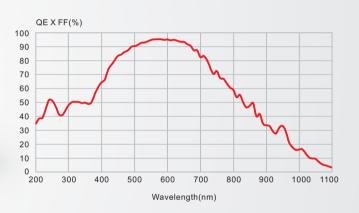
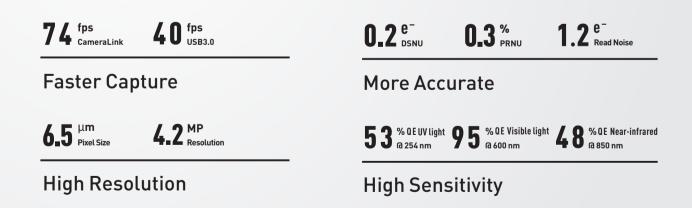
# TUGSEN

# **Dhyana 400BSI 2** BSI Scientific CMOS Camera







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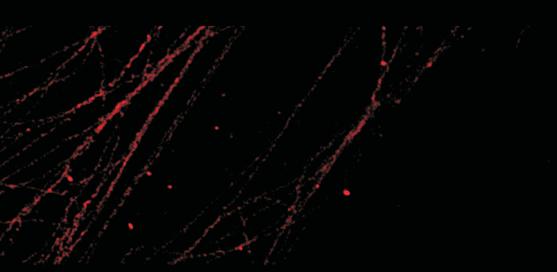
# **A New Breakthrough for New Discoveries!**

Since its launch, the Dhyana 400BSI sCMOS camera has been receiving great attention and focus. The image quality of the product is fully recognized to be comparable, or even better than its competitors. However, the Tucsen R&D group continues to pursue greater levels of excellence. This resulted in an upgraded product, the Dhyana 400BSI V2.

The Dhyana 400BSI V2 achieves a core breakthrough in the transmission speed compared with 400BSI V1, and a high-speed data transmission rate of 74fps @ Cameralink and 40fps @ USB3.0 at full resolution. Moreover to meet the demands for accurate quantification for high-end scientific imaging such as single molecule and super resolution, the 400BSI V2 calibrated DSNU & PRNU, minimized the difference between each pixel and reduced fixed pattern noise. So we are now able to achieve more accurate quantitative imaging data, providing a guarantee of reliable analysis results. The DSNU & PRNU calibration is of a great importance of quantitative analysis.

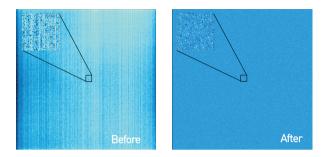
Simultaneously, the Dhyana 400BSI V2 preserves all the essences of Dhyana 400BSI V1, including the latest developed backilluminated sCMOS sensor, ultra-high quantum efficiency of 95%, microscope-friendly 6.5µm x 6.5µm pixel and 1.2e- @ Median ultra-low readout noise.

So, no matter of chasing for brilliant scientific images or accurate images quantitative data, 400BSI V2 is easy to implement!



# DSNU/PRNU calibration, more accurate quantitative analysis

To improve the overall performance of the camera, the Dhyana 400BSI V2 was calibrated in DSNU (dark signal nonuniformity) and PRNU (photo response non-uniformity) characteristically. After calibration, the DSNU value reduced from 0.3e- to 0.2e-, the PRNU value reduced from 1.6% to 0.3%. Thus the new upgraded camera has a more sophisticated capabilities, making it more suitable for quantitative analysis applications.





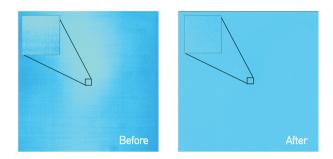


Photo Response Non-Uniformity (PRNU) Optimization

# Top-level cooling technology to reduce the impact of noise

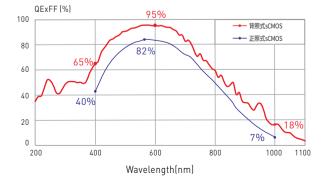
Dhyana 400BSI V2 advanced cooling mode can further reduce the impact of noise on imaging: compared to 1.2e- readout noise and 0.2e-DSNU, the dark curret corresponding to 100ms is less than 0.02e-. In high-end imaging applications,dark current becomes negligible.

