



## New Product Announcement

# QHY410C

Full Frame 35mm Format  
Back-Illuminated, Color Camera  
24.6 Megapixels @ 5.94um  
Photo and PRO Versions



### Features:

- Full Frame 35mm Format
- Back-Illuminated, 24.6 Megapixels
- 5.94um Pixel Size
- Read Noise as low as 1.1e-
- Deep Full Well, High Dynamic Range
- Low Dark Current
- Photo and Professional Models

### Full Frame, Back-Illuminated

The new QHY410C uses Sony's latest back-illuminated, full frame color sensor. The IMX410 is essentially a back-illuminated version of the sensor that used in the Nikon D750 and QHY128C cameras. In addition to BSI, the IMX410 also has larger 5.94 um pixels giving it increases sensitivity of extended objects in low light. The IMX410 is expected to be Sony's most sensitive full frame color sensor for astrophotography.

Similar in body size and design to the QHY268C, the QHY410C is available in two versions, a photographic version, the **QHY410C-PH** and a professional version, the **QHY410C-PRO**.

The **QHY410C-PH** (Photographic Version) is USB 3.0 only with 1GB DDR3 memory (32-bit data bus). It can output 15 frames per second, full resolution, 8-bit images or 7.5 frames per second, full resolution, 16-bit images.

The **QHY410C-PRO** (Professional Version) is USB3.0 plus 2 x 10G fiber optic ports with 2GB DDR3 memory. It can output 19.2 frames per second, full resolution, 16-bit images or 40 frames per second, full resolution, 12-bit images.

There is no difference in image quality between the Photographic version and the Professional version. The Photographic version QHY410C-PH is ready for delivery now. The QHY410C-PRO price and specifications will be announced in coming weeks.

## High Full Well Capacity - High Dynamic Range

One benefit of the back-illuminated CMOS structure is improved full well capacity. This is particularly helpful for sensors with small pixels. When back-illumination is combined with somewhat larger pixels, the full well capacity and dynamic range are improved dramatically. The QHY410C has a full well capacity of 120k electrons! With its low read noise this produces a dynamic range greater than 17,000:1 or more than 14 STOPS. Moreover, the dynamic range remains fairly uniform even at higher gain settings (see the graphs below).

## Low Read Noise

The QHY410C is capable of only 1.1 electron of read noise at high gain and fast readout speed. One electron of read noise means the camera can achieve a  $SNR > 3$  at only 3 to 4 photons. This is perfect performance when conditions are photon limited, i.e., short exposures, narrow band imaging, etc., making this large area sensor ideal for sky surveys and time domain astronomy. Low read noise facilitates taking more short exposures and combining them rather than needing fewer long guided exposures to get the ideal signal to noise in the final image. Short exposures allow grading of frames to be used, with the ability to discard the occasional guiding glitch instead of having a mount bump or airplane ruin an otherwise carefully guided long exposure.



## Back-Illuminated, Twice the Sensitivity of Front Illuminated Sensors

Sony's Exmor R back-illuminated technology produces sensors that Sony estimates are twice as sensitive as similar front illuminated sensors. QHYCCD tests have borne out this claim. Additionally, Sony sensors are well known for their low dark current. QHYCCD's proprietary thermal noise reduction technology and the QHY40C's dual-stage regulated thermoelectric cooling further reduce dark current to extremely low levels for clean, long duration exposures when required.

## Best Match for Longer Focal Length

The 5.94  $\mu\text{m}$  pixels of the QHY410C will subtend a half arcsecond FOV at approximately 2500mm of focal length (or 1 arcsecond at 1250). This, with its 35mm format sensor and high sensitivity make it ideal for imaging in color with longer focal length scopes.

TYPICAL SPECIFICATIONS MODEL QHY410C-PH	
Sensor	SONY IMX410 Full Frame CMOS Sensor
Illumination	Back-Illuminated
CMOS Chamber Window	Multi-layer AR coating
Pixel Size	5.94um x 5.94um
Effective Pixel Area	6072(H) x 4044(V)
Effective Pixels	24.55 M Pixels
Effective Image Area	36mm(H) x 24mm(V)
Full Well Capacity	120ke-
A/D Sample Depth	14-bit (output as 16-bit and 8-bit)
Sensor Size	Diagonal 43.3mm (Type 2.7)
Frame Rate (USB3.0)	Full Resolution 15FPS@8-bits, 7 FPS@14-bits
Readout Noise	3.75e-@Low gain, 1.1e-@High gain
Max. Dynamic Range	>17000:1 (More than 14 STOPS)
Dark Current	TBD
Exposure Time Range	100us - 3600sec
Anti-Amp Glow Control	Yes. Zero Amp Glow
Shutter Type	Electronic Rolling Shutter
Computer Interface	USB3.0
Built-in Image Buffer	1GByte (8Gbit)
Non-volatile built-in memory	512kbytes *
Cooling System	Dual Stage TEC cooler (-40C below ambient*)
Anti-Dew Heater	Yes
Desiccant Socket	Yes
Telescope Interface	M54/0.75 Female Thread on the fast installer/center adjust ring
Optic Window Type	AR+AR High Quality Multi-Layer Anti-Reflection Coating
Back Focal Length	18mm ( $\pm 0.5$ )
Weight	785g
Power Consumption	~ 30 Watts @ 100% TEC. 13 Watts @ 50%TEC

\* Built-in total 512Kbytes Flash Memory. 100Kbytes user-accessible space for stellar ROI frames for analysis of exoplanet investigation, occultations, atmospheric seeing measurement, focus, optical analysis etc. Supports 100\*100 image x 10 frames, 50\*50 image x 40 frames, 25\*25 image x 160 frames, 10\*10 image \* 1000 frames (based on 8-bit images).

