e+e- pair reconstruction

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The steps of reconstructing e+e- pair in PS ：

1) Filter out duplicate hits in ps detectors and fill the overlaps of two adjacent counters

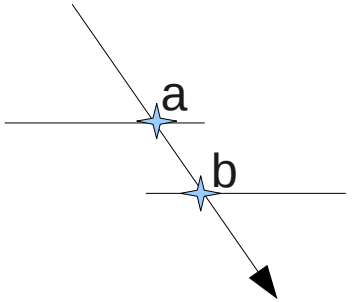


Figure 1: one particle track passes through overlapping region of two adjacent PS-counters.

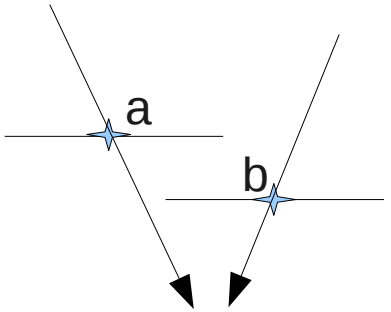


Figure 2: two different particle tracks pass through two adjacent PS-counters separately.

- Coincidence signal window cut for two overlapping PS-counters: [-4.5, 4.5]ns
- See Figure 1: If time difference between hit “a” and hit “b” :|tdiff_ab| <4.5ns, these two hits will be treated as one particle track which just pass through the overlapping region of this two counters. The time of this tack will be the time of the first hit on the geometry. Hit a,b will also be marked with “used” flags, and won't be compared with other hits anymore.
- If |tdiff_ab| >4.5ns, hits a,b are not the time coincidence event and will be used to compare with other unused hits in one event.
- See Figure 2: if one hit doesn't find any of its time coincidence hit on the adjacent counter, this hit would be corresponding to one track which doesn't pass through the overlapping region of two adjacent counters.
- In the end, 32 PS-counters will be convert to 64 PS-channels which is like the relationship between T-counters and T-channels

The steps of reconstructing e+e- pair in PS :

2) Find time coincidence signals between front and back counters for right and left arm separately.

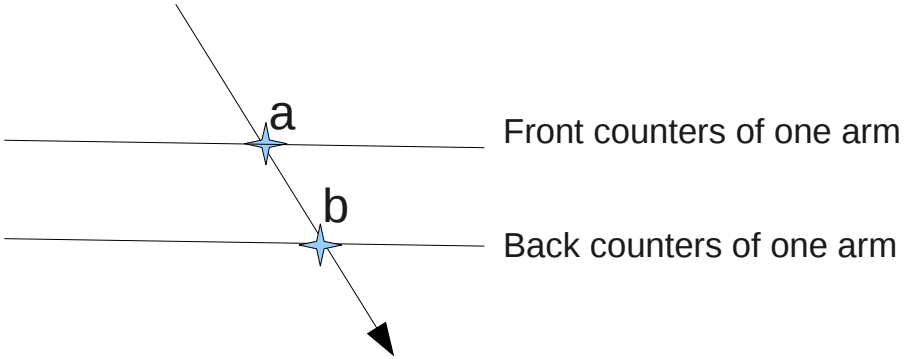
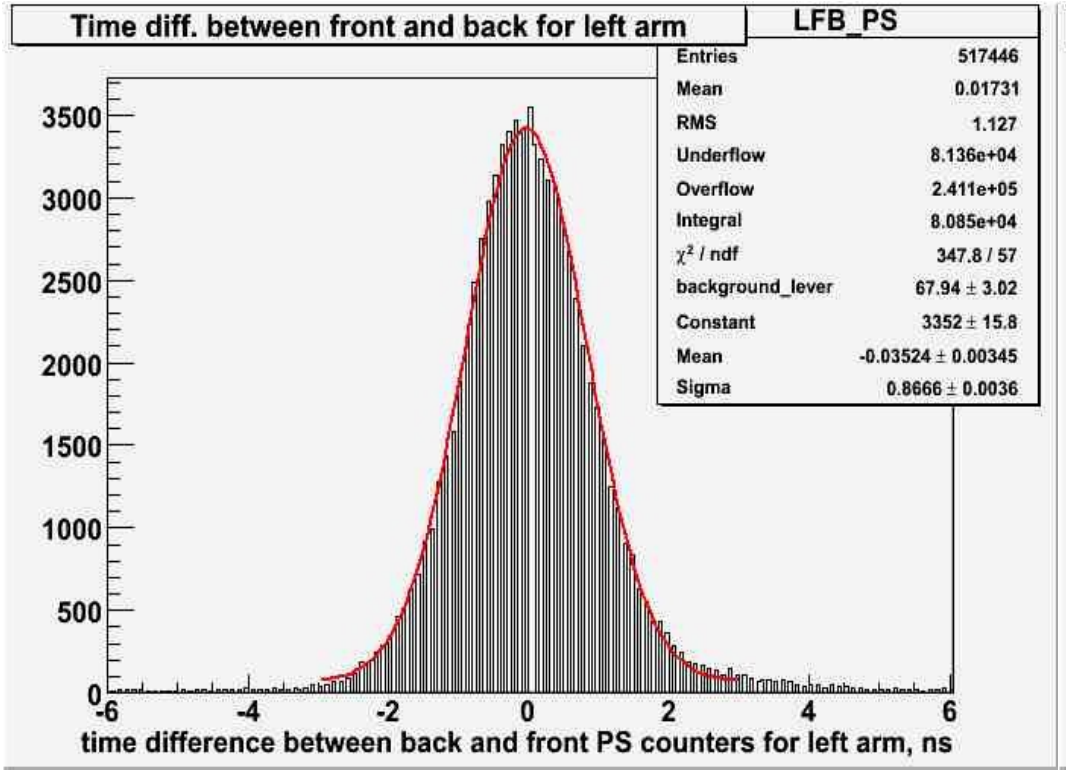


