

Status Report

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20 Dec. 2019

HK mPMT-Japan meeting

Updates

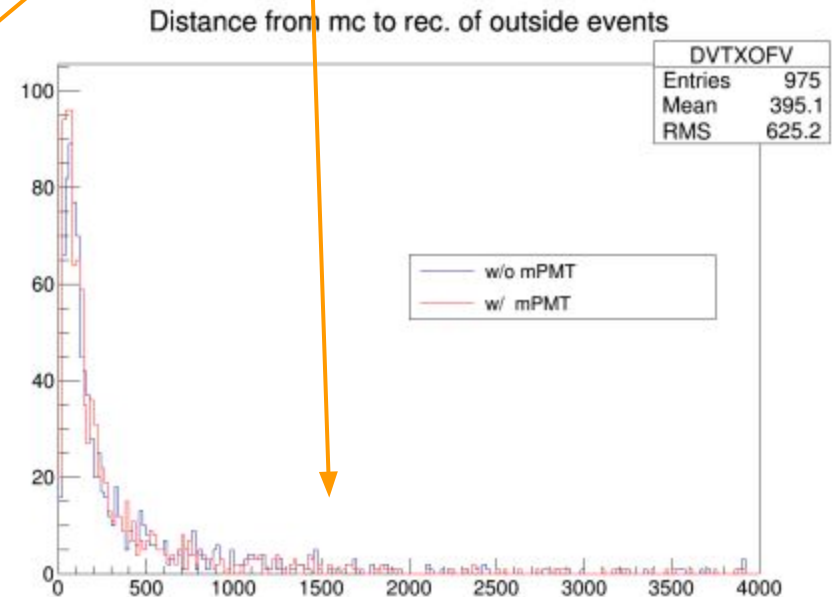
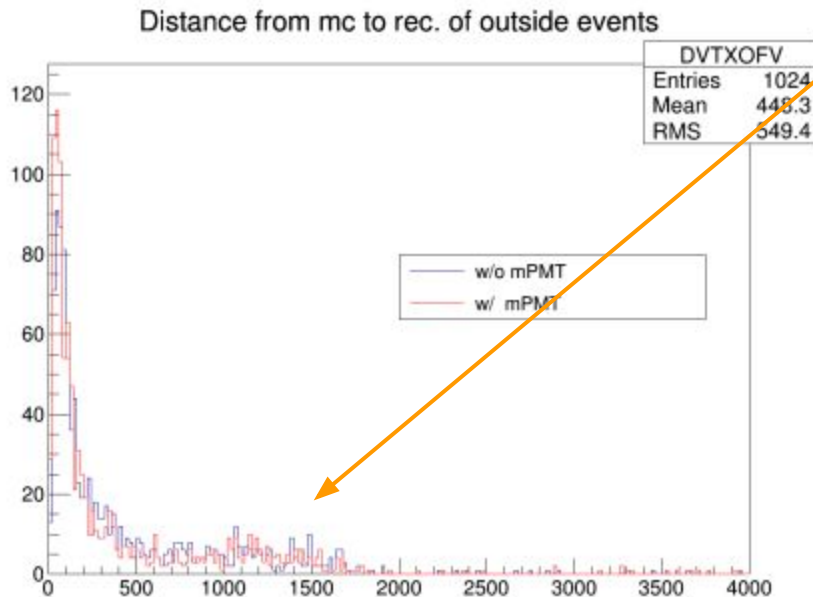
- mPMT different configuration
 - Found some mistakes
 - Checked other distributions and consistency

- HK Hybrid simulation
 - B&L: 20k, (D.R. 4.2 kHz)
 - mPMT:10k (D.R. 100, 200 Hz) (200 Hz is only mPMT 10k case)
 - Masking method: $\rightarrow$ 2k, 5k
- Event:
 - Energy: 3,4,5,6,8,10,15 MeV
 - Unifrom in tank, isotropy

$E=3$ MeV, 100 Hz (Left), 200 Hz (Right)

There are some inconsistency in the result w/o mPMT

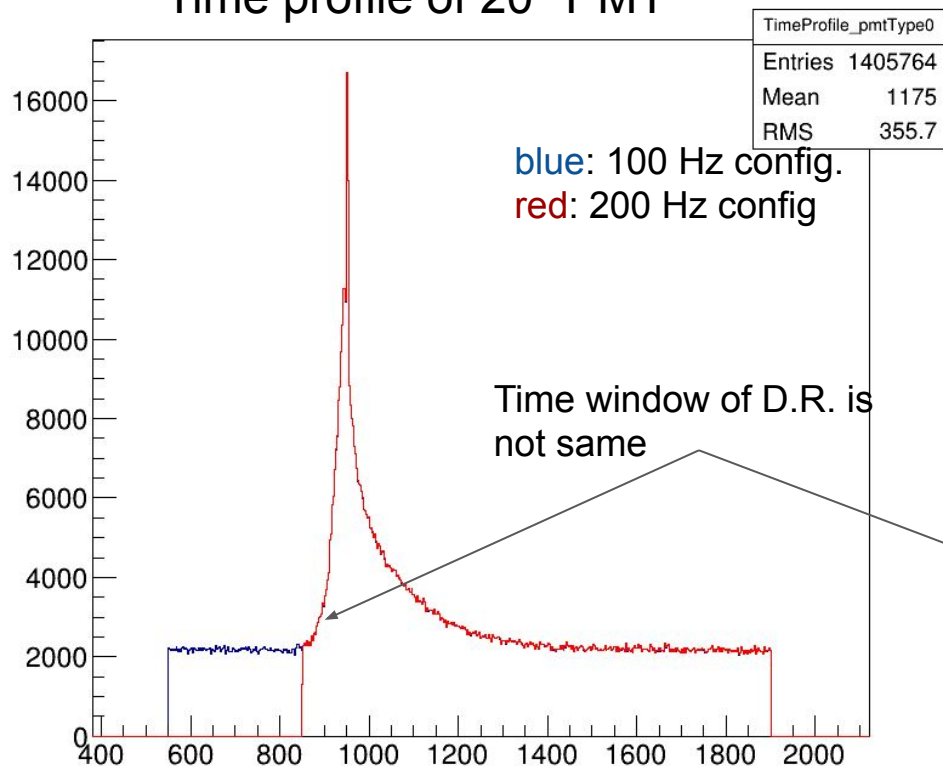
- Distance between rec. and MC vertex (unit = cm).
- Only events out of FV