Cooling Method	Cooling Temperature	Dark Current
Forced air (Ambient at +20 °C)	-15°C	0.15e-/p/s(typ.)
Water (Ambient at +20 °C)	-25°C	0.10e-/p/s(typ.)

# Wide spectral response range, high sensitivity

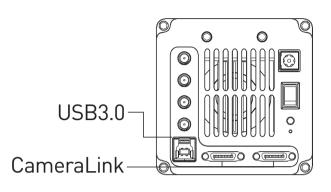
With its ultra-low noise, the advantage of the quantum efficiency in Dhyana 400BSI V2 is very significant. This is a huge breakthrough for scien-tific applications, not only in the visible region, but also in the ultraviolet and near-infrared.

Quantum Efficiency Comparison 🕨



# 74fps @ CameraLink, 40fps @ USB3.0, faster data capture

In addition to the signal to noise ratio advantage, the Dhyana 400BSI V2 has enhanced transmission speed, on one hand though the new CameraLink interface to meet the needs of high-end imaging research for higher frame rates, on the other hand through hardware improvements that increase the USB 3.0 throughput. These have achieved the ultimate transfer rate of 74fps with CameraLink and 40fps with USB3.0 at 4.2 MP full resolution.



Column	Row	USB3.0	CameraLink
2048	2048	40.4fps	74.0fps
2048	1024	79.9fps	147.9fps
2048	512	158.8fps	293.9fps
2048	256	317.6fps	582.8fps
2048	128	629.2fps	1147.9fps
2048	64	1242.6fps	2227.8fps

# Third-party applications

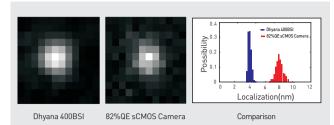
Third-party applications supported by Dhyana 400BSI V2 have also been greatly expanded, including Micromanager, Labview, Matlab, etc., to provide more application support and help.





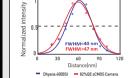


### **Customer applications**



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



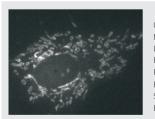


Dhvana 400BSI

82%QE sCMOS Camera

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

Camera: Dhyana 400BSI Lens: 20X Nikon (NA0, 75) Fluorescent labeling: GFP neuronal labeling Excitation light: 488nm ROI: 50um x 50um Exposure time: 100 ms Source: Zhejiang University School of Medicine



Camera: Dhyana 400BSI Microscope: Fluorescence microscope Lens: 100X TIRF dedicated oil mirror (NA1.49) Excitation light: 561 nm ROI: 55um x 43um Exposure time: 170 ms Source: College of Optical Science and Engineering, Zhejiang University

#### Single molecule localization

The high SNR can effectively improve the intensity of singlemolecule fluorescence emission. The statistical results of the localization accuracy of the fluorescent sphere shows that the accurancy of localization with 400BSI is twice as that of the third generation 82% QE sCMOS camera.

#### Super-resolution imaging

The lower the FWHM, the higher the resolution. In STORM superresolution imaging, the capturing spatial resolution of 400BSI reaches to 40 nm, while those of the third generation of 82% QE sCMOS can only achieve 47 nm resolution, so the spatial resoluiton of 400BSI with STORM super resolution microscope carries a superiority of 7nm.

#### Neuron fluorescence imaging

With the increasing of the exposure time, luminescent fluorophores produce phototoxicity to the cells. Compared with other cameras, the exposure time of 400BSI is shorter, which can protect cell samples from light damage better.

#### TIRF wide field imaging

In the TIRF applications, the light signal of the samples is very weak, but 400BSI with the ultra-high SNR camera is able to capture the practical and good quanlity of images effectively with rather short exposure time, resulting in a faster and fully widefield imaging.



