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Direct dark matter search with the XENON1T experiment

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The XENON Dark Matter Project opened the era of ton-scale detectors seeking for direct evidence of dark matter with the XENON1T experiment. XENON1T focused on the search for WIMPs, the most investigated class of particles hypothesized to be the DM constituent. The detector is a dual-phase (liquid-gas) time projection chamber (TPC) featuring 2.0 t liquid xenon (LXe) target mass and operated in the underground Laboratori Nazionali del Gran Sasso.

XENON1T reached the lowest ever electronic recoil background in dark matter direct searches of $82^{+5}_{-3}(\text{syst}) \pm 3(\text{stat}) (\text{t} \cdot \text{y} \cdot \text{keV})^{-1}$, in agreement with the rate and spectrum predicted by MC simulations.

A total of 278.8 live-days were collected, between late 2016 and early 2018, with XENON1T for WIMP search, corresponding to the final exposure of 1 t·y for the selected 1.3 t fiducial mass of LXe.

The profile likelihood analysis finds no significant excess over background and sets the world-best exclusion limit on the WIMP-nucleon spin-independent cross section for WIMP masses above $6 \text{ GeV}/c^2$, with a minimum of $4.1 \times 10^{-47} \text{ cm}^2$ at $30 \text{ GeV}/c^2$.

The XENON Dark Matter Project will rapidly move towards the upgraded detector, XENONnT, with increased TPC (containing 6 t of LXe) and further reduced background. The XENONnT experiment will improve the sensitivity to WIMPs by one order of magnitude in 5 years of data acquisition.

Collaboration name

XENON

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