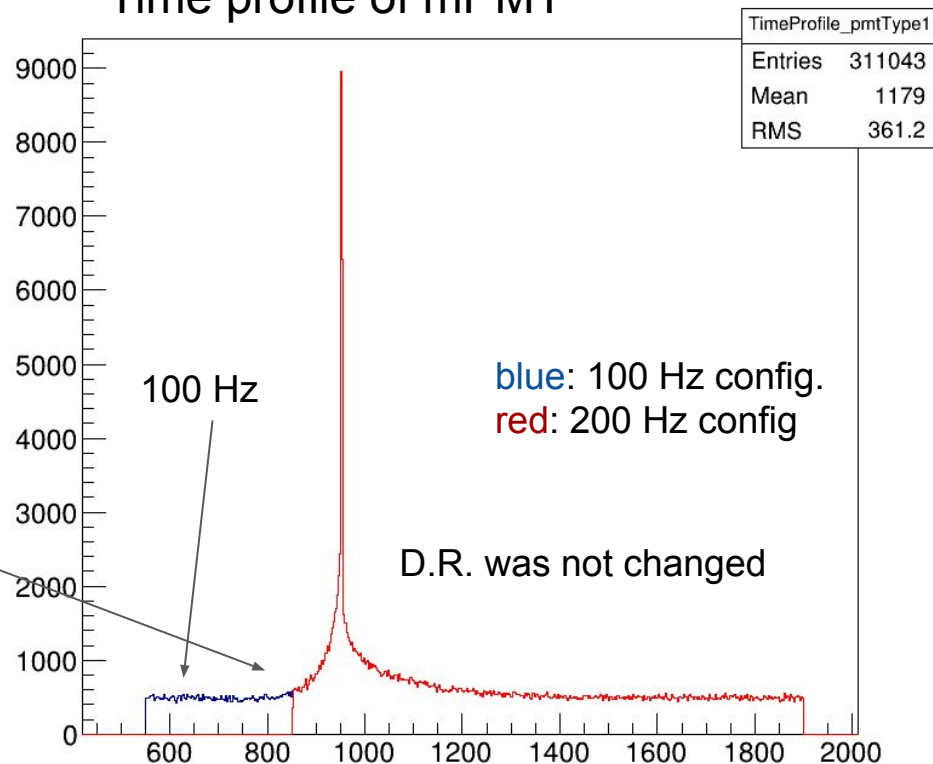
D.R. (100 / 200 Hz)

- I found that dark rate was not generated correctly.
 → I will check the mac-file again and reproduce the MC
 - Chaged only “WCSimPMTObject.cc”

Time profile of 20" PMT



Time profile of mPMT



Change in src and mac files

- Changed only “WCSimPMTObject.cc”

```

1
2 G4float PMT3inchR14374::GetDarkRate(){
3   // Realistic/Optimistic value from published (proceedings) measurements.
4   // ToDo : update this value
5   const G4float rate = 100*CLHEP::hertz;//100*CLHEP::hertz;
6   return rate;
7 }
8

```

- Mac file

```

03 #i.e. hit time (/DarkRate/SetDarkWindow)
04 /DarkRate/SetDarkMode 1
05 /DarkRate/SetDarkHigh 100000
06 /DarkRate/SetDarkLow 0
07 /DarkRate/SetDarkWindow 4000
08

```

← Configuration of p.5 right plot
h

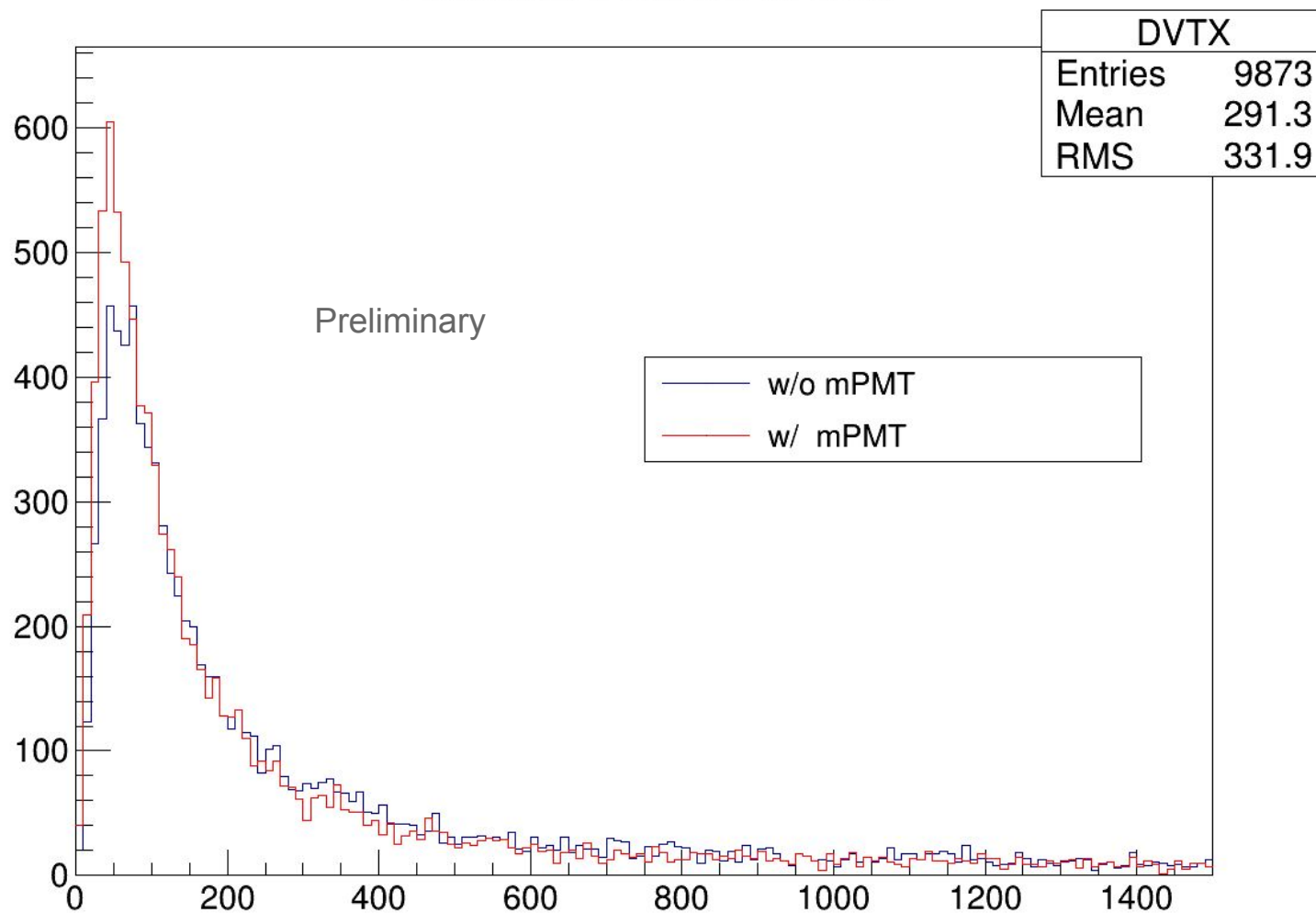
- I will change as followings
- /DarkRate/SetDarkMode 0
- /DarkRate/SetDarkHigh 1050
- /DarkRate/SetDarkLow -450

