

Characterization of Hamamatsu R11410-23 Photomultiplier Tubes and Performance in the PandaX-4T Detector

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Abstract

The PandaX-4T liquid xenon detector uses Hamamatsu 3-inch R11410-23 photomultiplier tubes (PMTs) as the light sensors for ultra-low radioactivity, high quantum efficiency, and long-term stability at cryogenic temperature. Each PMT was thoroughly tested in a dedicated chamber before being installed in the detector to ensure compliance with experimental requirements. Main PMT characteristics, including gain, dark count rate, and after-pulse probability, were measured and the distributions of these parameters were presented. Additionally, all PMTs were tested in a cryogenic environment to simulate their operating conditions in an actual detector environment. Finally, we report the long-term performance of all PMTs during the commissioning run of the PandaX-4T experiment, and most of the PMTs performed well.

Note: Figure translations are in progress. See original paper for figures.

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