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5/30/19



QHYCCD

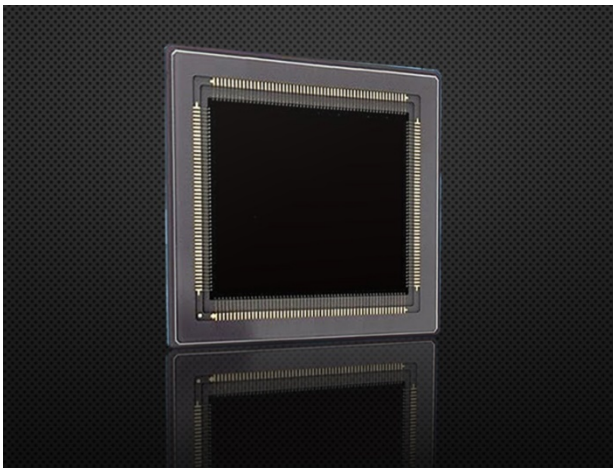
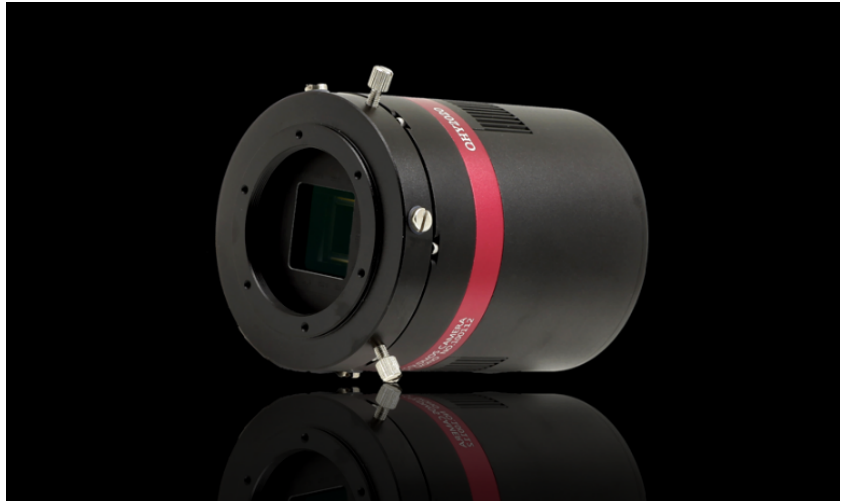


QHY2020 Scientific CMOS



QHY2020 Mono

4.2 Megapixels
Back-Illuminated
1.7e- Read Noise



Features:

- **Back-Illuminated sCMOS**
- **94% Peak Quantum Efficiency**
- **1.2e- Read Noise**
- **Low Dark Current**
- **High Dynamic Range**
- **Dual Channel / Dual Gain Output**
- **High Frame Rate**
- **USB 3.0**

Illuminated Scientific CMOS Camera, 94% QE

The QHY2020 uses a GSENSE2020BSI back-illuminated scientific CMOS image sensor with 4.2MP resolution and $6.5\mu\text{m}$ pixel size. With six-transistor (6T) pixel architecture, GSENSE2020BSI features readout noise of $1.6e^-$, full well of $54ke^-$, as well as peak QE of 94%. The $13.3\text{mm} \times 13.3\text{mm}$ array has wide spectral response from 200nm to 1100nm. It has 94% peak QE at 550nm-600nm and 60% QE at 240nm. It also has very good QE in the NIR range, 60% at 800nm, 38% at 900nm.

Ultra-Low Read Noise, $1.6e^-$

With read noise as low as $1.6e^-$, this camera can capture photons from very dim objects. At 3.5 electrons it can achieve $\text{SNR}=2$, which means 4 photons. In addition, the sensor supports correlated multiple sampling (CMS). The read noise can be further reduced to $1.2e^-$ with 2-CMS operation. The GSENSE2020BSI is offered in two variations: -H and -M. -H has better MTF and higher full well capacity, while -M has lower dark current.

Efficient Two-Stage Thermoelectric Cooling

The QHY2020 has dual stage TE cooling that reduces the sensor temperature to -40°C below ambient.



Dual 12-bit A/D, High Dynamic Range, Dual Image Output

The effective image size is 2048 x 2048 pixels. However, it has the capability to output dual channels as a 4096 x 2048 image with one half at low gain, high dynamic range and the other half at high gain, low read noise. The two ADCs will sample the same signal at the same time to generate the two images.

Electronic Rolling Shutter, Microlens Free Array

The GSENSE2020 sensor has an electronic rolling shutter with Global Reset and does not use a microlens array over the pixels. Microlens are often employed to increase the quantum efficiency of the sensor by redirecting light from obscured areas of the pixel toward the photosites. This microlens effect can vary depending on the angle of incidence of the light cone making photometric calibration of large fields taken at low f/ratios problematic. However, the back-illuminated GSENSE2020 achieves high quantum efficiency without microlens making it ideally suited to photometric calibration.

