Multi-track efficiency

➢ Outline

- **Review:**

  Multi-track efficiency systematic study

  Data quality check

- **New for VDC efficiency:**

  a. One-track VDC misconstruction

  b. Add electron+ background cut

  c. New sample

Review

Settings: E=1157MeV P=1081.97MeV

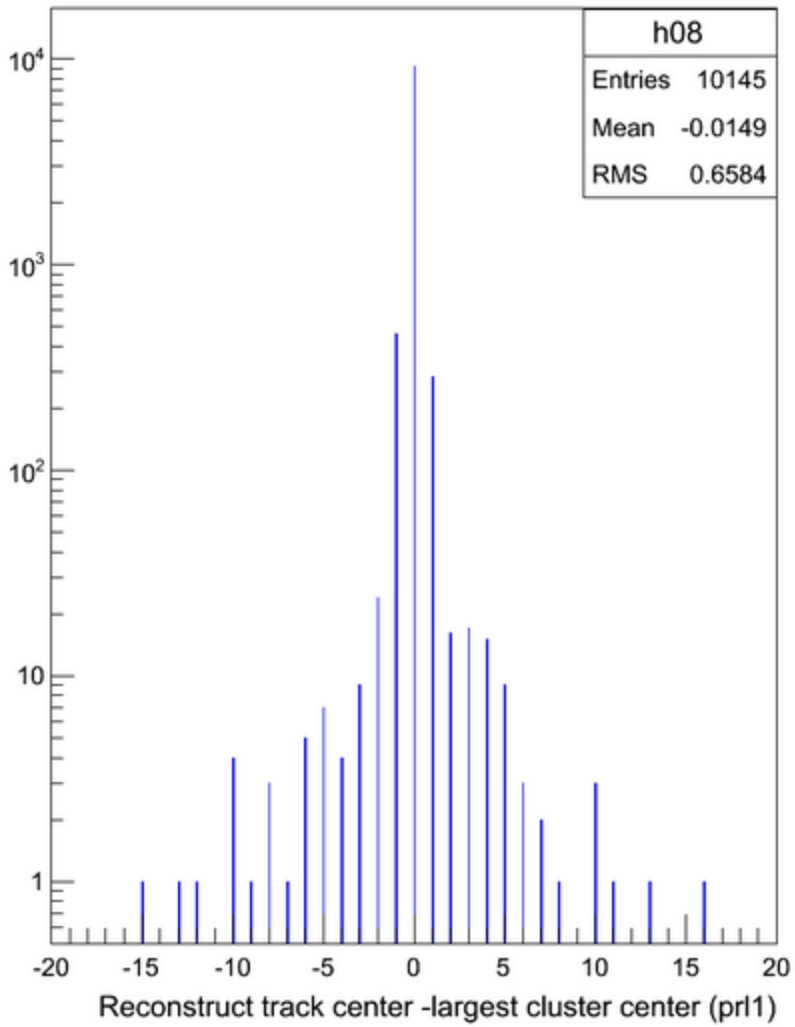
RUN# 5039

- Track probability in electron sample for 1.157GeV, 1081.97MeV, 2.5T

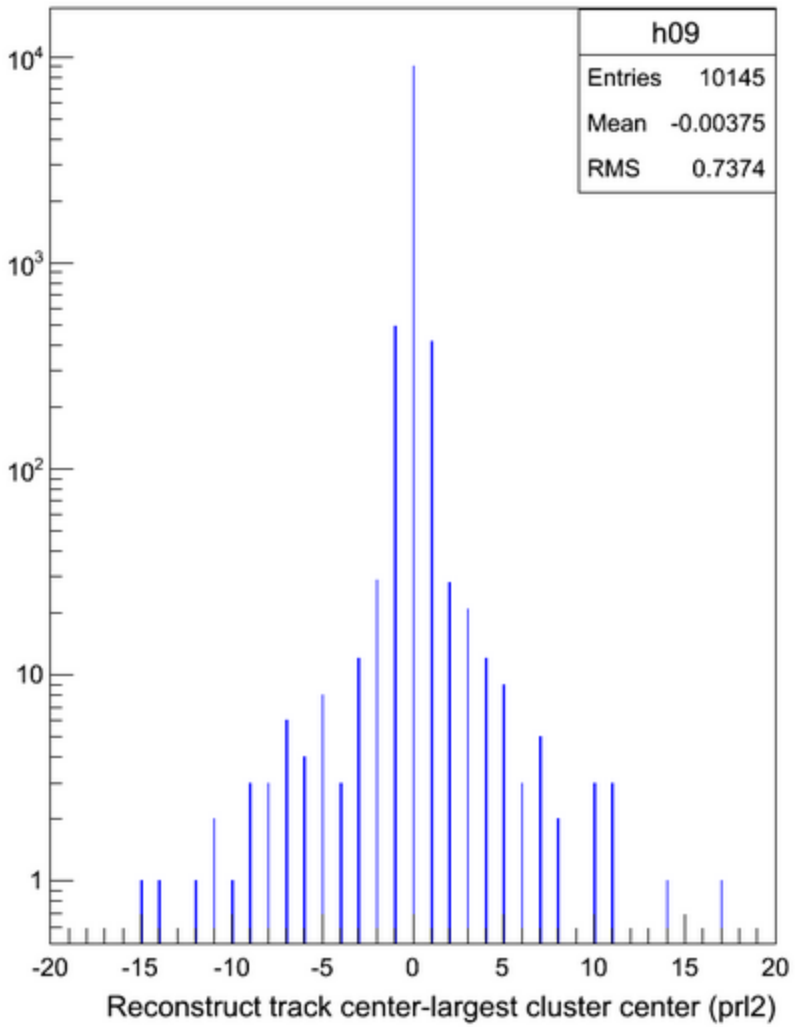
Number of tracks	0	1	2	3	4	5	6	7	More than 7
LHRS	0.00107	0.70016	0.18626	0.07471	0.02331	0.00894	0.00339	0.00135	0.00081

