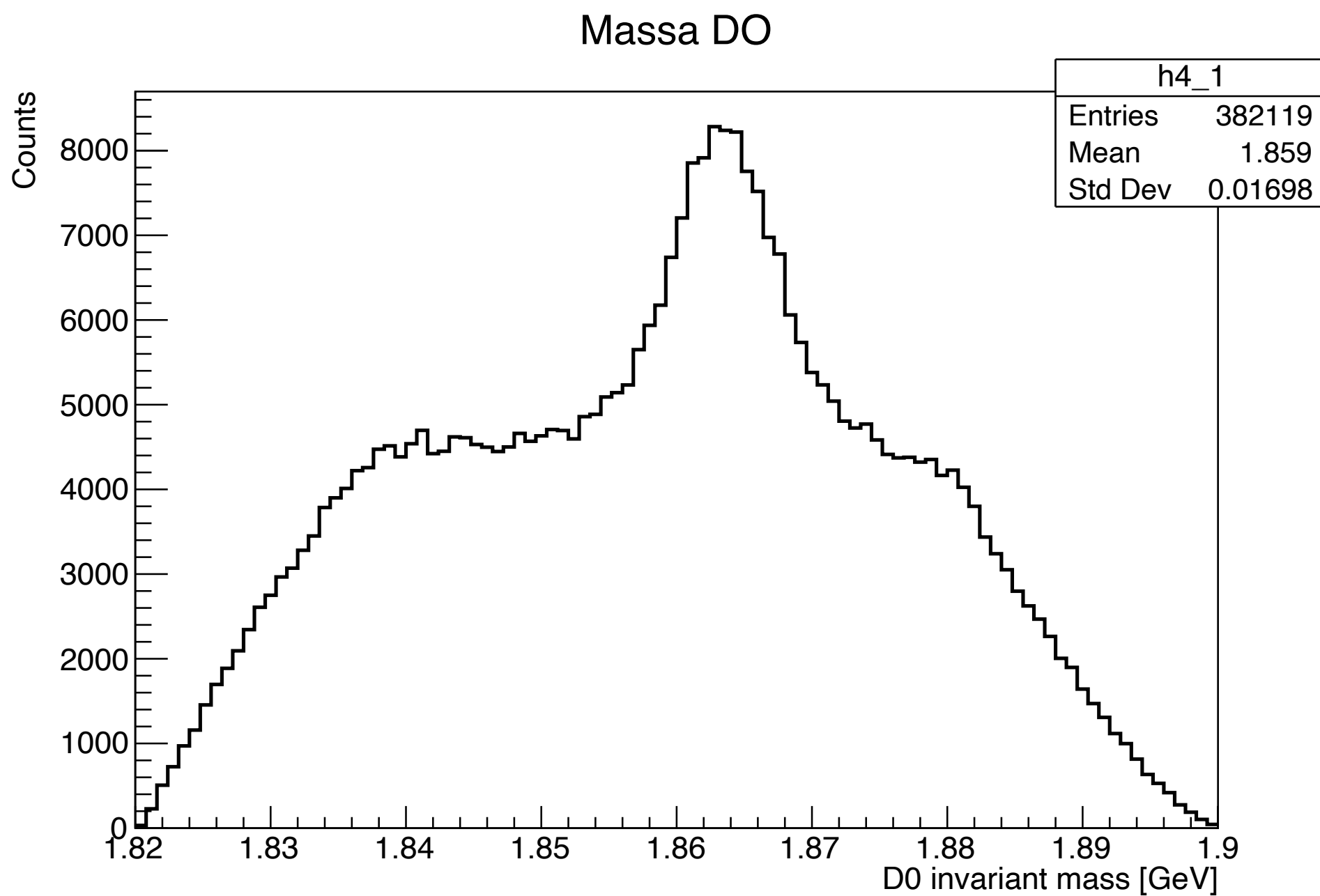


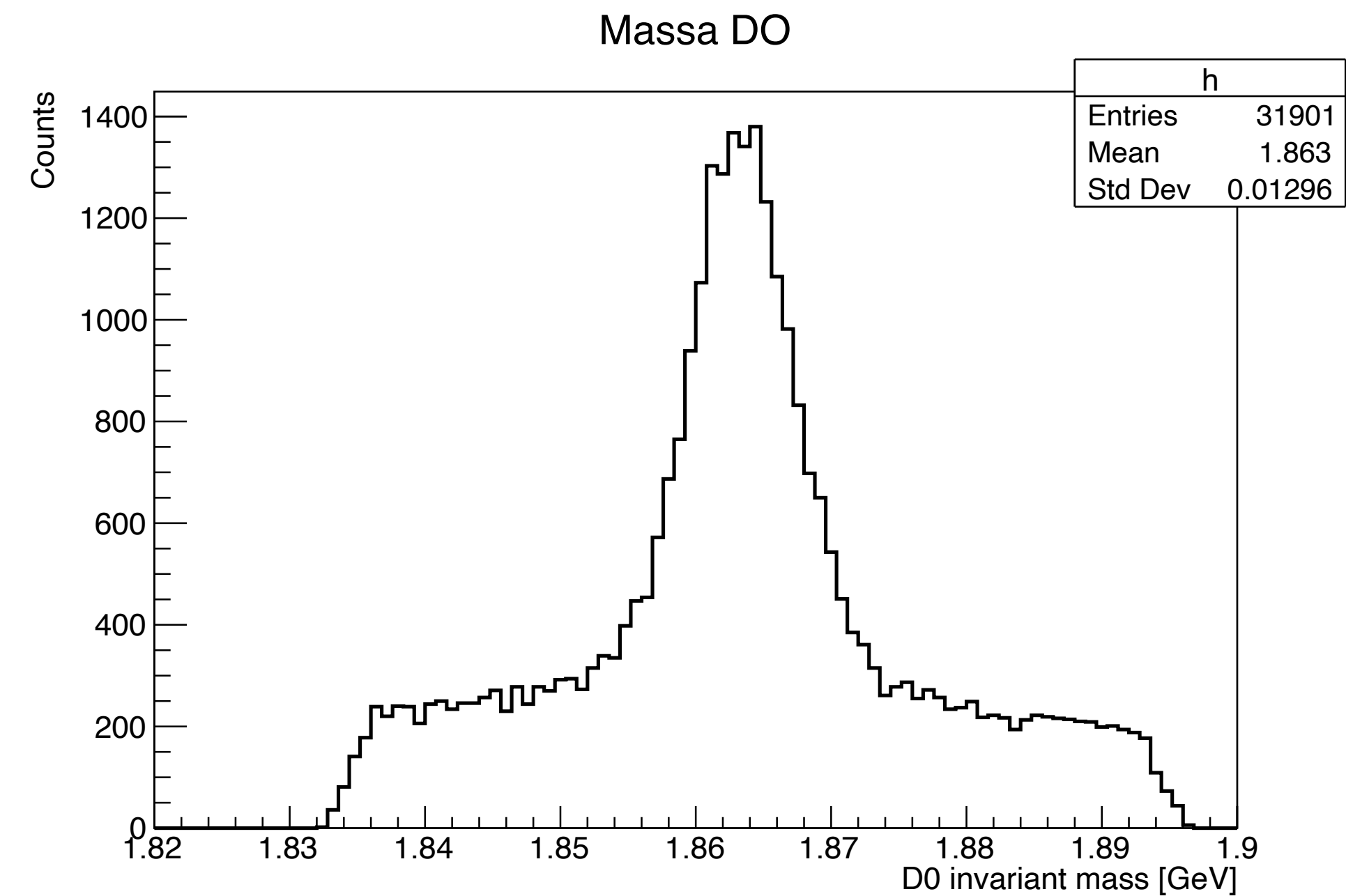
Study of the $D^* \rightarrow [D^0 \rightarrow K\pi]\pi$ decay

- Study of the efficiency of TOP detector
- Study of mis-reconstructed events on TOP detector



Selection based on:

