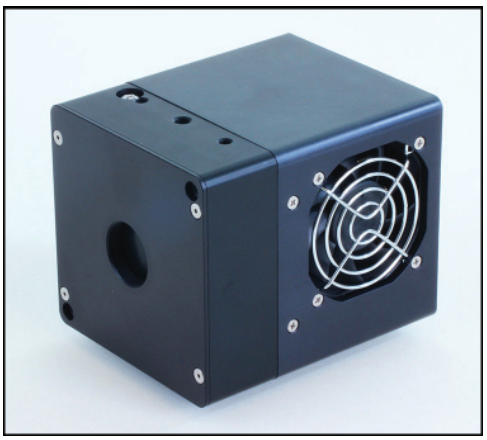
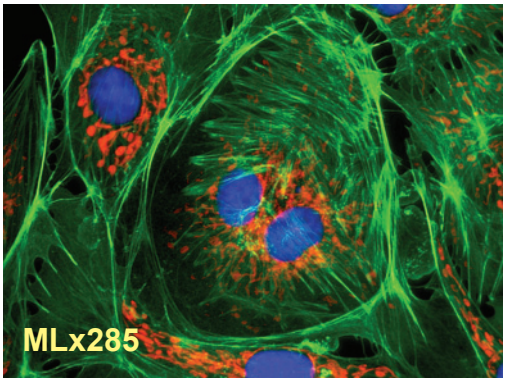
FLI™
Finger Lakes Instrumentation

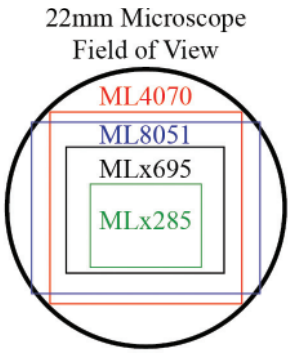
MicroLine Camera Systems

High Sensitivity Cooled CCD Cameras for Life Science

Small, lightweight housing with cooling up to 60°C below ambient
16-bit Digitization (all modes)
USB 2.0 Interface
Arbitrary Binning
Multiple Subarray Readout
External Triggering
Simultaneous Readout and Exposure
Reaches Operating Temperature in 5 Minutes







Recently Added:
9 megapixel MLx 814 with Sony ICX814:
3380 x 2704 with 3.69 micron pixels

12 megapixel MLx834 with Sony ICX834:
4242 x 2830 with 3.1 micron pixels

3 e- read noise at 1.5 MHz.

Wide Selection of Sensors

FLI supports a wide variety of sensors. Only a few of the sensors have been featured here. Please visit www.flicamera.com for a more complete listing. If you do not see what you need there, please contact us about supporting a new CCD.
FLI supports other ON Semi interline transfer CCDs such as the KAI-1050, 2050, 2150, 4050,16050 and 29050; 8670, 16070, 16000, 11002, 4022, and 2020.

MLx285

This sensor's high sensitivity and low noise make it the most popular sensor for cooled CCD imaging. Ideal for low light fluorescence applications. Deep cooling for exceptionally low dark current. Low noise 16 bit 7 MHz readout.

MLx285
Sony ICX285
1360 x 1024
6.45 micron pixels
8.8 x 6.6 mm (58 mm²)
Full well: 20K e-
5.5 e- noise @ 7 MHz

MLx695

The MLx695 offers over four times the resolution of the MLx285 with twice the field of view. Software selectable 1.7 MHz and 12 MHz digitization (optionally 2 channels at 10 MHz each).

MLx695
Sony ICX695
2750 x 2200
4.54 micron pixels
12.5 x 10 mm (125 mm²)
Full well: 17K e-
3 e- noise @ 1.7 MHz

ML8051

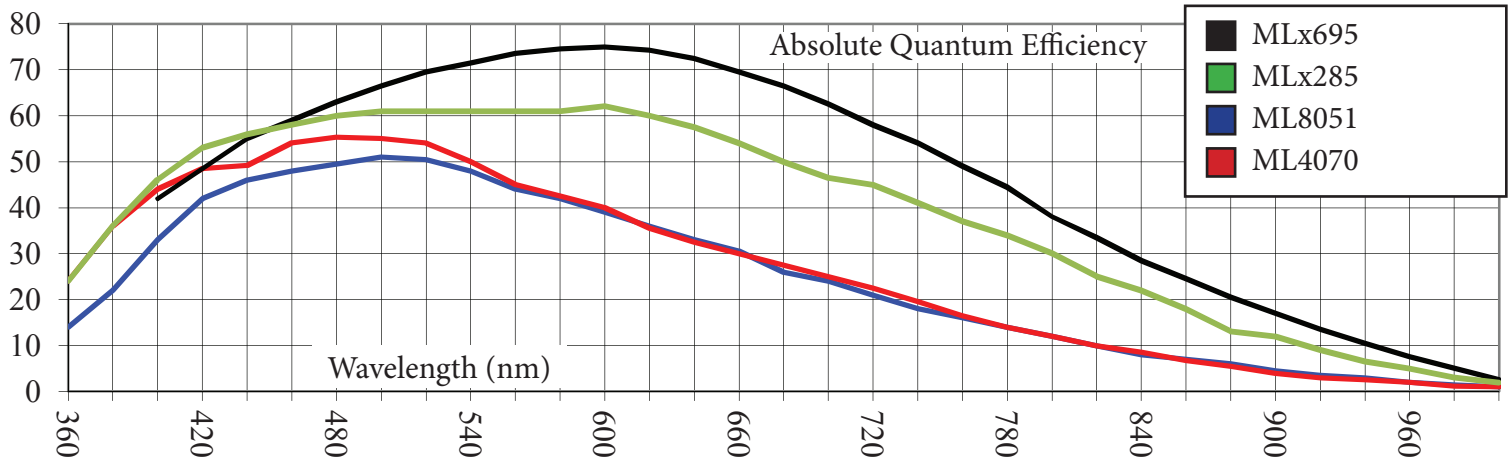
Eight megapixel resolution filling the microscope's field of view. Deep cooling for less than an electron of dark current every 10 minutes. Software selectable 1.5 MHz and 12 MHz digitization (optionally 2 channels at 10 MHz each).

