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Preliminary results of a Skipper-CCD inside a nuclear power plant

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Due to its low energy threshold, in the eV range, the Skipper-CCD technology has proved its potential to probe neutrino detection exploiting the CEvNS interaction channel [1]. CCDs are already being used for experiments using antineutrinos from a nuclear reactor, where they have shown their ability in constraining new physics models [2]. In addition, sensitivities to a variety of standard and beyond standard models have been evaluated for a Skipper-CCD in a reactor neutrino experiment [3, 4]. Here we report preliminary results from the first Skipper-CCD sensor inside the dome of a nuclear power plant. The detector, consisting of 0.675 gr effective-active mass, enclosed in a 5 cm lead shield and extra neutron shield based on polypropylene, was installed at 12 m from the center of the reactor core inside the containment building of the Atucha II nuclear power plant. Atucha II is a 2 GWth commercial nuclear reactor situated 100 km north of Buenos Aires City. The system is remotely monitored and operated on continuous readout mode with a sub-electron readout noise of 0.17 e. We discuss the commissioning of the Skipper CCD detector inside Atucha II, evaluate its current performance compared to that reported for the same detection system above ground in [5], and present preliminary data acquired during reactor-ON and reactor-OFF periods during the end of the year 2022.

[1] J. Tiffenberg, M. Sofo Haro, Alex Drlica-Wagner, Rouven Essig, Yann Guardincerri, Steve Holland, Timer Volansky, and Tien-Tien Yu, "Single-electron and single-photon sensitivity with silicon Skipper CCD", Physical Review Letters 119 (2017).

[2] CONNIE Collaboration • Alexis Aguilar-Arevalo (Mexico U.) et al. Search for light mediators in the low-energy data of the CONNIE reactor neutrino experiment. JHEP 04 (2020), 054.

[3] G. Fernandez-Moroni, P. A. N. Machado, I. Martinez-Soler, Y. F. Perez-Gonzalez, D. Rodrigues, and S. RosauroAlcaraz. The physics potential of a reactor neutrino experiment with Skipper CCDs: Measuring the weak mixing angle. JHEP, 03:186, (2021).

[4] G. Fernandez-Moroni, R. Harnik, P. A. N. Machado, I. Martinez-Soler, Y. F. Perez-Gonzalez, D. Rodrigues, and S. Rosauro-Alcaraz. The physics potential of a reactor neutrino experiment with Skipper-CCDs: Searching for new physics with light mediators. J. High Energ. Phys. 2022, 127 (2022).

[5] G. Fernandez Moroni, F. Chierchie, J. Tiffenberg, A. Botti, M. Cababie, G. Cancelo, E. L. Depaoli, J. Estrada, S. E. Holland, D. Rodrigues, I. Sidelnik, M. Sofo Haro, L. Stefanazzi, and S. Uemura. "Skipper Charge-Coupled Device for Low-Energy-Threshold Particle Experiments above Ground", Phys. Rev. Applied 17 (2022).

[6] D. Delgado, E. Depaoli, D. Rodrigues, I. Sidelnik, J. Tiffenberg, A. Botti, M. Cababie, F. Chierchie, J. Estrada, G. Fernandez-Moroni, "Skipper-CCD deployment inside a nuclear power plant", Neutrino Seul (2022)

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