

IMAGING PERFORMANCE SPECIFICATION

FLIR **BLACKFLY**[®] *USB3 Vision*



USB[™]
VISION

Version 5.1
Revised 1/26/2017



FCC Compliance

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation.

Korean EMC Certification

The KCC symbol indicates that this product complies with Korea's Electrical Communication Basic Law regarding EMC testing for electromagnetic interference (EMI) and susceptibility (EMS).

Hardware Warranty

The warranty for the Blackfly USB 3.1 camera is 3 years. For detailed information on how to repair or replace your camera, please see the [terms and conditions on our website](#).

WEEE

The symbol indicates that this product may not be treated as household waste. Please ensure this product is properly disposed as inappropriate waste handling of this product may cause potential hazards to the environment and human health. For more detailed information about recycling of this product, please contact us.



Trademarks

Names and marks appearing on the products herein are either registered trademarks or trademarks of FLIR Systems, Inc. and/or its subsidiaries.

Licensing

To view the licenses of open source packages used in this product please see [What open source packages does firmware use?](#)

1 Specifications

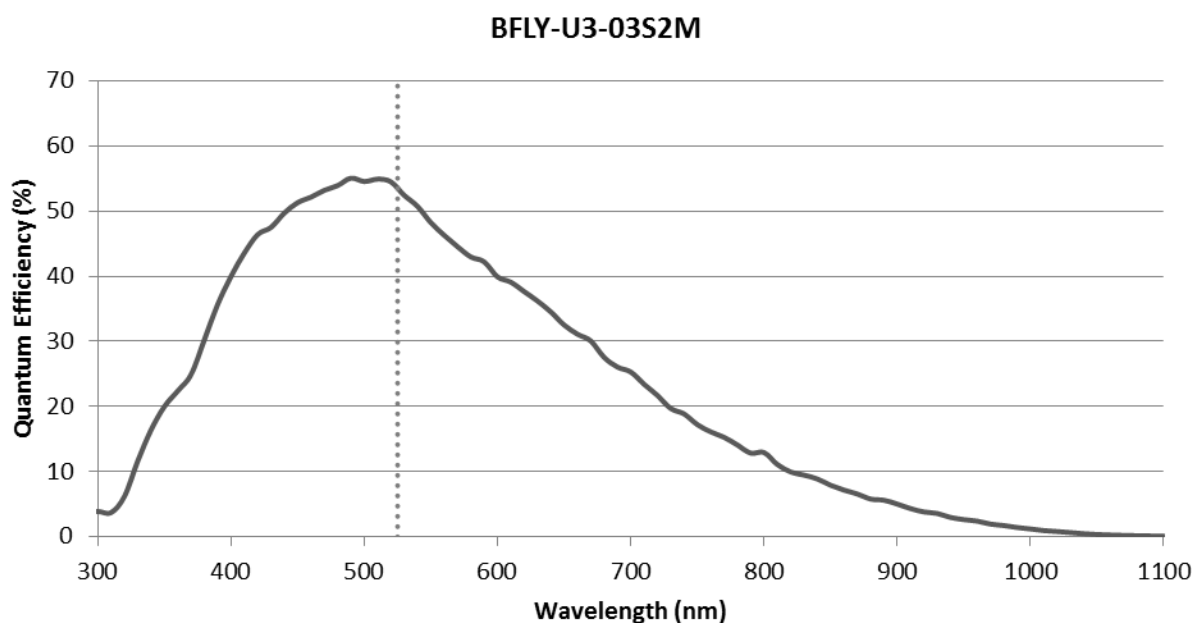
Model	Sensor	Maximum Resolution	Pixel Size	Firmware	Results
BFLY-U3-03S2M-CS	Sony ICX424, 1/3", Mono	648 x 488	7.4 μm	1.3.3.0	page 2
BFLY-U3-03S2C-CS	Sony ICX424, 1/3", Color	648 x 488	7.4 μm	1.3.3.0	page 3
BFLY-U3-05S2M-CS	Sony ICX693, 1/3", Mono	808 x 608	6.0 μm	1.6.3.0	page 4
BFLY-U3-05S2C-CS	Sony ICX693, 1/3", Color	808 x 608	6.0 μm	1.6.3.0	page 5
BFLY-U3-13S2M-CS	Sony ICX445, 1/3", Mono	1288 x 964	3.75 μm	1.2.3.0	page 6
BFLY-U3-13S2C-CS	Sony ICX445, 1/3", Color	1288 x 964	3.75 μm	1.2.3.0	page 7
BFLY-U3-20S4M-CS	Sony ICX274, 1/1.8", Mono	1624 x 1224	4.4 μm	1.6.3.0	page 8
BFLY-U3-20S4C-CS	Sony ICX274, 1/1.8", Color	1624 x 1224	4.4 μm	1.6.3.0	page 9
BFLY-U3-23S6M-C	Sony IMX249, 1/1.2", Mono	1920 x 1200	5.86 μm	1.8.3.0	page 10
BFLY-U3-23S6C-C	Sony IMX249, 1/1.2", Color	1920 x 1200	5.86 μm	1.8.3.0	page 11
BFLY-U3-50H5M-C	Sharp RJ32S4AA0DT, 2/3", Mono	2448 x 2048	3.45 μm	1.8.3.0	page 12
BFLY-U3-50H5C-C	Sharp RJ32S3AA0DT, 2/3", Color	2448 x 2048	3.45 μm	1.8.3.0	page 13



