

High Granularity Timing Detector: an application of Ultra-Fast Silicon Detectors

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Abstract

The high luminosity LHC will offer a wide spectrum of physics opportunities. However the proposed detectors will have to overcome harsh experimental conditions such as the unprecedented level of background from about 200 proton-proton collision events per bunch crossing (pileup). One of the main challenges will be disentangling hard-scatter events from those produced by soft interactions, especially in the endcap calorimeters at rapidities between 2.5 and 4. ATLAS is investigating the use of the timing capabilities of Ultra-Fast Silicon Detectors (UFSD) in the High-Granularity Timing Detector (HGTD) to reduce the background from pileup interactions by a factor 10. The HGTD layout will be presented together with a discussion of design and measured performance of the UFSD and their challenges, such as a novel interconnect concept using conductive glue between sensor and readout ASIC, radiation levels, readout ASIC, power consumption, and cooling.