Dark Energy Camera CCD and Imager Production and Testing

Dark Energy Camera (DECam) is a 520 Mpix, 3 square-deg FOV imager being built for the Blanco 4m Telescope at CTIO. This facility instrument will be used for the "Dark Energy Survey" [1] of the southern galactic cap. DECam has chosen 250 um thick CCDs with good QE in the near IR for the focal plane. We present the progress in production and testing of the detectors and focal plane assembly. We compare with the technical requirements.

"Pedestal" (Focal Plane) Package

At Fermilab we have a CCD testing facility with five testing stations; For the full focal plane we need to have 62 2kx4k devices (+ spares), for which we expect to test about 250 CCDs. We also need to produce 12 (+ spares) 2kx2k packages for Guide and Focus needs. As of December 25, 2009 we have 63 science grade 2kx4k packages that have passed all test criteria; enough to build DECam. We have 6 science grade 2kx2k packages.

"Science Grade" Detectors

So far we have found 63+ that pass all requirements and are working on building up a supply of spares. Here we show some of their characteristics.

CCDs Developed by LBNL [2].

- 250 microns thick, fully depleted
- 2 Readout channels/device
- 2k x 4k 15µm pixels. Size 31.5 mm x 63 mm
- High QE in the near infrared compared to standard astronomical CCDs.

Requirements for DECam CCDs

- Pixel array 2048 x 4096 pixels
- Pixel size 15 µm x 15 µm
- # Outputs 2
- QE Instability <0.3% in 12-18 hrs
- QE Uniformity in focal plane <5% in 12-18 hrs
- Full well capacity >130,000 e-
- Dark current <25 e-/pixel
- Persistence None worse than 2.5%
- Read noise < 15 e- @ 250Kpix/s
- Charge Transfer Efficiency < 10-%
- Charge diffusion 1D σ < 1.5 µm
- Cosmetic Requirements None worse than 2.5%
- Linearity 1%
- Package Flatness 10 microns. See Below

Summary

Production CCD packaging and testing is proceeding well. We are about 2/3 finished. So far we have 63+ devices that satisfy the DECam requirements. We are now building up a supply of spare detectors.

Some characteristics of the science grade devices are shown in detail.

We use a prototype camera to perform integration studies and operation of the CCDs, electronics, and cooling system. Construction of the production imager is nearly done.

We will test DECam using a "Telescope Simulator".