Photocoverage

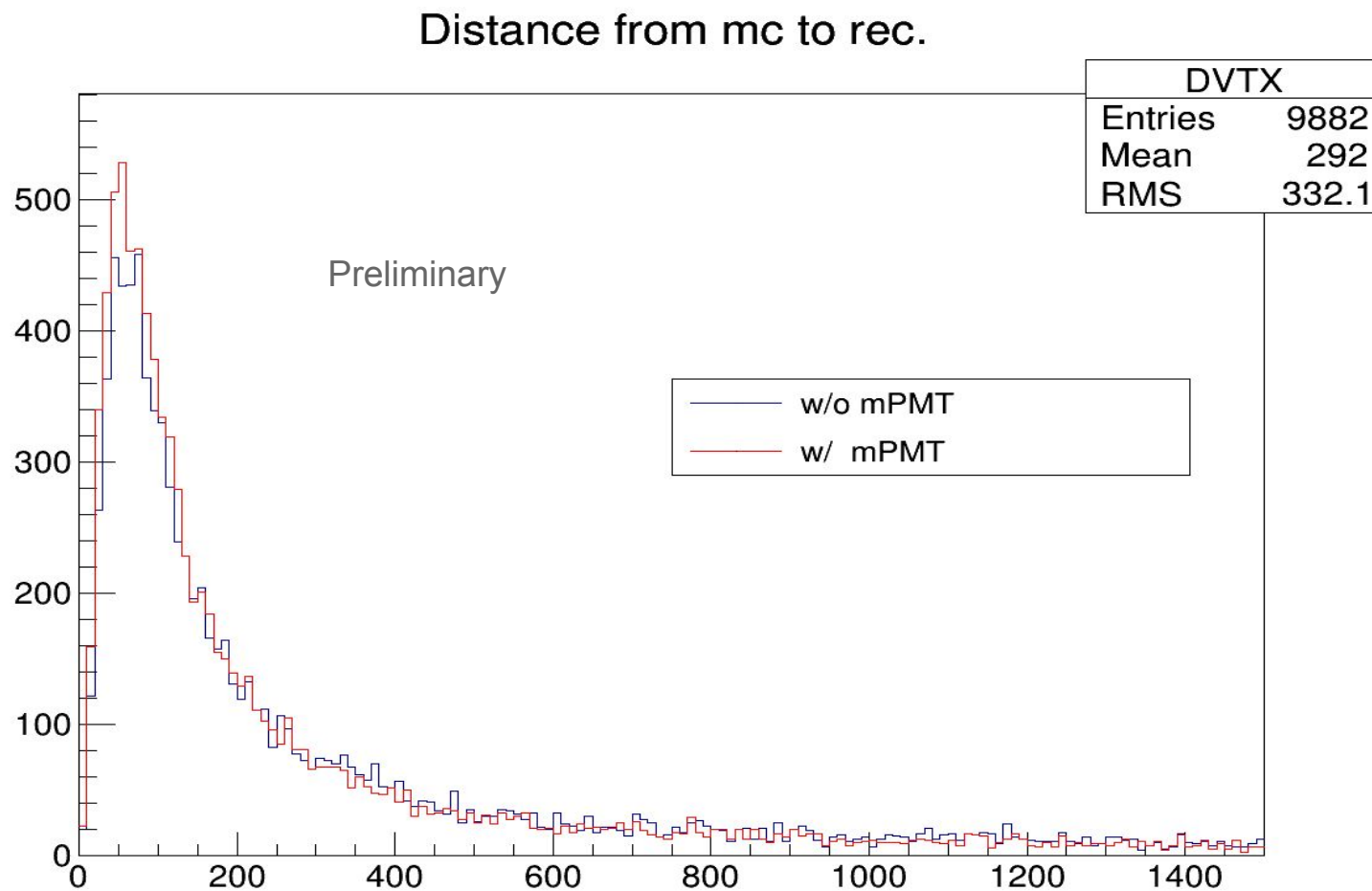
- Drew the distribution of “distance from mc to rec. vertex”
- Following plots are generated from the MC, in which I think the dark rate were generated correctly.
 - Anyway I will check in detail: time profile, hit profile etc.

$E = 3 \text{ MeV}$, # of mPMT = 10 k

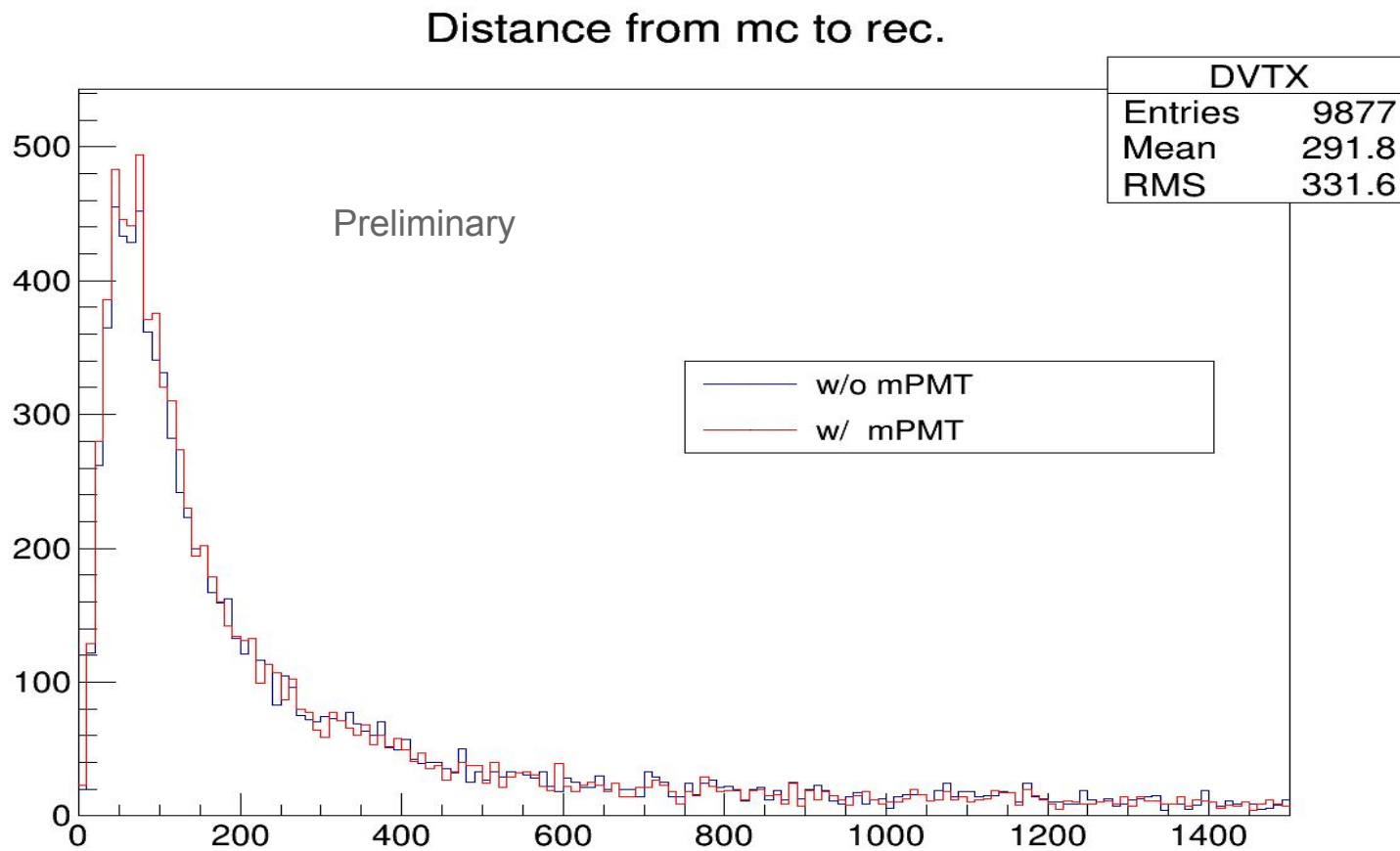
Distance from mc to rec.



