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Optimal Filtering on ARM for ATLAS Tile Calorimeter Front-End Processing

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Modern Big Science projects such as the Large Hadron Collider at CERN generate enormous amounts of raw data which presents a serious computing challenge. After planned upgrades in 2022, the data output from the ATLAS Tile Calorimeter will increase by 200 times to over 40 Tb/s! Advanced and characteristically expensive Digital Signal Processors (DSPs) and Field Programmable Gate Arrays (FPGAs) are currently used to process this quantity of data.

It is proposed that a cost-effective, high data throughput Processing Unit (PU) can be developed by using several ARM processors in a cluster configuration to allow aggregated processing performance and data throughput while maintaining minimal software design difficulty for the end-user. ARM is a cost effective and energy efficient alternative CPU architecture to the long established x86 architecture.

This PU could be used for a variety of high-level algorithms on the high data throughput raw data. An Optimal Filtering algorithm has been implemented in C++ and several ARM platforms have been tested. Optimal Filtering is currently used in the ATLAS Tile Calorimeter front-end for basic energy reconstruction and is currently implemented on DSPs.

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