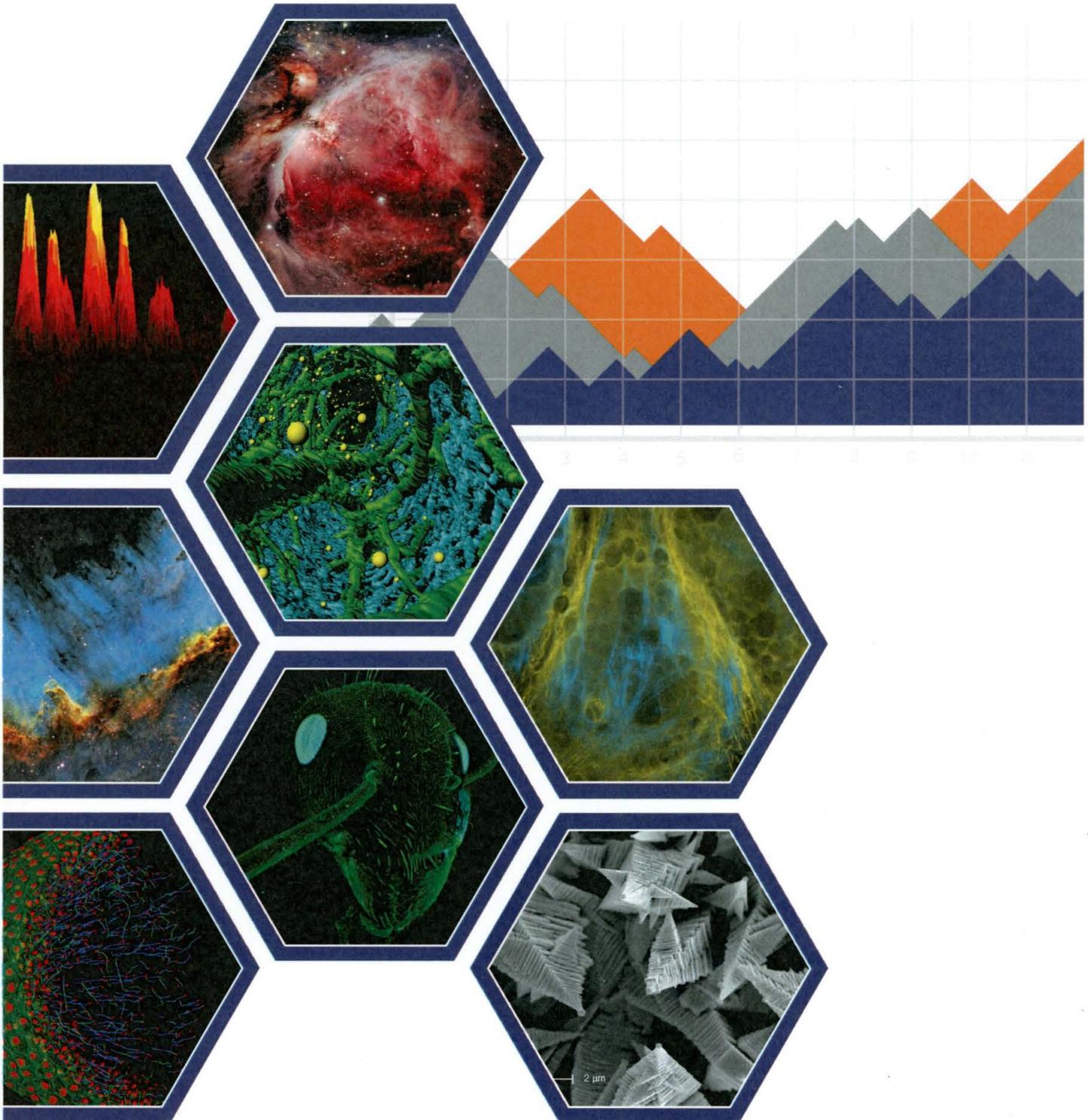


RMA# R62042

CCD-17878
BS01

ANDOR
an Oxford Instruments company

System Performance Booklet



SHIPMENT NO: R62042
Andor Order No: R62042
Division : US / Unknown
Customer Order No: F018895

Date: 30 October 2018

Ship To:
 SJSU RESEARCH FOUNDATION
 MLML MARK YARBROUGH
 965 N NIMITZ HWY
 HONOLULU HI 96817
 UNITED STATES

Customs Information: UG-STD
 Goods are part of an Optical
 Checking/Measuring Device
 Harmonized No 90275000
 Manufacturer code GBANDTEC7BEL
 Goods are made in the UK
 Values are for Customs Purposes

These goods are uncontrolled
 to destination.
 Goods re-exported may require an
 export licence

ITEM	PART NUMBER	DESCRIPTION	QUANTITY	UNIT PRICE	VALUE
1	NWR (S)	NON WARRANTY REPAIR R62042	1	1,750.00	1,750.00
		DU934P-BR-DD CCD-17878 ✓			
		VALUE FOR CUSTOMS USD 15000			
		CPC 3151000 - IPR IP/0920/500/21			
		HS CODE 9802004040 - 8525804000			
		TERMS NET 30			
		CONFIRM TO HUE NGO			
		END USER MARK YARBROUGH			
		ANDOR CONTACT TONY GADOLA			
CARRIER:			PACKAGES:	TOTAL (Exc. Tax)	
AIRWAY BILL: 1Z8W40070460071034			1	1,750.00 USD	