Measurements are taken based on guidelines in the EMVA 1288 standard; the full definition can be found at EMVA.org. Camera settings are at maximum bit depth unless otherwise noted. Temporal Dark Noise is measured at minimum exposure time. The center wavelength is 525 nm unless otherwise noted. The pixel format is Raw 16 or Mono 16 for mono cameras and Raw 16 for color cameras. Results are captured at room temperature (20°C).

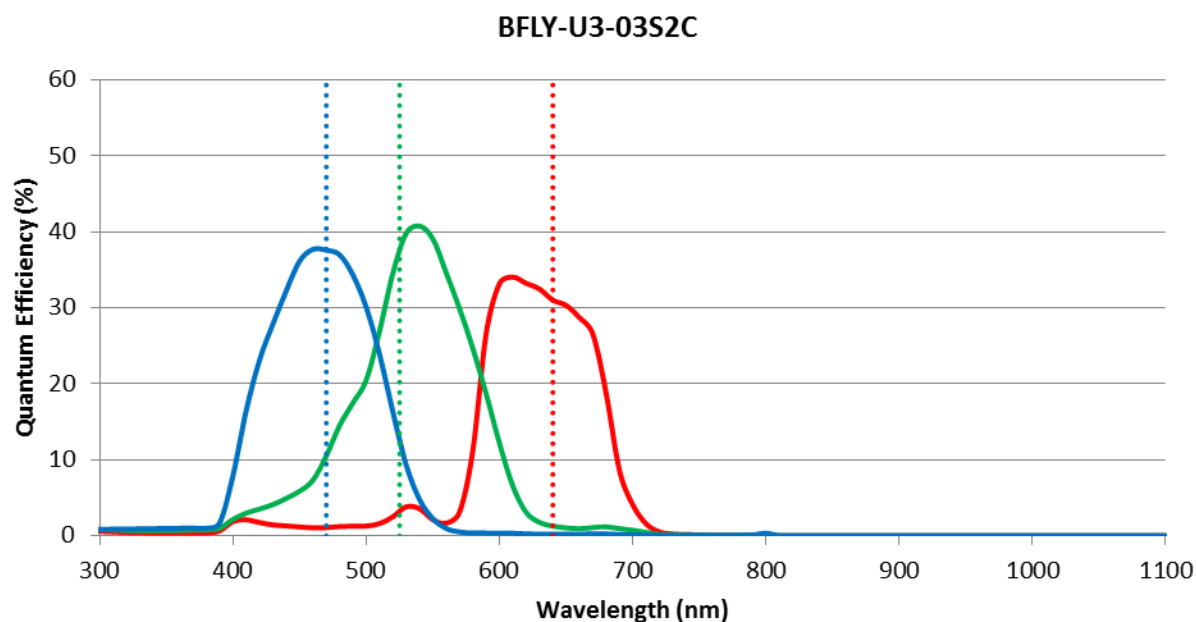
2 BFLY-U3-03S2M-CS Imaging Performance

Measurement	Video Mode 0
Pixel Clock (MHz)	36
ADC (Bits)	12-bit
Quantum Efficiency (% at 525 nm)	53
Temporal Dark Noise (Read Noise) (e-)	12.03
Signal to Noise Ratio Maximum (dB)	41.37
Signal to Noise Ratio Maximum (Bits)	6.87
Absolute Sensitivity Threshold (γ)	24.76
Saturation Capacity (Well Depth) (e-)	13701
Dynamic Range (dB)	60.78
Dynamic Range (Bits)	10.10
Gain (e-/ADU)	0.22



