

Telescope off-axis Guiding with EMCCD Camera

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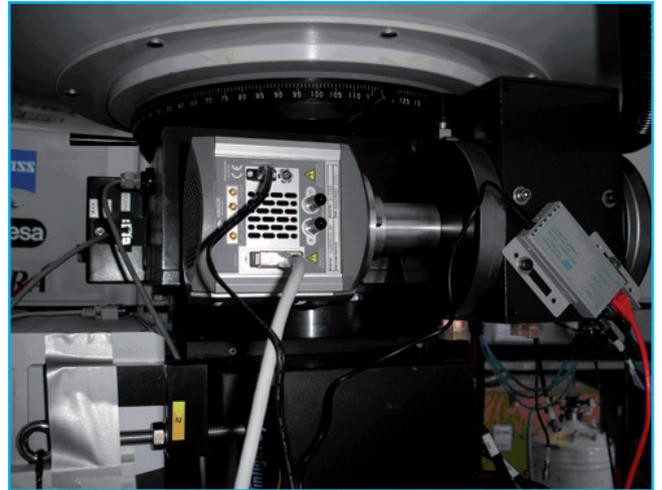
Application Note

Introduction

For stable tracking of celestial objects with telescopes off-axis guiding cameras are being used. The off-axis guiding camera must be capable of detecting a star anywhere in the telescope's field of view (FOV) and determining its position on the CCD. The star's position is then stored in a computer and any deviations in the position are fed-back to the tracking computer of the telescope. Thus, the off-axis guiding camera must have a high dynamic range and must be extremely sensitive to always detect a guide star in a small field of the sky.

The Off-Axis Guiding Camera of ESA

In ESA's optical ground station in Tenerife the Andor EMCCD camera iXon DV885 JCS-VP is used for off-axis guiding. It is attached to the Richey-Chretien (RC) focus of a 1-meter diameter telescope located on Tenerife, Canary Islands, Spain. The RC focus is equipped with an RC-controller, basically a small pick-off mirror on a motorised x,y-table used to pick-up a star within the 45 arcmin FOV of the 1-meter telescope. The FOV imaged by the mirror onto the guider camera is only a couple of arcmin in diameter, while with 13.3 meters focal length a 45 arcmin FOV of the RC focus corresponds to an image diameter of 174 mm. The telescope and the RC-controller are shown in picture 1.

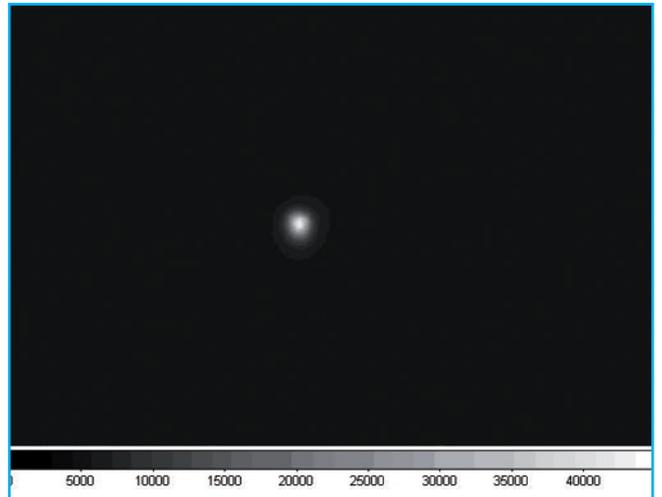


Picture 2: iXon EMCCD camera attached to the Richey-Chretien focus of the telescope



Picture 1: ESA 1-meter diameter telescope located on Tenerife, Canary Islands, Spain

While the scientific instruments (camera, spectrograph) are attached to the bottom of the RC-controller (in the centre of the FOV), the off-axis guiding camera has to pick-up a star anywhere in the outer areas of the FOV. Picture 2 shows the EMCCD camera attached to the RC-controller.



Picture 3: Typical guide star as imaged and tracked by the EMCCD camera.

In future applications the camera will also be used for the analysis of laser transmission through atmospheric turbulence in laser communication research applications.

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