Proposal Summary – Fermilab Intensity Frontier Fellowship

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The NOvA Test Beam program will help extend the physics reach for NOvA and most of the installation and commissioning at the FTBF has been completed. Test Beam data will directly improve the uncertainties for the largest systematics affecting some of the main physics goals and the large event library consisting of interactions with well-defined energy will also provide valuable input to NOvA's reconstruction framework which uses advanced machine learning techniques.

After building the initial model of the beamline and running simulations, my effort has been focused on improving the experiment's momentum and time resolution and establishing the characteristics of the beam. I worked with the ES&H personnel on safety and prepared the general safety training document for the experiment so we could start operations. I served as shifter, on-call expert and Run Coordinator during commissioning. I coordinated detailed field map measurements and am building a system to monitor the field directly spill by spill during the run with sensors mounted on the spectrometer magnet in order to eliminate the effect of magnetic field uncertainty from the momentum resolution. I have set up a cable measurement system to allow pre-calibrated TOF. I coordinated the installation of the monitoring infrastructure for the magnet, electronics racks, detectors and hall environmnt. I also led the effort to use the NOvA detector for debugging the upstream beamline and coordinated the studies with the External Beams Department. The follow-up beam studies after the shutdown will be critical to the success of the Test Beam program and I am supervising a simulation effort and designing a beam intensity monitor to help with these. I will continue to participate in data taking at Fermilab, serving as Run Coordinator as needed. At the conclusion of the run, I will organize another measurement campaign for calibration. In parallel with data taking, there will be a major data analysis challenge to provide timely feedback toward NOvA's main physics goals. Fellowship support would allow me to help set the direction of and contribute to the reconstruction and analysis sprint and provide an opportunity to work closely with students and postdocs. I have particular interests in studying reconstruction algorithms and applying multiple machine learning techniques using the Test Beam data set.