

# ORCA®-Flash4.0LT and W-VIEW GEMINI Synergize Your Dual Wavelength Imaging

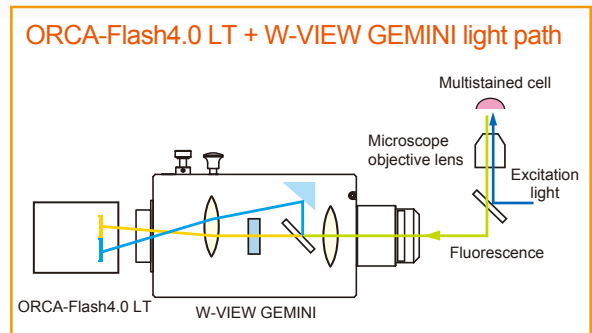


Beautiful things happen when the W-VIEW GEMINI Image Splitting optics is combined with the ORCA-Flash4.0 LT sCMOS camera.... the W-VIEW GEMINI equally divides the field of view into two separate images, side by side on a single camera. When that camera is the ORCA-Flash4.0 LT in W-VIEW Mode, it's now possible to use innovative new functions that include independent exposures and subarrays for each half of the sensor.

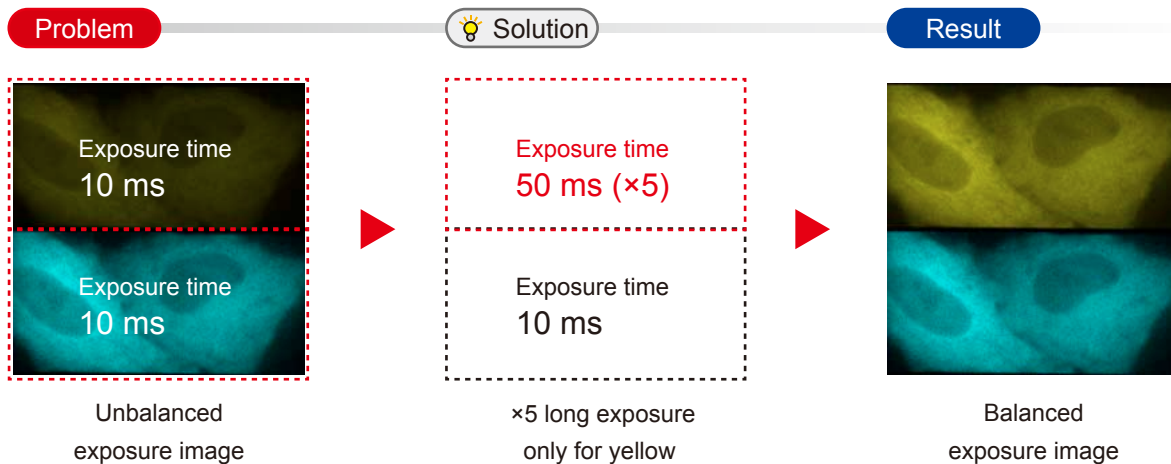
**ORCA-Flash4.0LT**  
Digital CMOS camera C11440-42U

**W-VIEW GEMINI**  
Image Splitting Optics A12801-01

Exceptional QE across a wide range of wavelengths combined with low noise make the ORCA-Flash4.0 LT a simple and affordable choice for low light imaging. With three times the field of view and two times the speed of traditional interline CCDs this camera opens a host of new possibilities. Hamamatsu's new W-VIEW Mode for the ORCA-Flash4.0 LT expands those possibilities even further. Dual wavelength fluorescence just got a lot less complicated. Simplifying multi-wavelength experiments like FRET, the W-VIEW GEMINI /ORCA-Flash4.0 LT duo get out of your way to bring you closer to the biology. What biological processes will this synergistic partnership bring closer to you?

