Abstract
Since last decades, we have been able to estimate the age of the Universe, investigate its evolution in time depending on energy and matter contents and observe its first emitted light: the Cosmic Microwave Background (CMB). Since the discovery of the CMB, the efforts of several generations of scientists allowed us to directly measure its tiny temperature and polarization anisotropies arose from a tight interplay of gravitational and quantum physics. In the polarization anisotropies, cosmologists are looking for the imprints of a stochastic background of Gravitational Waves produced at the time of inflation. These primordial gravitational waves are imprinted in the B-modes maps and they have not detected yet because of the diffused polarized emission from our Galaxy at the microwaves frequencies, known as Galactic foregrounds, and several technological challenges to get higher sensitivity in the polarization detectors. I will outline the state of the art of current and forthcoming CMB experiments observing the sky at microwave frequencies from the ground and from space. Furthermore, I present a 3D model to simulate the spatial distribution of Carbon Monoxide (CO) rotational lines emission in molecular clouds across the Galaxy. The model is aimed at forecasting the level of polarized emission of CO molecular clouds which could contaminate CMB polarization B-modes power spectrum away from the Galactic plane. Assuming realistic levels of polarization fraction we show that the level of contamination is equivalent to a cosmological signal with tensor-to-scalar ratio $r < 0.02$.