Gravitational waves background from QCD phase transition and space-time back-reaction

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We analyze the effective Savvidy QCD equation coupled to the Einstein field equation. We show that such a system has a time-crystal solution in a FRW space-time background. While the energy density of the quark-gluon mean-field is monotonously decaying in real time, its pressure undergoes a series of violent oscillations at the characteristic QCD time scales. This generates a primordial multi-peaked gravitational waves' signal in the radio frequencies' domain, accessible by the FAST and SKA telescopes.