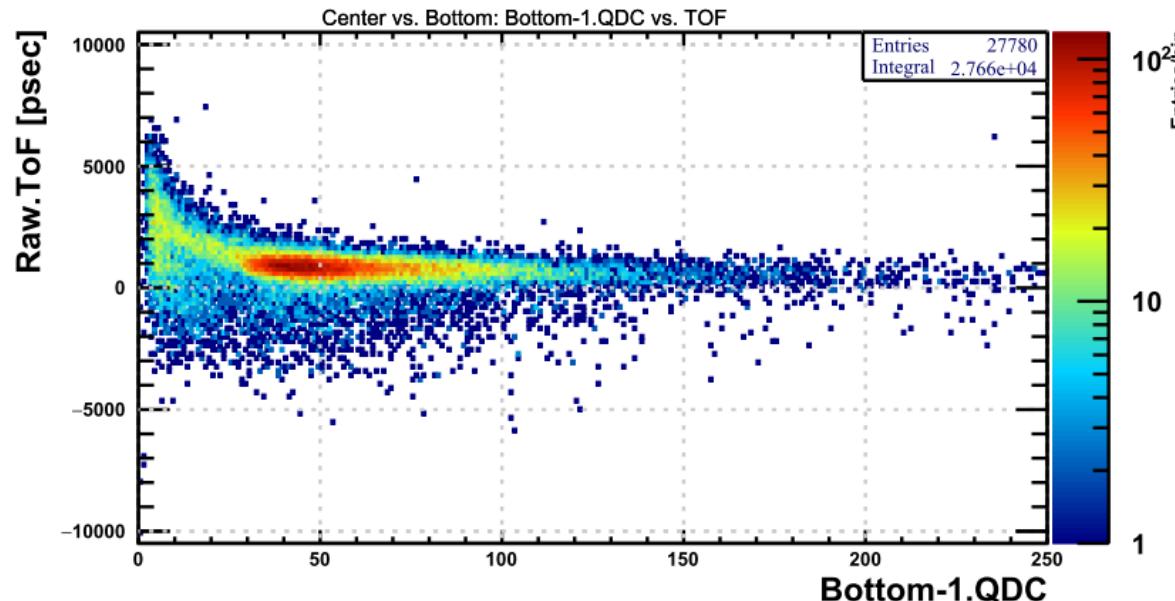
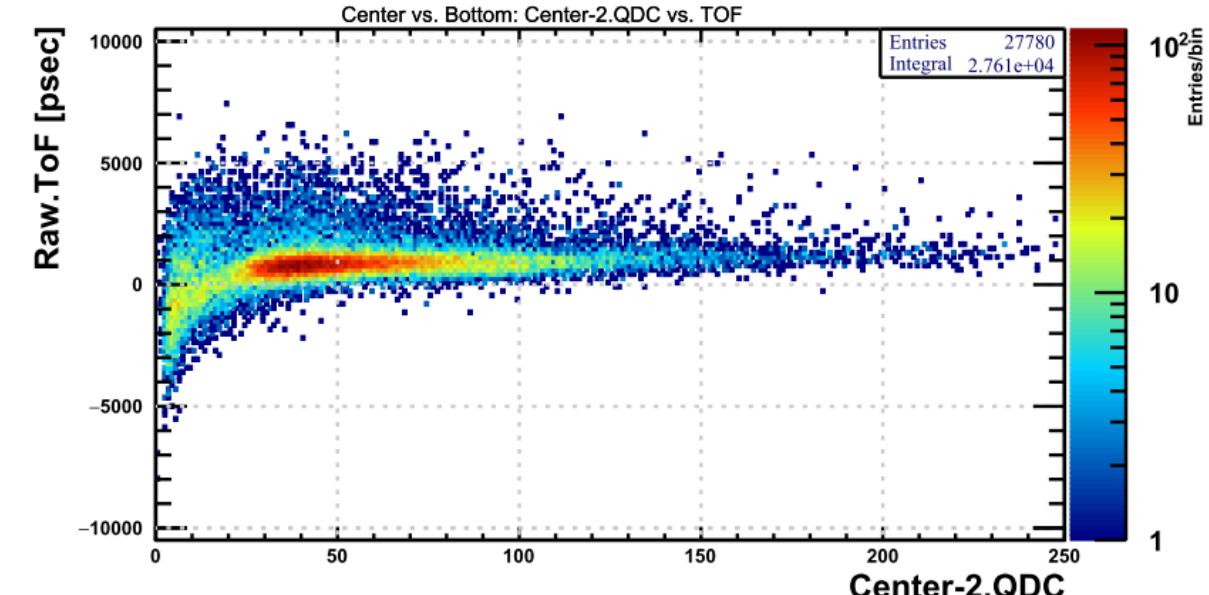
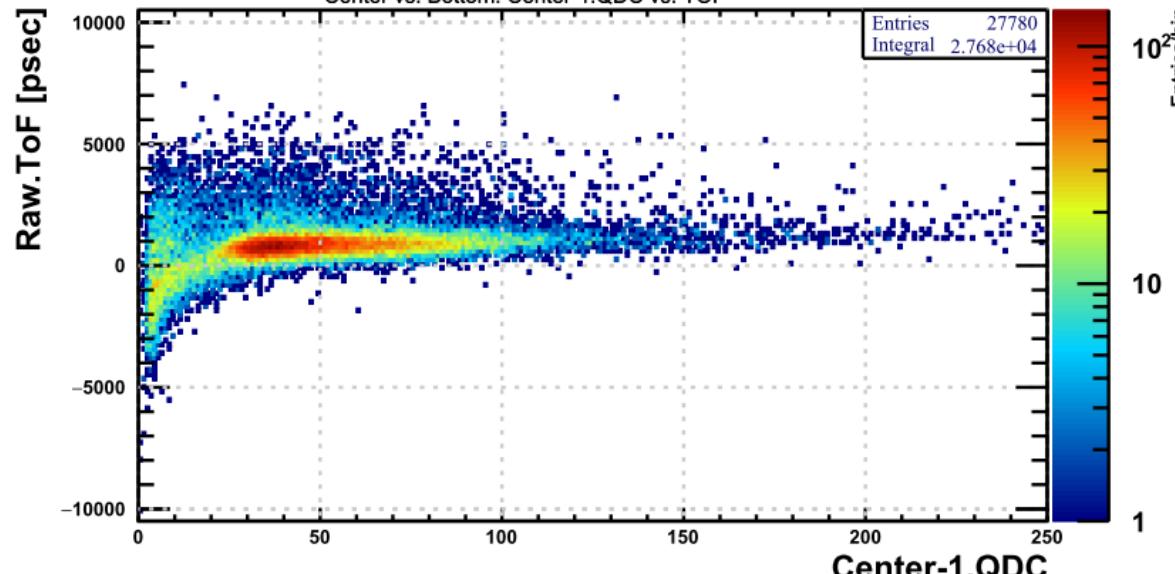
- 現在 ⇒ シンチレータ×3で宇宙線による取得を行っている
- 統計をためるために要する時間 ⇒ ~4日/data set
- 電圧依存性を見る場合, 5点は取りたい ⇒ ~20day/set
- 時間がかかりすぎている.
- $\beta$ 線源を使った測定に切り替えていく予定
- 現在取得しているセットが終了した後, テストベンチの組み換え
- ~来週後半からデータを取り始めたい

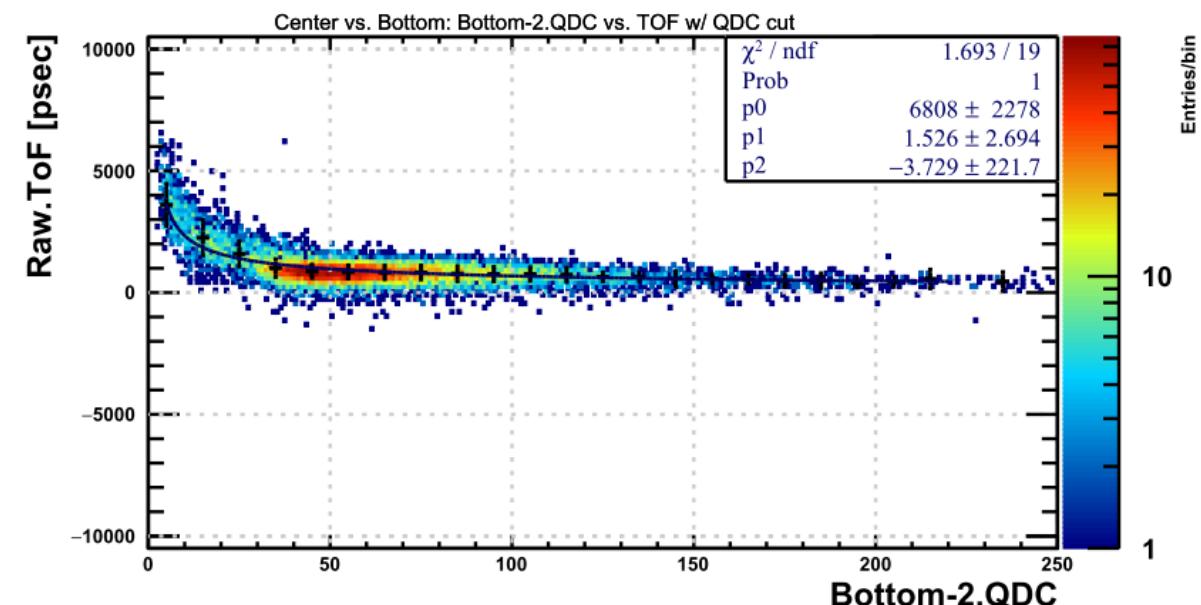
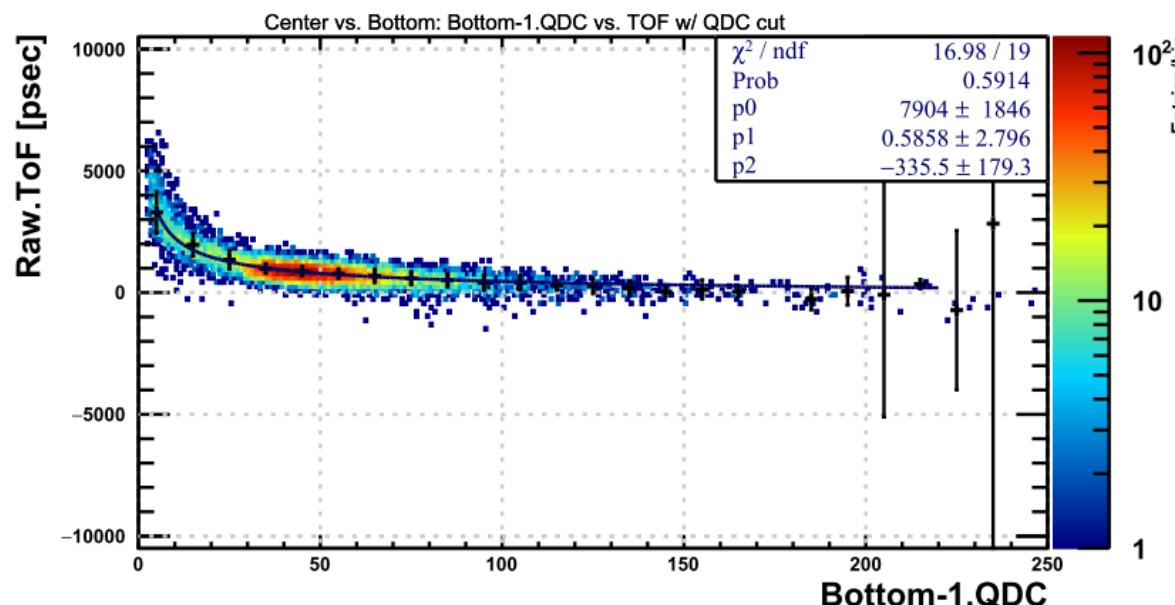
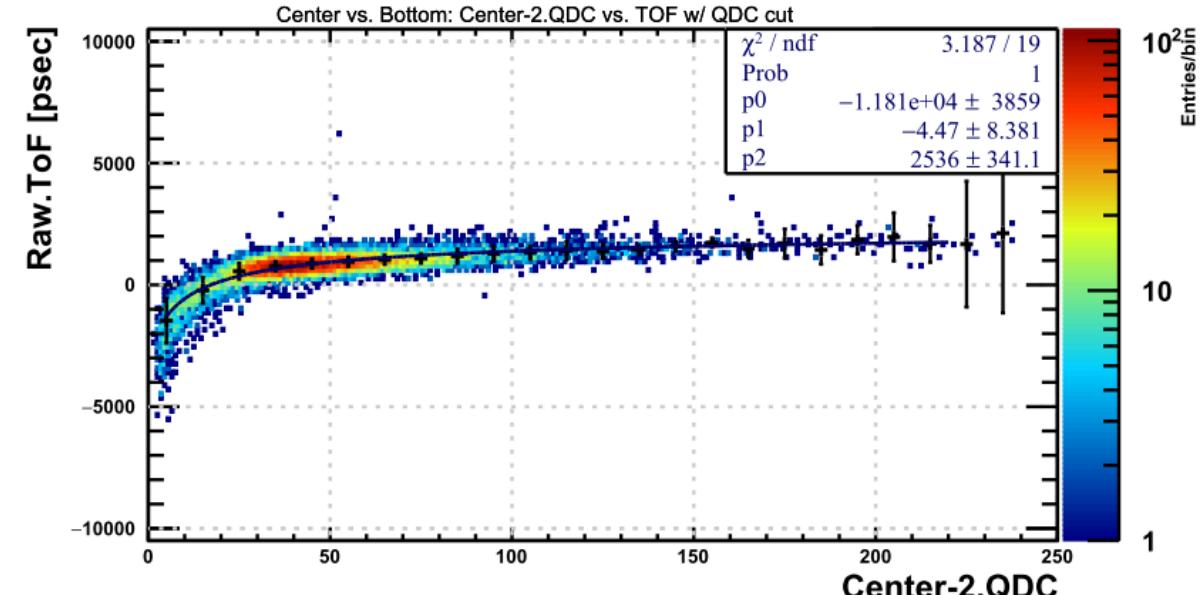
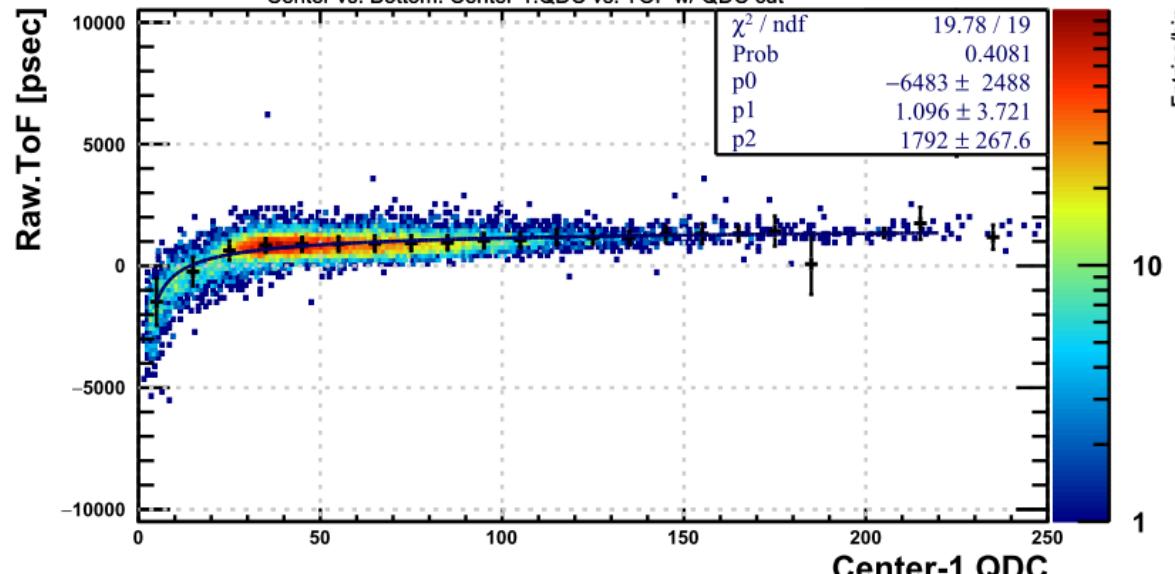


