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Constraints on non-standard neutrino-matter interactions from MINOS

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MINOS searches for neutrino oscillations using the disappearance of muon neutrinos between two detectors, over a baseline of 735 km. We recently reported the most precise measurement of neutrino oscillations in the atmospheric sector and the first tagged measurement of antineutrino oscillations. The neutrino mass splitting and mixing angle are measured to be $|\Delta m^2| = 2.32^{+0.12}_{-0.08} \times 10^{-3} eV^2$ and $\sin^2 2\theta > 0.90$ (90% C.L.) for an exposure of 7.25×10^{20} protons-on-target (PoT). Antineutrino oscillation parameters are measured as $\Delta \bar{m}^2 = (3.36^{+0.46}_{-0.40}(\text{stat.}) \pm 0.06(\text{syst.})) \times 10^{-3} eV^2$ and $\sin^2(2\bar{\theta}) = 0.86^{+0.11}_{-0.12}(\text{stat.}) \pm 0.01(\text{syst.})$ with an exposure of 1.7×10^{20} PoT in NuMI antineutrino running mode. We use the apparent difference in neutrino and antineutrino oscillation parameters to constrain non-standard matter interactions which could occur during propagation through the Earth's crust to the far detector.

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