Apogee
INSTRUMENTS INC

ASTRONOMY AND APOGEE

Astronomy is the foundation of our business. You can see us in Sky&Telescope, in Physics Today, and at American Astronomical Society meetings. And you'll see new astronomy products added all the time. Our cameras have been used for high-end astronomical applications like capturing the first images of optical counterparts of gamma ray bursts, plus thousands of discoveries of comets, near-Earth asteroids, and extra-solar planets. But they have also been used for the detection of fingerprints; x-ray inspection of car parts; fluorescent imaging of cell tissues; munitions testing, laser beam profiling, Raman spectroscopy; poacher surveillance, mammography; optics testing, and searching for a lower-cost means to detect anthrax. By expanding into other markets with other demands, Apogee has had to confront many technological hurdles that were not previously considered to be "astronomical" problems. For example, life science markets want SPEED....but as it turns out, our astronomical customers were quite frustrated with long readout times. Improvements created for life science became best sellers in astronomy. Less time waiting for readout means more images per precious cloudless night.

TIM PUCKETT, ASTRONOMY SALES MANAGER

Tim with Gene Shoemaker at Tim's workshop in Georgia.

Our Astronomy Sales Manager, Tim Puckett, currently operates a supernova search patrol. Puckett uses custom software to keep track of all the telescopes in the network to avoid overlap and to optimize output. To date Puckett has taken more than one million images in the search, and discovered more than 200 supernovae. Tim's photos of comets and deep-sky objects have been published in books and magazines in 25 countries. His work has also been featured on ABC, NBC, CBS, FOX, CNN, BBC, The Discovery and Learning Channels and Good Morning America.

N7000. Tim Puckett & Adam Block. Alta U9 camera, Televue 180 telescope.

Tim Puckett
Astronomy Sales Manager
Apogee Instruments Inc.
1020 Sundown Way, Ste. 150
Roseville CA 95661 USA
tel 916 960 9885
fax 916 218 7451
tpuckett@ccd.com

www.ccd.com

FREE CD/ POSTER

Our 24-page astronomy brochure, plus complete set of camera data sheets as well as mechanical drawings are on our website, www.ccd.com, or on our Integration Starter Kit CD, available on request. Also available on request is the poster to the right (18" x 24").

NGC 3031 and Arp's Loop. Image courtesy of Jay Gabany.
Apogee Instruments Alta U16M (4096 x 4096) camera.
RC Optical 20" Truss Telescope.
AstroDon E-Series Filters
Blackbird Observatory, New Mexico

ASTRONOMY / PHYSICS
Spring 2010

Apogee
INSTRUMENTS INC

1020 Sundown Way, Ste 150
Roseville CA 95661 USA
tel 916-218-7450
fax 916-218-7451
http://www.ccd.com

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NEW PRODUCTs

ALTA CAMERA SYSTEMS

Alta cameras integrate the best of the best in imaging components: from back-illuminated CCDs to front-illuminated CCDs to interline transfer CCDs. We know their strengths and weaknesses from first-hand experience. We can guide you to the best trade-offs between price and performance--or we can show you the best of the best if you're done with compromise...

- 5 MHz 12-bit and 1 MHz 16-bit digitization
- 32Mbyte camera memory
- USB 2.0 interface: no plug in cards or external controllers
- Programmable, intelligent cooling to 75°C below ambient
- Standard, High Cooling, Low Profile, and Wide Angle housings available
- Fan or liquid circulation heat transfer
- Binning up to 8 Horizontal x Height of CCD (up to 4095)
- Subarray readout and fast sequencing modes
- Precision time delayed integration (TDI) and kinetics mode readout
- Programmable fan speed for low / zero vibration
- Two serial port outputs for control of peripheral devices
- General purpose programmable I/O port
- External triggering and strobe controls
- ActiveX drivers included with every system
- Field upgradeable firmware
- Fused silica windows with MgF2 coating both sides (optional BBAR)
- Runs from single 12V supply with input voltage monitor
- Compact enclosure
- Programmable status indicators
- Two year warranty with lifetime guarantee against condensation

M16 image courtesy Jim Wood and
Emanuele Colognato.
Alta U42 Camera, Lightbuckets RCOS 0.61m
RC telescope.

FEATURED PRODUCTS

ALTA U16M

The U16M is partly new product and partly dramatic change in Kodak's pricing of an old standby for huge field-of-view. Kodak has added anti-blooming and microlenses, maintaining most of the quantum efficiency of the old U16.

U16M
Kodak KAF-16803
4096 x 4096
9 micron pixels
36.9 x 36.9 mm
1359 mm2
Full Well: 85K e-

U9000
Kodak KAF-09000
3056 x 3056
12 micron pixels
36.7 x 36.7 mm
1346 mm2
Full Well: 110K e-

ALTA U9000

For those with medium focal lengths, the new 12 micron format is a great fit for large field of view. The U9000 also sports twice the full well capacity of the interline 11000, higher quantum efficiency, and much lower dark current. The 300X anti-blooming is ideal for astrophotography.

