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DATA REDUCTION PIPELINE FOR EMIR, THE NEAR-IR MULTI-OBJECT SPECTROGRAPH FOR GTC

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EMIR (Balcells et al. 2000) is a near-infrared wide-field camera and multi-object spectrograph being built for the GTC. The Data Reduction Pipeline (DRP) will be optimized for handling and reducing near-infrared data acquired with EMIR.

EMIR will be a state-of-the-art instrument with which multi-object spectroscopic observations will be possible for up to 45 simultaneous targets with a resolution about 4000 and a spectral coverage from 0.9 to 2.5 microns. The field of view (FOV) will be 6×3 in spectroscopic mode. EMIR will also have imaging capabilities in the J, H and K near-IR bands. In this case, the FOV is 6×6 , with a spatial sampling around 0.175"/pixel.

The EMIR DRP will process data acquired with EMIR. It shall deliver reduced images, by means of robust software tools and algorithms optimized for handling near-IR data. The DRP is prepared to handle wide-field frames in imaging mode, as well as, multi-object observations (up to 45 slitlets). Reduced data and associated error frames, as well as raw data, will be delivered to the end-users. It is fully integrated into the GTC Data Factory, which constitutes a common framework in which EMIR and other instruments can be used. The DRP status can be accessed through the GTC generic tool Inspector. The EMIR DRP is coded following GTC programming and software standards, under an object-oriented architecture. Some of the feature included are: check and quality control procedures, on line help and documentation, error propagation is considered and the reduction process is fully automatic.

The procedure followed by the DRP to reduce direct imaging is described here. The raw science images are corrected from dark and flat-field. The corrected science images then enter a iterative process where they are combined to obtain a sky flat-field; in this step a object mask is used to avoid including data from the objects in the sky flat-field (initially this mask is empty and it is updated in each iteration). The science images are then corrected from the computed sky flat-field. In the next step, the sky background in each image is computed and subtracted. The frames are combined to produce a first-iteration result image and an object mask is produced. The mask is used to refine the sky flat-field obtained in the previous step. The pipeline goes through these steps until convergence is achieved. Usually four iterations are needed. Figure 1 shows the result of different steps of processing.

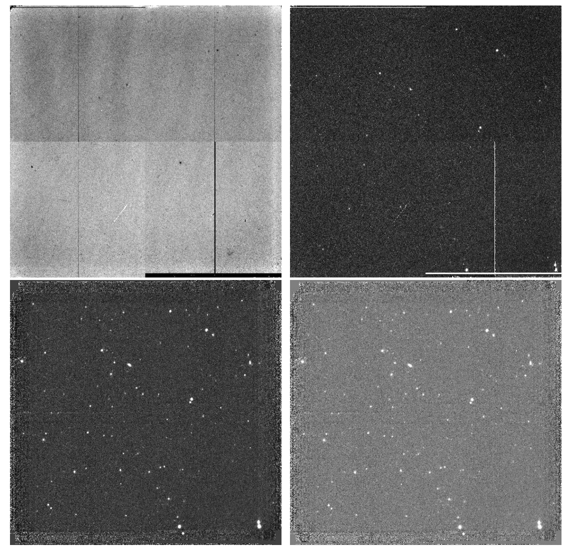

Fig. 1. From top to bottom and left to right, a raw frame, frame corrected from dark and flat field. The two images on the bottom are obtained combining the complete set of frames. On the bottom left, the image is the result of the first iteration of the process. On the right, the final image obtained after four iterations, using with a full object mask to remove the contribution of the objects to the sky background.

The presented prototype is currently under development. Improvements in different steps are planned to be included before the final pipeline is finished. The pipeline for the spectroscopic mode will be implemented after the direct imaging pipeline is finished.

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REFERENCES

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