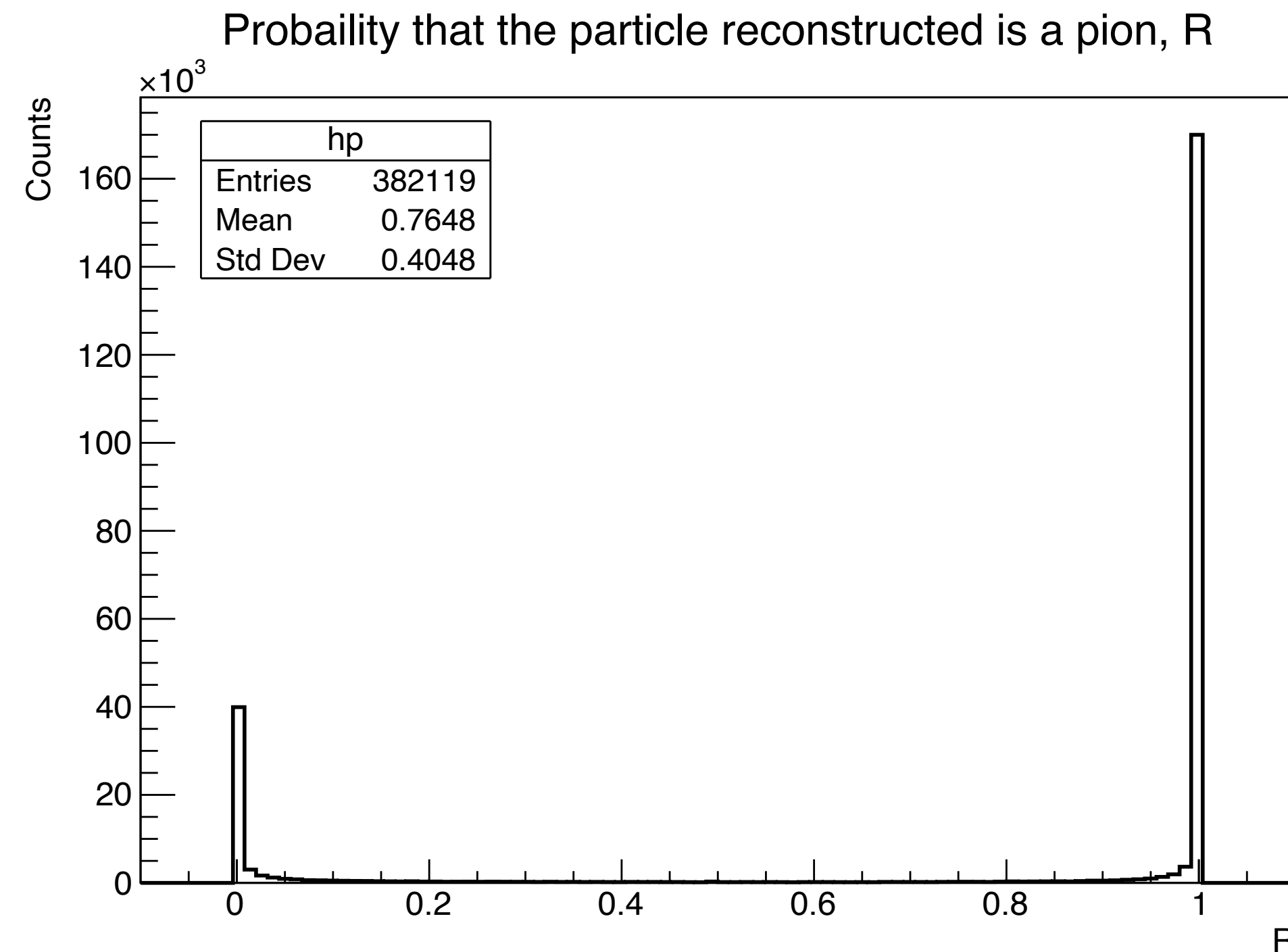
- Momentum of the soft pion
- Expected mass of D^0
- Interaction vertex position
- Mass difference between D^* and D^0
- Q-value of the reaction



