

<1.0 e⁻ BSI sCMOS
Super Signal to Noise Ratio

Cooled Scientific CMOS Camera

Dhyana **NEW**
400BSI



A New Breakthrough, for New Discoveries!

Tucsen's Dhyana series of high-end scientific research cameras is one of the few leading imaging technologies created in China. The Dhyana95 with its quantum efficiency of 95% achieved a major breakthrough, which opened a new era of high sensitivity imaging applications.

The new Dhyana400BSI achieves a paradigm shift on multiple core metrics such as sensitivity, speed and resolution. Not only does it have a 95% super-high quantum efficiency, but also achieves breakthroughs in key technologies that deliver a read out noise of less than one electron from a smaller 6.5um pixel size, that provides far more details.

The new discovery is at hand, Dhyana400BSI allows you to see more, faster and clearer!



6.5x6.5µm Pixel
BSI sCMOS sensor



<1e-@CMS{median}
Low Read Noise



30,000e-
Full Well Capacity



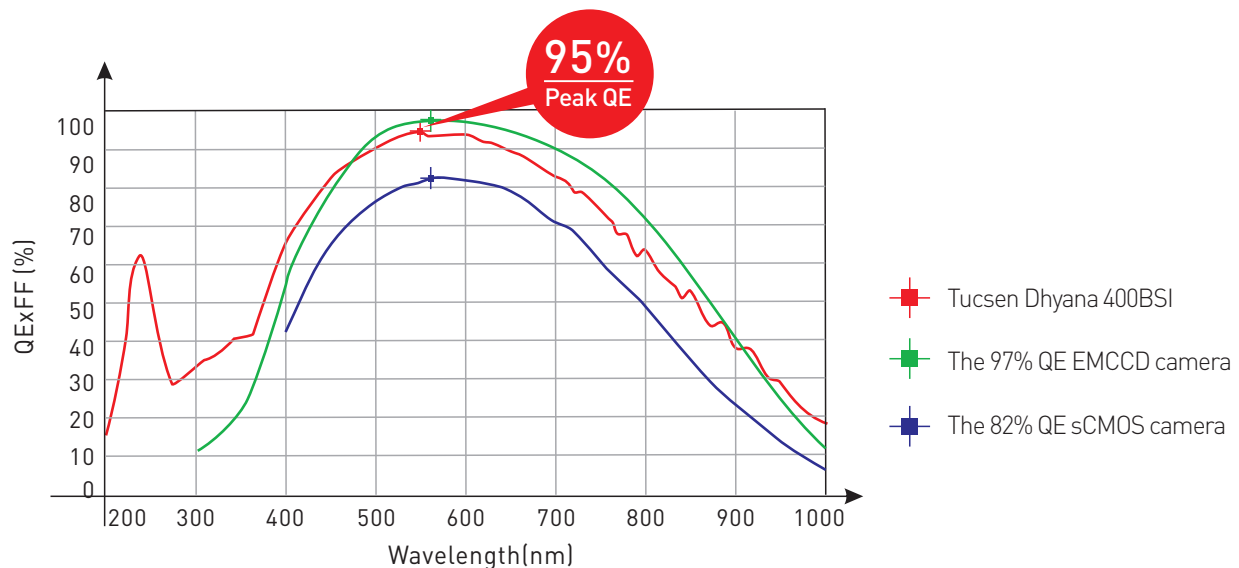
-10°C Cooling
Low Dark Current



USB3.0
High Frame Speed

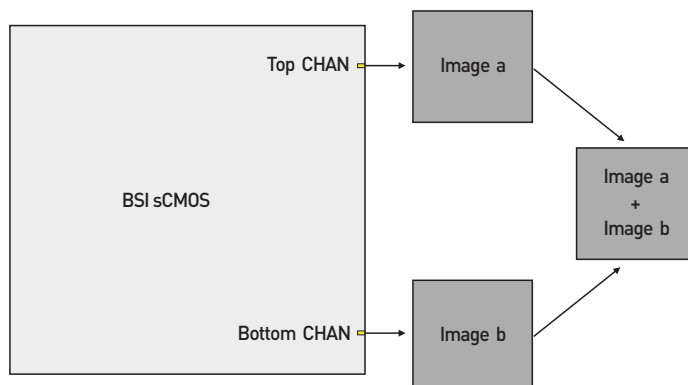
95%@550nm, super-high quantum efficiency

