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Amplitude Walk in Fast Timing: The Role of Dual Thresholds

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In preparation for HL-LHC operation, a number of new detector systems are being constructed with timing precision on physics objects of ≤50 picoseconds. These time stamps will reduce the level of pileup induced backgrounds as the number of interactions per crossing will reach of order 100-200.

In this report we note that this high pileup level will necessitate a new approach to calibration of these large timing arrays (typically with several ×105 channels) since a single t0 reference is hard to come by in regular data taking.

We demonstrate that enhancing the usual pair of timing ASIC data (ie threshold time and amplitude or time-over-threshold) with a 2nd threshold time greatly simplifies the analysis of amplitude walk. Since slope at threshold is directly relevant for amplitude walk, day-1 walk calibration can often have an analytical solution.

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