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The PDU test facility for the Darkside20k experiment.

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The DarkSide-20k is a 20-tonne fiducial mass dual phase Liquid Argon Time Projection Chamber (LArTPC) detector for the direct dark matter search, filled with low radioactivity Argon and equipped with customised cryogenic SiPM photosensors. The experiment will be constructed in INFN Gran Sasso underground Laboratory (LNGS), and is expected to be free of any instrumental background for an exposure of >100 tonne year. The DarkSide SiPMs were developed specifically for LAr use in collaboration with Fondazione Bruno Kessler (FBK). This activity leaded to the production and assembly of large surface arrays of SiPMs (20×20 cm2) the Photo Detection Units (PDU) in a INFN dedicated production site NOA at LNGS. The total of 528 PDUs will be produced in the following year to be allocated on the two Optical Planes (OP) of the TPC (with ˜21 m2 total SiPM surface). All PDUs before installation on the OP must be tested and qualified in LN, this will done in a dedicated test facility (PDU Test Facility) designed, assembled and commissioned in Naples Cryogenic Laboratory for the Dark Matter Direct Searches of UNINA Physics Department. Two one-month long testing campaigns with very first 6 and later 10 PDUs were conducted in Naples in May and October of 2024. The PDUs were tested for varying over-voltage values and different readout and power configurations. The key parameters like SPE position, Base line RMS, signal-to-noise ratio, Gain and Sensitivity as a function of time were acquired for the stability study. The description of tests and results will be presented in this talk.

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