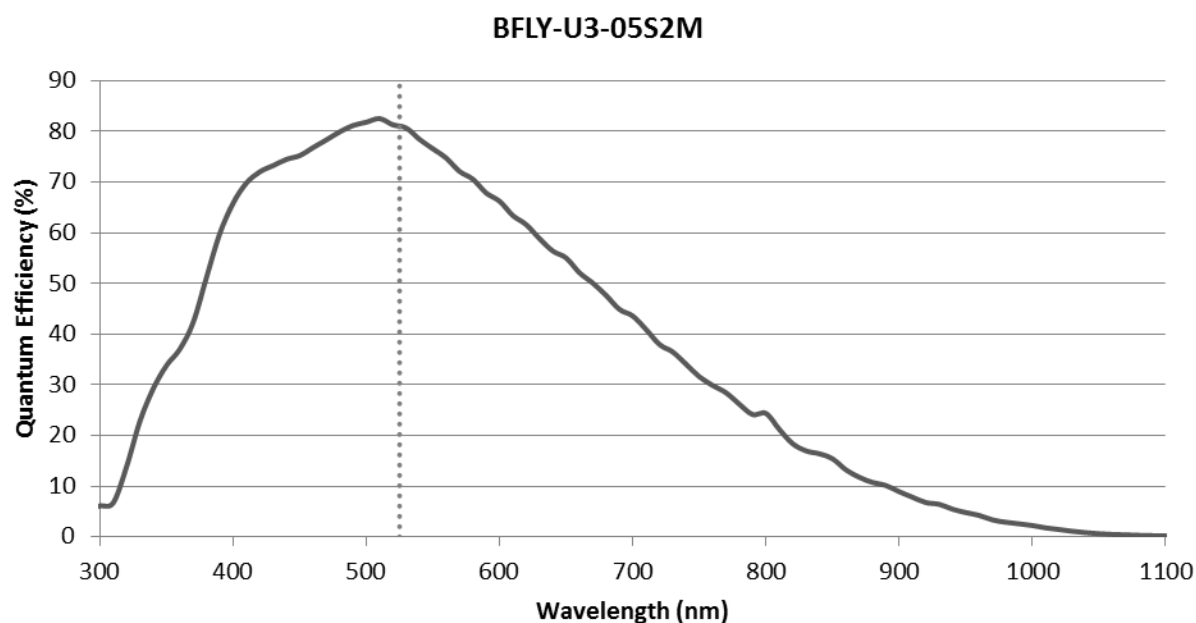
3 BFLY-U3-03S2C-CS Imaging Performance

Measurement	Video Mode 0
Pixel Clock (MHz)	36
ADC (Bits)	12-bit
Quantum Efficiency Blue (% at 470 nm)	37
Quantum Efficiency Green (% at 525 nm)	37
Quantum Efficiency Red (% at 640 nm)	31
Temporal Dark Noise (Read Noise) (e-)	11.90
Signal to Noise Ratio Maximum (dB)	41.35
Signal to Noise Ratio Maximum (Bits)	6.87
Absolute Sensitivity Threshold (γ)	34.80
Saturation Capacity (Well Depth) (e-)	13648
Dynamic Range (dB)	60.83
Dynamic Range (Bits)	10.10
Gain (e-/ADU)	0.22



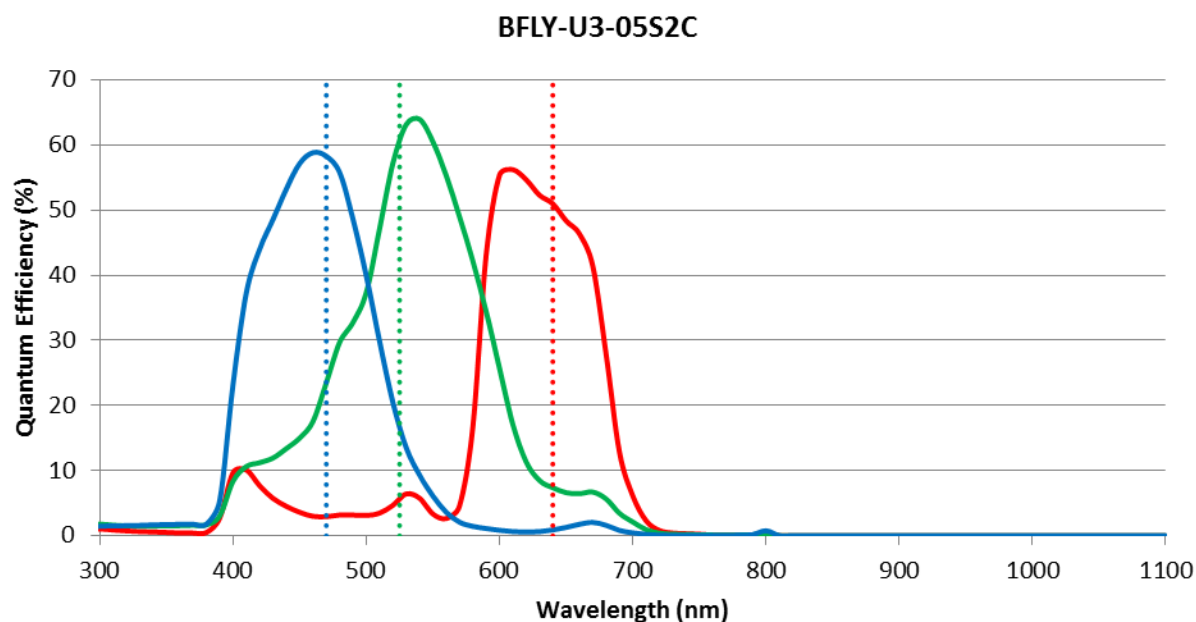
4 BFLY-U3-05S2M-CS Imaging Performance

Measurement	Video Mode 0
Pixel Clock (MHz)	36
ADC (Bits)	12-bit
Quantum Efficiency (% at 525 nm)	81
Temporal Dark Noise (Read Noise) (e-)	9.51
Signal to Noise Ratio Maximum (dB)	43.44
Signal to Noise Ratio Maximum (Bits)	7.22
Absolute Sensitivity Threshold (γ)	12.83
Saturation Capacity (Well Depth) (e-)	22074
Dynamic Range (dB)	66.87
Dynamic Range (Bits)	11.11
Gain (e-/ADU)	0.37



