TUCSEN

95 % BSI sCMOS
High Quantum Efficiency

Cooled Scientific CMOS Camera

Dhyana 95

Backside-illuminated sCMOS technology

Opening a new era of high sensitivity imaging applications!

The Dhyana 95 is a highly sensitive scientific camera developed around back-illuminated sCMOS technology, not only with ultra-high quantum efficiency comparable to that of an EMCCD, but faster frame rate and excellent signal-to-noise performance, as well as a 2" field of view, 200-1100nm spectral response and dynamic range of 11um pixels.

These innovative features open a new era to disciplines such as: life sciences; spectral analysis; astronomical observation and other cutting-edge research areas.

11x11µm Pixel
BSI sCMOS sensor

1.45e-(Peak)
Low Read Noise

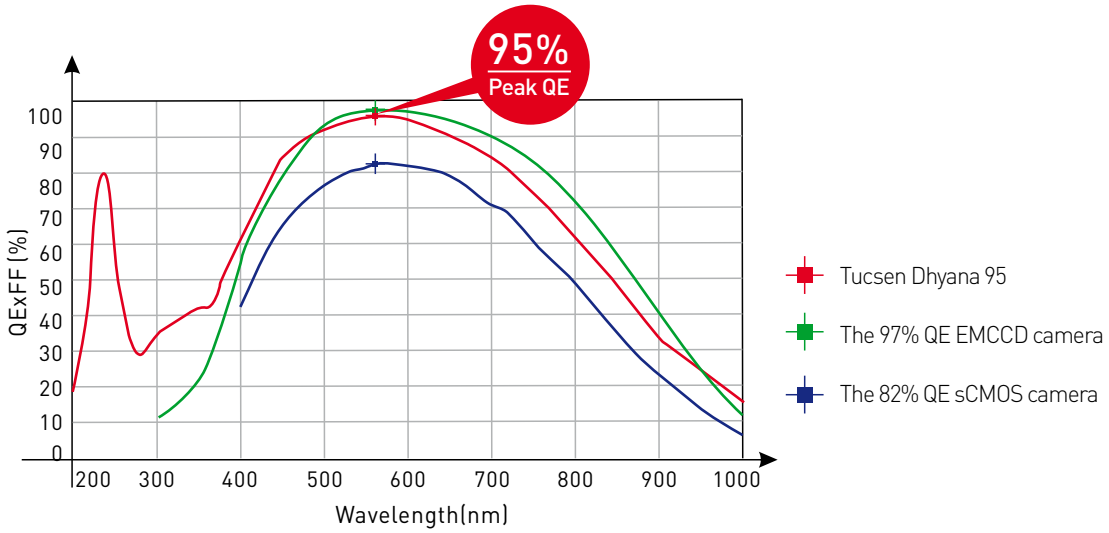
90,000e-
Full Well Capacity

-10°C Cooling
Low Dark Current

USB3.0
High Frame Speed

Ultra-high quantum efficiency

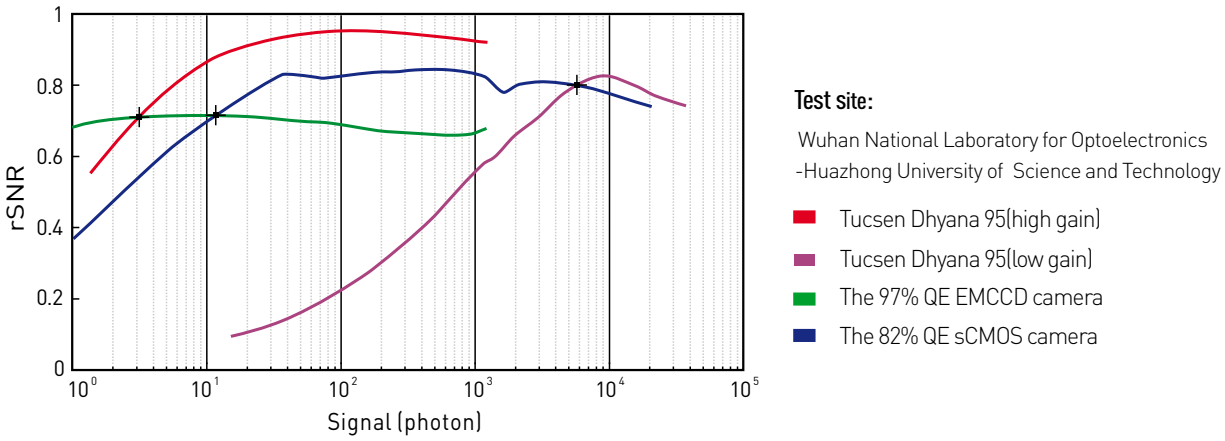
Quantum efficiency refers to the ratio of the average number of photoelectrons produced per unit time at a particular wavelength to the number of incident photons. It is an important parameter to describe the photoelectric conversion capability of optoelectronic devices and is one of the important indicators to measure camera sensitivity.



