Non-Markovian quantum Boltzmann equation in the sky

Abstract

In this talk, we review the application of the non-Markovian quantum Boltzmann equation (QBE) in CMB and GWs physics. Using this equation we study the microscopic influence of a cosmic environment on a system of cosmic background photons or stochastic gravitational waves. We apply the non-Markovian QBE to study the damping of gravitational waves propagating in a medium consisting of decoupled ultra-relativistic neutrinos. It is shown that, in contrast to intensity and linear polarization that are damped, the circular polarization (V-mode) of the gravitational wave (if present) is amplified by propagating through such a medium. We will also discuss the decoherence induced by squeezed stochastic GWs and show that one can derive the decoherence damping time using non-Markovian open quantum system approach.