MVA energy correction for unconverted photons (update)

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MVA analysis current status

- Regression analysis (CMS-like) to improve the energy resolution have been implemented for unconverted photons
- Promising results have been observed from preliminary studies having a cut on the true energy
- No improvement on the energy resolution has been observed while removing the cut on the true energy
- Studies for the optimization of the mva methods (BDT, BDTG and MLP) have been performed

To attempt to remove the constraint on the true energy for the regression analysis we use MVA analysis to determine the energy range to which the events belong to.

Once the energy range (bin) is determined, the regression analysis is applied.

MVA Energy bin classification

Unconverted photons (isconv = 0)

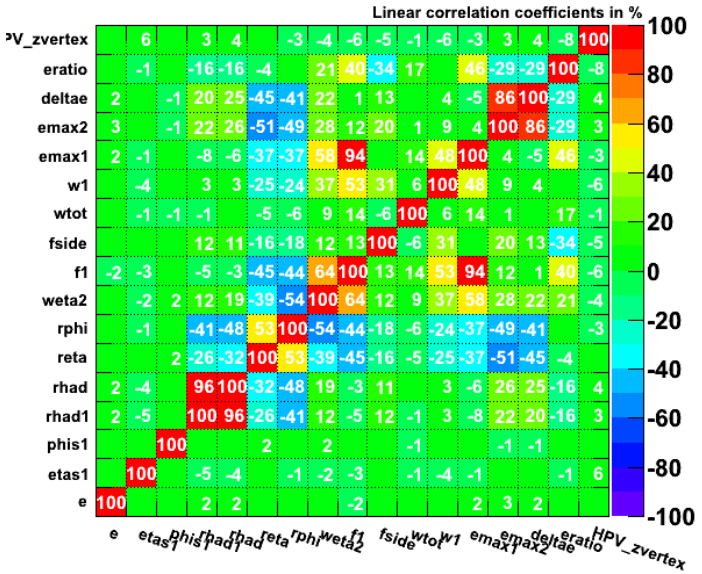
Etas2 [0.3, 0.6]

Signal : events with E = [60,65] GeV

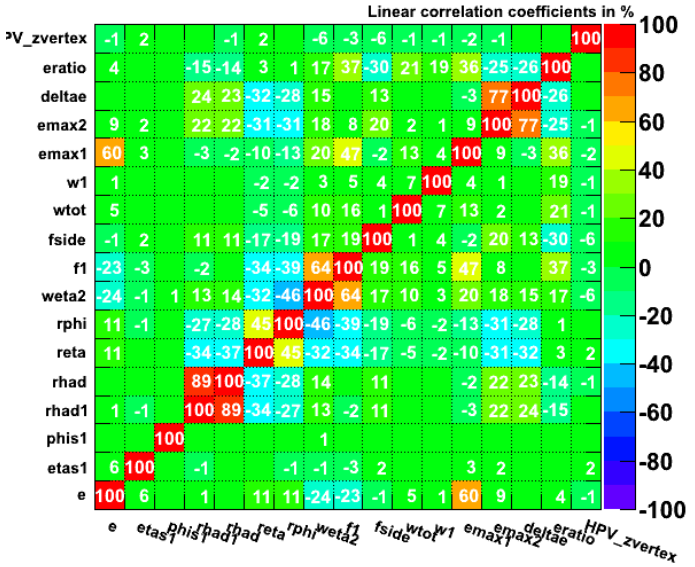
Background : events with E = [20, 60 [&&]65, 150] GeV