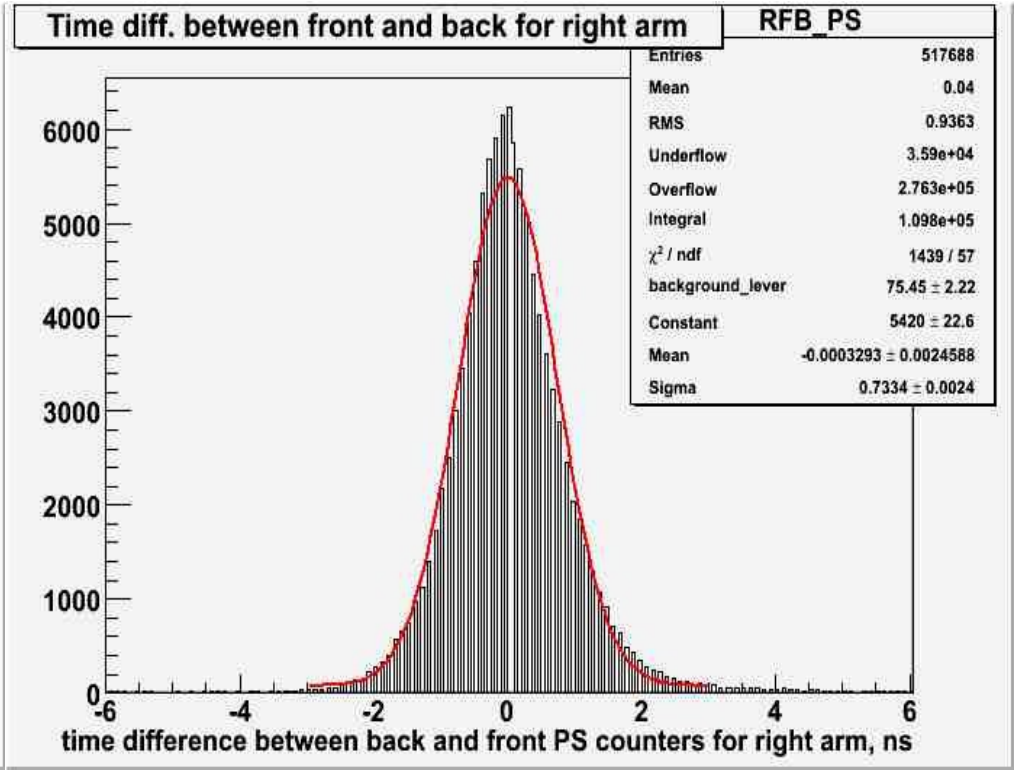
Figure 3: one particle track passes through from one of front PS-channels(hit a) to one of back PS-channels(hit b).

- Coincidence signal window cut for front and back PS-channels: [-4, 4]ns
- See Figure 3: If time difference between hit “a” and hit “b”: |tdiff_ab| <4ns, these two hits will be treated as one particle track which pass through from one of front PS-channels to one of back PS-channels. The time of this tack will be the time of the hit from the front channels. Hit a,b will also be marked with “used” flags, and won't be compared with other hits anymore.
- If |tdiff_ab| >4ns, hits a,b wouldn't be time coincidence event and will be used to compare with other unused hits in the same event
- In the end, the hit would be filtered as a background if it doesn't find any possible coincidence hit.

