The LHCb Level 1 Vertex Trigger

The L1 vertex group of LHCb

Abstract

The Level 1 Vertex trigger of LHCb has certain features that make it unique amongst the LHC experiment trigger schemes:

The problem it addresses is a reduction factor of 25 for minimum bias events while retaining good efficiency for signal B events. The best way to achieve such reduction factors is to rely on the most striking property of those B events, the long decay time of the B particles. The trigger therefore has to reconstruct the event around the interaction region and tag signal events using topological criteria. An accurate vertex detector is one of the key components of LHCb and a natural choice for providing the data for such a triggering scheme.

The algorithm for the reconstruction of the event is complicated and not readily parallelisable in its totality. We are therefore proposing an architecture that resembles a high-level trigger architecture, where the event building function is performed by a switch network and each event is processed by a single processor, part of a processor farm. The total data size is about 3Kbytes per event, making the total sustainable throughput of the switch network 3GBytes/sec. The repetition rate, and the big challenge in this project, is 1MHz.

The way we are proposing to tackle the problem will be presented, together with some feasibility study results.