



Aerial Triangulation Report
**2022 City of Nanaimo Aerial
Mapping Project**

**City of Nanaimo,
455 Wallace Street,
Nanaimo, B.C.,
V9R 5J6**

Attention: **Mr. Mark Willoughby,**

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1.1 SCOPE OF PROJECT

Aeroquest Mapcon Inc. adjusted a total of 1183 digital colour images to support an aerial Triangulation accuracy (AT) of 4.0cm RMSE horizontally and vertically. An additional 159 models were created based solely on post processed airborne GPS/IMU data for images covering water. Summary of Aerial Triangulation input data, procedure and results are presented below.

1.2 PHOTOGRAPHY

Digital color images were flown at a mean photo scale of 1:8,845 to support a 4.0cm pixel size and 4.0cm AT accuracy. All images were captured by Kisik Aerial Survey of Richmond, B.C. using a Vexcel UltraCam Eagle M3 digital camera with airborne GPS and inertial measuring unit. Flights took place on May 19, May 20, June 07 and June 23, 2022. All images were flown at a nominal 60% forward gain and 30% sidelap. All images were flown with < 2° off level and course. Camera calibrations report can be found in Appendix E.

1.3 GROUND CONTROL

Ground control used was surveyed by J. E. Anderson & Associates in 2016 and 2018 of Nanaimo, B.C. and by Eagle Mapping Ltd. of Port Coquitlam B.C. For 2016 Lidar control. Additional control was supplied by City of Nanaimo and existing BC Government MASCOT points.

1.3a Ground control and weights

- I. **40** J.E. Anderson controls were used in final adjustment. 35 points were used as horizontal and vertical (HV) control and 5 as vertical-only. All HV points were photo identified locations.
- II. **8** Eagle controls were used in final adjustment. Of these 6 were used as horizontal/vertical control, 2 were used as horizontal-only control. All horizontal points were at photo identified locations.
- III. **15** BC Government MASCOT points were used in final adjustment. 12 were used as horizontal and vertical control and 3 as vertical-only. Horizontal point locations were based on visible monument access covers.
- IV. **60** City of Nanaimo supplied points were used in final adjustment. 59 points were used as horizontal and vertical control. One was used as vertical-only. 17 HV points were used as check points in preliminary adjustment, 1 point was used as H-ONLY and 1 point as V-ONLY. HV points were targeted and 3 photo-identified.
- V. All control points were assigned a horizontal/vertical weight of 4cm.

1.4 CONTROL DATUM

Projection – UTM zone 10
 Horizontal Datum - North American 1983 (CSRS)
 Vertical Datum – CGVD28 (HTv2.0)
 Units – Metres

1.5 PROCEDURE

All adjusted images were bridged using Vexcel’s UltraMap (ver. 5.6) automatic tie point generation software (ATP). The ATP results were then analyzed and areas of failed correlation were densified by manual means using Intergraph’s ISAT software (ver. 16.6.0). Ground control was also read in ISAT. All bridged data was then exported to GIP’s BINGO (ver. 7.2) adjustment software. A preliminary adjustment with check points ‘floated’ was performed. Once satisfied check point residuals fell within 4cm of surveyed coordinates they were weighted and used as control in a final adjustment. The final adjustment was exported back to Intergraph’s ISAT and models created. QC of the model was then done using Intergraph’s ISSD module. The QC involved checks for tie to ground control, parallax and line tie accuracy. The project extent covers areas of water, where some images could not be adjusted. Model setups for these images are based on post processes airborne GPS and IMU received from Kisik Aerial Surveys.

1.6 RESULTS

Statistical results are based on the final adjustment that included check points as control. Results are based on RMSE (root/mean/square) or approximately 68% confidence interval.

Type of measurements	A priori Standard Deviation			Estimated Standard Deviations		
	X	Y	Z	X	Y	Z
	meter	meter	meter	meter	meter	meter
Pass/tie points	3.0 microns	3.0 microns	n/a	2.1microns	1.8microns	n/a
Surveyed HV	0.04	0.04	0.04	0.030	0.030	0.033
Airborne GPS	0.10m	0.10m	0.10m	0.004	0.004	0.010
IMU	0.0016°	0.0016°	0.0283°	0.0079°	0.0066°	0.0252°

There are 153,648 measurements of 19,439 block points for this AT project, giving an average of 7.9 readings per point and an average 16.4 points per photo.

# - Rays	Number of points	Percentage
> 6	796	4.1
6	2074	10.7
5	3572	18.4
4	2561	13.2
3	5595	28.8
2	4841	24.9
Total	19439	100
Average rays/points		7.9
Average points/photo		16.4

Statistical results are based on the final adjustment that included check points as control. Results are based on RMSE (root/mean/square) or approximately 68% confidence interval.

Standard Deviations of Adjusted Terrain Coordinates

		X [m]	Y [m]	Z [m]
Total number	19,439			
Mean Precision		0.015	0.023	0.059 *

* - Mean vertical precision is high due to many 2-ray tree top points that have no weight in the adjustment. The vertical precision base on ≥ 3 -ray points is 2.8cm.

Standard precision of adjusted Orientation Parameters

		X0 [m]	Y0 [m]	Z0 [m]	Omega [Deg.]	Phi [Deg.]	Kappa [Deg.]
Total number	1183						
Mean Precision		0.004	0.004	0.003	0.0004 ^o	0.0003 ^o	0.0003 ^o

Image observation residuals

	X microns	Y microns
RMS value	0.3	0.3
Max residual	9.1	6.8

1.7 Statement of Accuracy

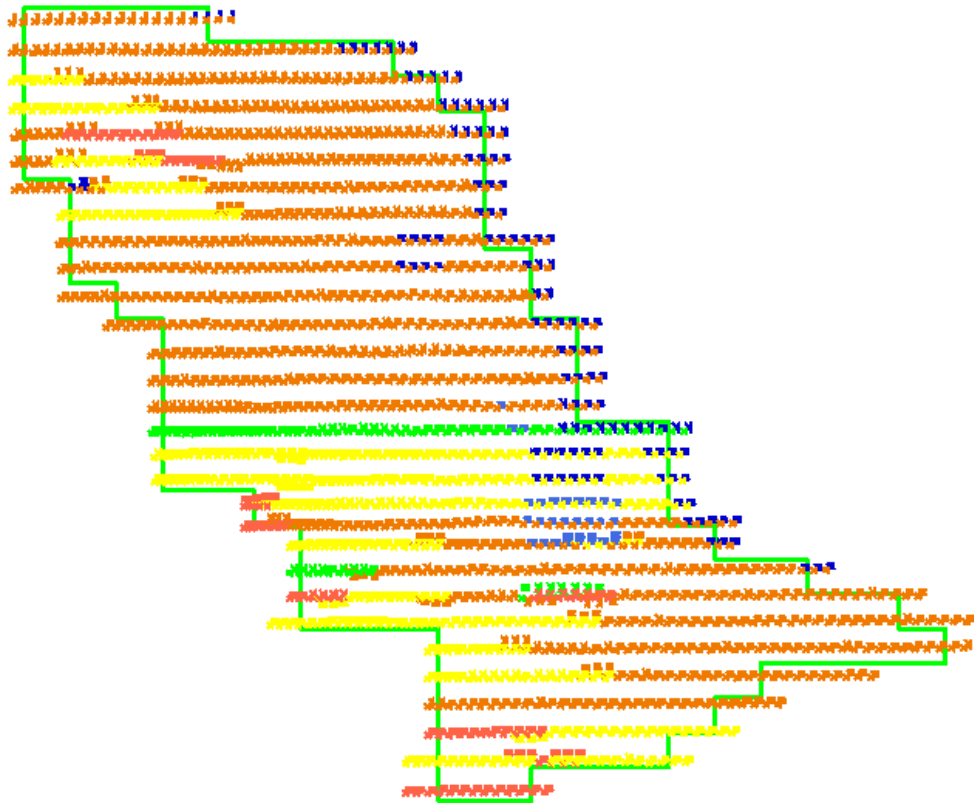
A total of 153,648 readings of 19,439 adjusted points were generated by the adjustment. This result is 7.9 readings per point and 16.4 point per image. The computed mean ground sample distance (GSD) for the adjusted images is 3.6cm. The mean standard deviation of ground control used is 0.030m horizontally and 0.033m vertical. The mean standard deviation of adjusted terrain points is 0.019m horizontal and 0.059m (without 2-ray points) vertical. This shows that both photography and adjustment fall within specification for 4.0cm image resolution and 8.0cm horizontal and vertical data accuracy.

Yours Truly,

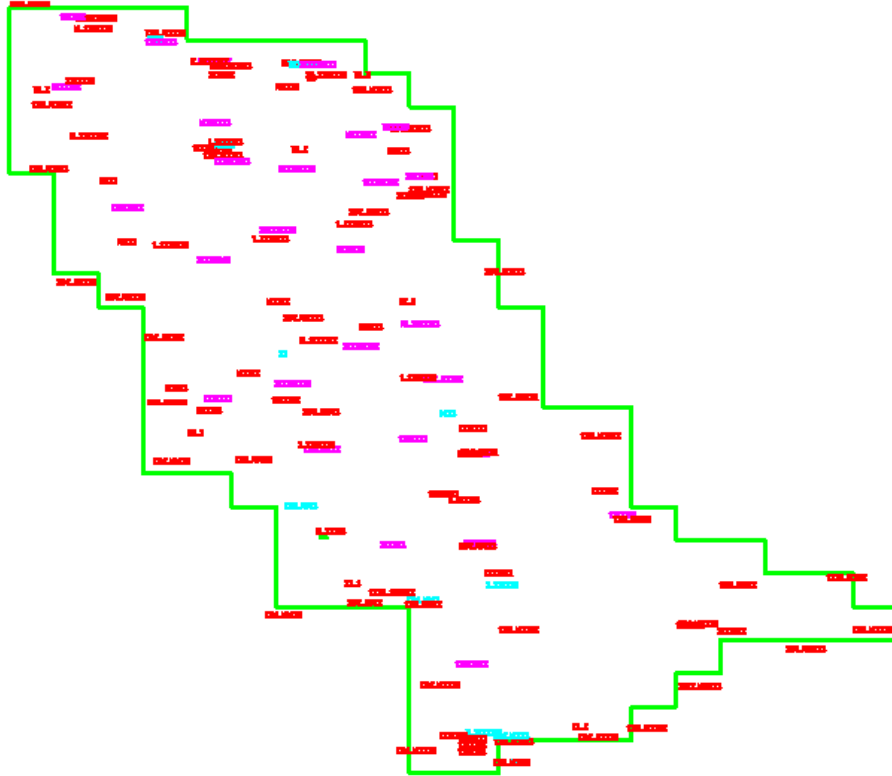
Alexander Gikas, Dipl. Geodesy Engineer
 Senior AT Specialist
 AeroquestMapcon Inc
 1214 Austin Ave.,
 Coquitlam, B.C.,
 V3K-3P5

