Data/MC comparison for Test Beam 2024

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HiDRa meeting - 15/04/2025

Procedure to get timing information from the calorimeter simulation

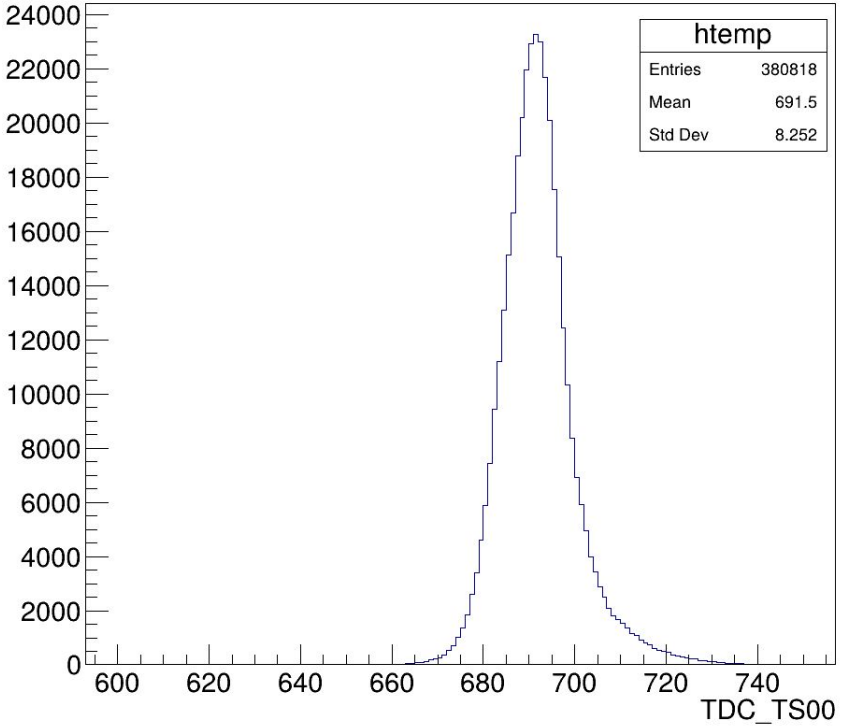
For each fiber, a collection of optical photons arrival times is passed to the SiPM simulation, which provides one Time-of-Arrival, and Integral and Time-over-Threshold. For now, only using the ToA.
In the output file, only fibers which read a number of photons higher than 0 are stored.

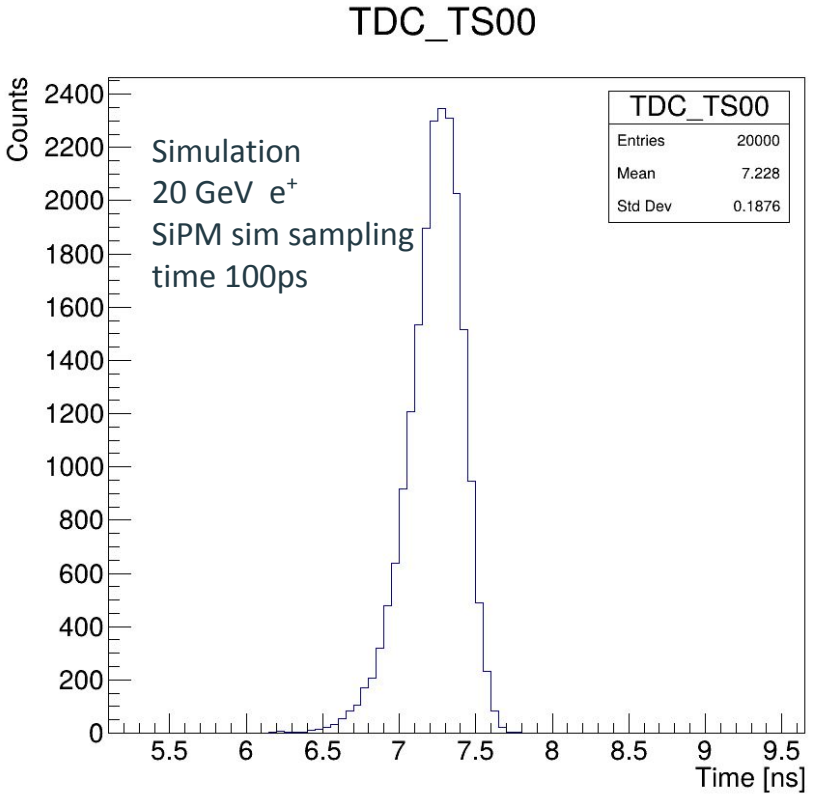
In order to obtain one TDC value per tower, one loop is used to obtain all firing fiber in the T00, T11 and T15 towers, and the mean value of the TDCs in the different towers (averaged over the number of fired fibers) is saved.

Are there smarter (or more correct) ways to “emulate” a timing information from PMTs?

Run 0994 - 140ps resolution
"(abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000) & (TDC_TS11*140/1000>85) & (TDC_TS11*140/1000<110) "

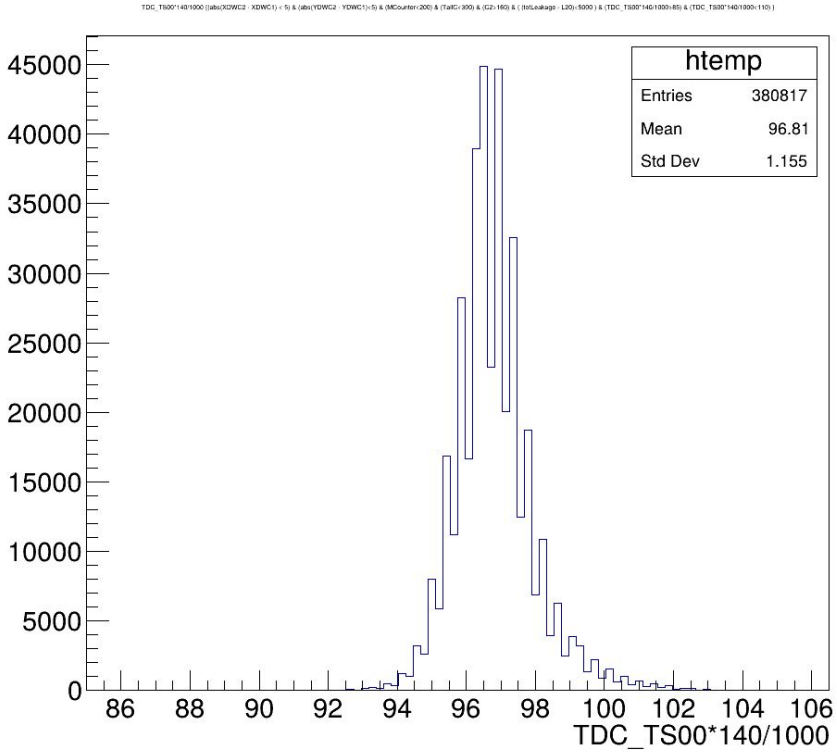
Comparing data/MC timing information -> Tower 00 S channel

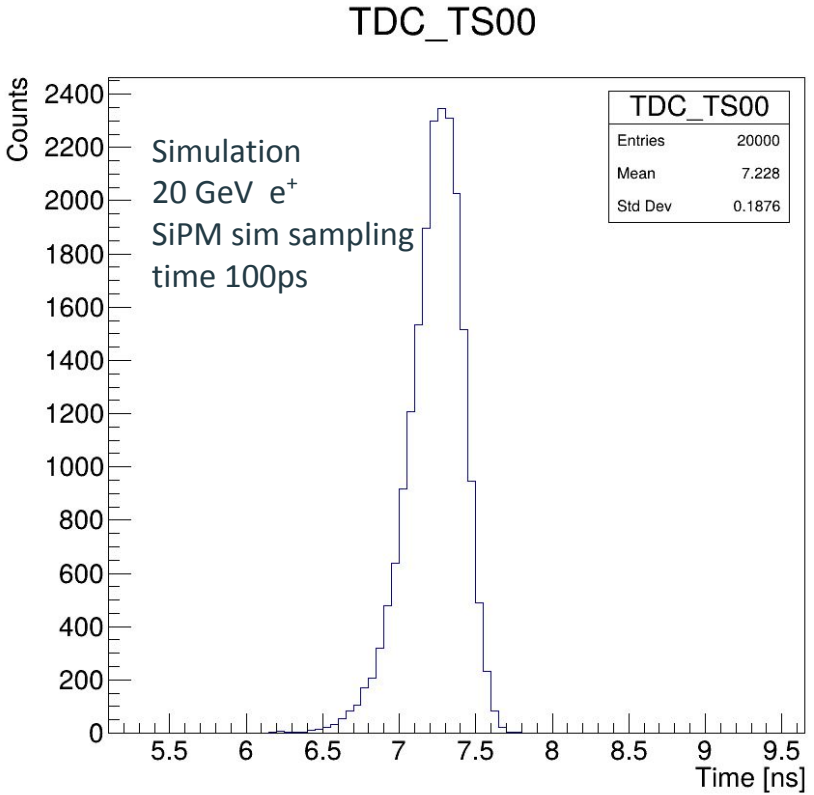




Run 0994 - 140ps resolution
"(abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000) & (TDC_TS11*140/1000>85) & (TDC_TS11*140/1000<110) "