新しいテストベンチに使用予定の  
リファレンス用シンチレータ  
(永尾さんから頂いた)

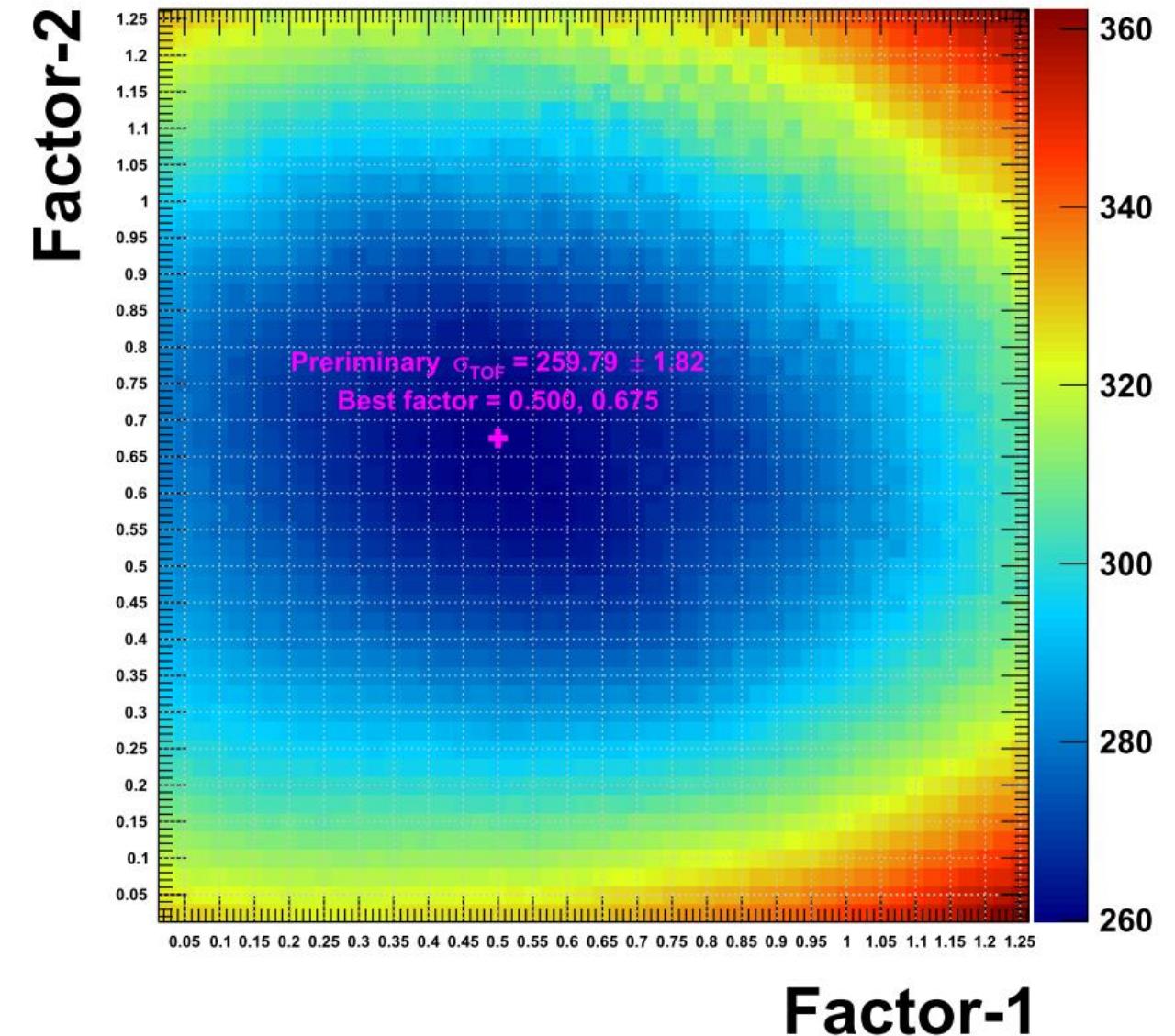
- Construct testbench
- Geant4 simulation