$E = 3 \text{ MeV}$, # of mPMT = 5 k

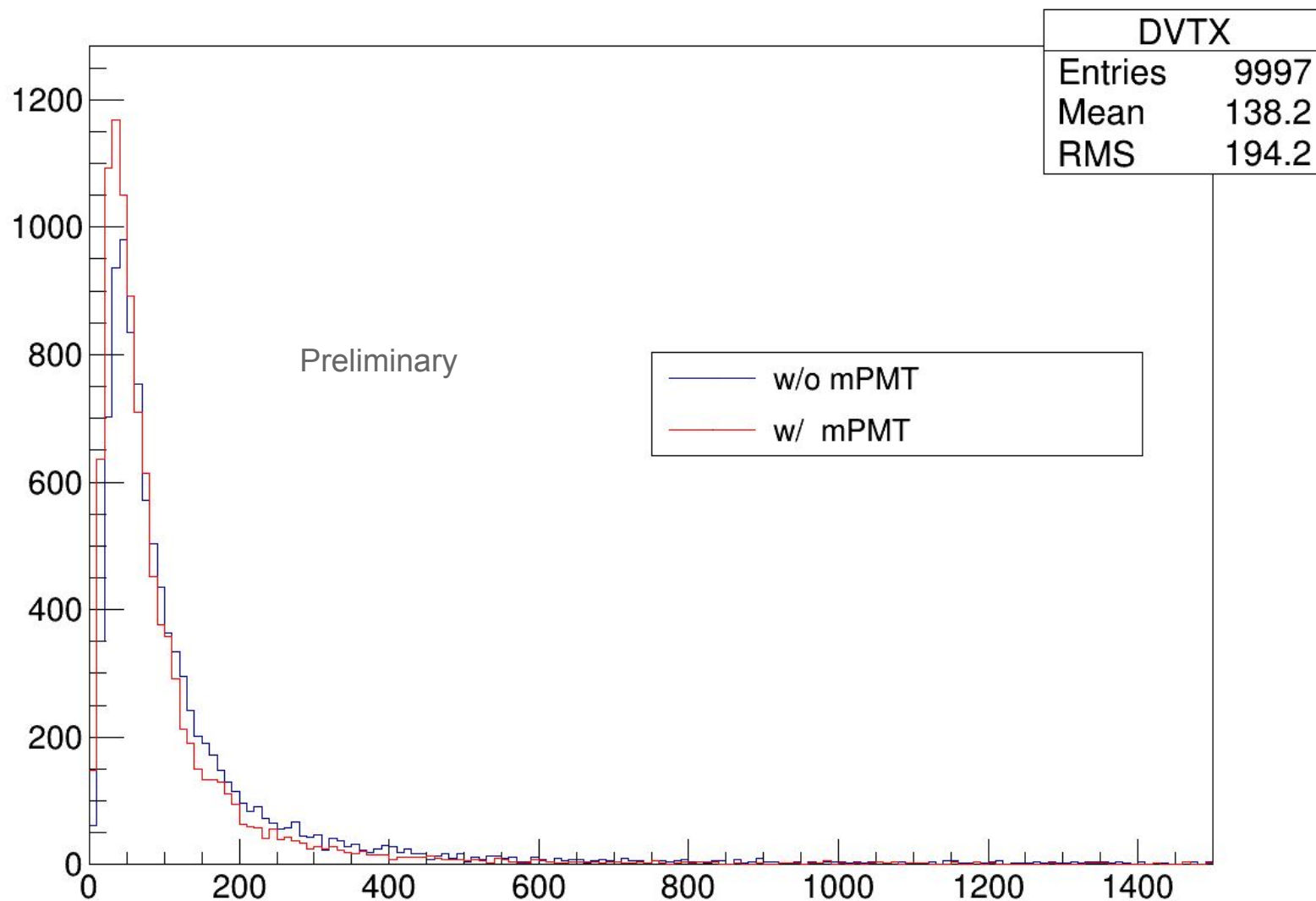


$E = 3 \text{ MeV}$, # of mPMT = 2 k

