NOvA is a next generation long-baseline experiment optimized for the detection of $\nu_e \rightarrow \nu_x$ and $\bar{\nu}_e \rightarrow \bar{\nu}_x$ oscillations. The Far Detector (FD) is located on the surface under 14 radiation lengths of barite and concrete overburden. Cosmic rays passing through the FD present a unique challenge in cosmic ray background rejection. We show cosmic ray data versus Monte Carlo from the NOvA FD 4 di-block partial configuration. The cosmic ray data represents approximately 30 minutes of livetime. We also demonstrate preliminary cosmic rejection levels in the signal region using these data.

We have constructed several particle ID algorithms in order to discriminate $\nu_e$ CC events from other topologies, including cosmic rays. One of them, EID, is based on shower shape and likelihood comparisons to the confounding particles. We have benchmarked the bulk of the cosmic ray data aligned with the beam direction for these variables. Transverse $dE/dx$ (left) is the average of total prong energy in a cell per total path length; the longitudinal $dE/dx$ (middle), calculated plane-by-plane (first plane shown), is the total prong energy in the plane per the path length in the plane. The $\nu_e$ particle identification discriminating variable (EID) constructed from these and other shape variables (middle), calculated plane (first plane shown), is the total prong energy in the plane per the path length in the plane. The $\nu_e$ particle identification discriminating variable (EID) constructed from these and other shape variables is also shown (right). Events in the signal region can easily be rejected mainly with basic cuts related to steepness and distance from the top of the detector.

Applying signal-like pre-selection cuts based on data quality, energy and containment, a basic set of cosmic rejection cuts are defined, and applied to the cosmic ray sample in the 4 di-block FD. We show this sample after a cut on EID with the very few data events that pass the combined set of cuts together with the signal simulation. The ratio of event transverse momentum (PT) by event total momentum (P) (left) rejects the predominantly vertical cosmic rays with large PT/P and retains the neutrinos that go along the beam direction with small PT/P.

The Max Y distribution (right) is a measure of the larger value of the start and stop Y position of the most energetic shower thus rejects entering cosmic background close to the top of the FD. We also cut on the distance (gap) between the vertex and start point of the shower to remove misreconstructed events that can confuse the PID.

Using 3 basic cosmic rejection cuts we achieve excellent cosmic background rejection with 0.5 cosmic background events in one year of optimal neutrino running time of NOvA. The events that passed these cuts are mostly short, neutron-like events that are closer to the top of the detector. The figure of merit (signal/sqrt(signal+background)) for 1 year of optimal running is 3.1 after these cuts.