# Backup

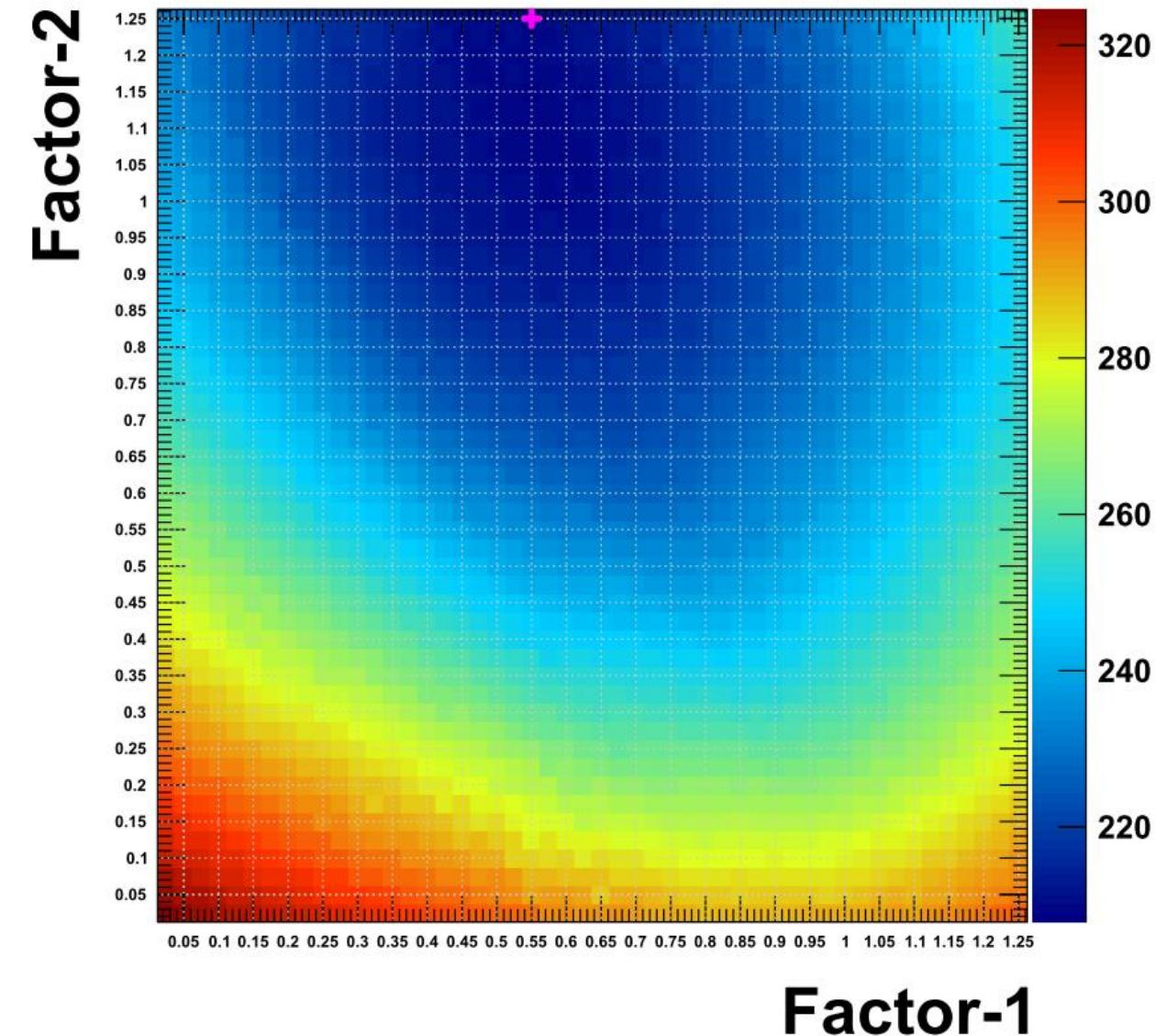


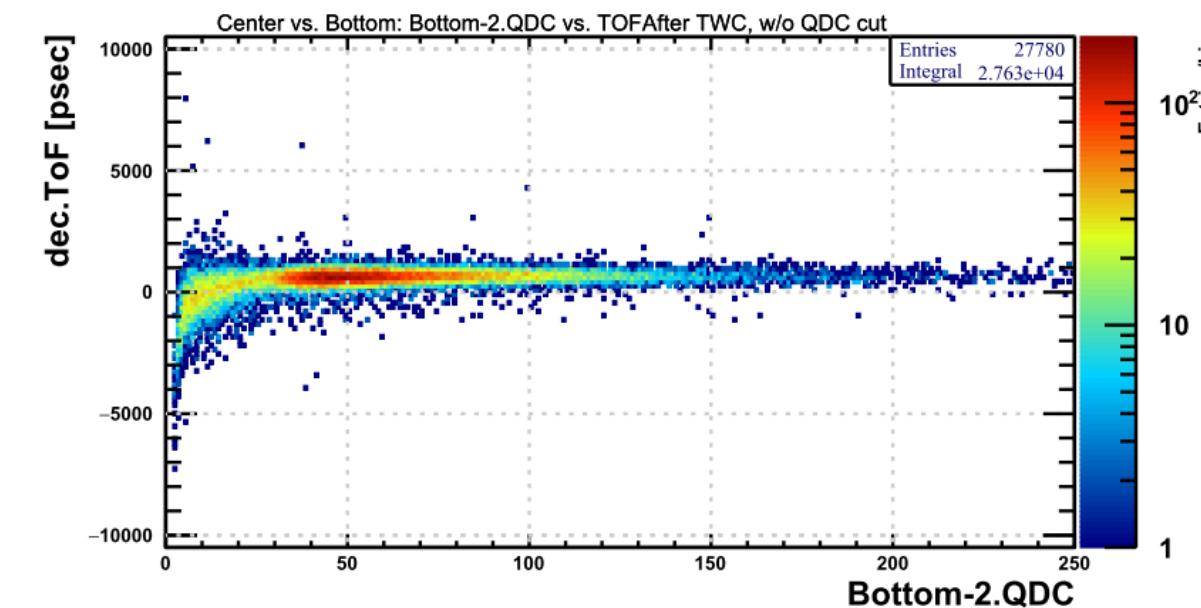
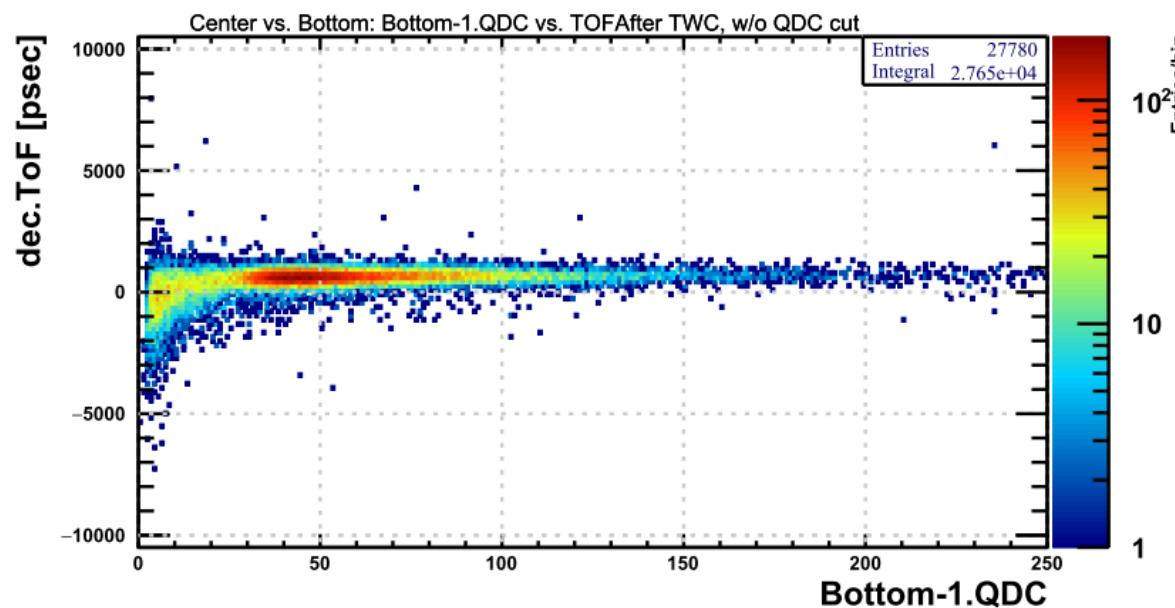
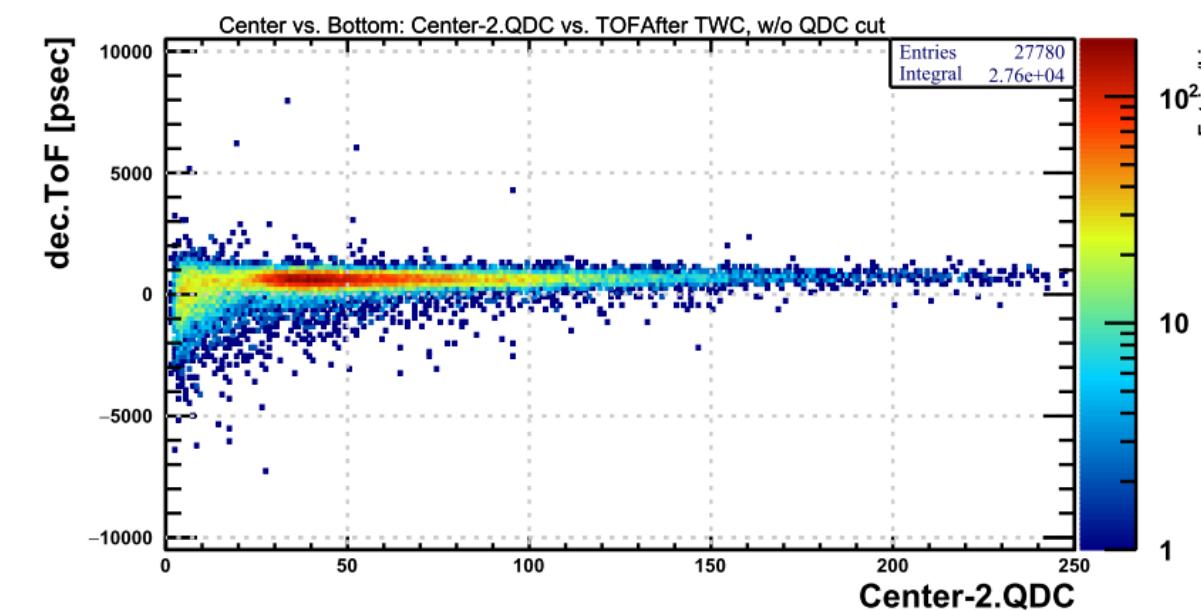
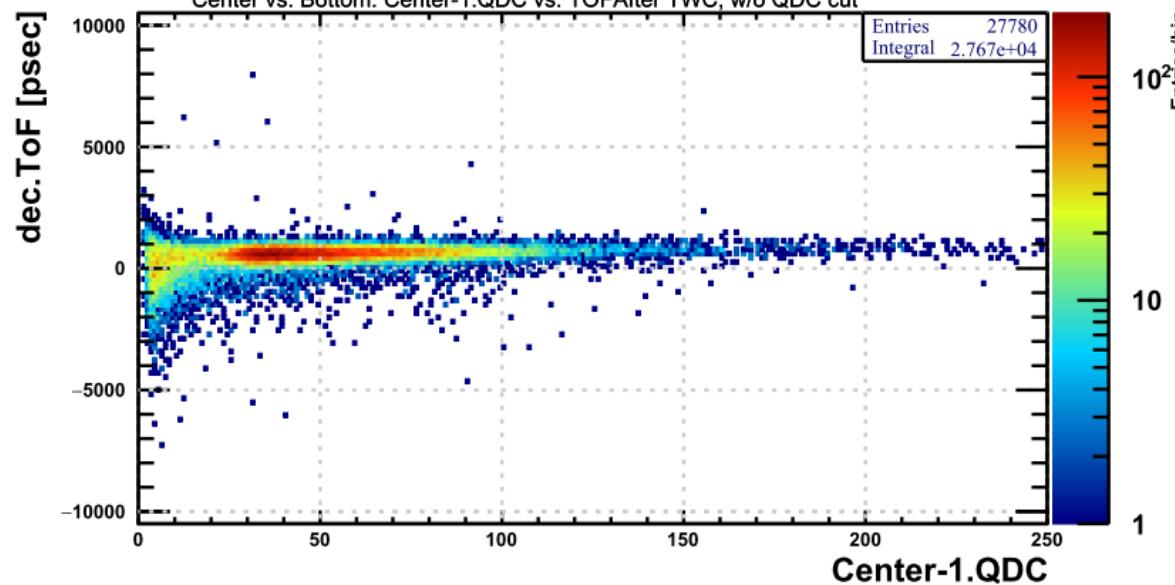


Center vs. Bottom: Preliminary  $\sigma_{\text{TOF}}$  Center side



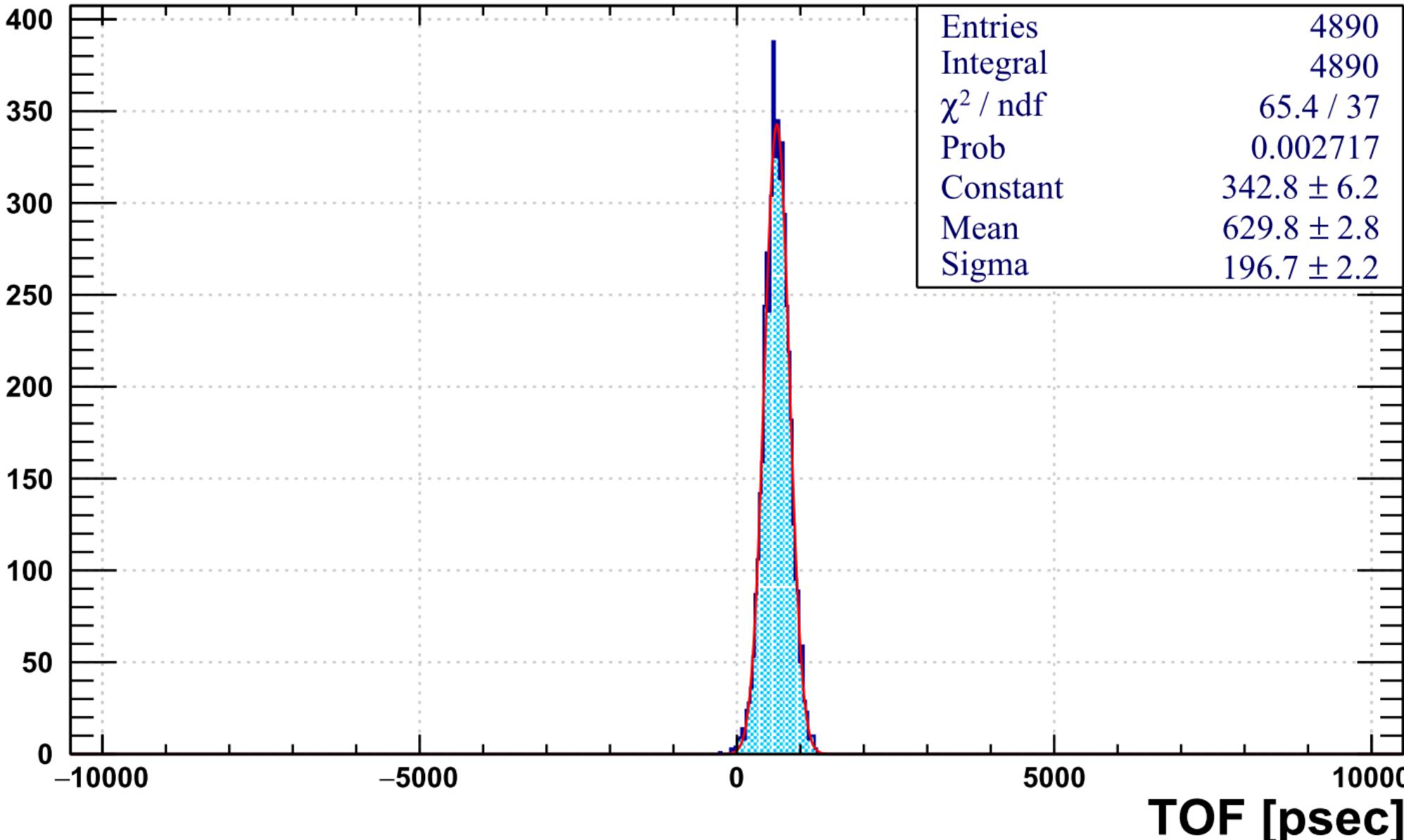
Center vs. Bottom: Preliminary  $\sigma_{\text{TOF}}$  Bottom side