Input: shower shape variables

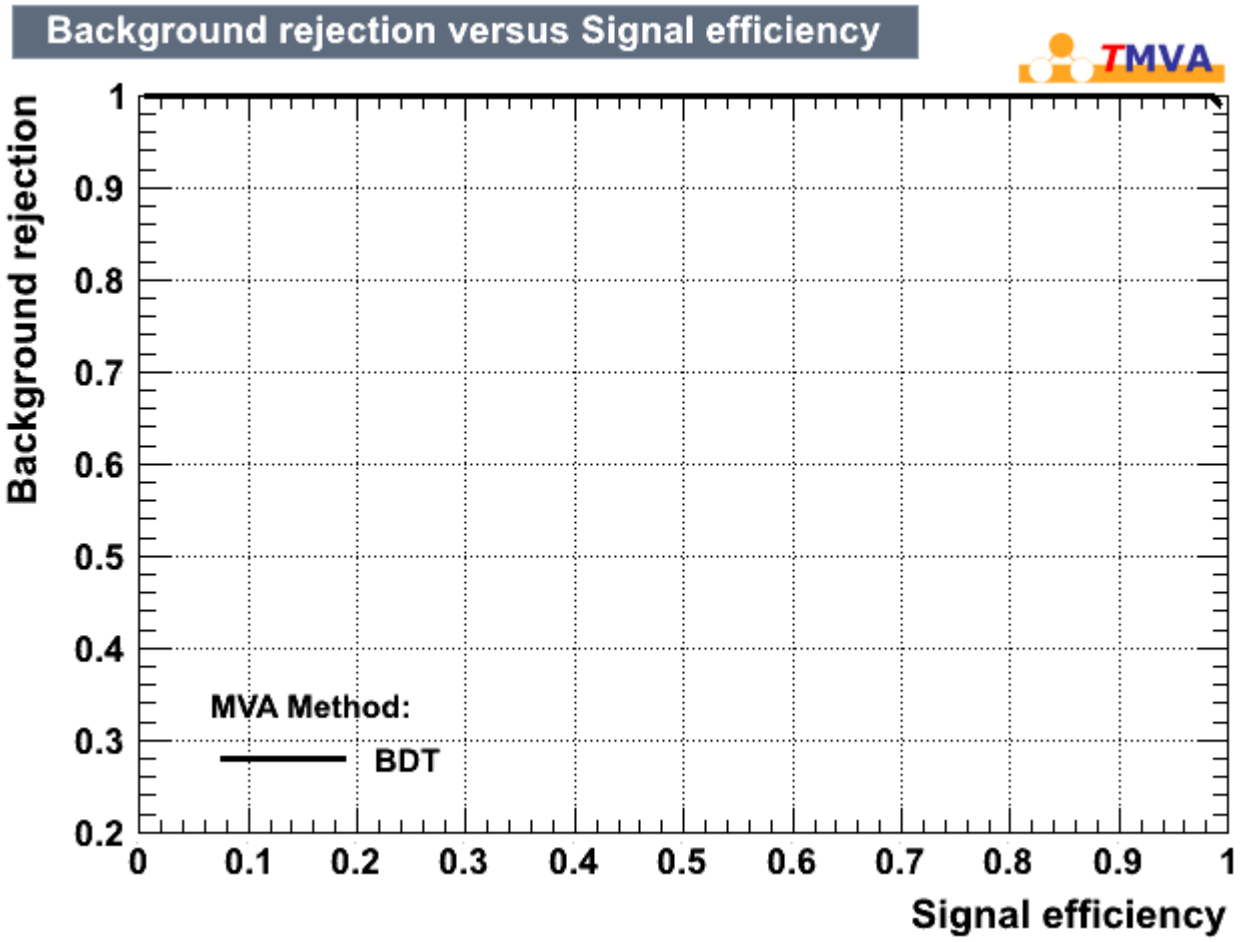
Correlation Matrix (signal)