- **Total Events Efficiency & uncertainty:**
- $97.2\%(eff)\begin{cases} -1.2\%(sys.) \\ +0.2\%(sys.) \end{cases}$
- Not include one-track systematic

h08

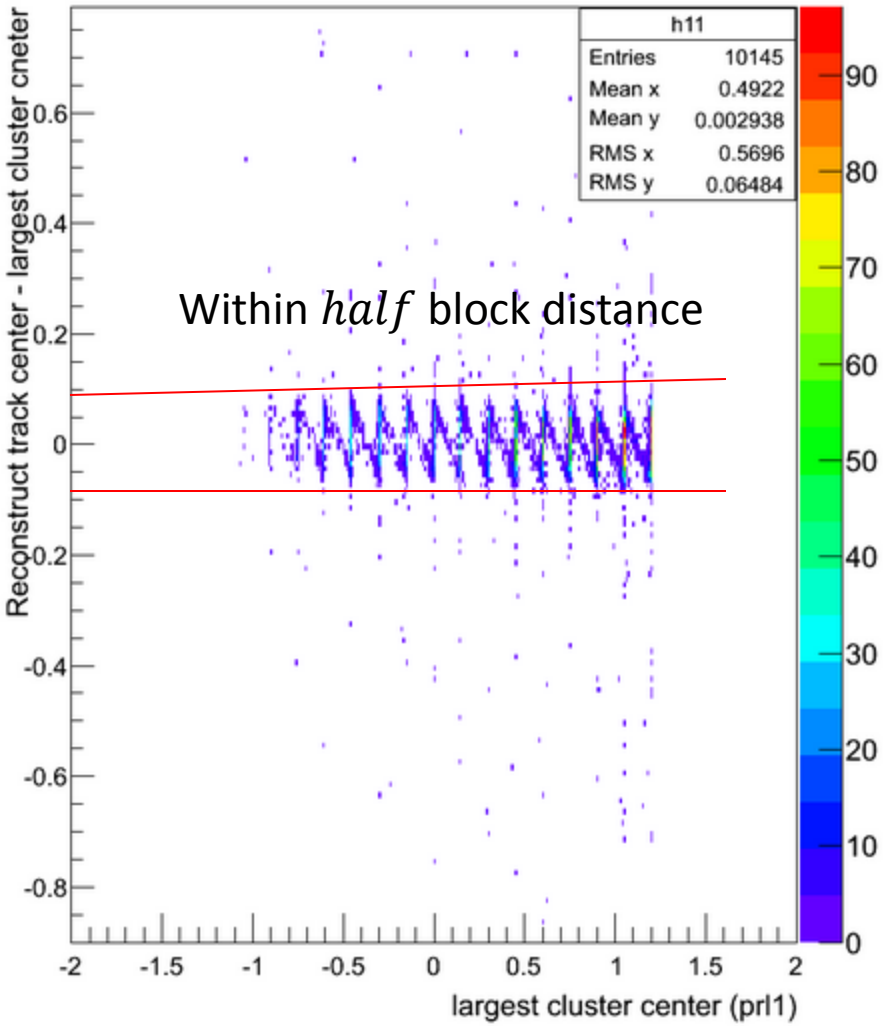


h09



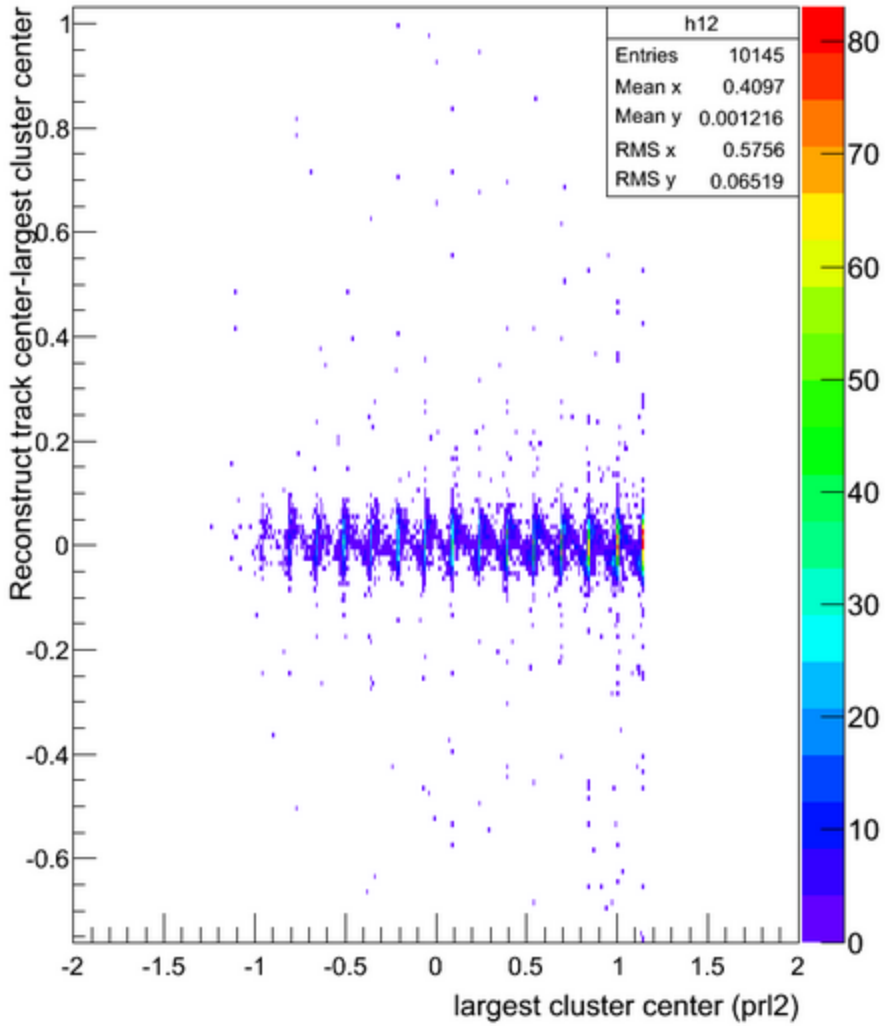
~ 1.4% of one track (with electron cuts) are not aligned in prl1, VDC misconstruction