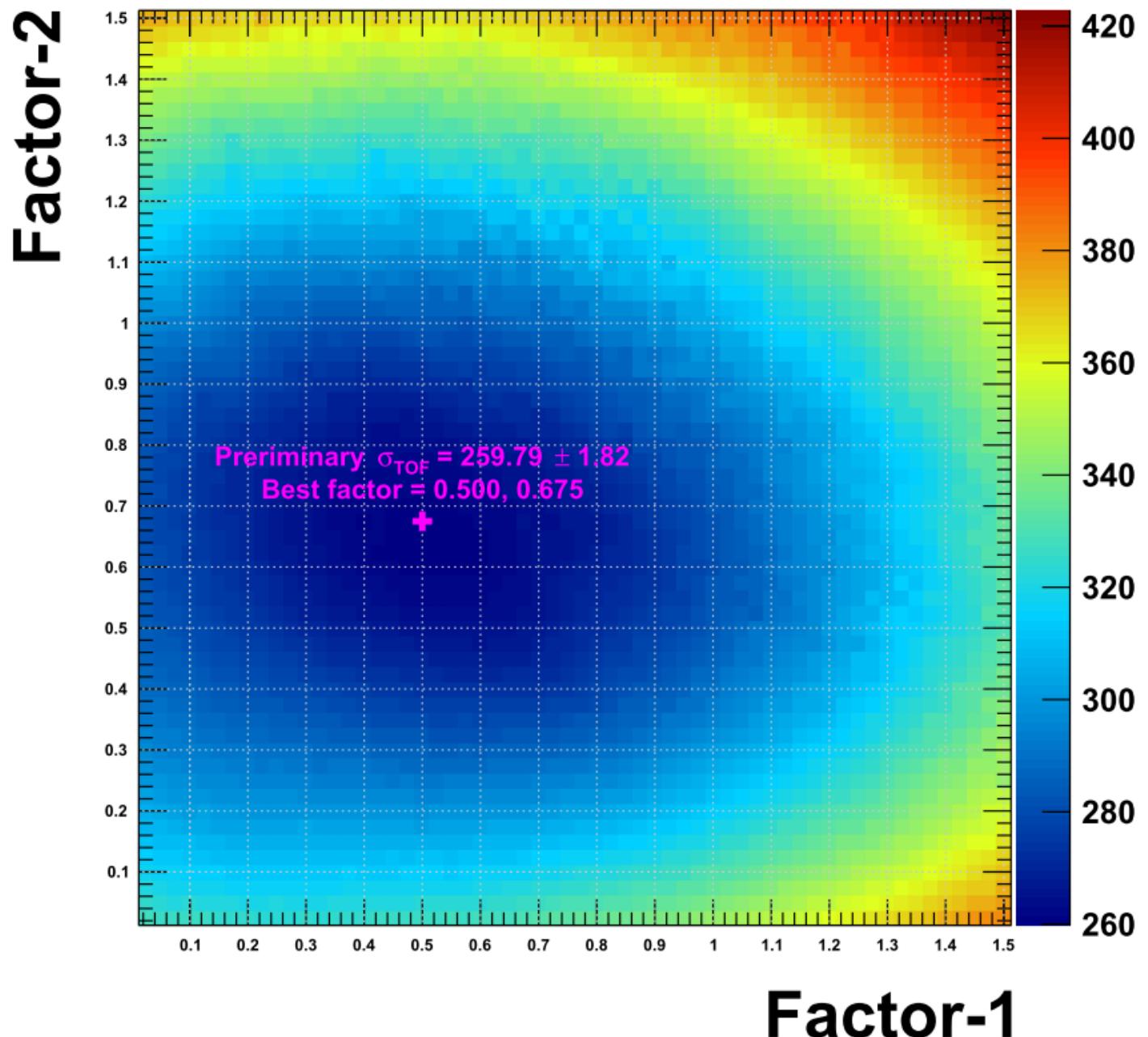
**Counts/35 psec**

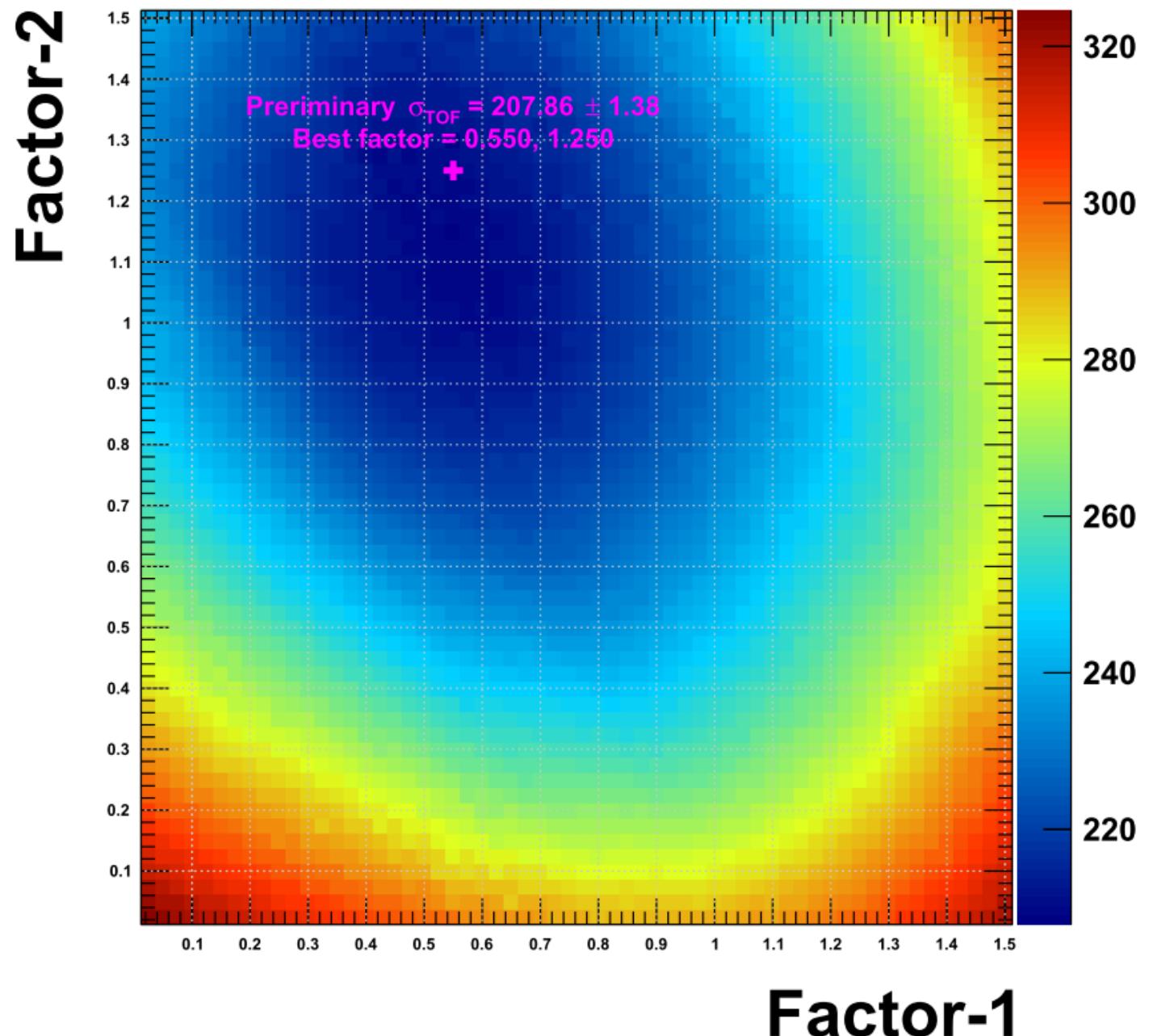
dec.TOF



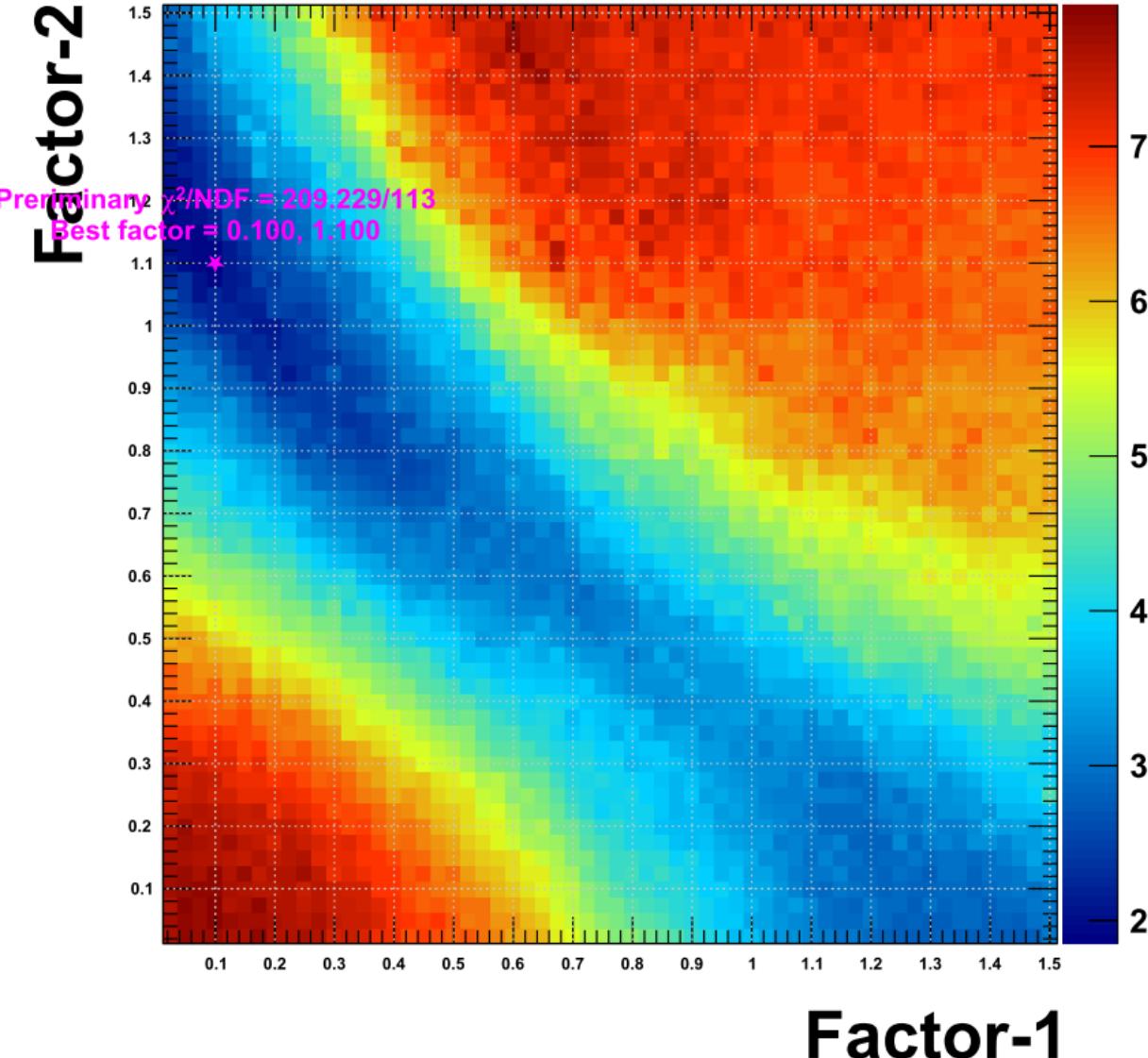
# Center vs. Bottom: Preliminary $\sigma_{\text{TOF}}$ Center side

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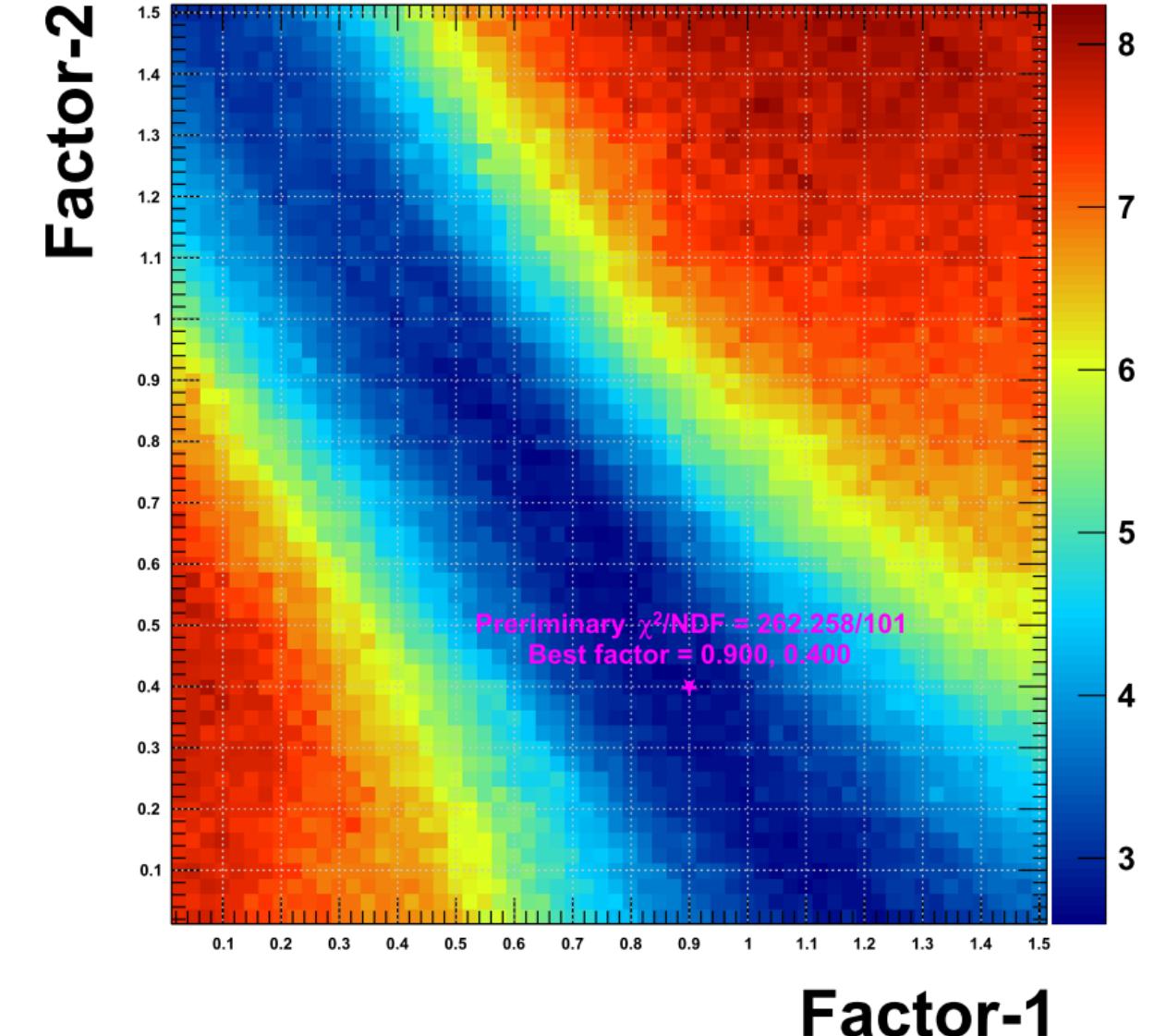


