OSIRIS @ GTC: MOS at Multiplex ~ 250

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ABSTRACT

We present preliminary results of an OSIRIS Guaranteed Time proposal aimed at checking the feasibility of combining microslits and order sorter filters to increase the multiplexing capabilities of OSIRIS@GTC up to N~250 over a small wavelength range.

OBJECTIVE AND DESIGN

In order to reach a multiplexing capability N~250 (almost tenfold the standard OSIRIS figure) we follow the ideas in Glazebrook & Bland-Hawthorn (*2001 PASP, 113, 780*). We **compactify the spectra** simultaneously in both directions of the focal plane:

- **Spatially**, by using very narrow slits (typically 3″). Almost perfect sky subtraction is obtained by interspersing *empty (sky) exposures* in between the *target exposures*. This means 33% of the target time is actually devoted to overhead sky observations.

- **Spectrally**, by cutting the spectral range to a narrow band using the OSIRIS order sorters. In our case, we use ~200Å around two characteristic emission or absorption wavelengths at the target redshift.

TARGET AND SCIENTIFIC OBJECTIVE

We choose Abell2219, a massive, well-known cluster with σ~1100 km/s at z~0.225. At this redshift the emission lines [OIII]λλ4959,5007Å will lie at λ~6100Å, and the Calcium absorption doublet (λλ3934,3969Å) at λ~4850Å. Our main scientific target will be the *determination of cluster membership* and the *measurement of group dynamics* using as many galaxies as possible in a single OSIRIS field. Thus, we choose to observe the same objects both (i.e., the same mask) both in emission and absorption.

Two of the order-sorting filters in the OSIRIS set are centered at 6080Å (width~220Å) and 4810Å (width~150Å). They cover the velocity range in our cluster even when the known shift in central wavelength with position in the GTC focal plane (well characterised in Pérez-González *et al. 2013 ApJ, 762, 46*) is taken into account.

OBSERVATIONS AND DATA REDUCTION

Using the OSIRIS Mask Designer Tool (de Miguel Ferreras et al., *2006 ASP Conference Series, 351*) we have designed a single MOS mask that includes 274 target galaxies and 4 fiducial stars in a single OSIRIS field. A preselection was performed, based on *ugr* archival images of the cluster, combining the probability of our targets to be at the cluster redshift and the magnitude information.

The available observing time (5 hours) was divided in 4 observing blocks, yielding a total, on-target exposure time of 3600 seconds at 6080Å and 4800 seconds at 4810Å. We chose R~2500, which results in spectra that cover ~220 pixels in the spectral direction. Observations took place in two separate nights in May 2014.

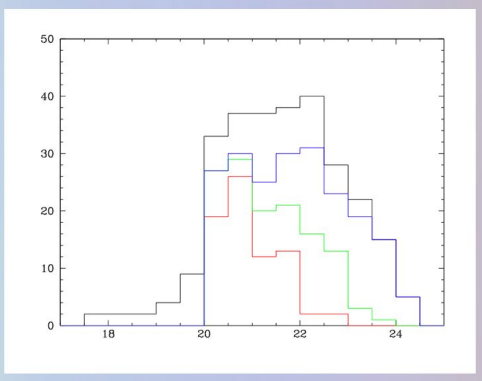
Data reduction is relatively straightforward, although it is still a **work in progress**. OSIRIS has proved to be very stable, and the sky subtraction technique has proved extremely reliable. We subtracted from each target exposure its neighbouring sky exposure, and combined all images in one for each filter.

PRELIMINARY RESULTS

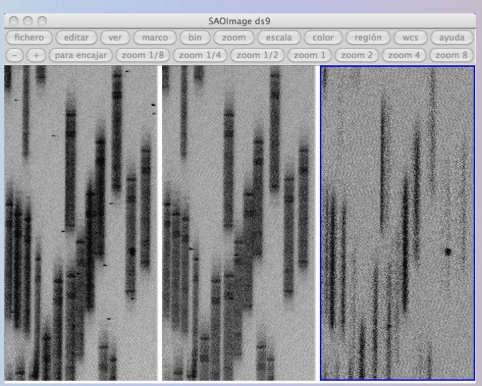
At the time of producing this poster the results are only preliminary, as we are still designing and testing the software necessary to extract and calibrate the spectra. As can be seen in the picture on the right side, most of the sources are detected with good S/N values in the continuum, and in particular many emission and absorption features are clearly present.

We invite all interested parties to contact the IP (fsoto@ifca.unican.es) in order to obtain more information about the project and the final stages of the reduction, once they are completed.

Image of the focal plane mask punched at the GTC workshop, courtesy of Antonio Cabrera. The round holes correspond to the fiduciary stars used for plate positioning.



Magnitude distribution of the selected targets. The red histogram corresponds to the highest priority objects, followed in descending order by green, blue and black.



Demonstration of the quality of the sky subtraction method. The left panel is one of the "on-target" images, and the middle panel is its associated "off-target" image. The right panel shows the final combination of all the images obtained subtracting them.