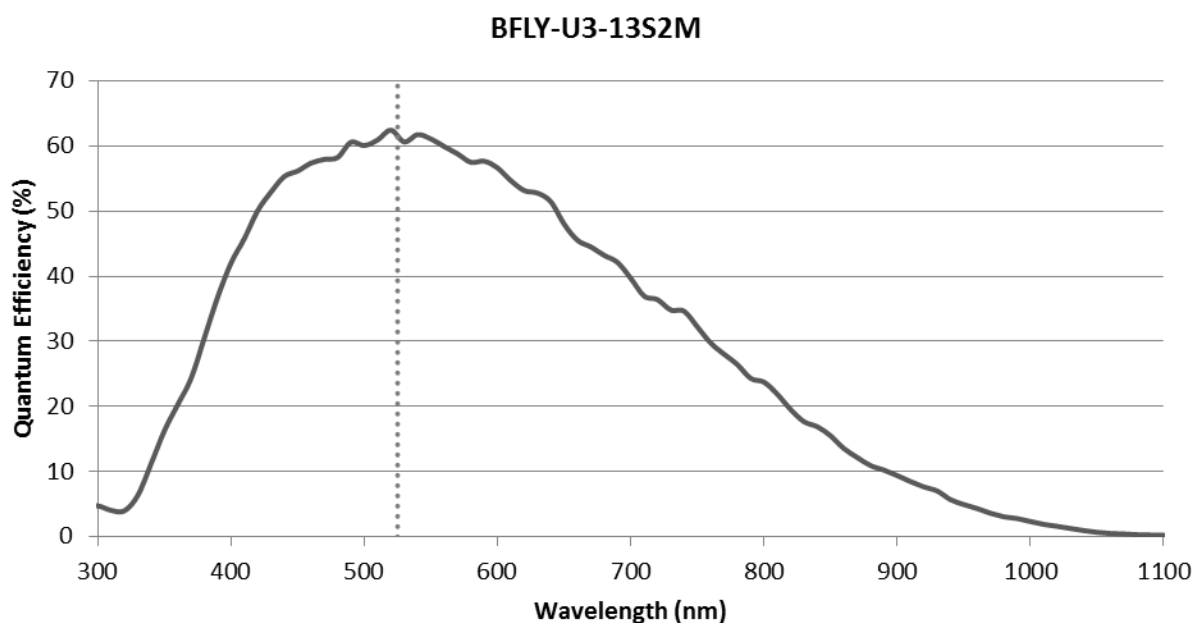
5 BFLY-U3-05S2C-CS Imaging Performance

Measurement	Video Mode 0
Pixel Clock (MHz)	36
ADC (Bits)	12-bit
Quantum Efficiency Blue (% at 470 nm)	58
Quantum Efficiency Green (% at 525 nm)	60
Quantum Efficiency Red (% at 640 nm)	50
Temporal Dark Noise (Read Noise) (e-)	9.20
Signal to Noise Ratio Maximum (dB)	43.33
Signal to Noise Ratio Maximum (Bits)	7.20
Absolute Sensitivity Threshold (γ)	17.13
Saturation Capacity (Well Depth) (e-)	21516
Dynamic Range (dB)	66.92
Dynamic Range (Bits)	11.11
Gain (e-/ADU)	0.36



