

Apogee Imaging Systems Alta F42 CCD Camera with Back Illuminated EV2 CCD42-40 Sensor

- The **Apogee Alta F42 CCD Camera** has a back-illuminated full frame 4 megapixel EV2 CCD42-40 sensor with very high quantum efficiency. Midband, broadband, and UV-enhanced versions of the CCD are available.
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- Ideal for applications requiring large field of view, such as ideal for biological science OEMs, astronomy, and spectroscopic imaging.
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- The **Apogee Alta F42 CCD Camera** includes Apogee TE cooled camera head, CCD, 5m cable, international power supply and ActiveX driver.

Apogee Alta® F Series

Faster readout speeds, Alta reliability

The Apogee Alta® F Series represents the next step in the evolution of the Alta line of cameras with faster readout speeds. The Alta line continues to support a wide variety of front-illuminated, back-illuminated and interline transfer CCDs. All Alta systems are backed by a 2 year warranty on the camera and lifetime warranty on the CCD chamber integrity.

Apogee's Alta Camera Series focuses on quality and reliability so you can focus on innovation and discovery. Every Alta camera includes a lifetime warranty against condensation in the inner chamber, and a two year parts and labor warranty, including the CCD.

Apogee Alta F Series Highlights...

- 1 to 8 MHz 16-Bit digitization
- 32 MByte camera memory
- Field upgradeable firmware
- USB 2.0 interface
- Resolution from 512 x 512 to more than 39 megapixels
- Wide variety of CCD architectures
- Free / open source driver for MicroManager / Image J software
- No plug in cards or external controllers
- Runs from single 12V supply
- Subarray readout and fast sequencing modes
- 32/64 bit ActiveX drivers included with every system
- Programmable cooling to 65C below ambient
- General purpose programmable I/O port
- Adjustable fan speed for low/zero vibration
- Programmable status indicators
- AR coated fused silica windows
- RBI pre-flash
- Maintenance free chambers - No desiccant plugs required
- Liquid cooling option
- Precision locking filter wheels optional

About E2V Technologies CCD Array...



E2V is a leading CCD supplier, delivering high sensitivity imaging devices through very low read noise output amplifiers and the use of back-illumination for high quantum efficiency. e2v also delivers high speed and high resolution devices through the use of multi-polysilicon and multi-metal level technology. Partial customisation and full custom CCD design and manufacturing services are available, to optimally match device characteristics to system performance. Let's take a look at how each model varies...

Pixel Size - The selection of pixel size is a balance between basic performance parameters. Smaller pixels will give increased resolution, assuming that resolution is not limited elsewhere in the system. As the pixel size decreases, well capacity (the amount of charge that can be stored in a pixel) and the overall dynamic range decrease. As well as having a higher dynamic range, larger pixels gather more photons and hence may improve overall system sensitivity in light-starved applications. However, larger pixels also accumulate more dark current per pixel and a lower operating temperature may be necessary to offset this effect.

Number of Pixels - This is determined by the active area and the pixel size. The number of pixels required for a given application may be limited by the readout time needed. Increasing the readout frequency will increase the read noise and may limit low signal performance. By reading out through multiple outputs, the frequency per output and hence the read noise may be reduced while maintaining the readout time.



Output Amplifier Type - Several different types of output amplifier designs are used on e2v CCDs. The Very Low Noise (VLN) amplifier is optimised for the lowest possible read noise performance at slow scan speeds. The VLN amplifier can have a noise floor as low as 2 electrons. The Large Signal (LS) amplifier is optimised for high output node capacity to maximise dynamic range at slow scan speeds. It typically has a somewhat higher noise floor than the VLN amplifier. The High Speed (HS) amplifier is optimised for low noise at speeds of 10 MHz or higher. Very high speed amplifiers are also used for 40 MHz data rate. The dental CCDs use a moderate speed output amplifier with an integral sample and hold (S+H) to minimise the drive circuitry needed outside the CCD and to drive the long connection cable. The L3Vision devices utilise a HS amplifier and a unique gain register that multiplies signal electrons, allowing signals to be read at high speeds with our effective total noise (including CCD44-82 amplifier noise) less than 1 electron.