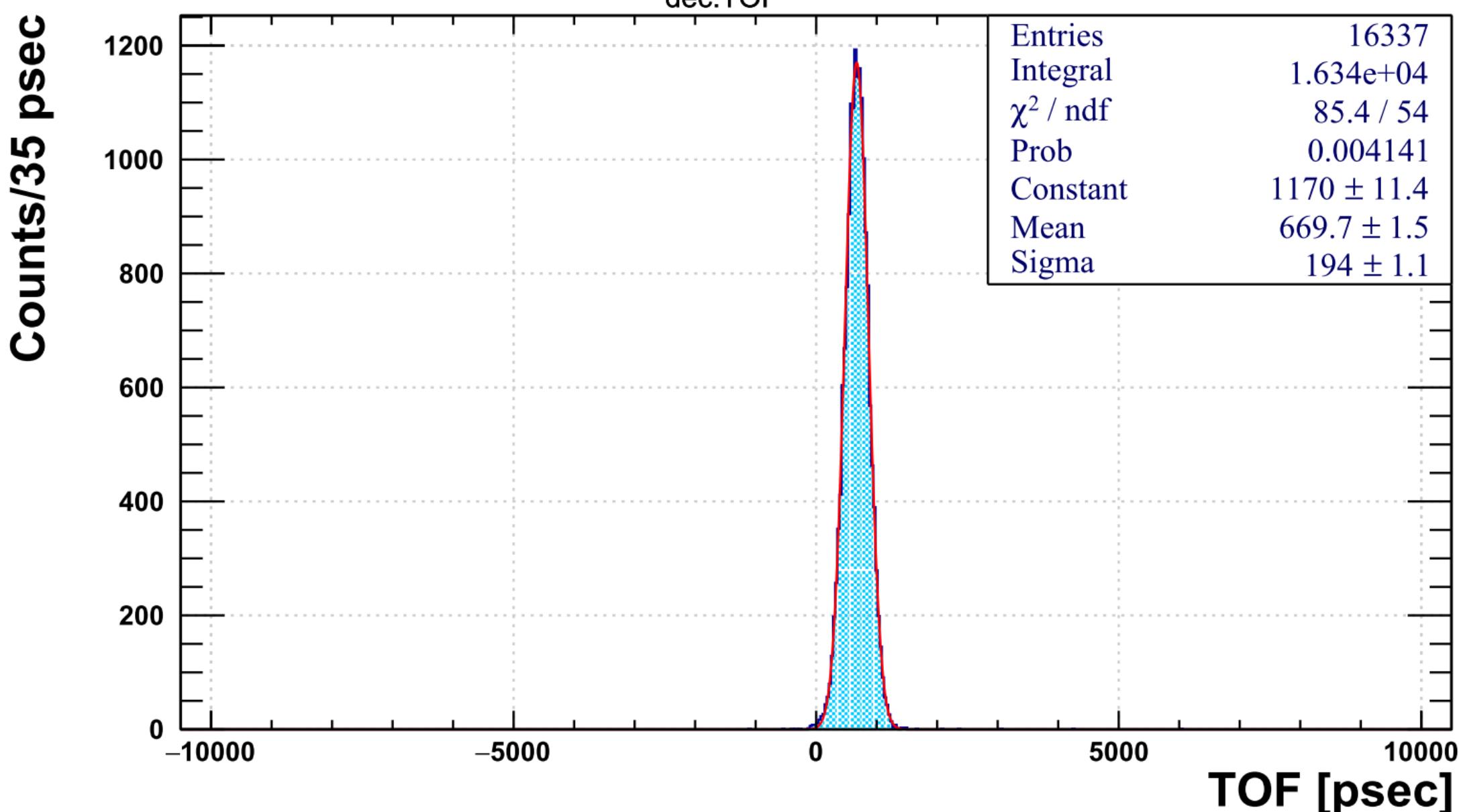


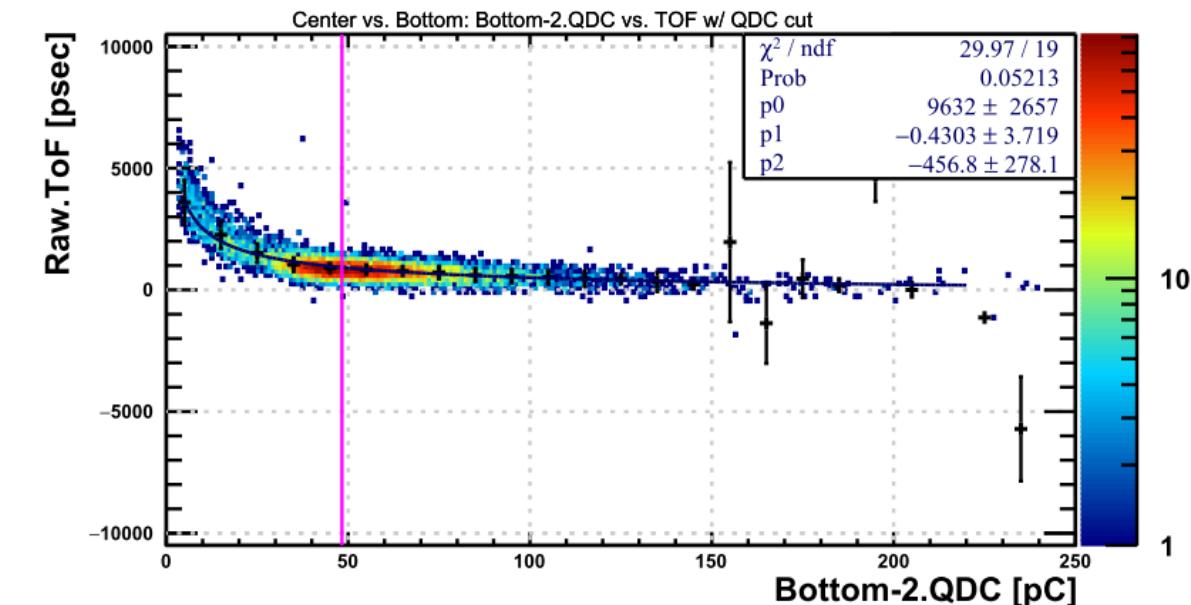
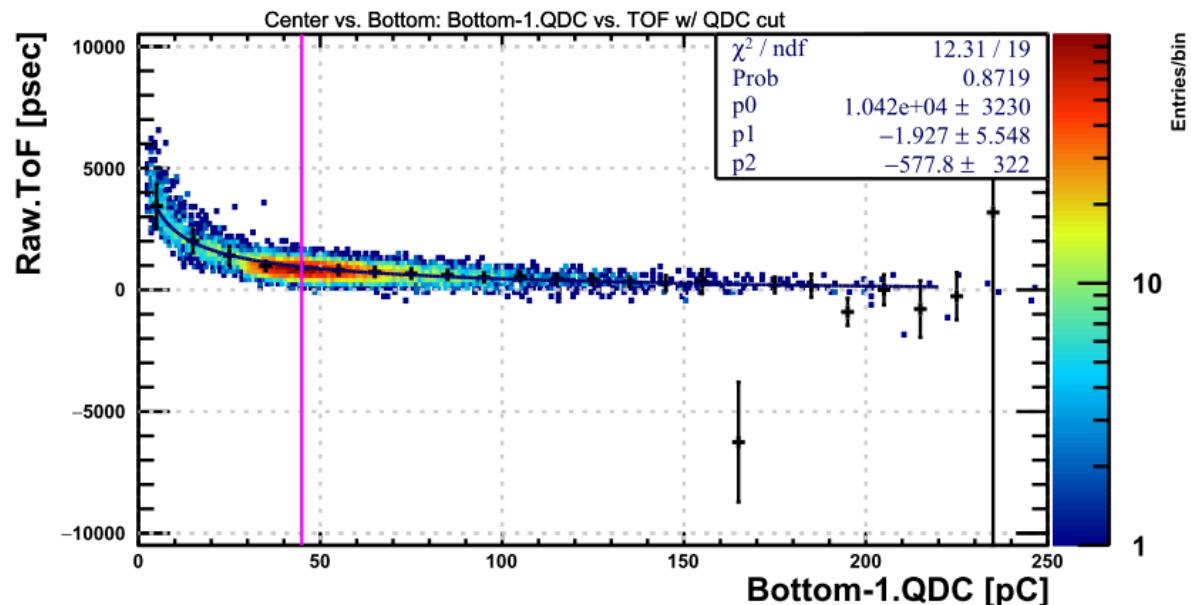
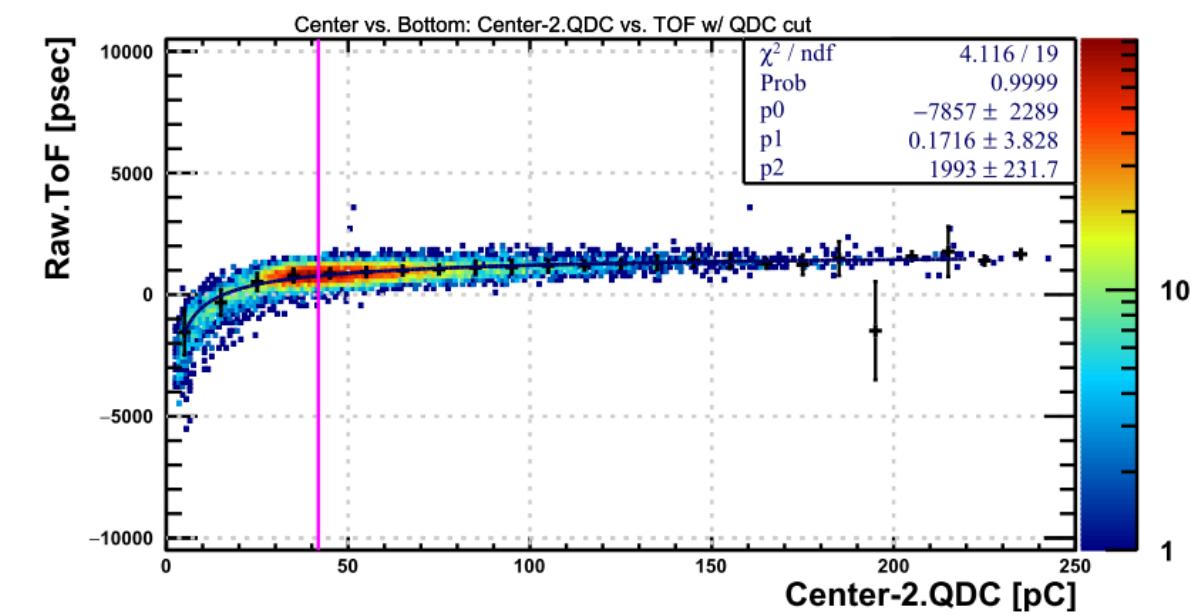
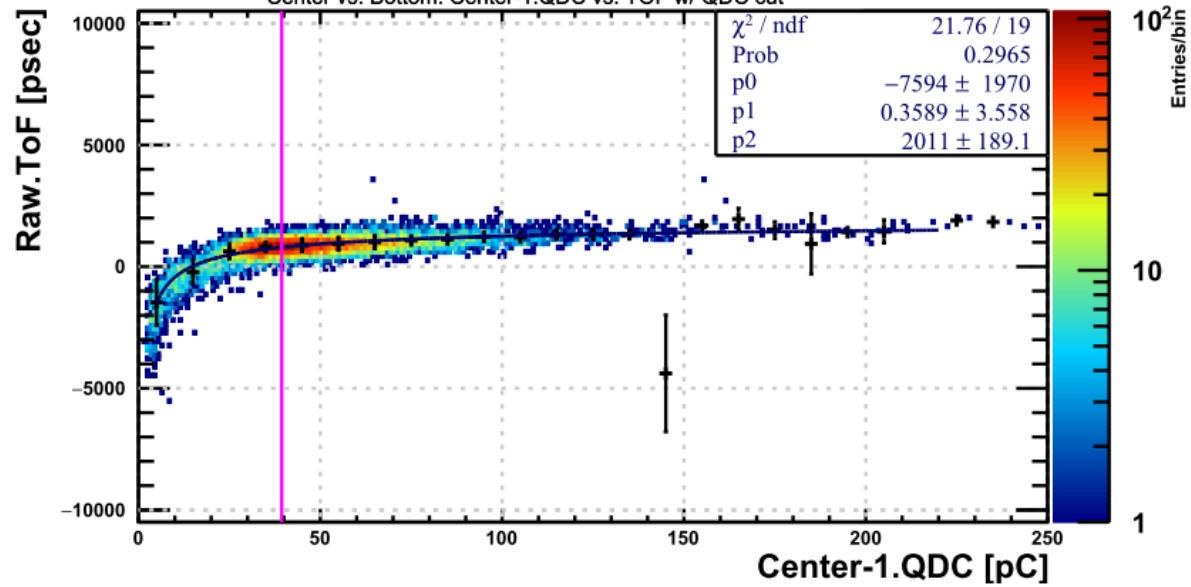
Center vs. Bottom: Preliminary  $\chi^2/\text{NDF}$  Center side

