

## 1. Soft drop method in future collider performance

In this section, we use the specific method about the soft-drop to study the performance of the detector in the different cell sizes. In the Figure , , , , are the distribution of the signal and background.

### 1.1. Analysis method

In this analysis, We fix the central at the median in signal distribution, and we use the different width to open the window to draw ROC curves.

### 1.2. The conclusion of the results

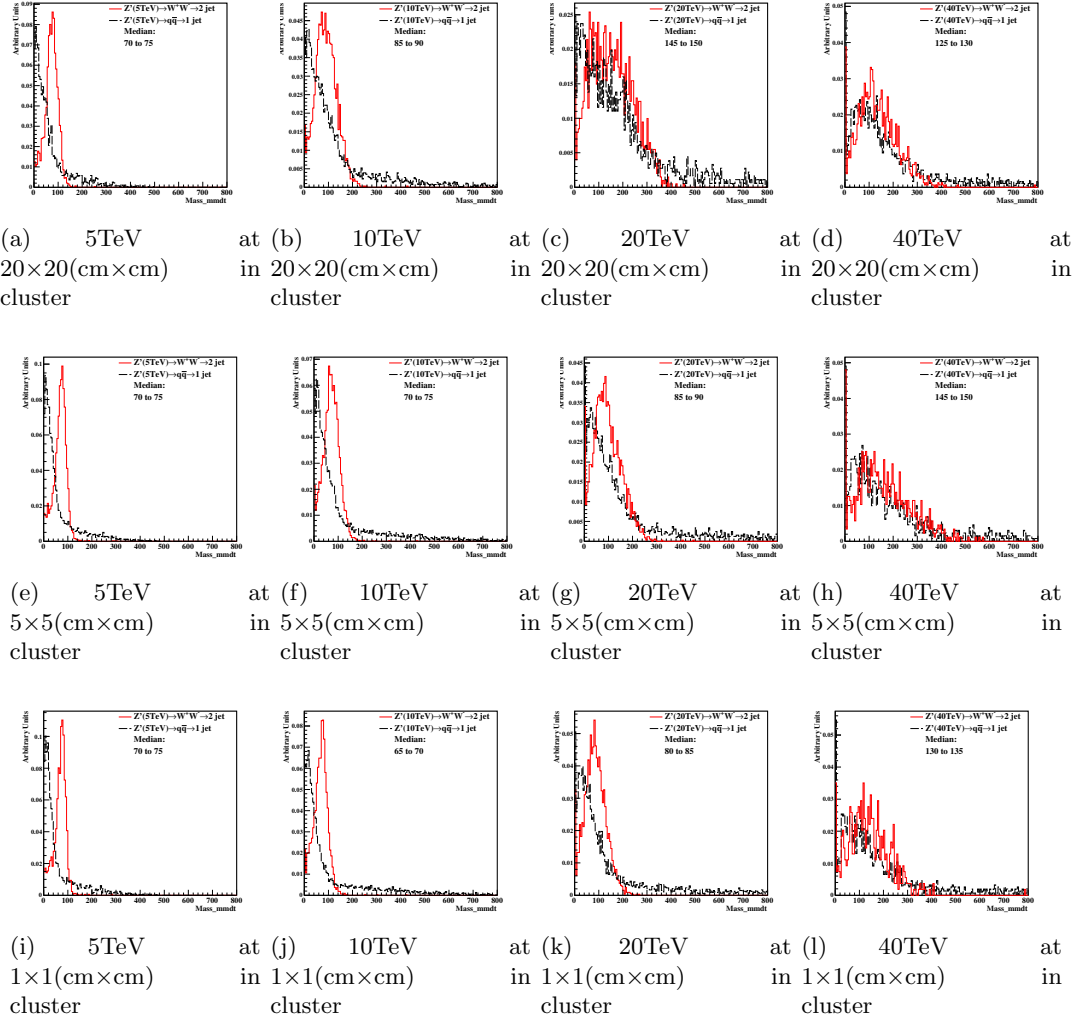
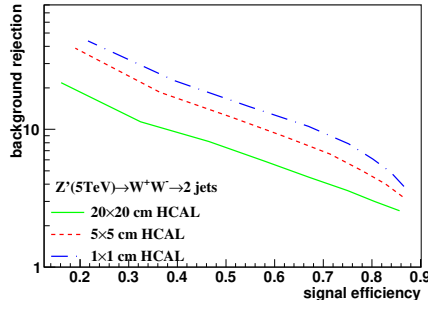
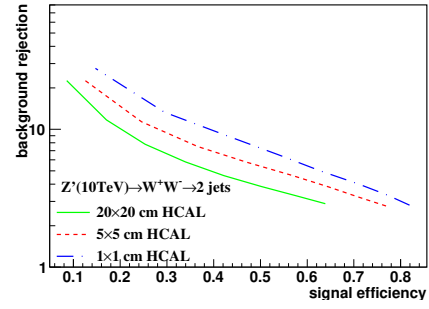