h11



Within $half$ block distance

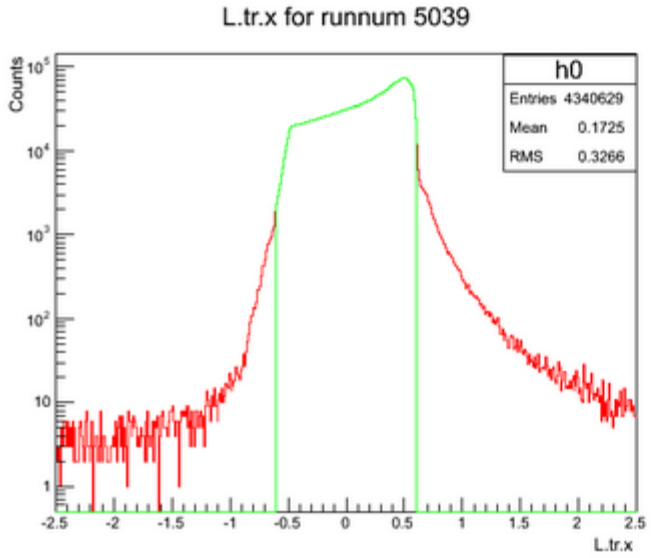
h12

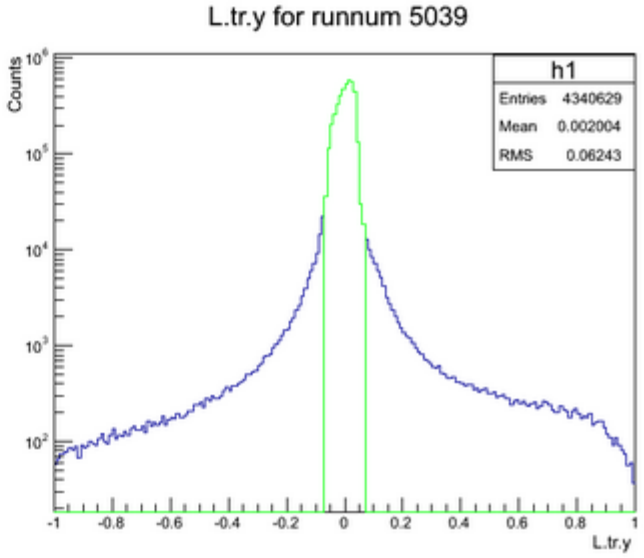


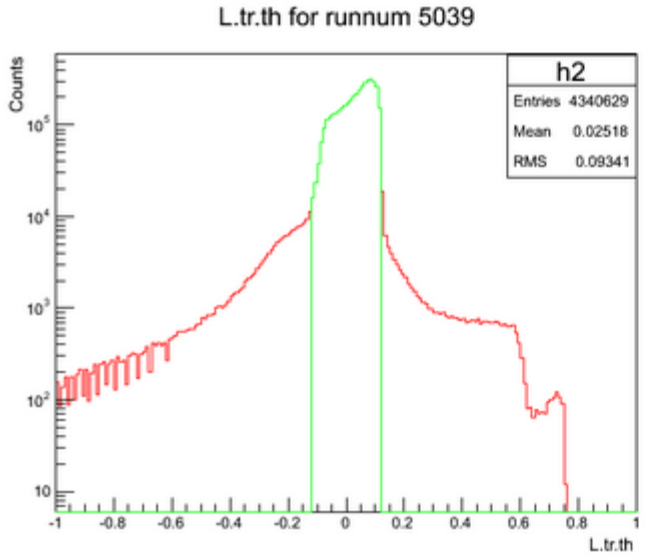
Comparison :

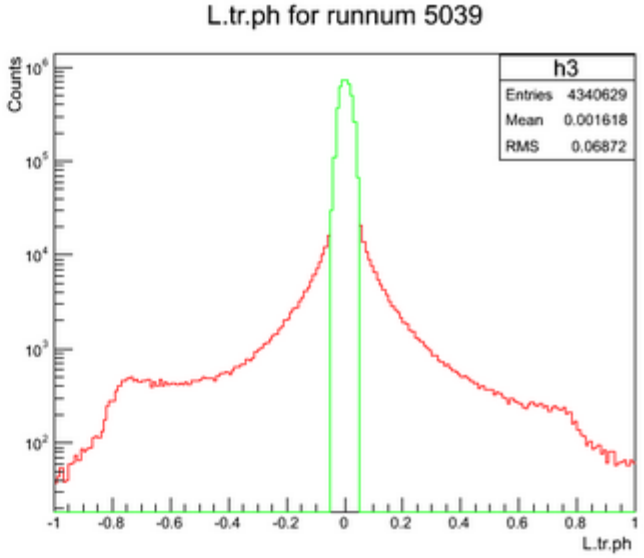
one track reconstructed cluster center VS. Largest cluster center

