Abstract: This thesis deals with production processes of cosmic $\gamma$-rays in astrophysical objects and methods of their detection. Possible interactions leading to the emission of high energy $\gamma$-rays in the active galaxy Centaurus A are discussed in this context. Cherenkov Telescope Array is presented as a new experiment focused on the detection of air showers initiated by cosmic $\gamma$-rays. Cherenkov light of air showers is studied in the simulations done by CORSIKA simulation tool. Method of data analysis within the framework of Cherenkov telescopes is described and performed on the dataset of the active galaxy PKS 2155-304. The results include statistical tests of $\gamma$-ray source presence and its time variability.

Keywords: Cosmic rays, gamma rays, astroparticle physics, high energy astrophysics, acceleration, CTA experiment