NEWSLETTER

Next generation of scientific cooled cameras launched

greateyes introduces its next generation portfolio of scientific, cooled cameras for imaging and spectroscopy. A modular camera concept allows to operate more than 30 different scientific CCD sensors within a single hardware platform. With a width of only 45mm, they are the most compact detectors in the deep cooled scientific camera segment. At readout speeds of 500kHz, they achieve a total read-noise performance of minimum 2.4 electrons per pixel.

The user can select among different models which have an excellent spectral sensitivity in the ranges of soft X-ray, XUV, VUV, UV, VIS and NIR up to 1100nm. Vacuum flanges, various optical windows, objective adapters and water cooling systems are available to full-fill demanding requirements.

Scientific cameras features	
Resolution (pixel size)	1024 x 1024 (13µm), 1024 x 256 (26µm), 2048 x 512 (13.5µm), 2048 x2048 (13.5µm)
Spectral sensitivity ranges	X-Ray up to 20keV, Soft X-Ray, XUV, VUV, UV, VIS, NIR downto 1100nm
Pixel readout frequency	250kHz- 3.0 MHz
Readout noise	Minimum 2.4 e^- rms, Typical: 4 e^- rms at 500kHz
Sensor full-well capacity	100000e^- to 500000e^-
AD converter resolution	16 bit
flanges	greateyes flange, ISO-F or CF vacuum flanges
Camera cooling	max. --60°C to -80°C depending on model, forced air or water cooling
Data Link	USB 2.0 or Gigabit-Ethernet
Interfaces	external trigger, shutter and sync signals
Binning	Fully flexible along row and column direction

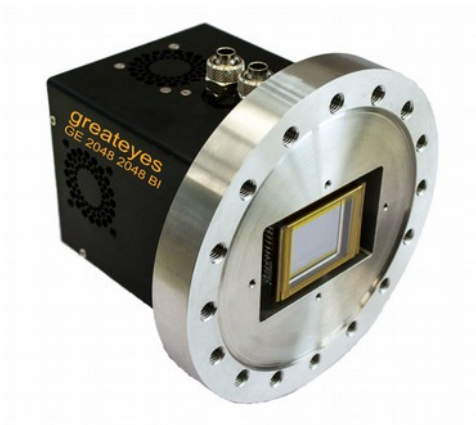
Read more :

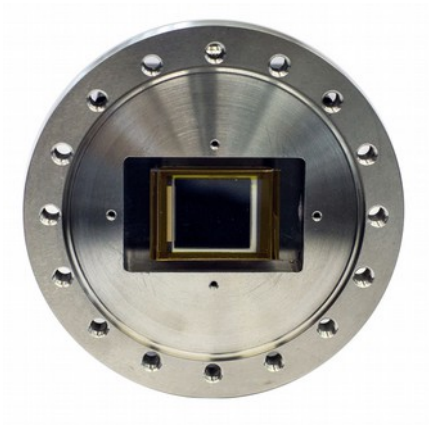
(1) Improved camera cooling subsystem

Cooling is necessary to reduce the thermal noise of the CCD sensor which otherwise becomes the dominant noise source during longer exposure times. For this purpose the sensor is integrated together with the Peltier element in a patented hermetically sealed chamber with a single optical window. The excess heat is removed by forced air cooling. Besides the improvement of the thermal design, the camera head is now equipped with an additional water cooling adapter. In this way heat can be removed more efficiently to reach deeper temperatures. Quick connect shut-off couplings, hosepipes and circulators are available together with the camera for this purpose.

Cameras are currently available with 3 and 4 stage Peltier devices. Using a 3 stage element the sensor can be cooled down to – 45^{0}C with forced air and to – 60^{0}C with water cooling. 4 stage Peltier cooling achieve -65^{0}C and -80^{0}C, respectively.

(2) Cooled, scientific cameras with 2k x 2k pixels for UV, VUV, EUV and X-Ray imaging and spectroscopy are now available





The large format detectors employ e2V CCD sensors having an image size of 27.6mm x 27.6mm, the pixel size is 13µm. The portfolio comprises several front- and back-illuminated sensors with different spectral sensitivities. The cameras are typically offered with Conflat flanges like CF DN100 or CF DN160. A temporary glass window on the CCD chip protects the image plane from being contaminated before installation take place. (As shown in the images above). The detector incorporates a three stage Peltier element reaching a cooling temperature down to – 60^{0}C maximum. Specific flange designs with additional vacuum ports for connection to UHV/HV pumps are available on request.

(3) Readout noise performance of the greateyes cameras

Readout noise is an important performance parameter of a scientific camera. It depends on the CCD sensor employed and on the readout electronics of the camera including the analog digital converter.

We measured the readout noise of the greateyes cameras by taking 30 dark frame images at a sensor temperature of -40^{0}C. The exposure time was set to 1ms and the pixel readout frequency was set to 500kHz. For all pixels of the detector the single pixel noise has been determined by calculating the standard deviation of the pixel signal across the 30 measurements. The camera gain is nearly 1 count/electron for the model under test (GE 2048 512 BI UV1).

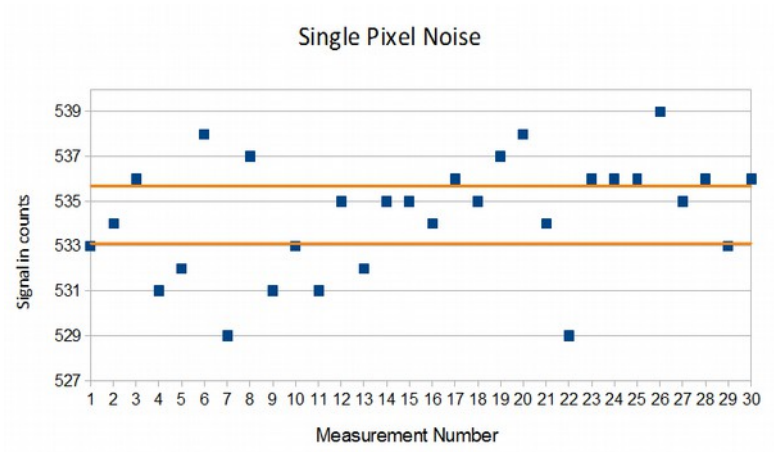


Image: Single pixel noise across 30 dark image frames. The orange lines indicate the confidence levels for 1 σ, corresponding to 2.4 counts or 2.4e^-.

In summary, the greateyes cameras achieve lowest noise levels at speeds of 500kHz. Other vendors reported similar noise performance only at pixel readout speeds below 50kHz. In comparison sCMOS cameras realize read noise values of about 1 e^- at higher speeds but there spectral sensitivity is limited. Back-thinned scientific CCD devices still achieve the highest quantum efficiencies in the UV, VUV, EUV and Soft-X-Ray ranges.

(4) Driver for camera access under Linux

For data read out and control of the camera's functionalities we are offering the greateyes Vision software package for Windows, a Labview Driver and a dynamic link library (DLL) for Windows in case the user wants to control the camera using their own software. Now, the DLL provides access to the camera also under LINUX environments and we supply an application for simple data readout & camera control.

Upcoming Exhibitions

Get in touch with greateyes and its products during the following events:

Laser Optics Berlin
Location: Berlin, Germany
Date: 18th-20th March 2014

Presentations & Product Demonstration

Currently we are offering a cost-free talk about : "Requirements for scientific image detectors". If you are interested integrate our presentation into your group meeting or related scientific event please get in touch with us.
In case you are interested to test the greateyes scientific cameras together with your application, please send an request as well.

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