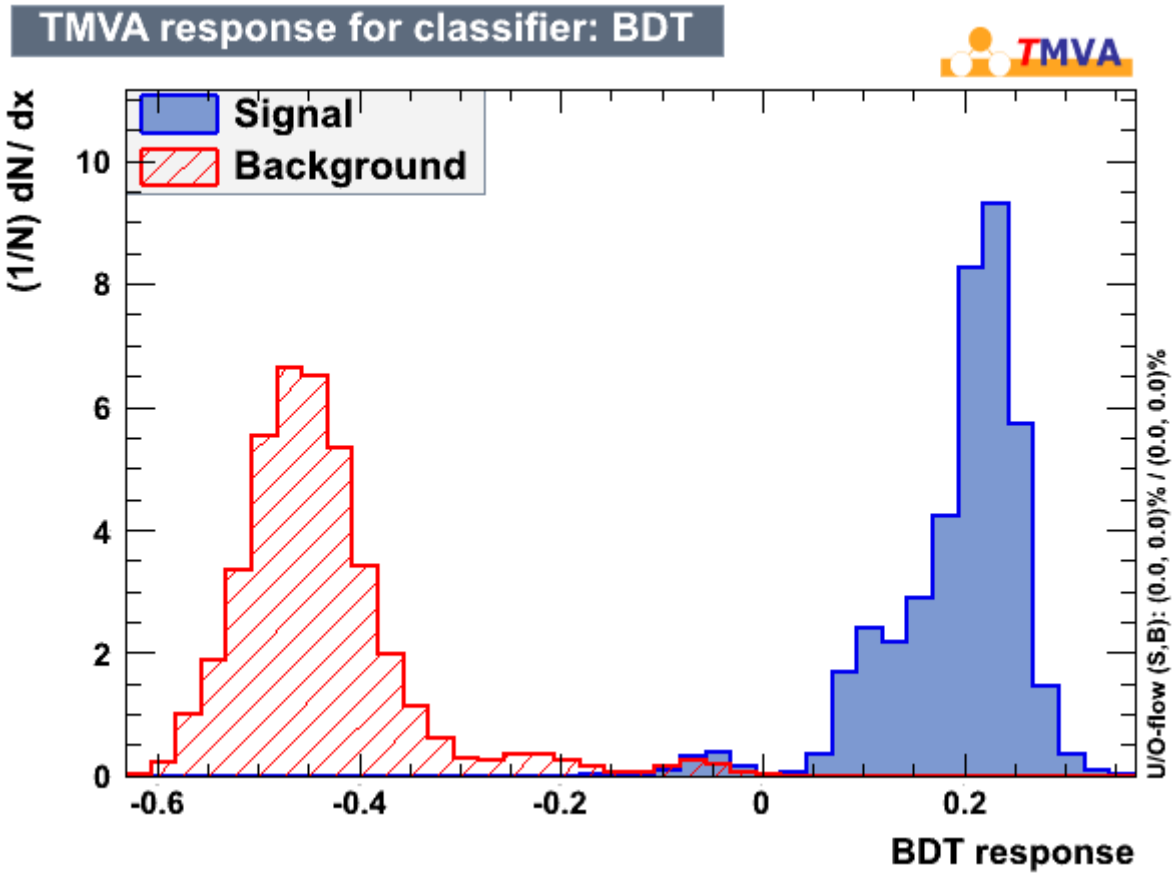
Correlation Matrix (background)



