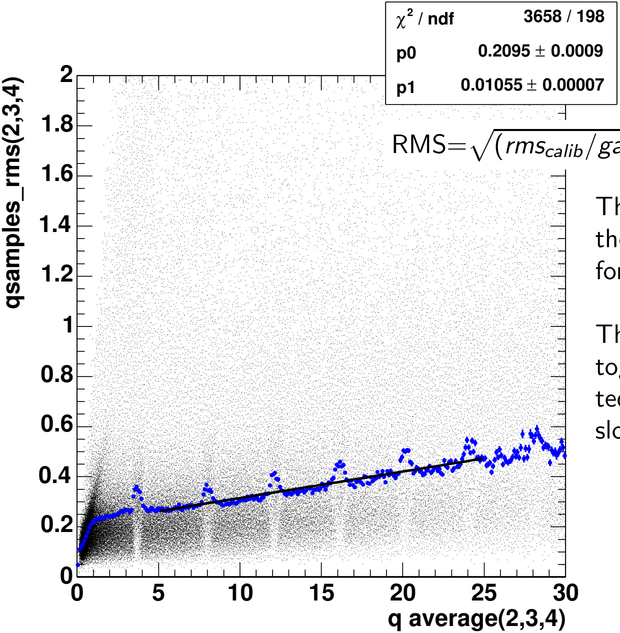
Error on the charge distribution

Hugo Pereira and Catherine Silvestre
Saclay

June 22, 2007

Outline

RMS sample vs charge Real Data

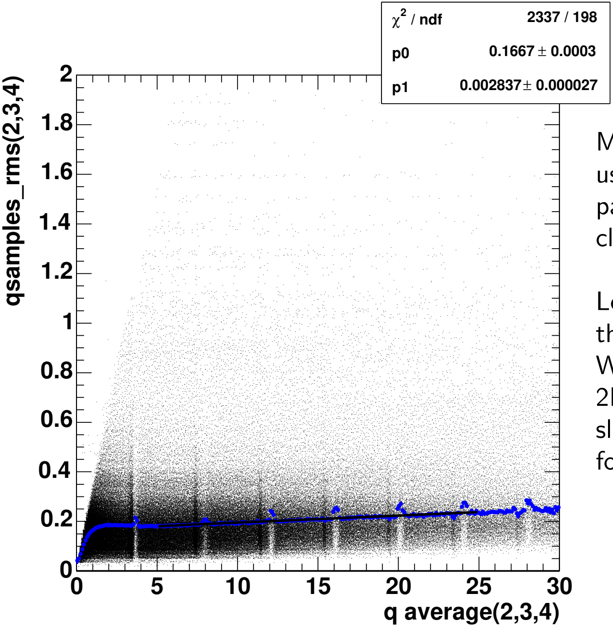


$$\text{RMS}=\sqrt{(rms_{calib}/gain_{calib})^2 + qsamples\_rms^2}$$

There is a big dispertion of the error for a given charge for Real Data.

The profile of the 2D histogram in bins of x can be fitted linearly for $q > 3$, with a slope of 0.012.

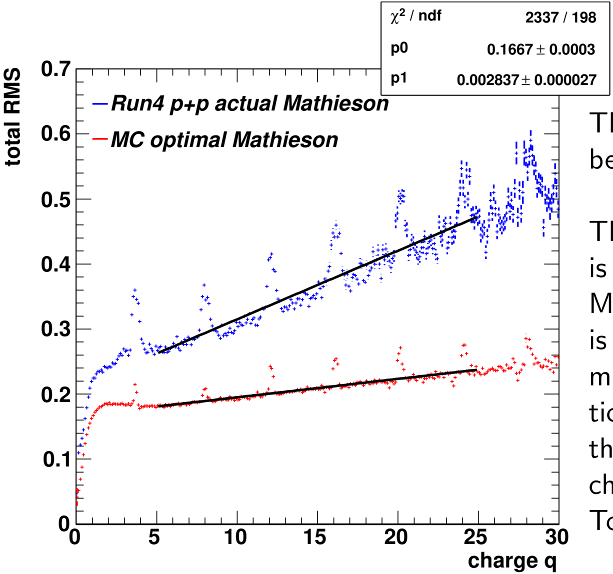
RMS sample vs charge MC new mathieson



MC jpsi were reconstructed using the optimal Mathieson parameters for a match of the cluster size vs q.

Less dispertion of the error than for RD.
We fit the TPofile of the 2D distribution linearly. The slope is 10 times smaller than for RD: 0.003.

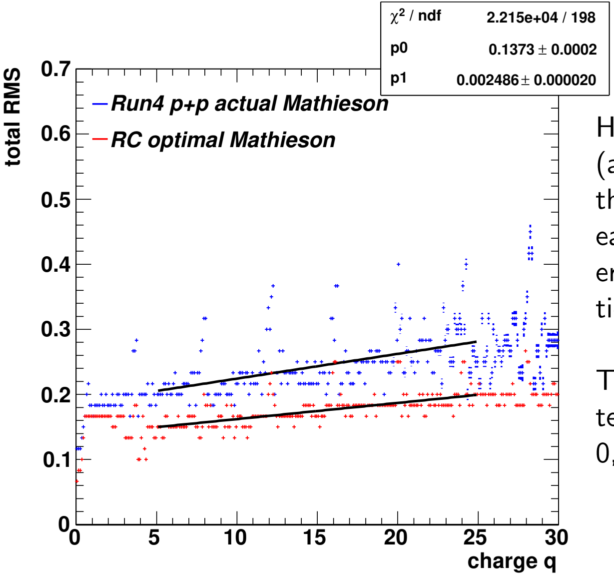
RMS sample vs charge [RD vs MC]



The slopes are different between RD and MC.