Acceptance cut

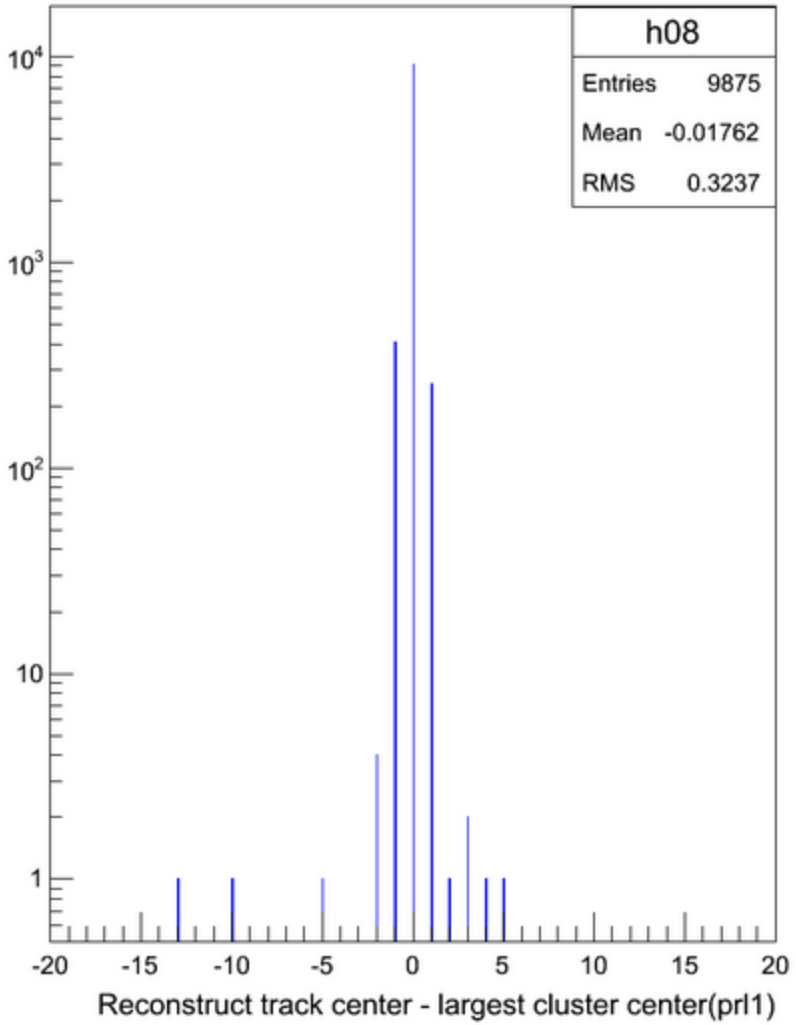








h08



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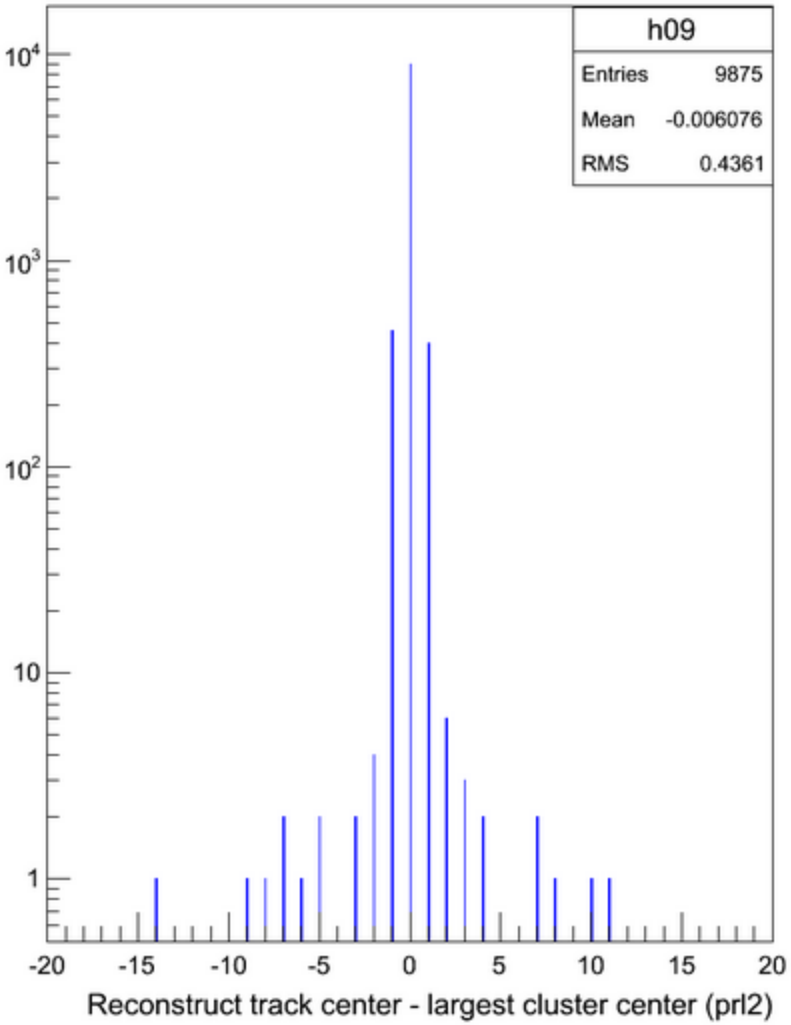


99.9% are aligned with acceptance cuts to sample in prl1

Previous study

➢ Step

Electron sample —Reconstruct in lead glass→ at-least-one-good track probability

❑ **Sample selection rule:**

- Cerenkov cut:
  L.cer.asum_c>200
- Pion rejector cuts:
  L.prl1.e>prl1_cut
  Etot>Etot_cut
- No any other track information

❑ **PID cuts:**

At-least-one track satisfy:

- Cerenkov cut:
  L.cer.asum_c>200
- Pion rejector cuts:
  L.prl1.e>prl1_cut
  Etot>Etot_cut

Now

➢ Step

Electron sample —Reconstruct in lead glass→ at-least-one-good track probability

❑ **Sample selection rule:**

- Cerenkov cut:
  L.cer.asum_c>200
- Pion rejector cuts:
  L.prl1.e>prl1_cut
  Etot>Etot_cut
- At least one track within acceptance

❑ **PID cuts:**

At-least-one track satisfy:

- Cerenkov cut:
  L.cer.asum_c>200
- Pion rejector cuts:
  L.prl1.e>prl1_cut
  Etot>Etot_cut
- This track should within acceptance cut

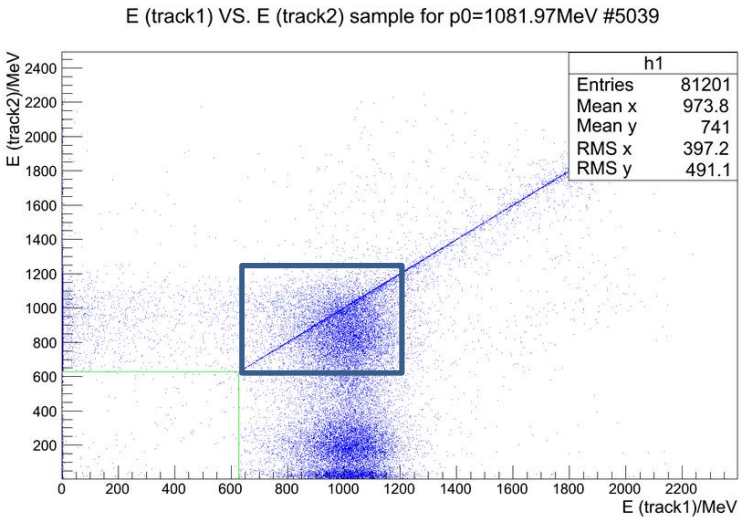
One track efficiency

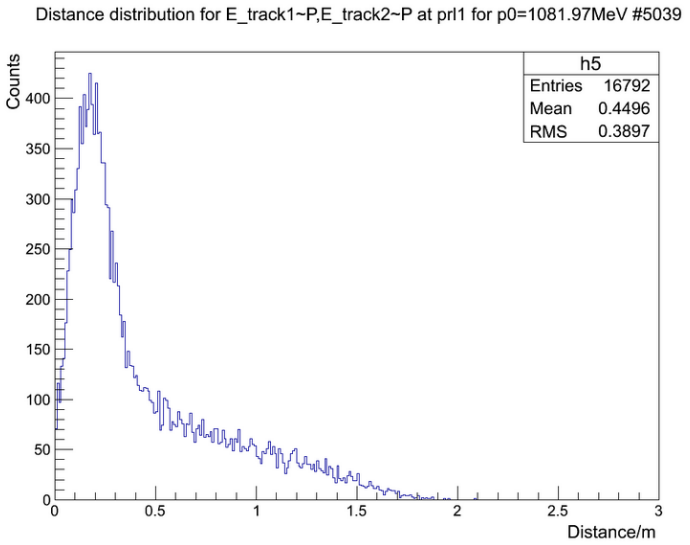
One track study	Efficiency of all track events	inefficiency
Now	71.44%	0.39%
Previous	70.01%	1.41%