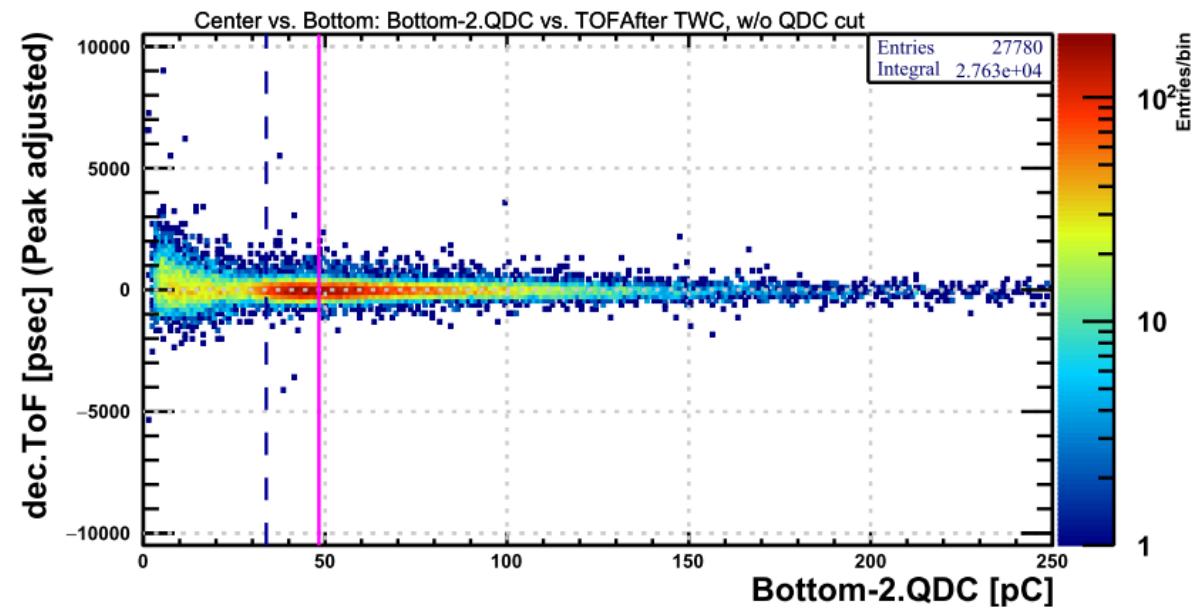
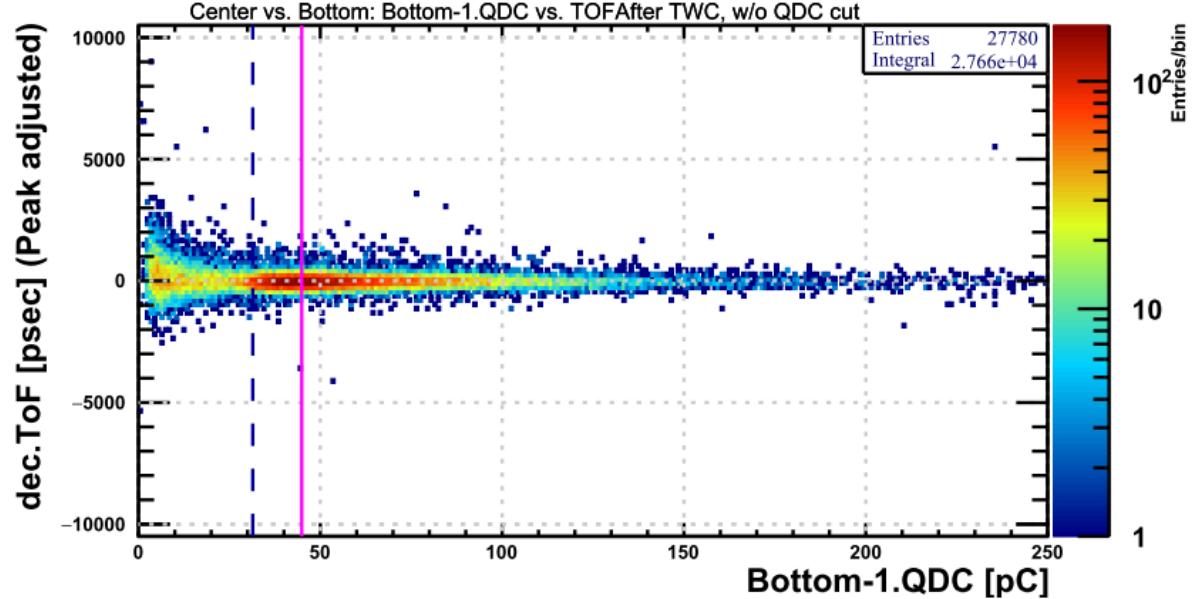
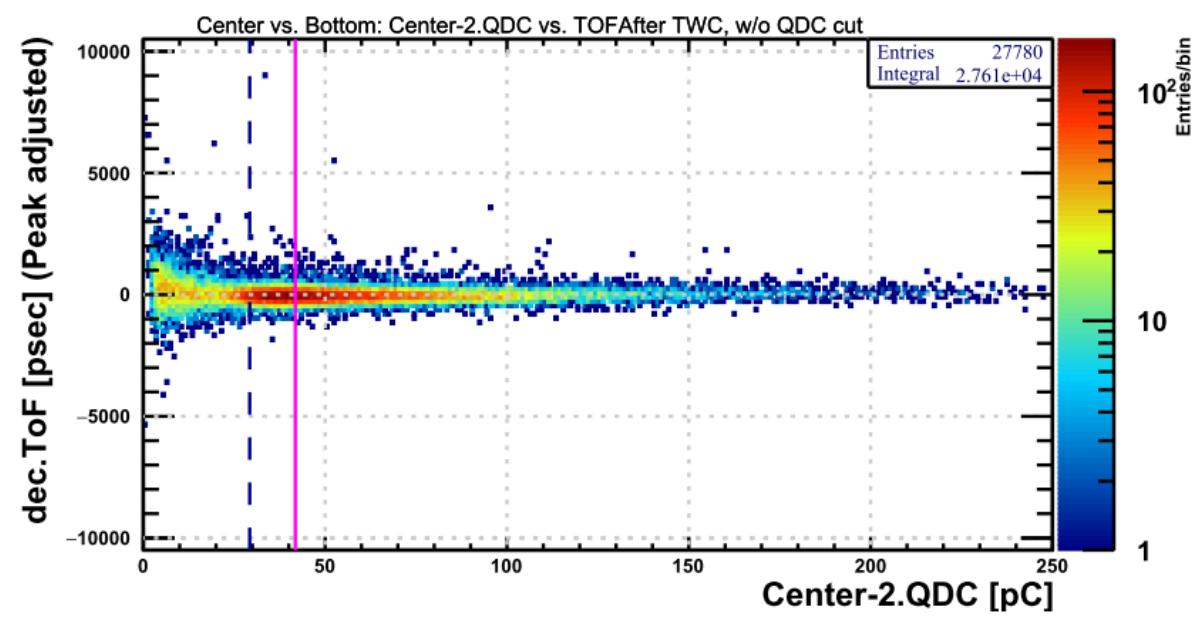
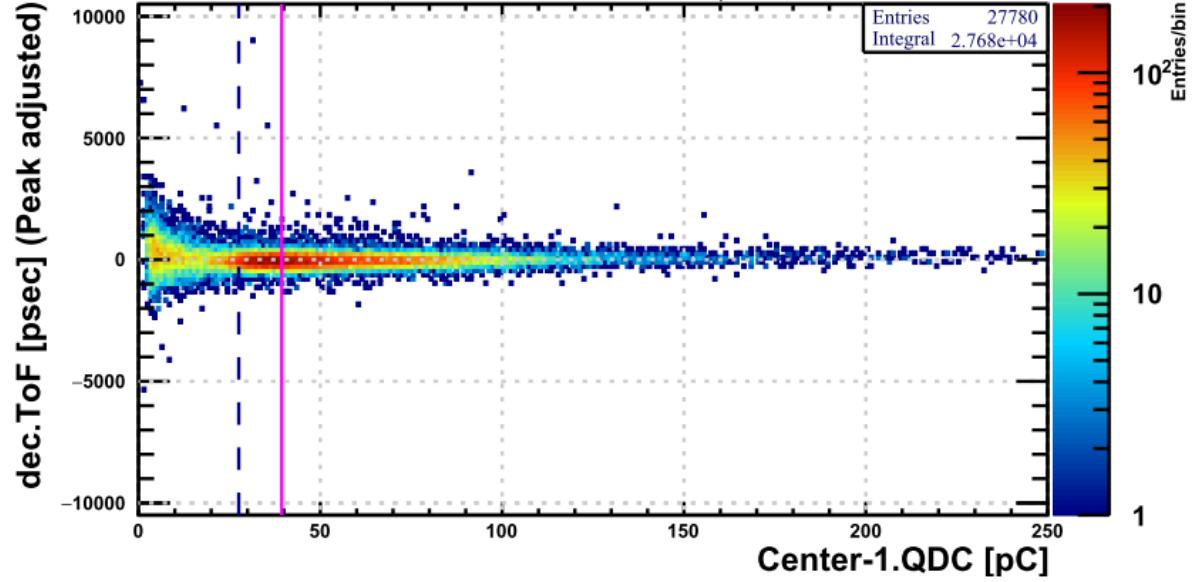


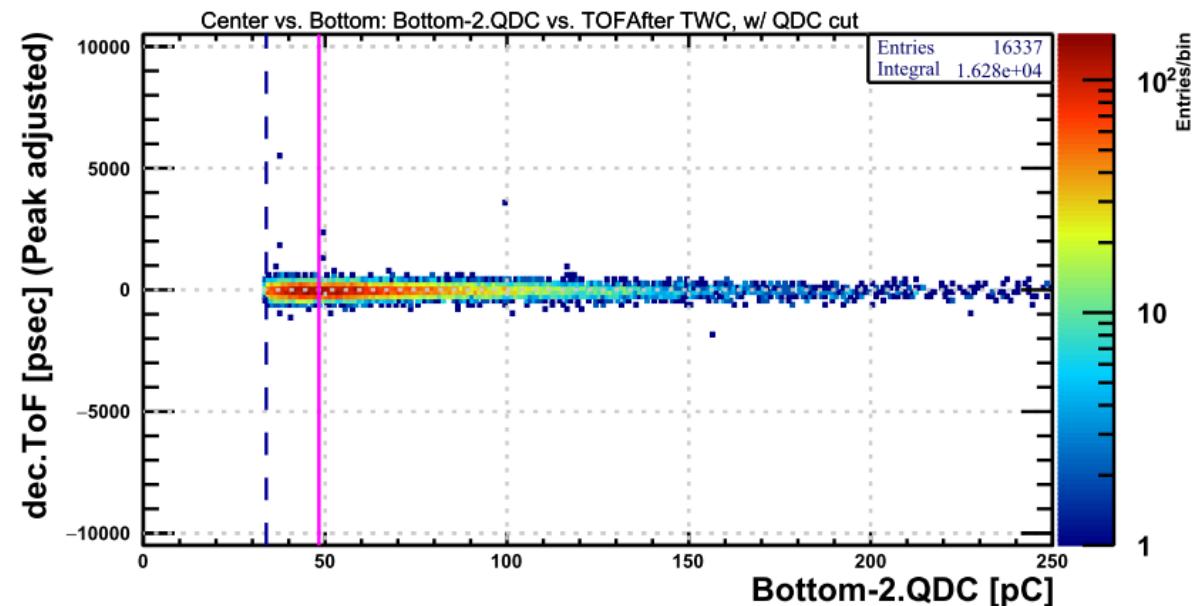
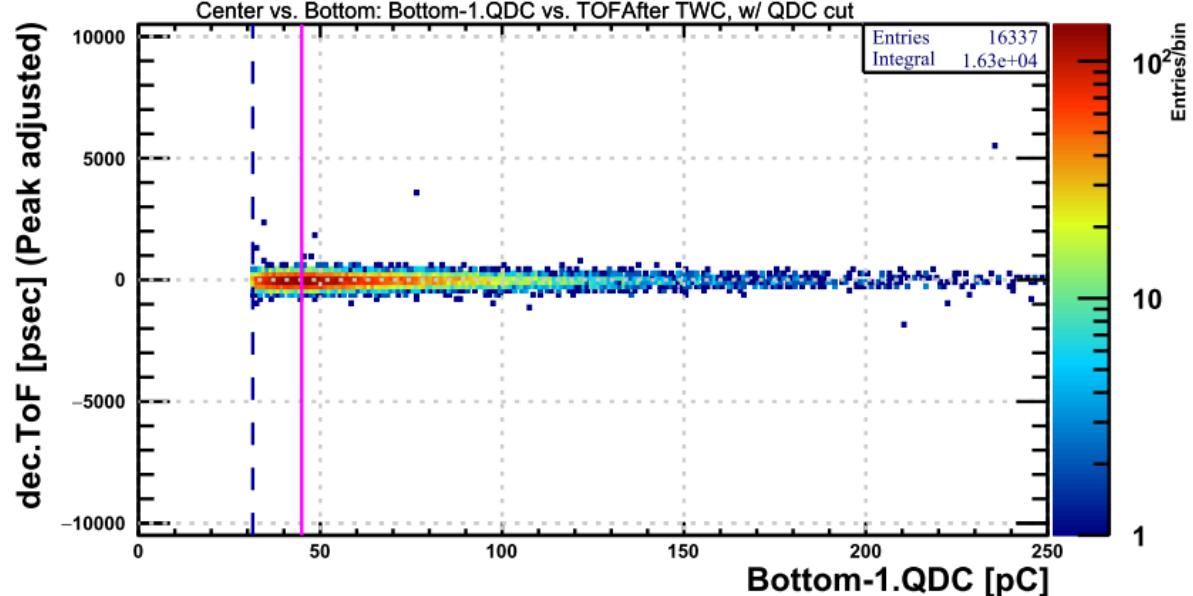
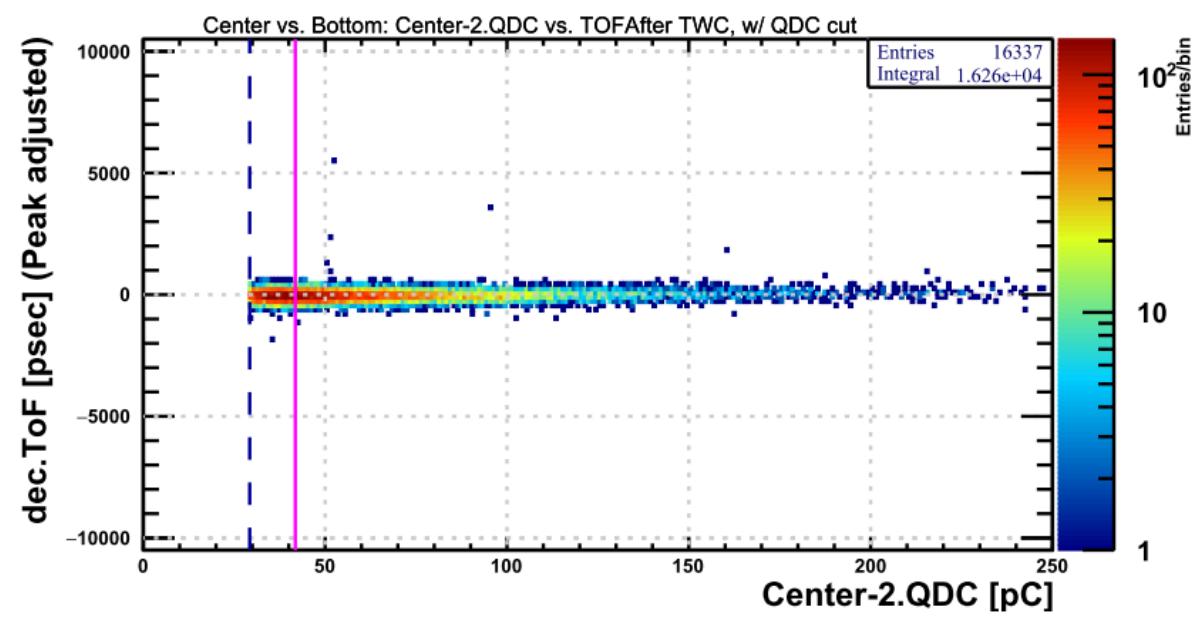
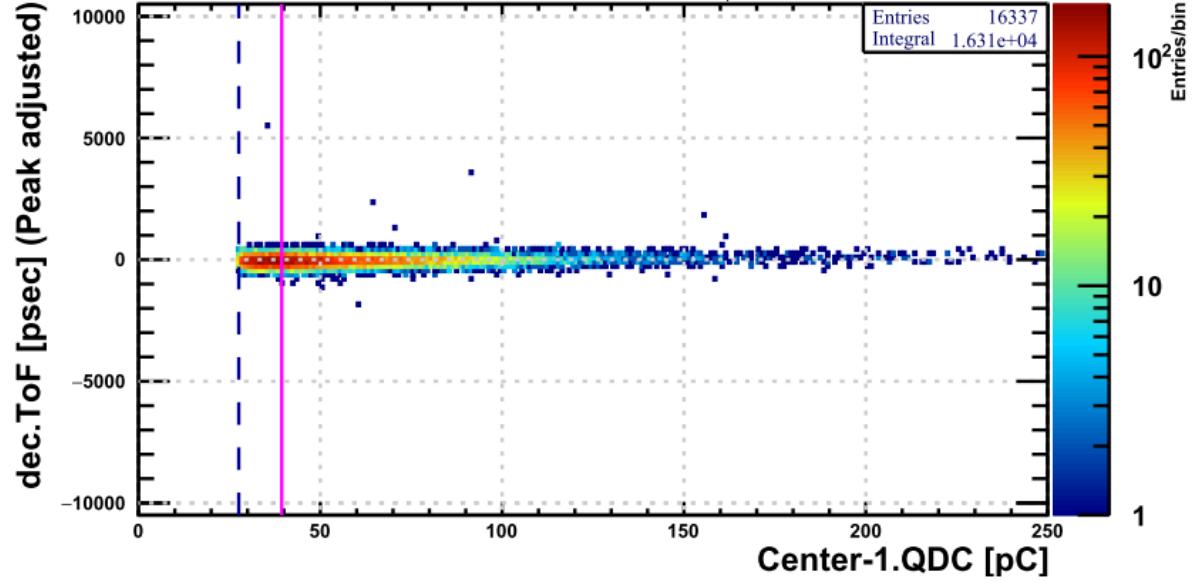
Center vs. Bottom: Preliminary  $\chi^2/\text{NDF}$  Bottom side



