

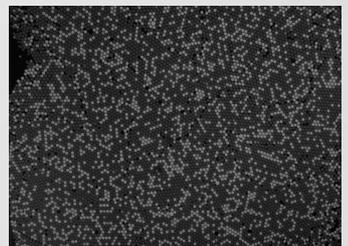
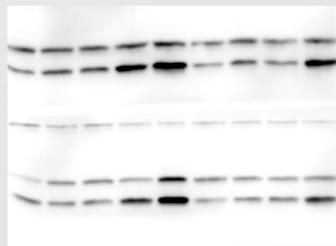
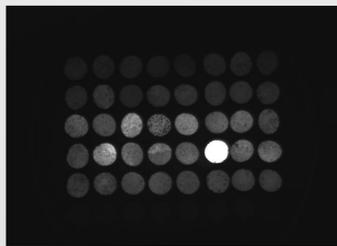
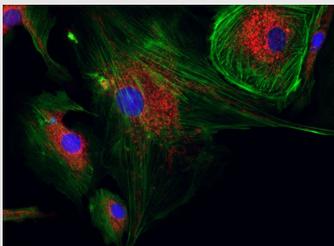
TUCSEN

# FL-20BW

## Cooled Monochrome CMOS Camera

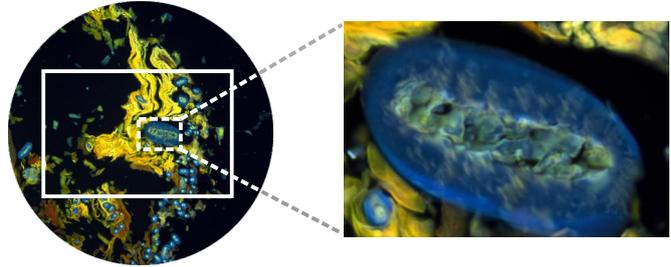
**20** MP  
Resolution

**0.001** e<sup>-</sup>/pixel/s  
Dark Current



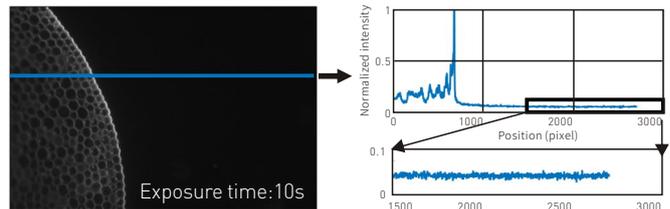
## 20 Megapixels, Capturing High Resolution Images at Once

The 1-inch image sensor covers the best image quality FOV for C-mount; the sensor resolution is up to 20 megapixels, so the optical resolution is not lost even when imaging with 4X and 10x microscope objectives.



## Advanced Cooling Technology Reduces Dark Current Down to 0.001e-/pixel/s

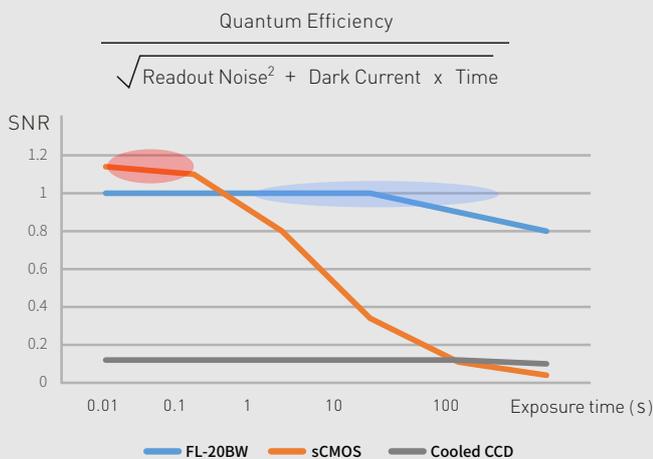
Based on Tucsen's professional cooling technology from sCMOS cameras, FL-20BW can achieve a dark current level as low as 0.001e-/pixel/s, which significantly reduces the hot pixel noise during long exposure time.



Raw data, no DSNU/PRNU calibration

## High SNR, Balanced with Exposure Time

Quantum efficiency and noise correspond to signal and noise. Respectively, the higher the ratio, the higher the signal-to-noise ratio. While providing high quantum efficiency of 84%, the FL-20BW strives for excellence in noise control, reducing read noise to 0.6e- and dark current to 0.001e-/s, which makes FL-20BW the best camera for High signal-to-noise ratio balanced with exposure time.

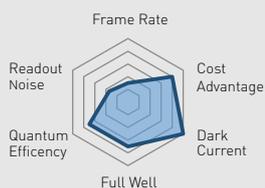


**Red circle area:** Under short-term exposure, sCMOS has the best signal-to-noise ratio because of its high quantum efficiency and low readout noise.

**Blue circle area:** At the exposure time around above 1 second. The FL-20BW maintains a better signal-to-noise ratio because of the combined advantages of low readout noise and dark current noise, while the SNR of sCMOS drops rapidly, because of the high dark current noise.