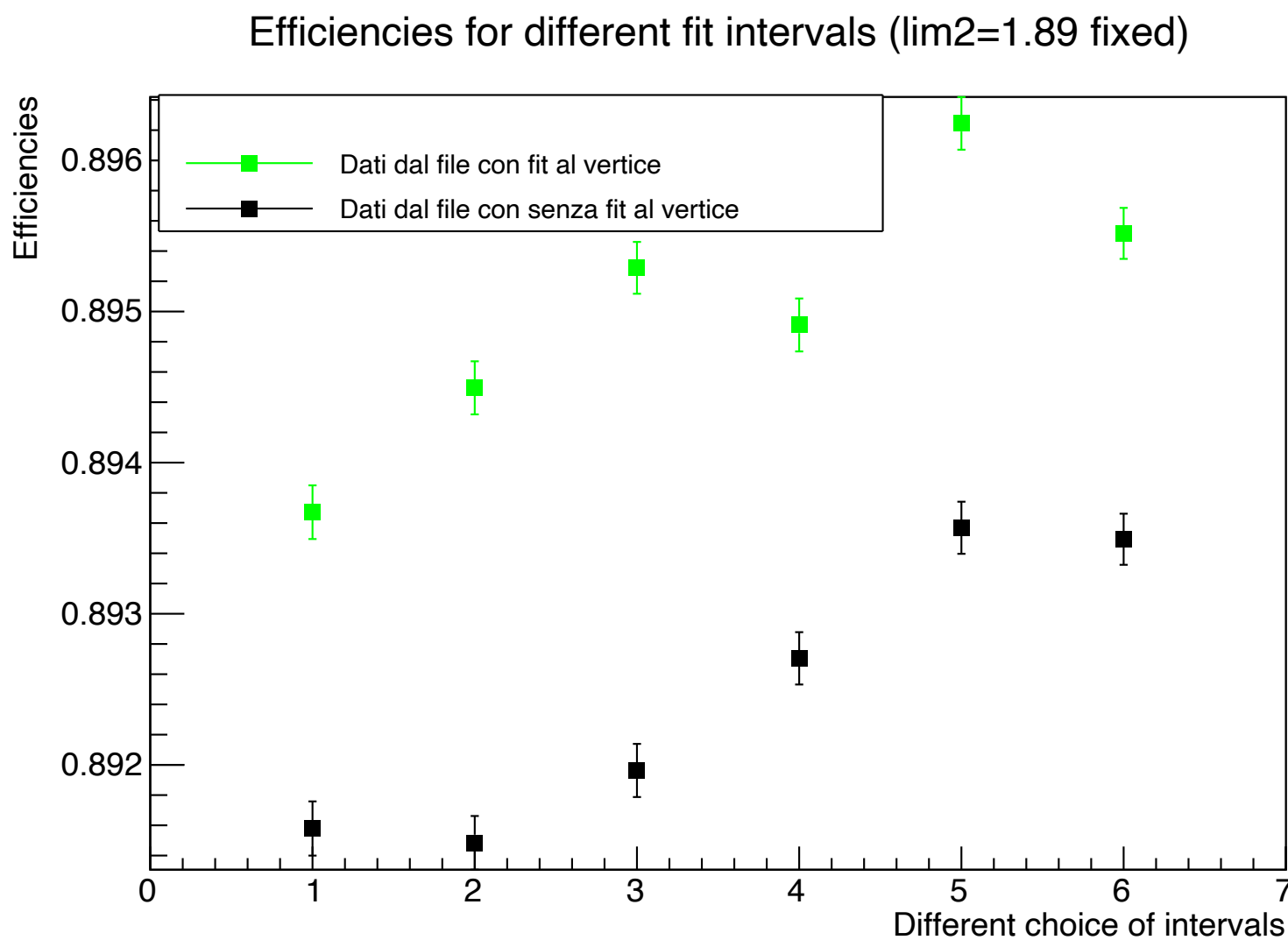
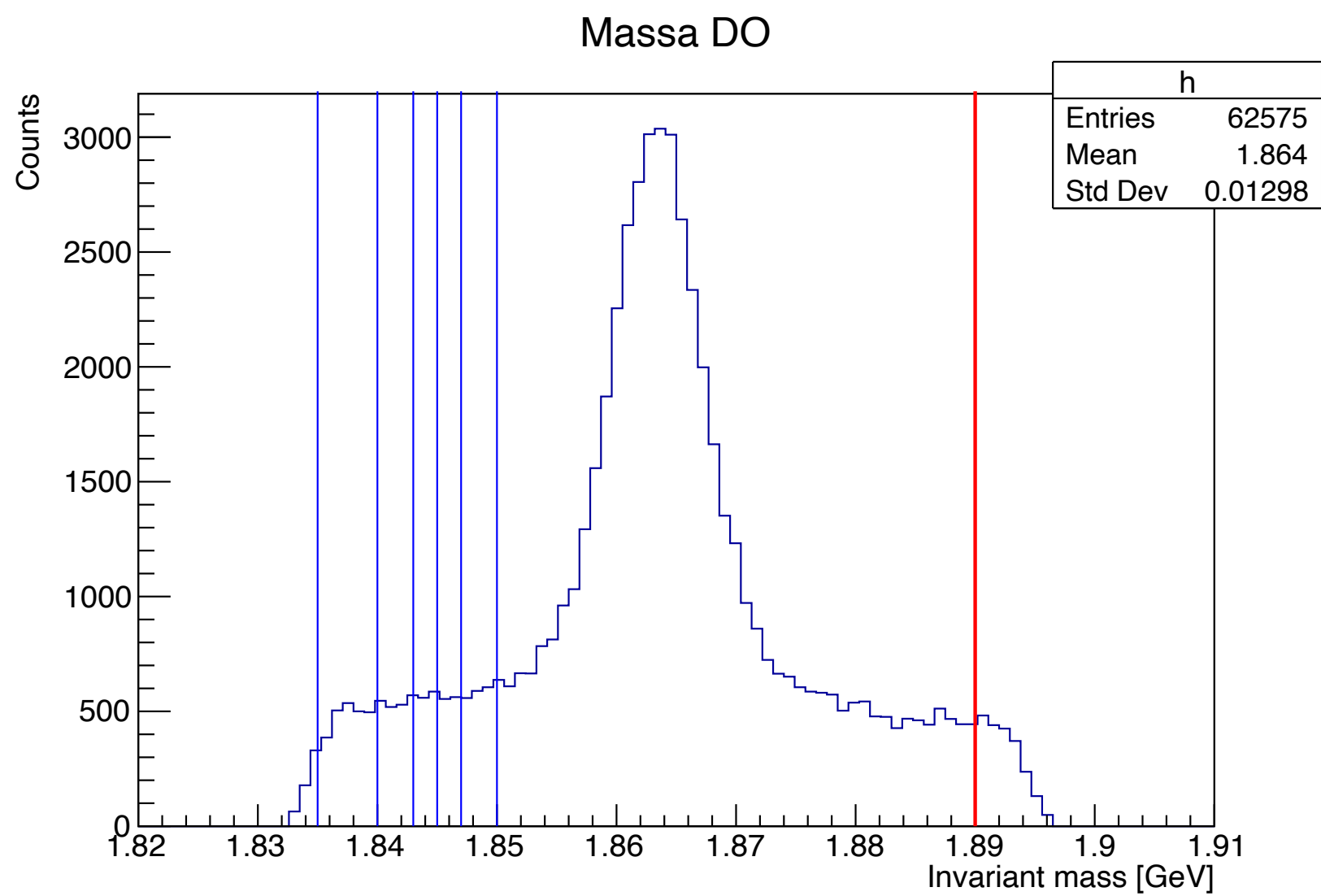
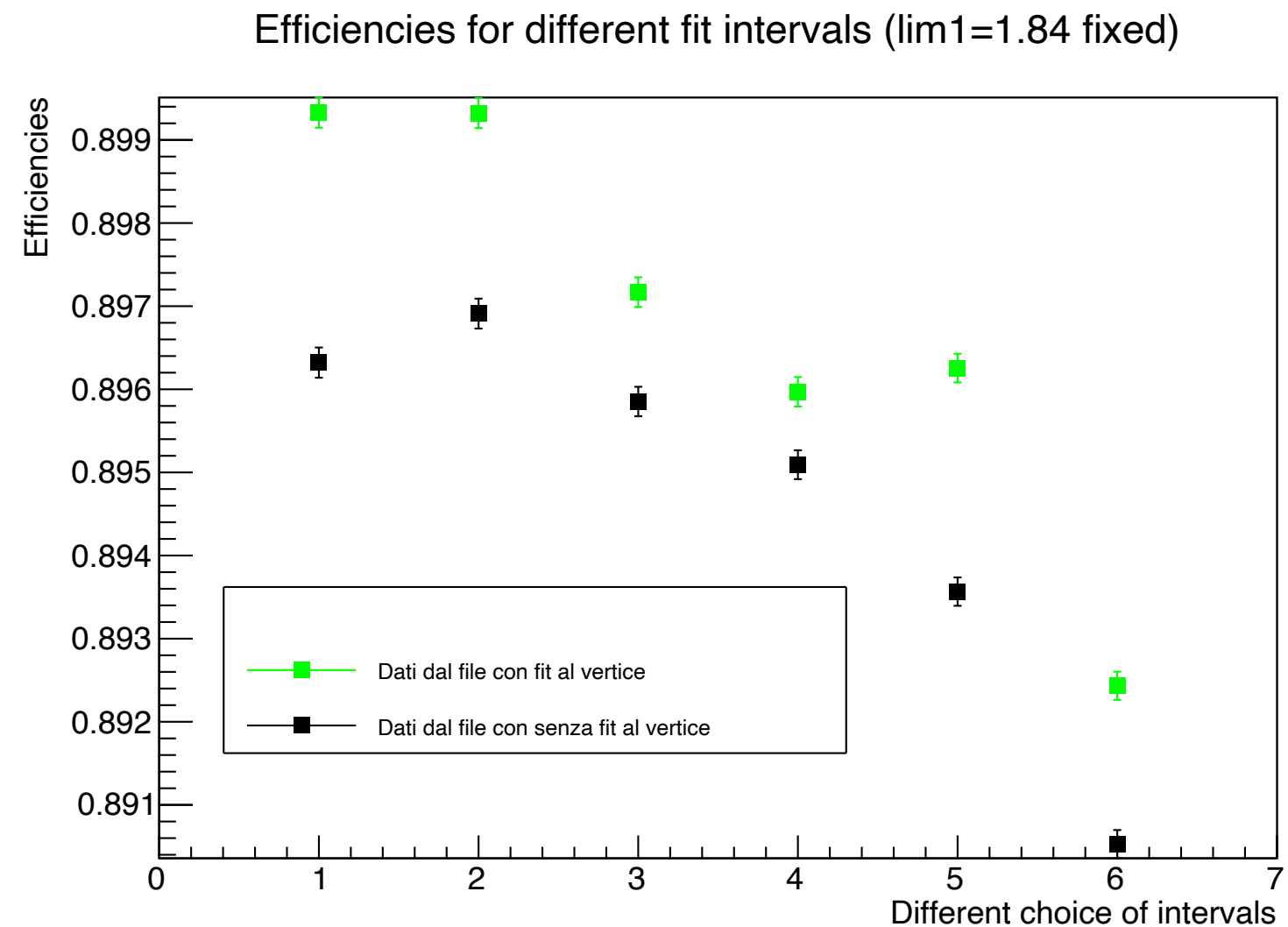
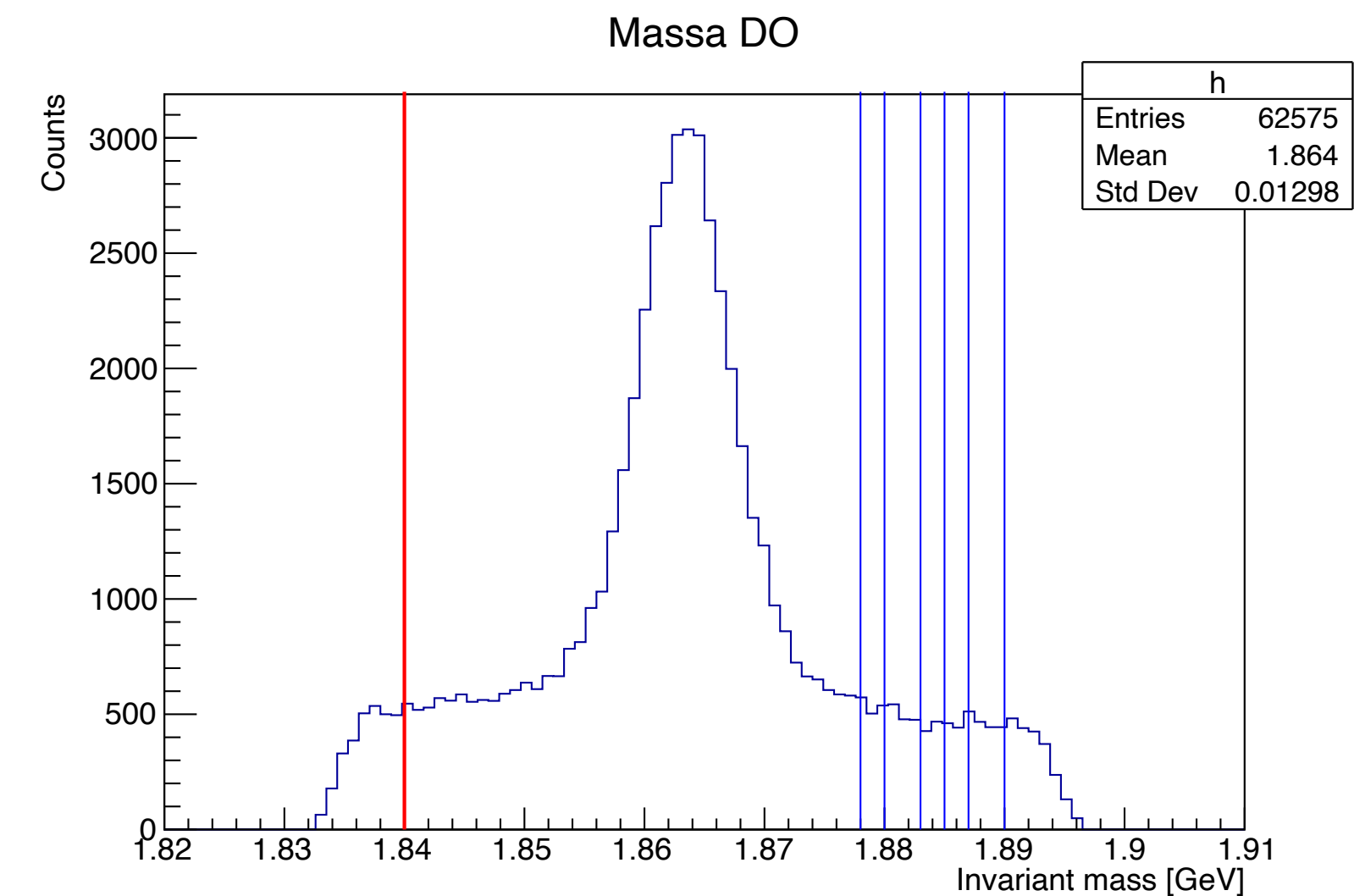
Efficiency of TOP detector

