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Dark matter annual modulation results from the ANAIS-112 experiment

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An annual modulation in the interaction rate of galactic dark matter is expected by the revolution of the Earth around the Sun; a modulation signal compatible with expectations has been observed by the DAMA/LIBRA experiment for about twenty years, being one of the most puzzling experimental results in the field as it has not been confirmed by other dark matter direct detection experiments. ANAIS, using 112.5 kg of sodium iodide as target, is taking data at the Canfranc Underground Laboratory in Spain since August 2017 aiming at testing the observation by the DAMA/LIBRA experiment using the same target and technique.

Here, the ANAIS-112 experiment will be described presenting the set-up, performance, and analysis methods and the annual modulation results from 3 years exposure will be discussed. The best fits obtained for the modulation amplitude in the [1-6] keV ([2-6] keV) energy regions are (-0.0034)±0.0042 cpd/kg/keV (0.0003±0.0037 cpd/kg/keV), supporting the absence of modulation in the data and being incompatible with the DAMA/LIBRA result at 3.3 (2.6) σ, for a sensitivity of 2.5 (2.7) σ. In addition, some complementary analyses (a phase-free annual modulation search and the exploration of the possible presence of a periodic signal at other frequencies) have been made together with several consistency checks. All the obtained results have confirmed the ANAIS-112 projection of reaching a 3σ sensitivity for the scheduled 5 years of operation.

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