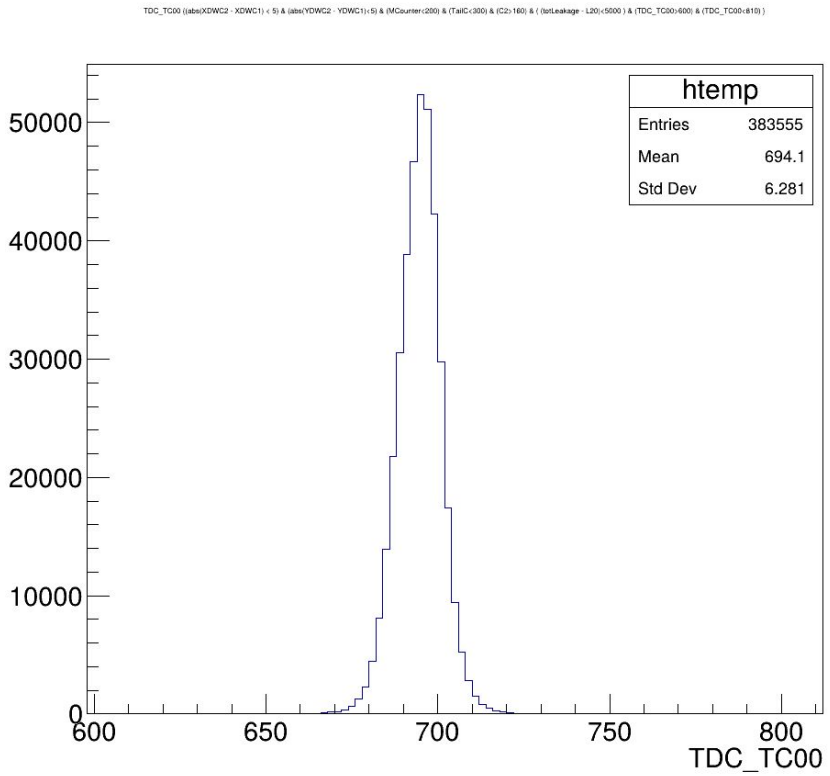
Comparing data/MC timing information -> Tower 00 S channel

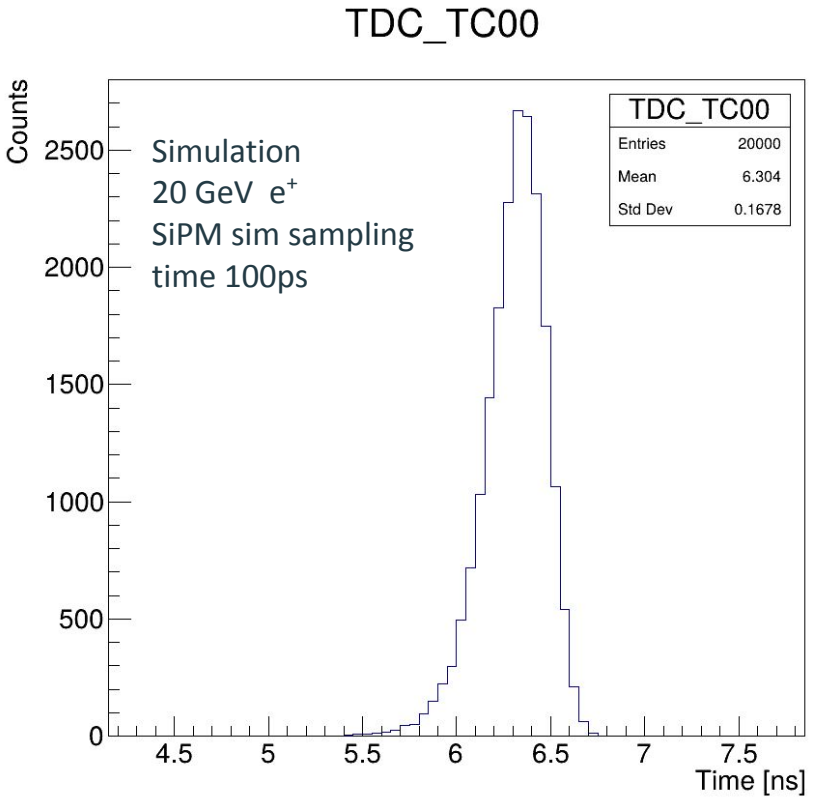




Run 0994 - 140ps resolution
"(abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000) & (TDC_TS11*140/1000>85) & (TDC_TS11*140/1000<110) "

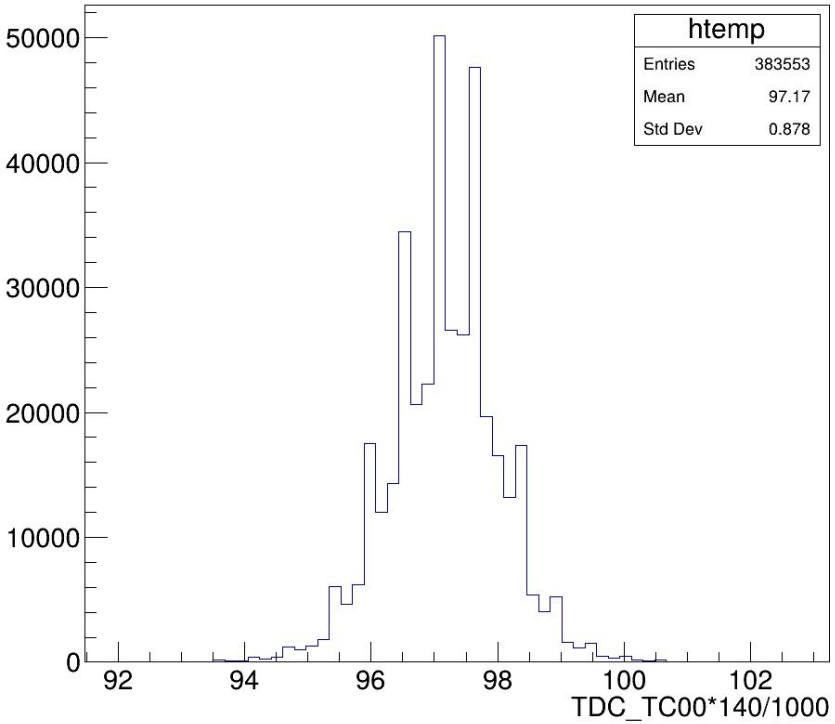
Comparing data/MC timing information -> Tower 00 C channel