Tel:778 383-3735
 Fax:604 931-2026
 email:agikas@aeroquestmapcon.com
 web:aeroquestmapcon.com

APPENDIX A: Image Centre Layout



APPENDIX B: Ground Control Layout



APPENDIX C: CHECK POINT REPORT

EXPECTED RMSE ACCURACY = 4 cm			CONTROL WEIGHT XY/X =4cm		PROJECT NAME City of Nanaimo			Units=meters		
SURVEY PT	SURVEYED X	SURVEYED Y	SURVEYED Z	ADJUSTED X	ADJUSTED Y	ADJUSTED Z	DELTA X	DELTA Y	DELTA Z	
79H9243	432703.662	5439625.798	23.594	432703.664	5439625.780	23.566	-0.002	0.018	0.028	
77H5007	431891.890	5446263.347	10.688	431891.873	5446263.337	10.716	0.017	0.010	-0.028	
77H5101	431159.291	5445396.758	41.566	431159.287	5445396.769	41.604	0.004	-0.011	-0.038	
77H5257	430268.656	5446834.445	63.123	430268.665	5446834.460	63.140	-0.009	-0.015	-0.017	
79H9263	430050.461	5452431.873	102.680	430050.457	5452431.857	102.696	0.004	0.016	-0.016	
77H5321	429999.582	5448514.688	62.677	429999.609	5448514.711	62.695	-0.027	-0.023	-0.018	
77H5260	429910.237	5444729.118	73.980	429910.261	5444729.161	74.015	-0.024	-0.043	-0.035	
79H9309	428648.294	5448448.122	94.469	428648.288	5448448.139	94.491	0.006	-0.017	-0.022	
82H5651	428601.184	5450568.471	57.002	428601.210	5450568.475	57.151	-0.026	-0.004		
83H6035	427746.903	5454214.609	40.071	427746.899	5454214.616	40.081	0.004	-0.007	-0.010	
16H2775	427329.700	5446009.126	164.623	427329.714	5446009.139	164.593	-0.014	-0.013	0.030	
82H5705	426220.000	5449790.000	117.462	426220.782	5449791.174	117.439			0.023	
79H9180	425962.920	5451224.581	116.945	425962.923	5451224.564	116.935	-0.003	0.017	0.010	
92H0752	425333.764	5453586.229	117.972	425333.751	5453586.233	118.000	0.013	-0.004	-0.028	
79H9225	424507.906	5455193.106	73.597	424507.894	5455193.083	73.616	0.012	0.023	-0.019	
96H2092	437948.558	5441643.454	3.000	437948.525	5441643.452	2.994	0.033	0.002	0.006	
92H0726	429469.948	5446965.031	61.288	429469.957	5446965.057	61.378	-0.009	-0.026	-0.090	
79H9225	424507.906	5455193.106	73.597	424507.894	5455193.083	73.616	0.012	0.023	-0.019	
77H5328	429900.918	5449550.046	29.825	429900.936	5449550.085	29.890	-0.018	-0.039	-0.065	
							RMSE	0.016	0.020	0.034
							MAX	0.033	0.043	0.090
							MIN	0.000	0.000	0.000

APPENDIX D: FINAL BINGO ADJUSTMENT REPORT

Input Data Report: No. of Used Points 19439 No. of Used Photos 1183 No. of Used Cameras 1 Used Points per Photo 62 Ignored Images 0 Ignored Points 7 Ignored Control Points 0		SIGMA0: 0.55																															
		Photo Measurement Residuals (μm) <table> <tr> <td></td> <td>x'</td> <td>y'</td> </tr> <tr> <td>RMS</td> <td>0.3</td> <td>0.3</td> </tr> <tr> <td>MAX</td> <td>9.1</td> <td>6.8</td> </tr> </table>			x'	y'	RMS	0.3	0.3	MAX	9.1	6.8																					
	x'	y'																															
RMS	0.3	0.3																															
MAX	9.1	6.8																															
Control Point Residuals (1/1000) <table> <tr> <td></td> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>RMS</td> <td>30.</td> <td>30.</td> <td>33.</td> </tr> <tr> <td>MAX</td> <td>123.</td> <td>121.</td> <td>136.</td> </tr> </table>			X	Y	Z	RMS	30.	30.	33.	MAX	123.	121.	136.	GPS Residuals (1/1000) <table> <tr> <td></td> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>RMS</td> <td>4.</td> <td>4.</td> <td>10.</td> </tr> <tr> <td>MAX</td> <td>15.</td> <td>15.</td> <td>47.</td> </tr> </table>			X	Y	Z	RMS	4.	4.	10.	MAX	15.	15.	47.						
	X	Y	Z																														
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GPS/IMU (max) <table> <tr> <td></td> <td>s_X</td> <td>s_Y</td> <td>s_Z</td> </tr> <tr> <td>Drift</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Shift</td> <td>-</td> <td>-</td> <td>-</td> </tr> </table>			s_X	s_Y	s_Z	Drift	-	-	-	Shift	-	-	-	Additional Parameters																			
	s_X	s_Y	s_Z																														
Drift	-	-	-																														
Shift	-	-	-																														
Variance-component estimation test value: $s(\text{a posteriori}) / s(\text{a priori})$ <table> <tr> <td>Photo coordinates</td> <td>0.17</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Camera data incl. vector e'</td> <td>0.01</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Coordinates of control points</td> <td>0.88</td> <td>x:0.79</td> <td>y:0.81</td> <td>z:1.06</td> </tr> <tr> <td>Exterior orientations incl. GPS</td> <td>0.68</td> <td>x:0.55</td> <td>y:0.50</td> <td>z:0.77</td> </tr> <tr> <td>Photo positions and orientations</td> <td>0.99</td> <td>o:-</td> <td>p:-</td> <td>k:-</td> </tr> <tr> <td>Sum of all observation</td> <td>0.28</td> <td></td> <td></td> <td></td> </tr> </table>				Photo coordinates	0.17				Camera data incl. vector e'	0.01				Coordinates of control points	0.88	x:0.79	y:0.81	z:1.06	Exterior orientations incl. GPS	0.68	x:0.55	y:0.50	z:0.77	Photo positions and orientations	0.99	o:-	p:-	k:-	Sum of all observation	0.28			
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Sum of all observation	0.28																																
No. of points measured on photos <table> <tr> <th>No. of Photos</th> <td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td> </tr> <tr> <th>Count</th> <td>4841</td><td>5595</td><td>2561</td><td>3572</td><td>2074</td><td>458</td><td>218</td><td>77</td><td>29</td><td>12</td><td>2</td> </tr> </table>		No. of Photos	2	3	4	5	6	7	8	9	10	11	12	Count	4841	5595	2561	3572	2074	458	218	77	29	12	2	Freq. of photo measurement residuals 							
No. of Photos	2	3	4	5	6	7	8	9	10	11	12																						
Count	4841	5595	2561	3572	2074	458	218	77	29	12	2																						



VEXCEL
IMAGING

ULTRACAM

Calibration Report

Camera: UltraCam Eagle M3
Serial: UC-EpII-1-22814295-f80

Laboratory Calibration Date: Dec-11-2020
Camera Revision: Rev02.00

Date of Report: Jan-04-2021
Version of Report: V01



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Venice, Italy

Photo on page 1 courtesy of Vexcel Imaging GmbH

ULTRACAM

Geometric Calibration

Camera: UltraCam Eagle M3
Serial: UC-EpII-1-22814295-f80

Panchromatic Camera: ck = 79.800 mm
Multispectral Camera: ck = 79.800 mm

PPA Information: X: 0.000 mm
Y: -0.000 mm



Panchromatic Camera

Large Format Panchromatic Output Image

Image Format	long track cross track	68.016mm 105.840mm	17004pixel 26460pixel
Image Extent		(-34.008, -52.920)mm	(34.008, 52.920)mm
Pixel Size		4.000µm*4.000µm	
Focal Length	ck	79.800mm	± 0.002mm
Principal Point (Level 2)	X_ppa	0.000mm	± 0.002mm
	Y_ppa	-0.000mm	± 0.002mm
Lens Distortion		Remaining Distortion less than .002	nm

