Understanding track fitting options

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Initial conditions
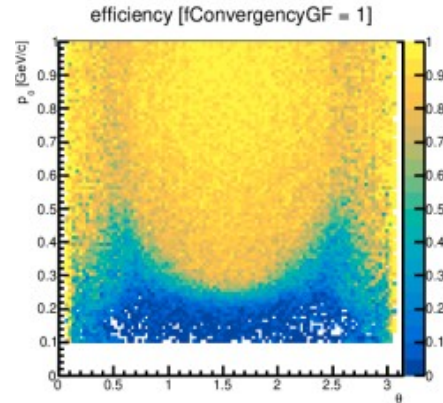
Generated sample

efficiency [fConvergencyGF = 1]

$\phi \ 90 \ degree$
$\theta \in [0-90] \ degree$
$p \in [0.1; 1.0, step=0.05 \, GeV]$
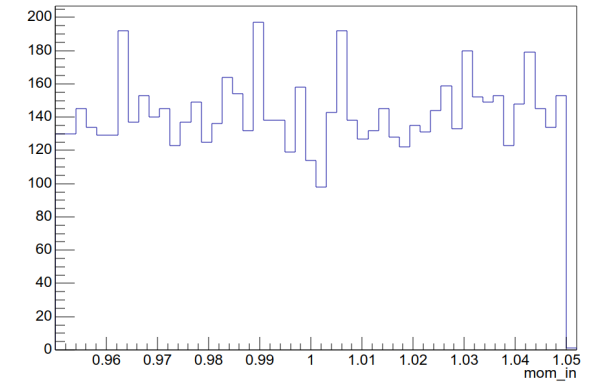$positive \ pions$

GetConvergency() *(Class SpdTrackFitPar)*

0   = fit not convergency

-1 = fit converged partially

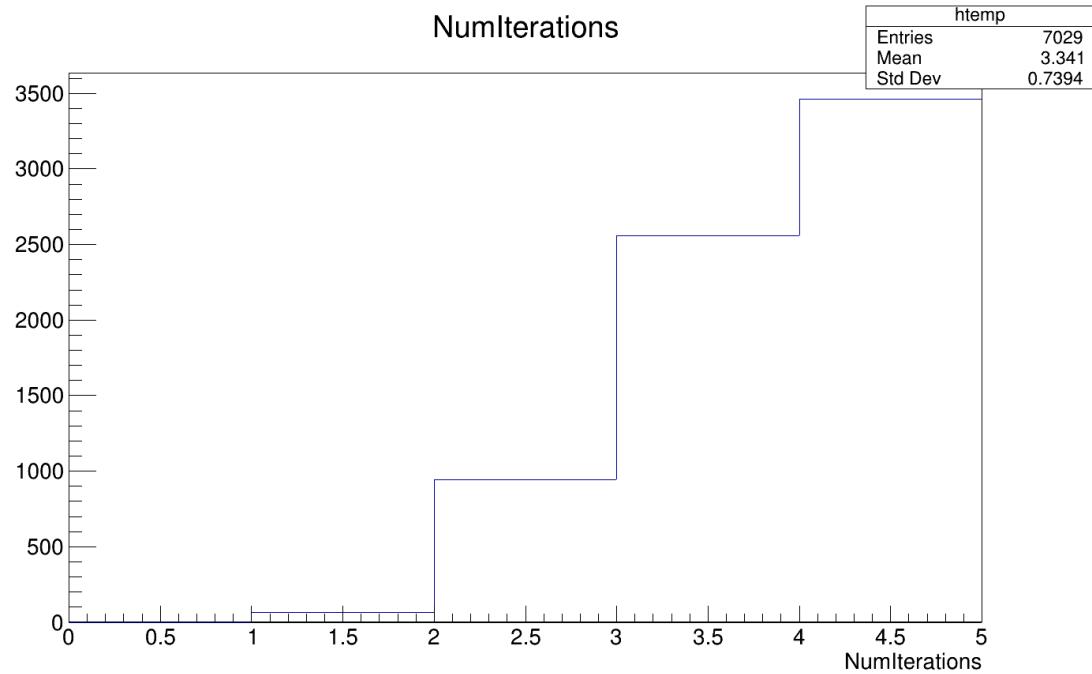1   = fit converged fully   No failed hits

