

Gravitational Waves from Confinement in $SU(N)$ Yang-Mills Theory

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The advent of gravitational wave astronomy has brought with it the potential for novel approaches to study physics beyond the Standard Model. In particular, the null searches for signatures of dark matter at direct and indirect detection experiments has left the so-called “nightmare scenario”, where the dark matter interacts with the Standard Model only through gravity, a distinct possibility. However, gravitational wave detection offers an escape clause. In this talk, I will consider the case of a dark sector described by $SU(N)$ Yang-Mills theory which is decoupled from all Standard Model fields. Lattice studies have shown that for $N \geq 3$, the corresponding confinement phase transition is of first order, such that a stochastic gravitational wave background would have been generated. I will give an overview of the lattice-informed effective theory we have used to study the nucleation of true vacuum bubbles and then describe the computation of parameters which enter formulae for the gravitational wave power spectrum. Finally, I will present our results of the power spectra, which demonstrate generically weak signals but strong N -dependence. As the spectra vary greatly with N , our results show that sensitive future interferometers will be able to constrain the particle content of such a hidden sector.

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