- Additional selection on the data: impose $R > 0.8$
(R =probability that the particle reconstructed is a pion)
- Fit of the D^0 invariant mass using pol0+gaussian function with and without the above selection

$$\text{Efficiency} = \frac{\text{Integral of the Gaussian fitting } D^0 \text{ invariant mass with } R > 0.8}{\text{Integral of the Gaussian fitting } D^0 \text{ invariant mass}}$$



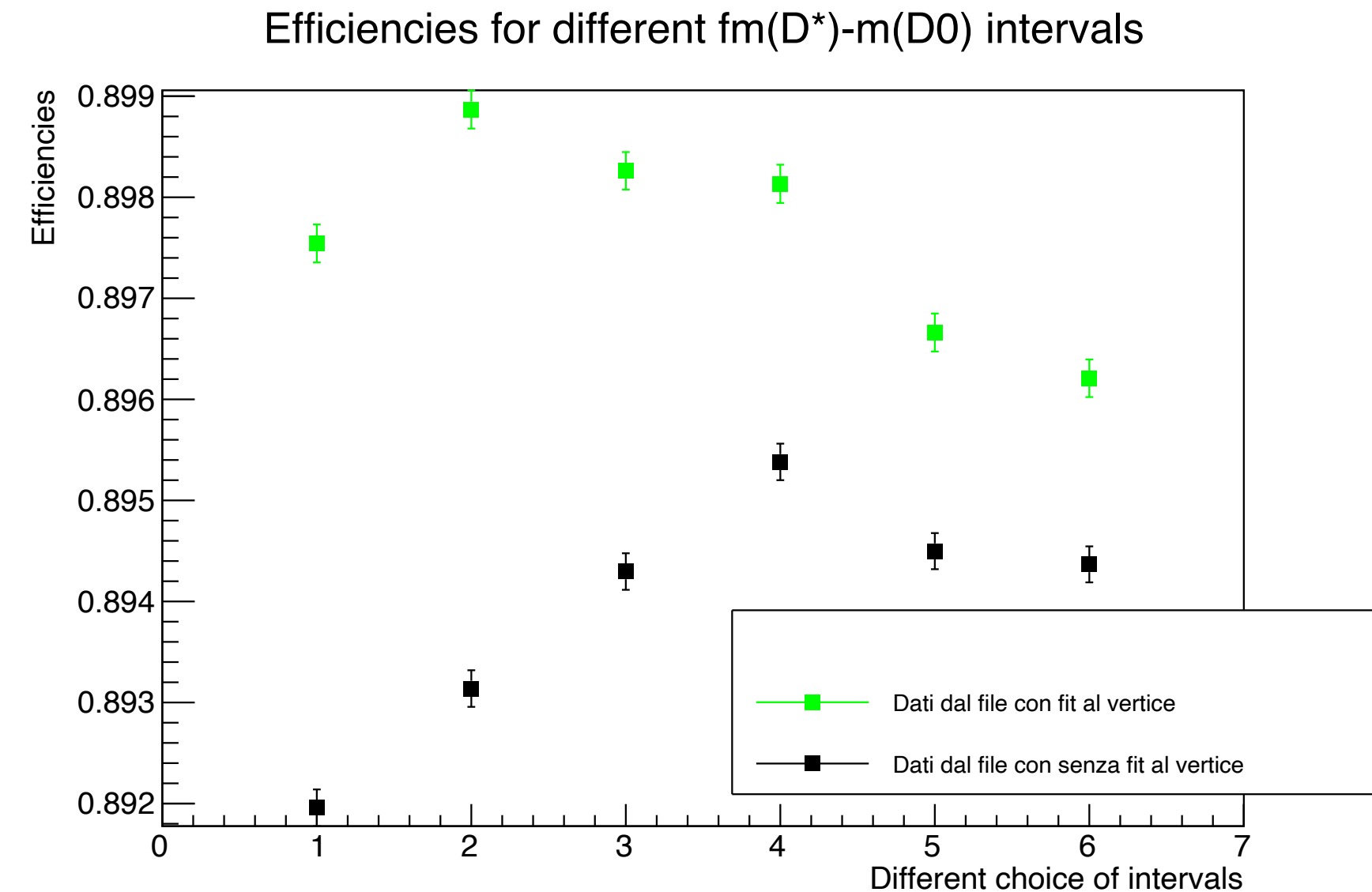
Efficiency of TOP detector



Sistematic uncertainty related to the choice of the fit interval:

$$\Delta x_{sis} \approx 0.007$$

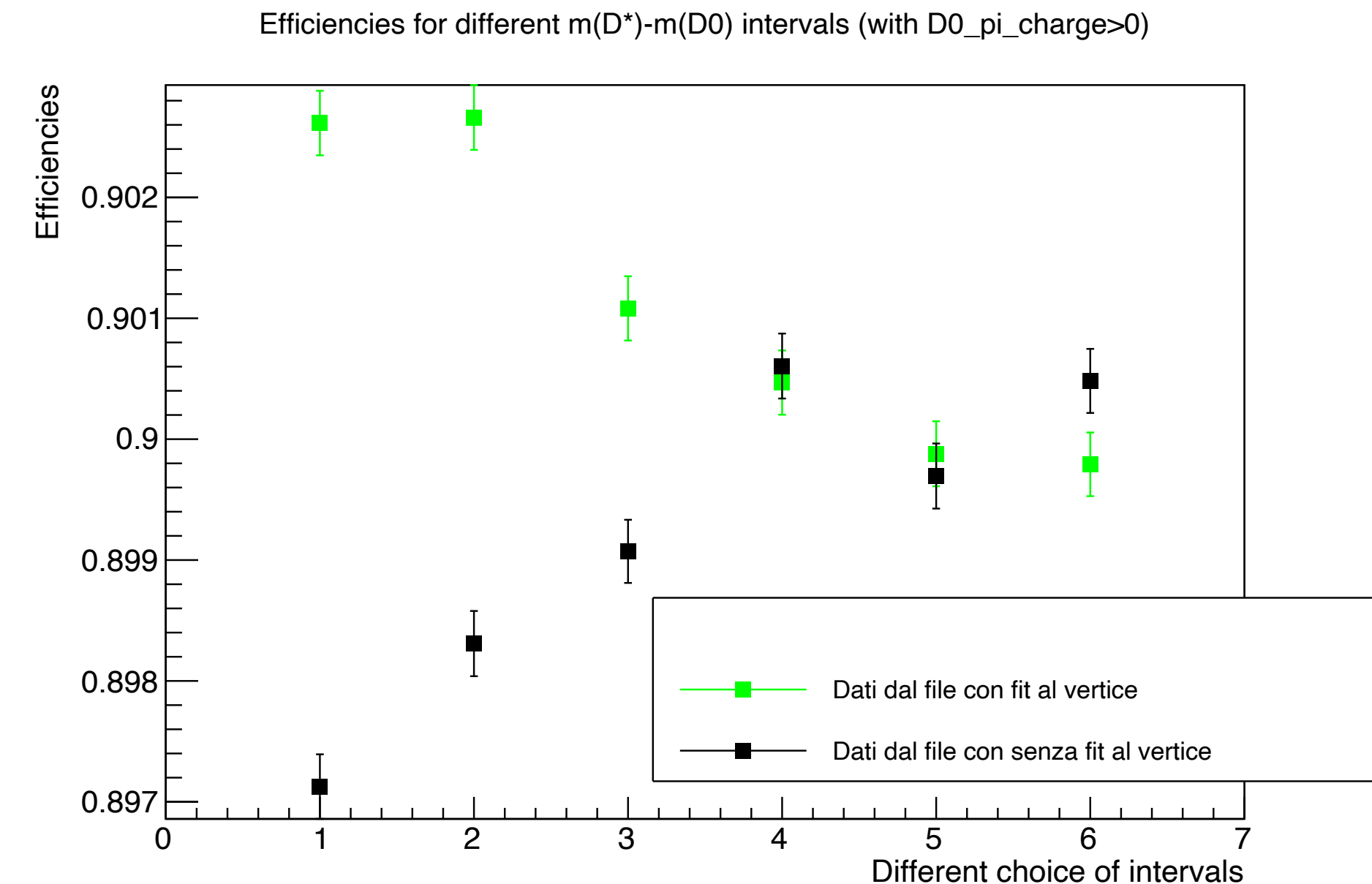
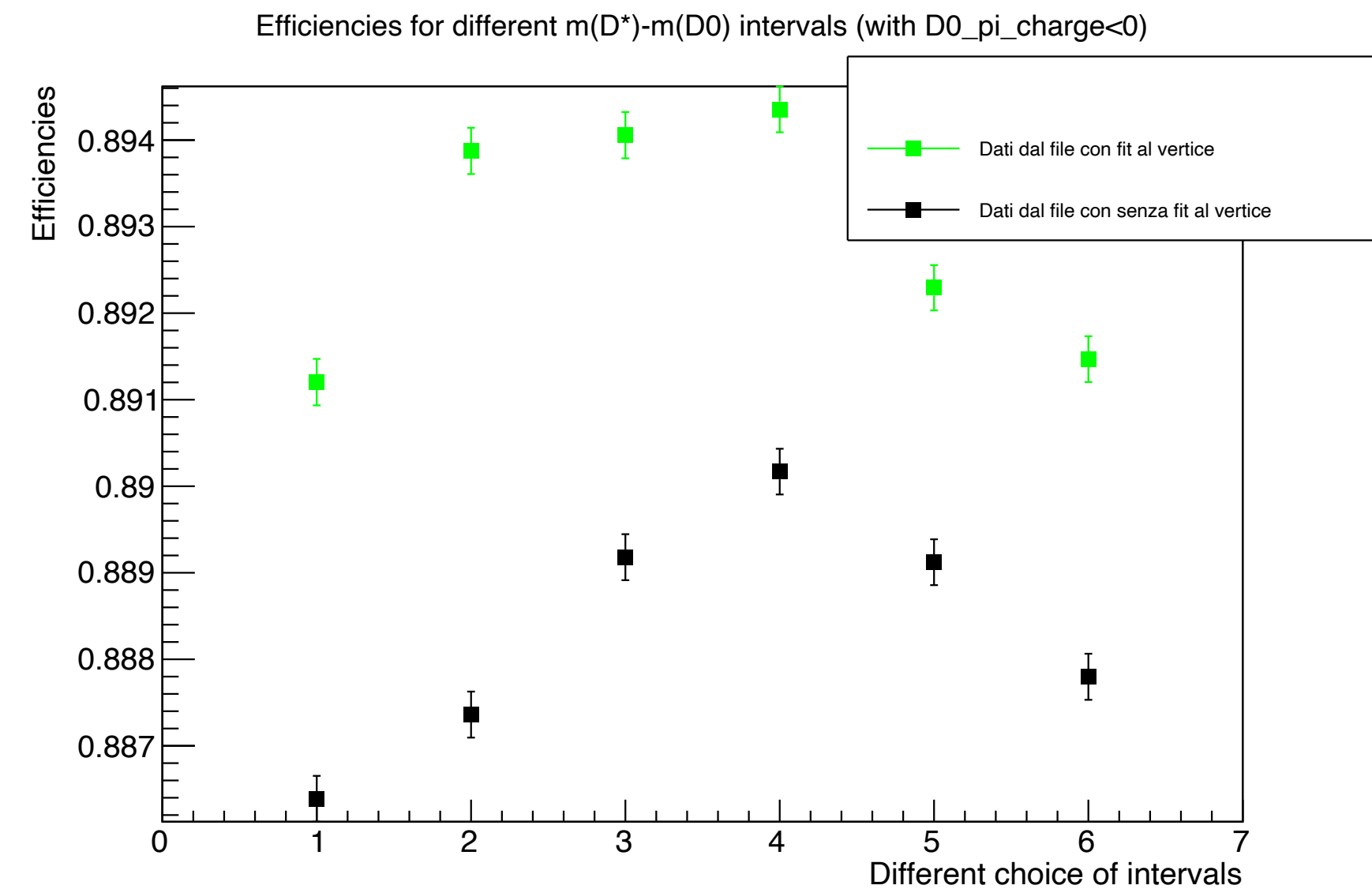
Efficiency of TOP detector