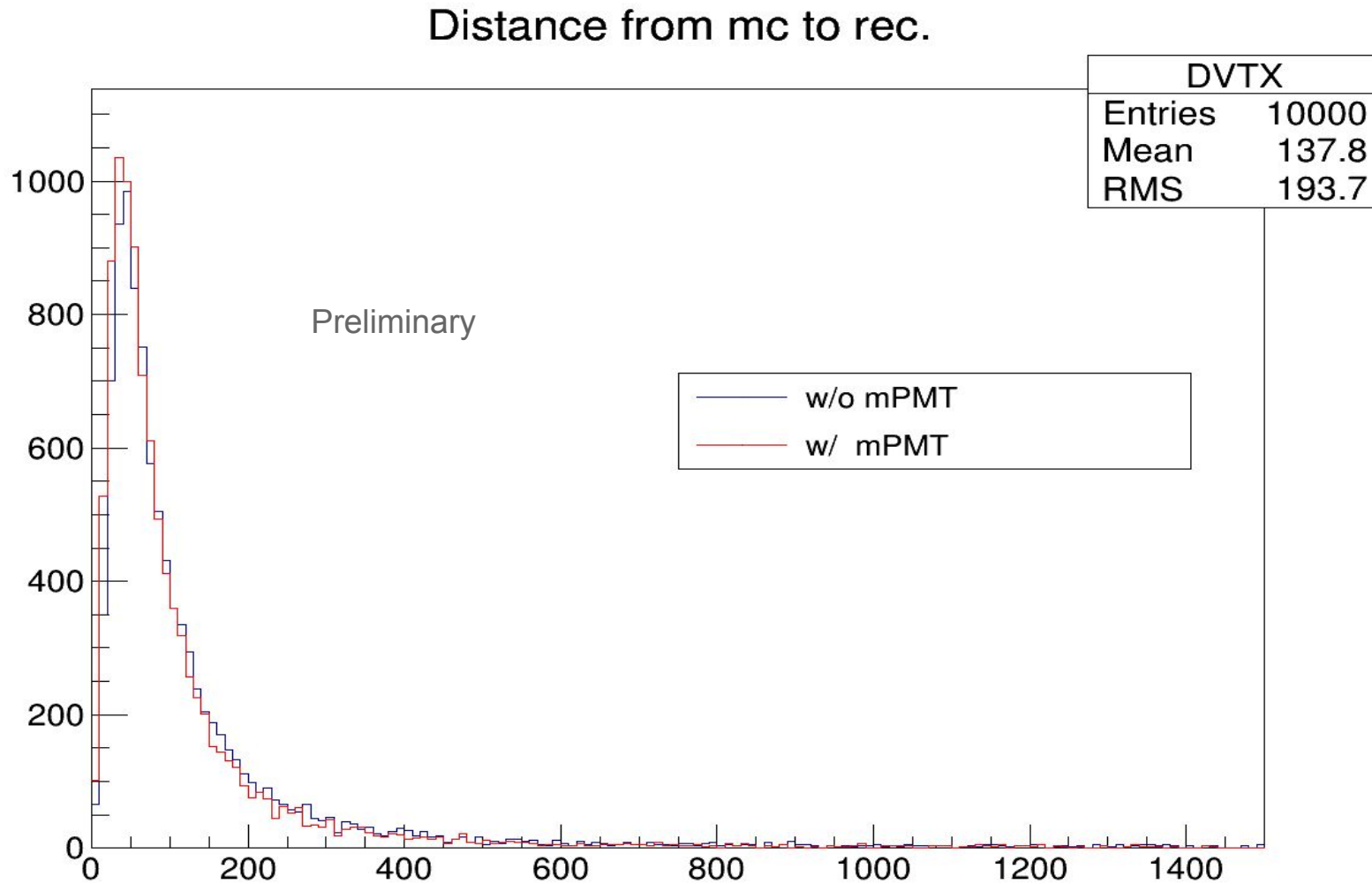


$E = 5 \text{ MeV}$, # of mPMT = 10 k

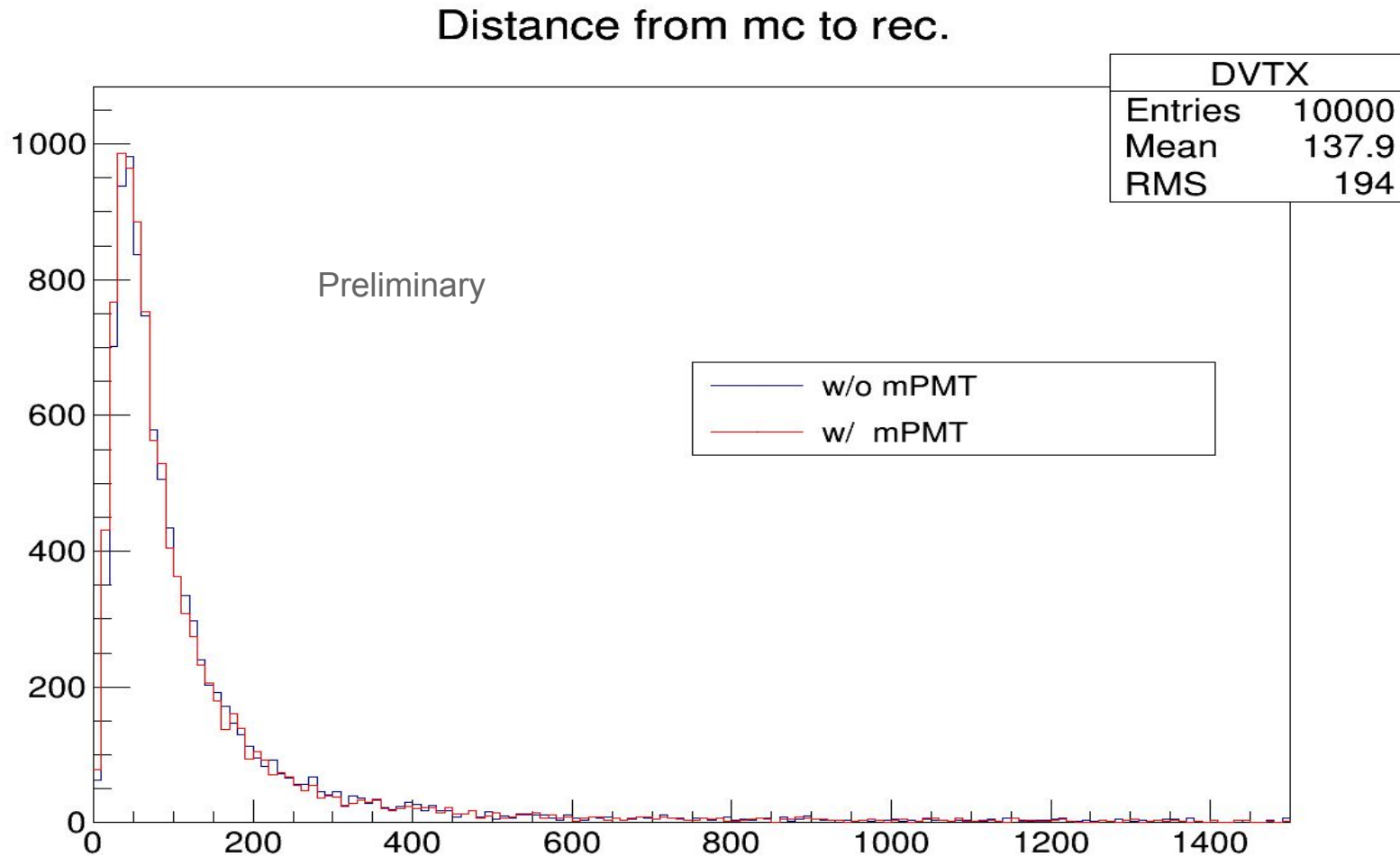
Distance from mc to rec.



