ABSTRACT

The measurement of the time arrival of the particles at the layers is a crucial part of this study. The timing signals from the different layers take different paths although the electronic circuitries are similar. Hence a calibration of the timing signals is necessary to compensate any such systematic errors.

The calibration set-up is shown in the block diagram above. Since the effective contribution to the time delays come mainly from the electronics succeeding the pre-amplification stage, all calibration signals are input to the Analog Front-End (AFE) stage of the signal processing.

Signals from the fan-out of a pulse generator are sent simultaneously to (a) the lower most layer RPC₀, (b) the layer to be calibrated RPCₙ, and (c) the TDC trigger input.

To reduce the systematics due to the Pulse Generator, the fan-out channels are swapped and the measurement, repeated. The difference between the two measurements yields the corrected time difference relative to RPC₀.

\[ \Delta t_{corr} = \frac{(\Delta t + \Delta t_{swap})}{2} \]

The plot shows the relative time-differences for the different layers taken over a period of time. These data were used to correct the timing data.

The relative velocity (β) distribution of the cosmic muons are plotted above. The plot in the logarithmic scale reveals the presence of a considerable amount of outliers (especially β > 1) indicating a possible unknown source of errors in our measurements. Although the results reveal a higher positive to negative event ratio, as expected, further studies need to be made and are currently in progress to address this anomaly.