Now the sample is much more clean

Last time

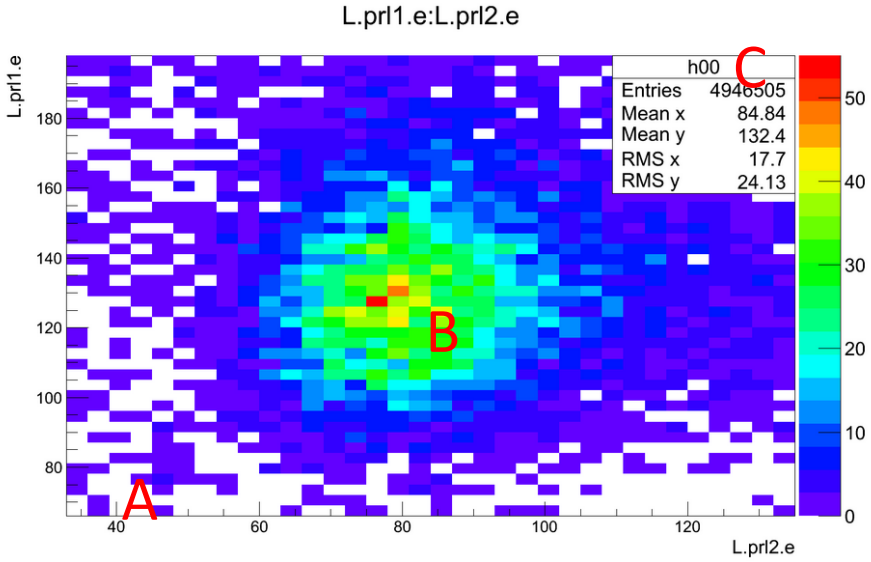
RUN# 5039

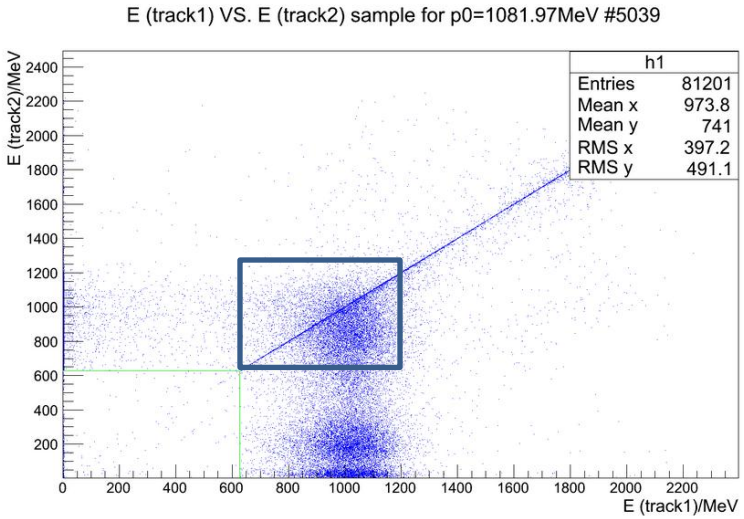




- Consider two tracks are very close and within one block distance, put into uncertainty → **Method 1**
- events: 0.099 of two-track events (0.018 of total track events)
- Method 1: contribute uncertainty 0.9% (half of 0.018)

Electron + background cut





- Electron cut+ background Cut @B
- Good track satisfy

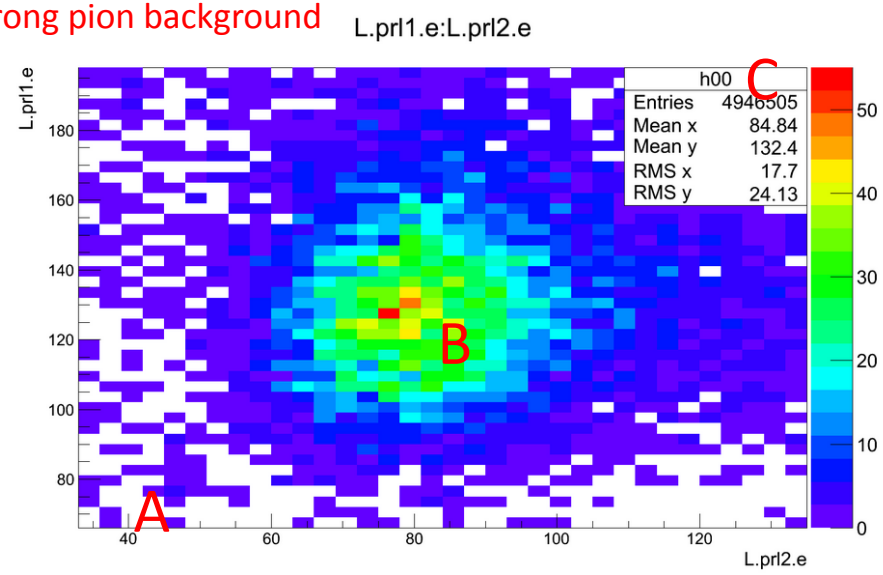
✓ L.prl1.e>prl1_cut (electron)+ prl1_cut (B)

✓ Etot>Etot_cut (electron) +Etot_cut (B)