Initial momentum to GenFit2

The fitter has a minimum and maximum number of iterations, which are 2 and 4 by default. As soon as the minimum number of iterations have been done, it is checked if the p-value has changed less than $1 \times 10{-3}$ with respect to the previous iteration. However, tracks with a p-value close to zero are often considered as "converged" with this criterion, while the χ2 , albeit big, is still changing significantly, indicating that the fit is still improving. This occurs often for tracks which are given bad start values. To cure this issue, a non-convergence criterion has been introduced: If the relative change in χ2 from one iteration to the next is bigger than 20 %, the fit will continue.
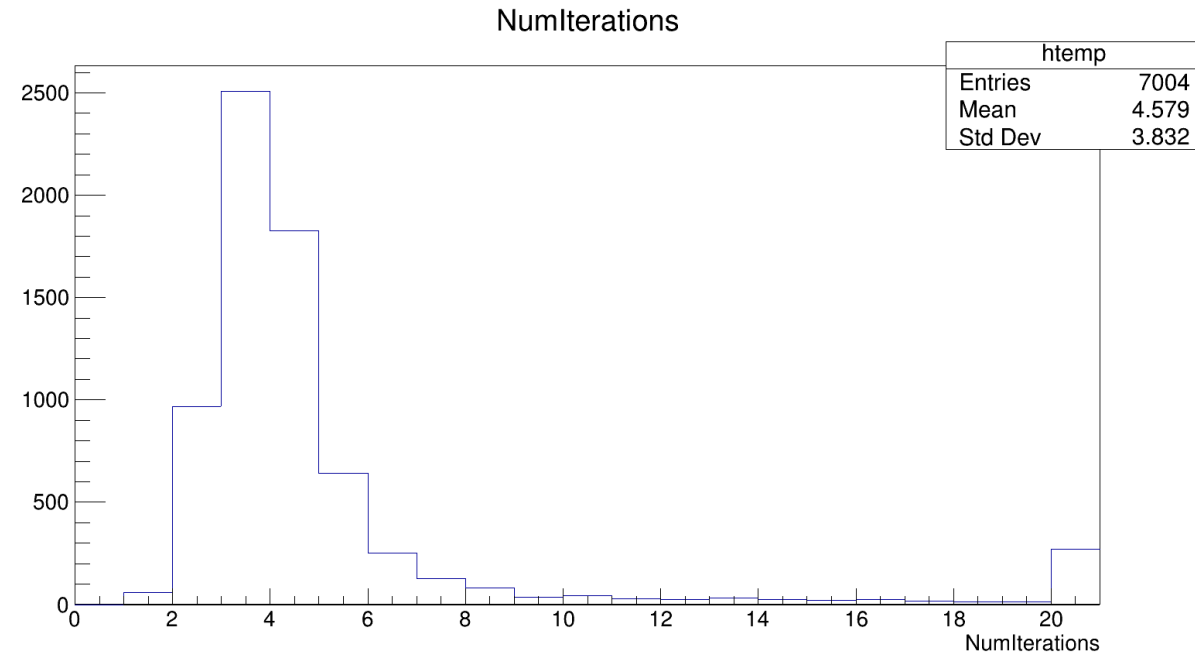The number of iterations and convergence criteria values can be adjusted by the user.