The Dhyana 400BSI, like the Dhyana95, uses a back-illuminated sCMOS thinned chip technology to avoid light interference from the wiring layer of the sensor and improve the light-receiving area and thus the photoelectric conversion efficiency, as shown: At 550 nm, the quantum efficiency is as high as 95% This cannot be matched by front illuminated sensor and is comparable to the sensitivity of an EMCCD.



<1.0e-@CMS, ultra-low readout noise

Back-illuminated technology opens a new era of high sensitivity applications for sCMOS. The Dhyana400BSI achieves a key technological breakthrough in back-illuminated sCMOS, a readout noise of less than 1 electron using CMS processing technology.

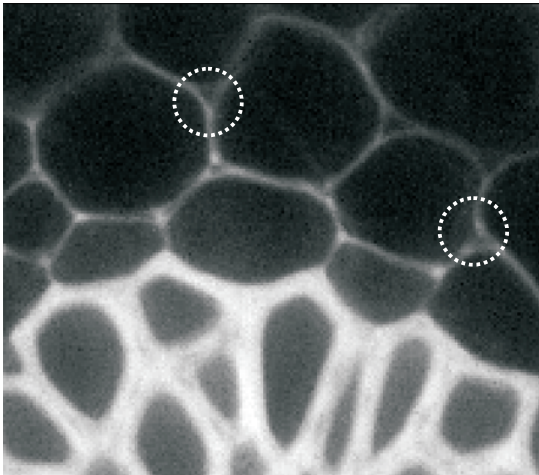


What is "CMS"?

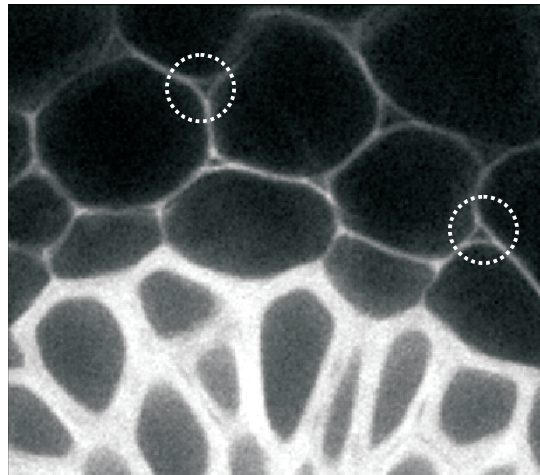
CMS (correlated multiple sampling), reduces the readout noise by taking several samples of both the reset and signal levels of a pixel output, these are then summed and the average level for each is calculated. This results in a noise reduction proportional to the square root of the number of samples taken.

6.5 μ m size, higher image resolution

Not only does the Dhyana400BSI make breakthroughs in two key performance areas, quantum efficiency and readout noise, but also the smaller 6.5-micron pixel size is one of the key factors in obtaining more resolution detail in microscopy . As shown in the figure, the Dhyana 400BSI shows even greater detail with the same exposure time in very low light conditions.