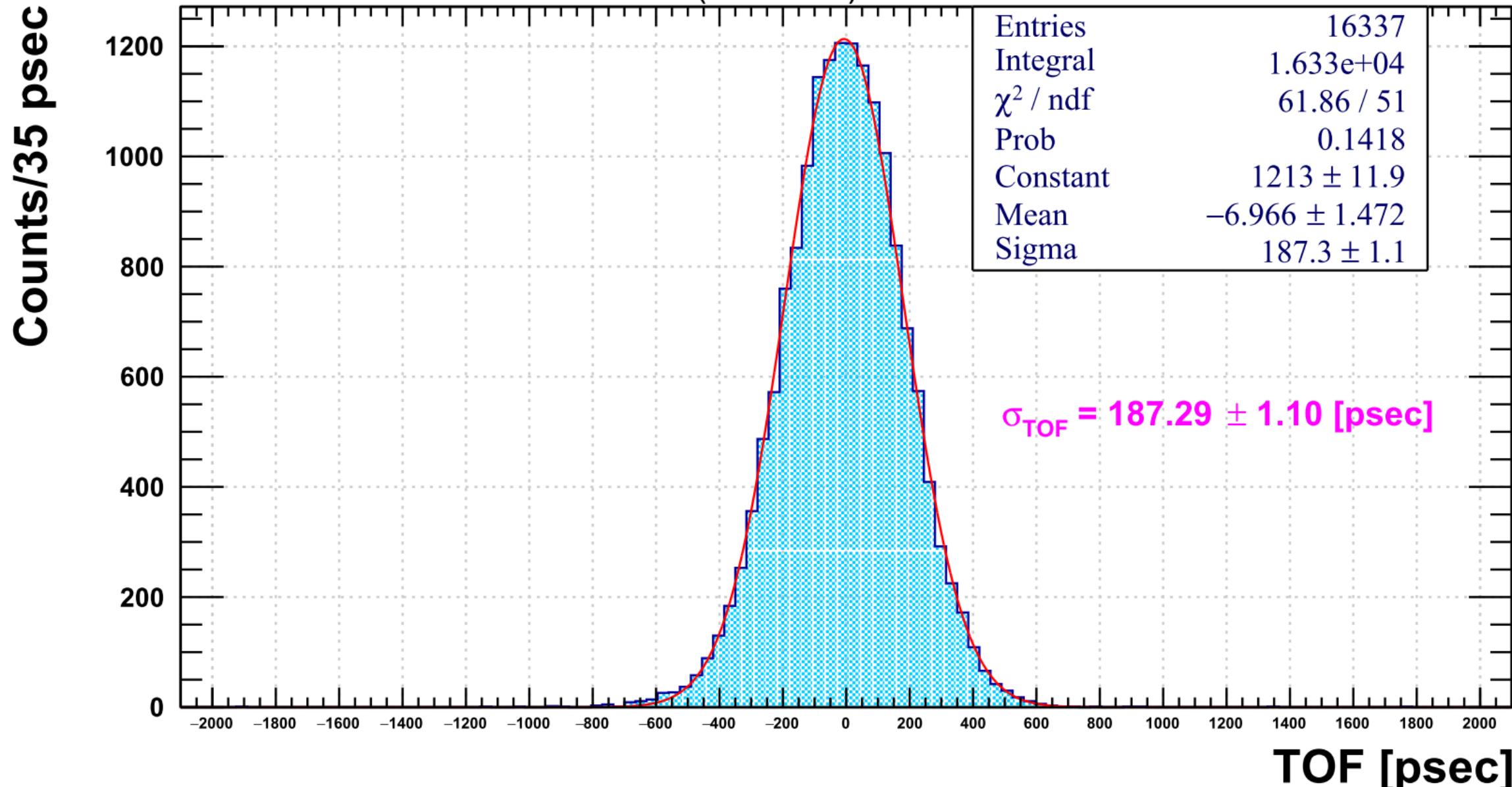






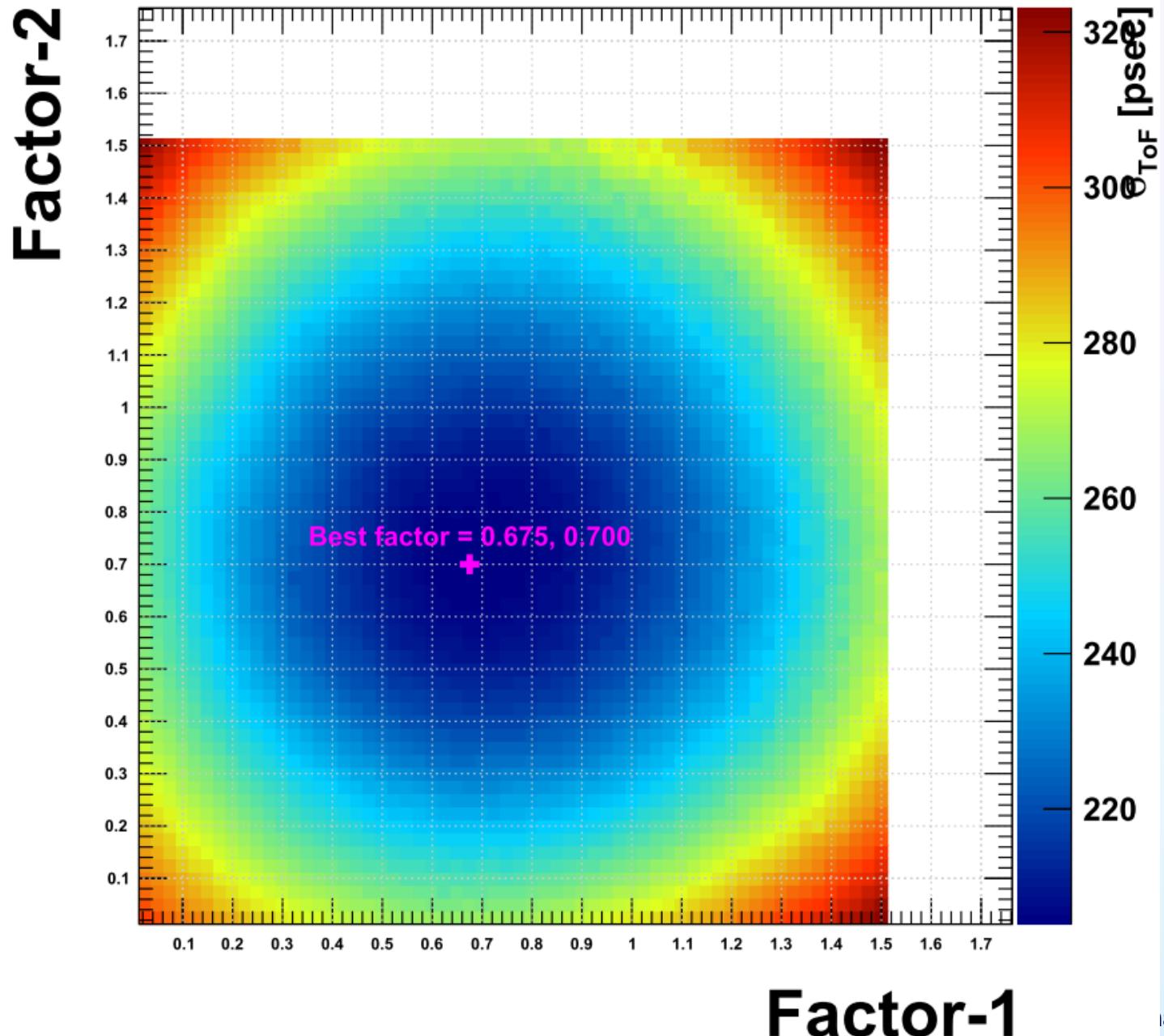


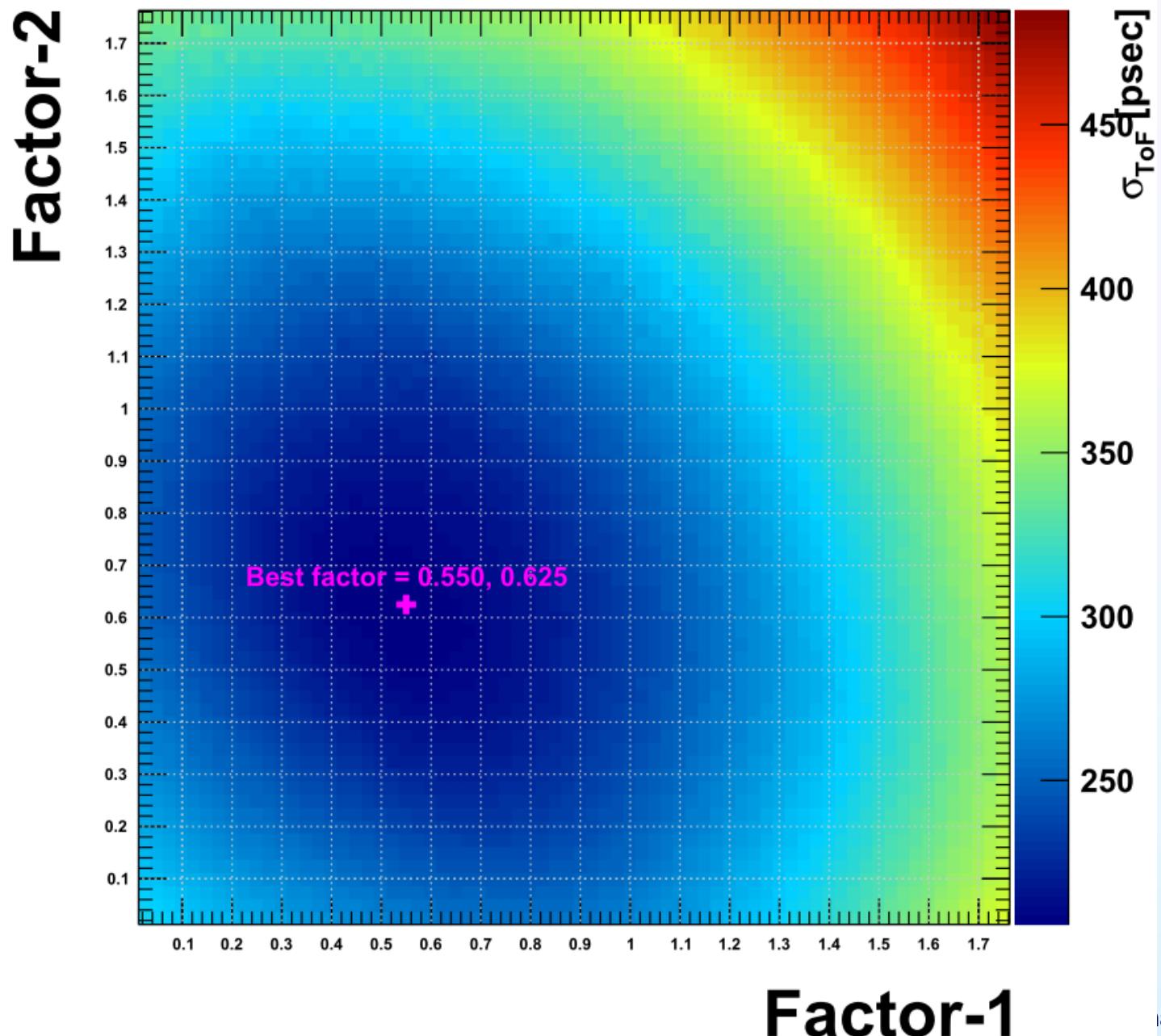
# dec.TOF (after TWC)

