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Progress and results from the Cosmic Axion Spin Precession Experiment (CASPEr)

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The nature of dark matter, the invisible substance making up over 80% of the matter in the Universe, is one of the most fundamental mysteries of modern physics. Ultralight bosons such as axions, axion-like particles or dark photons could make up most of the dark matter. Couplings between such bosons and nuclear spins may enable their direct detection via nuclear magnetic resonance (NMR) spectroscopy: as nuclear spins move through the galactic dark-matter halo, they couple to dark-matter particles and behave as if they were in an oscillating magnetic field, generating a dark-matter-driven NMR signal. Here we present preliminary CASPEr results obtained via ultralow-field NMR spectroscopy and report progress of the experiment probing the so called axion-wind coupling in the mass range from 1 peV to 10 neV currently under construction in Mainz.