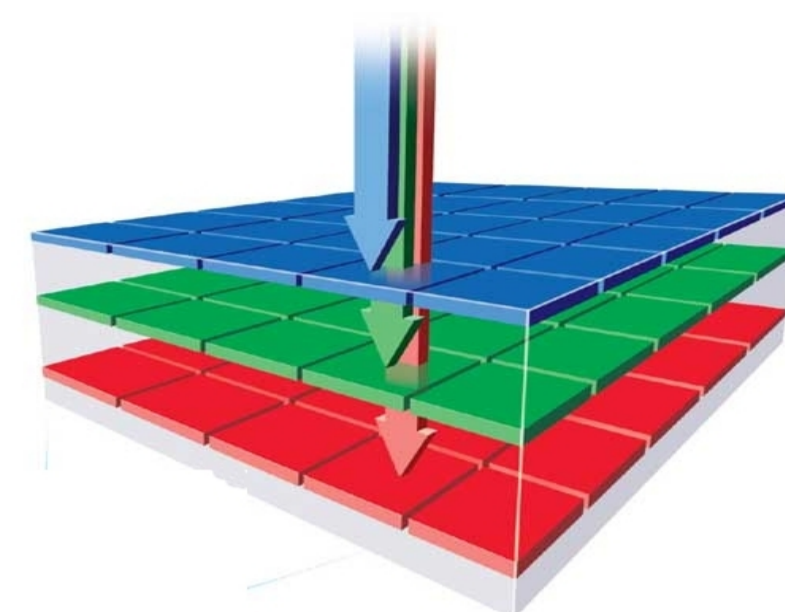
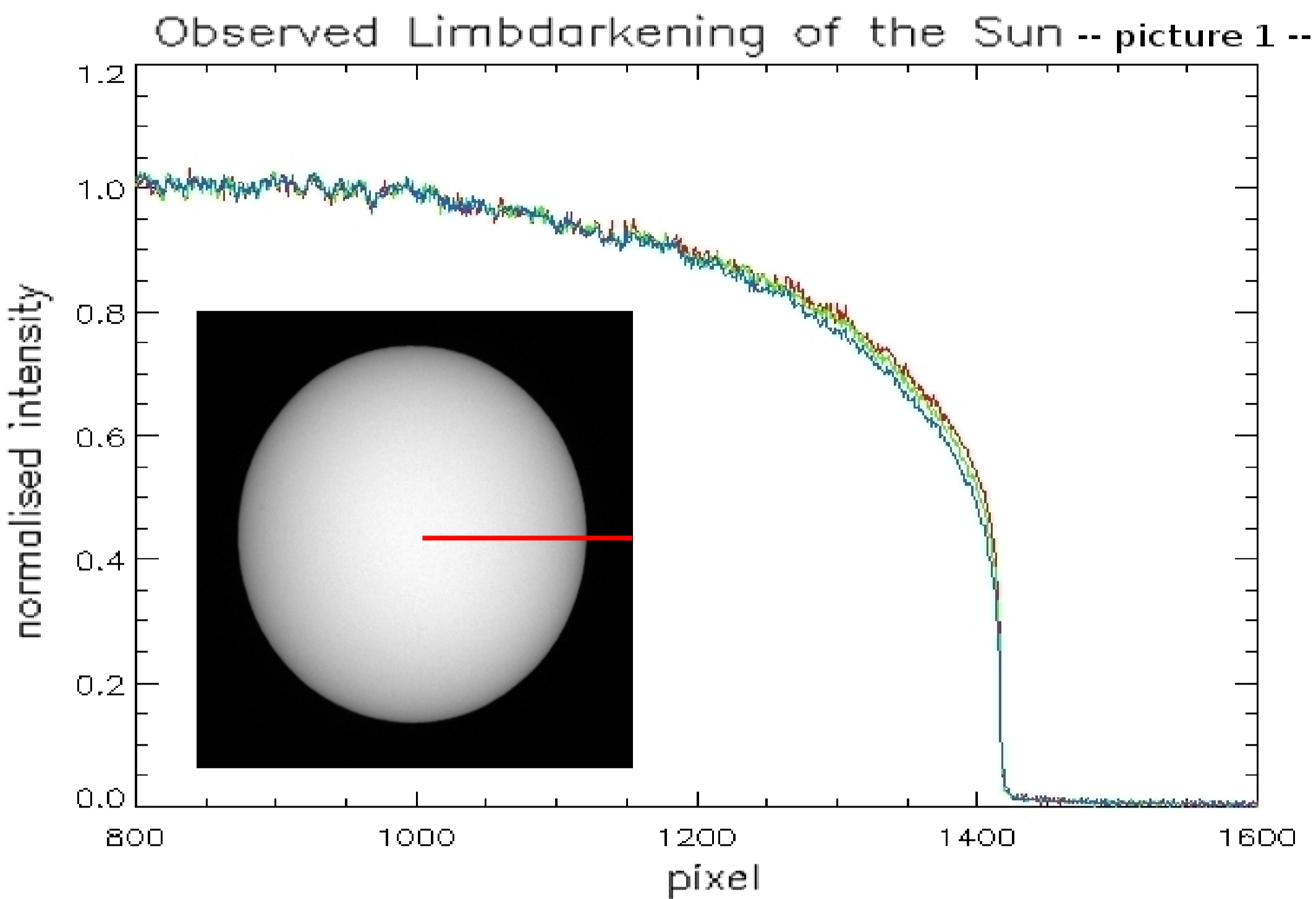


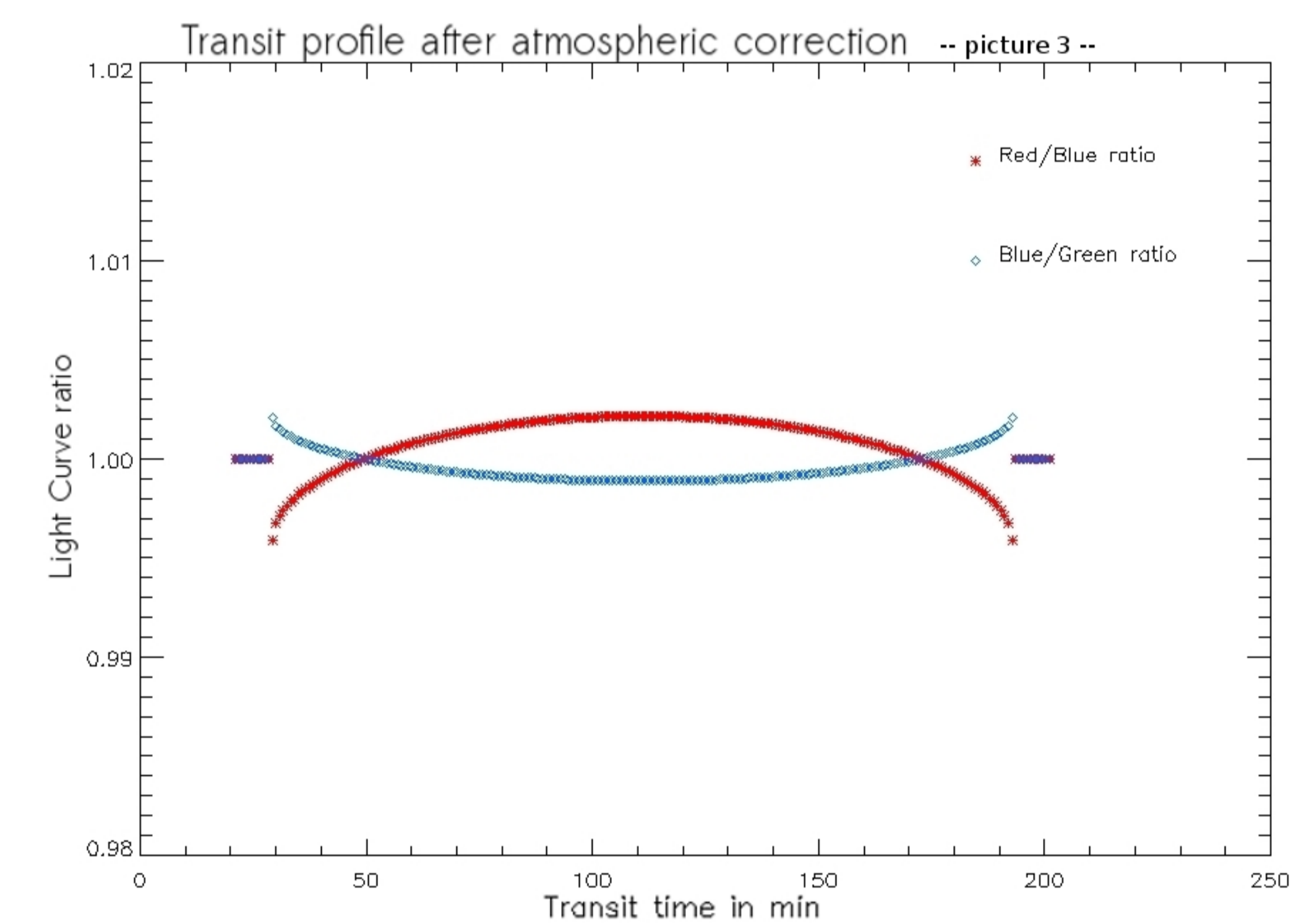
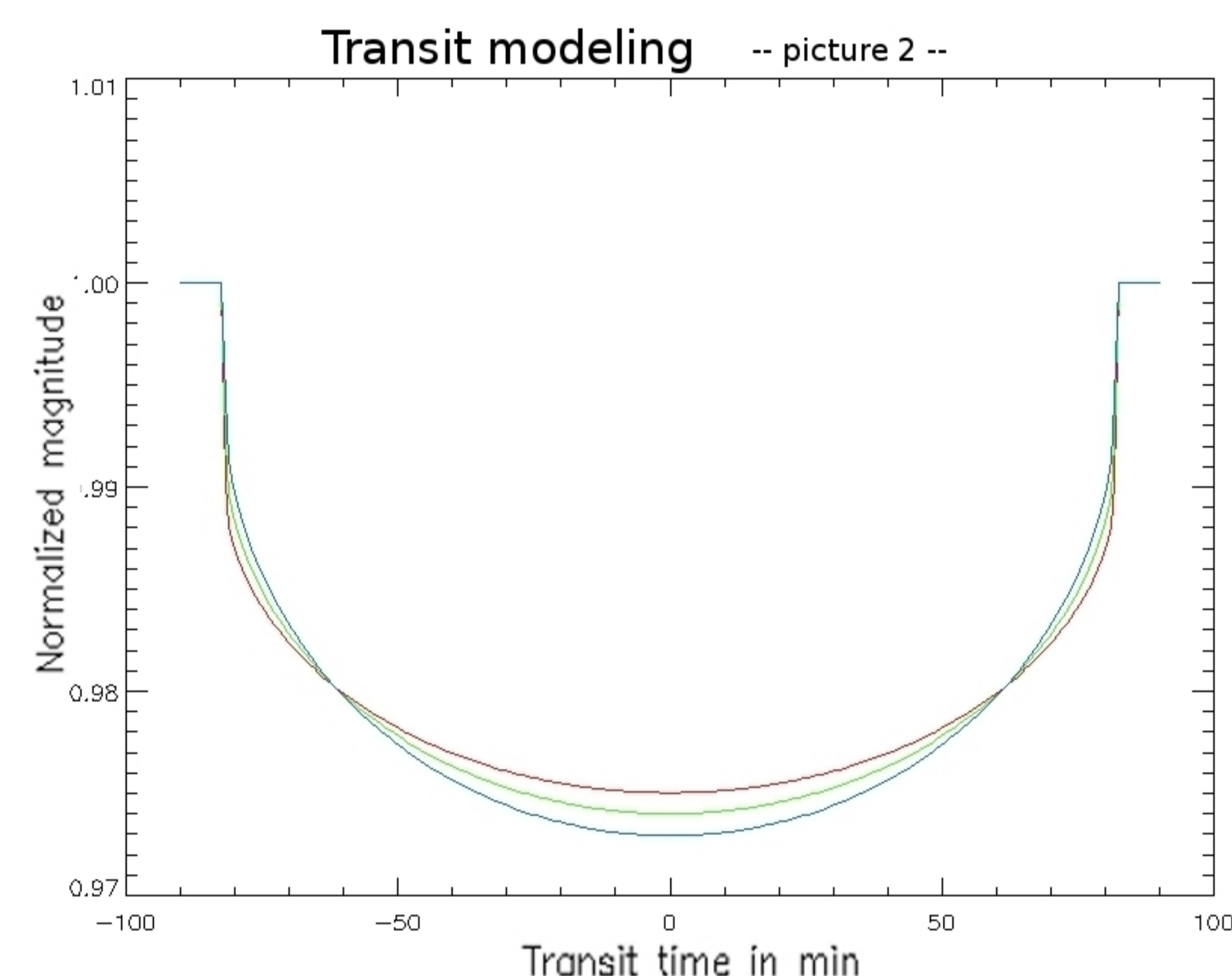
# Evaluation of the Foveon X3 sensor for astronomy

Foveon X3 is a CMOS sandwich sensor using three separate and overlapping layers for the acquisition of color images. Due to the position matching of the layers and the possibility to take simultaneously three independent images at different wavelength, this detector could be used for differential imaging and photometry on a transit planet.



