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Modern 3D-Detectors

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In historic perspective 3D-detectors have greatly advanced particle physics: cloud and bubble chambers, emulsion chambers, spark and streamer chambers have either led to Nobel Prize-worthy discoveries, or their invention itself was rewarded by a Nobel Prize. However, these detectors are read out visually and are thus notoriously slow. In this respect the invention of multi-wire proportional-chambers was a breakthrough (also rewarded by a Nobel Prize) and their offspring, e.g. drift and time-expansion chambers had further advanced particle science. However, modern experiments require 3D-detectors capable of taking data at unprecedented rates. This, in turn, evokes a further paradigm change in detectors technology: high performance front end computing becomes an integral part of the detector. We will present two examples of very modern, in fact, not yet existing 3D-detectors: the proposed upgrade of the ALICE TPC and the CBM Silicon Tracking System. Both detectors are designed to record data at previously not conceivable rates and can be made working only in combination with massive online computing.

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