

Particle Physics with Neutrino Detector in Space

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The question of what type of new physics could be done if a neutrino detector was able to operate close to the Sun was initially raised in 2015. This idea at the time was completely unexplored but innovative. Since asking this question we have determined how such a detector might be operated in space with little shielding and have explored scientific outcomes: better understanding of the solar interior which is a NASA major goal as stated in the decadal survey and unique new particle physics that could only be done in a close proximity to the sun while changes distance. Preliminary calculations show that such a spacecraft, if properly shielded, can operate in this environment and take data of neutrino interactions which can be distinguished from random background rates of other solar emissions, Galactic charged cosmic-ray and gamma-rays by using a double pulsed signature. A NASA funded study by our group which includes simulations of backgrounds and identifying the neutrino interaction signal, a demonstrator spacecraft detector concept mission and achievable science goals from a space flight missions would enable a whole new type of science investigation to explore and study our Sun, with unique particle physics in details that could not be done with the largest neutrino detectors on Earth nor other spacecrafts that are not capable of neutrino detection.

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