Time diff. between any of two hits from front and back counters separately for left arm

Time diff. between any of two hits from front and back counters separately for right arm





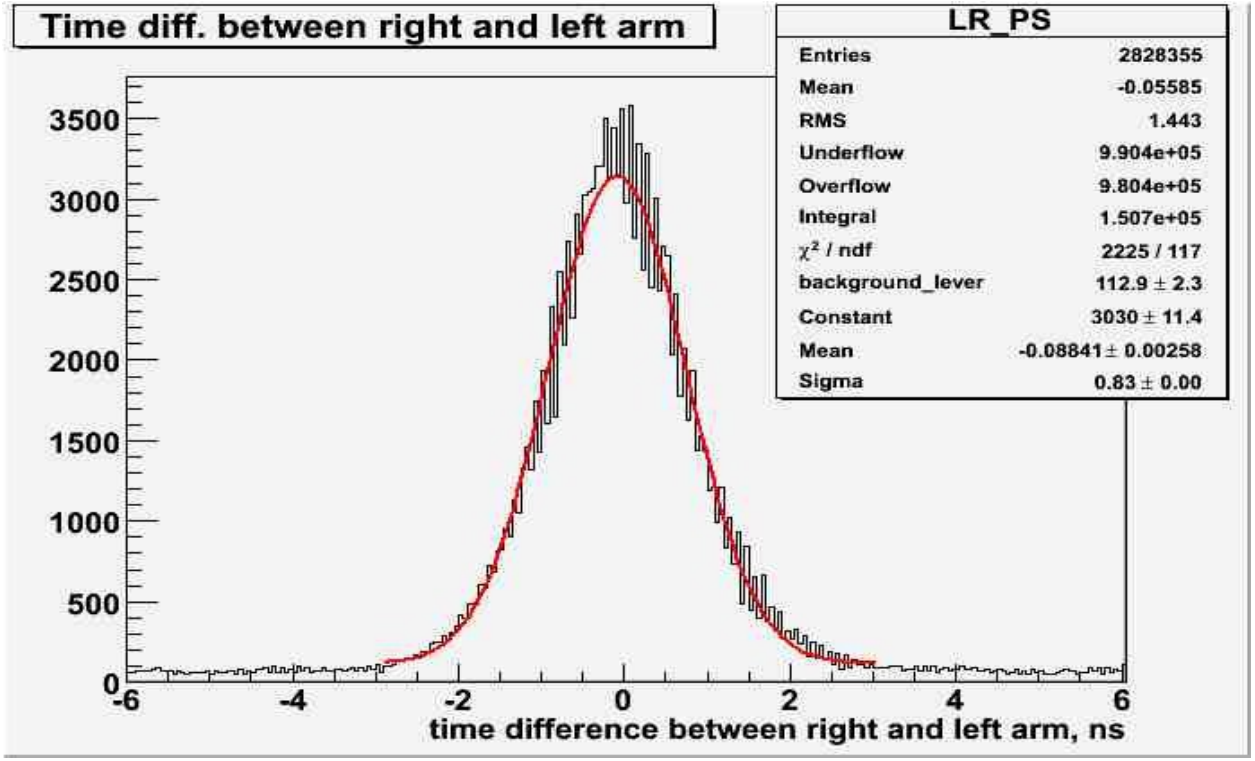
The steps of reconstructing e+e- pair in PS ：

3) Find time coincidence tracks between right and left arm.

Figure 4: Two particle tracks L and R pass through left and right arm seprately

- Coincidence signal window cut for left arm and right arm: [-4, 4]ns
- See Figure 4: If time difference between track L and track R: |tdiff_LR| <4ns, these two tracks will be treated as one e+e- pair. The time of this e+e- pair will be the time of track from the right
- arm(downstream). These two tracks will also be marked with “used” flags, and won't be compared with other tacks anymore.
- If |tdiff_ab| >4ns, those two tracks wouldn't be time coincidence event and will be used to compare with other unused tracks.
- In the end, the track on one side arm would be filtered as a background event if it doesn't find any possible coincidence track on the other side arm.

Time diff. between any of two hits from left and right arm separately



Note: the three pictures are from analyzing skim file of PS

Time diff. Between e+e- pair and tagger (the first file of raw data)

Cut condition of filling histogram: 1)Cut window for two overlapping counters:(-4.5, 4.5)ns
2)Cut window for time diff. between front and back counters (-4,4)ns
3)Cut window for time diff. between left and right arm (-4,4)ns