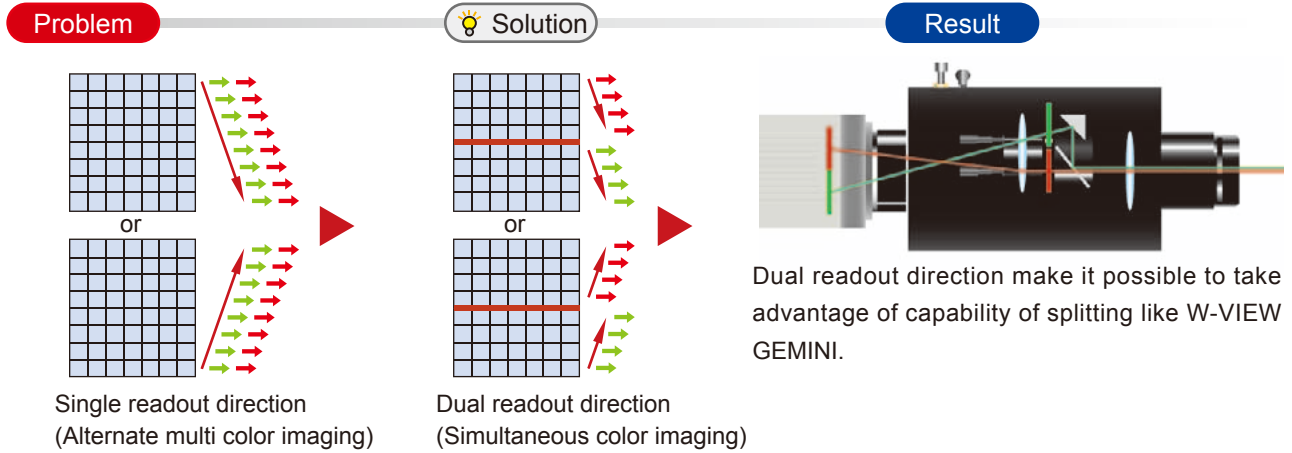


## W-VIEW Mode Feature1: Independent Exposure Times



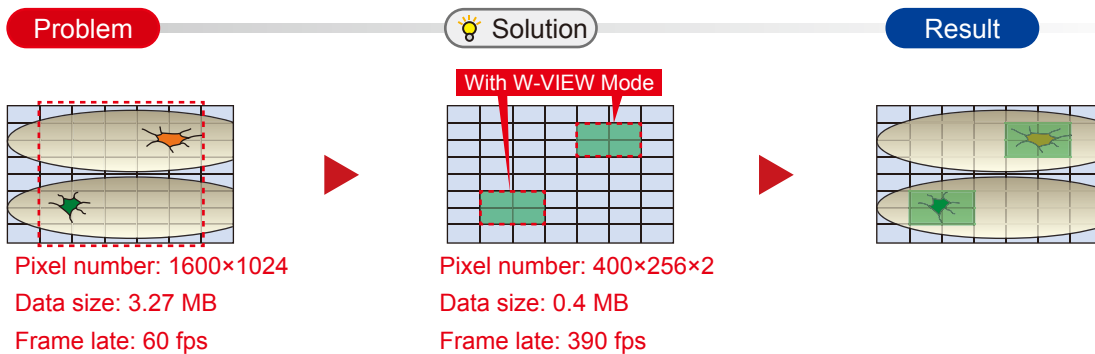
It's pretty rare that the signals from dual wavelength fluorescence samples warrant the same exposure times. When your cyan channel is screaming but your yellow is ho-hum horrible, the LT's new W-VIEW Mode takes away the need for complicated tweaks in optics or filtration and seamlessly ensures more balanced exposures for reliably quantitative dual wavelength imaging.

## W-VIEW Mode Feature 2: Independent and Selectable Readout Directions



With the independent readout direction, synchronous illumination of two different wavelength is possible to image two-wavelength excitation/ two-wavelength emission simultaneously by the W-VIEW GEMINI.

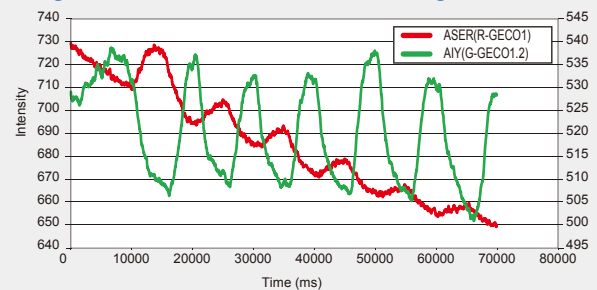
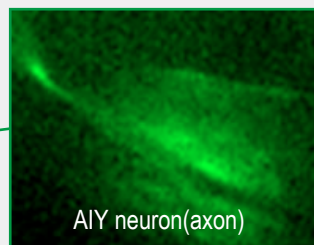
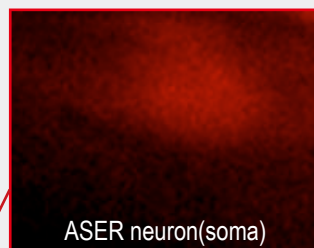
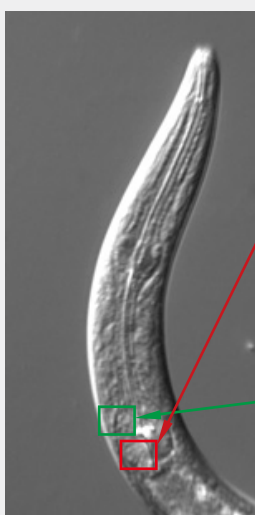
## W-VIEW Mode Feature 3: Independent Subarray



