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The Point Spread Function in CIS113

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GravityCam is a proposed ground based telescope capable of increasing the angular precision of measurements 3-5 fold from existing telescopes. This is achieved through the use of Lucky Imaging, whereby a large number of short exposure images are taken at a high frame rate and used to create one image, with greatly reduced atmospheric aberrations and defocus effects. This precision is necessary for measuring gravitational microlensing accurately, which GravityCam hopes to accomplish. Traditionally, a CCD would be used as the imaging sensor in such a telescope, but due to the high frame rate needed, interest has turned instead to CMOS sensors. One of the CMOS sensors under consideration is CIS113.

CIS113 was designed and manufactured by Teledyne e2v. It is back illuminated with an image area consisting of 1920x4608 16μm pixels. Each pixel contains 5 transistors, allowing global reset and correlated double sampling. The device is capable of close butting on three sides so can be used to form large arrays. It is also able to read out a large number of small regions of interest (ROIs) with a higher frame rate if needed.

In order to get an accurate measure of the gravitational microlensing, the point spread function (PSF) of the sensor must be well known. In backside illuminated (BSI) CCDs PSF uniformity is quite good. In CMOS sensors however, each pixel varies slightly due to manufacturing inconsistencies. A map of these non-uniformities must be generated. To do this, a spot of light is shone onto the sensor, with spot sizes ranging from sub-pixel to larger than a pixel. The sensor is mounted on translation stages capable of moving the spot from pixel to pixel. PSF measurements are presented at varying wavelengths, with particular interest in the near infrared.

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