ROC curve

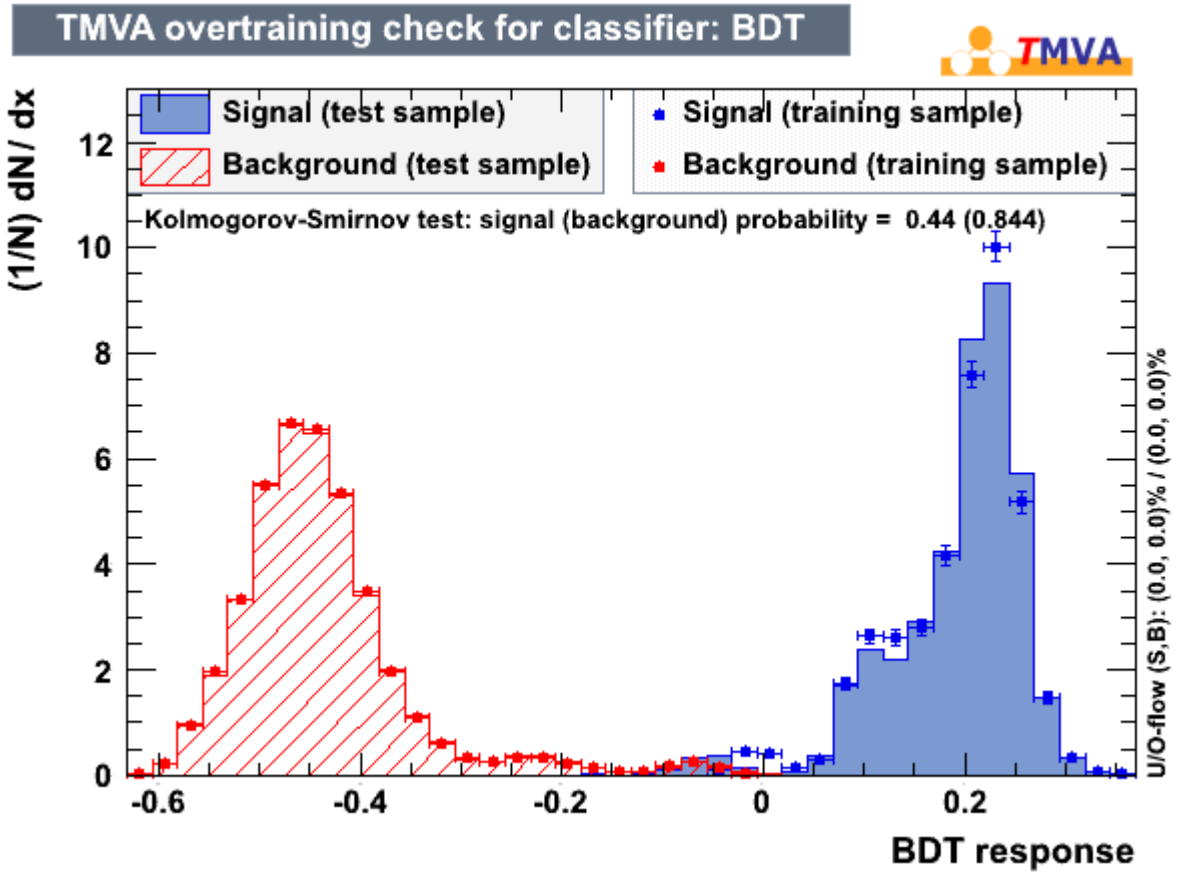

Background rejection versus Signal efficiency
TMVA
Background rejection
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Signal efficiency
MVA Method:
BDT