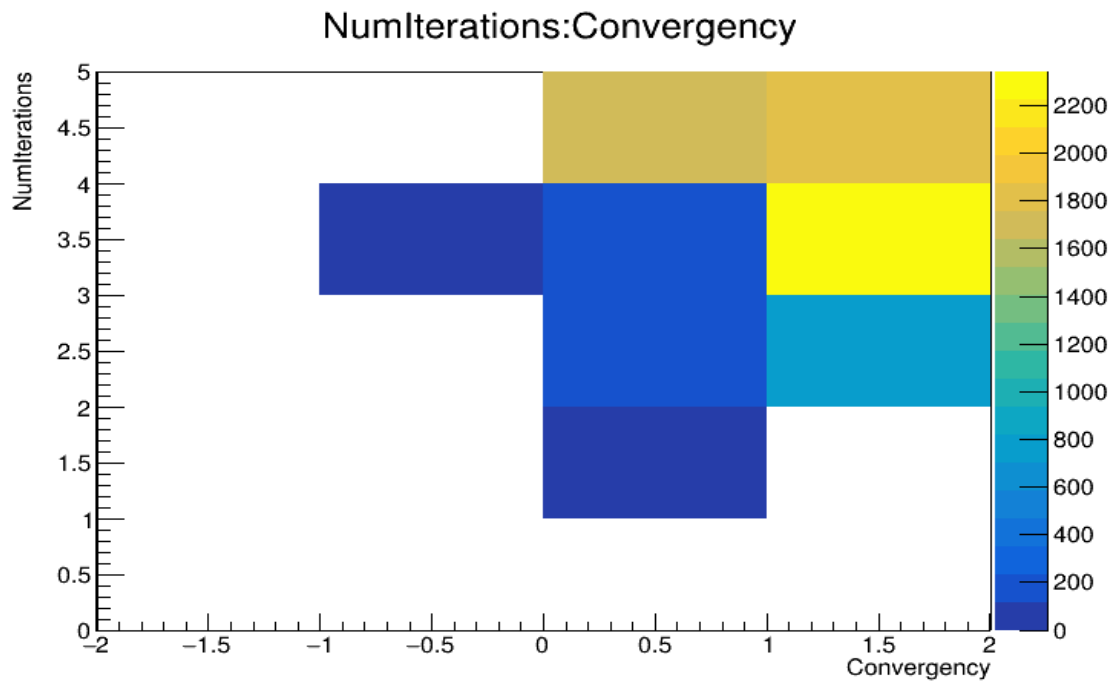2

Number iterations

MinIterations = 1
MaxIterations =4   default

MinIterations = 1
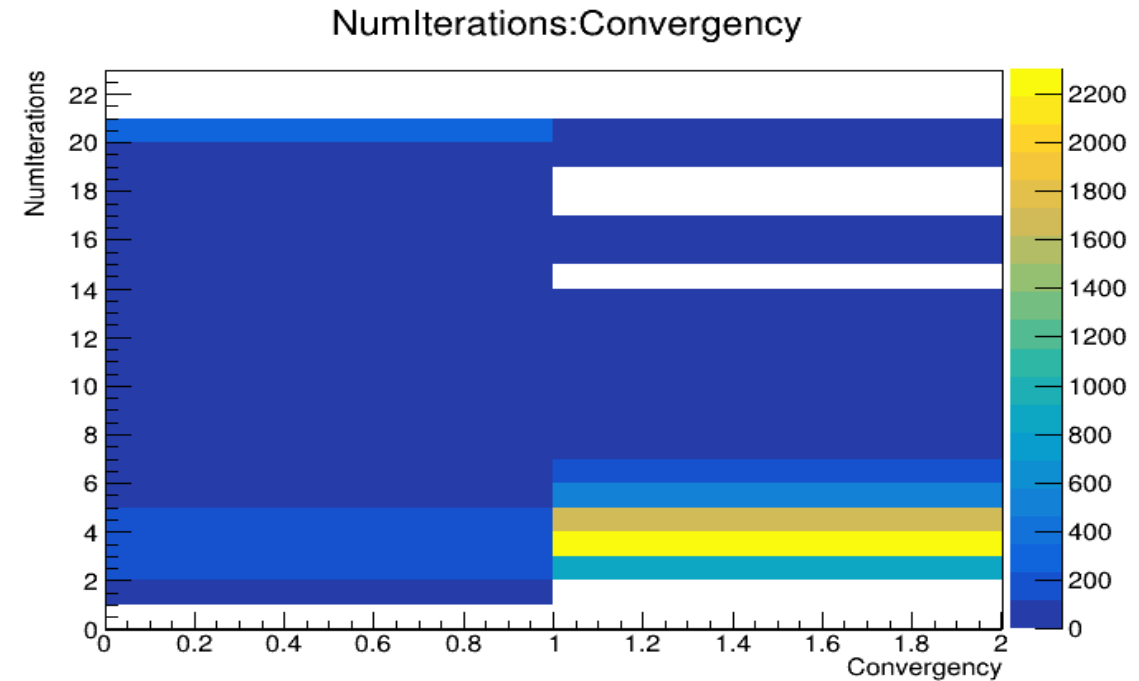MaxIterations =20   extended