HIGHEST QUANTUM EFFICIENCY BACK-ILLUMINATED CCDs

ALTA U47

e2v CCD47-10
1024 x 1024
13 micron pixels
13.3 x 13.3 mm
177 mm2
Full Well: 100K e-

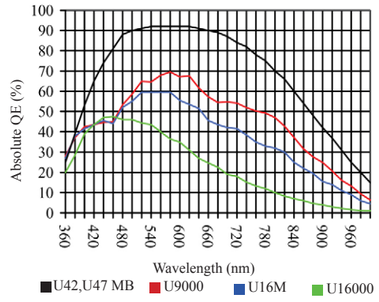
ALTA U42

e2v CCD42-40
2048 x 2048
13.5 micron pixels
27.6 x 27.6 mm
764 mm2
Full Well: 100K e-

Back-illuminated CCDs have long been the ideal research instruments of the astronomy community. Their exceptional sensitivity and low readout noise make them ideal for minimizing exposure time and maximizing signal-to-noise in low light applications like astronomy.

www.ccd.com

Quantum Efficiency:
U42, U9000, U16M, U16000



ALTA U230

e2v CCD230-42
2048 x 2048, 15 micron pixels
30.7 x 30.7 mm
944 mm2
Full Well: U230: 150K e-

This large-format back-illuminated CCDs has a somewhat larger pixel size than the CCD42-40 in the U42 camera.

ALTA U16000

Kodak KAI-16000
4872 x 3248
7.4 micron pixels
36 X 24 mm
867 mm2
Full Well: 40K e-

Kodak's newest large format interline transfer CCD shares the 35mm film format with the KAI-11002, but with lower noise and lower dark current. Smaller pixels are an ideal match for large fields of view on shorter focal length telescopes.

ALTA U8300

Kodak KAF-8300
3326 x 2504
5.4 micron pixels
18 x 13.5 mm
243 mm2
Full Well: 25.5K e-

The U8300 is an ideal low cost camera for short focal length telescopes. The CCD is available as monochrome or color.

NEW DEEP COOLING HOUSING

Apogee is pleased to announce an optional, deeper cooling housing, called the D09, that provides cooling to as much as 75°C below ambient without liquid circulation. A wide variety of sensors are supported, including large format and spectroscopic format CCDs.

Blue boxes are actual size of imaging CCD imaging area. For comparison, this is the size of a Kodak KAF-0402ME:

M82. Image courtesy Greg Morgan.
U16M camera, RC Optical 12.5" f/9 scope.
Software Bisque Paramount ME
Astrodon LRGB filters
Sierra Remote Observatories, California

ALTA U43

Kodak KAI-4320
2048 X 2048
24 micron pixels
49.1 X 49.1 mm
2416 mm2
Full Well: 500K e-

This large format Kodak CCD has a huge field of view as well as very deep full well capacity.

ALTA U1109

Hamamatsu S10140-1109
2048 x 512, 12 micron pixels
24.6 x 6 mm (149 mm2)
Full Well: 75K e-

This TDI / spectroscopic format back-illuminated CCD has exceptional QE across the visible and deep into the ultraviolet at a very affordable price point.

NEW HOUSINGS

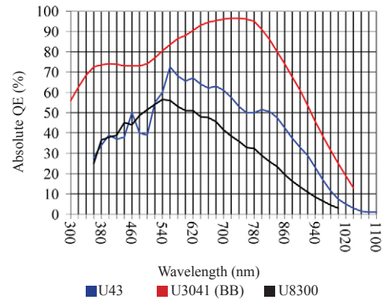
Apogee now offers two new variants for our housings, the Wide Angle and the Low Profile. Wide Angle housings move the CCD close to the front of the camera and widen the entrance aperture to allow for very fast beams. The Low Profile variant moves the CCD to about 12mm from the front of the camera. For the largest CCDs like those in the U230, U3041, U43, and U22C, the Wide Angle variant includes an internal 90mm shutter. The other Wide Angle and Low Profile variants do not have internal shutters.

ALTA U3041

Fairchild CCD3041
2048 x 2048, 15 micron pixels
30.7 x 30.7 mm
944 mm2
Full Well: 100K e-

This large-format back-illuminated CCD is available with either a broadband or UV coating. The UV version has exceptional QE in the deep UV.

Quantum Efficiency:
U43, U3041, U8300



ALTA FILTER WHEEL

Apogee offers an optional filter wheel for nine 2" round filters or seven 2" square filters up to 7mm thick. Precise mechanical positioning is provided for photometric applications.
The filter wheel is controlled via USB. The filter wheels can be used independent of Apogee cameras.

CAMERA DATA SHEETS

The cameras featured here are just a few of many systems that we offer. For a complete listing of our products, our 24-page astronomy brochure, and all data sheets and mechanical drawings, please visit www.ccd.com.