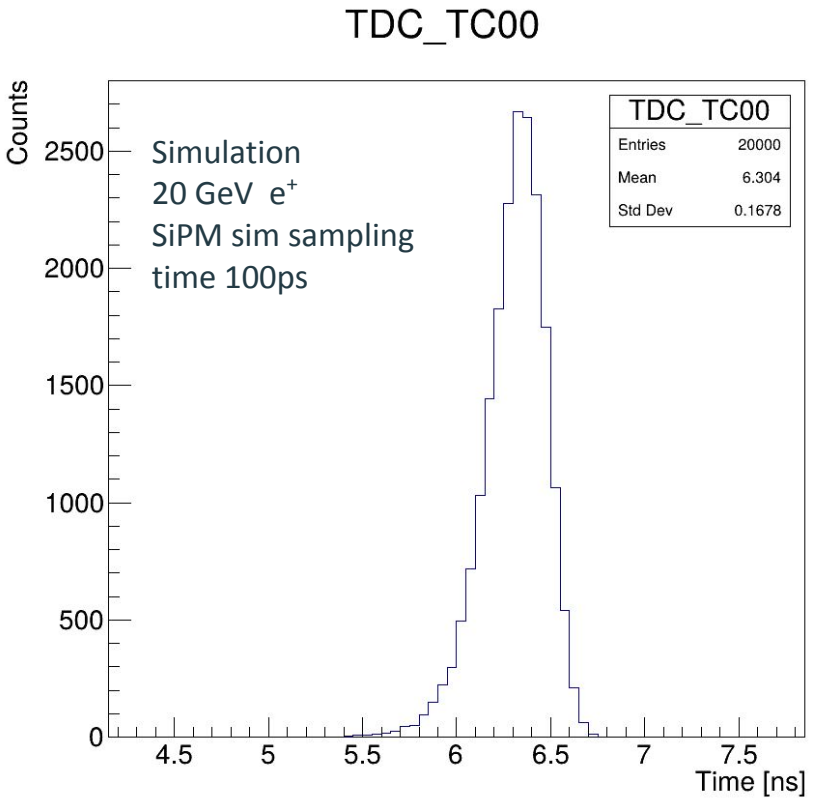




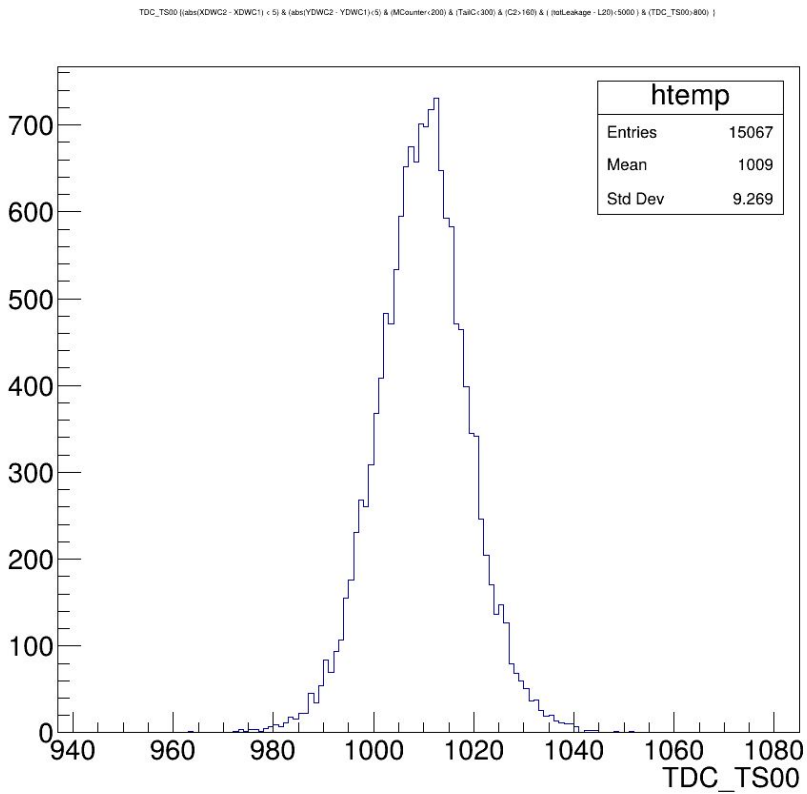
Run 0994 - 140ps resolution
"(abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000) & (TDC_TS11*140/1000>85) & (TDC_TS11*140/1000<110) "

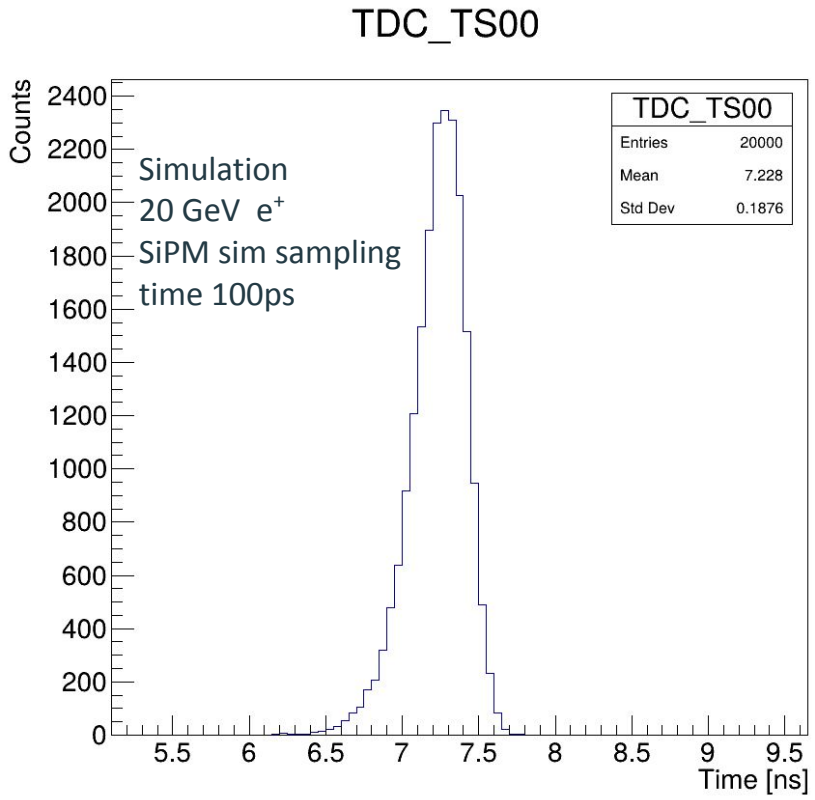
Comparing data/MC timing information -> Tower 00 C channel



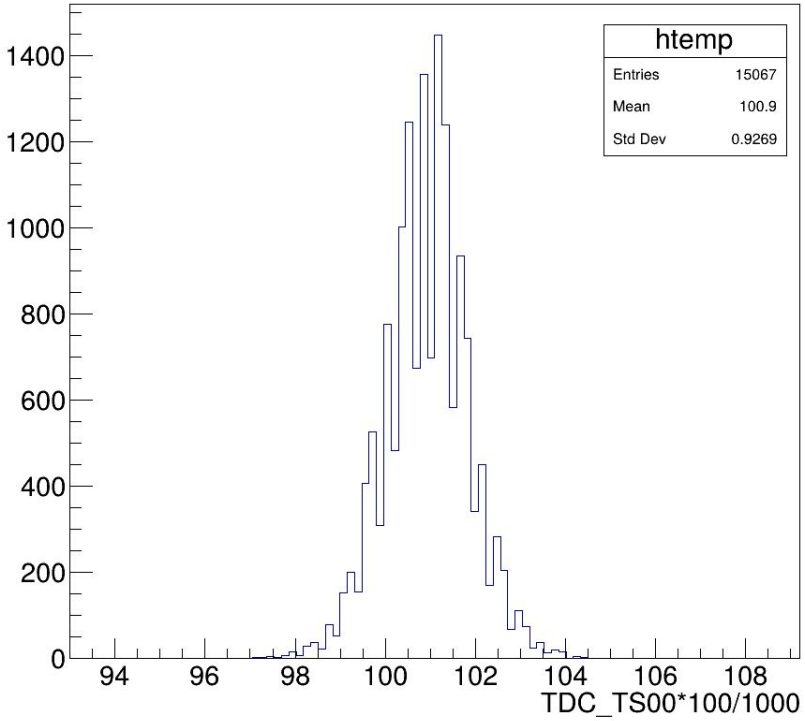


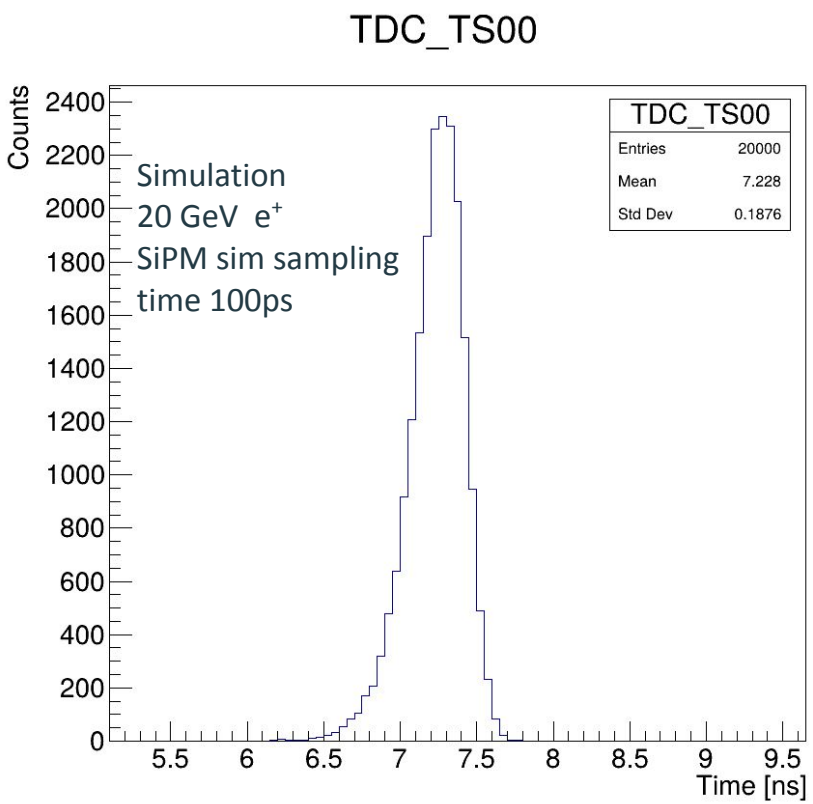
Run 1018 - 100ps resolution
"(abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000) & (TDC_TS11*140/1000>85) & (TDC_TS11*140/1000<110) "