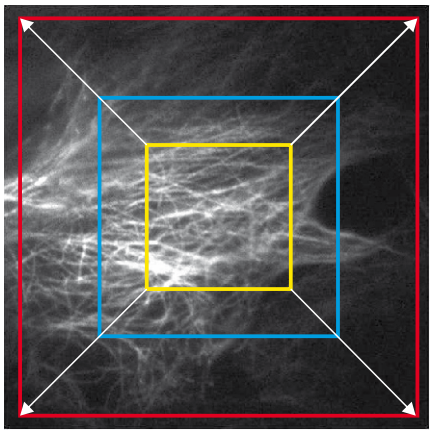
The Dhyana95 uses backside-illuminated sCMOS thinned chip technology to avoid light interference from the wiring layer, thereby increasing the pixel area and improving the photoelectric conversion rate, as shown in the figure: at 560 nm, the quantum efficiency is 95%, which a front illuminated sCMOS camera cannot match, and is comparable to the best EMCCD camera.

Excellent signal to noise ratio

Signal-to-noise ratio is the ratio of detectable signal to background noise. The higher the signal-to-noise ratio, the more obvious the recognizable signal is.



The Dhyana95 read noise is only 1.45 electrons(peak), therefore the signal to noise ratio is significantly better than other sCMOS cameras, and when the incident photons are>3, there is a better performance than EMCCD based cameras.



2" large field of view

The 2" array can not only adapt to more optical interfaces and deliver a greater field of view, but also results in fewer lens switches to find the area of interest on the sample.

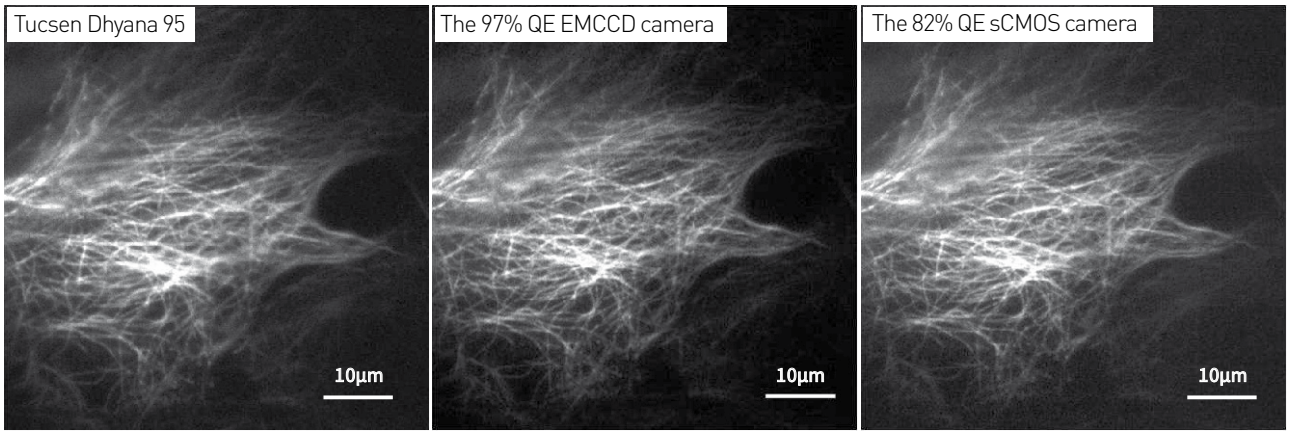
- 2" Tucsen Dhyana 95
- 1.2"sCMOS Camera
- 2/3" EMCCD Camera

