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An overview of the test station involved in the production of the LVPS Bricks for the Phase II upgrade of the ATLAS Tile Calorimeter

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The Phase II upgrade of the ATLAS experiment at CERN represents a significant advancement in preparing for the High Luminosity Large Hadron Collider (HL-LHC) era. This upgrade includes substantial enhancements to the detector, particularly the integration of radiation-resistant transformer-coupled buck converters, referred to as Low Voltage Power Supply (LVPS) bricks. A thorough quality assurance process is being implemented to improve the reliability of LVPS bricks within the ATLAS Hadronic Tile-Calorimeter (TileCal). In partnership with the University of the Witwatersrand and iThemba LABS, more than a thousand LVPS bricks will be developed. These bricks are essential for converting 200 V direct current (DC) power into the 10 V DC power needed for detector operation. Extensive initial testing of these bricks is critical to ensure their reliability and performance under the challenging conditions anticipated in the HL-LHC era, including high radiation levels, increased trigger rates, and substantial pile-up. The next phase will involve gathering and analysing test data using advanced machine learning techniques. This data-driven approach will offer deeper insights into the bricks' behaviour under extreme conditions, enabling the optimization of their design and performance to meet the demanding requirements of the HL-LHC.

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