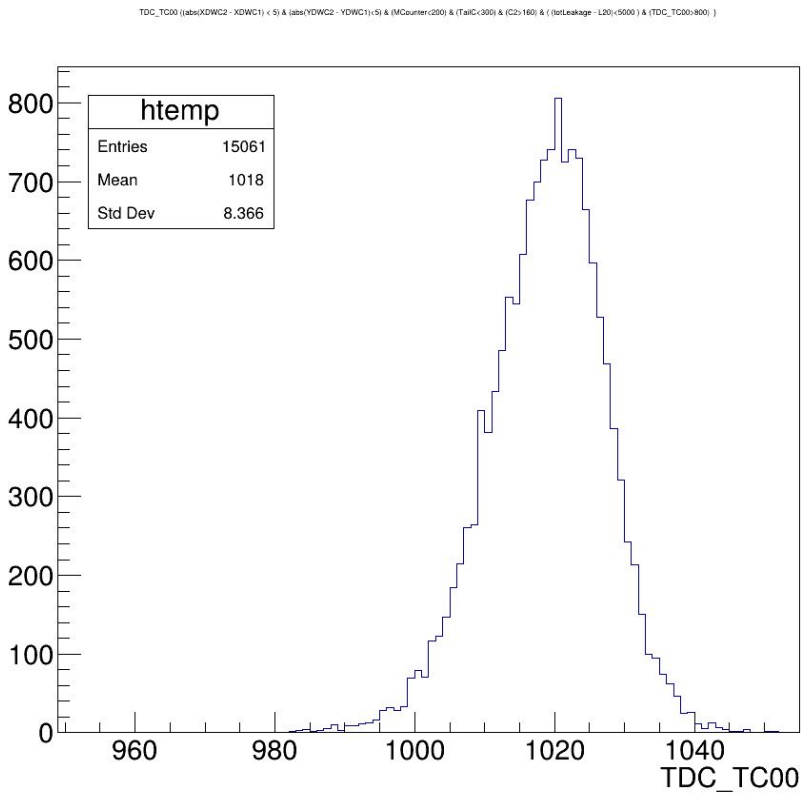


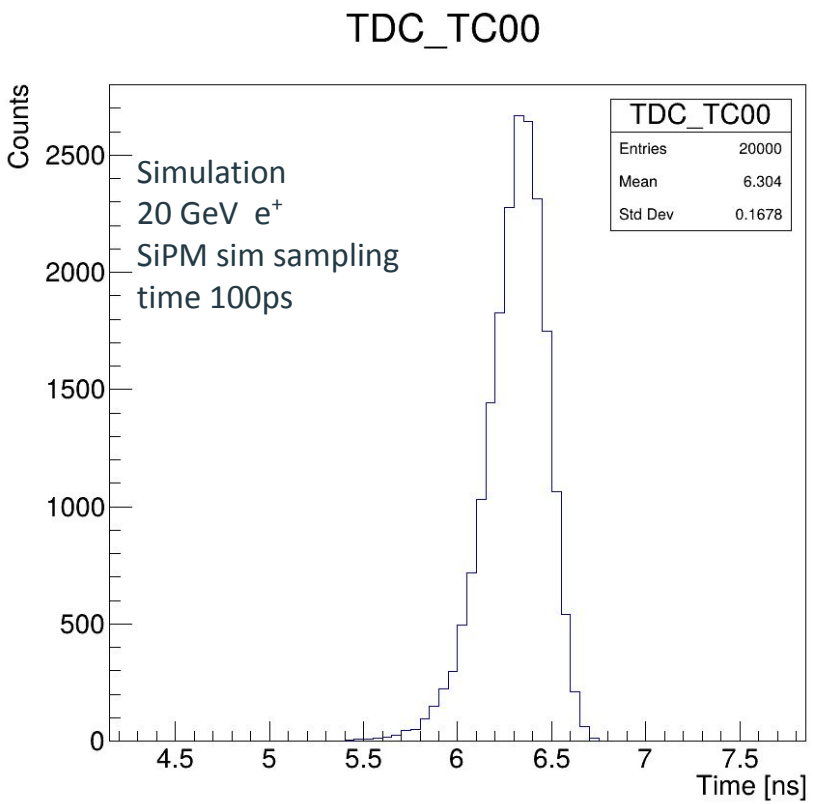
Run 1018 - 100ps resolution
"(abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000) & (TDC_TS11*140/1000>85) & (TDC_TS11*140/1000<110) "



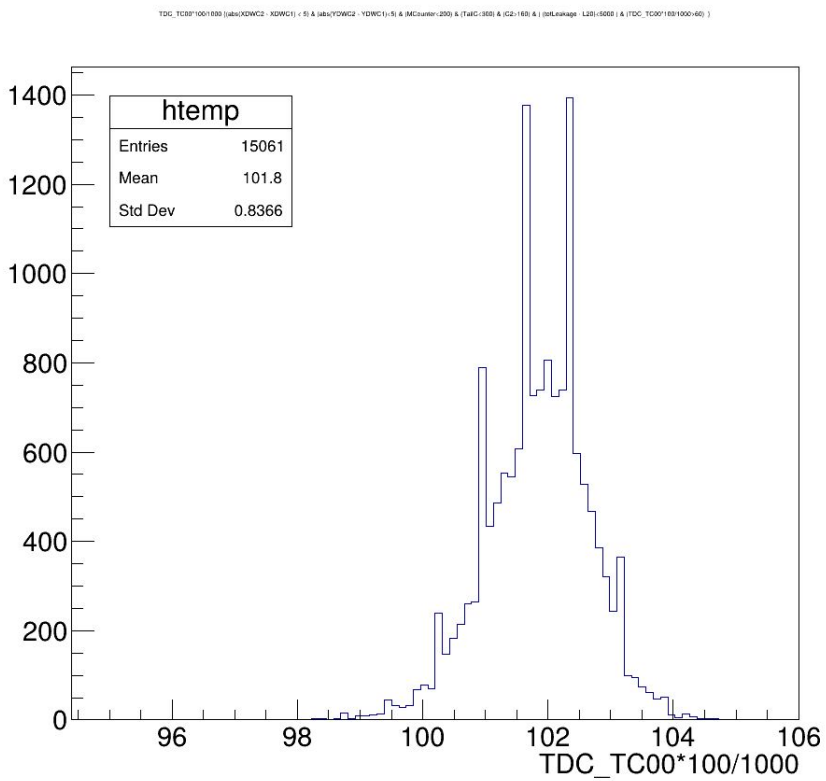


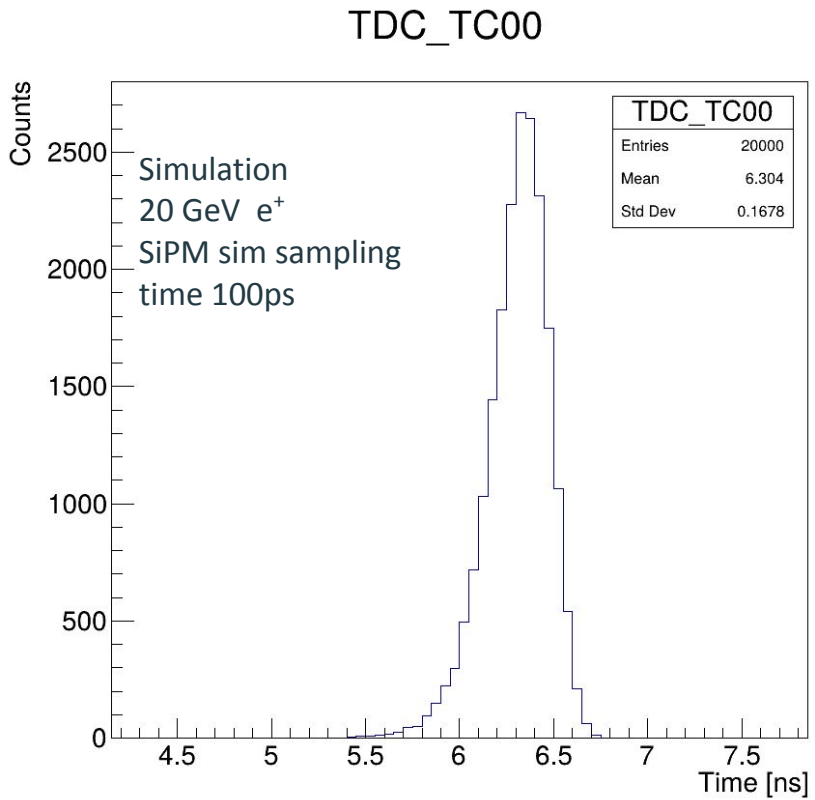
Run 1018 - 100ps resolution
"(abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000) & (TDC_TS11*140/1000>85) & (TDC_TS11*140/1000<110) "

