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## Curved detectors for high performance astronomical spectrographs: Towards a MUSE upgrade for the VLT.

Master of Science thesis

### Laboratories :

Laboratoire d'Astrophysique de Marseille (LAM, France),  
Centre de Recherche Astrophysique de Lyon (CRAL, France),  
European Southern Observatory (ESO, Germany).

### Thesis advisors:

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### Description:

MUSE (Multi Unit Spectroscopic Explorer) is a unique and high performance integral field spectrograph currently operated at the Very Large Telescope: It has a broad range of astrophysical applications, from objects in our galaxy to the most distant galaxies. MUSE recently perform the survey of thousands of galaxies in the Hubble deep field, measuring their spectra for a better understanding of the formation of galaxies in the distant Universe (<http://www.eso.org/public/news/eso1738>).

Preparing the next generation of such an instrument, already using the utmost performance of its components, requires to make use of emerging technologies. The advent of flexible electronics today opens a new perspective for the design of astronomical instruments, which could benefit from the multiple advantages offered by the ***curving of science-grade detectors***.

By directly compensating for the field curvature aberration in optical designs, the use of curved focal planes allows reducing the number of elements in an optical train, reduces the complexity of the optics, whilst increasing the field of view and allowing the design of very fast wide field camera modules, which could not be realized with classical flat electronic sensors.

### Skills and work program:

The selected grad student will work on optimizing and comparing different design possibilities for a next generation of a MUSE-like instrument.

The student must have skills in instrumentation and optics, to work on the design of the spectrograph modules using ray-tracing softwares, and on the simulations to estimate the impact on the performance of the proposed instrument compared to the state of the art.

**Location:**

The proposed work program will be done at LAM (Marseille), in collaboration with the CRAL (Lyon) and ESO (Munich, Ge), and be placed in the frame of the design of a MUSE-like multiplexed spectrograph concept for the very large telescope by an international consortium of research institutes. The work will also be done in collaborations with the CEA-LETI in Grenoble, manufacturing the curved detectors.

**Application:**

Applicants should send a CV, a one-page application letter, and a recommendation letter.

The LAM values gender balance, equity and inclusion in the fields of astronomy and instrumentation. We commit to equal evaluation of applications coming from under-represented communities, through the criteria defined by the European Commission.

*This MSc thesis is preparing a PhD thesis on curved detectors for astronomical instrumentation, already funded, starting end of 2018.*