Fast experiments can generate a lot of data. What if you need to go fast but not necessarily keep every single pixel of the image? The ability to specify two regions of interest on the ORCA-Flash4.0 LT means both a big increase in speed and smaller files sizes. High-speed, extended time course data are recorded with more simplicity than ever before.

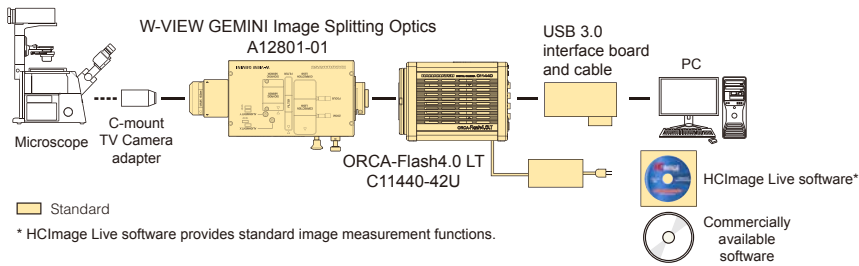
### Application data using ORCA-Flash4.0 LT (W-VIEW Mode) & W-VIEW GEMINI

An analysis of the spatio-temporal activity in a salt-sensing neuron of the nematode *C. elegans*



Sample: *C. elegans*  
 Fluorophore: ASER-R-GECO1\_Aiy-G-GECO1.2  
 Stimulation: NaCl concentration change(50 mM to 0 mM), 5 sec interval  
 Lens: 60×(oil)  
 Camera: ORCA-Flash4.0 LT  
 Ch1(G-GECO1.2) Exposure time: 33 ms, Ch2(R-GECO1) Exposure time: 33 ms  
 Binning: 2×2  
 Scan mode: W-VIEW Mode  
 Optics: W-VIEW GEMINI  
 DIC image is prepared by HAMAMATSU PHOTONICS as reference  
 Rolling average(4frames)  
 Sample and Image courtesy of Masahiro Kuramochi and Motomichi Doi, Ph.D.  
 University of Tsukuba  
 Biomedical Research Institute,  
 NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY (AIST)

# Configuration example



# Specifications

|  |   |  |
|--|---|--|
| <b>Product name</b>                                  | ORCA-Flash4.0 LT Digital CMOS camera  |  |
| <b>Product number</b>                                | C11440-42U  |  |
| <b>Imaging device</b>                                | Scientific CMOS sensor FL-400   |  |
| <b>Effective number of pixels</b>                    | 2048(H) × 2048(V)   |  |
| <b>Cell size</b>                                     | 6.5 μm × 6.5 μm   |  |
| <b>Effective area</b>                                | 13.312 mm × 13.312 mm   |  |
| <b>Full well capacity (typ.)</b>                     | 30 000 electrons  |  |
| <b>Readout noise (typ.)</b>                          | 0.9 electrons (median), 1.5 electrons (rms)   |  |
| <b>Readout noise (Rapid rolling mode) (typ.)</b>     | 1.3 electrons (median), 1.9 electrons (rms)   |  |
| <b>Dynamic range (typ.)<sup>1</sup></b>              | 33 000:1  |  |
| <b>Quantum efficiency</b>                            | Over 70 % at 600 nm   |  |
| <b>Cooling temperature</b>                           | +10 °C (Ambient +25 °C)   |  |
| <b>Dark current (typ.)</b>                           | 0.6 electrons/pixel/s   |  |
| <b>PRNU (Column fixed pattern noise<sup>2</sup>)</b> | 0.1 %   |  |
| <b>MTF (Theoretical)</b>                             | 76.9 lp/mm  |  |
| <b>Frame rate<sup>3</sup></b>                        |   |  |
| Full resolution                                      | 30 frames/s   |  |
| 2048 × 1024 <sup>4</sup>                             | 60 frames/s   |  |
| 2048 × 8 <sup>4</sup>                                | 7696 frames/s   |  |
| 512 × 8 <sup>4</sup>                                 | 25 000 frames/s (Rapid rolling mode only)   |  |
| <b>AD conversion<sup>5</sup></b>                     | 16 bit  |  |
| <b>Readout mode</b>                                  | Normal readout mode 1×1<br>Digital binning 2×2/4×4<br>Sub-array readout mode<br>(Configurable different value in the top and bottom areas.) <sup>6</sup><br>Readout direction change <sup>6</sup> |  |
| <b>Exposure time</b>                                 | Normal mode   | Rapid rolling mode                         |
| Internal trigger mode <sup>7</sup>                   | 3 ms to 10 s<br>3 ms to 6 s <sup>6</sup>  | 1 ms to 10 s<br>1 ms to 2 s <sup>6</sup>   |
| Internal trigger mode with sub-array readout         | 130 μs to 10 s<br>130 μs to 6 s <sup>6</sup>  | 40 μs to 10 s<br>40 μs to 2 s <sup>6</sup> |
| External trigger mode                                | 3 ms to 10 s<br>3 ms to 6 s <sup>6</sup>  | 1 ms to 10 s<br>1 ms to 2 s <sup>6</sup>   |
| <b>Interface</b>                                     | USB 3.0   |  |