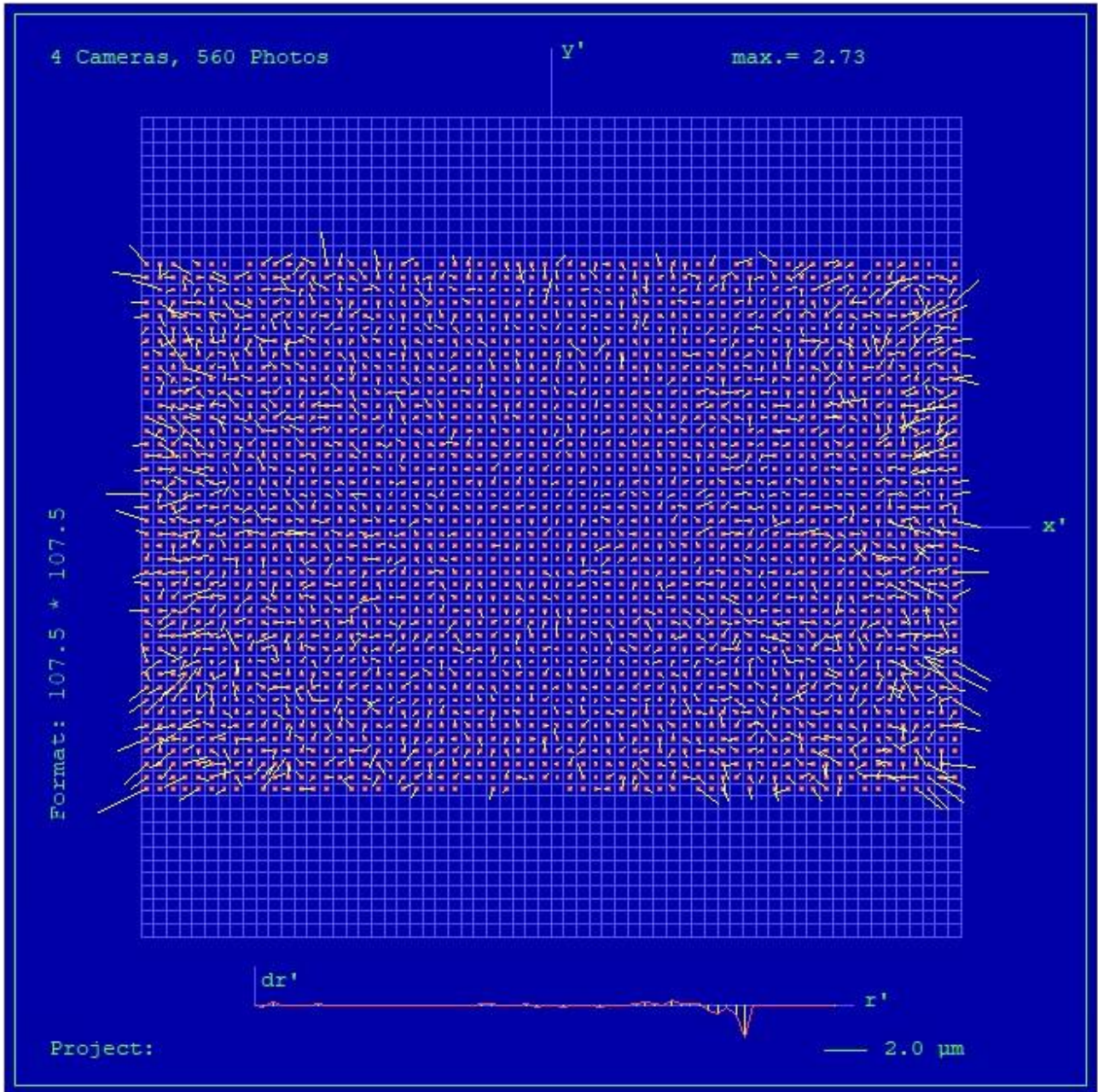
Multispectral Camera

Medium Format Multispectral Output Image (Upscaled to panchromatic image format)

Image Format	long track cross track	68.016mm 105.840mm	5668pixel 8820pixel
Image Extent		(-34.008, -52.920)mm	(34.008, 52.920)mm
Pixel Size		12.000µm*12.000µm	
Focal Length	ck	79.800mm	± 0.002mm
Principal Point (Level 2)	X_ppa	0.000mm	± 0.002mm
	Y_ppa	-0.000mm	± 0.002mm
Lens Distortion		Remaining Distortion less than .002	nm



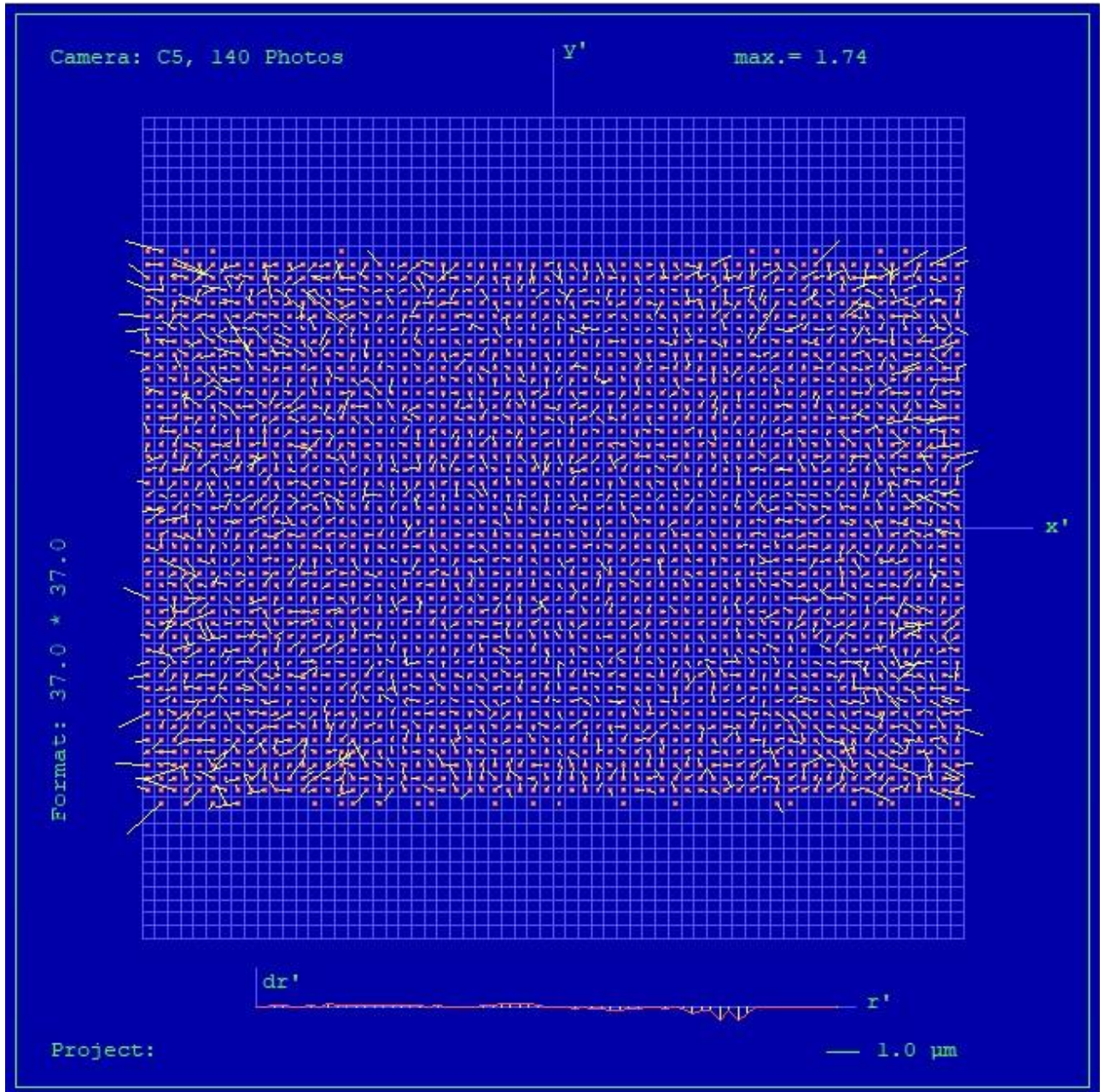
Full Panchromatic Image, Residual Error Diagram



Residual Error (RMS): **0.69 μm**



Green Cone (Cone 5), Residual Error Diagram



Residual Error (RMS): **0.50 μm**



Explanations

Calibration Method:

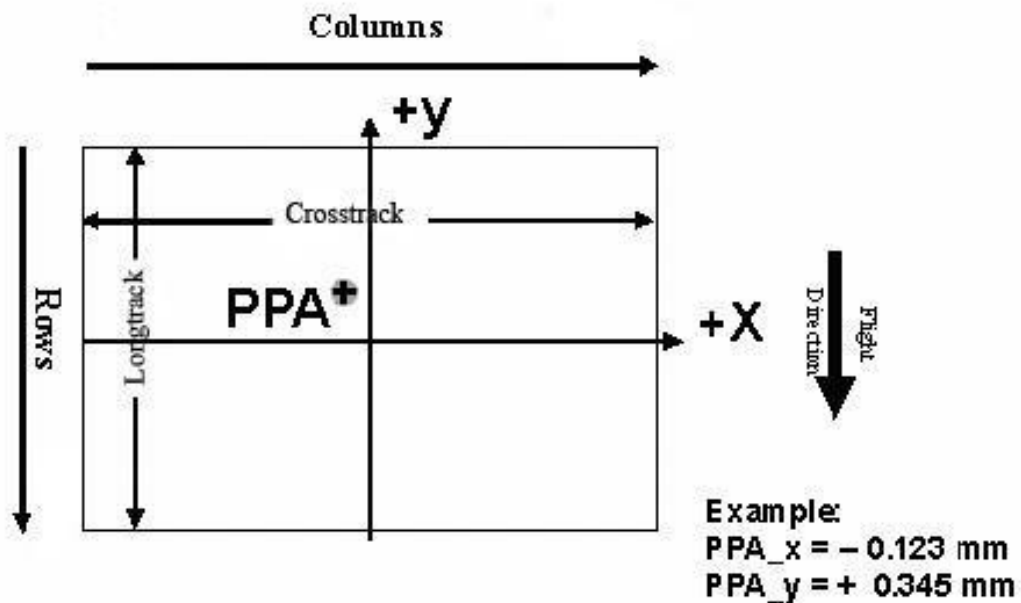
The geometric calibration is based on a set of 140 images of a defined geometry target with 394 GCPs.