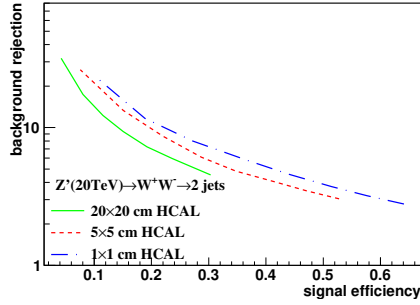
Figure 1: Distributions of mass soft drop at  $\beta=0$ , signal=ww, in 5,10TeV energy of collision in different detector sizes. Cell Size in 20×20, 5×5, and 1×1(cm×cm) are shown here.



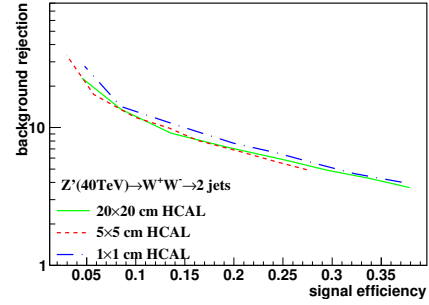
(a) Central at Median( $20 \times 20 = 80, 5 \times 5 = 80, 1 \times 1 = 80$ ) change width in cluster at 5TeV



(b) Central at Median( $20 \times 20 = 95, 5 \times 5 = 80, 1 \times 1 = 75$ ) change width in cluster at 10TeV



(c) Central at Median( $20 \times 20 = 155, 5 \times 5 = 95, 1 \times 1 = 90$ ) change width in cluster at 20TeV



(d) Central at Median( $20 \times 20 = 130, 5 \times 5 = 150, 1 \times 1 = 135$ ) change width in cluster at 40TeV

Figure 2: study of "fix central and change width" in mass soft drop at  $\beta=0$ , signal=ww, in 5, 10, 20, 40TeV energy of collision in different detector sizes. Cell Size in  $20 \times 20$ ,  $5 \times 5$ , and  $1 \times 1$ (cm $\times$ cm) are shown in each picture.