The additional noise on MC is not represented in the MC errors shown here. It is charge independent and may lead to an overestimation (or underestimation) of the error for small (or big) charges.
To be confirmed.

RMS sample vs charge: fitting the projection



Here, we fit the **maximum** (as opposed to mean) of the RMS distribution in each bin in x.

error = error on the position of the peak.

The slopes agree a lot better: 0.0038 for RD and 0,0025 for MC.

Discussion [1/2]

The dispertion of the error for a given charge has various contributions:

- The contribution of the calibration that varies from one strip to another. It is the same for MC and RD.
- The contribution from the signals drift time (compared to the measured time). Should be identical for MC and RD.
- The contribution from intrinsic noise, uncorrelated beetween samples that could appear in RD but is not take into account in MC.

The third contribution could be the reason for the difference between MC and RD.

Today we don't account for the large dispersion of the samples RMS.

Discussion [2/2]

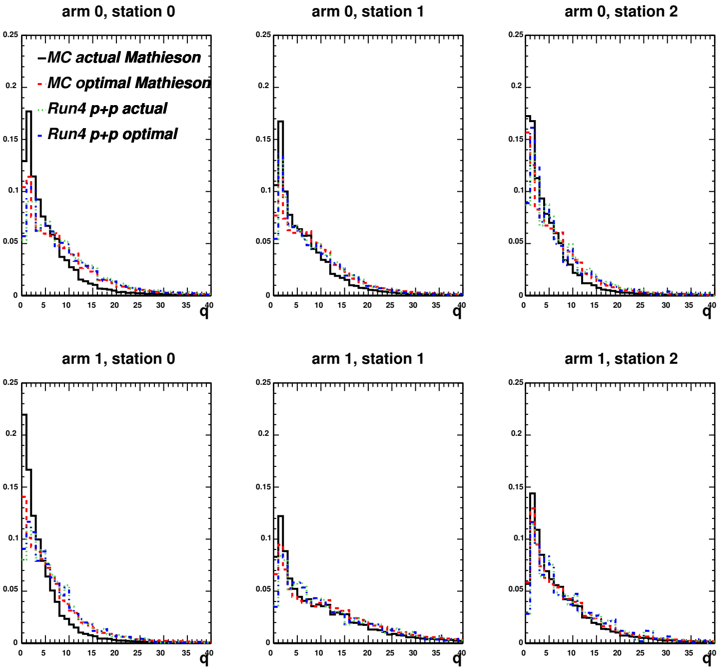
Open questions:

- The charge dependence of the error is dominated by the natural effect of the signal amplitude and drift time, and not by a charge dependent noise. Should we add an additional noise that would fluctuates between samples as the dispertion of the RMS instead of an independant common noise ?
- To assign an error on the charges, should we use the calculated RMS between the samples (as done now) ? Or the mean value of the RMS distribution (slide 3) ? Or the maximum of the distribution (the value of maximum probability, as on slide 6) ?

To do:

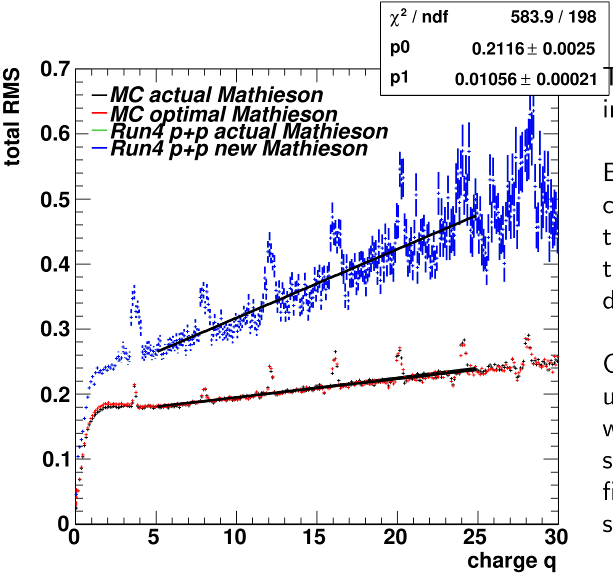
- Look at $w_{true} - w_{fit}$ vs w_{true} as done by Jamie using new Mathieson parameters.
- Look at run 7 not zero-suppressed data.
- Try to implement the use of the maximum of the RMS distribution as error on the charge.

Charge distribution



Better agreement of the charge distribution for RD and for MC when using the optimal Mathieson parameters.

Backup: RMS vs charge comparing RD vs MC, old vs new mathieson parameters



The distributions are superimposed for RD as for MC.

Even if the distribution of charge vs strip changes with the Mathieson parameters, the error for a given charge does not change.

Comment: this plot was done using recently made evalutors which happens to have less statistics than what is on the first part of this talk, for a reason not yet understood.