Number of point measurements for the panchromatic camera : >16000
Number of point measurements for the multispectral camera : >60000

Determination of the image parameters by Least Squares Adjustment.
Software used for the adjustment: BINGO (GIP Eng. Aalen, Germany)

Level 2 Image Coordinate System:

Lvl2, Camera prop. Orientation

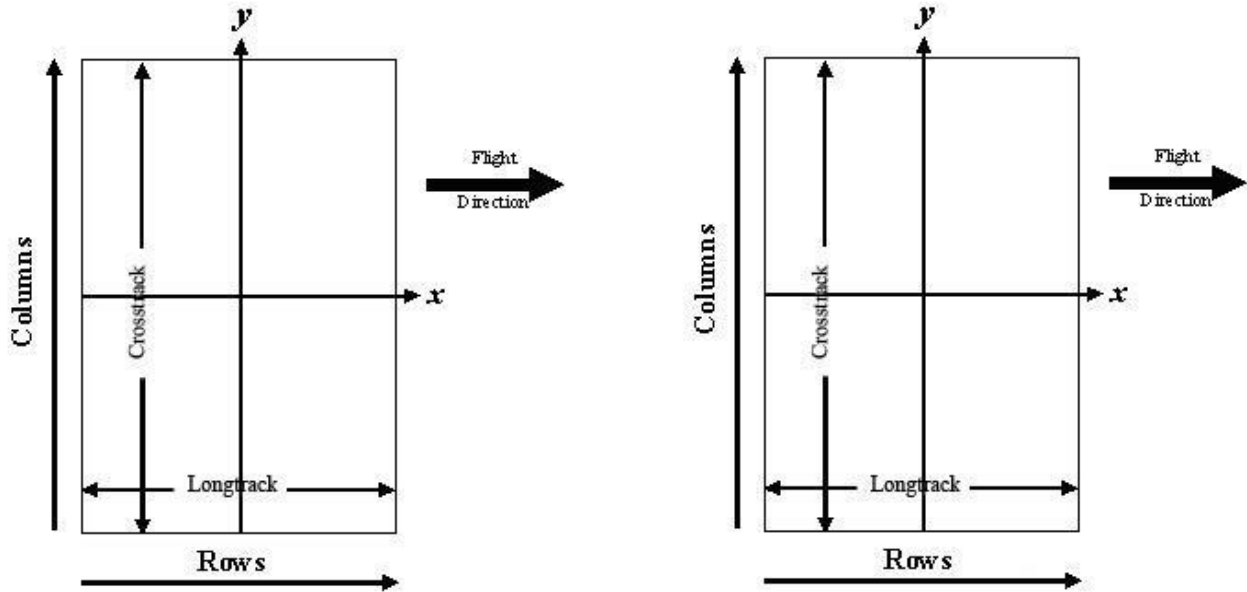


The image coordinate system of the Level 2 images is shown in the above figure. The basic image format and coordinate of the principal point in the level 2 image is given on page 4 of this report.

The above figure shows the position of an example principal point at the coordinate (-0.123 / 0.345).



Level 3 Image Coordinate System:
(after rotation of 270° CW)



Panchromatic Image Format
Image Format

Multispectral

Position of Principal Point in Level 3 Image

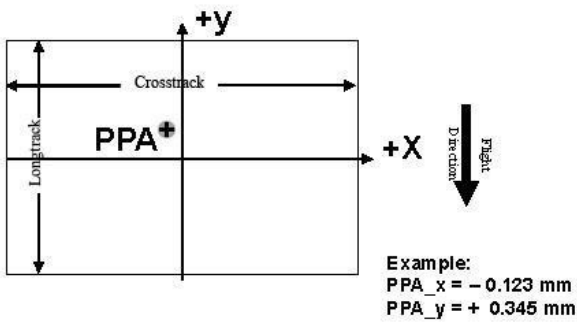
The position of the principal point in the level 3 image depends on the “rotation” setting used in UltraMap during the pan-sharpening step. The exact position relative to the image center is given in the table below as a function of the rotation setting used in UltraMap. The coordinates are specified for clockwise (CW) rotation in steps of 90 degrees, according to the principal point coordinate given on page 4 for high- and low resolution images.

Image Format	Clockwise Rotation (Degree)	PPA	
		X	Y
Level 2	-	0.000	-0.000
Level 3	0	0.000	0.000
Level 3	90	0.000	-0.000
Level 3	180	-0.000	-0.000
Level 3	270	-0.000	0.000

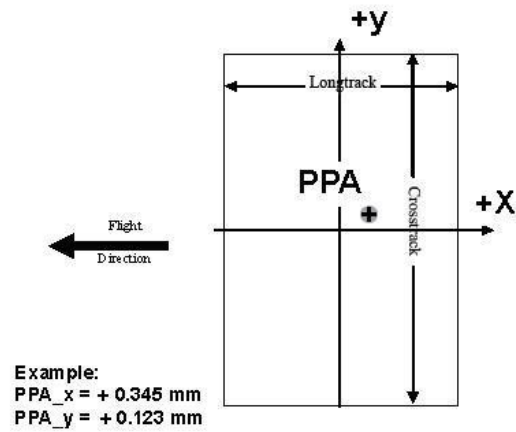


The coordinates in the figure below are only example values to illustrate the effect of image rotation on the principal point position, and do **not** correspond to the camera described in this report.

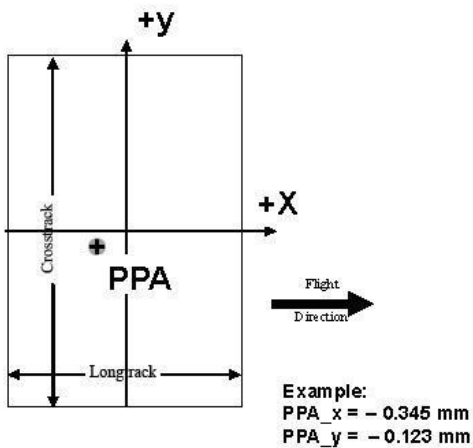
Lvl3, Rotation 0 deg clockwise



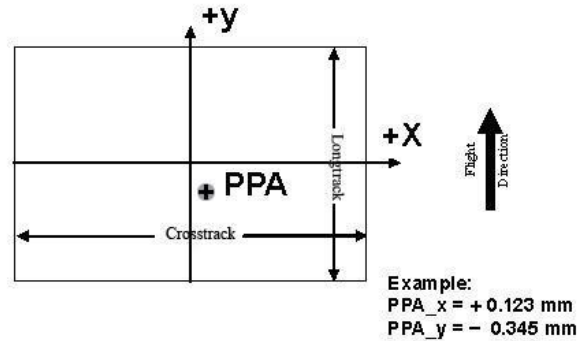
Lvl3, Rotation 90 deg clockwise



Lvl3, Rotation 270 deg clockwise



Lvl3, Rotation 180 deg clockwise



Lens Resolving Power

The following curves show the development of the modulation transfer function across different image heights of the panchromatic cones.



Please note that these values have been calculated and can vary up to 10% with optics from production (especially at high LP's).

The curves are given for the meridional (tangential) and sagittal (radial) component of signals at frequencies of 12.5, 25, 50 and 100 line pairs per millimeter.

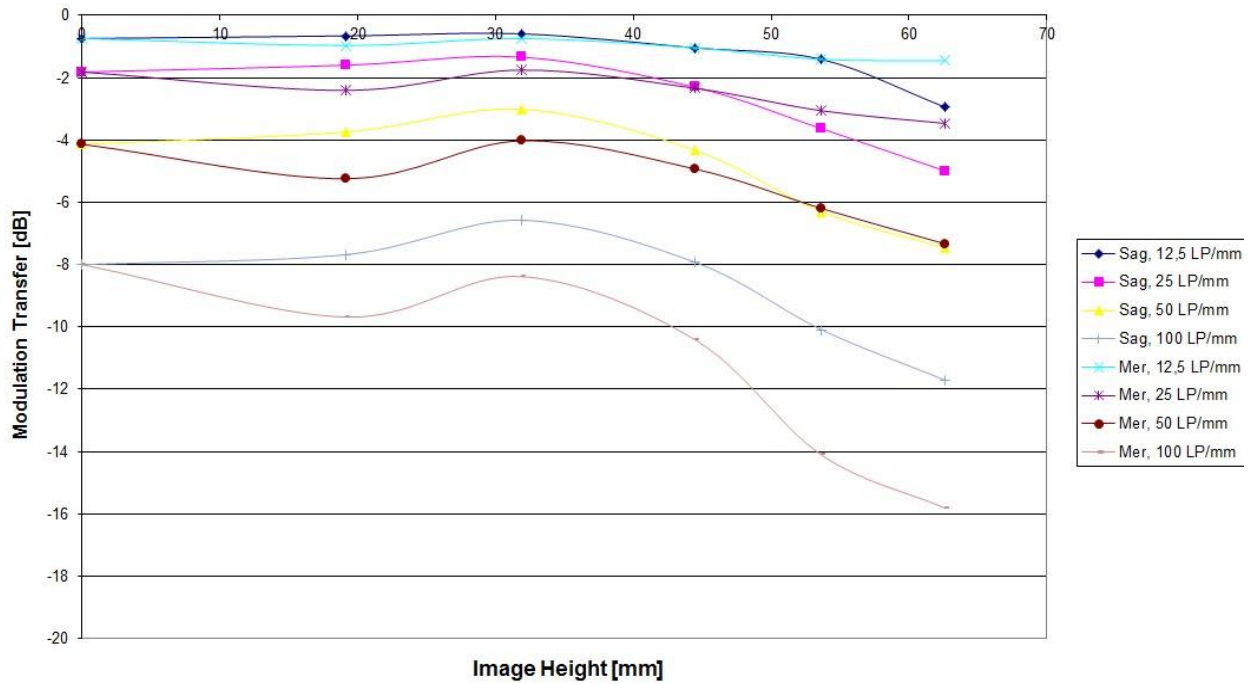
As the MTF is a function of the specific aperture size used, one set of curves is given for each aperture size.

