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The NOvA data driven trigger

The NOvA experiment is a second generation long-baseline neutrino oscillation experiment situated in the Fermilab NuMI beam line. The NOvA experiment consists of a 300-ton near detector and a 14-kiloton far detector separated by a 810 km baseline. The experiment is designed to measure the nu_e and nu_mu content of the NuMI beam before and after oscillation with the aim of making high precision measurements the neutrino mixing parameters and determining the neutrino mass hierarchy.

NOvA uses a novel data acquisition system based on a continuous deadtime-less readout of the front-end electronics, extended buffering of the data stream and asynchronous software triggering. In this system each of the more than 340,000 detector cells is constantly sampled and buffered for real time analysis by the "data-driven trigger" (DDT) system. Using this system, the decision to record or discard time windows in the data streams can be based on complex event topologies. The system operates highly asynchronously, allowing for the delayed triggering and extraction of data corresponding to a beam spill time window, and can even use inputs from external sources like the supernovae early warning system (SNEWS) to trigger the data long after its initial collection. The flexibility of this system allows NOvA to collect enhanced samples of important backgrounds, good calibration data and even to search for new exotic particles.

This poster will present the system design, details of its deployment, operation and performance as well as an early look at the triggered data collected by the NOvA DDT on the soon to be completed far-detector.

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