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Offline calibration procedure of the CMS Drift Tube detectors

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of the drift velocity, as demonstrated by eq. (4.4), therefore higher accuracy can only be achieved using a procedure for fine tuning of the time pedestal which is independent of the drift velocity.

An alternative approach consists in using the different dependences on $t_{\rm trig}$ mis-calibration of the various meantimer formulas to calibrate the pedestal. The differences among the values of $T_{\rm max}$ computed using different formulas can be used to measure the value of the mis-calibration Δt once the dependence of the meantimer on the track impact angle is well understood. This would allow $t_{\rm trig}$ to be tuned without relying on the residual distribution and therefore without depending on the calibration precision of the drift velocity. This alternative approach will be investigated in the future.

5 Conclusions

The calibration task is fundamental to the DT hit reconstruction: the knowledge of the time pedestal is an unavoidable prerequisite for the computation of the drift distance, while the calibration of the average drift velocity determines the accuracy of the reconstruction.

For this reason, a robust calibration procedure has been developed to satisfy the requirements imposed by all possible running conditions: dedicated cosmic runs, test beams, and pp-collision data.

The calibration algorithms described in the present document have been tested both on simulated and real data acquired during the 2004 test beam, the 2006 Magnet Test and Cosmic Challenge [9, 10] and the commissioning with cosmics.

Using the tools developed for the calibration and synchronization procedure we also studied the effect of possible mis-calibration of the pedestals and of the drift velocity on the muon track fit and thus eventually on higher level reconstructed quantities. We analyze these systematic uncertainties in the study of the physics reach of the experiment [11].

Further optimization is still possible. In particular, the accuracy of the current procedure is limited by the interdependence of the time pedestal and the drift velocity used in the reconstruction. Other methods for fine tuning of $t_{\rm trig}$ are under study; a procedure based on the usage of different meantimer formulas to estimate the best value of the time pedestal is the most promising.

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