INTERVALS	
1:	[0.1431 ; 0.1477] GeV
2:	[0.1432 ; 0.1476] GeV
3:	[0.1433 ; 0.1475] GeV
4:	[0.1434 ; 0.1474] GeV
5:	[0.1435 ; 0.1473] GeV
6:	[0.1436 ; 0.1472] GeV

Best efficiency* expected in the range [0.1434;0.1474] GeV

* "Study of charged $K^\pm$ and $\pi^\pm$ identification performance in Phase II data using $D^{*+} \rightarrow [D^0 \rightarrow K^- \pi^+] \pi^+$ sample"
D. Nevarov



Study of mis-reconstructed events on TOP detector

Looking at the distribution of D0_pi_Pairpi (=R), we noticed that around 1/3 of the events are tagged as NaN

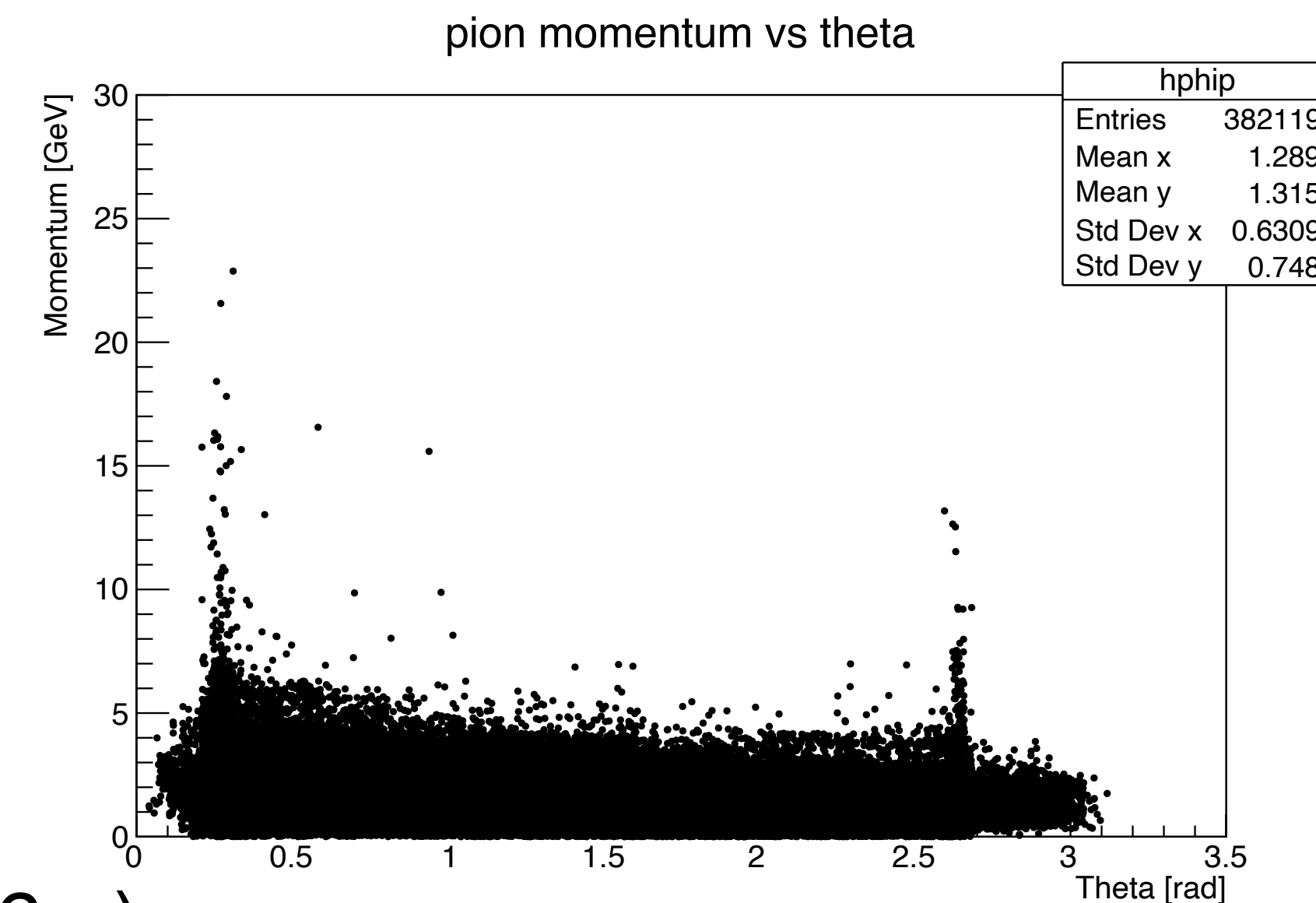
→ events that are mis-reconstructed in the TOP detector

TOP detector has a esadecagonal shape:

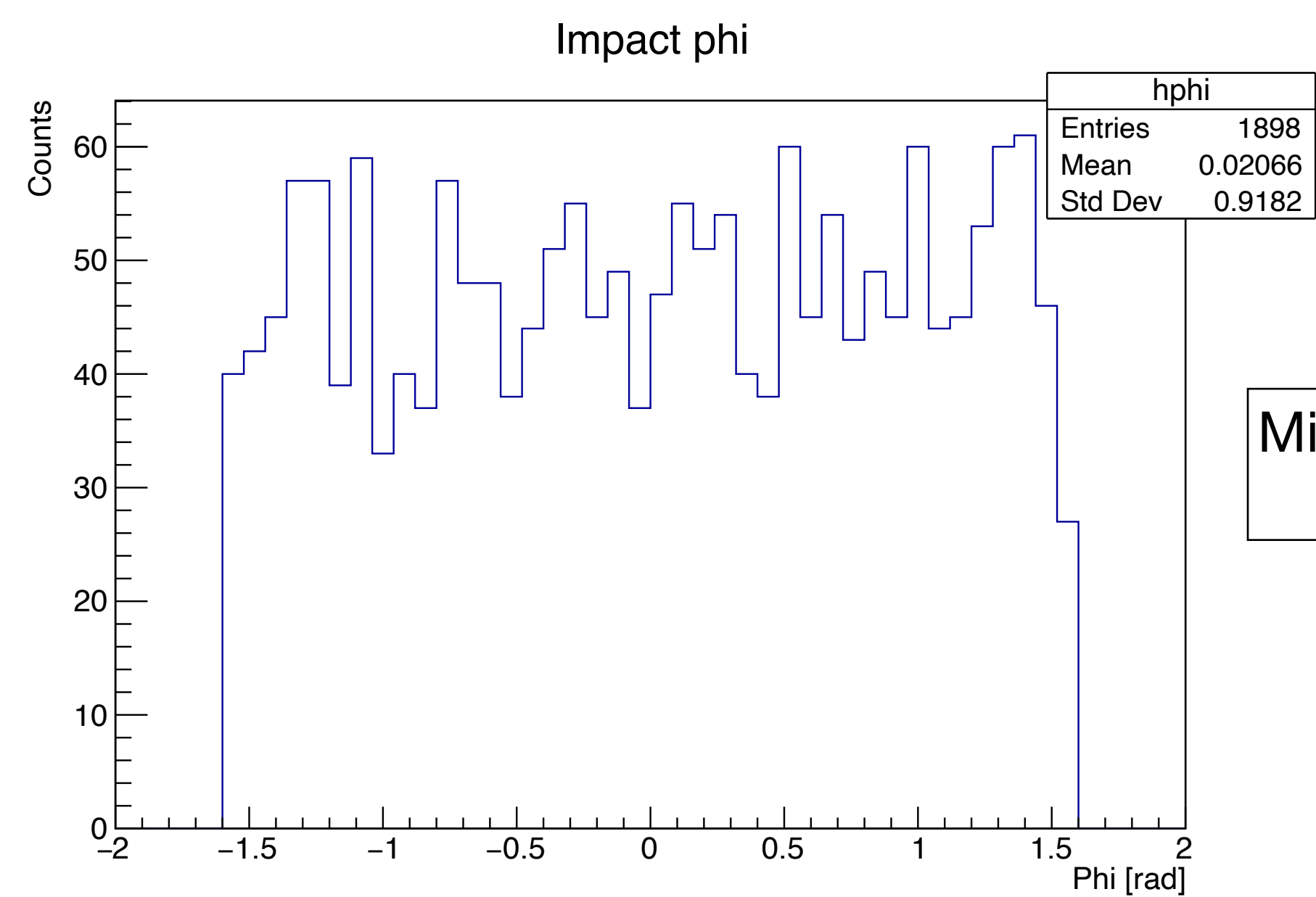
→ some pions might have hit the detector in its joint parts

Procedure:

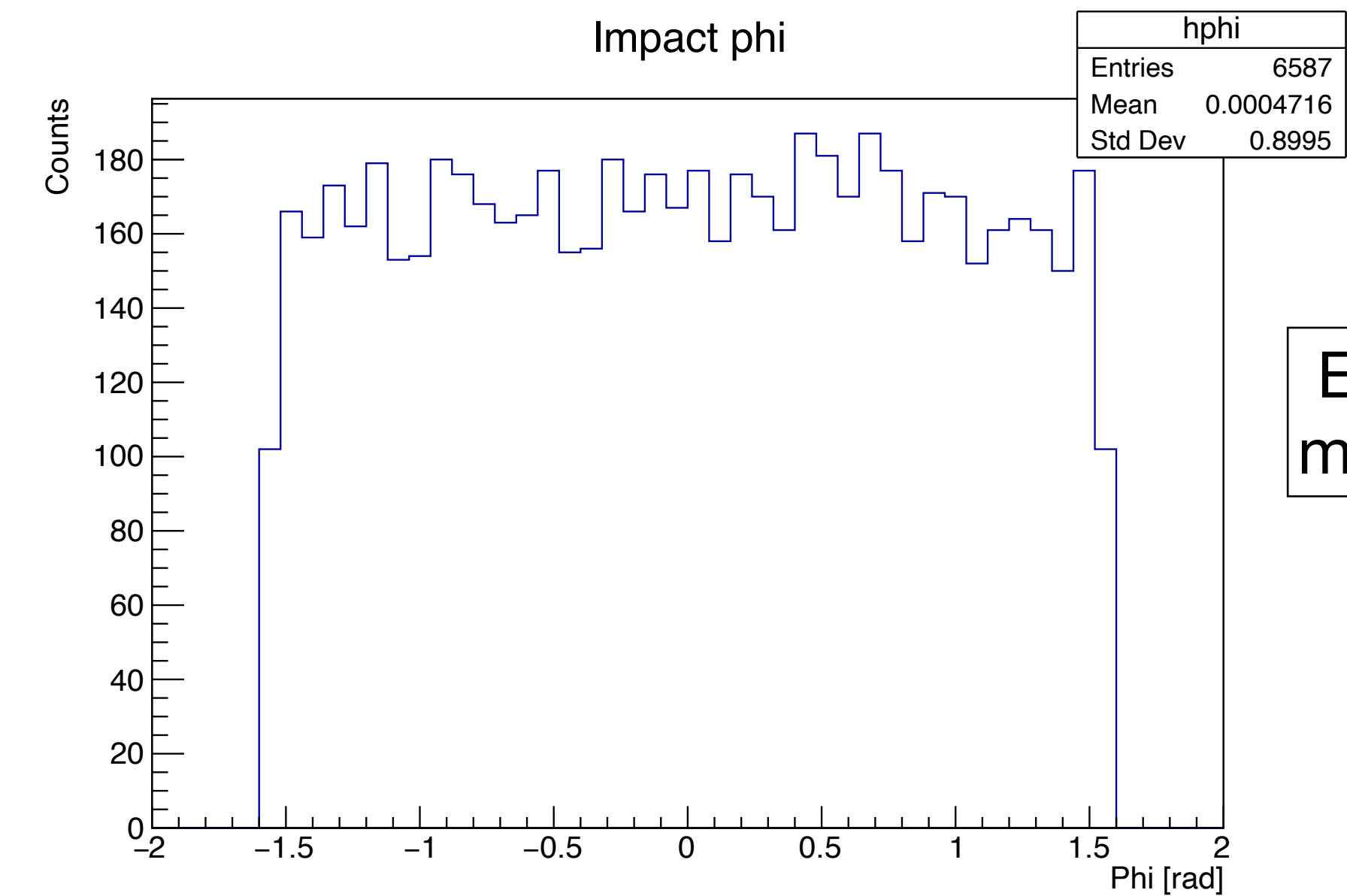
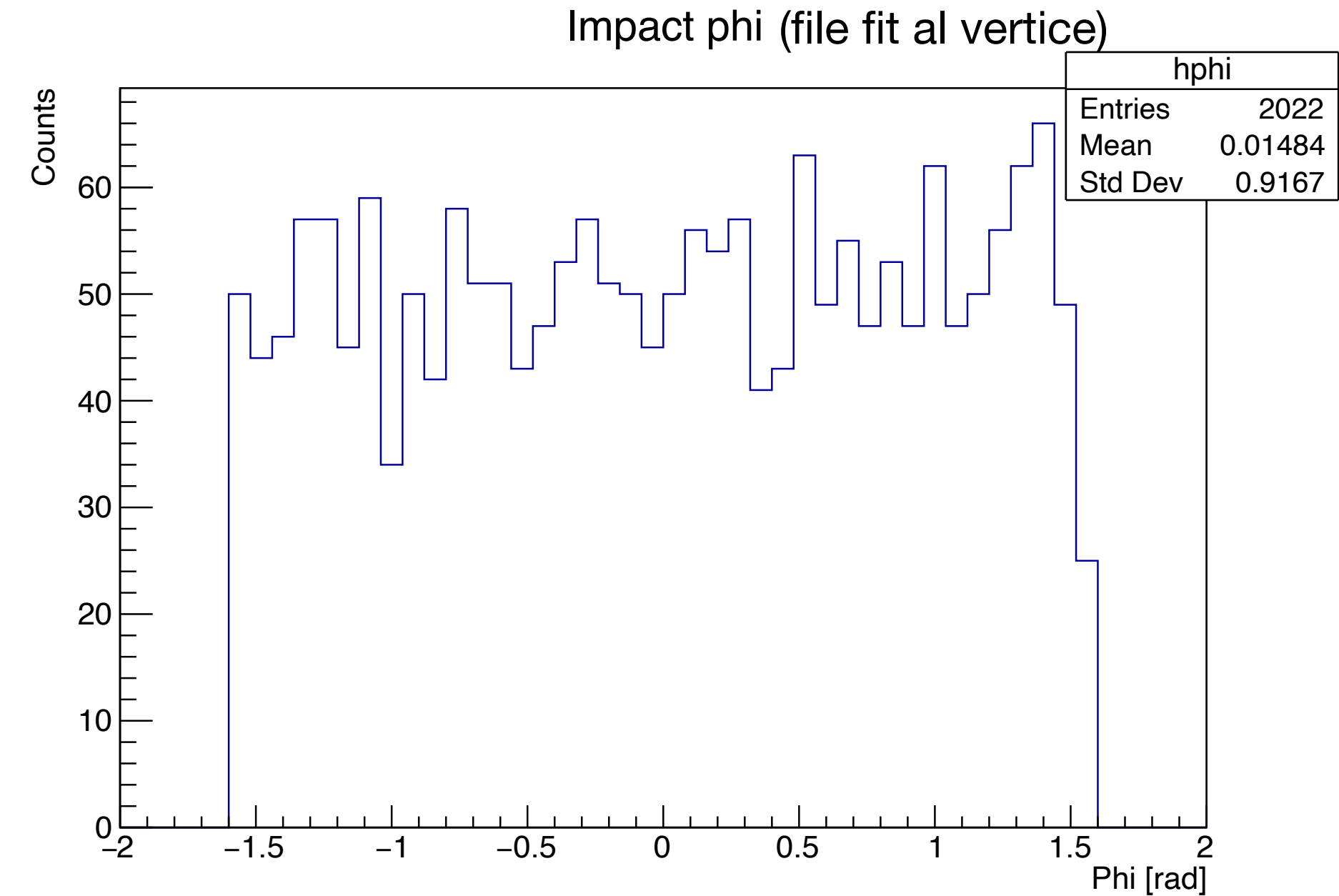
- Select only pions hitting the TOP
(with selection on θ angle and momentum)
- From the pion's ϕ distribution, derive the impact ϕ angle on the TOP detector
(from geometric considerations, assuming $B=1.5T$, $R(TOP)=1.6m$)