$E = 5 \text{ MeV}$, # of mPMT = 5 k

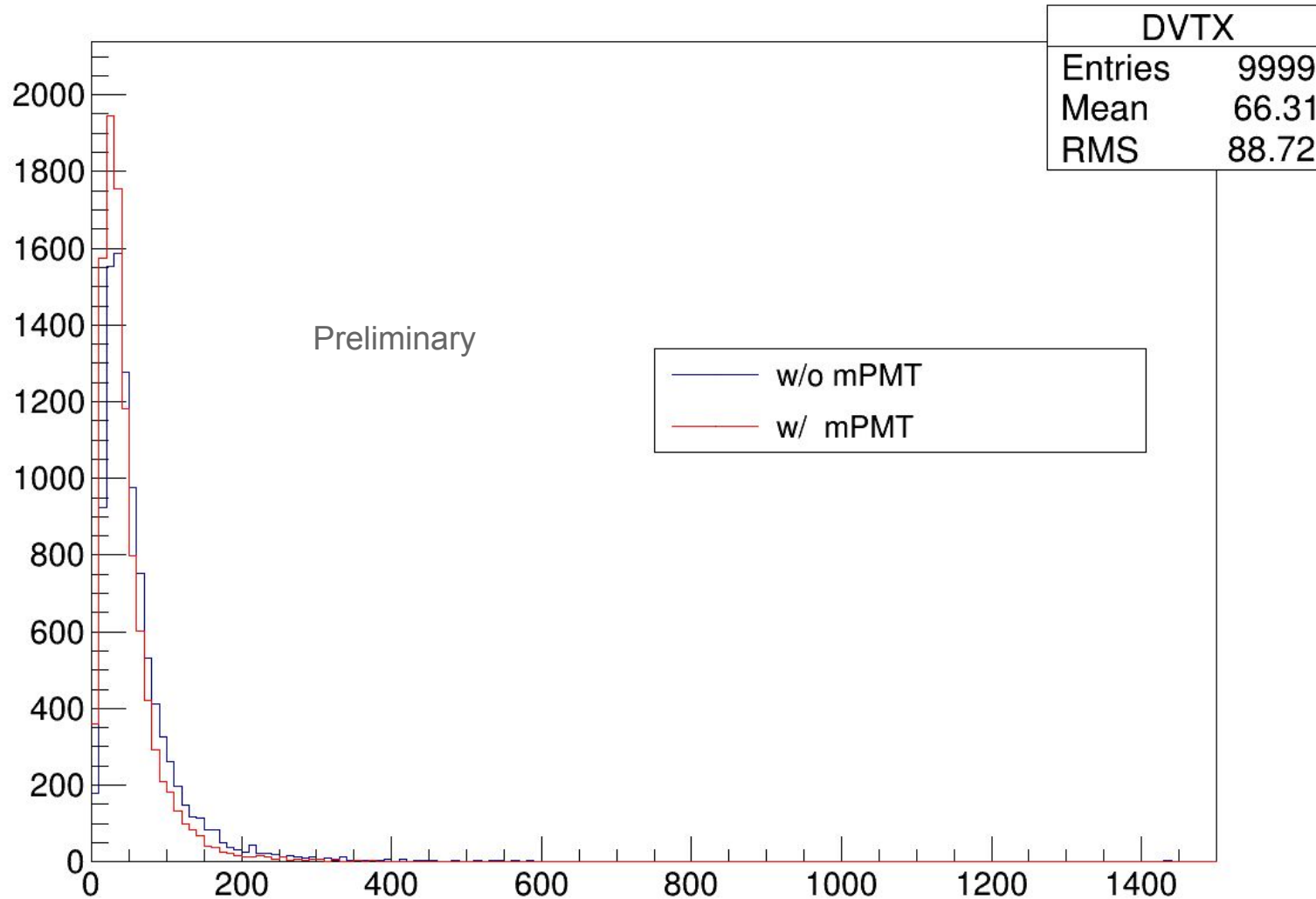


$E = 5 \text{ MeV}$, # of mPMT = 2 k



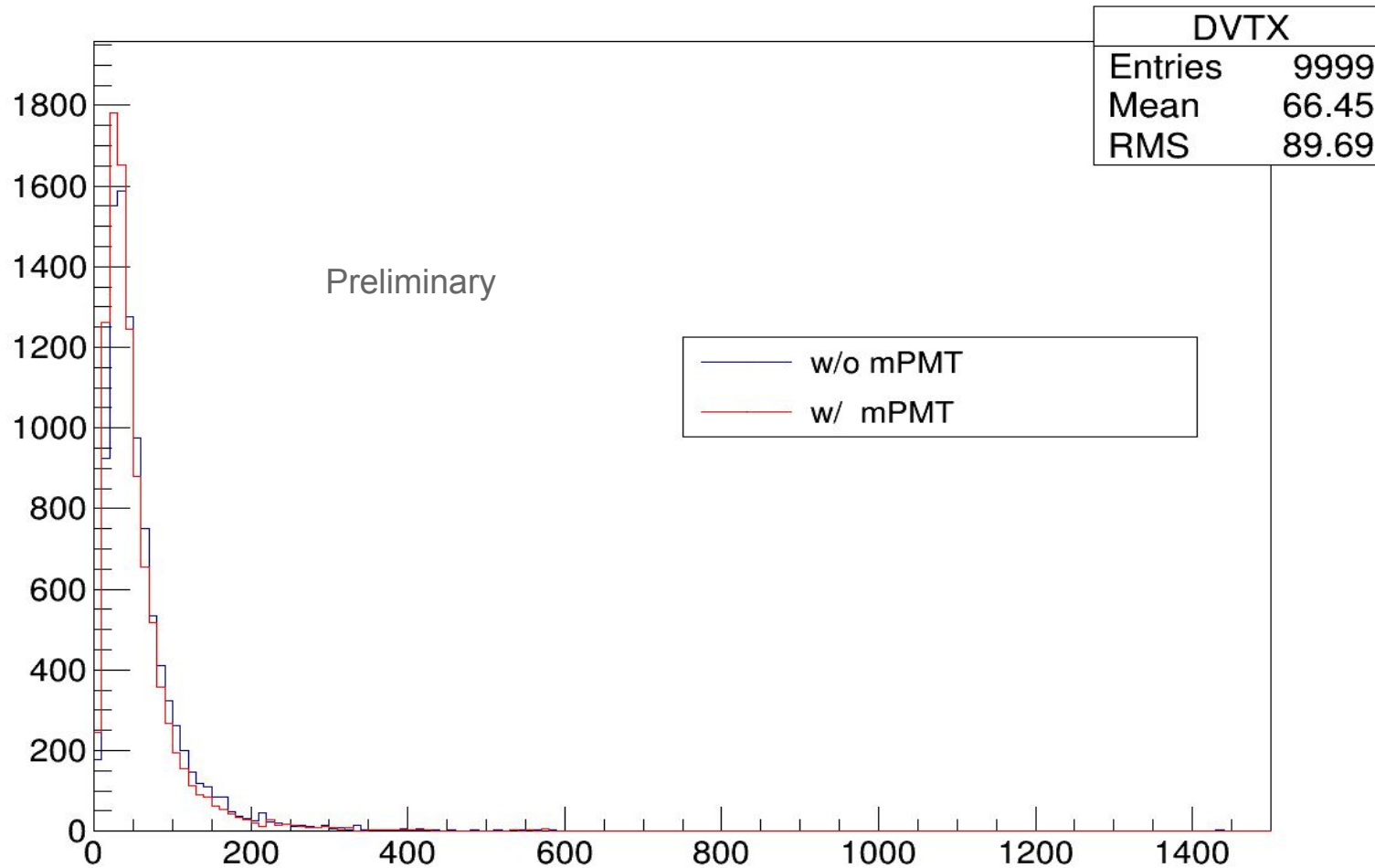
$E = 10 \text{ MeV}$, # of mPMT = 10 k

Distance from mc to rec.