86dB ultra-high dynamic range

The Dhyana95's 11μm pixel has a huge full well capacity, resulting in ultra-high dynamic range to support a variety of complex optical environments.

Challenge the most extreme applications

The Dhyana95's significant breakthrough in quantum efficiency means that sCMOS cameras have the potential to challenge much more extreme applications, with lower excitation energy, lower dye concentrations, and weaker photon signals, and still provide rich image information.



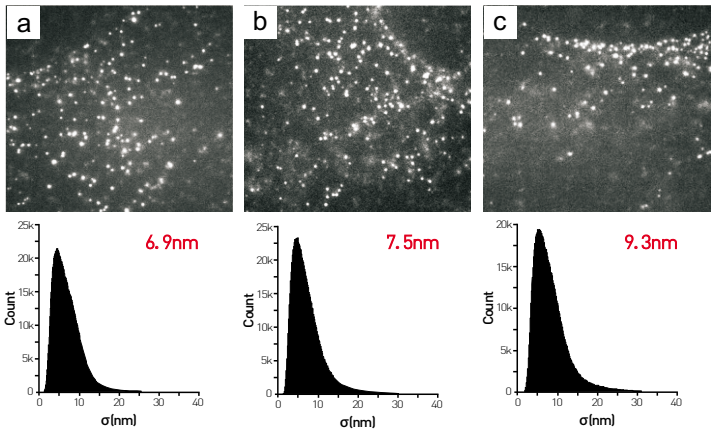
Under very weak laser illumination (< 0.002 kW cm^{-2}), Dhyana 95 camera showed comparable fluorescent intensity to the 97%QE EMCCD camera with 100 EM gain. On the other hand, Dhyana 95 had similar background fluorescence noise when comparing to the 82%QE sCMOS camera, which has 1.0e-low read noise.

Customer Case Studies and References

"Extensive tests and comparisons with other top-of-the-line EMCCD and sCMOS cameras have been performed in our laboratory. We found Dhyana 95, the new sCMOS camera stood its own ground remarkably well and offered satisfactory performance across the board". —Professor Ning Fang at Georgia State University