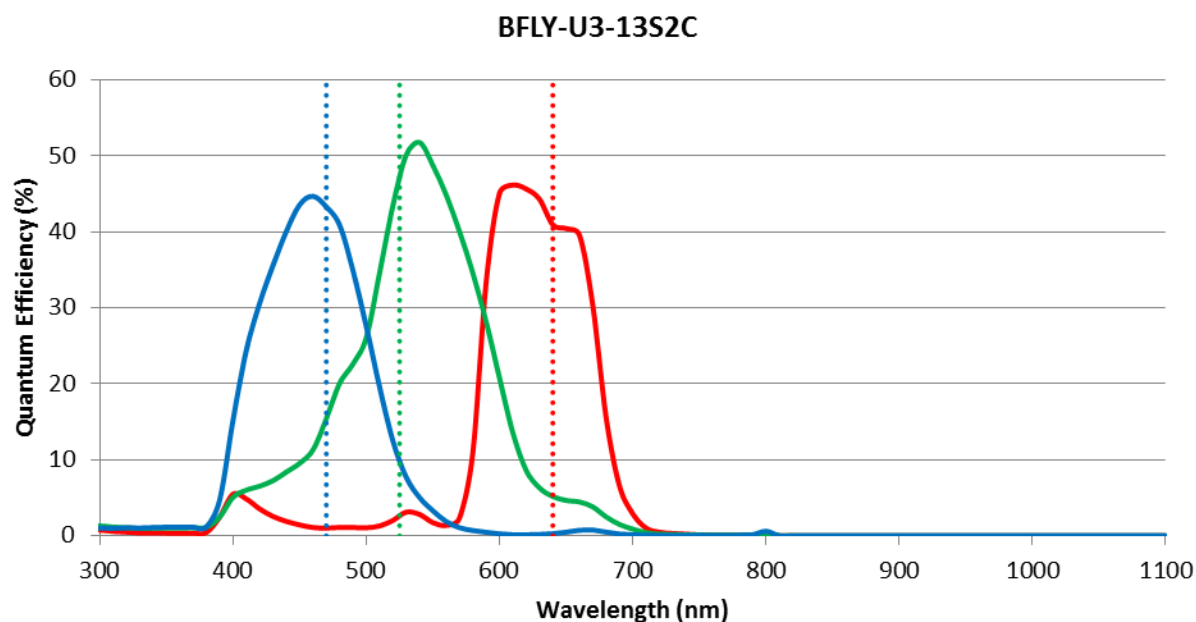
6 BFLY-U3-13S2M-CS Imaging Performance

Measurement	Video Mode 0
Pixel Clock (MHz)	45
ADC (Bits)	12-bit
Quantum Efficiency (% at 525 nm)	61
Temporal Dark Noise (Read Noise) (e-)	10.30
Signal to Noise Ratio Maximum (dB)	39.86
Signal to Noise Ratio Maximum (Bits)	6.62
Absolute Sensitivity Threshold (γ)	17.78
Saturation Capacity (Well Depth) (e-)	9686
Dynamic Range (dB)	59.06
Dynamic Range (Bits)	9.81
Gain (e-/ADU)	0.15



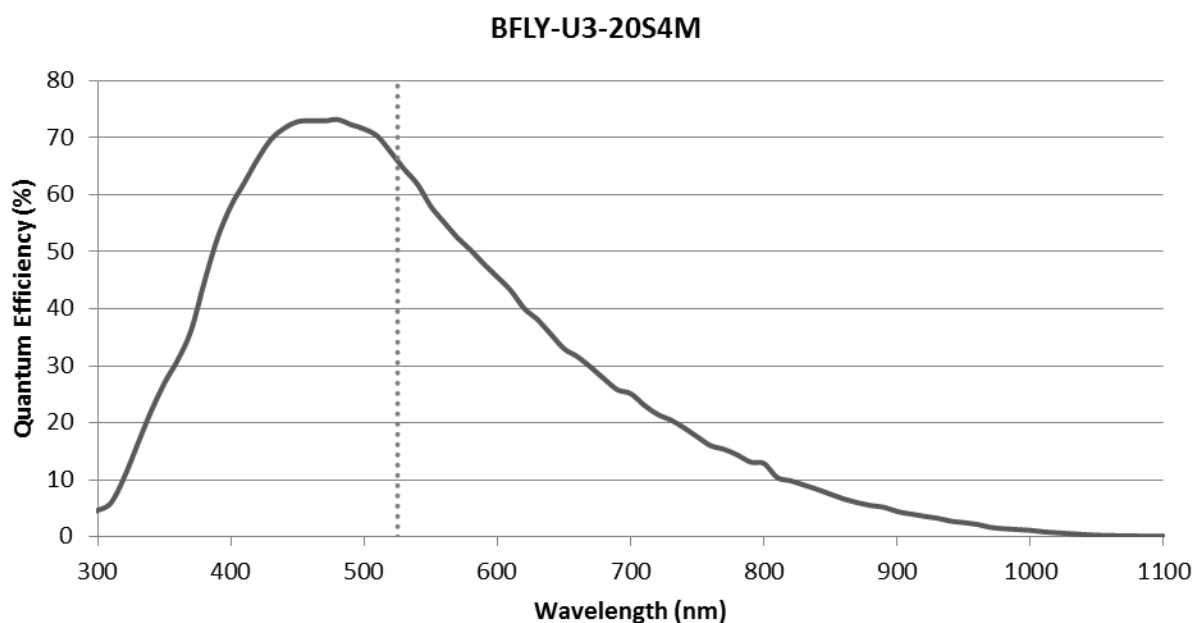
7 BFLY-U3-13S2C-CS Imaging Performance

Measurement	Video Mode 0
Pixel Clock (MHz)	45
ADC (Bits)	12-bit
Quantum Efficiency Blue (% at 470 nm)	43
Quantum Efficiency Green (% at 525 nm)	46
Quantum Efficiency Red (% at 640 nm)	40
Temporal Dark Noise (Read Noise) (e-)	9.23
Signal to Noise Ratio Maximum (dB)	39.77
Signal to Noise Ratio Maximum (Bits)	6.61
Absolute Sensitivity Threshold (γ)	21.77
Saturation Capacity (Well Depth) (e-)	9487
Dynamic Range (dB)	59.78
Dynamic Range (Bits)	9.93
Gain (e-/ADU)	0.15



