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Complex scalar field dark matter and its impact on detectability of the stochastic gravitational wave background from inflation TANJA RINDLER-DALLER, University of Vienna, BOHUA LI, PAUL SHAPIRO, University of Texas at Austin — We consider an alternative dark matter candidate to WIMP-CDM, ultralight bosonic dark matter ($m \geq 10^{-22}$ eV) described by a complex scalar field (SFDM). In a ΛSFDM universe, SFDM starts relativistic, evolving from a maximal stiff equation of state to radiation-like, before becoming nonrelativistic at late times. The SFDM particle parameters, mass and selfinteraction coupling strength, are therefore constrained by cosmological observables, esp. $N_{\rm eff}$, the effective number of neutrino species during BBN, and the redshift of matter-radiation equality. Furthermore, since the energy density contributed by the stochastic gravitational wave background (SGWB) from inflation is amplified during the stiff phase, this makes possible the detection of this SGWB at high frequencies by current experiments, e.g. aLIGO/Virgo and eLISA. We show that, for SFDM particle parameters that satisfy those cosmological constraints, the amplified SGWB is detectable by aLIGO, for values of tensor-to-scalar ratio r currently allowed by CMB polarization measurements, for a broad range of possible reheat temperatures. A nondetection by aLIGO O1 would provide a new kind of cosmological constraint on SFDM. Also, a wider range of parameters and reheat temperatures will be probed by aLIGO O5.

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