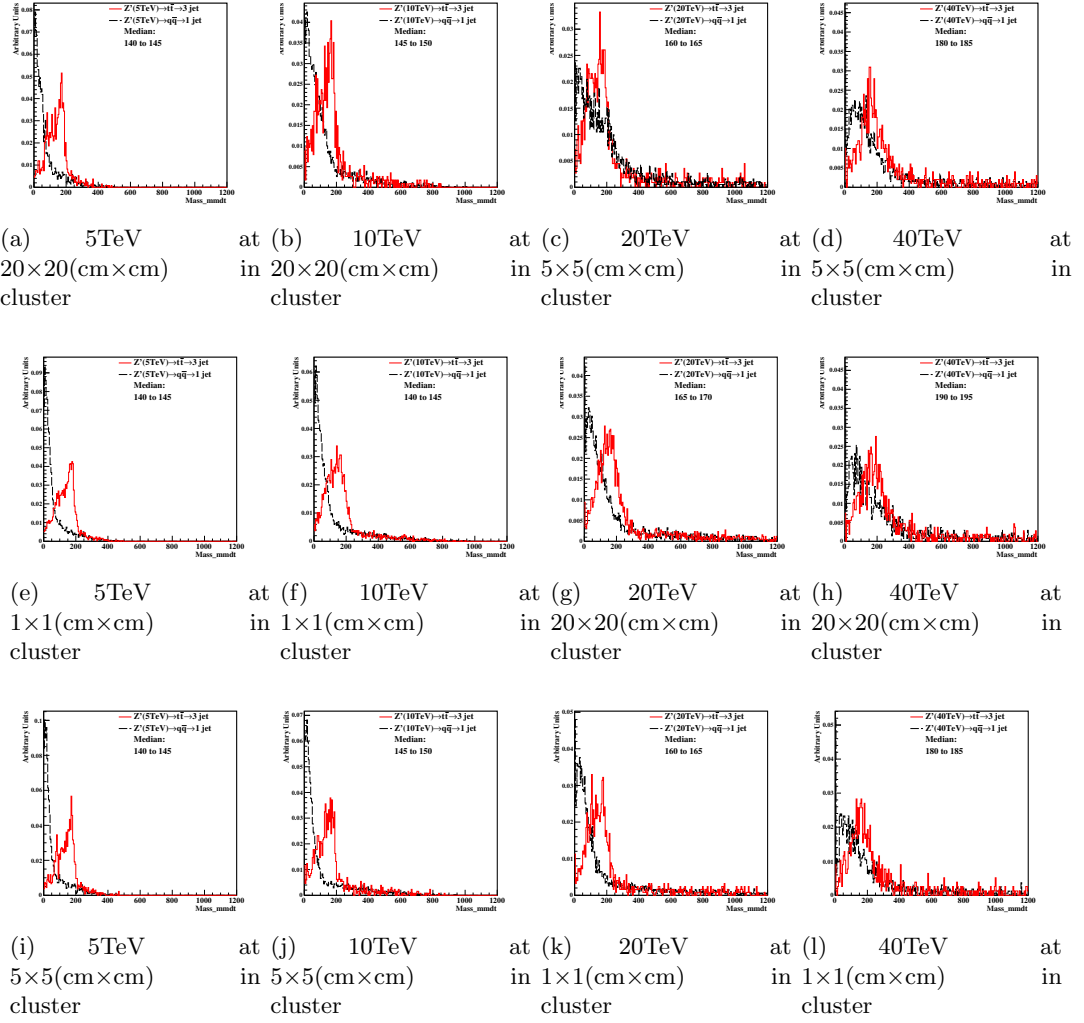
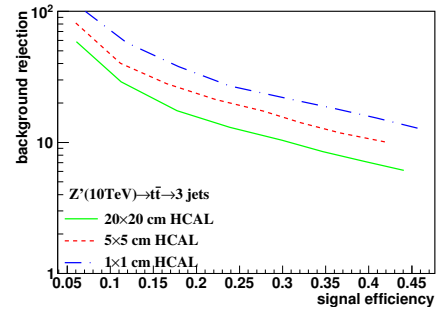
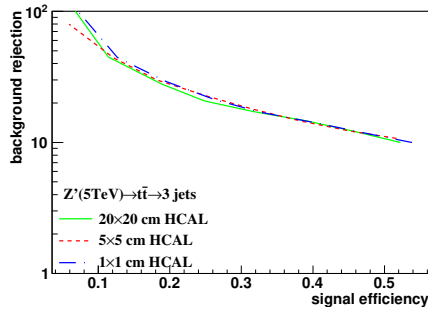
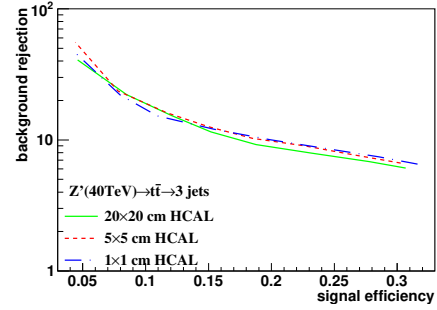
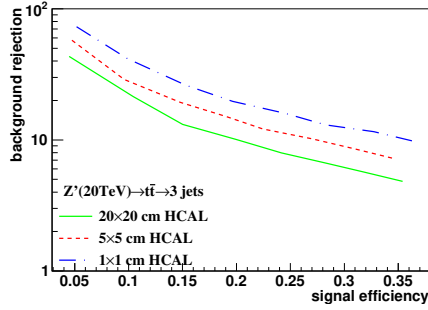


Figure 3: Distributions of mass soft drop at  $\beta=0$ , signal= $tt$ , in 5,10TeV energy of collision in different detector sizes. Cell Size in 20×20, 5×5, and 1×1(cm×cm) are shown here.



(a) Central at Median( $20 \times 20=150, 5 \times 5=150, 1 \times 1=150$ ) change width in cluster at 5TeV



(c) Central at Median( $20 \times 20=165, 5 \times 5=175, 1 \times 1=170$ ) change width in cluster at 20TeV

(d) Central at Median( $20 \times 20=190, 5 \times 5=200, 1 \times 1=190$ ) change width in cluster at 40TeV

Figure 4: study of "fix central and change width" in mass soft drop at  $\beta=0$ , signal= $tt$ , in 5, 10, 20, 40TeV energy of collision in different detector sizes. Cell Size in  $20 \times 20$ ,  $5 \times 5$ , and  $1 \times 1$ (cm $\times$ cm) are shown in each picture.