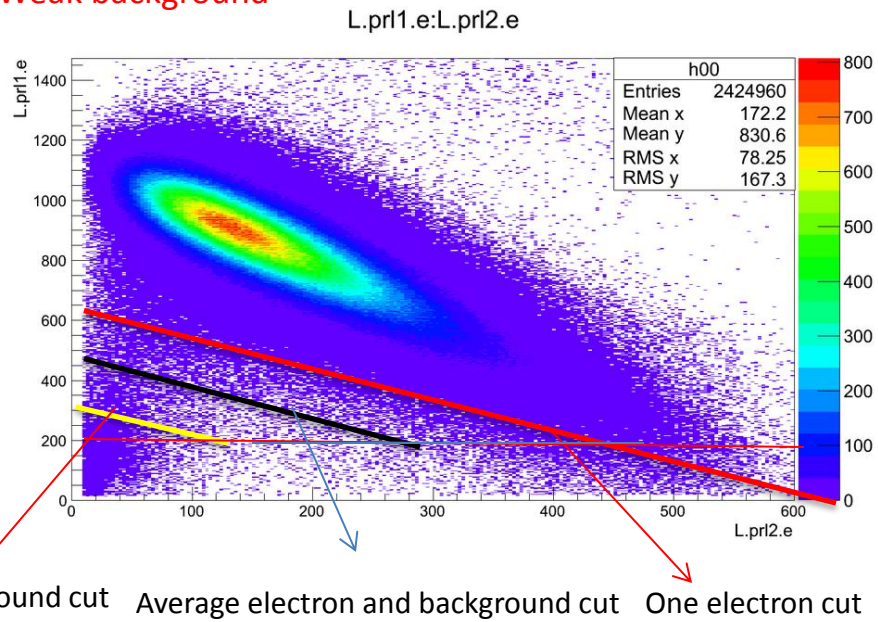
✓ within acceptance cuts

✓ Applied to the track within one block distance

Strong pion background



Weak background



One background cut Average electron and background cut One electron cut

Apply to the events with one-block in the square (1.8% of total sample)

- Electron cut + background cut@ A
  1.74% satisfied (0.06% inefficiency)

- Electron cut + background cut@ B
  1.66% satisfied (0.14% inefficiency)

- Electron cut + background cut@ C
  1.39% satisfied (0.41 % inefficiency)

$$17.73\% \begin{cases} +0.14\%(sys.) \\ -0.27\%(sys.) \end{cases}$$

NEW Settings: E=1157MeV P=1081.97MeV RUN# 5039

Number of tracks	1	2	3	4	5	6	7	More than 7
LHRS	0.71446	0.18068	0.07142	0.02105	0.00762	0.00283	0.00108	0.00086

- **Total Events Efficiency & uncertainty:**

- Optional 1: $98.30\%(eff)\begin{cases}-0.59\%(sys.)\\+0.49\%(sys.)\end{cases}$ Only center value consider one-track inefficiency. No sys. Put on one-track efficiency

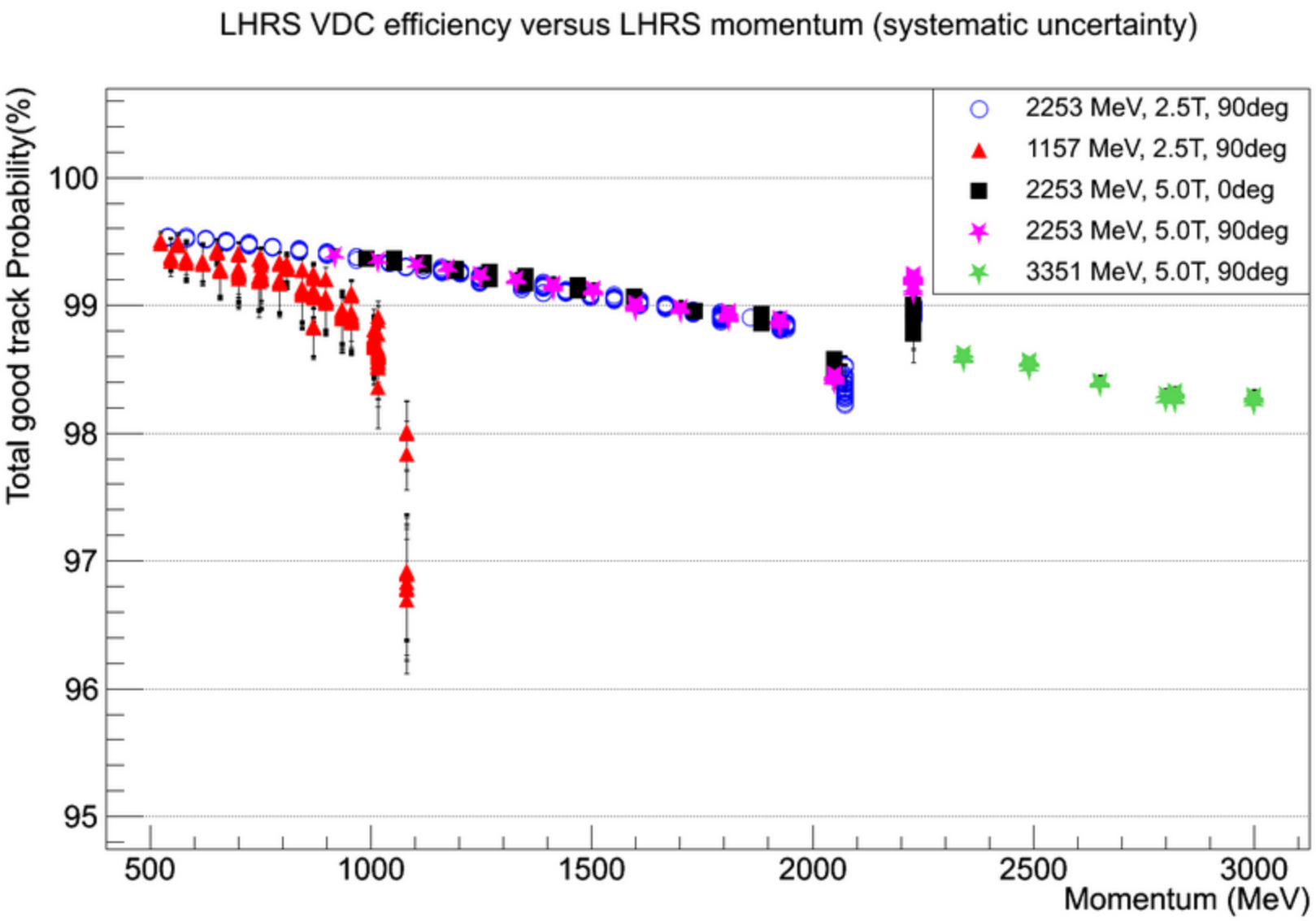
- Optional 2: $98.30\%(eff)\begin{cases}-0.59\%(sys.)\\+0.49\%(sys.)+0.39\%\ (one\ track\ ineff.)\end{cases}$

