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Cherenkov Light in Liquid Scintillator at the NOvA Experiment

NOvA is a long-baseline neutrino experiment. Its physics goal is to measure 23 and values and to determine the mass hierarchy of neutrinos. NOvA has two functionally identical detectors, both of which are fine segmented and filled by liquid scintillator. In NOvA oscillation analyses, the systematic uncertainty contributed from scintillator response is one of the significant systematic contributions. There are two main models in NOvA detectors light response simulation. One is Birks suppression, which is optimized to improve the data and Monte-Carlo (MC) agreement for energy loss along particle tracks. The other one is Cherenkov model, which corrects the radiation response of NOvA detectors by capturing the Cherenkov radiation emitted when a charged particle passes through the detectors at a speed greater than the velocity of light in that medium. In general, Cherenkov effect will compensate with Birks model. Introducing these two models and performing a joint fit gives us a better agreement between our observed data and simulated MC events. In this poster, I will present the details of the data-driven tuning of the Cherenkov model and the impact of the new scintillator model on oscillation results.

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