

On a Lossless Compression of an ATLAS Tile Calorimeter Drawer Raw Data.

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At this moment, at 100 KHz frequency, in the Tile Calorimeter ROD DSP using Optimal Filtering Reconstruction method Amplitude, Time and Quality Factor (QF) parameters are calculated. If QF is good enough only Amplitude, Time and QF are stored, otherwise the data quality is considered bad and it is proposed to store raw data for further studies. Without any compression, bandwidth limitation allows to send up to 9 channels of additional raw data.

Simple considerations show that when QF is bad due to the shape differences between standard pulse shape and current signal, all channels are likely to have bad QF. So, the possibility to send just 9 samples is insufficient.

Experiments show that standard compression tools such as RAR cannot successfully deal with this problem because they cannot take benefit of smooth curved shape of the raw data and correlations between channels. A lossless data compressing algorithm is proposed which is likely to better meet existing challenges. This method was checked on SPLASH events (run 87851, contains 26 SPLASH events) and proved to be sufficient to save ALL channels data using the existing bandwidth. Unlike the common purpose compressing tools the proposed method exploits heavily the geometry-depended correlations between different channels. On the other hand, it does not require exact information about the pulse shape function to compress the data. So this method can be tried used for recording either bad or piled up signal.

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