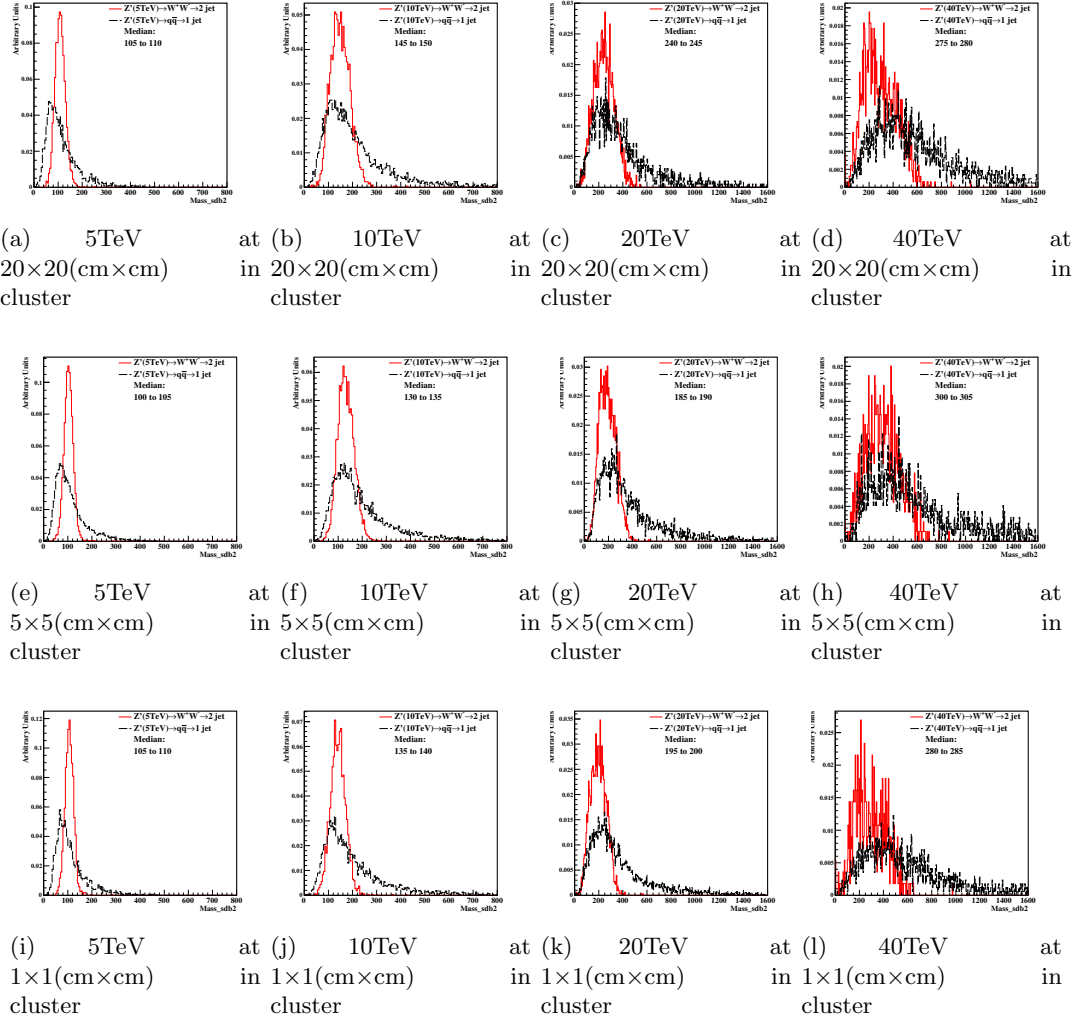
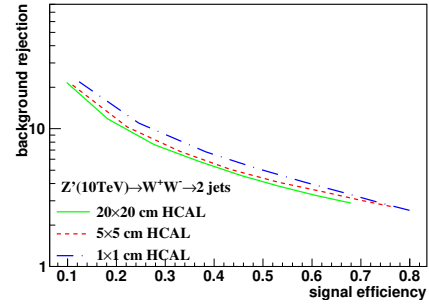
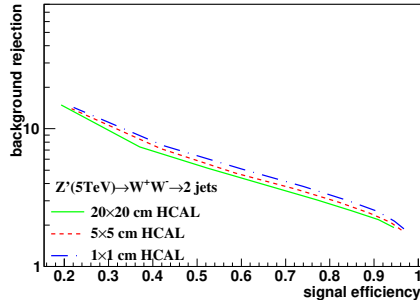
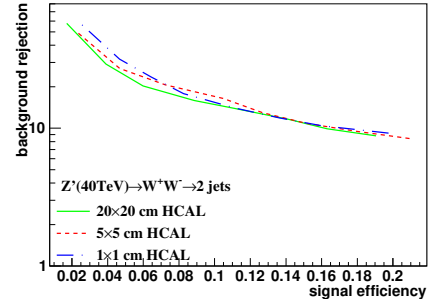
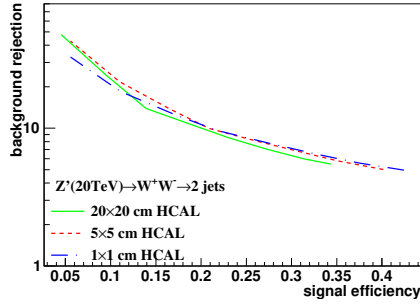