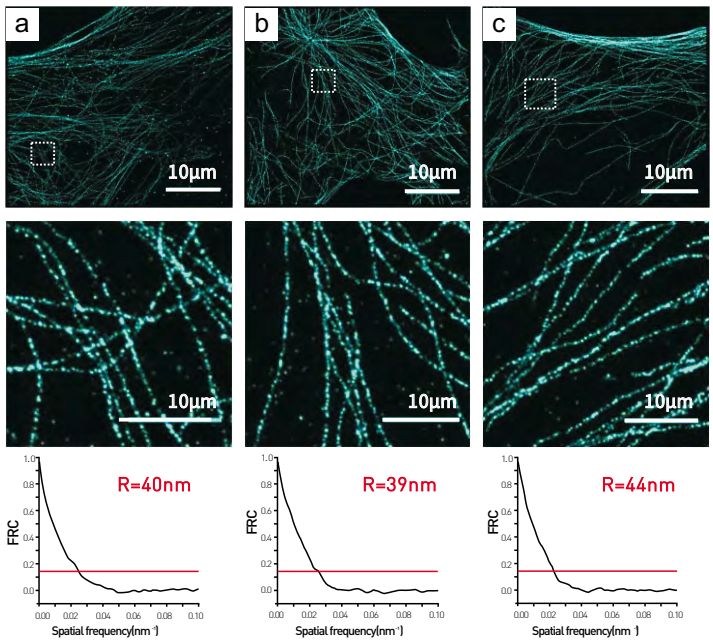
STORM Imaging

"The beta tubulin of Hela cell was immunostained with mouse anti-tubulin primary antibody and Alexa fluor 647 conjugated Donkey anti mouse secondary antibody. The ROI is about 50µm x 50µm. For Epifluorescence images the exposure time is 100 ms giving imaging rate of 10 fps. It is 50 fps for STORM imaging and was taken over 40000 frames to reconstruct the STORM images."



The localization precision from Dhyana 95 was calculated to be 6.9 nm, an increase of 8% and 35% in localization precision compared to the 97%QE EMCCD camera (7.5 nm) and the 82%QE sCMOS camera (9.3 nm), respectively.

a. Tucsen Dhyana 95
b. the 97% QE EMCCD camera
c. the 82% QE sCMOS camera



The FRC resolution of the Tucsen Dhyana 95 camera (40nm) was comparable to that (39nm) of the 97%QE EMCCD camera and slightly better than that (44nm) of the 82%QE sCMOS camera.

a. Tucsen Dhyana 95
b. the 97% QE EMCCD camera
c. the 82% QE sCMOS camera

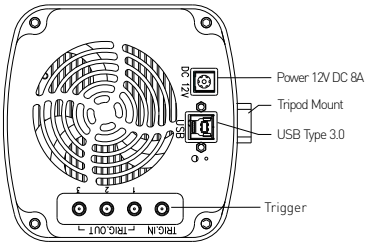
Technical Features

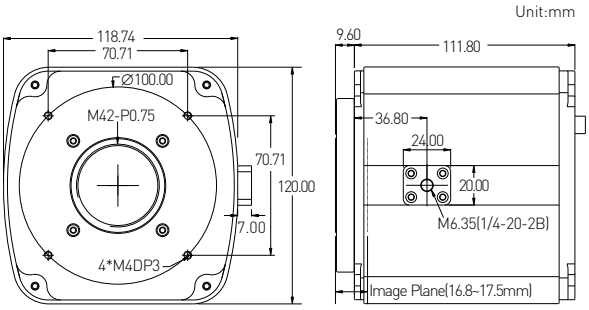
Model	Dhyana 95
Sensor size	2"
Sensor model	G400 BSI (Backside-illuminated sCMOS)
Color/monochrome	Monochrome
Quantum efficency	95%@560nm
Effective no.of pixels	2048(H) x 2048(V)
Pixel size	11 x 11(μm)
Effective area	22.528 x 22.528(mm)
Full well capacity	90,000e-
Frame rate	24fps@(2048x2048 via USB3.0)
Read noise	1.45e-(Peak), 1.71e-(Median)
Shutter type	Rolling Shutter
Exposure mode	Manual / Auto
Exposure time	0.021ms-10s
Cooling method	Peltier cooling
Cooling temperature	Forced air (Ambient at +25°C): -10°C
Dark current	3electrons / pixel / s (0°C) (typ.)
	1.5electrons / pixel / s (-10°C) (typ.)
Dynamic range	86dB
Sub-array	Available
External trigger mode	Standard/Synchronous/Global trigger
Trigger delay function	0-10,000s
Trigger output	3 programable timing output (Exposure/Global/readout signal)
External trigger routing	SMA
Digital interface	USB3.0
SDK	Support
Bit depth	16 bit
Lens mount	T or C-mount
Power supply	12V / 8A
Power consumption	50W
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

Tucsen Photonics Co., Ltd.