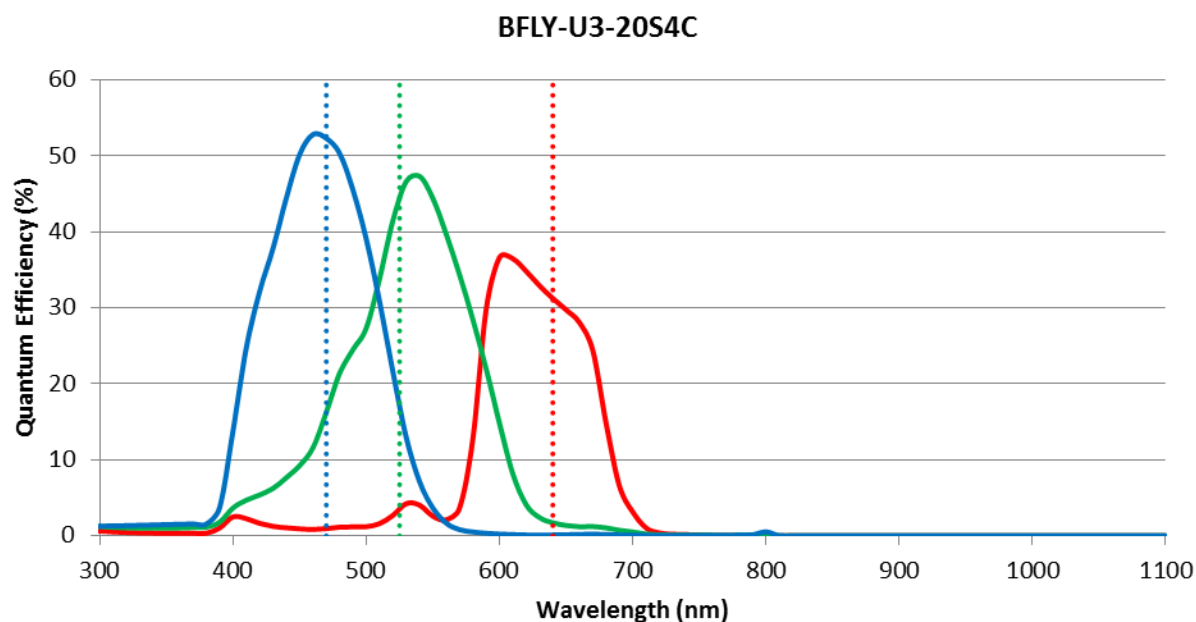
8 BFLY-U3-20S4M-CS Imaging Performance

Measurement	Video Mode 0
Pixel Clock (MHz)	36
ADC (Bits)	12-bit
Quantum Efficiency (% at 525 nm)	65
Temporal Dark Noise (Read Noise) (e-)	8.53
Signal to Noise Ratio Maximum (dB)	39.62
Signal to Noise Ratio Maximum (Bits)	6.58
Absolute Sensitivity Threshold (γ)	14.65
Saturation Capacity (Well Depth) (e-)	9168
Dynamic Range (dB)	60.13
Dynamic Range (Bits)	9.99
Gain (e-/ADU)	0.15



