

Status and prospect of the ANKOK project: Low mass WIMP dark matter search using double phase argon detector

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Liquid argon is known as an excellent target material for WIMP dark matter direct search experiment. Use of its ionization and scintillation signals, and scintillation pulse shape provides strong discrimination between the electron and nuclear events. Relatively small atomic mass ($A=40$) gives higher nuclear recoil energy for WIMP-Ar nuclear scattering, thus it potentially has higher sensitivity for low mass WIMP (~ 10 GeV/c²). On the other hand, the 128 nm VUV scintillation light of argon is relatively hard to detect with nominal photo sensors, and use of wavelength shifter lowers the light detection efficiency and likewise the spatial resolution of the reconstructed event. At present, there are no liquid argon detectors which prove their sensitivity for the low mass WIMP.

The ANKOK project is a dark matter search experiment in Japan using the double phase argon detector which is specialized for the low mass WIMP detection. Using a prototype detector, we are proceeding R&D efforts to establish its physics sensitivity. A detector with fiducial mass of about 30 kg is under construction.

We plan to operate the detector at surface within a year, following collection of the underground physics data in the next few years.

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