

Charge collection in the Silicon Drift Detectors of the ALICE experiment

B. Alessandro, R. Bala, G. Batigne, S. Beole', E. Biolcati, P. Cerello, S. Coli, Y. Corrales Morales, E. Crescio, P. De Remigis, D. Falchieri, G. Giraudo, P. Giubellino, R. Lea, A. Marzari Chiesa, M. Maserà, G. Mazza, G. Ortona, F. Prino, L. Ramello, A. Rashevsky, L. Riccati, A. Rivetti, S. Senyukov, M. Siciliano, M. Sitta, M. Subieta, L. Toscano, F. Tosello

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A detailed study of charge collection efficiency has been performed on the Silicon Drift Detectors (SDD) of the ALICE experiment. Three different methods to study the collected charge as a function of the drift time have been implemented. The first approach consists in measuring the charge at different injection distances moving an infrared laser by means of micrometric step motors. The second method is based on the measurement of the charge injected by the laser at fixed drift distance and varying the drift field, thus changing the drift time. In the last method, the measurement of the charge deposited by atmospheric muons is used to study the charge collection efficiency as a function of the drift time. The three methods gave consistent results and indicated that no charge loss during the drift is observed for the sensor types used in 99% of the SDD modules mounted on the ALICE Inner Tracking System. The atmospheric muons have also been used to test the effect of the zero-suppression applied to reduce the data size by erasing the counts in cells not passing the thresholds for noise removal. As expected, the zero suppression introduces a dependence of the reconstructed charge as a function of drift time because it cuts the signal in the tails of the electron clouds enlarged by diffusion effects. These measurements allowed also to validate the correction for this effect extracted from detailed Monte Carlo simulations of the detector response and applied in the offline data reconstruction.

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