Lens types

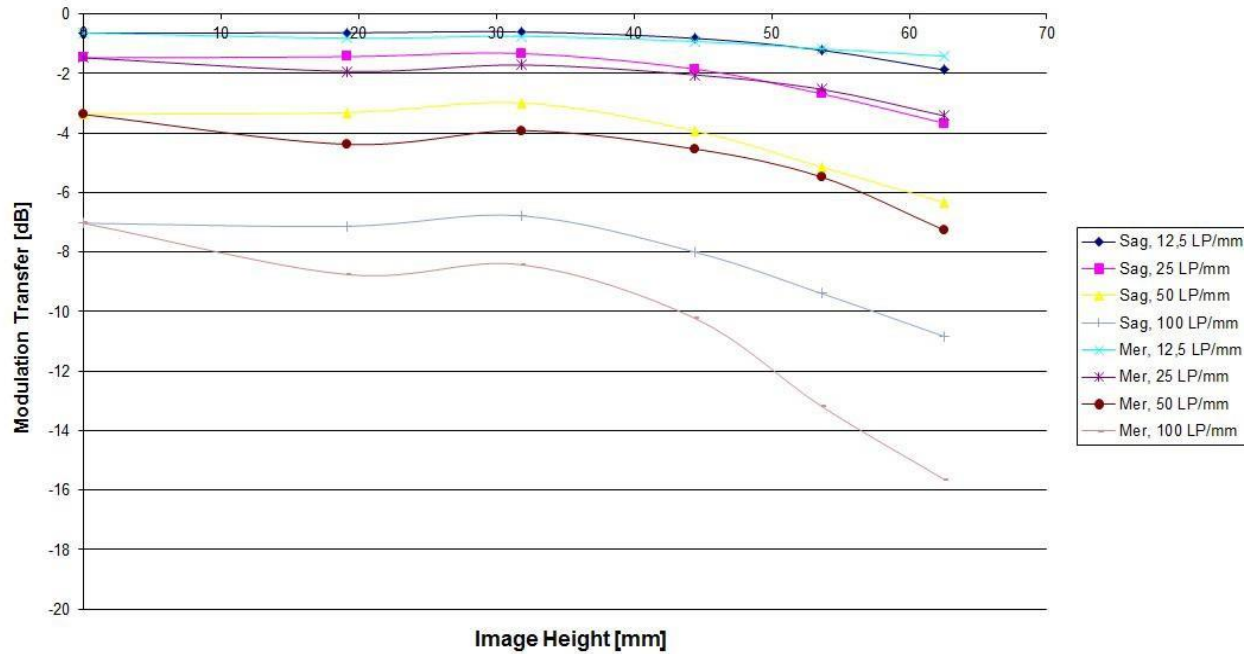
Cone	Lens
C0 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/80mm, Qioptic GmbH, Germany
C1 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/80mm, Qioptic GmbH, Germany
C2 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/80mm, Qioptic GmbH, Germany
C3 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/80mm, Qioptic GmbH, Germany
C4 (RED)	Qioptic Vexcel HR Digaron 1:4/27mm, Qioptic GmbH, Germany
C5 (GREEN)	Qioptic Vexcel HR Digaron 1:4/27mm, Qioptic GmbH, Germany
C6 (BLUE)	Qioptic Vexcel HR Digaron 1:4/27mm, Qioptic GmbH, Germany
C7 (NIR)	Qioptic Vexcel HR Digaron 1:4/27mm, Qioptic GmbH, Germany



