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Neutrino-less double beta decay study in the CANDLES experiment

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Neutrino-less double beta decay is one of the hottest topics in the particle physics, since it could probe long-searched neutrino-mass and its hierarchy, also could confirm that neutrino is Majorana particle. The decay is extremely rare, thus an experiment must have ultimately low background environment. 48Ca has the largest Q value (4.3 MeV) among double beta decay nuclei, which is even much higher than that of most of environmental radio-impurities. Therefore, zero-background condition could be achieved. The CANDLES III+ experiment consists 305 kg of CaF2 in 96 crystals, where 350 g of 48Ca are contained. The active veto of liquid scintillator effectively suppresses both the external and internal background by providing pulse shape difference. In the recent couple of years, the experiment has upgraded with the cooling system and the geomagnetic compensation coils toward higher light yield and energy resolution. The passive shield made of lead blocks (7 to 12 cm thick) and the boron sheets (5 mm thick) have also been installed in order to suppress high energy gamma rays originated from the surrounding rock and metal materials by two orders of magnitude. Continuous data acquisition for searching neutrino-less double beta decay using the all the planned upgrades has started since June, 2016. In this talk, recent experiment status and performance and the studies for neutrino-less double beta decay search will be reported.

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