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Muon Neutrino Dissapearance in the NOvA experiment

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NOvA is a long-baseline neutrino oscillation experiment looking for muon neutrino disappearance and electron neutrino appearance. Having the longest baseline of any past or present accelerator experiment, NOvA uses the upgraded Neutrino Main Injector (NuMI) beam at Fermilab. The experiment measures oscillations within a muon neutrino beam using a 300 ton Near Detector and a 14 kiloton Far Detector placed 810 km away from each other, both located 14 milliradians off-axis. The energy spectra observed in this neutrino beam peaks at 2 GeV close to the oscillation maximum. NOvA being an oscillation experiment uses the Near Detector (ND) at Fermilab to measure the initial beam spectra and flavour composition. Then the spectra is extrapolated to the Far Detector (FD) at Ash River to search for oscillations.

The NOvA Collaboration has updated its first analysis and has recently released a new ν_μ disappearance result using an exposure of 6×10^{20} protons-on-traget (POT). Our just-published result disfavours the symmetric mixing scenario ($\theta_{23} = \pi/4$) at 2.6 sigma significance, well beyond that of past results. By the end of February 2017, NOvA had been exposed to 9×10^{20} POT for a ν_μ beam which will allow us to better constrain the allowed regions for the oscillation parameters Δm^2_{32} and $\sin^2\theta_{23}$. Furthermore, the Disappearance Analysis Group has been pushing to increase its sensitivity, coming from a finner energy binning and hadronic energy fractions. These improvements are underway and waiting to be tested with real data once the reconstruction is done and ready by the beginning of Summer 2017. This talk will discuss the improvements to the muon neutrino disappearance analysis and how our sensitivity to non-maximal mixing can be improved.

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