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Reworking vTiles to improve photodetector production yield for Darkside-20k

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Darkside-20k is a dual-phase liquid argon time projection chamber designed to search for dark matter interactions. Interactions in the argon are observed using silicon-photomultiplier (SiPM) array detectors, composed of SiPMs assembled onto a printed circuit board to form a vTile. During production, the vTiles undergo quality assurance and quality control (QA/QC) testing at ambient and cryogenic temperatures, with a cumulative yield of devices passing QA/QC to date of 87% after production of 1400 vTiles. If a vTile fails QA/QC, specialised testing is conducted to identify the defective SiPM. vTiles with high dark count rates are imaged using a long exposure sCMOS camera, and a "Bed of Nails"circuit board is used to measure the IV characteristics of individual SiPMs. This poster outlines the rework process for replacing individual SiPMs, to enable these vTiles to be reintroduced into the production pipeline for integration into the veto instrumentation. As of January 2024, reworking 96 vTiles has increased the total cumulative production yield to 92%.

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