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**If dark matter dominates before BBN: implications, from gravitational wave detection to the growth of structure** TANJA RINDLER-DALLER, University of Vienna, BOHUA LI, Tsinghua University, Beijing, PAUL SHAPIRO, University of Texas at Austin — There is recently great interest in ultralight scalar-field dark matter (SFDM) models, in which structure formation is supposed to be similar to standard CDM on large scales, while suppressed on small scales by quantum effects. Complex field SFDM with a global U(1)-symmetry, having a conserved charge, can emerge after reheating, along with the standard model particles. By setting this conserved charge to the present observed DM density, complex SFDM obeys a stiff equation of state in the early Universe. As a result, DM dominates all the other cosmic components during this phase. We have studied in great detail and accuracy the evolution of such LSFDM models, whose cosmic inventory is the same than for LCDM, except that CDM is replaced by SFDM. We have previously constrained the epoch of stiff-SFDM-domination by studying the impact onto the SFDM model parameter space, using cosmological observables from Big Bang nucleosynthesis (BBN) and the CMB to the inflationary stochastic gravitational wave background which gets amplified during such a stiff phase. We will present these findings, along with new ones concerning the implications of stiff-SFDM-domination for the growth of perturbations prior to and after BBN, with interesting consequences for structure formation in the Universe.

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