Camera: Dhyana 400BSI Microscope: Fluorescence microscope Excitation light: 488nm,fluorescent: 525nm Exposure time: 20 ms fastest frame rate: > 50fps Source:Suzhou Institute of Biomedical Engineering and Technology Chinese Academy of Sciences

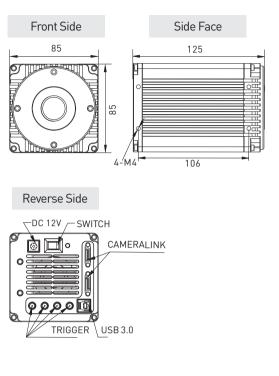
#### SIM cytoskeleton imaging

SIM imaging requires the cameras to capture as sharp as possible pictures with as low as possible the exposure time, along with others same shooting conditions, the Dhyana 400BSI V2 has a significant signal-to-noise ratio advantage, resulting in better images quality than other cameras.

# **Technical Specifications**

NodelDyna 400BS1V2Sensor modelSIS CMOSShutter typeA cling / GlobalChoryMonoMonoEffective areaJ 33mm x1 33mmFiselutionO48(H) × 204(V)Fixel sizeSig M x 6.5µmFixel sizeSig M x 6.5µm <th></th> <th></th>		
Shutter typeReling / GlobalGlor/MonoMonoErlective area303mm x 13.3mmResolutionSu48(H) x 2048(V)Pixel sizeSufum x 6.5µmGlu95%e600nmGluSibaeGlu-Mell capacitySibaeFarmarate70/pe@CameraLink: 40/ps@USB3.0Routo moise6.6µ-10sFarbau camerationSibaeRouto moise6.4µ-10sGoling Method1.62-0µ-10sForling MethodA'sCelouv ambientCooling Method1.62-0µ-15°CRouto moise3.62-0µ-15°CGluridi : 0.16e / pixel / s@-15°CRouto moise1.62-0µ-15°CGluridi : 0.16e / pixel / s@-15°CRouto moise1.62-0µ-15°CRouto moise1.62-0µ-15°CRouto moise1.62-0µ-15°CRouto moise1.62-0µ-15°CRouto moise1.62-0µ-11s/GRouto moise	Model	Dhyana 400BSI V2
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Power Consumption60WDimensions85mm x 85mm x 125mmWeight1460gSoftwareMosaic / LabVIEW / Matlab / Micromanager / MetaMorphSDKSupportOperating SystemWindows / Linux	Optical Interface	C-mount
Dimensions85mm x 85mm x 125mmWeight1460gSoftwareMosaic / LabVIEW / Matlab / Micromanager / MetaMorphSDKSupportOperating SystemWindows / Linux	Power Supply	12V / 8A
Weight 1460g   Software Mosaic / LabVIEW / Matlab / Micromanager / MetaMorph   SDK Support   Operating System Windows / Linux	Power Consumption	60W
Software Mosaic / LabVIEW / Matlab / Micromanager / MetaMorph   SDK Support   Operating System Windows / Linux	Dimensions	85mm x 85mm x 125mm
Software MetaMorph   SDK Support   Operating System Windows / Linux	Weight	1460g
Operating System Windows / Linux	Software	· · · · · · · · · · · · · · · · · · ·
	SDK	Support
Operating Environment Temperature 0-40°C / Humidity 10-85%	Operating System	Windows / Linux
	Operating Environment	Temperature 0~40°C / Humidity 10~85%

# Dimensions



# Part Number for Purchase

	Water cooling (-W)		
	Dhyana 400BSI-W-U3	Dhyana 400BSI-W-CL	
USB3.0 (-U3)	•		
CameraLink (-CL)		•	
O	Forced air (-F)		
	Dhyana 400BSI-F-U3	Dhyana 400BSI-F-CL	
USB3.0 (-U3)	•		
CameraLink (-CL)		•	

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