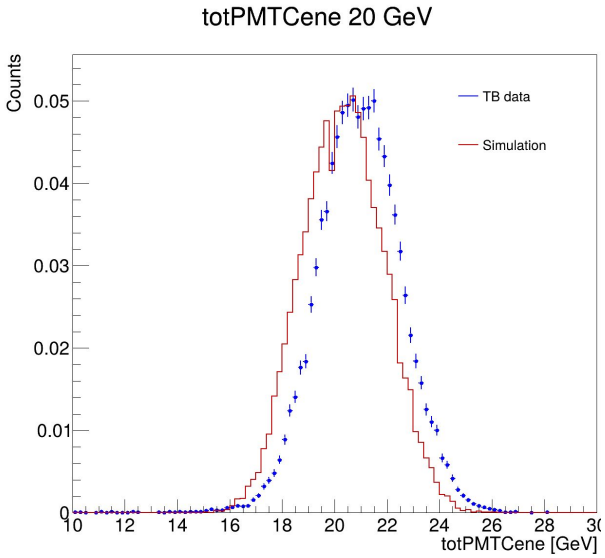


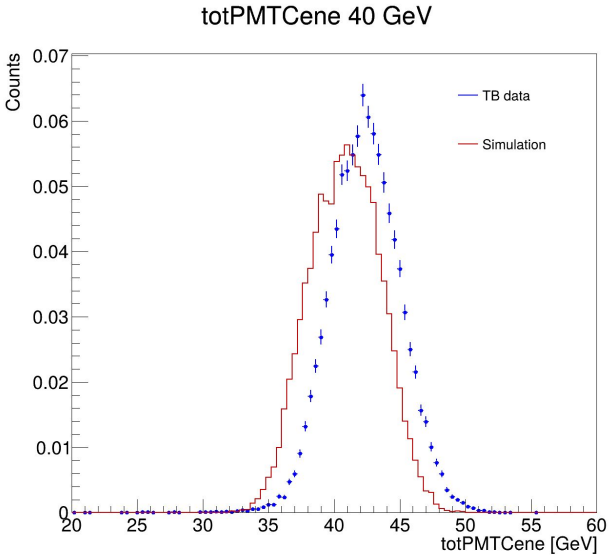


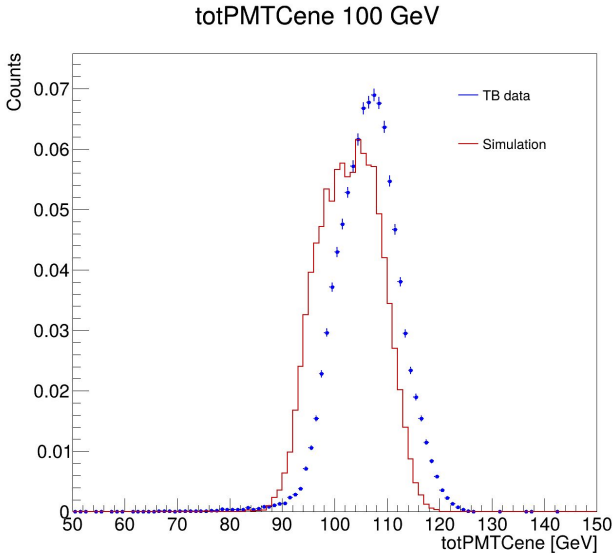
Run 1018 - 100ps resolution
"(abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000) & (TDC_TS11*140/1000>85) & (TDC_TS11*140/1000<110) "

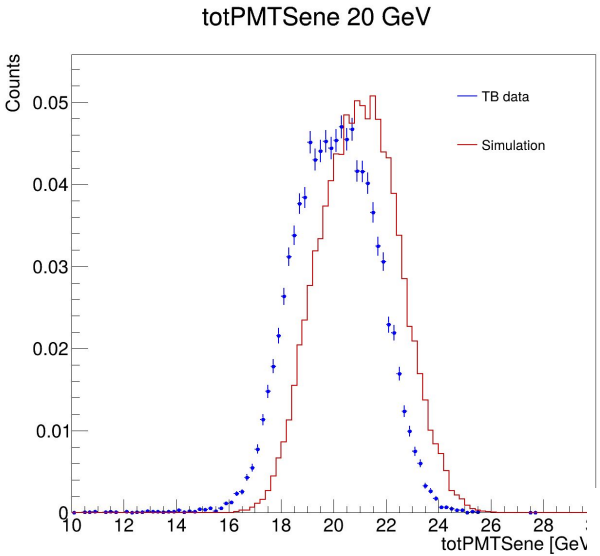


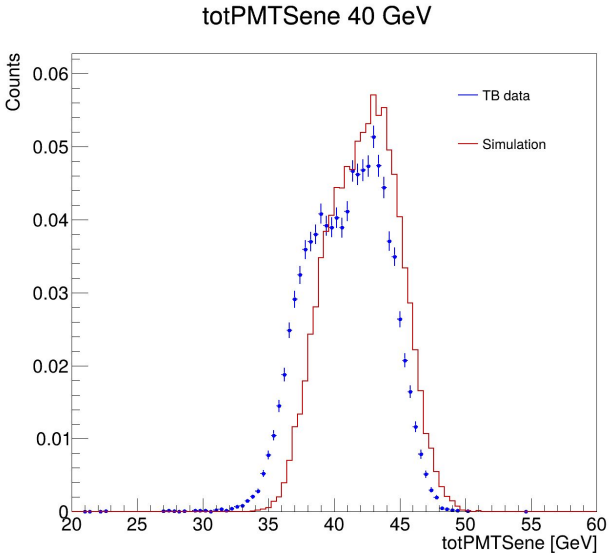


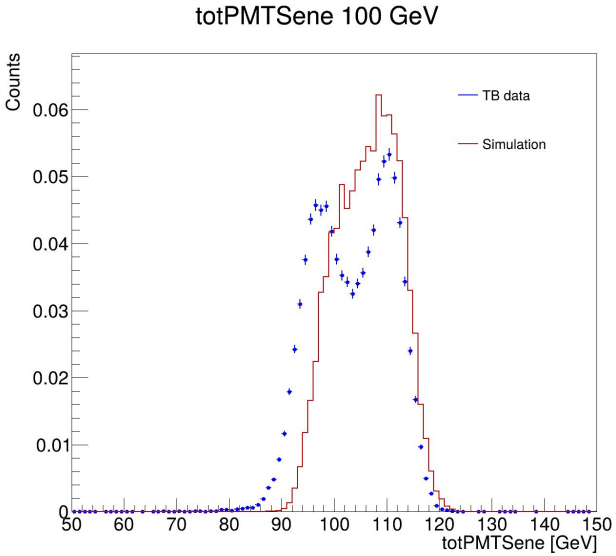

totPMTCene 20 GeV
Counts
TB data
Simulation
totPMTCene [GeV]

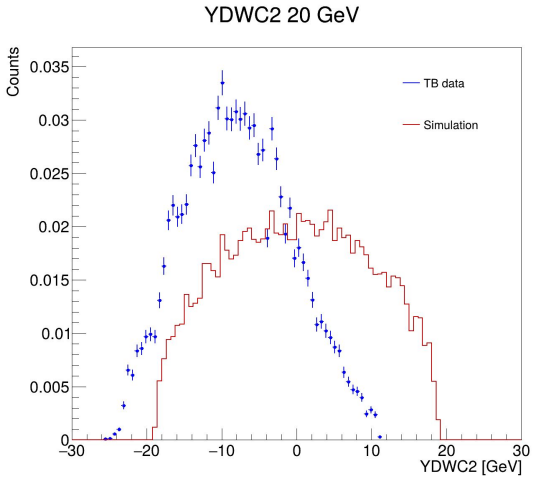

totPMTCene 40 GeV
Counts
TB data
Simulation
totPMTCene [GeV]

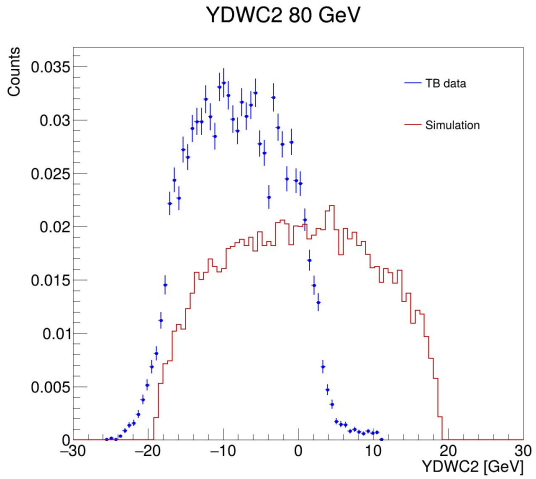

totPMTCene 100 GeV
Counts
TB data
Simulation
totPMTCene [GeV]

