Memorandum

Study on synchronous noise on DT chambers

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The preparation of the DT chambers commissioning at SX5 was done in Legnaro. The basic idea was the performance of a test in autotrigger mode using cosmic rays. While performing these tests in several situations na anomaly was noticed on the drift time distribution, shown in Figure 1. Apart from the well-known problem of the 25 ns oscillation, this distribution shows a bump around 250 TDC units.

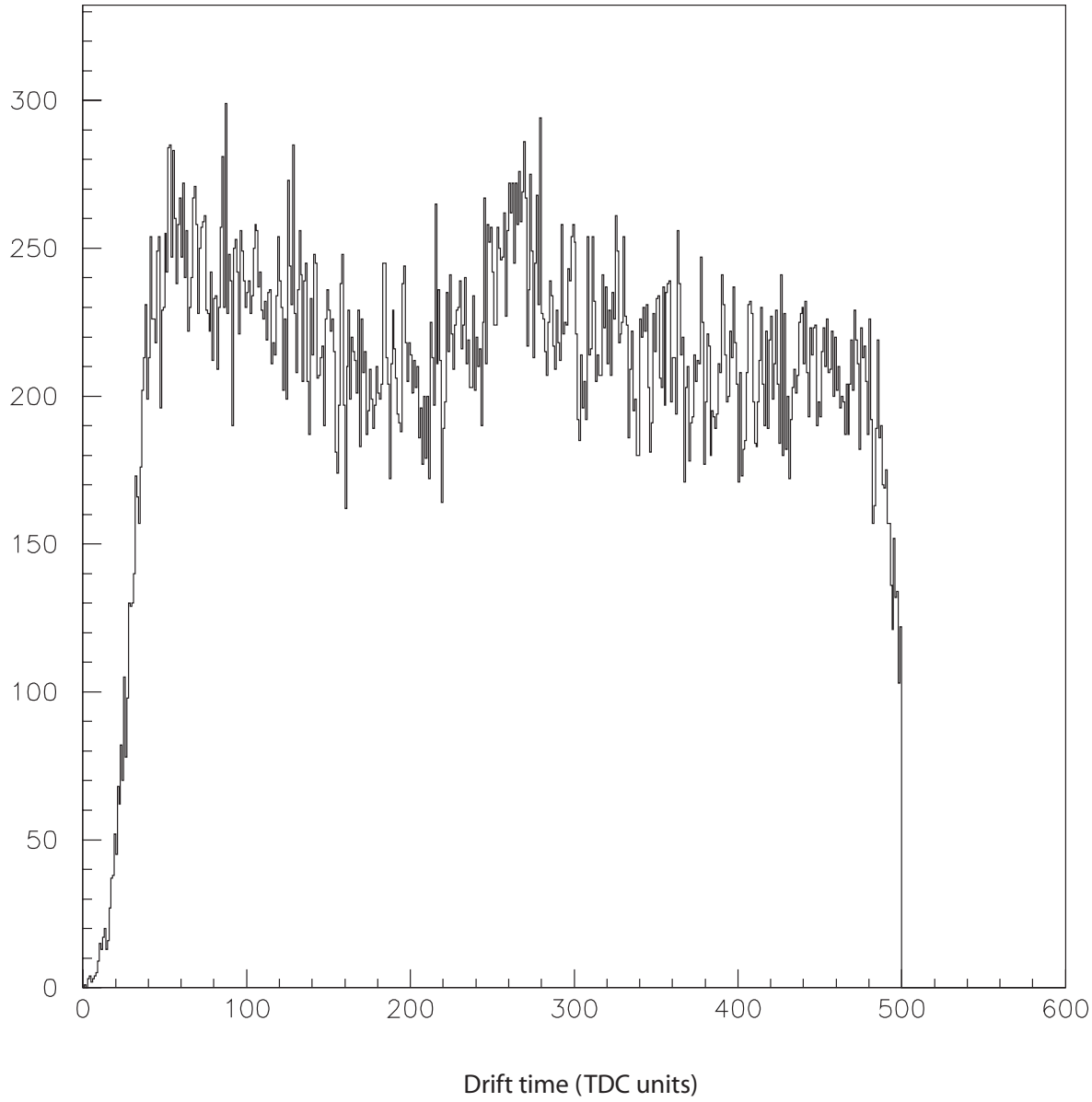

Figure 1- Drift time distribution for cosmics on a MB3 chamber at LNL with the minicrate setup in default configutration,The distribution refers only to layer 1 of SL 1. No difference is observed on the other layers.