MVA response: BDT method

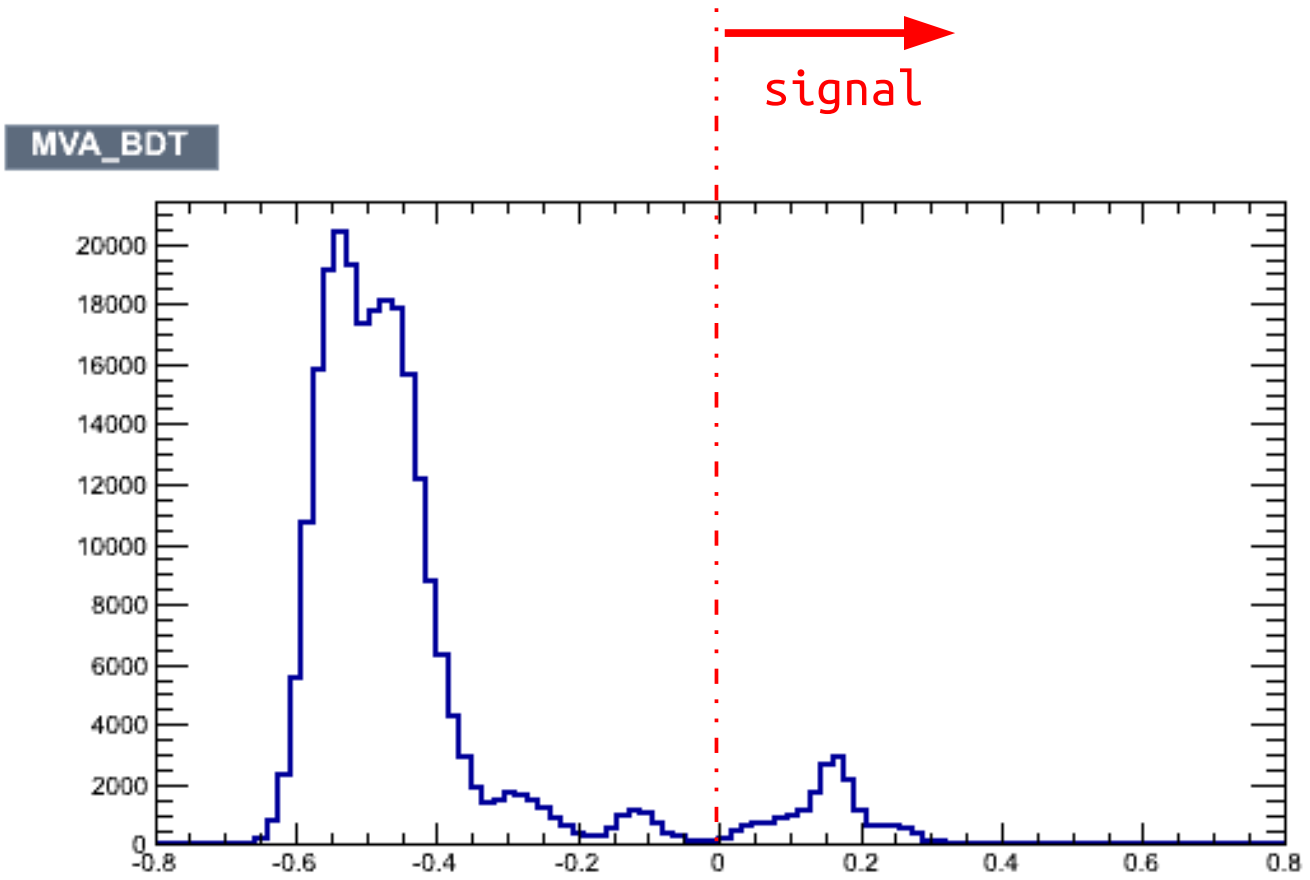


(S): Mean = 0.193699; RMS = 0.066798
(B): Mean = -0.437695; RMS = 0.0866981

Overtraining check

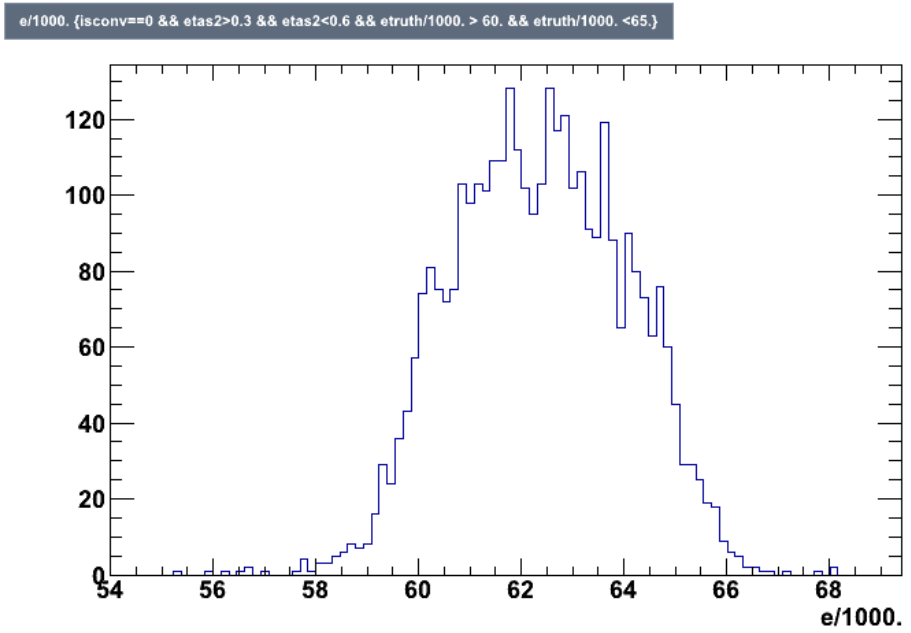


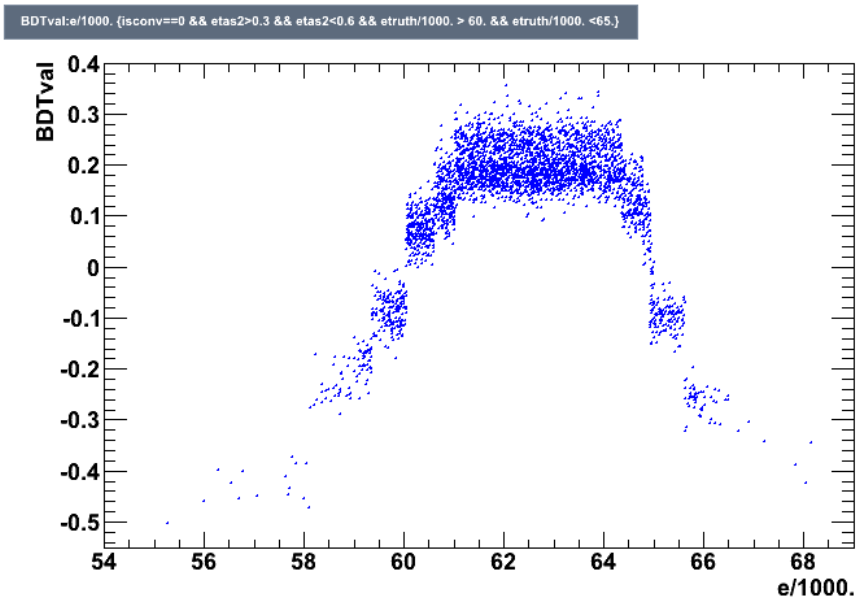
Application



Regression analysis (using MLP)