Modulation versus Image Height - Aperture f / 5.6

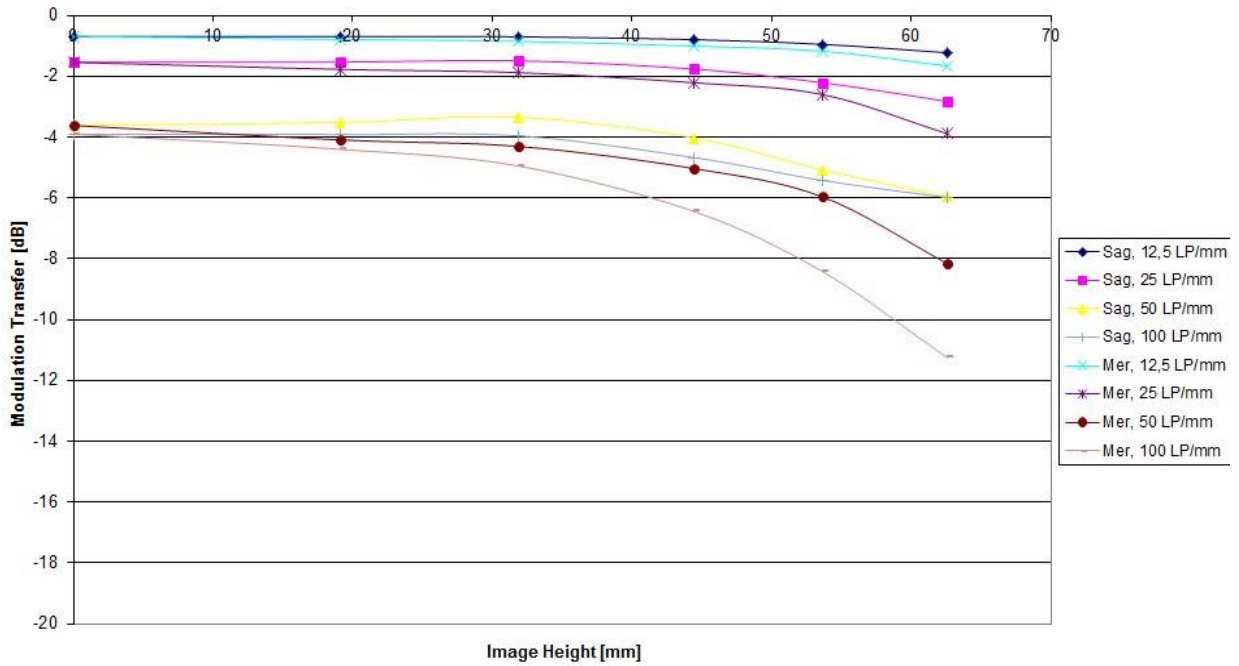


Modulation versus Image Height - Aperture f / 6.7

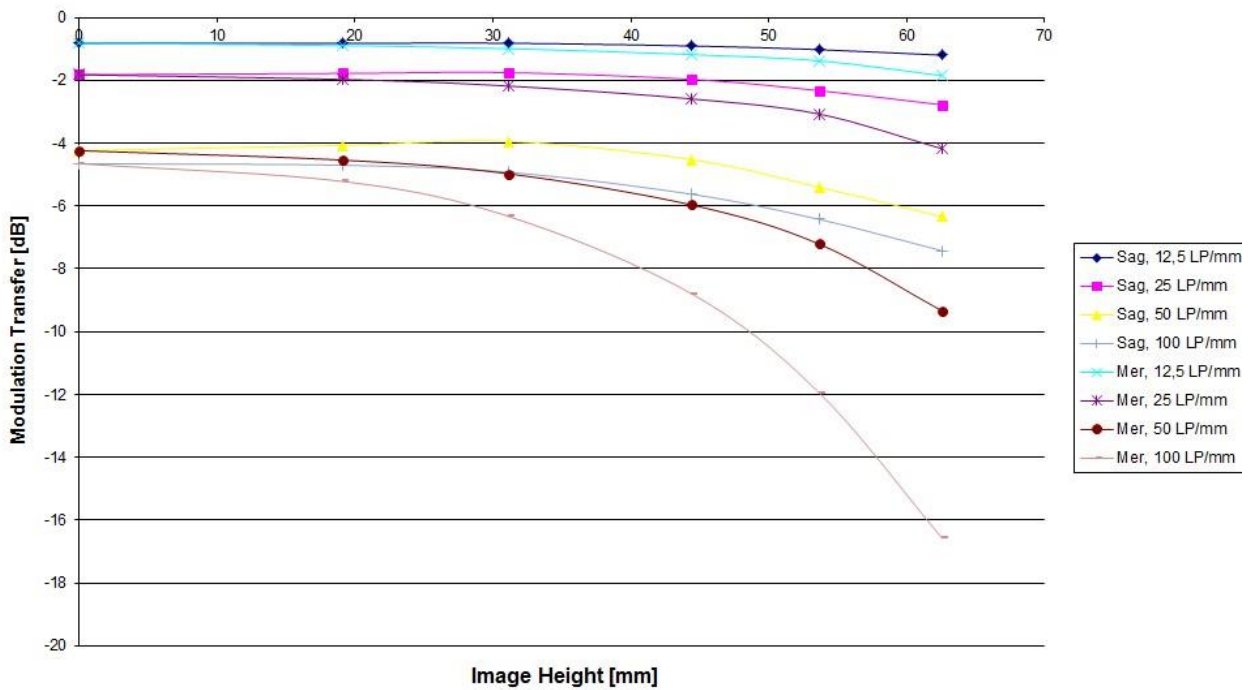




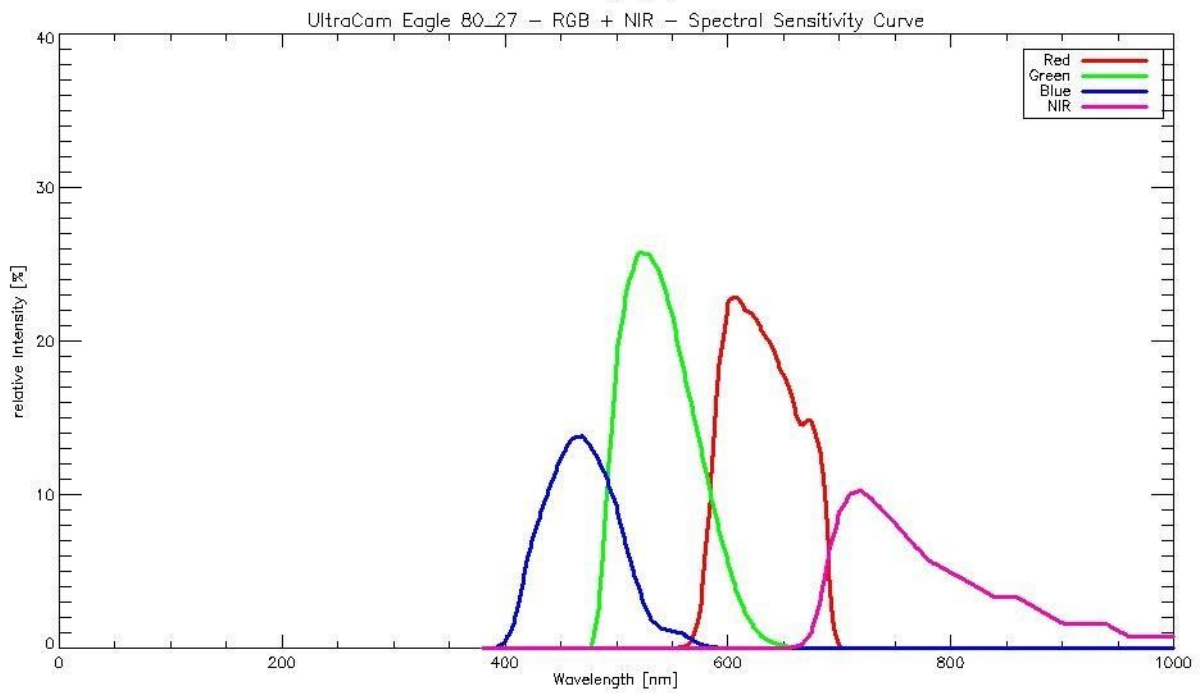
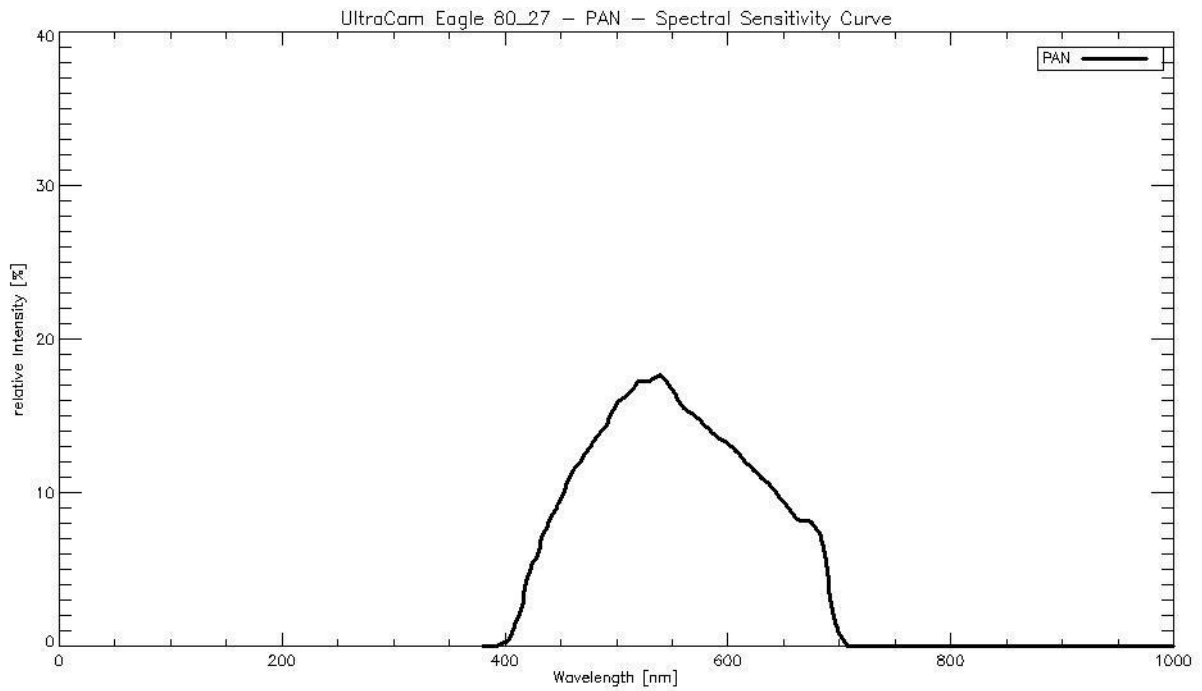
Modulation versus Image Height - Aperture f / 8



Modulation versus Image Height - Aperture f / 9.5



Spectral Sensitivity





ULTRACAM

Radiometric Calibration

Camera:
UC-EpII-1-22814295-f80

UltraCam Eagle M3 Serial:

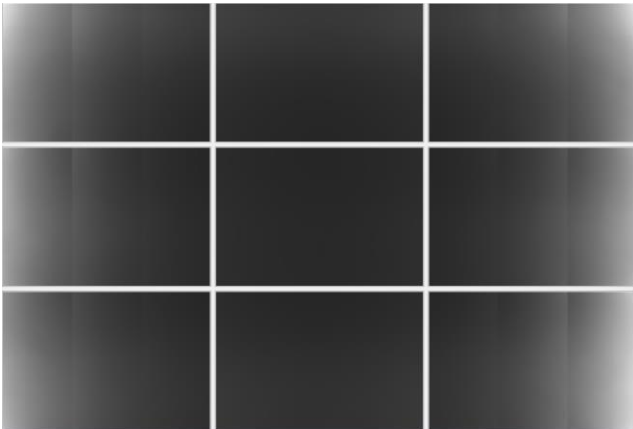
	PAN	R, G, NIR	B
Ap ert ur e s e d	F5.6	F4.8	F4.8
	F6.7	F5.4	F4.8
	F8	F6.7	F4.8
	F9.5	F8	F5.6
	F11	F9.5	F6.7
	F13	F11	F8
	F16	F13	F9.5
	F22	F19	F13

Dead Pixel Report: see Appendix I

Calibration of Vignetting for working Aperture F6.7

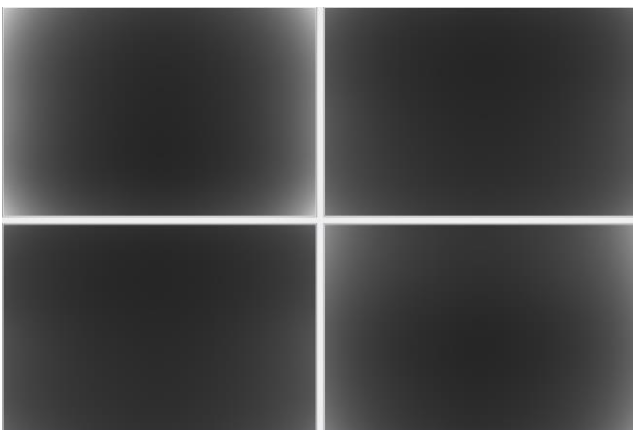
	PAN	R, G, NIR	B
Aperture	F67	F54	F48

Graphical Overview of Pan Sensors:



00_00	01_00	00_01
02_00	03_00	02_01
00_02	01_01	00_03

Graphical Overview of Multispectral Sensors:



04_00 (RED)	06_00 (BLUE)
05_00 (GREEN)	07_00 (NIR)

Explanations

Calibration Method:

The radiometric calibration is based on a series of 50 flat field images for each aperture size and sensor. The flat field is illuminated by eight normal light lamps with known spectral illumination curves.



These images are used to calculate the specific sensitivity of each pixel to compensate local as well as global variations in sensitivity. Sensitivity tables are calculated for each sensor and aperture setting, and applied during post processing from level 0 to level 1.

Outlier Pixels that do not have a linear behavior as described in the CCD specifications are marked as defective during the calibration procedure. These pixels are not used or only partially used during post processing and the information is restored by interpolation between the neighborhood pixels surrounding the defective pixels.

Certain pixels that are named Qmax pixels due to the fact that they can only store and transfer charge up to a certain maximum amount are detected in an additional calibration step. These pixels are treated differently during post processing, since their behavior can affect not only single pixel values but whole columns.

ULTRACAM

Shutter Calibration

Camera: UltraCam Eagle M3
Serial: UC-EpII-1-22814295-f80

Panchromatic Camera: 4 * Prontor Magnetic 0 HS
Prontor-Werk Alfred Gauthier GmbH, Germany

Multispectral Camera: 4 * Prontor Magnetic 0 HS
Prontor-Werk Alfred Gauthier GmbH, Germany

Calibration of Shutter Release Times:

The shutter release times measured during the calibration describe the time from the moment when the electrical current through the shutter is turned off by the electronics, until the shutter is mechanically closed.

This time is relevant for the exposure control and needs to be known before image recording can take place.

Currently used SRT values (operation values):

Cone Number	Lens Serial Number	SRT F5.6 [ms]	SRT F6.7 [ms]	SRT F8 [ms]	SRT F9.5 [ms]	SRT F11 [ms]	SRT F13 [ms]	SRT F16 [ms]	SRT F22 [ms]	Measurement Tolerance [ms]
C0 (Pan)	12 12 19 79	6.50	6.72	7.04	7.25	7.36	7.46	7.70	7.95	+/- 0.2
C1 (Pan)	12 15 61 10	6.36	6.56	6.90	7.15	7.26	7.41	7.61	7.98	+/- 0.2
C2 (Pan)	12 12 19 85	6.80	7.02	7.36	7.57	7.71	7.78	8.06	8.23	+/- 0.2
C3 (Pan)	12 12 19 97	6.97	7.18	7.50	7.69	7.83	7.95	8.23	8.48	+/- 0.2
C4 (Red)	12 12 05 92	7.22	7.22	7.40	7.47	7.50	7.63	7.75	7.93	+/- 0.2
C5 (Green)	12 12 06 35	7.06	7.16	7.34	7.38	7.45	7.58	7.73	7.89	+/- 0.2
C6 (Blue)	12 11 00 49	7.43	7.43	7.43	7.58	7.74	7.84	7.98	8.28	+/- 0.2
C7 (NIR)	12 11 00 40	7.67	7.73	7.92	8.08	8.19	8.27	8.47	8.66	+/- 0.2

ULTRACAM

Electronics and Sensor Calibration

Camera: UltraCam Eagle M3
Serial: UC-EpII-1-22814295-f80

Panchromatic Camera: 9 * FTF9060-M Area CCD Sensor by DALSA
Multispectral Camera: 4 * FTF9060-M Area CCD Sensor by DALSA

Calibration of Negative Substrate Voltage (VNS):

For optimum performance of the DALSA CCD sensors, the negative substrate voltage is adjusted to a value specified by DALSA.

This voltage value is measured to achieve the best anti-blooming performance possible for each particular sensor.