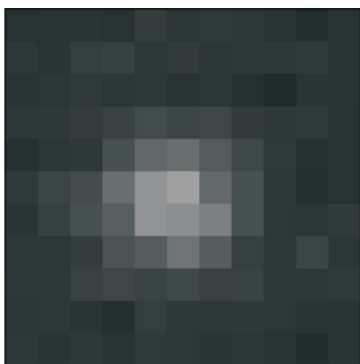
11 μ m



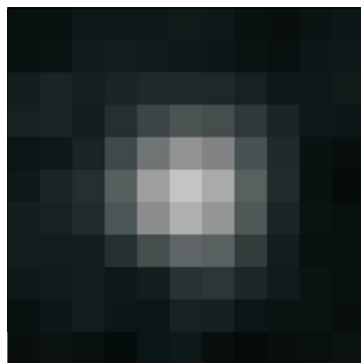
6.5 μ m

Signal enhancement algorithm

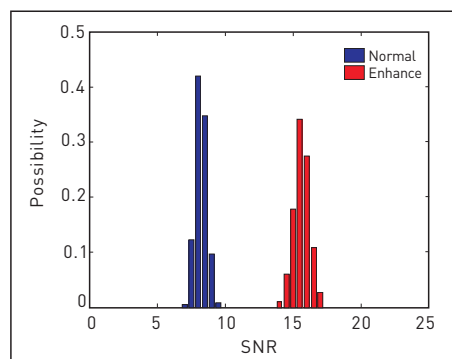
As shown in the figure, the signal enhancement algorithm can effectively improve the signal to noise ratio, which can reduce the exposure time in some low light applications.



400BSI (Normal)



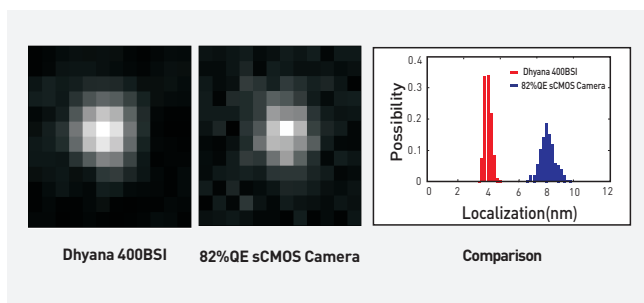
400BSI (Enhance)



Comparison

Customer case studies and references

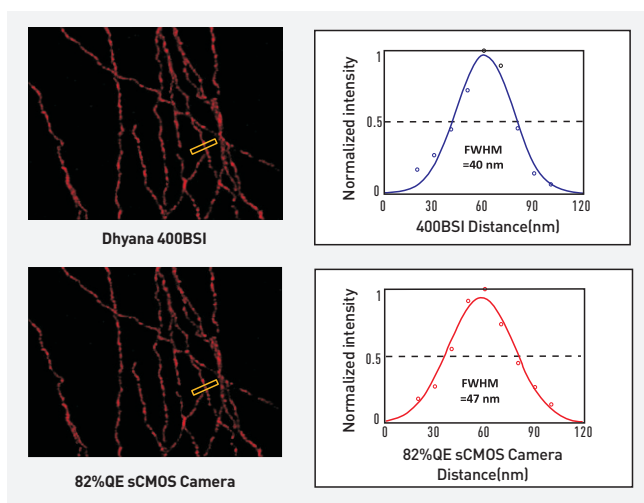
The 400BSI has significant signal to noise ratio advantages, especially for low light imaging and positioning accuracy requirements related to the application.



Single molecule localization

The high signal-to-noise ratio of the camera can effectively improve the intensity of single-molecule fluorescence emission. The statistical results of the localization accuracy of the fluorescent sphere show that the localization accuracy of the 400BSI is twice that of the third generation 82% QE sCMOS camera.

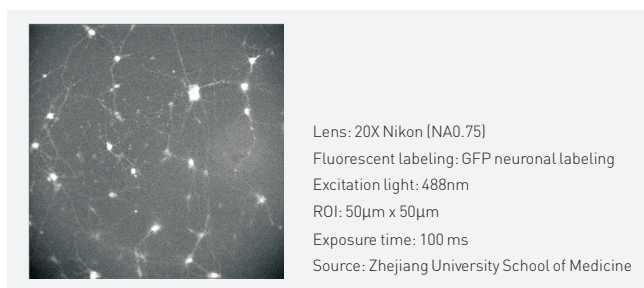
Source: Wuhan National Laboratory for Optoelectronics
-Huazhong University of Science and Technology



Super-resolution imaging

The lower the FWHM, the higher the resolution. In STORM super-resolution imaging, the 400BSI resolution reached 40 nm, while the third generation of 82% QE sCMOS can only achieve 47 nm resolution, the 400BSI STORM super high resolution microscope has a resolution improvement of 7 nm!

