

Dark energy constitutes roughly 70% of energy density of the Universe and remains one of the greatest mysteries of modern physics. In order to properly understand its nature we need precise cosmological measurements. One of projects exploring this exotic form of a matter will be the Large Synoptic Survey Telescope which will help confirm or disprove the standard cosmological model (Λ CDM). For success of the project, various theories of dark energy need to be explored. One of alternative theories explaining accelerated expansion of the Universe is the so called chameleon gravity. The chameleon is a new scalar field with a mass depending on surrounding density. In dense environments such as the Solar system the field acquires large mass and propagates only over small distances and can pass standard tests of gravity. In the thesis we study behavior of the chameleon field near stars and in galaxies. We show on which circumstances this field can be detected through spectroscopic and weak lensing measurements.