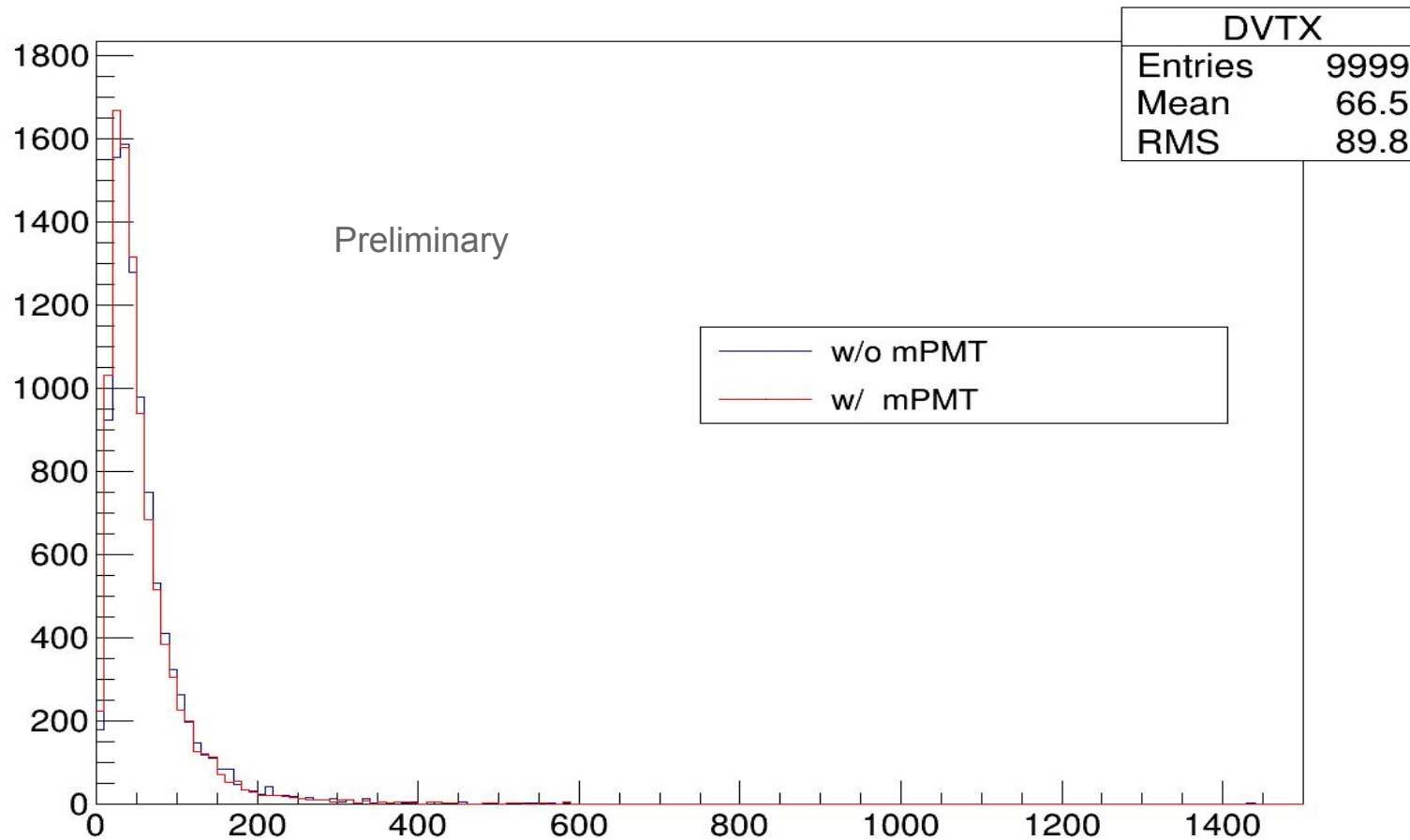
$E = 10 \text{ MeV}$, # of mPMT = 5 k

Distance from mc to rec.



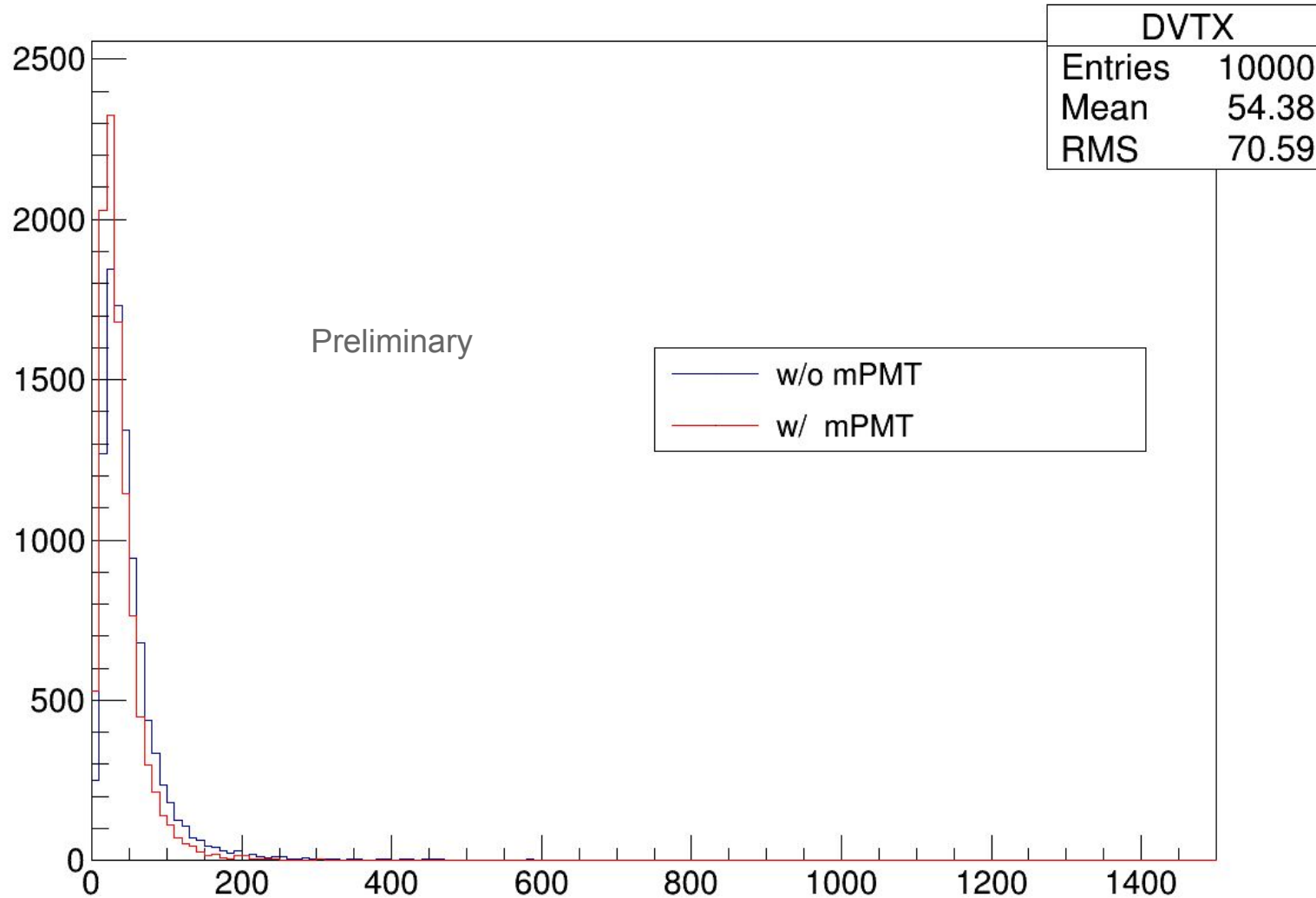
$E = 10 \text{ MeV}$, # of mPMT = 2 k

Distance from mc to rec.



