
Thesis subject

Name of the laboratory: Laboratoire d'Astrophysique de Marseille (LAM)

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Subject's title: **Cosmic Reionization: The Privileged Combined View of MUSE and EMIR**

Subject description:

The goal of this thesis project is to understand the galaxy formation process, based on the identification and study of the **first galaxies formed in the early universe**, and their relative **contribution to cosmic reionization**. The student will take advantage from a privileged access to the best facilities currently available to achieve this goal, namely the MUSE/VLT(1) and EMIR/GTC(2) Guaranteed Time Observations, and participate to the scientific activities of these two collaborations on this domain.

The GOYA project (for Galaxy Origins and Young Assembly) is at the origin of EMIR, a multi-object NIR spectrograph mounted on the only 10m telescope available to the French community in the Northern Hemisphere, combining a large multiplex capability and unparalleled efficiency for the study of weak and compact sources in the near-IR. EMIR observations will combine together, on the same mask, rare high-redshift ($z > 6$) photometric candidates and low-mass, lower redshift analogues of the first galaxies ($1 < z < 4$), more numerous, both in blank fields and lensing clusters. In preparation for this combined survey, the GOYA team has conducted specific photometric surveys to photometrically select targets for EMIR, including the WUDS survey at the CFHT (Pello+2018), in addition to the classical public cosmological fields. MUSE observations for this project are focused on the Lyman- α emitters at $3 < z < 7$, in particular behind lensing clusters, without any photometric pre-selection. This is an original aspects of this project because a large fraction of LAE are not detected in deepest photometric surveys or displays extended Lyman- α emission (see e.g. Wisotzki+ 2016) The feasibility of the concept has been demonstrated by two pioneer studies conducted by our group on a sub-sample of four lensing clusters, which made it possible, for the first time, to constrain the shape of LF for the faintest LAEs (Bina+2016, de la Vieuville+ 2019), and to evaluate the interrelation between the populations of LBG and LAE within the same volume of the universe (de la Vieuville et al. submitted). The combination of EMIR pointed observations on the most distant sources and intermediate-redshift analogues, and the MUSE blind survey of magnified galaxies at $3 < z < 7$ represents a

unique opportunity for a student to explore galaxy formation when large projects such as JWST, EUCLID and the ELTs will start operations.

Bibliography:

(1) <http://muse-vlt.eu/science/>

(2) <http://www.gtc.iac.es/instruments/emir/emir.php>

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Wisotzki, L., Bacon, R., Blaizot, J., et al. 2016, A&A, 587, A98