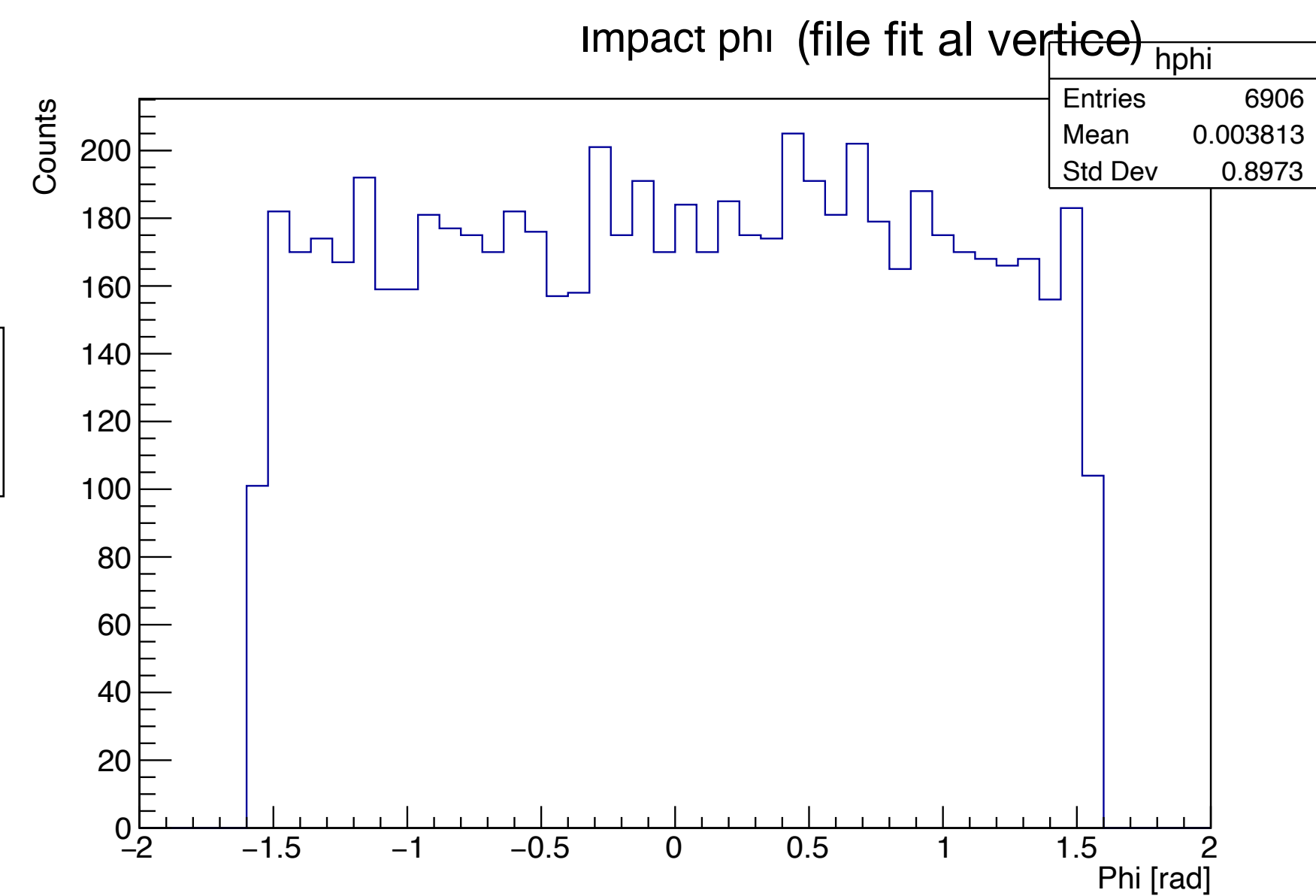
Study of mis-reconstructed events on TOP detector