- Bin definition:
- True energy [60.,65.] GeV
- 0.3 < etas2 < 0.6
- For all unconverted photons belonging to the bin and having a BDT value > (0., 0.1, 0.18) an energy correction is applied





Some results

photons in the bin = 3461

	BDTval = 0	BDTval = 0.1	BDTval = 0.18
# photons corrected	2992 (86.5%)	2655 (76.7%)	1569 (45.3%)
# positive correction	870 (29.1%)	1382 (52.1%)	384 (24.5%)
#negative correction	2122	1268	1185

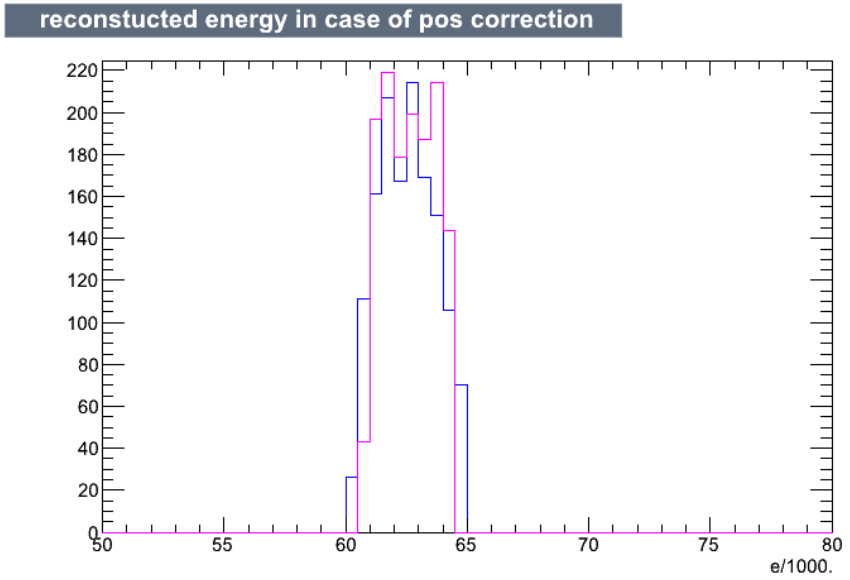
Positive correction:
|e-etruth| > |ecorr - etruth|

Negative correction:
|e-etruth| < |ecorr - etruth|

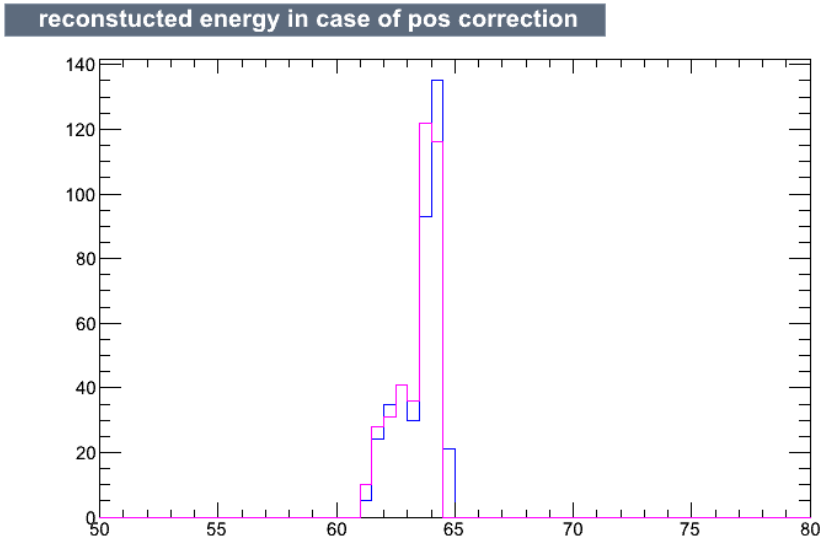
backup

Energy distribution

energy
corrected energy



RMS energy = 1.15
RMS corrected energy = 1.02



RMS energy = 0.86
RMS corrected energy = 0.83