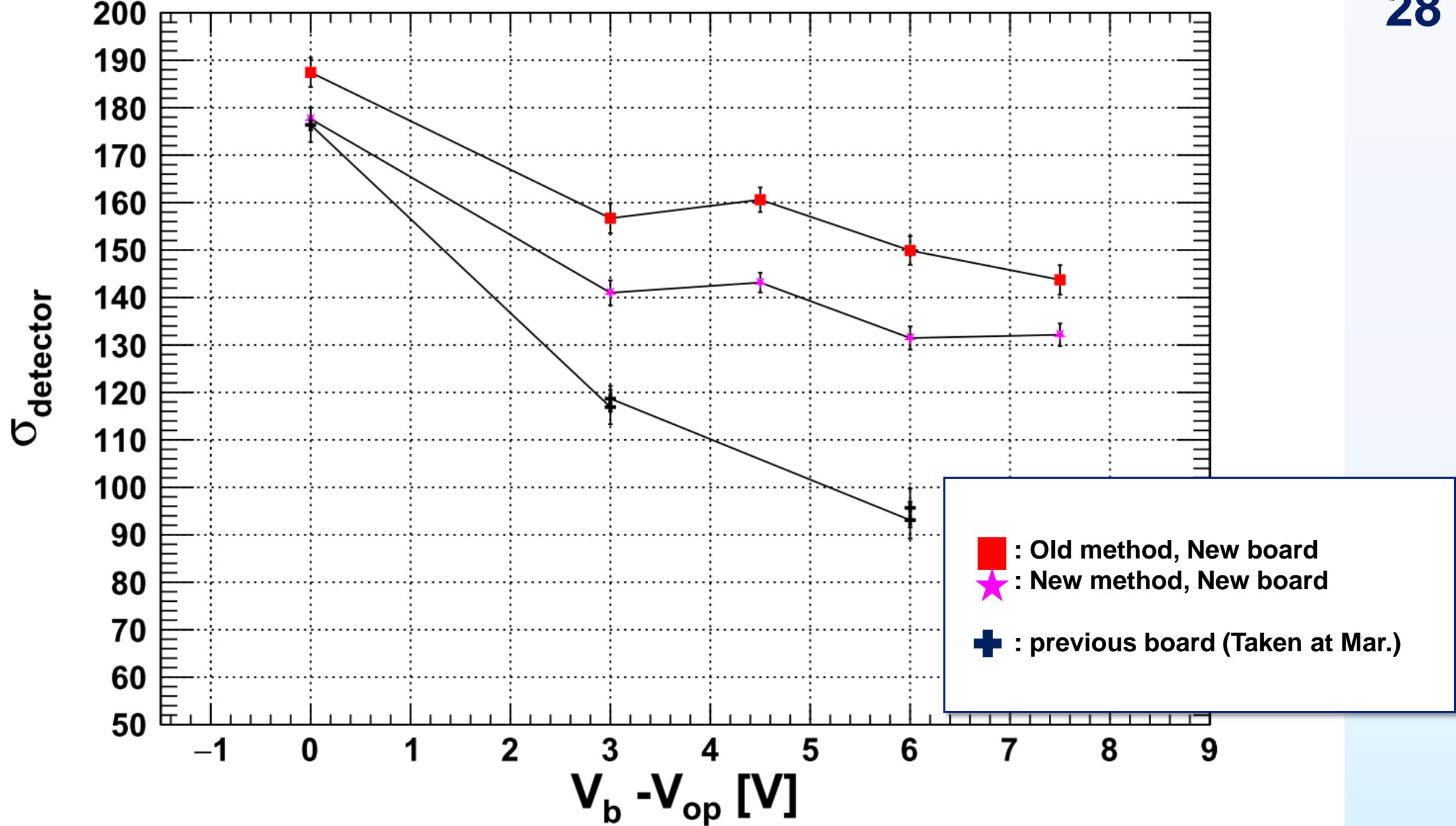


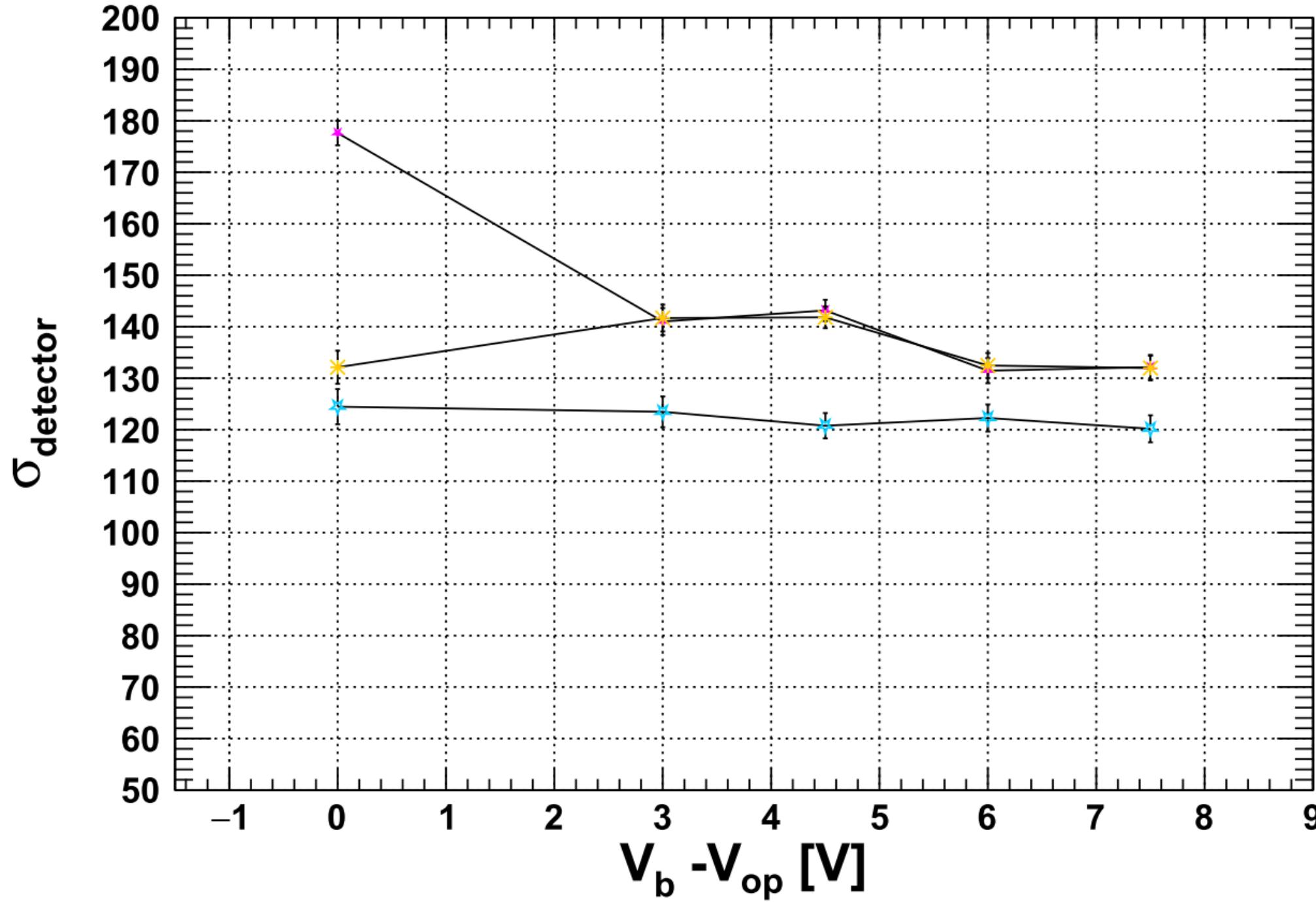
# Center vs. Bottom: Preliminary $\sigma_{\text{TOF}}$ Center side

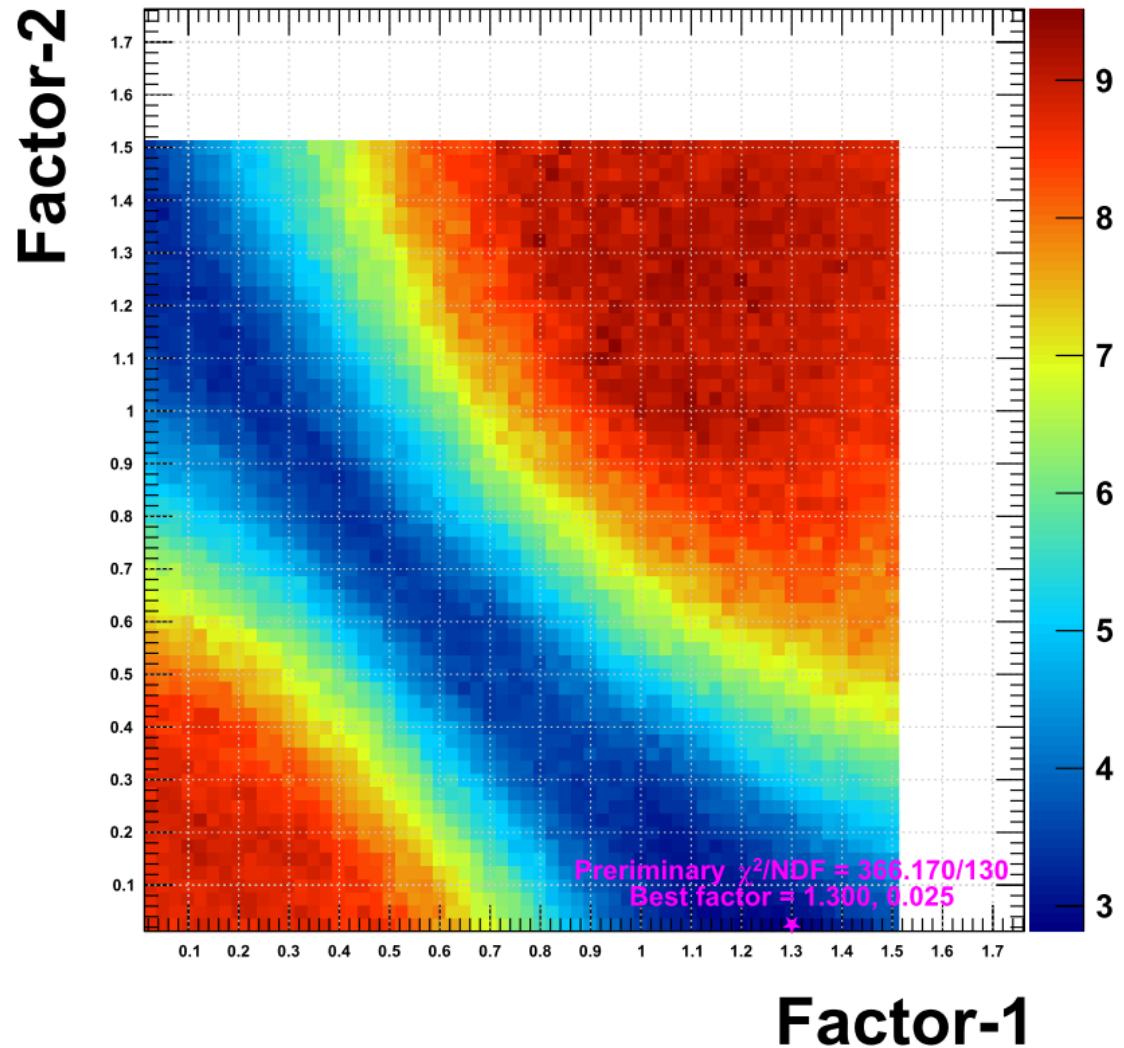
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Center vs. Bottom: Preliminary  $\chi^2/\text{NDF}$  Center sideCenter vs. Bottom: Preliminary  $\chi^2/\text{NDF}$  Bottom side