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From Photoelectrons to Bytes in DarkSide-20k

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Darkside-20k is a planned experiment at LNGS in Italy, supported by the Global Argon Dark Matter Collaboration. Darkside-20k is a dual phase liquid argon TPC, readout by SiPM-based cryogenic photosensors and designed to perform direct detection of Weakly Interacting Massive Particles (with a mass up to the TeV/c^2 range). The 20-tonne (fiducial mass) of Argon from an underground source is surrounded by an active neutron veto detector, based on a Gd-loaded acrylic shell. The scintillation light is collected at the bottom and the top planes of the TPC, as well as by the veto photodetectors. This talk focuses on the light detection technology and the trigger-less data acquisition system. The photosensor readout unit is a 25 cm^2 array of SiPMs, called Photo Detector Module, or PDM. The PDM's performances will be outlined, including an overview of the characterization of the unit's signal-to-noise ratio and time resolution. The PDM signals are digitized and processed online in a dedicated computing farm. The implementation of the data acquisition will be presented, along with the preliminary performance estimate.

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