Currently used VNS and VOG values (operation values):

Cone_Sensor	Sensor Type	Sensor Serial Number	VNS Voltage [V]	VOG Voltage [V]
00_00	FTF9060-M	18 3918/053	22.40	6.67
00_01	FTF9060-M	18 3918/065	23.00	6.22
00_02	FTF9060-M	18 3918/062	22.60	6.65
00_03	FTF9060-M	18 3918/059	23.00	6.02
01_00	FTF9060-M	18 3918/036	22.60	6.74
01_01	FTF9060-M	18 3918/031	22.40	6.28
02_00	FTF9060-M	18 3918/049	22.40	6.10
02_01	FTF9060-M	18 3918/025	22.60	6.59
03_00	FTF9060-M	18 3918/002	22.80	6.70
04_00 (red)	FTF9060-M	18 3918/011	22.60	7.25
05_00 (green)	FTF9060-M	18 3918/040	22.40	6.54
06_00 (blue)	FTF9060-M	18 4458/029	22.40	7.15
07_00 (NIR)	FTF9060-M	18 3918/067	22.80	6.57

Calibration of Intensity Threshold for Exposure Control:

Each CCD sensor and electronics module varies slightly in global sensitivity and intensity scale.

Therefore the maximum possible intensity of each sensor needs to be measured to evaluate the sensitivity behavior of the CCD and electronics.

This value is used as a threshold for the exposure control dialogue shown in the in-flight user interface of the Eagle.

Currently used Threshold values (operation values):

Cone_Sensor	Sensor Type	Sensor Serial Number	Intensity Threshold [DN]	
			Tap 1	Tap2
00_00	FTF9060-M	18 3918/053	13560	12820
00_01	FTF9060-M	18 3918/065	13270	12380
00_02	FTF9060-M	18 3918/062	13290	12510
00_03	FTF9060-M	18 3918/059	13020	12110
01_00	FTF9060-M	18 3918/036	13440	12530
01_01	FTF9060-M	18 3918/031	13400	12780
02_00	FTF9060-M	18 3918/049	13350	12600
02_01	FTF9060-M	18 3918/025	13300	12420
03_00	FTF9060-M	18 3918/002	13460	12560
04_00 (red)	FTF9060-M	18 3918/011	12540	11470
05_00 (green)	FTF9060-M	18 3918/040	13680	12910
06_00 (blue)	FTF9060-M	18 4458/029	12410	11720
07_00 (NIR)	FTF9060-M	18 3918/067	13150	12500

ULTRACAM

Summary

Camera:
EpiI-1-22814295-f80

UltraCam Eagle M3 Serial:

UC-

Laboratory Calibration Date: Dec-11-2020

Camera Revision: Rev02.00

Date of Report: Jan-04-2021

Version of Report: V01

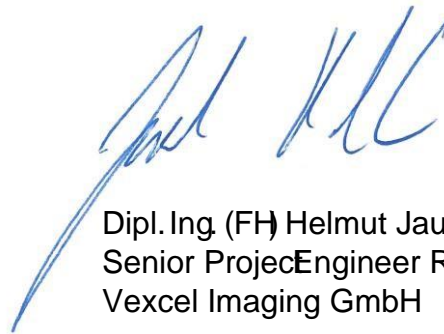
The following calibrations have been performed for the above mentioned digital aerial mapping camera:

- Geometric Calibration
- Radiometric Calibration
- Shutter Calibration
- Sensor and Electronics Calibration

This equipment is operating fully within specification as defined by Vexcel GmbH.



Dr. Michael Gruber
Chief Scientist, Photogrammetry
Vexcel Imaging GmbH



Dipl. Ing. (FH) Helmut Jauk
Senior Project Engineer R&D
Vexcel Imaging GmbH

Imaging

Appendix I

Dead Pixel Report:

Sensor number

Anomaly type X-Coordinate Y-Coordinate

C00-00

PIXEL: 52/4580
PIXEL: 323/3008
PIXEL: 416/1996
PIXEL: 933/5882
PIXEL: 1084/1777
PIXEL: 1338/1999
PIXEL: 1811/1631
PIXEL: 2012/2086
PIXEL: 2133/5753
PIXEL: 2248/2323
PIXEL: 2248/4466
PIXEL: 2248/5957
PIXEL: 2297/5712
PIXEL: 2769/2085
PIXEL: 2995/4121
PIXEL: 3162/2300
PIXEL: 3273/4862
PIXEL: 3447/4727
PIXEL: 3563/1241
PIXEL: 4008/3491
PIXEL: 4279/1219
PIXEL: 4297/2810
PIXEL: 4506/3788
PIXEL: 4736/5773
PIXEL: 4805/5903
PIXEL: 5120/1658
PIXEL: 5121/3760
PIXEL: 5149/5518
PIXEL: 5202/4295
PIXEL: 5239/1320
PIXEL: 5328/1748
PIXEL: 5377/5373
PIXEL: 5398/1887
PIXEL: 5398/2234
PIXEL: 5398/4450
PIXEL: 5398/4619
PIXEL: 5398/4620
PIXEL: 5398/4644
PIXEL: 5398/5254
PIXEL: 5398/5325
PIXEL: 5398/5892
PIXEL: 5398/5893
PIXEL: 5398/5900
PIXEL: 5398/5990
PIXEL: 5642/5602
PIXEL: 5726/3525
PIXEL: 5837/3429
PIXEL: 5999/3122
PIXEL: 6387/3090
PIXEL: 6415/2712
PIXEL: 6586/4039
PIXEL: 6790/3639
PIXEL: 6800/2104
PIXEL: 6895/5869
PIXEL: 7029/5660
PIXEL: 7037/ 232
PIXEL: 7081/2826
PIXEL: 7309/3512
PIXEL: 7309/5410

PIXEL: 7551/4991
PIXEL: 7593/5499
PIXEL: 7678/5396
PIXEL: 7693/1596
PIXEL: 7693/3785
PIXEL: 7693/4837
PIXEL: 7693/5515
PIXEL: 7938/2816
PIXEL: 7963/2891
PIXEL: 8053/ 304
PIXEL: 8084/5543
PIXEL: 8261/ 895
PIXEL: 8398/5547
PIXEL: 8418/3164
PIXEL: 8422/5640
PIXEL: 8550/ 593
PIXEL: 8638/4542
PIXEL: 8679/5305
PIXEL: 8735/2841
PIXEL: 8776/2359
PIXEL: 8776/4353
PIXEL: 8819/5789
PIXEL: 9004/3500
PIXEL: 9041/1323
PIXEL: 64/ 527
PIXEL: 87/2437
PIXEL: 96/5548
PIXEL: 98/ 593
PIXEL: 119/3772
PIXEL: 149/1882
PIXEL: 153/4152
PIXEL: 166/4324
PIXEL: 214/ 731
PIXEL: 234/ 297
PIXEL: 237/ 871
PIXEL: 241/2998
PIXEL: 247/ 388
PIXEL: 305/4482
PIXEL: 414/1737
PIXEL: 509/ 146
PIXEL: 579/1392
PIXEL: 662/2326
PIXEL: 708/5488
PIXEL: 719/2840
PIXEL: 759/2597
PIXEL: 831/2836
PIXEL: 895/ 115
PIXEL: 1020/ 410
PIXEL: 1060/ 289
PIXEL: 1088/5333
PIXEL: 1098/ 229
PIXEL: 1118/3628
PIXEL: 1142/2147
PIXEL: 1150/ 99
PIXEL: 1324/3775
PIXEL: 1344/1006
PIXEL: 1474/1858
PIXEL: 1766/2518
PIXEL: 1865/ 266
PIXEL: 1876/ 789
PIXEL: 1897/ 125
PIXEL: 1922/ 453

PIXEL: 2167/2256
PIXEL: 2283/2062
PIXEL: 2304/1920
PIXEL: 2451/ 951
PIXEL: 2522/ 458
PIXEL: 2887/1700
PIXEL: 3212/3234
PIXEL: 3746/1253
PIXEL: 3926/ 789
PIXEL: 4009/ 734
PIXEL: 4281/ 437
PIXEL: 4672/ 695
PIXEL: 5066/ 25
PIXEL: 6348/5475
COLUMN: 3404/5060

C00-01

PIXEL: 39/4202
PIXEL: 309/1881
PIXEL: 309/2806
PIXEL: 309/2818
PIXEL: 309/3392
PIXEL: 309/3589
PIXEL: 309/3730
PIXEL: 309/4259
PIXEL: 309/4476
PIXEL: 309/4734
PIXEL: 309/5114
PIXEL: 309/5337
PIXEL: 309/5703
PIXEL: 309/5758
PIXEL: 309/5832
PIXEL: 430/5311
PIXEL: 622/2212
PIXEL: 662/1427
PIXEL: 1161/4456
PIXEL: 1411/ 843
PIXEL: 1491/3414
PIXEL: 1561/1783
PIXEL: 1790/ 455
PIXEL: 1899/4895
PIXEL: 2056/2761
PIXEL: 2222/ 678
PIXEL: 2248/4606
PIXEL: 2257/ 727
PIXEL: 2300/3109
PIXEL: 2908/1566
PIXEL: 2919/3735
PIXEL: 3057/1076
PIXEL: 3072/4951
PIXEL: 3530/1161
PIXEL: 4994/2254
PIXEL: 5323/5511
PIXEL: 5353/4134
PIXEL: 5357/2444
PIXEL: 5375/1041
PIXEL: 5603/ 522
PIXEL: 5603/3393
PIXEL: 5924/2822
PIXEL: 6041/3006
PIXEL: 6359/4378
PIXEL: 6500/3238

