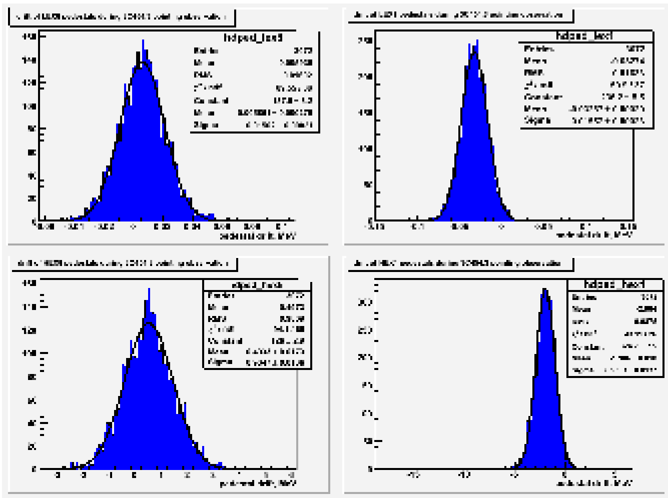
Effect of calorimeter pedestals drift on energy measurement during 3C454.3 TOO

To estimate the effect of calorimeter pedestals drift due to temperature variations during pointing observation I compared pedestals determined from the run 292376780 collected at the end of pointing observation (April 07 23:46 UTC) with initial pedestals from 292158898 collected just before the start of pointing observation (April 05, 11:14 UTC).

Pedestal drift for each calorimeter channel is show on four histograms below, separately for each energy range:



Each calorimeter channel has its own temperature drift coeficient and the values are randomly distributed over the calorimeter volume, so the spread of the pedestal drift on the histograms above contribute to energy measurement error, while the mean value of the histogram give the systematic energy bias.

The most significant contribution to energy measurement error is given by lowest (LEX8) energy range, used to measure crystal energies between 2 MeV and 100 MeV. As the spread of pedestal drift is 0.016 MeV, the upper limit on the contribution to the energy measurement error 0.016/2.0 = 0.8% for each crystal, so for the sum of energies for the crystals with energies below 100 MeV we have 0.8%/sqrt(N_lex8), where N_lex8 number of hit crystals in LEX8 energy range. Upper limit on systematic bias is 0.006 MeV/ 2MeV = 0.3%.

Other energy ranges give much smaller contributions, because they are used to measure higher crystal energy depositions:

- LEX1 range: spread < 0.016 MeV/100 MeV = 0.016%   systematic bias < 0.006 MeV / 100 MeV =0.006%
- HEX8 range: spead < 1 MeV/1000 MeV = 0.1%   systematic bias < 0.5 MeV / 1000 MeV = 0.05%
- HEX1 range: spread < 1 MeV / 7 GeV = 0.016%   systematic bias < 2 MeV / 7 GeV =0.03%

General conclusion: there is no need to correct this pedestal drift.

Other possible problem of pointing observation:

All the photons from the source being observed are arriving at small incident angle (10 degrees in case of recent 3C454.3 TOO) and thus have always small number of CsI radiation lengths: as cos(10 deg) = 0.985, all photons cross 8.6 X0 CsI or 10.1X0 including tracker. This is different from survey mode when significant fraction of photons arrives at incident angles >40 degrees and thus cross >13X0 including tracker. This could affect the reconstruction efficiency for photons above 10 GeV. May be for 3C454.3 it is not a big problem, but if in future we'll do the pointinmg observations of sources with hard spectrum, emmitting photons above 10 GeV, it would be better to use higher incident angles for the source being observed - I'm pretty sure significant fraction of 100 GeV photons will be lost at 10 degrees incident angle, because shower maximum will not be contained.