9 BFLY-U3-20S4C-CS Imaging Performance

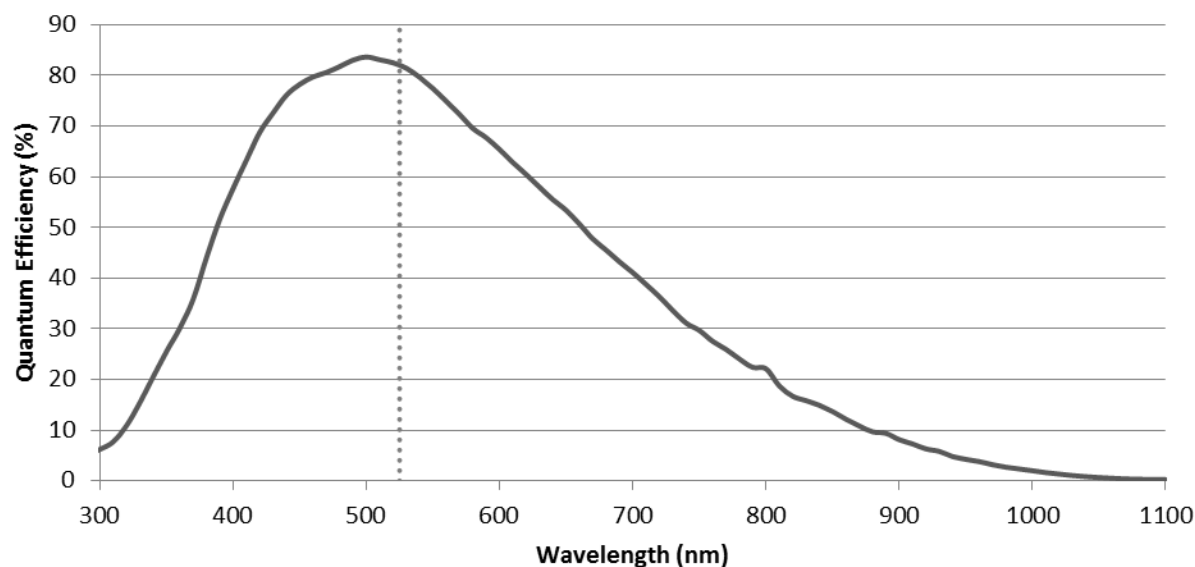
Measurement	Video Mode 0
Pixel Clock (MHz)	36
ADC (Bits)	12-bit
Quantum Efficiency Blue (% at 470 nm)	52
Quantum Efficiency Green (% at 525 nm)	44
Quantum Efficiency Red (% at 640 nm)	31
Temporal Dark Noise (Read Noise) (e-)	8.21
Signal to Noise Ratio Maximum (dB)	39.35
Signal to Noise Ratio Maximum (Bits)	6.54
Absolute Sensitivity Threshold (γ)	21.09
Saturation Capacity (Well Depth) (e-)	8617
Dynamic Range (dB)	59.90
Dynamic Range (Bits)	9.95
Gain (e-/ADU)	0.15



10 BFLY-U3-23S6M-C Imaging Performance

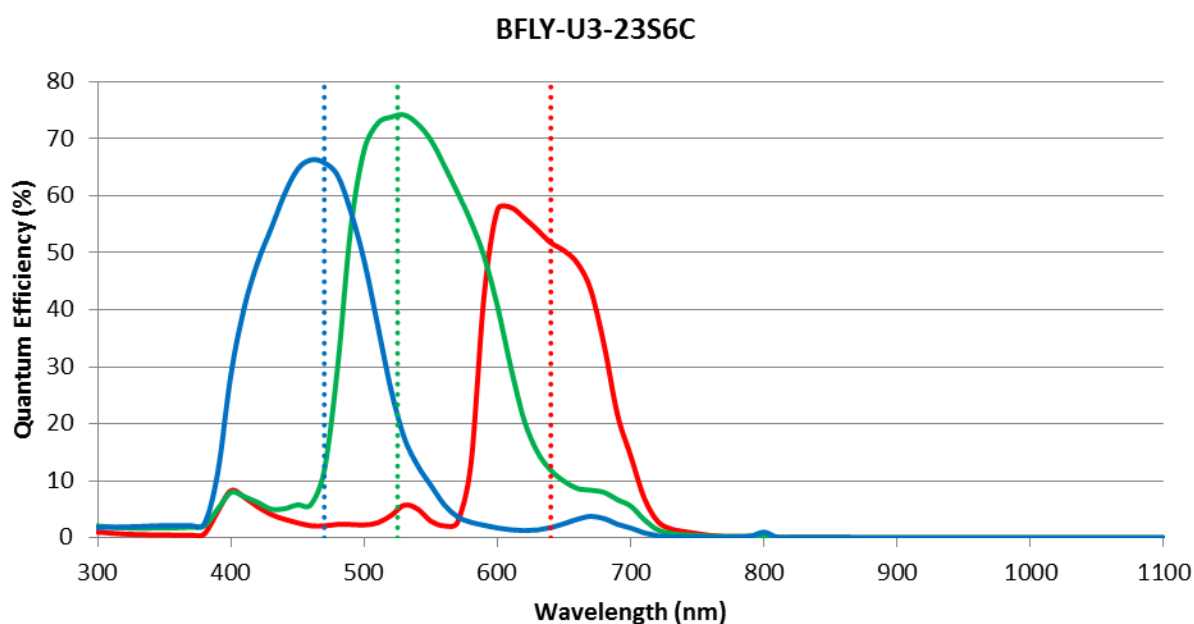
Measurement	Video Mode 0	Video Mode 7
Pixel Clock (MHz)	37.5	37.5
ADC (Bits)	10-bit	12-bit
Quantum Efficiency (% at 525 nm)	81	82
Temporal Dark Noise (Read Noise) (e-)	14.25	6.97
Signal to Noise Ratio Maximum (dB)	45.25	45.27
Signal to Noise Ratio Maximum (Bits)	7.52	7.52
Absolute Sensitivity Threshold (γ)	18.61	9.36
Saturation Capacity (Well Depth) (e-)	33489	33676
Dynamic Range (dB)	67.12	73.08
Dynamic Range (Bits)	11.15	12.14
Gain (e-/ADU)	0.53	0.53