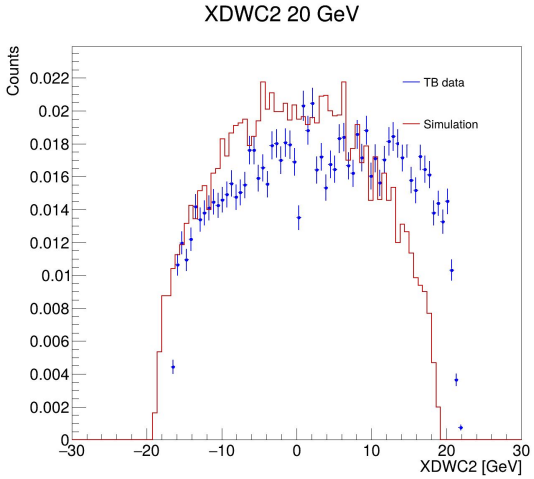

totPMTSene 20 GeV
Counts
TB data
Simulation
totPMTSene [GeV]

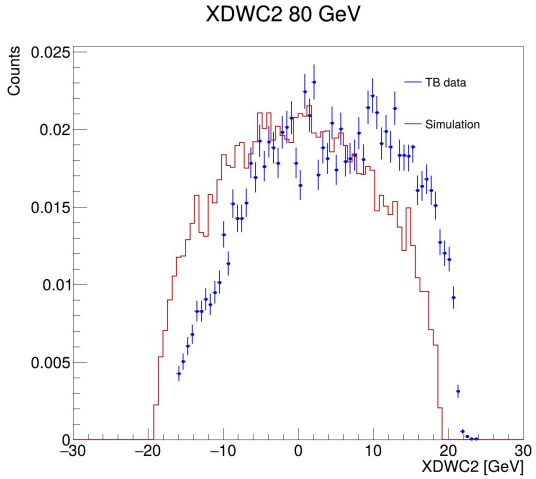

totPMTSene 40 GeV
Counts
TB data
Simulation
totPMTSene [GeV]


totPMTSene 100 GeV
Counts
TB data
Simulation
totPMTSene [GeV]


YDWC2 20 GeV
Counts
TB data
Simulation
YDWC2 [GeV]

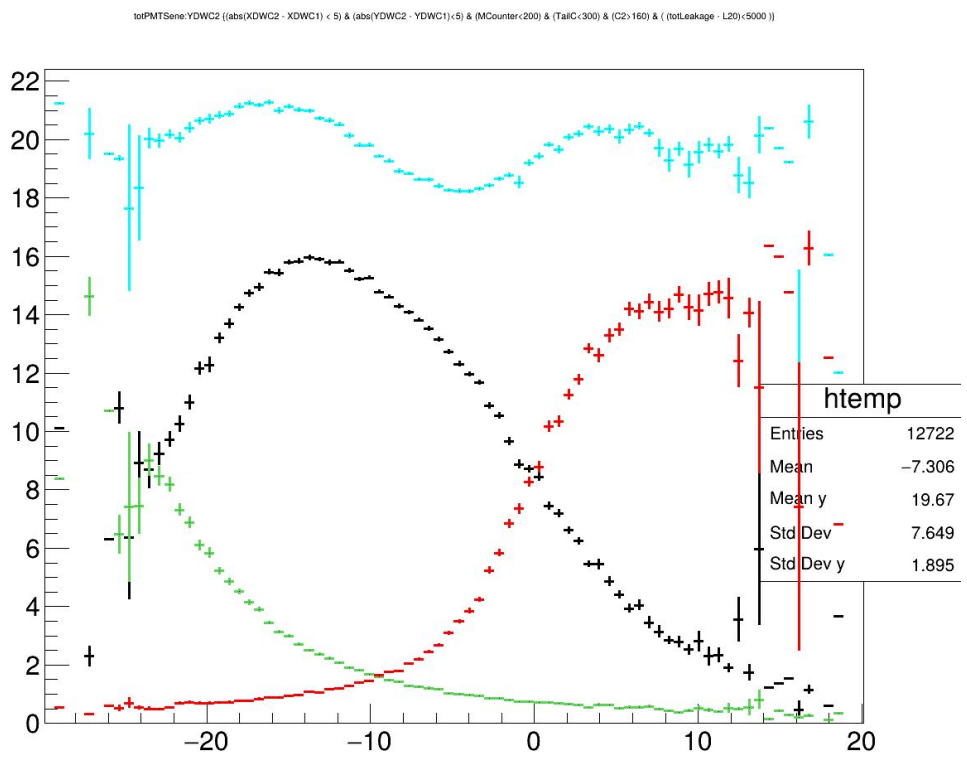

YDWC2 80 GeV
Counts
TB data
Simulation
YDWC2 [GeV]

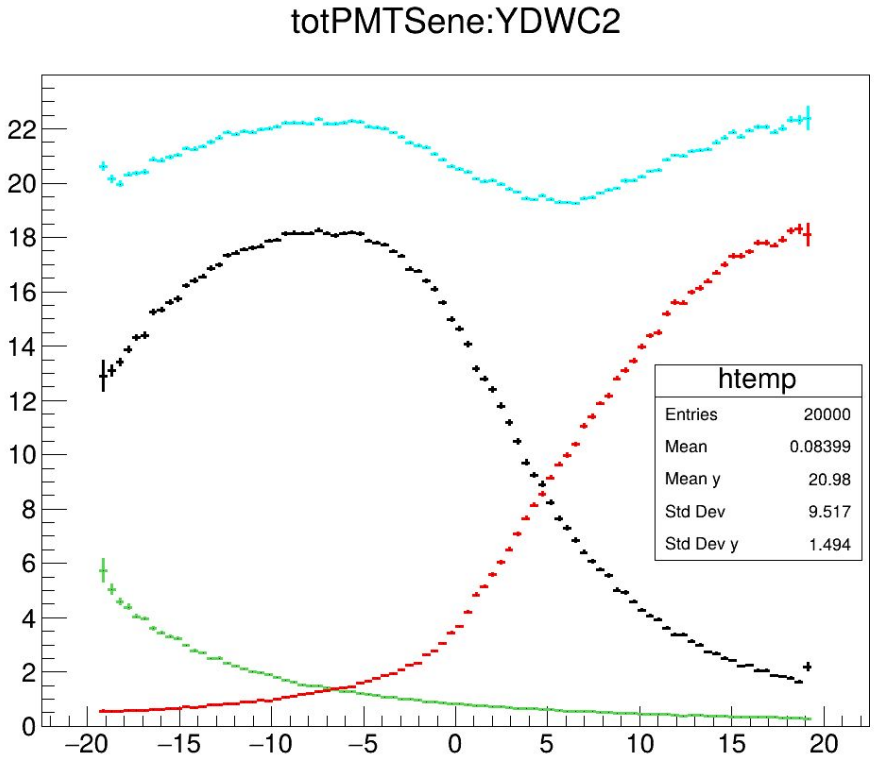

XDWC2 20 GeV
Counts
TB data
Simulation
XDWC2 [GeV]


XDWC2 80 GeV
Counts
TB data
Simulation
XDWC2 [GeV]

