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Latest results from the NOvA experiment

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NOvA is a long-baseline experiment that uses the NuMI beam, at Fermilab, to study muon neutrino to electron neutrino oscillations. The experiment is located 14.6 mrad off the beam axis which allows access a narrow band of neutrino energies centered at 2 GeV. NOvA is a two-detector experiment with one located underground at Fermilab (Near Detector), and the other one located on the surface in northern Minnesota (Far Detector), 810 km away from Fermilab. The design of the two detectors is identical, varying only in their mass: 14 kton for the Far Detector, and 300 ton for the Near Detector. The experiment has made a 4.4σ -significant observation of electron neutrino appearance using 12.33×10^{20} protons on target delivered to the Fermilab NuMI neutrino beamline. The experiment recorded 27 muon neutrino to electron neutrino candidates with a background of 10.3 and 102 muon neutrino to muon neutrino candidates. The new antineutrino data is combined with neutrino data to measure the oscillation parameters $|\Delta m^2_{32}| = 2.48 \pm 0.11 - 0.06 \times 10^{-3} \text{ eV}^2/c^4$, $\sin^2 \theta_{23} = 0.56 \pm 0.04 - 0.03$ in the normal neutrino mass hierarchy and upper octant and excludes most values near $\delta_{CP} = \pi/2$ for the inverted mass hierarchy by more than 3σ . The data favor the normal neutrino mass hierarchy by 1.9σ and θ_{23} values in the upper octant by 1.6σ .

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