NumIterations

htemp	
Entries	7029
Mean	3.341
Std Dev	0.7394

NumIterations

htemp	
Entries	7004
Mean	4.579
Std Dev	3.832

Number iterations *vs* convergence

MinIterations = 1
MaxIterations =4   default
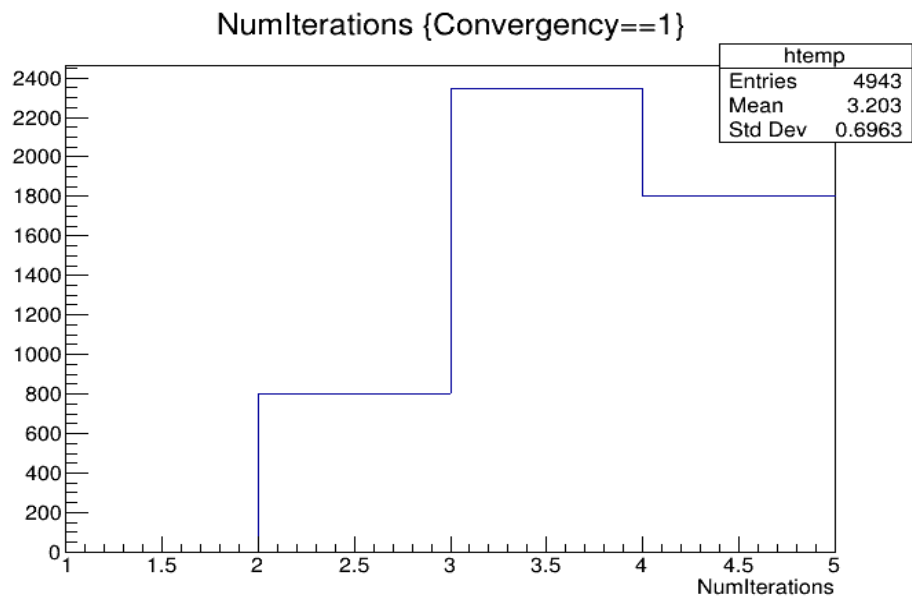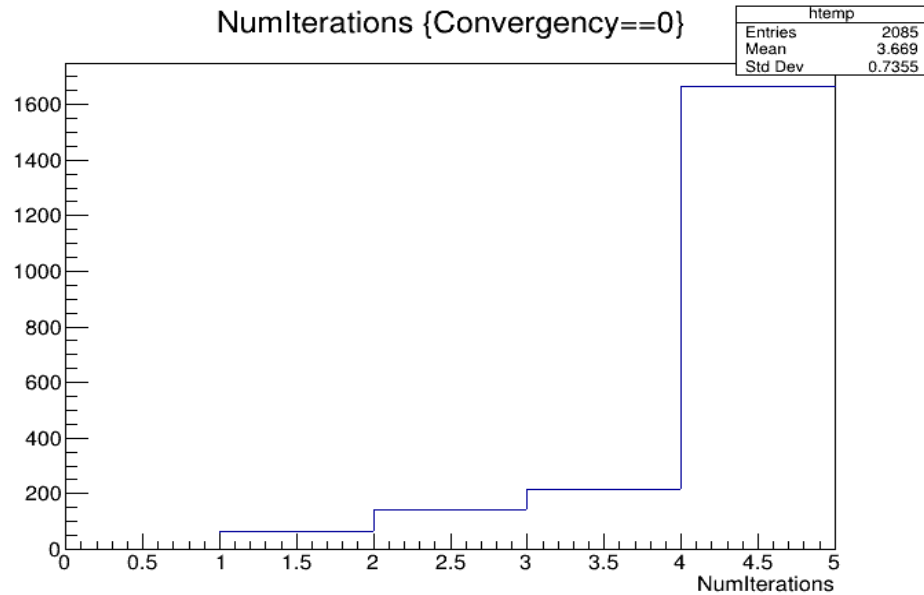
MinIterations = 1
MaxIterations =20   extended