Data

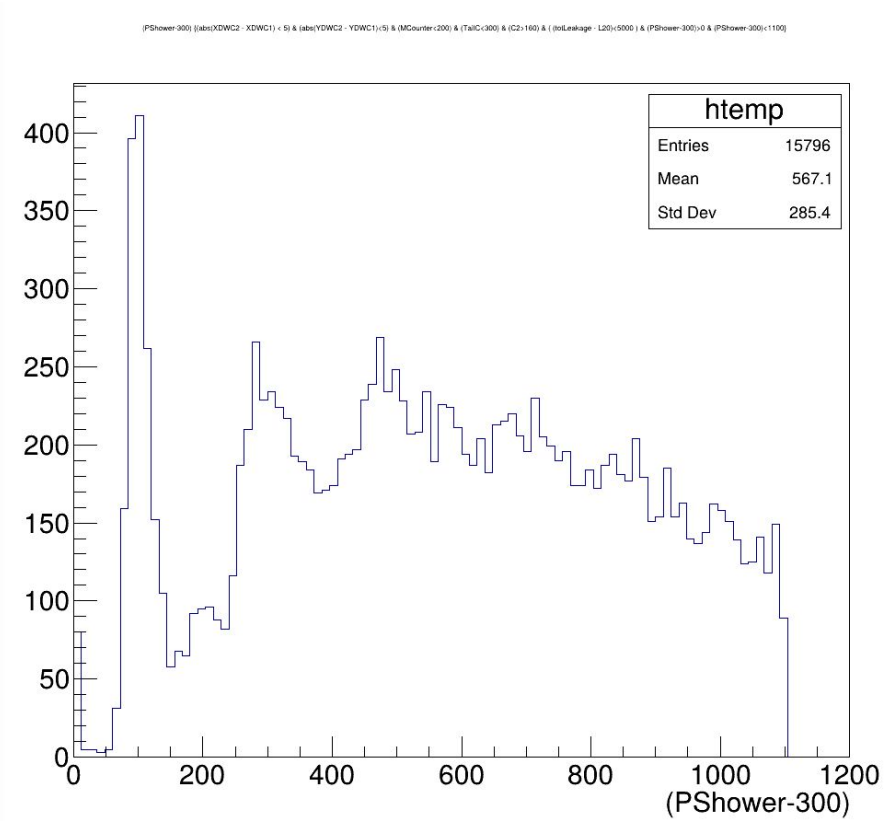
Sim

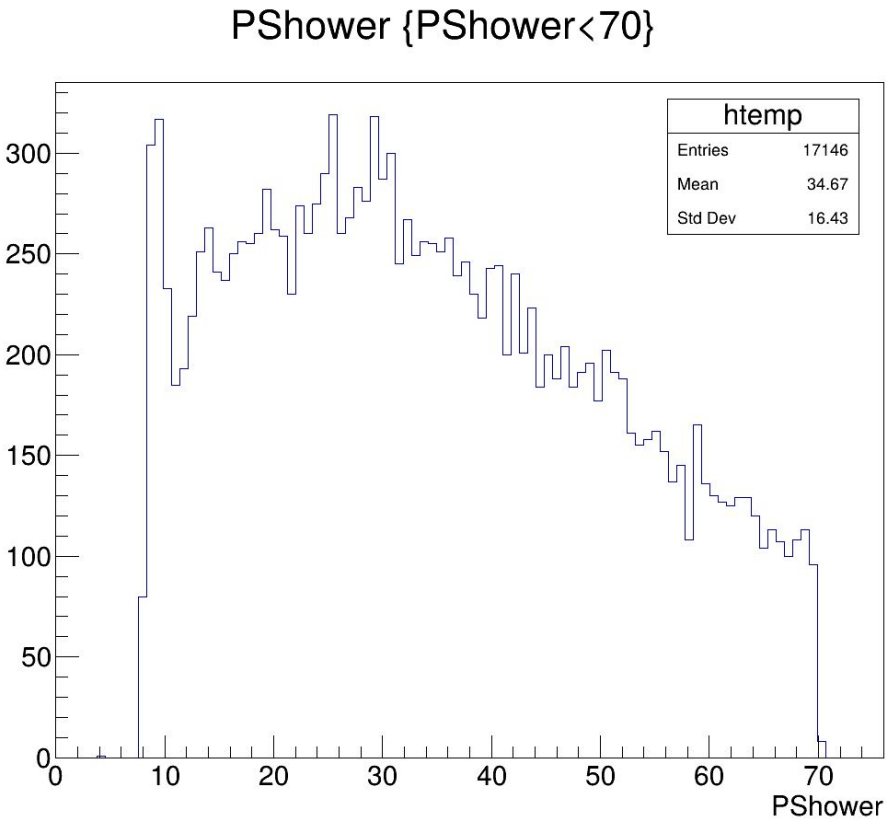

totPMTSene:YDWC2 {(abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000)}
htemp
Entries 12722
Mean −7.306
Mean y 19.67
Std Dev 7.649
Std Dev y 1.895


totPMTSene:YDWC2
htemp
Entries 20000
Mean 0.08399
Mean y 20.98
Std Dev 9.517
Std Dev y 1.494

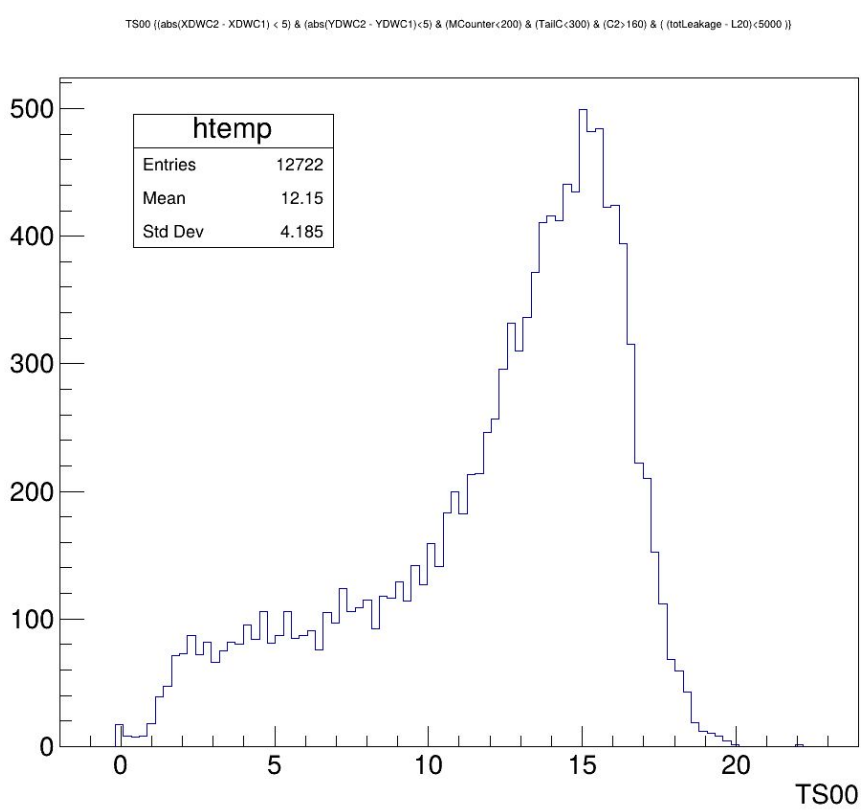
Data

Sim

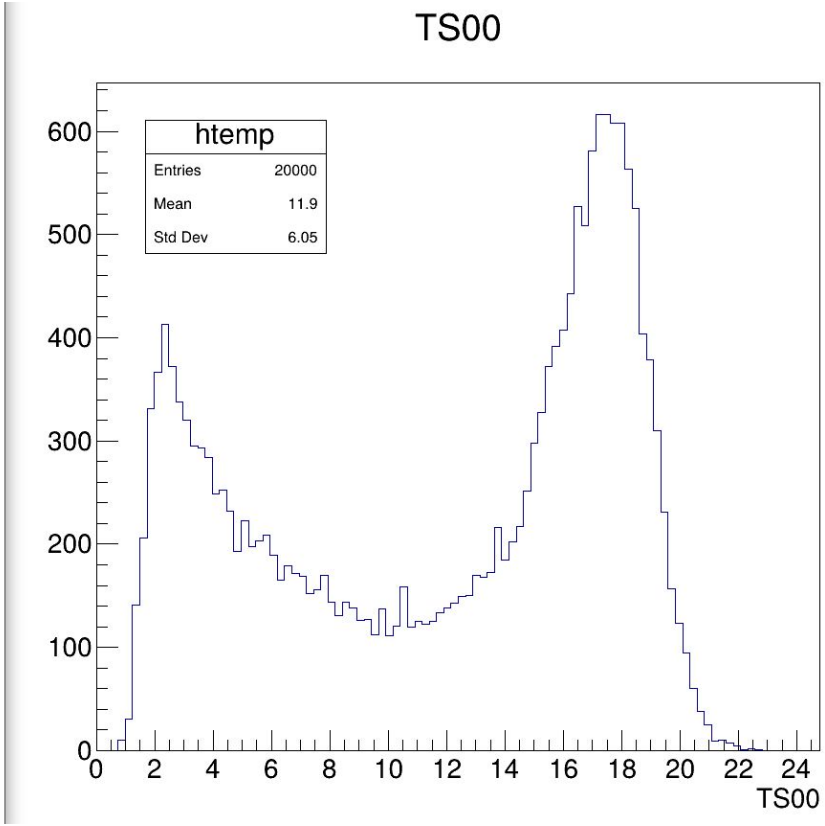

htemp
Entries 15796
Mean 567.1
Std Dev 285.4
(PShower-300)


PShower {PShower<70}
htemp
Entries 17146
Mean 34.67
Std Dev 16.43
PShower

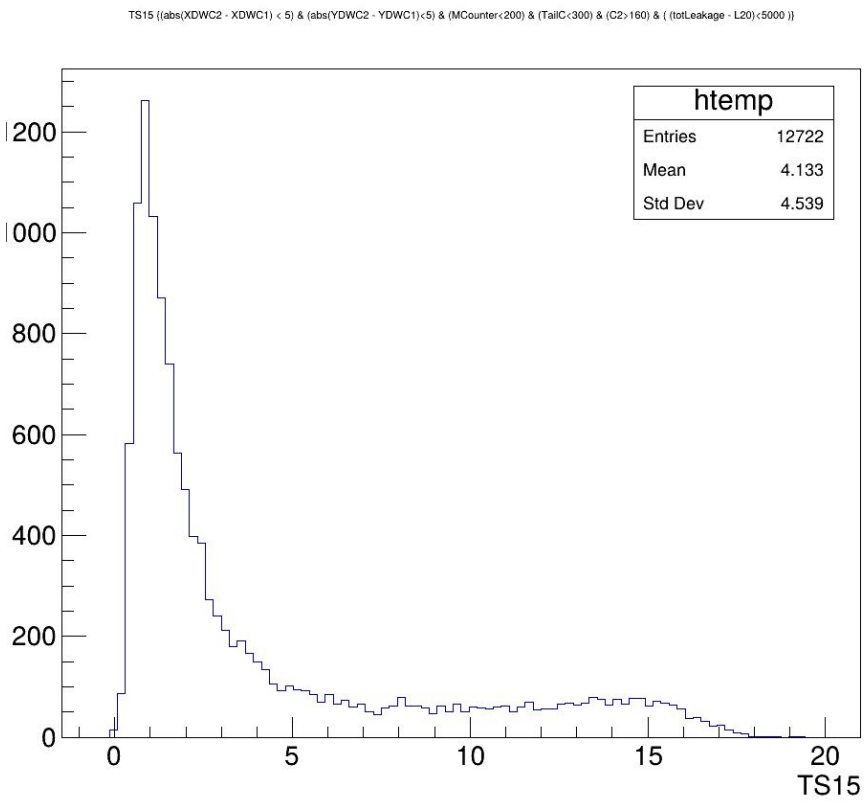
Data


TS00 ((abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000))
htemp
Entries 12722
Mean 12.15
Std Dev 4.185
500
400
300
200
100
0
0
5
10
15
20
TS00