The enhanced process in combination with e2v's AIMO (Advanced Inverted Mode Operation) device design is only available on smaller sensors so that high row shift rates may be maintained. Larger sensors are available with the enhanced process, but only of the NIMO (Non-IMO) type. Back-thinned devices are supplied with an anti-reflection coating, optimised for a particular wavelength, as shown in the Quantum Efficiency (QE) curves. Not all coatings are available for all types of chip, except to special order. Other coatings are available upon request.

TDI (Time Delay Integration) - TDI architectures have been developed with multi-output features to improve signal-to-noise ratio, especially for high speed and high resolution applications.

TE Cooled Package - E2V offers an integral thermo-electric (TE) cooled package option for several devices. The solid-state TE (or Peltier effect) cooler can cool the device up to 40° Celsius below ambient temperature. The package has a 36-pin DIL (dual in line) format with a sealed window - a good option where space is at a premium and

moderate cooling is required.



Anti-Blooming - Anti-blooming is a device feature that removes excess charge from a CCD when it is overexposed. This feature is essential in TV devices where the light level is not well controlled. Anti-blooming reduces the well capacity and is therefore not normally used in scientific devices. Depending on device design, anti-blooming may be either fixed or gated. Fixed anti-blooming is easier to operate, but is inflexible since overexposure handling and well capacity are fixed by design. Gated anti-blooming may be set to operate at a given level of charge and may also be used to clear charge from a device prior to image exposure. Antiblooming is not currently available with the IMO or AIMO option, except on select L3Vision sensors.

IMO (Inverted Mode Operation) - IMO (also known as MPP or multi-phase pinned) devices have a modified structure which, when used in conjunction with the correct clock sequence and operating voltages, reduce dark current by a factor of at least 100. The reduction is due to suppression of dark current generated at the silicon-gate insulator interface. However, this reduction in dark current is at the expense of a reduction in well capacity. e2v's advanced IMO (AIMO) structure maximises this loss in well capacity to typically 66% of that of a standard mode device (depending on pixel size). IMO or AIMO devices are generally used when medium to long integration times are required at high to medium temperatures, typically in systems with no cooler or a thermo-electric (TE) cooler. IMO and AIMO devices are not currently available with deep depleted or anti-blooming options (except on select L3Vision sensors).



Back-Thinning - This is the process by which a front-illuminated CCD is mounted upside down on a support substrate and the bulk silicon is removed to allow the incident photons to reach the sensitive pixel wells unimpeded by intervening gate structures and insulators. Back-thinned devices have much higher quantum efficiency than standard (front illuminated) devices. At UV and soft X-ray wavelengths, back-thinning will provide the highest quantum efficiency of any technology available today. Back-thinned devices are generally used in light-starved applications where a high signal to noise ratio is needed at very low light levels. Back-thinned devices are available with either the basic thinning process or for better UV quantum efficiency the enhanced (or "astro") process. For most applications, the basic process is the best type to use, and combines the highest quantum efficiency with the lowest cost.

Lumogen Coating - Lumogen is a coating that absorbs ultraviolet (UV) light and re-emits a proportional amount of visible light that can be detected by front-illuminated CCDs. Lumogen may be used as an alternative to back-thinning or open electrode structures where UV sensitivity is required but quantum efficiency is not critical.

For more model specific information, we've provided you with very comprehensive files that you may match with the sensor numbers. You'll find these pdf files under our "Additional Images and Articles" tab listed as [E2V Sensor Information](#) and [E2V Selection Guide](#).

E2V Technologies CCD Features...

- Device active areas: Largest to date 123mm x 46mm - In principle up to 92 mm x 92 mm
- Full-frame, frame transfer, split frame transfer architectures
- Specialized readout register options with thinning and back-illumination a standard production process
- 6-inch CCD wafer production with two-, three- and four-phase CCDs
- Defined or supplementary buried channel and bi-directional gate protection structures

- On-chip light shields and open electrode structures
- Advanced inverted mode operation (also called MPP) for low, dark current
- Anti-blooming options: fixed or gated barrier and shielded drain
- Radiation hardened process, amplifier read noise $<2e^-$ and pixel rate up to 40 MHz per amplifier
- Package and test capabilities include wafer dicing, die etch, wire bonding, fibre-optic coupling and multi-chip focal plane arrays
- Customer-specific encapsulation and output connections - optional scintillator, spectral bandpass / optimisation and anti-reflective coating
- Cryogenic, thermoelectric, vacuum and room temperature testing and full range of in-house environmental testing and screening

Apogee Instruments Product Number: **F42MB-0**

