

The Study of BSC Energy Thresholds

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The reason of this study:

The setup of Etot_l and Etot_h of BSC is very important for the status of online data acquisition. If the energy thresholds are too high, good events will be lost, however, too low thresholds will bring in large quantity of bad events in rawdata.

In march 2000, the event rate of BES became much higher, which meant the thresholds had become comparably lower. This didn't mean that the trigger system itself had something wrong, because this phenomenon could be caused by detectors and other factors. On account of this, we want to find the reasons and give a method to adjust the thresholds. Unfortunately, this study finds that the factors influencing the thresholds are complex and fickle, so no feasible method is found to adapt the thresholds.

The method to locate the thresholds at present:

1. We using the offline reconstructed data, the total energy of each event deposited in BSC that surpass the energy threshold is filled in one histogram and those of the events that do not surpass the threshold are filled in another histogram. Then the two histogram are placed together, the intersection point is the energy value that the threshold is equivalent to.
2. Use the online ADC data, and add all values of ADC channels, thus the intersection point is given in the accumulated value of ADC channels.

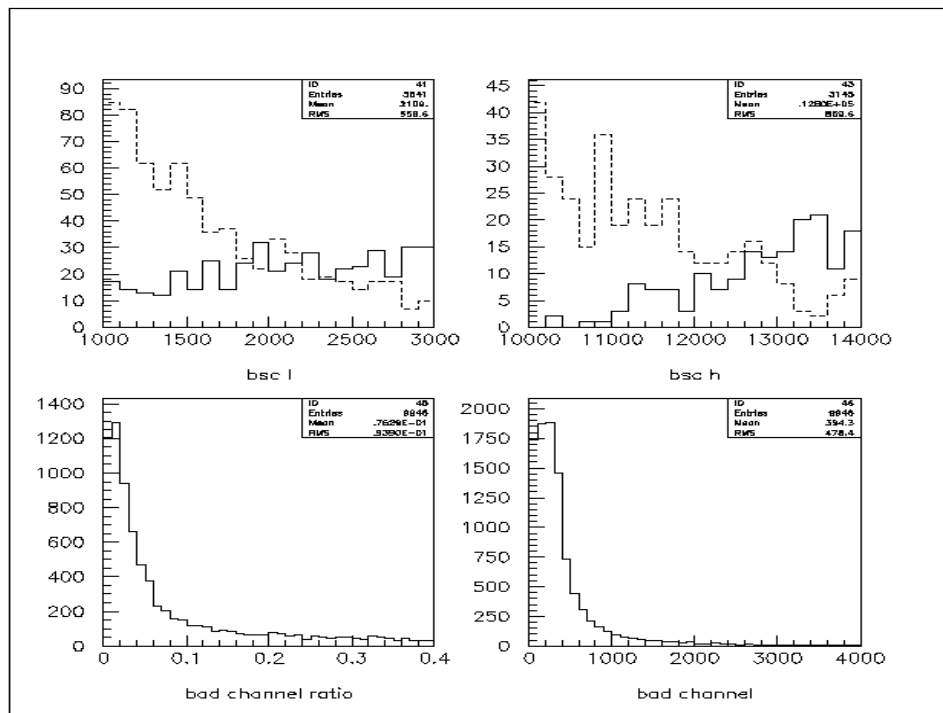


Figure 1: The first picture “bsc l” is for low energy threshold, the second “bsc h” for high energy threshold, and the fourth is for false (bad) signals.

The results and problems found:

We used the data run13566 to run13573(these data was collected in December of 1999 for BSC energy threshold study)and the data run15427 to run15430(also collected for BSC energy threshold study. The analysis results of the two group of data have large difference.the intersection point of the run13566 to run13573 is greater than run15427 to run15430 by more than 2000(ADC value) at the same energy threshold,which is equivalent to more than 200Mev energy shift .

Run	threshold low	Correspond E value	Correspond ADC value	Threshold high	correspond E value	correspond ADC value
13566	20	0.095	2200	55	0.72	13400
13567	25	0.22	4200	60	0.8	14600
13568	30	0.32	5800	65	0.83	15600
13369	35	0.39	7500	70	0.93	17000
13570	40	0.5	9000	75	1.03	18800
13571	45	0.54	10200	80	1.07	19600
13572	50	0.64	12000	85	1.12	20800
13573	55	0.72	13000	90	1.23	22200
15427	20	0	0	35	0.21	4450
15428	25	0.02	800	55	0.56	11000
15429	30	0.095	2300	65	0.7	14400
15430	35	0.2	4000	75	0.88	17000

Figure 2: this shows the difference between two groups of runs.

I want to mention another thing. The run13931 to 13939(January 11, 2000) was collected for trigger efficiency measurement. The Etot_l is set at 20 and the Etot_h is set at 55,their corresponding intersection points are 150Mev and 950Mev,comparably larger than those of run13566 to run13573, but less than those of run15427 to run15430 at the same thresholds. This suggests the corresponding intersection point of certain threshold value doesn't become less and less by time; it fluctuates as the time follows.

We had considered the influence of false ADC readout signals, and histogrammed the sum of these false signal ADC value (The SQS tubes are read out at two ends, and signals read out at only one end are considered as false signals). They (for each run listed above) all have peak value(about 400) at the low energy end , and the distribution is almost the same. This suggests that false signals contribute little to the shift of the intersection point corresponding to the same threshold.

The most probable reason is the change of wave shape, amplitude and baseline of BSC signals, but we didn't observe the wave systematically and keep a record of it . The temperature swift and the ingredient change of the gases in BSC will significantly affect the output signals. Since input signals used in BSC trigger(not integrated) is shaped differently from ADC input signals(integrated, although they all come from BSC), the consistency between trigger thresholds and its corresponding intersection points of energy or ADC values is only held when the detector

BSC is stable.

Another thing I want to mention is the computing results of run16034 (April 12, 2000) and run16070 (April 13). They are normal runs. An online figure give their Bhabha energy distribution, the difference between the peak value of the two runs is evident, but their corresponding energy intersection points of thresholds are the same. It's a strange thing.

The trigger table for this study (different from normal table):

TYPE COND TN	BHABHA	CHARGED	2-MU	CHAR2	NEUTRAL	ENEU	EBB	BB2
Active?	Y	Y	N	Y	Y	N	N	N
TOF B-B	-	-	-	-	-	-	-	-
Ntof>=1	Y	Y	Y	-	Y	-	-	-
NTOF>=2	-	-	-	Y	-	-	-	Y
RADIAL.	-	-	-	-	-	-	-	-
Nvc>=1.	Y	Y	-	Y	Y	-	Y	-
Erad1	-	-	-	-	-	Y	-	Y
ETOF B-B	-	-	-	-	-	-	Y	-
ETOF>=1	-	-	-	-	-	-	-	-
Nvc>=2	-	-	-	-	-	-	-	-
Ntrk>=1	Y	Y	-	-	Y	-	-	-
Ntrk>=2	-	-	-	Y	-	-	-	-
Ntrk>=4	-	-	-	-	-	-	-	-
MUON-OR	-	-	Y	-	-	-	-	-
Etrk	-	-	-	-	-	-	-	Y
ESC-Etot	-	-	-	-	-	Y	Y	-
E tot. l	-	Y	-	-	-	-	-	-
E tot. h	-	-	-	-	Y	-	-	-
3	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-

figure 2