12th Iberian Gravitational Waves Meeting

Contribution ID: **60** Type: **not specified**

Gravitational waves from strong first-order phase transitions

Wednesday 8 June 2022 11:15 (45 minutes)

Many theories of physics beyond the Standard Model, at the electroweak scale and above, predict first-order phase transitions that would have taken place in the very early universe. A first-order phase transition involves the nucleation, expansion and collision of bubbles of the new phase. The bubbles of the new phase interact with the hot plasma of the early universe as they expand, setting up expanding heated shells of plasma which also collide and interact, even after the bubbles have merged. The motion of the plasma after the transition, consisting initially of sound waves from the heated shells, can later become nonlinear and turbulent. Both the initial collisions of the bubbles and heated shells, and the subsequent dynamics of the plasma, are sources of gravitational waves.
For a phase transition at or around the electroweak scale, the length scales involved mean that these gravitational waves may be detectable by future missions such as LISA. They can indirectly provide a probe of particle physics beyond the Standard Model, complementary to future colliders. The stronger the phase transition, the better the chance of being observed (or constrained) by gravitational wave detectors. However, strong transitions are also relatively poorly understood as they are likely to lead to nonlinear effects, including turbulence. Such effects are an active area of theoretical and simulational research.
In this talk I will discuss some recent work to understand strong thermal first-order phase transi- tions and how they source gravitational waves.

Presenter: WEIR, David (University of Helsinki)