Contribution ID: 10

A hybrid simulation of gravitational wave production

Tuesday 22 September 2020 18:03 (12 minutes)

LISA telescope will be specially interesting to probe the scenario of a first order phase transition happening close to the electroweak scale. Recently, it became evident that the main contribution to the GW spectra would come from the sound waves propagating through the plasma. Current estimates of the GW spectra are based on numerical simulations of a scalar field interacting with the plasma or on analytical approximations – the so-called sound shell model. In this work we present a novel set up to calculate the GW spectra from sound waves. We use a hybrid method that uses a 1d simulation (with spherical symmetry) to evolve the velocity and enthalpy profiles of a single bubble after collision and embed it in a 3d realization of multiple bubble collisions, assuming linear superposition of the velocity and enthalpy. Our method has several advantages over 3d simulations in the literature: 1) it does not depend on solving the bubble wall scale (which is energetically negligible in realistic transitions); 2) it correctly captures shock waves persisting after collisions; 3) it enables fast computation of GW spectrum over a wide range of parameter space. We provide a parametrization of the final GW spectrum as a function of the wall velocity and the fluid kinetic energy.

Primary authors: Mr RUBIRA, Henrique (DESY); Dr JINNO, Ryusuke (DESY); KONSTANDIN, Thomas (DESY)

Presenter: Mr RUBIRA, Henrique (DESY)

Session Classification: Cosmology and Astroparticles session on Zoom and in Main Auditorium

Track Classification: Cosmology & Astroparticle Physics