Figure 5: Distributions of mass soft drop at  $\beta=2$ , signal=ww, in 5,10TeV energy of collision in different detector sizes. Cell Size in 20×20, 5×5, and 1×1(cm×cm) are shown here.



(a) Central at Median( $20 \times 20=115,5 \times 5=110,1 \times 1=115$ ) change width in cluster at 5TeV (b) Central at Median( $20 \times 20=155,5 \times 5=140,1 \times 1=145$ ) change width in cluster at 10TeV



(c) Central at Median( $20 \times 20=250,5 \times 5=195,1 \times 1=205$ ) change width in cluster at 20TeV (d) Central at Median( $20 \times 20=285,5 \times 5=310,1 \times 1=290$ ) change width in cluster at 40TeV

Figure 6: study of "fix central and change width" in mass soft drop at  $\beta=2$ , signal=ww, in 5, 10, 20, 40TeV energy of collision in different detector sizes. Cell Size in  $20 \times 20$ ,  $5 \times 5$ , and  $1 \times 1$ (cm $\times$ cm) are shown in each picture.

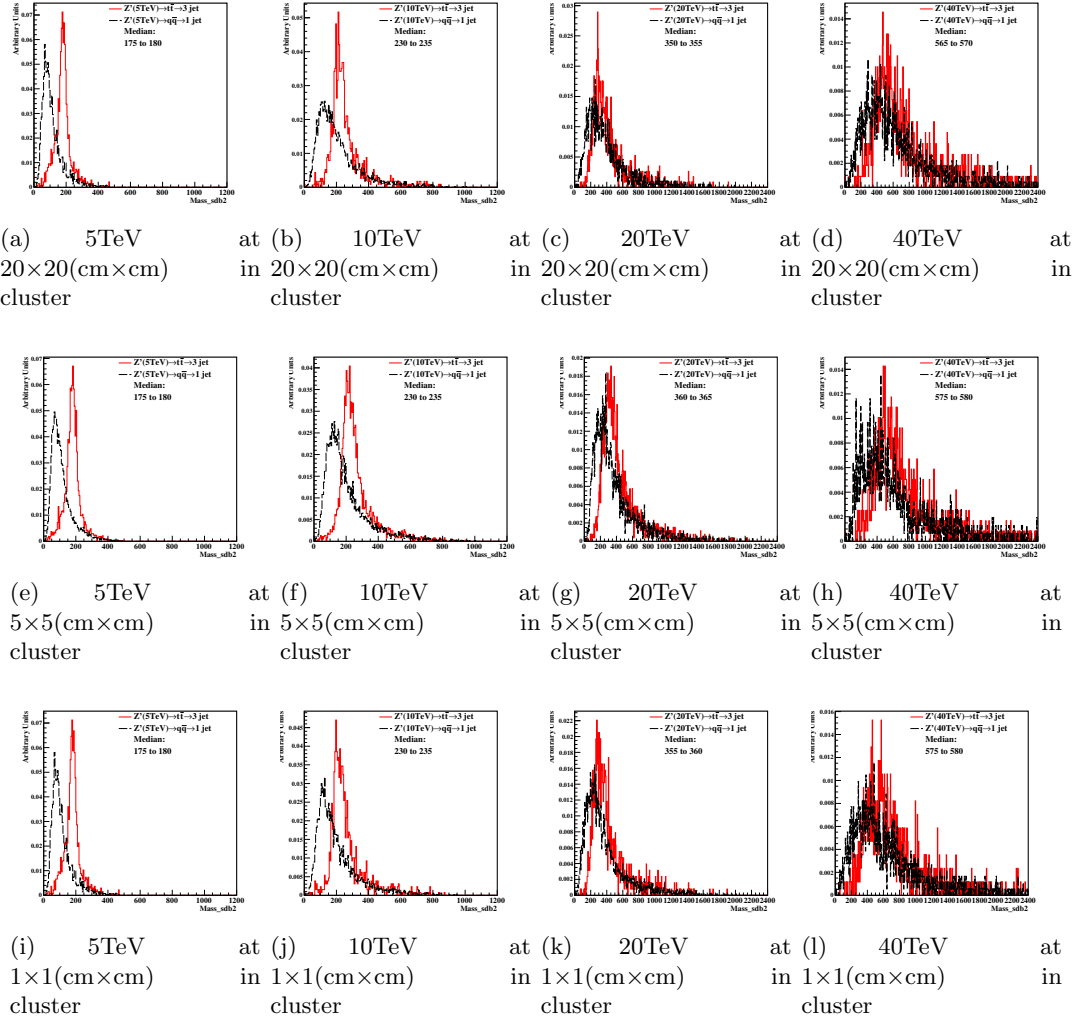
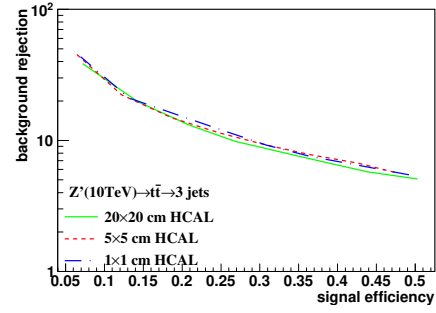
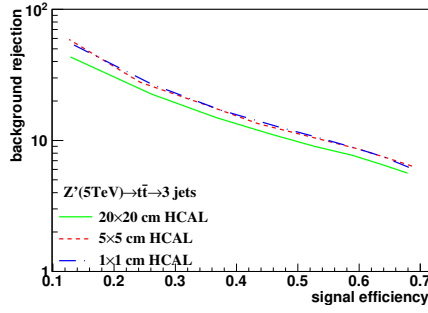
