RevMexAA (Serie de Conferencias), **42**, 126–126 (2013)

MEGARA DETECTOR TEST BENCH AT LICA-UCM

S. M. Tulloch,[1] M. L. García-Vargas,[1] M. Maldonado,[1] J. Zamorano,[2] A. Gil de Paz,[2] J. Gallego,[2] E. Carrasco,[3] J. M. Vílchez,[4] and F. M. Sánchez-Moreno[5]

LICA (Laboratorio de Instrumentación Científica Avanzada) is an initiative of the Campus de Excelencia Internacional of UCM. Among the facilities within LICA, a new laboratory has been assigned to MEGARA project for subsystem tests and AIV. This paper presents the current facilities installed at LICA for detector characterization, which will be used to test and characterize MEGARA detectors.

The LICA laboratory is sufficiently well equipped to carry out a wide range of integration and testing tasks associated with cryogenic optical detectors. It contains a 2.5 × 1.5 m optical table, half of which is occupied by a CCD test bench capable of providing flat-field illumination and artificial star images as well as the projection of test patterns. At the heart of this system is a programmable light source based on the Oriel Cornerstone 260 monochromator. A PC running LabView controls this monochromator and two filter wheels associated with it. A 20W quartz-halogen lamp provides the broad band input. Any desired illumination wavelength between 370 and 1000 nm can be selected using the LabView GUI. Figure 1 show the monochromator light source. Flat field illumination is obtained by passing the monochromator output through an Oriel integrating sphere. This sphere has an internal baffle that allows the exit port to be placed in-line with (i.e. 180° away from) the entrance port. This simplifies the design of the optical bench and makes the most of the limited space available. The CCD under test needs to be placed 1m distant from the integrating sphere to improve the illumination uniformity. This space is occupied by a 1m long optical rail on which additional optical elements can be placed. By placing a pinhole aperture over the spheres exit port and then mounting two optical doublets on this rail, an artificial star image can be projected onto the CCD. This optical delta function is extremely useful for diagnosing charge transfer problems within the CCD.

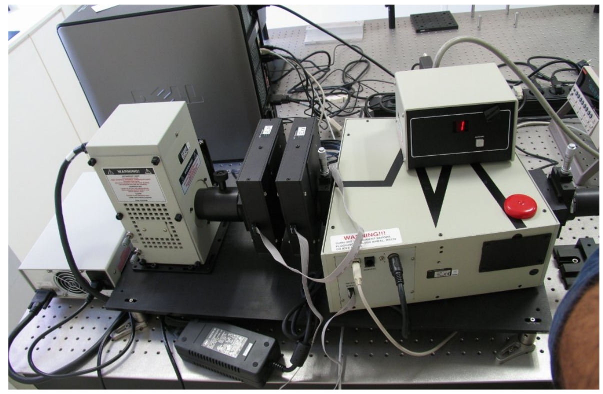

Fig. 1. The monochromator, light source and filter wheels that form the heart of the CCD test bench.

Quantum efficiency (QE) measurements can also be performed in "diode mode" where the CCD is operated as if it were a simple single-element photodiode and its current measured using a Keithley 6845 Picoammeter. The CCD current is then compared with that generated using an NPL-calibrated Hamamtsu photodiode to yield the CCD's QE.

In order to progress with the LICA laboratory in the absence of the final MEGARA science CCDs it was decided to build two test cameras using a 4k × 4k pixel E2VCCD230. This CCD is almost identical to, although much cheaper than, the proposed science device (it is thick, front-side illuminated and in a ceramic package) and will allow us to both commission the CCD test bench and to develop MEGARA detector cabling and data acquisition system software well in advance of science-CCD delivery. The first of these cameras has already been built. It is of a simple, un-cooled design and has allowed verification of the proposed MEGARA cabling and controller code. Its IMO design allows imaging at room temperature, although with high levels of dark current. The second camera will be built in an IR Labs cryostat and cooled to 170K using the Cryotiger cooler. It will permit higher-quality imaging and full commissioning of the CCD test bench.

The laboratory also contains a Pfeiffer HiCube80 turbo-pump, a 2-channel Lakeshore 325 temperature controller, a Pfeiffer vacuum gauge, an ARC CCD controller and the UCAM data acquisition system.

[1]FRACTAL SLNE, Madrid, Spain (smt@qucam.com).
[2]UCM, Madrid, Spain).
[3]INAOE, Mexico.
[4]IAA, Granada, Spain.
[5]UPM, Madrid, Spain.