BFLY-U3-23S6M



11 BFLY-U3-23S6C-C Imaging Performance

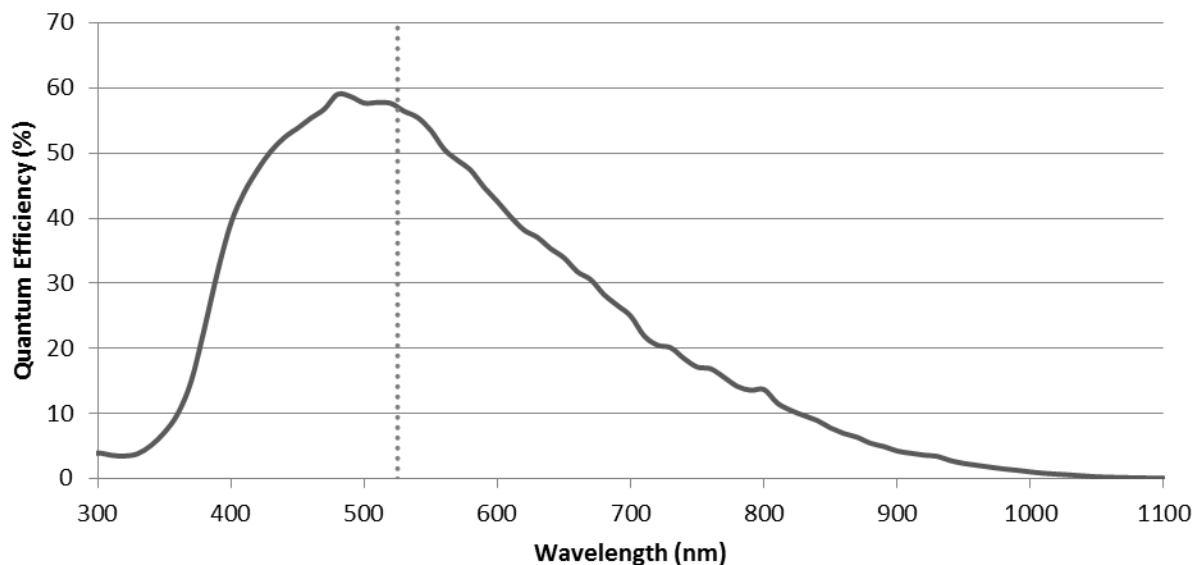
Measurement	Video Mode 0	Video Mode 7
Pixel Clock (MHz)	37.5	37.5
ADC (Bits)	10-bit	12-bit
Quantum Efficiency Blue (% at 470 nm)	65	66
Quantum Efficiency Green (% at 525 nm)	74	74
Quantum Efficiency Red (% at 640 nm)	51	52
Temporal Dark Noise (Read Noise) (e-)	13.77	6.89
Signal to Noise Ratio Maximum (dB)	45.21	45.23
Signal to Noise Ratio Maximum (Bits)	7.51	7.51
Absolute Sensitivity Threshold (γ)	20.26	10.42
Saturation Capacity (Well Depth) (e-)	33158	33368
Dynamic Range (dB)	67.33	73.09
Dynamic Range (Bits)	11.18	12.14
Gain (e-/ADU)	0.52	0.53



12 BFLY-U3-50H5M-C Imaging Performance

Measurement	Video Mode 0
Pixel Clock (MHz)	45
ADC (Bits)	12-bit
Quantum Efficiency (% at 525 nm)	57
Temporal Dark Noise (Read Noise) (e-)	6.28
Signal to Noise Ratio Maximum (dB)	39.17
Signal to Noise Ratio Maximum (Bits)	6.51
Absolute Sensitivity Threshold (γ)	12.40
Saturation Capacity (Well Depth) (e-)	8265
Dynamic Range (dB)	61.72
Dynamic Range (Bits)	10.25
Gain (e-/ADU)	0.13

BFLY-U3-50H5M



13 BFLY-U3-50H5C-C Imaging Performance

Measurement	Video Mode 0
Pixel Clock (MHz)	45
ADC (Bits)	12-bit
Quantum Efficiency Blue (% at 470 nm)	45
Quantum Efficiency Green (% at 525 nm)	50
Quantum Efficiency Red (% at 640 nm)	32
Temporal Dark Noise (Read Noise) (e-)	5.52
Signal to Noise Ratio Maximum (dB)	39.17
Signal to Noise Ratio Maximum (Bits)	6.51
Absolute Sensitivity Threshold (γ)	12.62
Saturation Capacity (Well Depth) (e-)	8258
Dynamic Range (dB)	62.75
Dynamic Range (Bits)	10.42
Gain (e-/ADU)	0.13