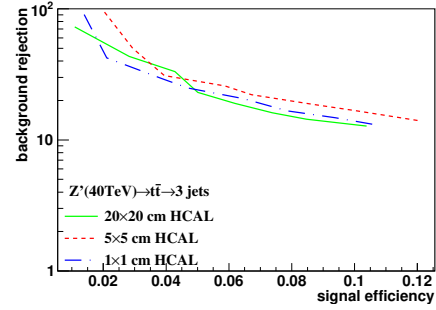
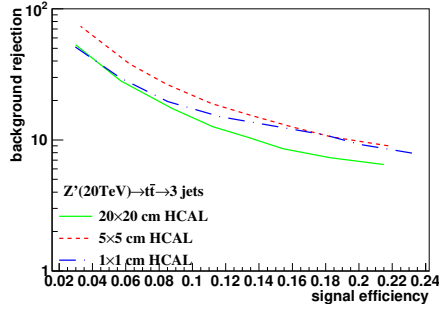


Figure 7: Distributions of mass soft drop at  $\beta=2$ , signal= $tt$ , in 5, 10 TeV energy of collision in different detector sizes. Cell Size in  $20 \times 20$ ,  $5 \times 5$ , and  $1 \times 1$  (cm x cm) are shown here.





(a) Central at Median( $20 \times 20=185,5 \times 5=185,1 \times 1=185$ ) change width in cluster at 5TeV (b) Central at Median( $20 \times 20=240,5 \times 5=240,1 \times 1=240$ ) change width in cluster at 10TeV



(c) Central at Median( $20 \times 20=360,5 \times 5=375,1 \times 1=365$ ) change width in cluster at 20TeV (d) Central at Median( $20 \times 20=620,5 \times 5=625,1 \times 1=630$ ) change width in cluster at 40TeV

Figure 8: study of "fix central and change width" in mass soft drop at  $\beta=2$ , signal= $tt$ , in 5, 10, 20, 40TeV energy of collision in different detector sizes. Cell Size in  $20 \times 20$ ,  $5 \times 5$ , and  $1 \times 1$ (cm $\times$ cm) are shown in each picture.