High Frame Rate, 43 FPS USB3.0

The standard version of the QHY2020 with USB3.0 produces a maximum frame rate of 43 frames per second for 8-bit images, or 25 frames per second for dual 12-bit images. The camera can also transfer selected regions of interest for extremely fast rates, e.g., 430 FPS at 200lines, 4300 FPS at 10 lines, and 21,500 FPS at 2 lines. This specially addressed line readout mode can also be customized.

Astronomical Imaging

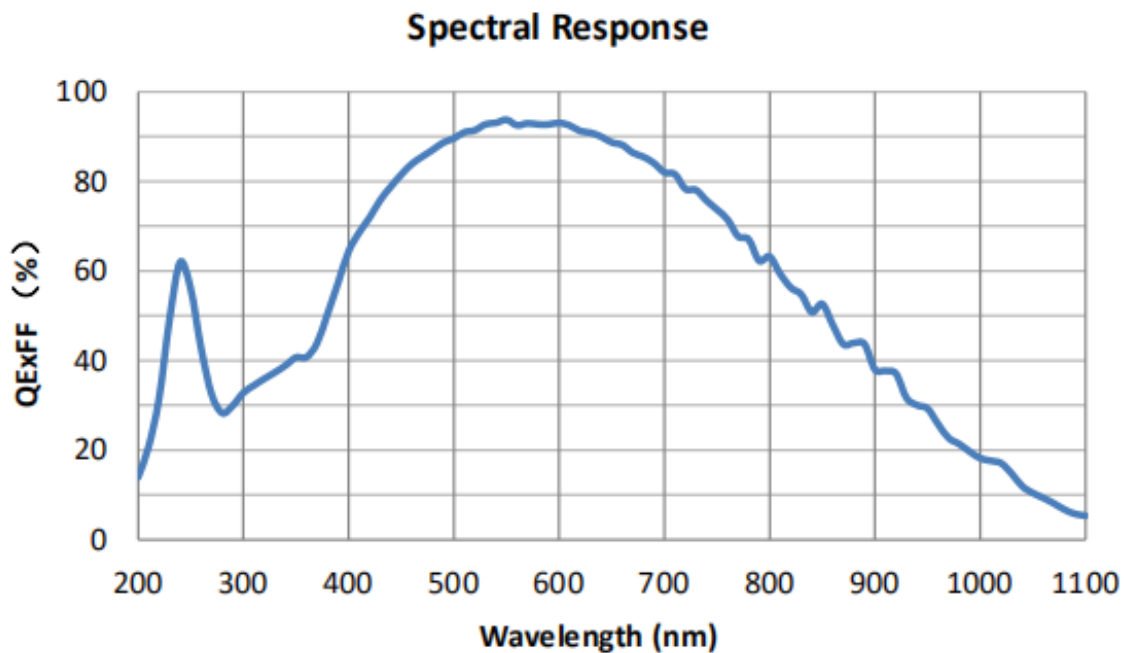
With ultra high QE and ultra low read noise, the QHY2020 is an ideal camera for time-domain astronomy, autoguiding large professional telescopes, and transient source detection and spectrum analyze.

Biological Imaging

The 13.3mm x 13.3mm sensor size is well matched to a microscope image circle. Microscopy applications will benefit from its high QE, low noise and fast readout. The QHY2020 is an ideal scientific CMOS camera for Fluorescence imaging .

Spectroscopy

The high, wide response from NIR to UV makes the QHY2020 a perfect camera for spectrum analysis and spectrum imaging systems.



QHY2020 SCIENTIFIC CMOS CAMERA SPECIFICATION

Model	QHY2020
CMOS Sensor	Gpixel Gense2020 BSI
Pixel Size	6.5um x 6.5um
Sensor Surface Glass	Clear Glass
Effective Pixel Area	2048 x 2048
Effective Pixels	4.2 Megapixels
Effective Image Area	13.3mm x 13.3mm
Full Well	56ke-
AD Sample Depth	Dual 12-bit A/D (High Gain Channel and Low Gain Channel) *
Sensor Size	Typical 2-inch
Full Frame Rate and ROI Frame Rate	43FPS@2048*2048 8-bit 43FPS@4096*2048 8-bit x2 HDR 25FPS@4096*2048 8-bit x2 HDR (Clock 2) 20.5FPS @ 4096*2048 8-bit x2 / 12bit x2 (Clock 3)
Readout Noise	1.6e- (High Gain)
Dark Current	TBD
Exposure Time Range	20us - 300sec
Anti-Glow Control	Yes. Can be enabled and disabled. Significant Glow Reduction
Shutter Type	Electric Rolling Shutter
Computer Interface	USB 3.0
Built-in Image Buffer	128MByte (512Mb) DDR2
Internal Image Storage	Built-in 100Kbytes user accessible memory for image storage of stellar ROI frames for analysis of exoplanet investigation, occultations, atmospheric seeing measurement, focus, optics analysis etc. Support 100*100 image x 10 frames, 50*50 image x 40 frames, 25*25 image x 60 frames, 10*10 image x 1000 frames.
Cooling System	Dual Stage TE Cooler, -40C below ambient
Anti-Dew Heater	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