Source: Wuhan National Laboratory for Optoelectronics
-Huazhong University of Science and Technology



Neuron fluorescence imaging

As the exposure time increases, luminescent fluorophores produce phototoxicity to the cells. Compared with other cameras, the 400BSI imaging exposure time is shorter, which can better protect cell samples and prevent light damage.



TIRF wide field imaging

In total internal reflection fluorescence (TIRF) applications, the light intensity is very weak, but the ultra-high signal-to-noise ratio of 400BSI can effectively reduce the exposure time, resulting in faster widefield imaging speed.

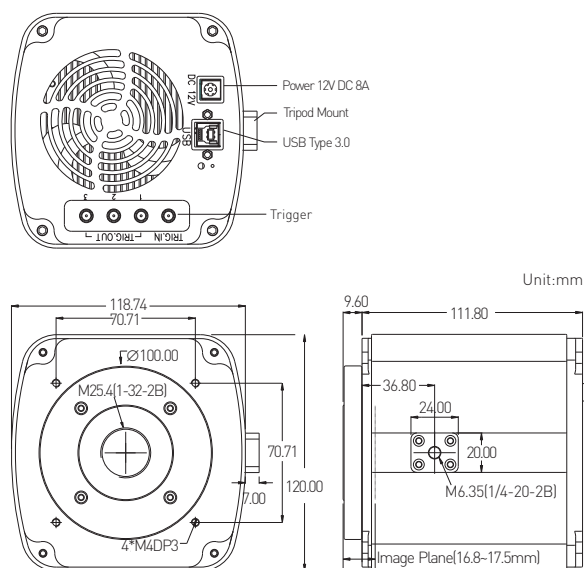
Technical Features

Model	Dhyana 400BSI
Sensor size	1.2"
Sensor model	G2020 BSI (Backside-illuminated sCMOS)
Color/monochrome	Monochrome
Quantum efficiency	95%@550nm
Effective no.of pixels	2040(H) x 2048(V)
Pixel size	6.5 x 6.5(μm)
Effective area	13.3 x 13.3(mm)
Full well capacity	30000e-(HDR)
Frame rate	35fps@(2048x2044via USB3.0)
Read noise	<1.0e-@CMS(peak), 1.1e-@CMS(median), 1.7e-@HDR(median)
Shutter type	Rolling Shutter
Exposure mode	Manual / Auto
Exposure time	0.014ms-10s
Cooling method	Peltier cooling
Cooling temperature	Forced air (Ambient at +25°C): -10°C
Dark current	0.9electrons / pixel / s (-10°C) (typ.)@CMS
Dynamic range	86dB
Binning	on FPGA
Sub-array	Available
External trigger mode	Standard/Synchronous/Global trigger
Trigger delay function	0-10,000s
Trigger output	3 programmable timing output (Exposure/Global/readout signal)
External trigger routing	SMA
Digital interface	USB3.0
SDK	Support
Bit depth	16 bit
Lens mount	C-mount
Power supply	12V / 8A
Power consumption	50 W
Camera size	120 x 119 x 121 (mm)
Parameter settings	White balance, Exposure, Contrast, Gamma, 3D denoise, Saturation, Flat Fielding
PC software	Mosaic / LabVIEW / Matlab / Micromanager
Compatible system	Windows / Linux / Mac
Operating temperature	0-60°C
Operating humidity	10%-85% RH

Application

- Super-resolution microscopy
- Real-time confocal microscopy
- Gene sequencing
- Live-cell imaging
- Single molecule detection
- Astronomical observation
- TIRF
- FRET

Dimensions



Tucsen Photonics Co., Ltd.

- Address: 6F NO.1 building Caimao Zone, 756# Qi'an Road, Gaishan Town, Cangshan Area, Fuzhou, Fujian, P. R. CHINA
Tel: + 86-591-88194580
Website: www.tucsen.com
Email: support@tucsen.com
- Europe/North America OEM/ODM Support:
Address: PO Box 31443, Tucson, AZ85751, United States.
Tel: +1-520-203-2643
E-mail: mikeblake@tucsen.com