Mis-reconstructed events:
around 8 peaks

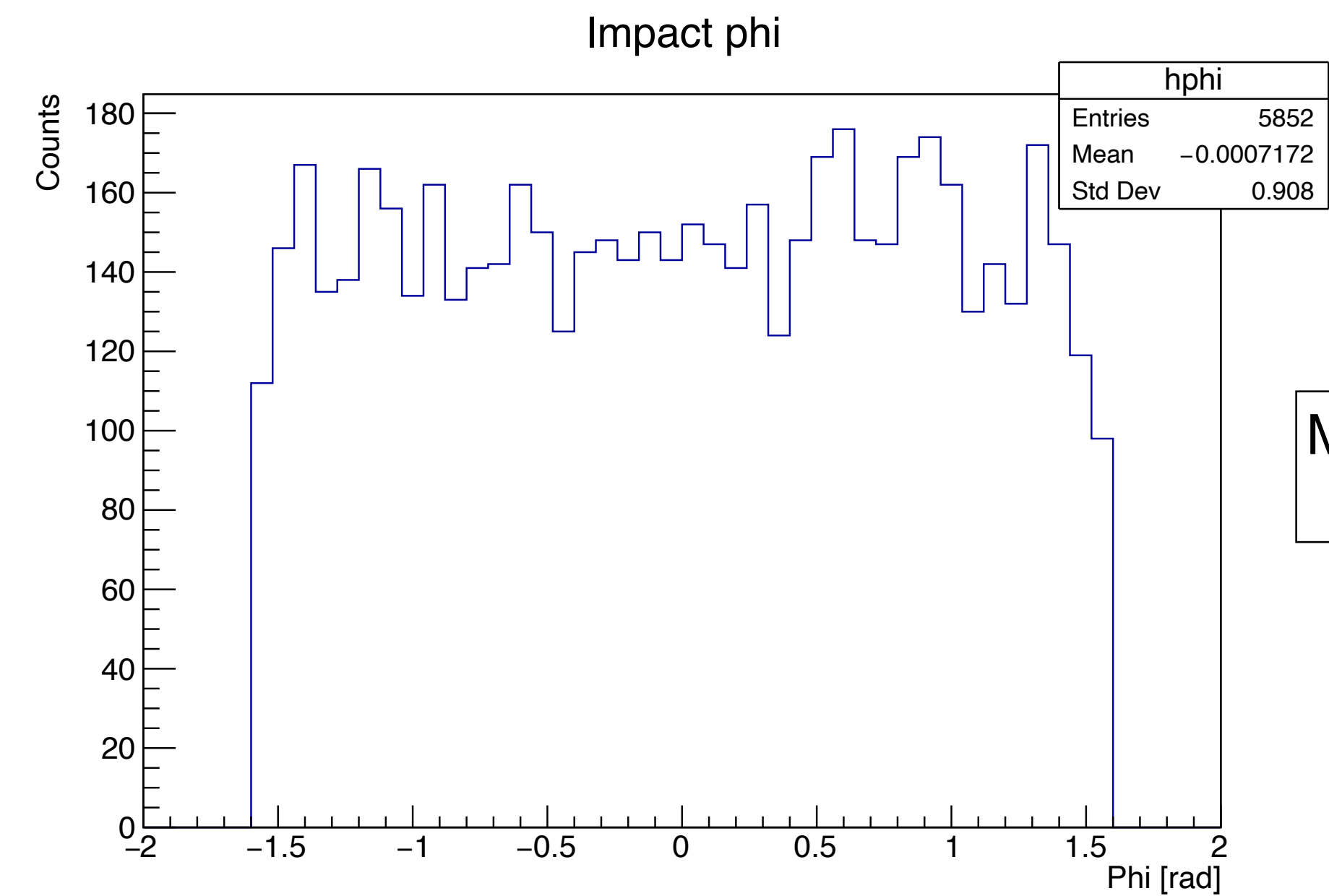


Events imposing $R > 0.8$:
more uniform distribution

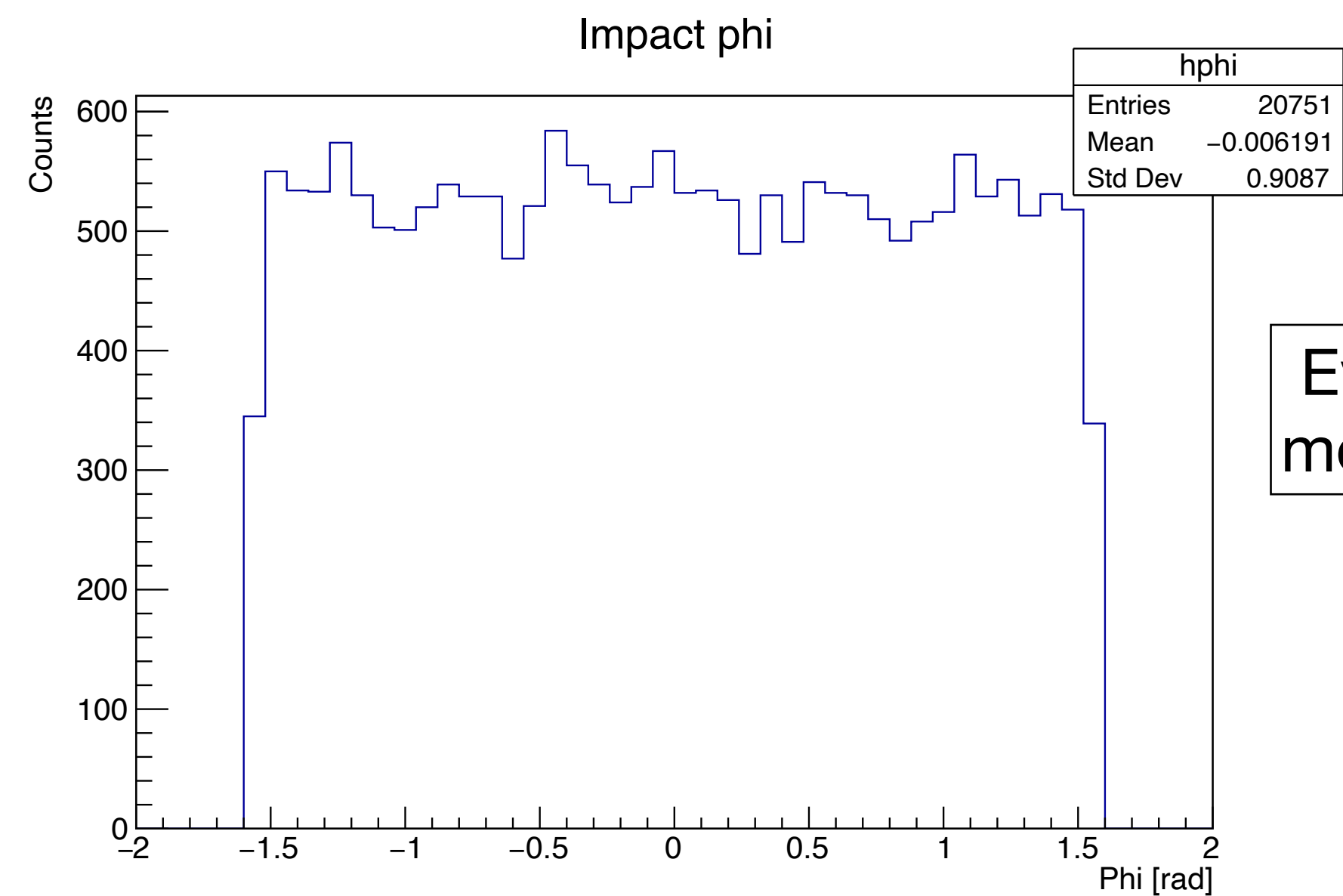
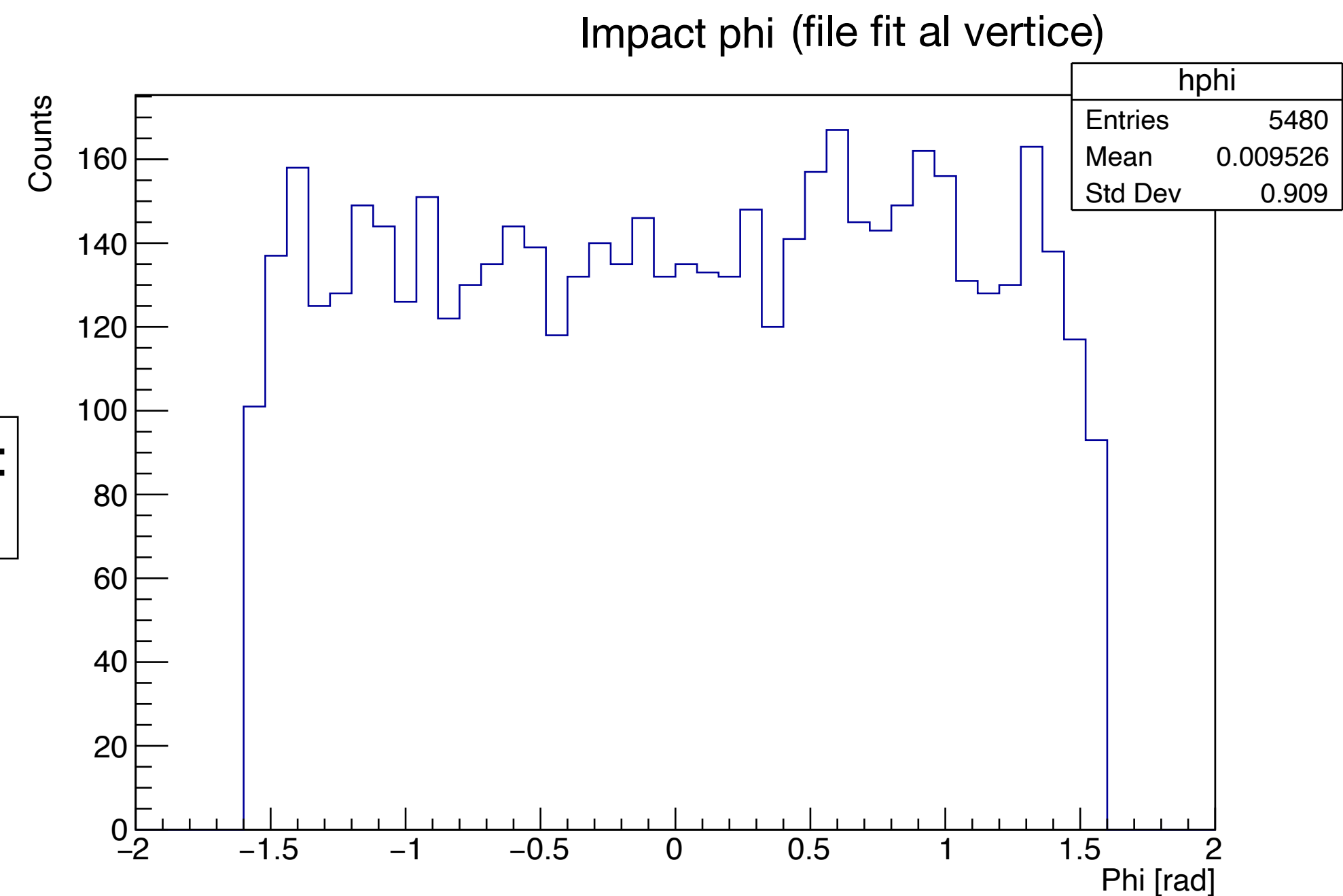


Study of mis-reconstructed events on TOP detector

Montecarlo data



Mis-reconstructed events:
Peaked structure



Events imposing $R > 0.8$:
more uniform distribution

