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Timing in the NOvA detectors with atomic clock based time transfers between Fermilab, the Soudan mine and the Nova Far detector.

The NOvA experiment uses a GPS based timing system to both internally to synchronize the readout of the DAQ components and to establish an absolute “wall clock” reference which can be used to link the Fermilab accelerator complex with the neutrino flux that crosses the NOvA detectors. We describe the methods that were used during the commissioning of the NOvA DAQ and Timing systems to establish the synchronization between the Fermilab beam and the NOvA far detector. We present how high precision atomic clocks were trained and transported between the MINOS and NOvA detectors during a Northern Minnesota blizzard to validate the absolute time offsets of the experiments and make the first observation of beam neutrinos in the NOvA far detector.

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