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Search for dark matter with the DarkSide-20k detector

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The nature of dark matter remains unknown, and its origin is currently one of the most important questions in physics. One of the most promising technologies to directly observe interactions of Weakly Interactive Massive Particles (WIMPs), a dark matter candidate, with ordinary matter is based on the use of a large mass of liquid argon as a target.

A general overview and status of the DarkSide-20k detector, now under construction in the Gran Sasso National Laboratory (LNGS) in Italy, will be presented in a broader context of the Global Argon Dark Matter Collaboration physics programme. DarkSide-20k aims to directly detect dark matter by observing weakly interacting massive particles (WIMPs) scattering off the nuclei in 20 tonnes of low radioactivity liquid argon in the dual-phase time projection chamber (TPC).

Special emphasis will be given to the Polish contributions to the project:

- Cryogenic testing of the veto silicon photomultiplier modules
- The light collection scheme for the veto detector, consisting of approx. 200 square meters of a novel polymeric wavelength shifting reflector film, based on polyethylene naphthalate
- Precise screening for traces of natural radioactivity in construction materials as a method to minimize the DarkSide-20k detector background.

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