- \*1 Full well capacity/Readout noise median  
\*2 Measured at 70 % of full well capacity  
\*3 Optimal running condition. For more information refer to [http://www.hamamatsu.com/resources/pdf/sys/SCAS0095E01\\_Global.pdf](http://www.hamamatsu.com/resources/pdf/sys/SCAS0095E01_Global.pdf)  
\*4 Measured center of image.  
\*5 The true 16 bit image data is achieved through seamless merging of the output from two 11 bit A/D converters.  
\*6 At the time of W-VIEW Mode  
\*7 Minimum exposure time in internal trigger mode varies depending on sub-array size and position.

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|   |   |
|---|---|
| <b>Product name</b>                               | W-VIEW GEMINI Image Splitting Optics                        |
| <b>Product number</b>                             | A12801-01   |
| <b>Structure</b>                                  | C-mount to C-mount linear structure                         |
| <b>Input mount</b>                                | C-mount (female)  |
| <b>Output mount</b>                               | C-mount (male)  |
| <b>Relay lens magnification</b>                   | 1.0   |
| <b>Field of view<sup>1</sup></b>                  | 13 mm × 6.4 mm (W-VIEW Mode)<br>13 mm × 13 mm (Bypass mode) |
| <b>Mode</b>                                       | W-VIEW Mode / Bypass mode <sup>2</sup>                      |
| <b>Transmittance wavelength range<sup>3</sup></b> | 400 nm to 800 nm  |
| <b>Transmittance (Typ.)<sup>4</sup></b>           | 97 %  |
| <b>Dichroic mirror<sup>5-6</sup></b>              | Compatible with 25.2 × 35.6                                 |
| <b>Bandpass filter<sup>5-6</sup></b>              | Compatible with f25.4 filter                                |
| <b>ND filter<sup>5-6</sup></b>                    | Compatible with f25.4 filter                                |

- \*1 Vignetting may occur when used with a relay lens or variable magnification lens. Please check with your Hamamatsu representative to confirm this point before purchase.  
\*2 Mode in which dichroic mirror, etc. are removed from the light path and the image from the microscope is projected to the camera without alteration.  
\*3 All are values in the bypass mode.  
\*4 Value at peak wavelength in the bypass mode.  
\*5 Because dichroic mirror, band-pass filter and ND filter are not included with the W-VIEW GEMINI, they must be purchased separately. Use an "imaging grade" dichroic mirror and bandpass filters.  
\*6 For the usable size, see "Size of dichroic mirror and filters".

### Size of dichroic mirror and filters

|                 | Size (mm) / Tolerances (mm) |         | Thickness (mm) |
|-----------------|-----------------------------|---------|----------------|
| Dichroic mirror | 25.2 × 35.6                 | 0.1     | 2.0(Max.)      |
| Bandpass filter | f25.4                       | +0/-0.6 | 6.0(Max.)*     |
| ND filter       |                             |         |                |

\*The value is total thickness of a bandpass filter and ND filter.