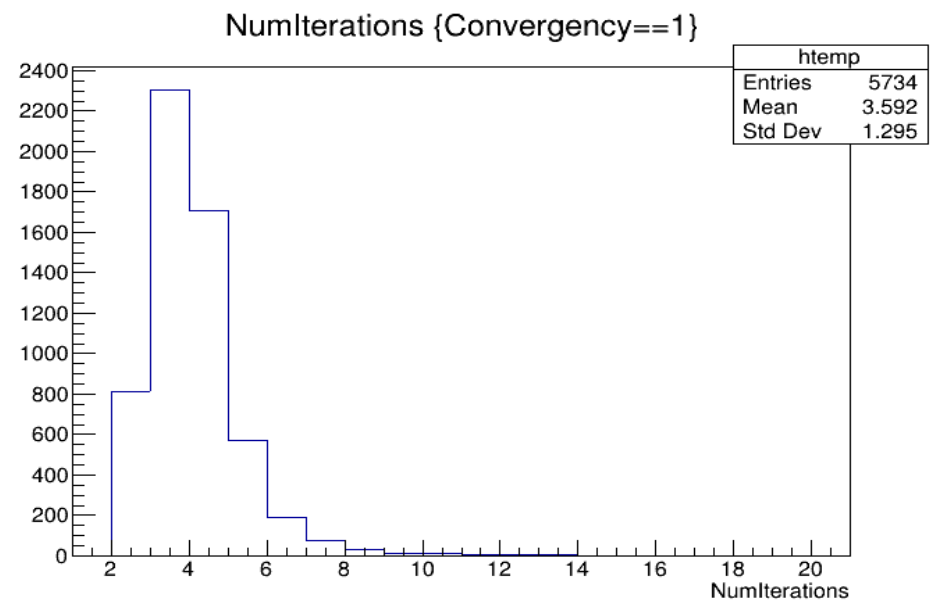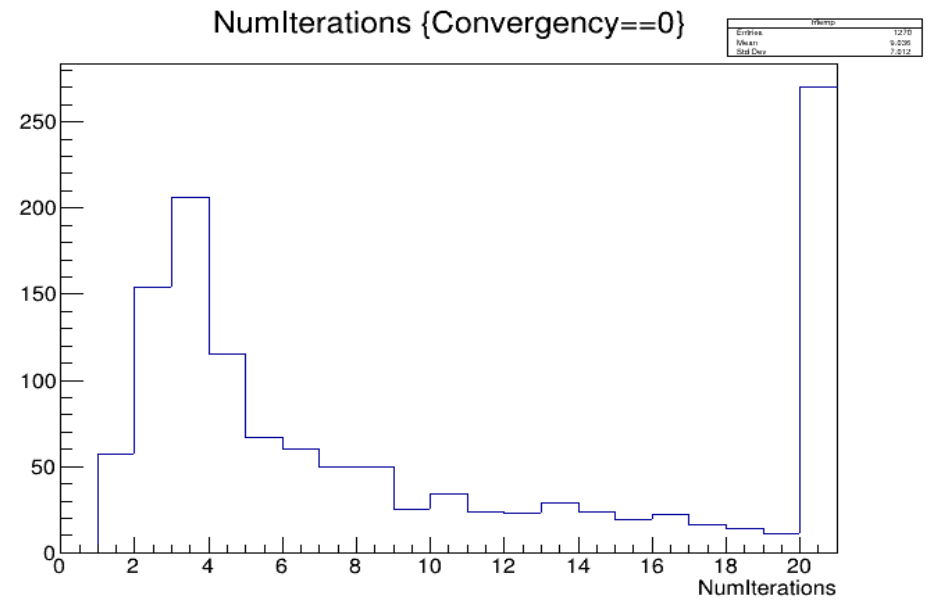Convergency =1: **70%**
Convergency =0: **29%**
Convergency =-1: **1%**