13 Nov 2018, MF ... B501

UPS tracking
 delivered
 01-Nov-2018

Returns Report

Customer	ANDUSA Yarbrough/MLML	Returns No	R62042
Classification	NON WARRANTY	Customer RMA No	None

Equipment Details	Model	Serial Number
Head	DU934P-BR-DD	CCD-17878
Card		
PSU		
Multi IO		
Other		

Reported Fault

Returning iKon-M camera for widow changes.

Camera parallel window to be replaced with WN35FS Broadband VUV-NIR Wedged windows, code- (BB-VV-NR)W.

Diagnosis

Confirmed requested wedged window replacement required.

Work Carried Out

Wedged window installed.

Full system QC & new performance sheets completed: - Passed.

	Receipt Date	Work Complete	Passed For Shipping	Shipped
Date	22/08/2018	25/10/18	25/10/18	
Initials	PMC	PJ	MB	

* In the case of Products which are upgraded, the old Model No / Serial No are bracketed first, followed by the new Nos:

** Returns must be passed for shipping by the manufacturing manager and / or Sales Support

System Overview

Description	Model	Serial Number
CCD Head <input checked="" type="checkbox"/>	D U 9 34P - BR-DD	CCD-17878
TE Cooler performance (<input checked="" type="checkbox"/>)	High	Ultra-high <input checked="" type="checkbox"/>
Accessories	Power Supply Unit (PS -24)	PS -25
	--	<input checked="" type="checkbox"/>
	SO- LM- MFL-	
Serial/Batch Number		
Other		

Sensor types are defined in Table 1 using the last two letters in box Model Number.

CCD Details

Manufacturer / Model No.	Pixels	Serial Number
E2V CCD47-10	1024x1024, 13µm x 13µm	12262-08-38
E2V CCD57-10	512x512, (FT), 13µm x 13µm	
E2V CCD77-00	512x512, 24µm x 24µm	

Special Feature	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)
NIMO	<input checked="" type="checkbox"/>	Custom Mounting Flange
Fringe Suppression		Custom Cables
Shielded Anti-Blooming		

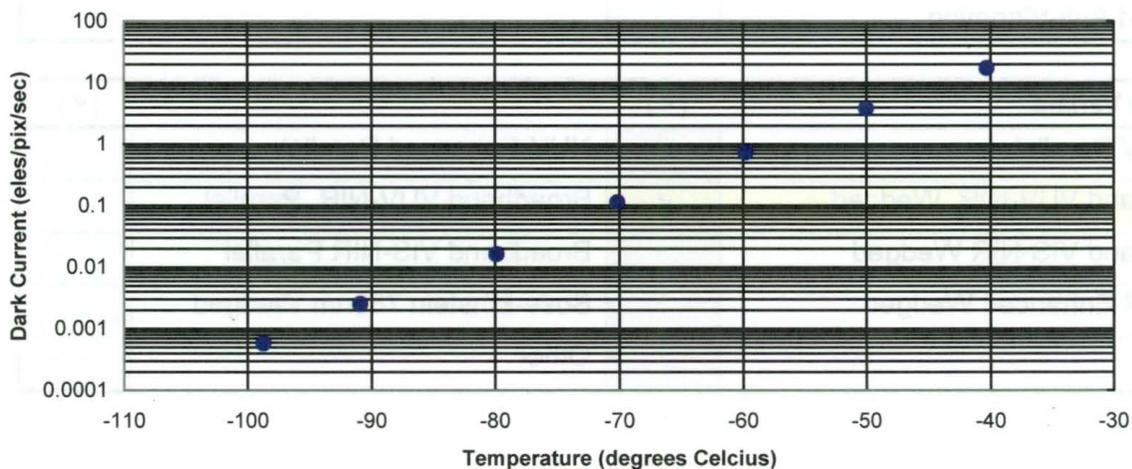
Window Variant	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)
VUV-UV Parallel		NUV-Enhanced Parallel
Broadband VUV-NIR Wedged	<input checked="" type="checkbox"/>	Broadband VUV-NIR Parallel
Broadband VIS-NIR Wedged		Broadband VIS-NIR Parallel
VIS-NIR Enhanced Wedged		Bose-Einstein 780nm Wedged
None		Other

Summary of System Test Data

Readout Noise $\diamond 1$ and Base Mean Level

A/D Rate (MHz All 16 bit)	Preamp setting	CCD	Single Pixel	Full Vert Bin	Base Level $\diamond 2$
		Sensitivity $\diamond 3$ eles per A/D count	Noise electrons	Noise electrons	(Counts)
5	x1	6.6	34.6	33.1	1025
5	x2	3.4	20.0	19.9	1657
5	x4	1.6	14.8	16.4	3302
3	x1	5.7	18.9	18.9	1069
3	x2	2.9	12.8	13.0	2000
3	x4	1.4	11.1	11.3	3681
1	x1	5.0	10.5	10.4	890
1	x2	2.7	8.1	7.9	1789
1	x4	1.2	6.5	6.4	3654
0.05	x1	5.1	5.1	5.0	544
0.05	x2	2.6	4.2	4.2	1420
0.05	x4	1.3	3.7	3.8	3234
Saturation Signal per pixel			106013	Electrons/pixel	