- Optional 3: $98.50\%(eff)\begin{cases}-0.59\%(sys.)-0.20\%\ (half\ of\ one\ trck\ ineff.)\\+0.49\%(sys.)+0.20\%\ (half\ of\ one\ track\ ineff.)\end{cases}$

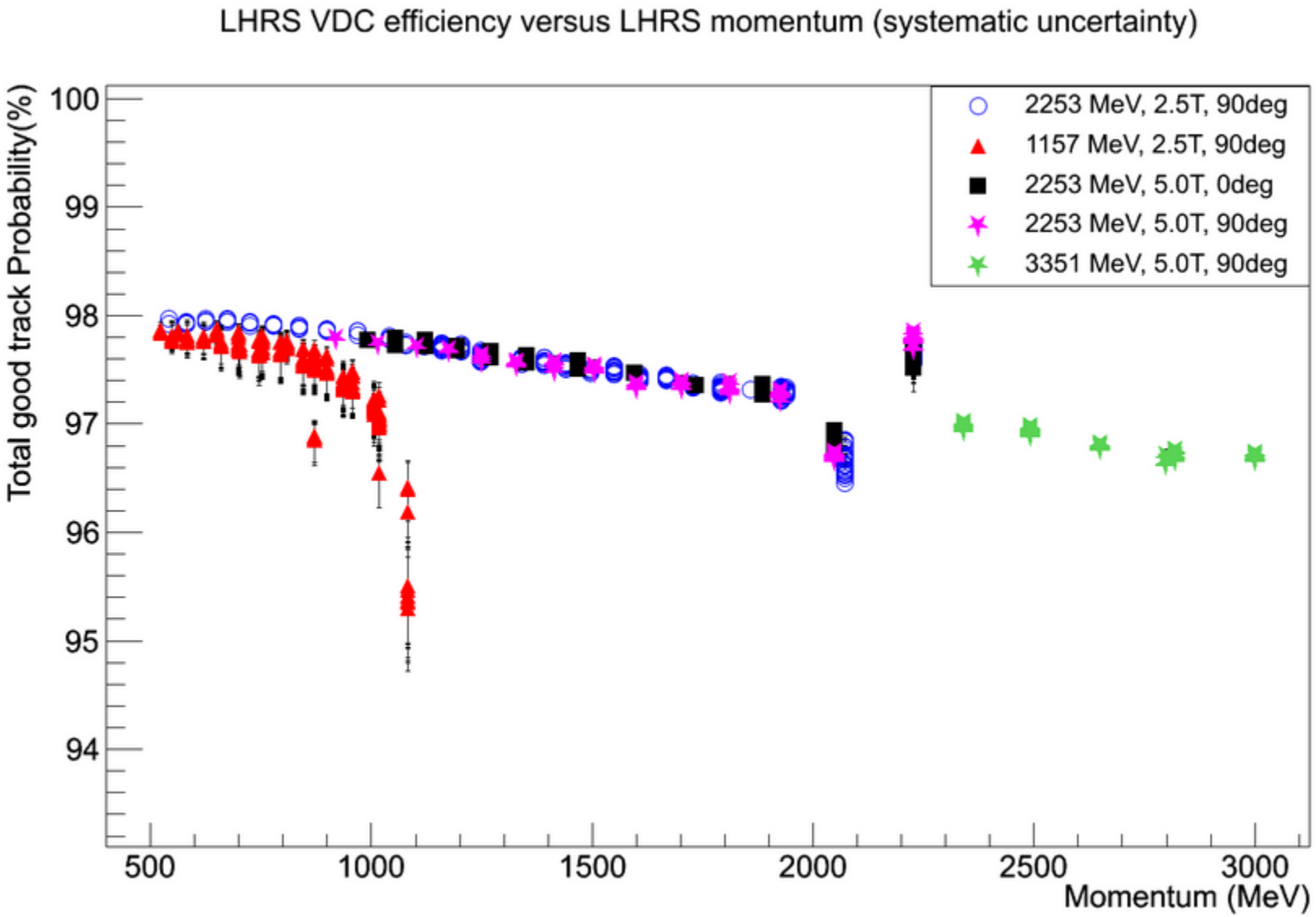
- Optional 4: $98.30\%(eff)\begin{cases}-0.59\%(sys.)-0.39\%\ (\ one\ trck\ ineff.)\\+0.49\%(sys.)+0.39\%\ (one\ track\ ineff.)\end{cases}$

Option 2-4 is loose.