The default configuration is requiring correlated trigges or uncorrelated HTRGs and therefore this bump is associated to triggers originated from drift times corresponding to the cell centre. Since the cosmic rays are asynchronous there is a drift time uncertainty of about 25 ns on the t_0 determination and therefore the peak is much larger than the drift time resolution. If the interpretation is correct this excess of events can be enhanced requiring that the trigger direction is normal to the chamber, i.e. that the cosmic ray is vertical in the LNL setup. This is indeed the case, since imposing this constraint in the minicrate configuration (the trigger granularity allows a window of about 4º) we get the distribution shown in Figure 2.

In both configurations the measurements are consistent with a noise rate of the order of 10 Hz, thus supporting the identification of this triggers as associated to vertical tracks (of course inexistent) at cell center.

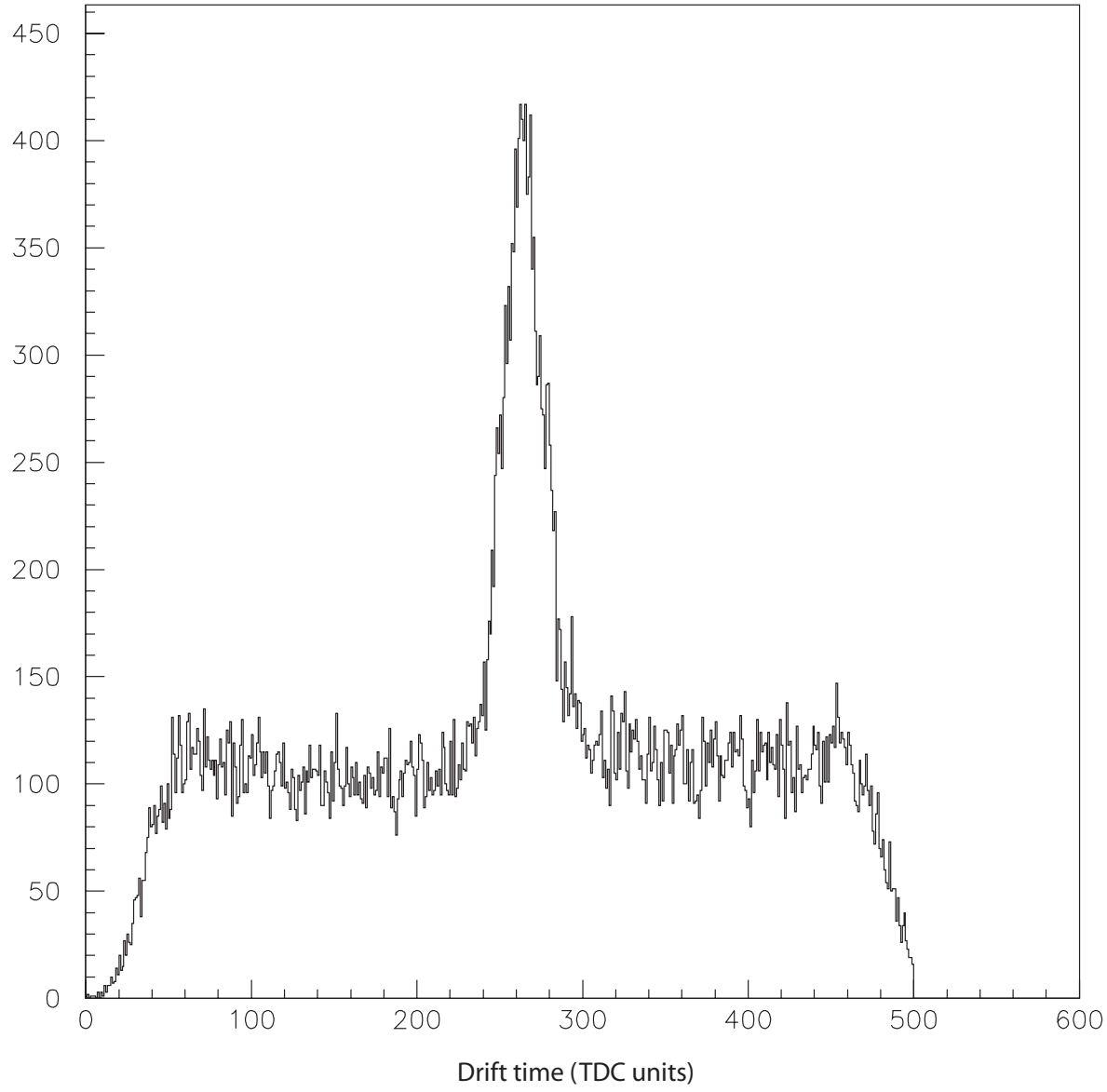

Figure 2- Drift-time distribution for vertical cosmics. Conditions and selections as in Figure 1

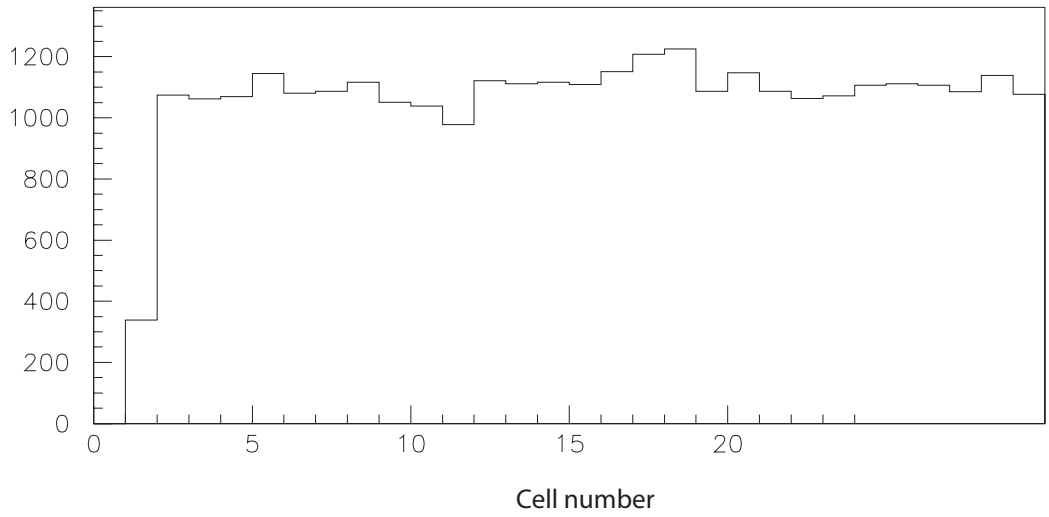

Figure 3- Occupancy of the first half of the layer 2 of SL 2 for verical cosmic. The second half is not shown since HV was disconnected.

Investigations were needed in order to understand the origin of the phaenomenon. The most quoted option is the existence of a signal pick-up somewhere on the cables or through the power supplies. This interpration in fact explains why the bump was not observed in the data triggered with an external source, since the drift times were scattered around in time, being not associated with real cosmic rays. In fact an accurate analysis of the data taken with scintillator trigger showed that this problem was existing, but rather difficult to see. The obvious intervention is the setup of filters on the different signal lines. We have tried filtering the HV lines and the threshold lines, but no benifit was achieved.

Other investigations were done modifying the threshold and the HV of the chambers. We measure a reduction of the false triggers fraction when increasing the threshold or decreasing the HV on the wire. This supports the alternative interpretation that the triggers may have an origin related to wire amplification like static discharges somewhere in the chamber. Anyway the noise is distributed all over the chamber since no particular hot point is found in the occupancy plot (Figure 3).

Other checks gave negative results too.

Further investigations are still in progress.