Source : Foveon inc.

The sensor produces for each layer an independent image. Thus, by doing photometry on a star, we obtain, not one, but three independent light curves, one for each layer.

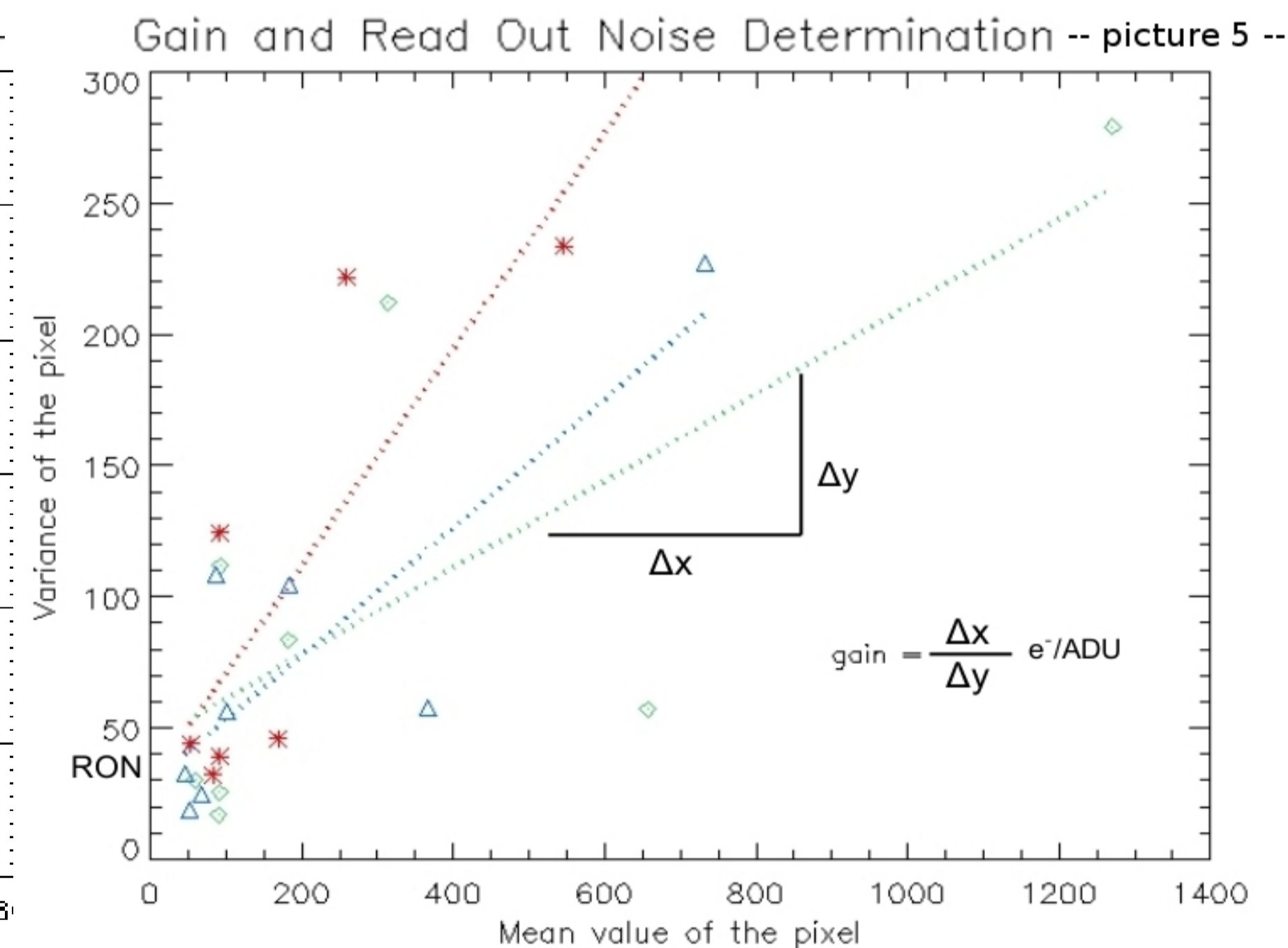
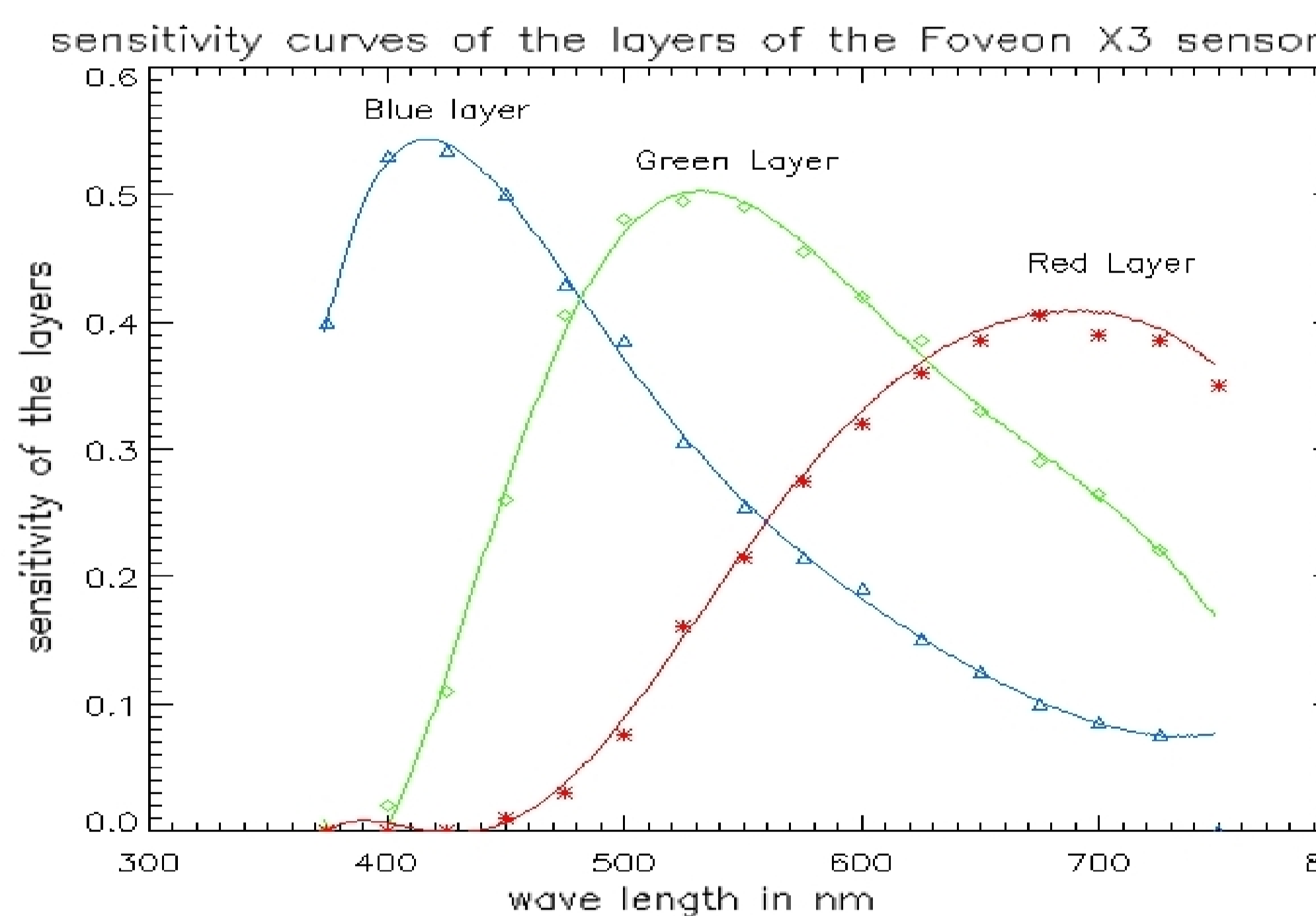


For a star with a planet, the transit light curves are affected by the limb darkening of the star (picture 2). With this sensor, it is possible to identify the atmospheric effects directly in the light curves. By dividing the light curves obtained by the layers, we obtain a new transit profile cleared of most of the color independent effects (picture 3).