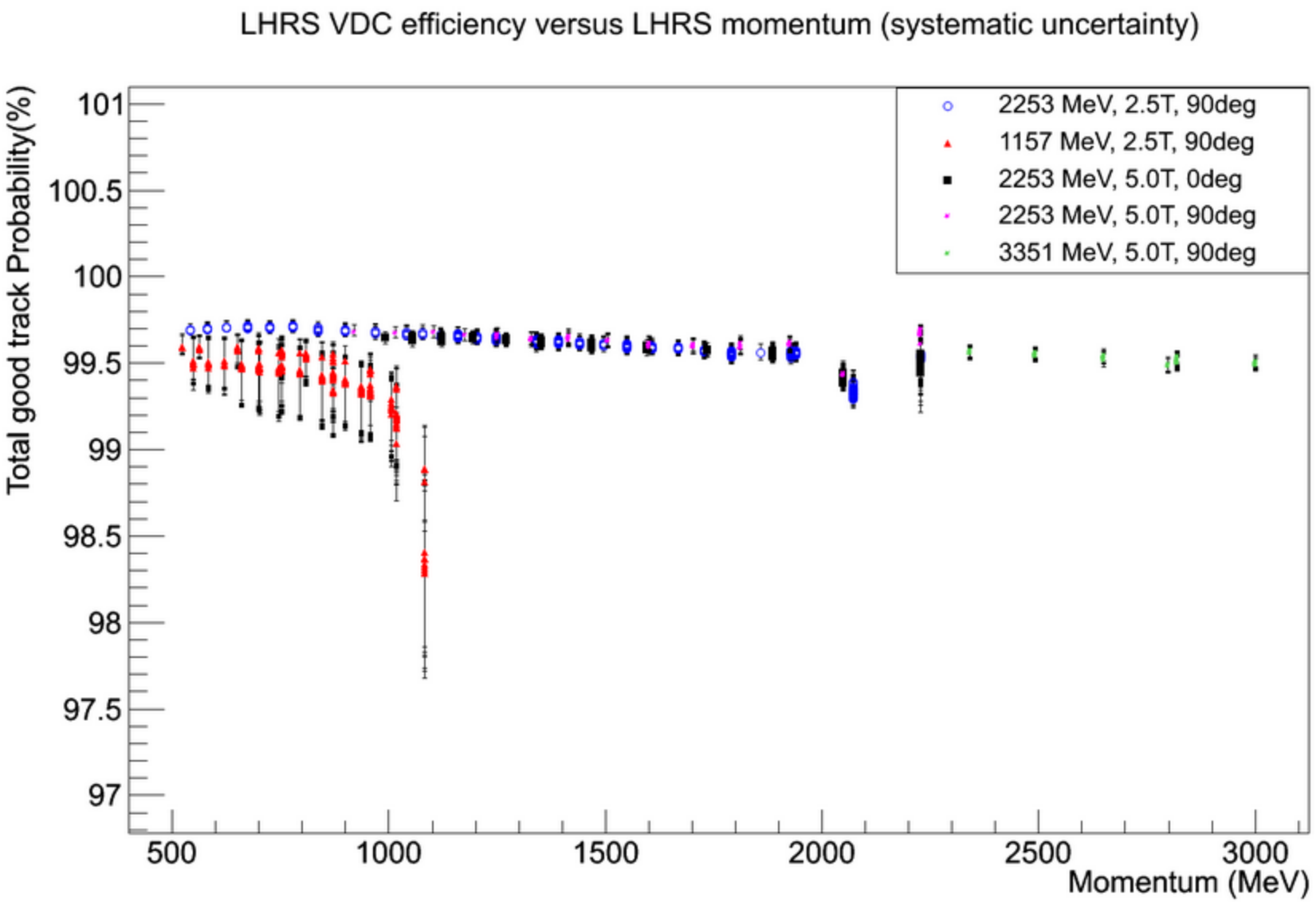
Previous study with background cuts added: center value not consider one-track inefficiency



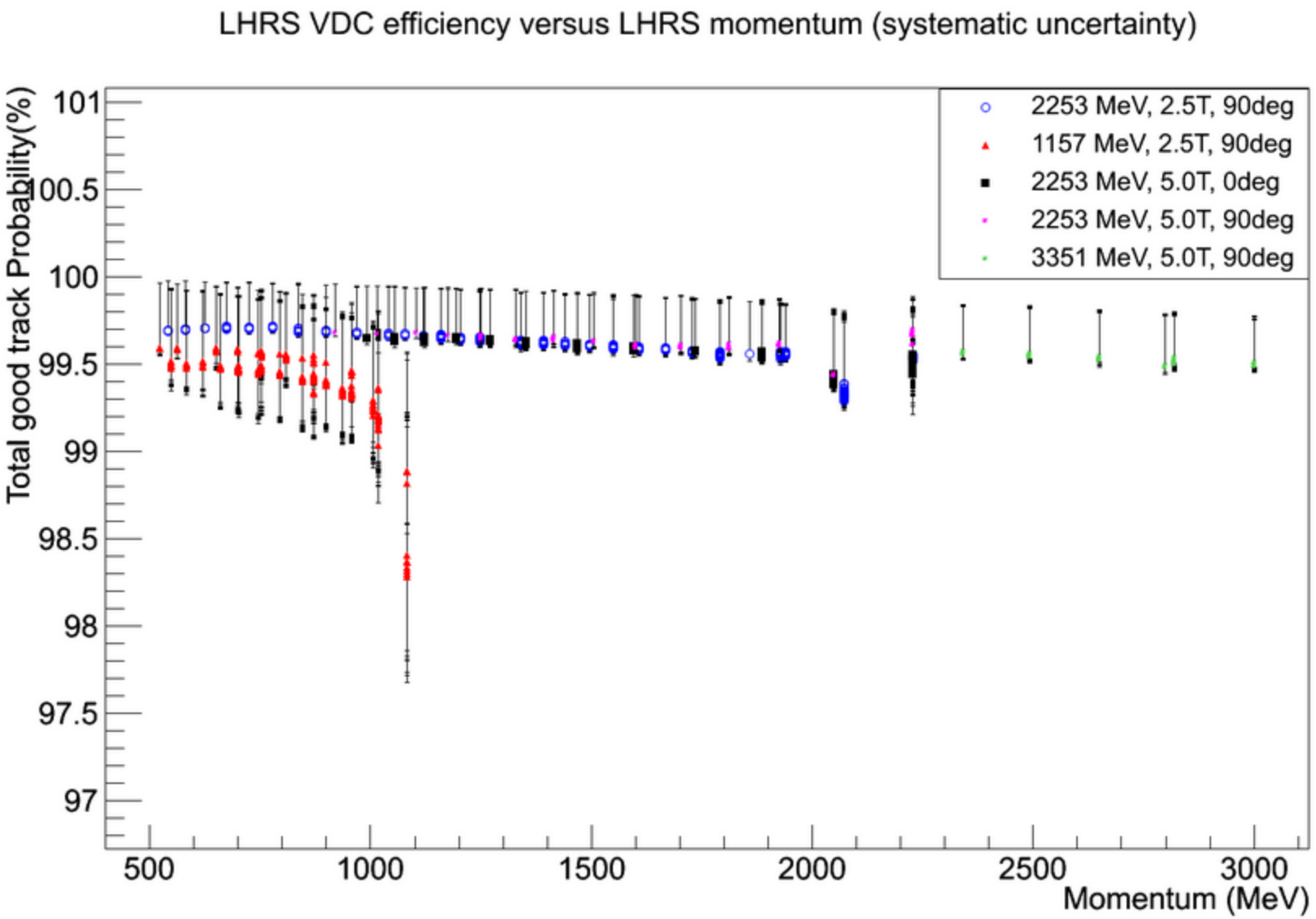
Previous study with background cut added: the center value consider one-track inefficiency



New study: Option 1



New study: Option 2



New study: Option 3