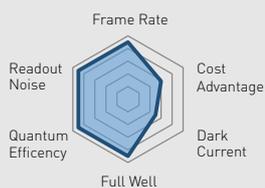
# The Core Advantage of the FL-20BW: the Most Comprehensive Performance

In the past decade, CCD has gradually withdrawn from the scientific imaging arena. The lower-noise, faster-speed sCMOS is the leader in advanced scientific imaging. However, sCMOS still does not solve the problem of high dark current noise and high cost. So in applications which require long exposure time and the need for cost-effective scientific imaging, users have to continue to use very old CCD cameras. Now, Tucsen has introduced the FL-20BW camera, which achieves the same level of CCD as the dark current noise and cost performance. At the same time, it has the typical characteristics of CMOS: lower readout noise and faster speed. It is a camera with the most comprehensive performance.



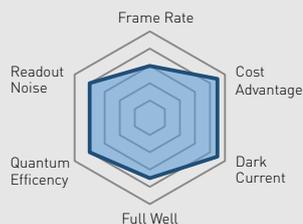
## CCD

Disadvantages of cooled CCD cameras: low speed, high readout noise, and discontinued production. Cooled CCD cameras typically have only 10-20fps, which is unsustainable for high frame rates applications. Its readout noise is usually  $5-10 e^-$ , so the SNR of low-light imaging is low. Moreover, in the process of image sensor production suspension, there have been no new technologies, nor new products are available.



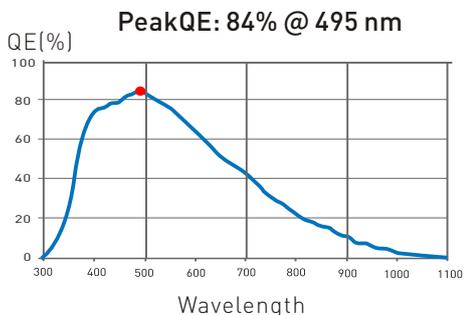
## sCMOS

Disadvantages of sCMOS cameras: high dark current noise, high cost. The dark current noise of the cooled sCMOS camera is only slightly less than 1 electron/second, and the signal-to-noise ratio drops rapidly for long exposure times. At the same time, the price of sCMOS is higher than CCD, so it is difficult to completely replace the application of CCD cameras.

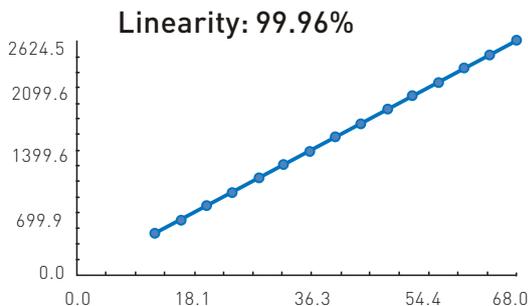


## FL-20BW

The FL-20BW camera achieves the same level of CCD camera as dark current noise and price/performance ratio, while offering the typical characteristics of CMOS: lower readout noise and faster speed. It is the most balanced camera with comprehensive performance.



FL-20BW : Quantum efficiency curve



FL-20BW: Light response curve

## Camera Specifications

Model	FL-20BW
Image Sensor	1" CMOS,(15.86mm)
Color/Mono	Mono
Resolution	5472(H) x 3648(V)
Pixel size	2.40μm x 2.40μm
Quantum efficiency	84%@495nm
Dark current	0.001e-/pixel/s
DSNU	0.2e-
PRNU	0.8%
Readout noise	0.6e-
Full well capacity	16000e-
Shutter mode	Rolling
Cooling	-15 °C
Frame Rate	16 fps @ 5472 x 3648 ( 8bit ), 8 fps @ 5472x3648 ( 16bit ) 53 fps @ 2736 x1824 ( 8bit ), 27 fps @ 2736x1824 ( 16bit ) 67 fps @ 1824 x1216 ( 8bit ), 67fps @ 1824 x1216 ( 16bit )
Binning mode	2x2, 3x3, 4x4, 8x8
Exposure settings	Auto/Manual
Exposure time	3us - 1hour
Image Format	JPG/PNG/TIFF/DICOM
Data interface	USB3.0
Bit depth	16bit/8bit
Power supply	12V/8A
Camera weight	980g
PC software	Mosaic V2
Operating system	Windows, Linux
Operating environment	Temperature: 0-40°C; Humidity: 10%-85%
Camera size	85mm x 85mm x 112mm

## Software Description

FL-20BW supports Tucsen standard SDK development kit, supports Microsoft Directshow, Twain video interface, and supports Mosaic 2.1 software.

Mosaic 2.1 software is a large imaging software developed by Tucsen to support Tucsen's full range of products. It has three modules: camera control, image processing and measurement. Its core features include compatibility with Microsoft Windows and Apple Mac OS dual-systems with advanced "real-time stitching" and "real-time EDF" algorithms, and so on.

## Mosaic 2.1 Key Features

### \* Real-time Image Stitching \ EDF \ 3D Noise Reduction

Real-time fluorescence image synthesis and editing

HDR image synthesis

Micro-imaging-based intelligent automatic exposure

Intelligent flat field correction based on dynamic calculation

Smart measurement workflow

Supports single shot, delayed camera

User parameter group save and load

Dynamic \ static measurement

Customize measuring gauges, layers, precision

Customize image naming, style, save location

Implements drawing: points, lines, rectangles, polygons, circles, arcs, angles

Data export as TXT or Excel, report generation and printing

## Tucsen Photonics Co., Ltd.

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