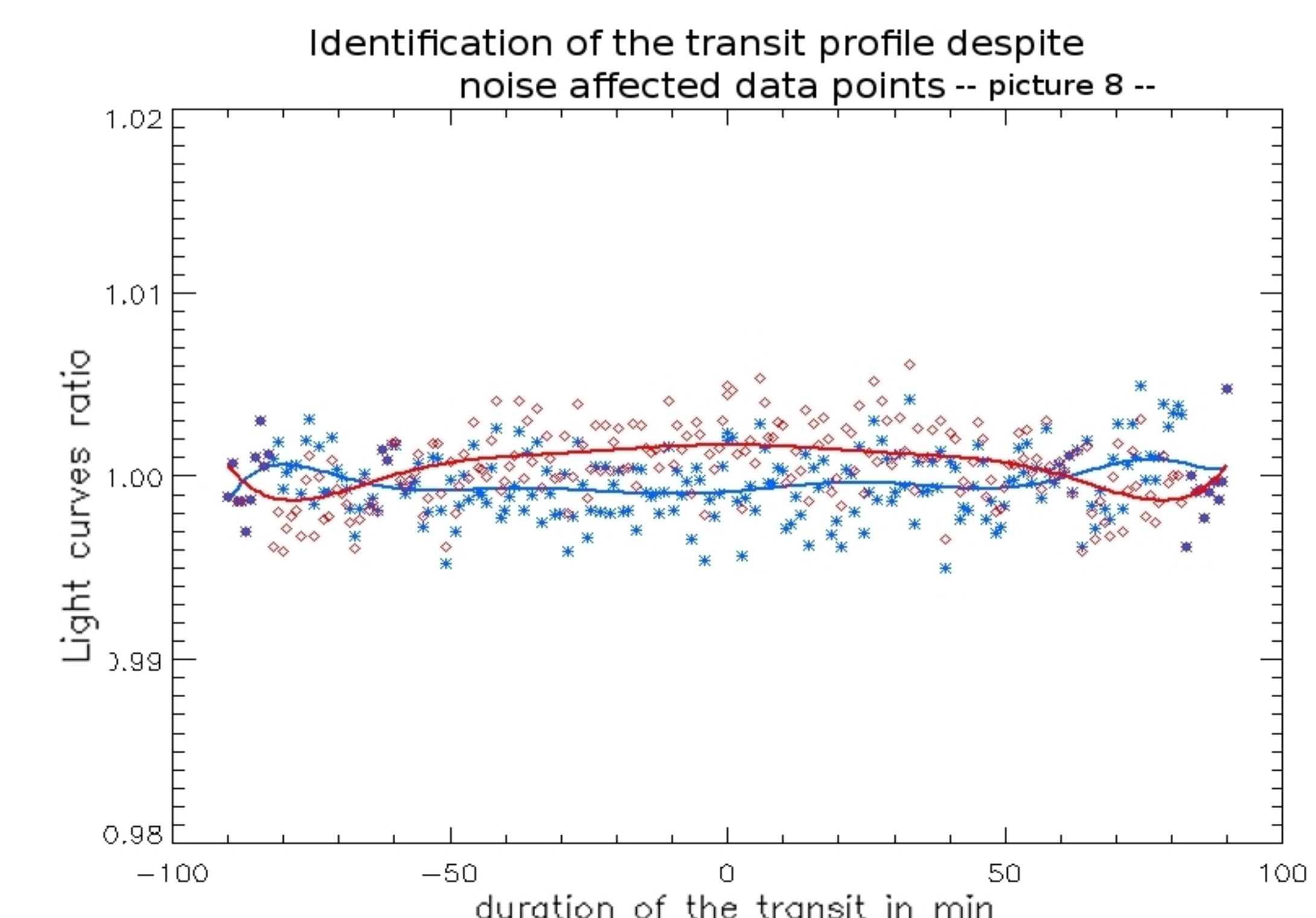
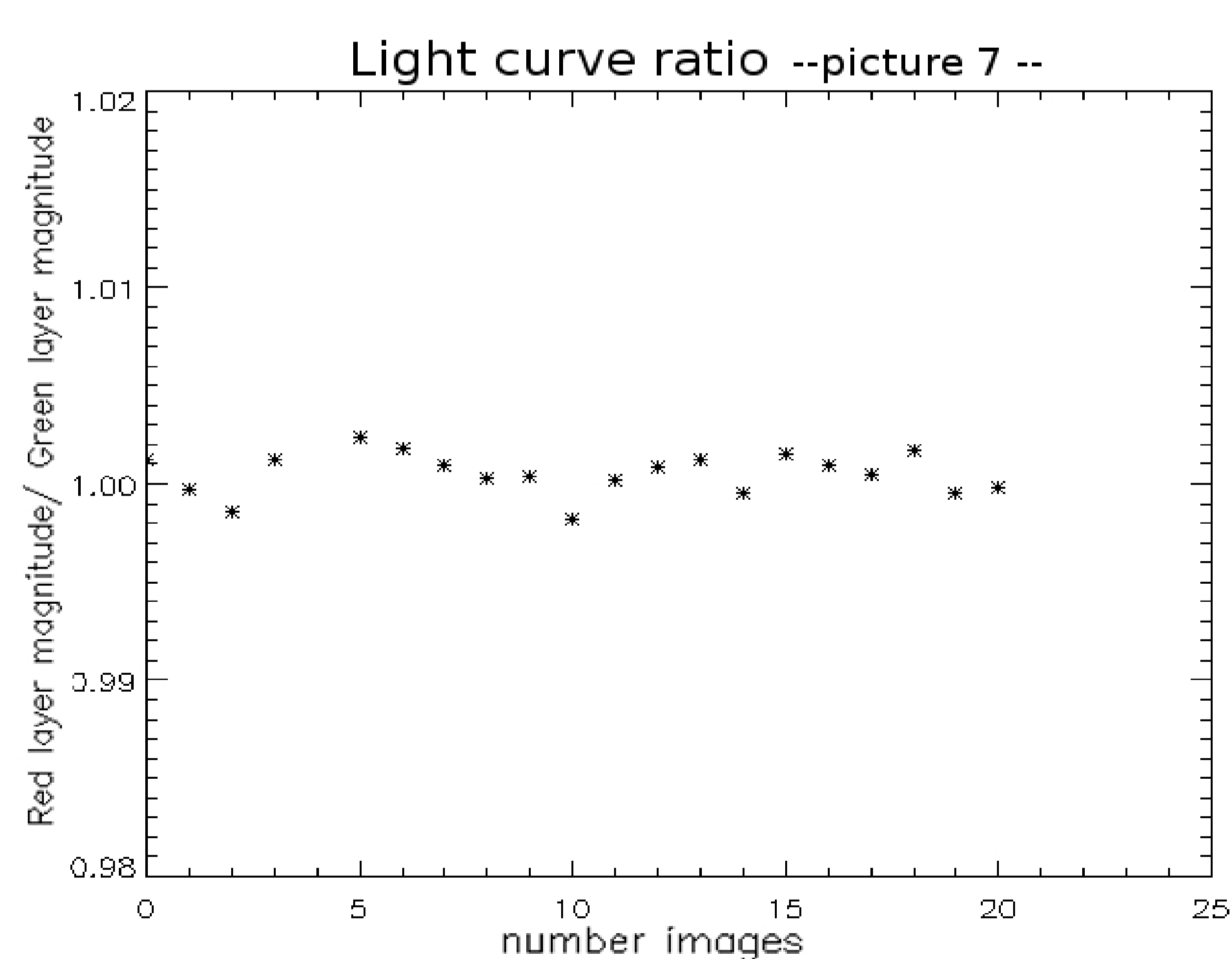
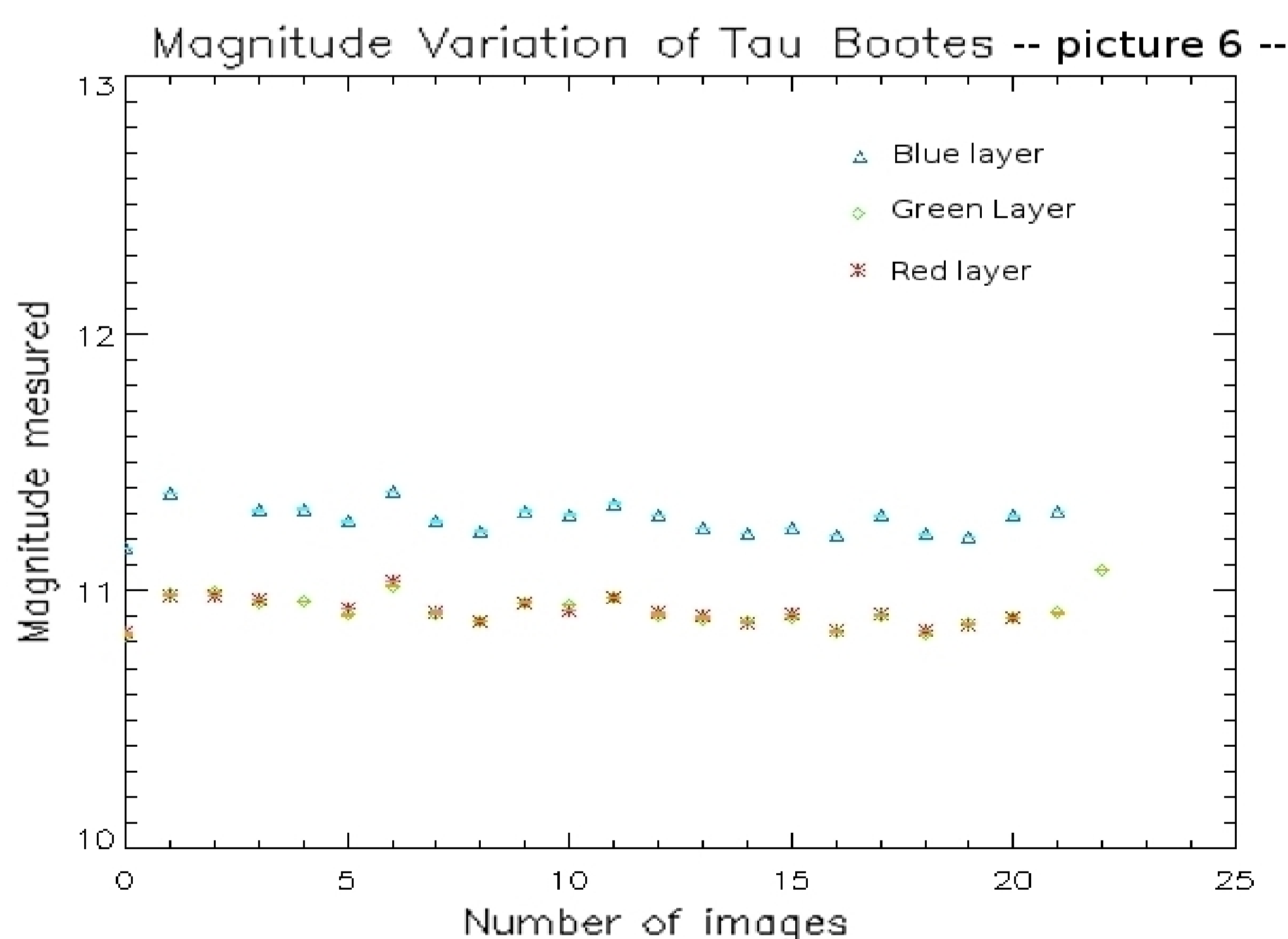
## Characterisation of the detector

The sensor was mounted in the SD14 camera. This camera is equipped with on board programs treating the images. One of these treatments was the subtraction of each image by a dark image with identical exposure time. This led to uncertainties on the Dark current and Read Out Noise determination.

Layer	Gain (e-/ADU)	Dark Current (e-/sec)	RON (e-)
Red	2.1 ± 0.7	5.5 ± 0.1	4.4 ± 0.5
Green	2.4 ± 0.8	7.1 ± 0.1	4.9 ± 0.5
Blue	3.7 ± 1.6	15.6 ± 0.3	7.4 ± 1.1



We verified that the color independent perturbations are higher than the other effects occurring during an observation of a bright star (pict. 6). These effects were then suppressed by dividing two light curves (pict. 7). The remaining variations are due to temperature and electrical instability. Despite the amplitudes of the variations seen in pict 7, it is still possible through a appropriate fitting to recover the transit profile (pict. 8)



The sensor has proved to be valid for the detection of transits, however we are confronted with the incapacity to take enough pictures during the transit due to the duplication of the exposure time by the camera. We might resolve this problem by removing the sensor from the camera, and cooling it.