CCD Dark Current



Minimum Dark Current Achievable $\diamond 4$	0.000581	electrons/pixel/sec		
@ Sensor Temperature of $\diamond 5$	-98.717	°C	16	°C cooling Water
		With PS-25		
CCD Dark Current Uniformity better than $\diamond 6$	0.401	electrons/pixel/sec		

Linearity and Uniformity

Linearity better than ♦7	1	% over 16 bits
Response Uniformity better than ♦8	1.90	%

Response Defects

White/Black Spots ♦9				(X, Y)	
Centroid		Number of Pixels	Centroid		Number of Pixels
(503 , 561)		1	(,)		
(138 , 61)		1	(,)		
(297 , 228)		1	(,)		
(656 , 391)		1	(,)		
(709 , 632)		1	(,)		
(197 , 633)		1	(,)		
White/Black Columns ♦10			Column numbers indicated		
			X	X	
			X	X	
Trap ♦11			(X, Y)	(X , X)	

Dark Current Defects

Hot Spots ♦12				(X, Y)	
Centroid		Number of Pixels	Centroid		Number of Pixels
(X , X)		X	(,)		
(X , X)		X	(,)		
(,)			(,)		
(,)			(,)		
(,)			(,)		
(,)			(,)		
Hot Columns ♦13			Column numbers indicated		
			X	X	

Test Conditions

Readout Noise tested at	-80 °C with	16 °C water
Base Mean Level measured at	-80 °C with	16 °C water
Dark Current Uniformity tested at	-65 °C with	16 °C water
Blemishes tested at	-65 °C with	16 °C water

Custom Testing

WN35FS Broadband VUV-NIR Wedged window fitted as per customer request.

System Passed for Shipping

Signed

Date

PATRICK McCANN

3RD OCTOBER 2018

Hardware	HEADBOARD	FPGA
Version #	AB	20.24
Shipping Software	SOLIS	SDK
Version #	--	--
Testing Software	SOLIS	SDK
Version #	4.31.30014.0	2.103.33014.0

▽ **Table 1; Key code to define the meanings of the last two letters in the Model Number**

Sensor Options			
OE	Open electrode	BU2	Back Illuminated (BI) + 250nm UV optimised
FI	Front illuminated (FI)	BU	BI + UV (350nm) optimised
UV	FI+UV coating	BV	BI + VIS (550nm) optimised
FO	FI + Fibre optic	BR-DD	BI + NIR +deepdepletion
FI-DD	FI + deep depletion	BN	BI with no AR coating

Performance Notes

- ◆1 Readout Noise is measured for both single pixel (SP) and fully vertically binned (FVB) with the CCD in darkness at temperature indicated and minimum exposure time. Noise values will change with pre-amplifier gain selection [PAG].
- ◆2 Average electronic DC offset for CCD in darkness at temperature indicated and minimum exposure time under dark conditions measured by single pixel (SP) for imaging systems and by (FVB) for spectroscopic systems.
- ◆3 Sensitivity is calculated in photoelectrons per A/D count from measurements of the Photon Transfer Curve.
- ◆4 Dark current falls exponentially with temperature. However, for a given temperature the actual dark current can vary by more than an order of magnitude from device to device. The devices are specified in terms of minimum dark current achievable rather than minimum temperature.
- ◆5 Minimum temperature achieved for thermoelectric (TE) cooler set to maximum value with water cooling
- ◆6 RMS (root mean square) deviation of dark current for fully binned operation for spectroscopic cameras, or full resolution image for imaging cameras, under dark conditions at temperature indicated (pixel/column defects not included). This variation is mainly cosmetic since it is fully subtractable without significant loss of performance.
- ◆7 Linearity is measured from a plot of Counts vs. Signal over the 16 bit dynamic range. Linearity is expressed as a %age deviation from a straight line fit. This quantity is not measured on individual systems.
- ◆8 RMS (root mean square) deviation from the average response of the CCD in full resolution image for imaging cameras, illuminated with uniform white light (defects not included).
- ◆9 White/black pixels have signals >25% above/below the average (25% contrast) with uniform illumination across the sensor.
- ◆10 A black column is defined as having ≥ 10 black pixels for imaging cameras.
- ◆11 Pixels which absorb charge as it is clocked through the defective area. When the light source is switched off, the signal from the trap appears to drop off more slowly than the signal from the surrounding pixels.
- ◆12 Hot spots are counted if they exhibit >50 times the maximum specified dark current at the test temperature indicated.
- ◆13 A column is considered defective if >10 pixels are affected, or if the column exhibits >2 times the maximum specified dark current at the test temperature indicated.