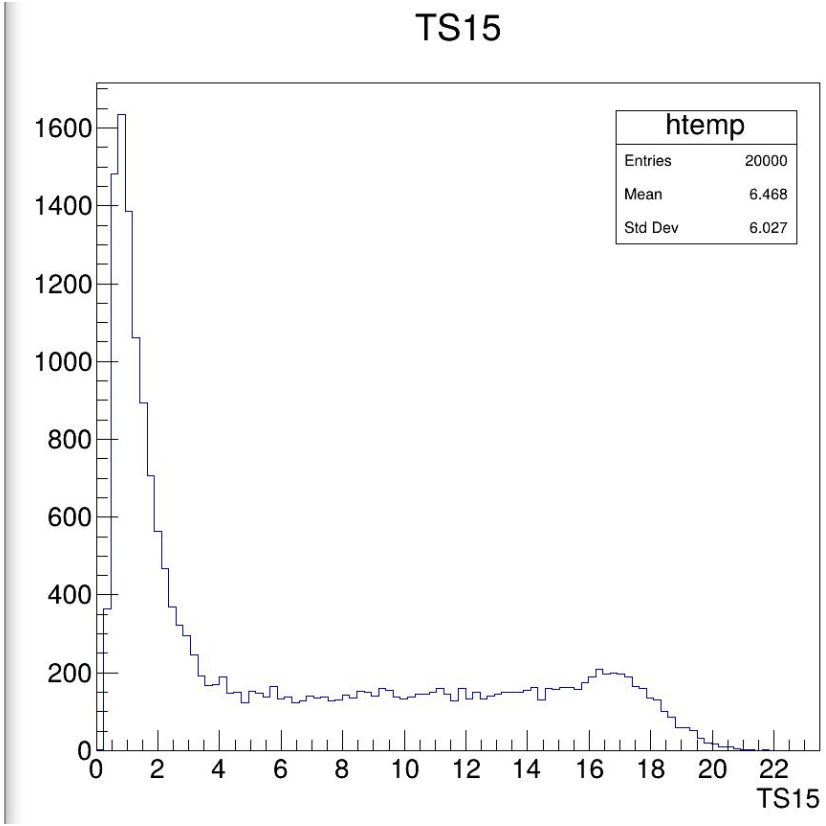
Sim


TS00
htemp
Entries 20000
Mean 11.9
Std Dev 6.05
600
500
400
300
200
100
0
0
2
4
6
8
10
12
14
16
18
20
22
24
TS00

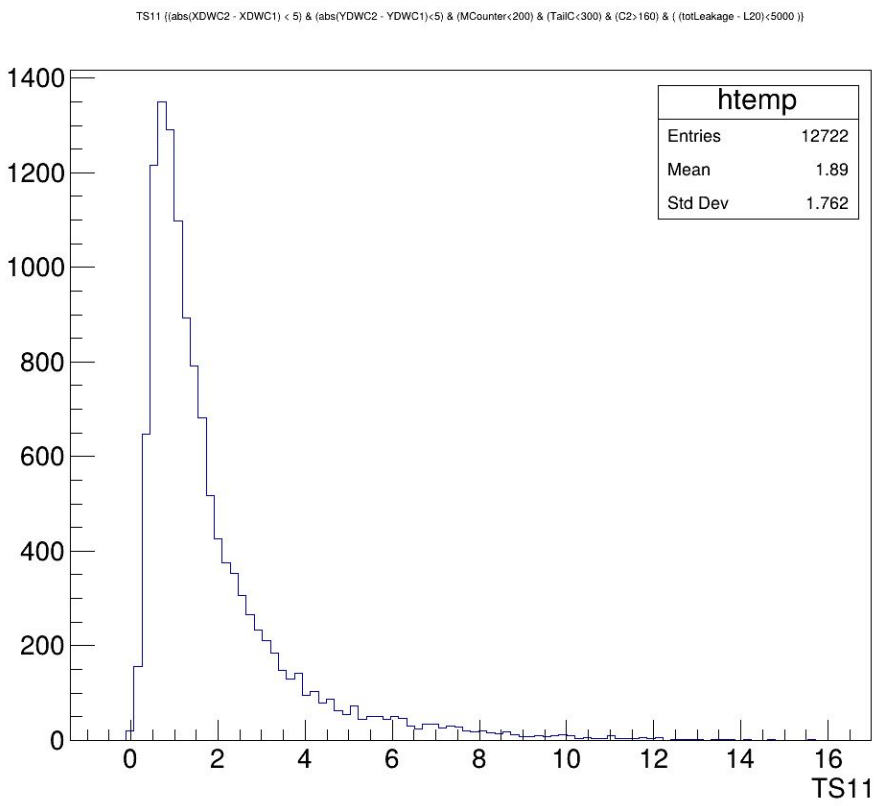
Data


TS15 {(abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000)}
htemp
Entries 12722
Mean 4.133
Std Dev 4.539
1200
1000
800
600
400
200
0
0
5
10
15
20
TS15

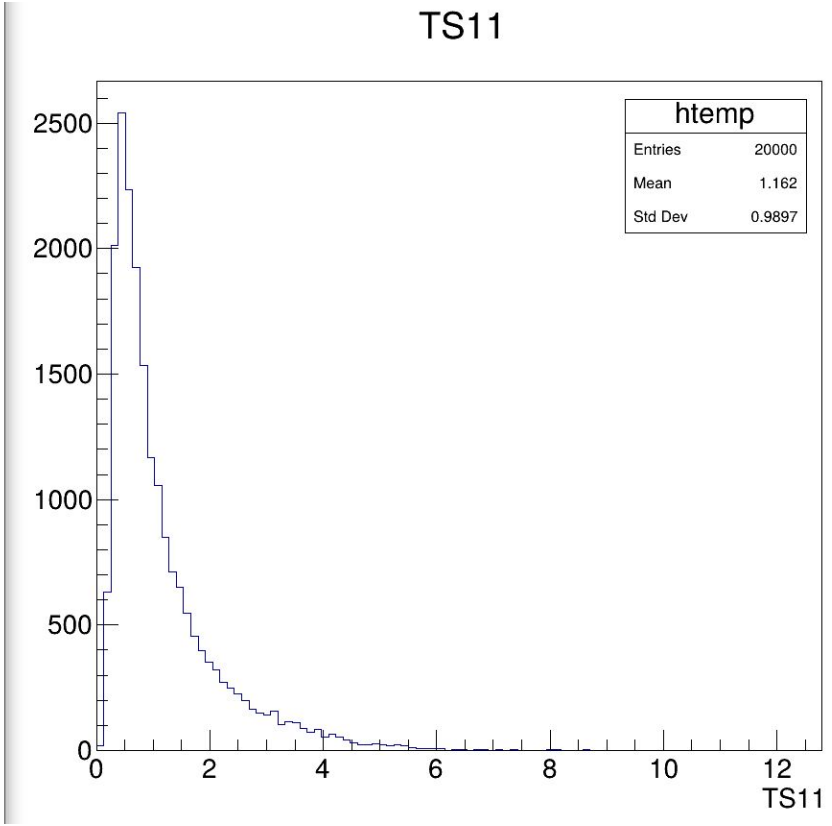
Sim


TS15
htemp
Entries 20000
Mean 6.468
Std Dev 6.027
1600
1400
1200
1000
800
600
400
200
0
0
2
4
6
8
10
12
14
16
18
20
22
TS15

Data


TS11 {(abs(XDWC2 - XDWC1) < 5) & (abs(YDWC2 - YDWC1)<5) & (MCounter<200) & (TailC<300) & (C2>160) & ((totLeakage - L20)<5000)}
htemp
Entries 12722
Mean 1.89
Std Dev 1.762
TS11

Sim


TS11
htemp
Entries 20000
Mean 1.162
Std Dev 0.9897
TS11

Backup