ML8051
ON Semi KAI-08051
3296 x 2472
5.5 micron pixels
18.1 x 13.6 mm (246 mm²)
Full well: 20K e-
3.5 e- noise @ 1.5 MHz

ML4070

New version of the KAI-4022 with big improvement in smear rejection. Twice the dynamic range of other sensors. Software selectable 1.5 MHz and 12 MHz digitization (optionally 2 channels at 10 MHz each).

ML4070
On Semi KAI-04070
2048 x 2048
7.4 micron pixels
15.2 x 15.2 mm (230 mm²)
Full well: 40K e-
6 e- noise @ 1.5 MHz



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Frequently Asked Questions

What software can I use?
FLI cameras and high speed filter wheels are supported by MicroManager / ImageJ (free; open source). FLI cameras include a basic image acquisition program, as well as an open source driver and SDK if you want to integrate camera control into a custom environment. Windows, OS X, and Linux operating systems are supported.

Should I buy a color or monochrome CCD?
FLI offers both. Color CCDs are great for applications with plenty of light (bright field microscopy) or applications requiring simultaneous exposure of all colors. For low-light scientific applications where the image is acquired through external filters (e.g. emission filters), a monochrome CCD is the best choice.

Can I use a color CCD with my filter cubes?
A color CCD has a fixed set of filters, typically in a Bayer pattern (red-green-green-blue). If you use a blue filter (e.g. DAPI) in front of a color CCD, only one of every 4 pixels will see any significant amount of light. An 8 megapixel color sensor is not delivering 8 megapixels of red, and 8 megapixels of green, and 8 megapixels of blue. A monochrome sensor acquiring sequential red, green, and blue images using a filter wheel or filter cubes acquires the full 8 megapixels of each.

What's the purpose of cooling the sensor?
Lower noise. CCDs create charge from incoming light but also from thermal energy. For very short exposures with plenty of light (bright field microscopy), you don't notice the thermal part of the image. But for low light applications like fluorescence, you want to minimize thermally generated charge to get a better signal-to-noise ratio in the light-generated charge.

Does binning improve download speed?
Yes. Binning is the process of adding pixels together on the CCD itself to increase the signal to noise ratio. Binning 2x2 adds together 4 pixels, but does not increase readout speed by a factor of 4; rather, by a factor of about 2.

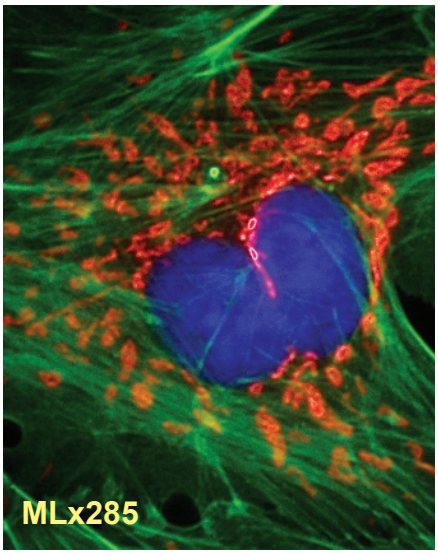
Should I use binning to speed up focusing?
For panning and rough focus, yes; for fine focus, no. Binning greatly increases the size of the pixels, which makes it harder to see if you are in focus. For fine focus, use subarray readout to increase frame rate.

Do FLI cameras have adjustable gain?
No, it is not needed. FLI's 16-bit digitization more than covers the dynamic range of the interline sensors used for low light microscopy. Cameras benefit from adjustable gain if the analog-to-digital converter has insufficient range to cover the capabilities of the sensor.

Why aren't all FLI cameras available with C-mount?
C-mount is a small aperture (1-inch / 25.4 mm) developed for small format sensors. The ML8050 featured on this flyer has a diagonal of 22.7mm. A C-mount adapter can be mounted on this camera but the corners of the sensor may not be fully illuminated.

Do FLI cameras provide a fast focus mode?
Yes. FLI cameras provide subarray readout, binning, and simultaneous readout and exposure. The actual frame rate depends on resolution of the sensor, the number of pixels being read out, and the binning factor selected.

Which CCDs does FLI support?
FLI supports over 40 CCDs, not including variations such as color versus monochrome or midband versus broadband.
Please see the chart at www.flicamera.com/ccdposter.pdf



The monochrome MLx285 is ideal for fluorescence and sequential color imaging.

FLI's High Speed Filter Wheel HS-625 with 6 positions for 25mm filters. Changes filters in as little as 23 milliseconds.