Convergency =1: **81%**
Convergency =0: **19%**
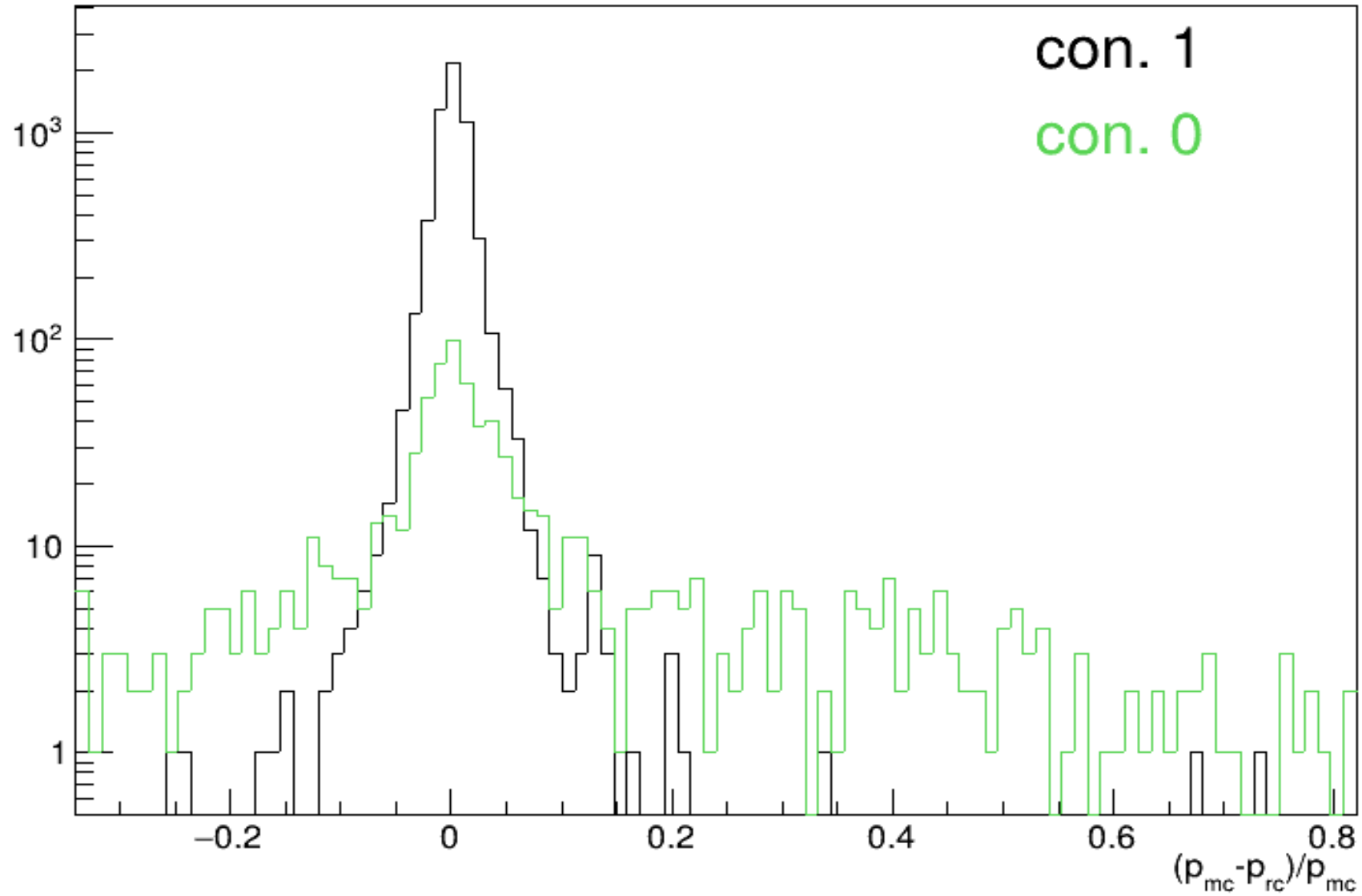
Convergency

MinIterations = 1
MaxIterations =4   default

MinIterations = 1
MaxIterations =20   extended

Resolution

con. 1

con. 0

$(p_{mc}-p_{rc})/p_{mc}$

6

Conclusion

- The relationship between the number of iterations and the parameter convergency was studied

- Using the default settings, minimum (1) and maximum (4) number of iterations we lost 30% tracks

- If maximum number of iterations will increase to 20, we lost 19% tracks