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HIGH REDSHIFT GALAXIES & LYMAN ALPHA EMITTERS THROUGH GRAVITATIONAL LENSING

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The techniques and some preliminary results on the study of the luminosity function (LF) of Lyman Alpha Emitters (LAEs) through gravitational lensing (GL) are presented. Clusters of galaxies, with suitably modeled gravitational lenses, are observed using the tunable filters (TF) of the instrument OSIRIS at the GTC. The combination GLs, and the higher contrast achievable by the TF, will allow the detection of very faint LAEs, reaching a step forward in understanding this primordial objects together with achieving a better determination of the mass distribution on the inner regions of galaxy clusters.

LAEs are distant dust-free galaxies that emit Lyα radiation. The gas in these galaxies is completely ionized, through photoionization, by the first generation of massive blue stars responsible for the reionization of the universe. LAEs are important in cosmology because they trace high redshift galaxies, their dark matter halos and the subsequent evolution of matter distribution in the Universe.

Usually, LAEs have been detected in the optical bands ($2 < z < 7$) using deep field narrowband imaging, with bandpass around 70 Å, to study discrete redshifts (e.g., Subaru Deep Field; Kashikawa, et al. (2006); Shimasaku et al. (2006); Ouchi et al. (2008)). With OSIRIS, and its set of TFs, we plan to reduce the bandpass to $\sim$15 Å, and obtain a higher contrast for LAE detections through the drop-out technique.

We plan to use GLs, by clusters of galaxies, to study faint high redshift sources. We expect to detect LAEs at high redshift, reaching luminosities $\sim 10^{42}$ erg s^{-1} for highly magnified objects (Santos et al. 2004), leading to constrict the limits of the LF. We have already modeled some GL clusters (Verdugo 2008), such as MS 0440.5+0204, to characterize the critical lines and calculate probabilities of amplification (Figure 1).

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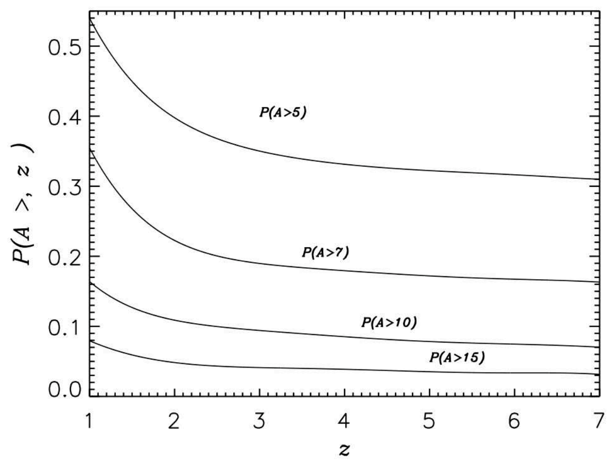

Fig. 1. Magnification probability for galaxies in a region around 15″ from the caustic lines of MS 0440.5+0204 (Verdugo 2008).

Three spectral regions, not contaminated by strong sky lines, will be observed: 6750–6930; 8100–8230 & 9110–9250 Å, with red TF. These regions correspond to line Lyα between $4.6 < z < 6.6$. From the LF of LAEs (Le Delliou et al. 2006), we expect to detect about 20 such objects per cluster field with fluxes $\geq 2 \times 10^{-17}$ erg s^{-1} cm^{-2}, to characterize the LF of LAEs, to improve GL models and to study the magnification bias by comparison between blank fields and different lensing regimes available from each 8×8 arcmin^2 OSIRIS field of view.

Observations have been already performed and data is almost reduced and will be analysed during the following months.

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