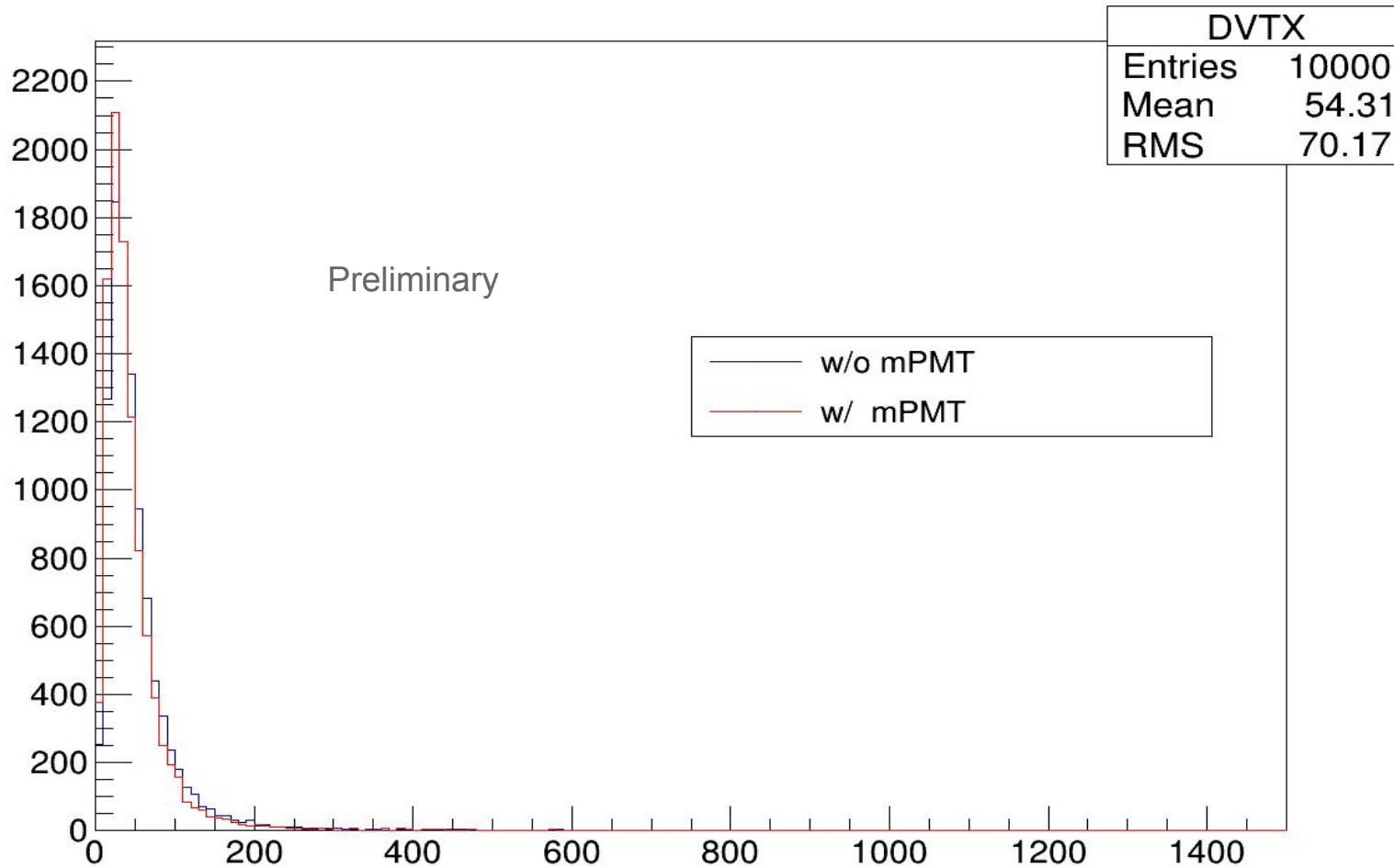
$E = 15 \text{ MeV}$, # of mPMT = 10 k

Distance from mc to rec.



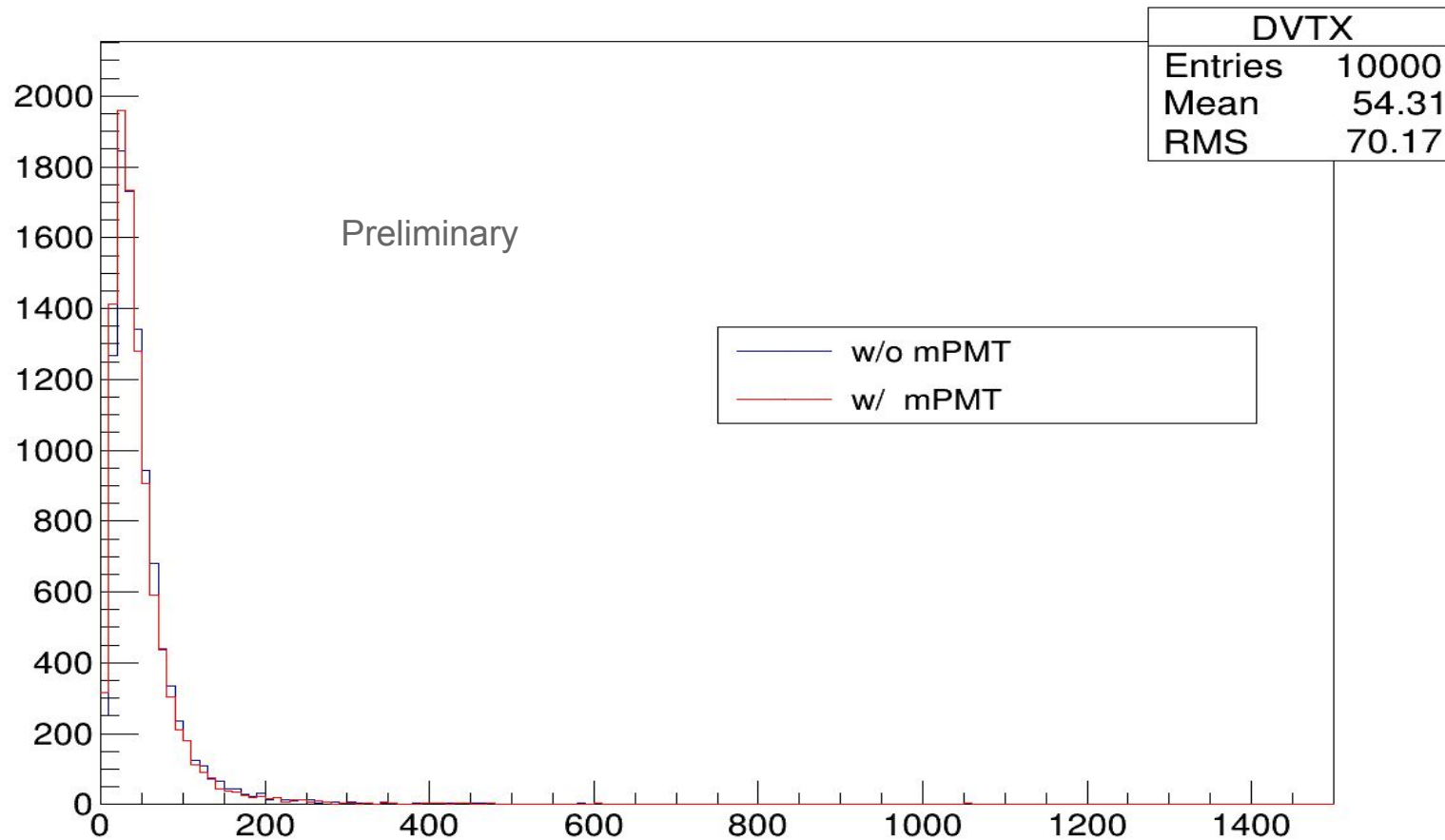
$E = 15 \text{ MeV}$, # of mPMT = 5 k

Distance from mc to rec.



$E = 15 \text{ MeV}$, # of mPMT = 2 k

Distance from mc to rec.



Summary

- Found the mistake around D.R. configuration
- The histograms w/o mPMT are consistent between each P.C. configuration
-
- Plan
 - Check D.R. setting etc. again
 - Generate MC
 - Calculate vertex resolution and miss-reconstructed fraction
 - Organize the plots to compare easily