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Gravitation waves from QCD and electroweak phase transitions

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We investigate the gravitation waves produced from QCD and electroweak phase transitions in the early universe by using a 5-dimension holographic QCD model and a holographic technicolor model. The dynamical holographic QCD model is to describe the pure gluon system, where a first order confinement-deconfinement phase transition can happen at the critical temperature around 250 MeV. The minimal holographic technicolor model is introduced to model the strong dynamics of electroweak, it can give a first order electroweak phase transition at the critical temperature around 100-360 GeV. We find that for both GW signals produced from QCD and EW phase transitions, in the peak frequency region, the dominant contribution comes from the sound waves, while away from the peak frequency region the contribution from the bubble collision is dominant. The peak frequency of gravitation wave determined by the QCD phase transition is located around 10^{-7} Hz which is within the detectability of FAST and SKA, and the peak frequency of gravitational wave predicted by EW phase transition is located at $0.002 - 0.007$ Hz, which might be detectable by BBO, DECIGO, LISA and ELISA.

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