

Studying the most massive galaxies using DESI optical spectra

The most massive galaxies in the Universe are found in the centres of clusters of galaxies. We can use optical spectroscopy to study the stellar populations of these Brightest Cluster Galaxies (BCGs), and then stellar population modelling to infer the star formation and evolution histories of these giant elliptical galaxies. The measurements we make can also be directly applied to well-known cosmological problems such as constraining the global expansion rate of the Universe, the Hubble parameter.

In this project, we will use recent catalogues of massive galaxy clusters (e.g., derived from the Atacama Cosmology Telescope latest data release). We will find the optical centres of the clusters, where the BCGs are located, and search for these galaxies in the Dark Energy Spectroscopic Instrument (DESI) public data release 1. We will retrieve their optical spectra and measure important stellar population indicators (e.g., the D4000n absorption index). This can be directly used to constrain the Hubble parameter by using the method called Cosmic Chronometers. In addition to this important application, we can use the spectra to study other properties of the BCGs and relate it to the properties of their host clusters.



The project requires a basic background in coding in python, and can lead to a PhD project.

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