PIXEL: 7040/4615
PIXEL: 7456/3640
PIXEL: 7960/4726
PIXEL: 8365/4667
PIXEL: 8505/6012
PIXEL: 8632/4125
PIXEL: 8762/ 336
PIXEL: 8773/ 839
PIXEL: 8928/2347
PIXEL: 3273/3115
PIXEL: 5676/ 254
PIXEL: 6058/2164
PIXEL: 7482/ 392
PIXEL: 7719/ 834
PIXEL: 7774/ 981
PIXEL: 7784/1085
PIXEL: 7837/ 504
PIXEL: 7905/ 494
PIXEL: 8119/ 620
PIXEL: 8149/ 549
PIXEL: 8242/1217
PIXEL: 8246/ 336
PIXEL: 8273/1564
PIXEL: 8395/1821
PIXEL: 8479/ 53
PIXEL: 8543/5769
PIXEL: 8613/1208
PIXEL: 8618/ 156
PIXEL: 8625/4369
PIXEL: 8726/3395
PIXEL: 8827/1710
PIXEL: 8849/ 535
PIXEL: 8855/1150
PIXEL: 8898/1442
PIXEL: 8921/2955
PIXEL: 8931/4213
PIXEL: 8963/4781
PIXEL: 9001/4954

C00-02

PIXEL: 436/2330
PIXEL: 1810/3625
PIXEL: 98/5383
PIXEL: 530/4892
PIXEL: 851/1591
PIXEL: 935/4708
PIXEL: 2023/2649
PIXEL: 3315/5766
PIXEL: 3428/2756
PIXEL: 3548/4905
PIXEL: 3548/5802
PIXEL: 3583/2614
PIXEL: 3698/3698
PIXEL: 4117/2097
PIXEL: 4324/2602
PIXEL: 4550/1691
PIXEL: 4844/5520
PIXEL: 4904/4669
PIXEL: 4951/1921
PIXEL: 5554/2490
PIXEL: 5563/1086
PIXEL: 5793/1841

PIXEL: 5896/ 507
PIXEL: 5976/2738
PIXEL: 6031/4132
PIXEL: 6101/3594
PIXEL: 6135/1237
PIXEL: 6219/2875
PIXEL: 6400/5410
PIXEL: 6792/1077
PIXEL: 7356/2608
PIXEL: 7448/5949
PIXEL: 7916/ 52
PIXEL: 7965/3727
PIXEL: 8000/2581
PIXEL: 8182/1072
PIXEL: 8297/2771
PIXEL: 8408/ 610
PIXEL: 8454/5457
PIXEL: 8469/5302
PIXEL: 8748/2010
PIXEL: 8962/2472
PIXEL: 8963/5492
PIXEL: 40/5013
PIXEL: 79/5235
PIXEL: 106/3763
PIXEL: 142/1746
PIXEL: 173/2644
PIXEL: 198/4606
PIXEL: 210/3007
PIXEL: 250/2114
PIXEL: 250/5794
PIXEL: 259/4494
PIXEL: 295/2856
PIXEL: 345/4633
PIXEL: 413/5316
PIXEL: 416/3498
PIXEL: 436/2329
PIXEL: 451/ 161
PIXEL: 497/3721
PIXEL: 623/3077
PIXEL: 668/2544
PIXEL: 686/3848
PIXEL: 766/5589
PIXEL: 772/ 709
PIXEL: 1120/4921
PIXEL: 1401/3866
PIXEL: 1438/ 443
PIXEL: 1438/ 444
PIXEL: 1451/5212
PIXEL: 1483/4620
PIXEL: 1766/4804
PIXEL: 1783/ 125
PIXEL: 1798/2509
PIXEL: 1811/3624
PIXEL: 2083/5772
PIXEL: 2457/ 820
PIXEL: 2546/ 989
PIXEL: 2947/4225
PIXEL: 3408/2434
PIXEL: 3520/2234
PIXEL: 5388/3623
PIXEL: 6271/ 542
PIXEL: 7016/2253

PIXEL: 8164/3033

C00-03

PIXEL: 957/4364
PIXEL: 1085/1621
PIXEL: 1418/3659
PIXEL: 1418/4929
PIXEL: 1418/5193
PIXEL: 1418/5536
PIXEL: 1418/5625
PIXEL: 1674/3504
PIXEL: 1927/1584
PIXEL: 2057/1813
PIXEL: 2955/4893
PIXEL: 2990/3136
PIXEL: 3032/ 895
PIXEL: 3077/ 426
PIXEL: 3110/ 461
PIXEL: 3204/ 331
PIXEL: 3578/4899
PIXEL: 3598/ 995
PIXEL: 3618/2004
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PIXEL: 3977/5390
PIXEL: 4471/5027
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PIXEL: 5984/1830
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PIXEL: 6584/1991
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PIXEL: 6847/2788
PIXEL: 6900/5902
PIXEL: 6948/1106
PIXEL: 7309/5861
PIXEL: 7348/3315
PIXEL: 7509/4011
PIXEL: 7653/4099
PIXEL: 7870/4256
PIXEL: 8085/ 95
PIXEL: 8710/5221
PIXEL: 8767/3668
PIXEL: 8817/2767
PIXEL: 1319/2446
PIXEL: 4324/3214
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PIXEL: 5310/1564
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PIXEL: 5961/4540
PIXEL: 6015/1591
PIXEL: 6125/ 334
PIXEL: 6142/5084
PIXEL: 6341/4846
PIXEL: 6391/5184
PIXEL: 6639/4350
PIXEL: 6750/ 133
PIXEL: 6784/1736
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PIXEL: 6994/4251
PIXEL: 7023/5616
PIXEL: 7029/4701
PIXEL: 7030/4701
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PIXEL: 7264/3204
PIXEL: 7355/5644
PIXEL: 7383/ 169
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PIXEL: 7452/4943
PIXEL: 7635/2034
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PIXEL: 8172/4435
PIXEL: 8179/ 915
PIXEL: 8212/3938
PIXEL: 8290/3908
PIXEL: 8301/5178
PIXEL: 8336/5324
PIXEL: 8370/5377
PIXEL: 8384/3422
PIXEL: 8404/4268
PIXEL: 8417/5857
PIXEL: 8441/3924
PIXEL: 8461/3833
PIXEL: 8525/2931
PIXEL: 8525/3792
PIXEL: 8540/1353
PIXEL: 8580/2925
PIXEL: 8580/3963
PIXEL: 8585/1134
PIXEL: 8614/3062
PIXEL: 8619/2664
PIXEL: 8620/5532
PIXEL: 8624/ 969
PIXEL: 8657/4494
PIXEL: 8676/2875
PIXEL: 8683/5476
PIXEL: 8684/5616
PIXEL: 8689/4216
PIXEL: 8737/2583
PIXEL: 8758/2638
PIXEL: 8781/ 250
PIXEL: 8792/ 912
PIXEL: 8838/2068
PIXEL: 8854/ 438
PIXEL: 8859/5414
PIXEL: 8870/2600
PIXEL: 8875/ 906
PIXEL: 8880/5111

PIXEL: 8882/2673
PIXEL: 8890/1108
PIXEL: 8897/ 127
PIXEL: 8901/5735
PIXEL: 8909/2492
PIXEL: 8913/5676
PIXEL: 8924/ 315
PIXEL: 8934/4282
PIXEL: 8961/2500
PIXEL: 8968/2408
PIXEL: 8972/4295
PIXEL: 8974/2198
PIXEL: 8994/1991
PIXEL: 8999/5333
COLUMN: 3191/1911

C01-00

PIXEL: 34/5205
PIXEL: 40/2297
PIXEL: 459/4440
PIXEL: 623/5056
PIXEL: 1534/1551
PIXEL: 1693/3950
PIXEL: 1932/3262
PIXEL: 2019/2683
PIXEL: 2060/ 541
PIXEL: 2077/4604
PIXEL: 2225/3729
PIXEL: 3536/ 55
PIXEL: 4175/4803
PIXEL: 4239/5406
PIXEL: 4380/4683
PIXEL: 4558/4879
PIXEL: 4609/4831
PIXEL: 4827/ 843
PIXEL: 5033/4383
PIXEL: 5327/5165
PIXEL: 5538/3480
PIXEL: 5929/5155
PIXEL: 6203/2822
PIXEL: 6281/4202
PIXEL: 6289/5555
PIXEL: 6422/1547
PIXEL: 6694/4633
PIXEL: 7162/5424
PIXEL: 7381/1600
PIXEL: 7537/5223
PIXEL: 7652/4572
PIXEL: 7686/3247
PIXEL: 7843/1731
PIXEL: 7869/3109
PIXEL: 8185/3631
PIXEL: 8546/4486
PIXEL: 8680/3606
PIXEL: 8744/5123
PIXEL: 8905/ 203
PIXEL: 1105/4468
PIXEL: 1818/4180
PIXEL: 2639/1595
PIXEL: 7999/3587
PIXEL: 8514/3714
PIXEL: 8515/3713

COLUMN: 202/2280
COLUMN: 4017/3069

C01-01

PIXEL: 81/3079
PIXEL: 619/4332
PIXEL: 962/2821
PIXEL: 973/4629
PIXEL: 1030/3046
PIXEL: 1341/2274
PIXEL: 1496/2558
PIXEL: 1712/1986
PIXEL: 2376/3969
PIXEL: 2675/3048
PIXEL: 2995/ 779
PIXEL: 2995/4466
PIXEL: 3265/ 111
PIXEL: 3932/1001
PIXEL: 4065/4233
PIXEL: 5158/1940
PIXEL: 5214/1614
PIXEL: 5897/2936
PIXEL: 6227/5176
PIXEL: 6425/ 599
PIXEL: 6867/1850
PIXEL: 7689/ 743
PIXEL: 8066/1213
PIXEL: 8326/2224
PIXEL: 8438/2791
PIXEL: 8589/ 310
PIXEL: 8589/3875
PIXEL: 9015/5316
PIXEL: 512/2955
PIXEL: 4816/5945
COLUMN: 1713/3620

C02-00

PIXEL: 75/1209
PIXEL: 120/1505
PIXEL: 500/1672
PIXEL: 701/1447
PIXEL: 741/2005
PIXEL: 892/4371
PIXEL: 1055/4556
PIXEL: 1476/ 963
PIXEL: 1504/1391
PIXEL: 1504/5042
PIXEL: 1504/5512
PIXEL: 1915/4514
PIXEL: 2129/ 113
PIXEL: 2179/1064
PIXEL: 2320/ 566
PIXEL: 2456/5599
PIXEL: 2848/3350
PIXEL: 3008/2278
PIXEL: 3146/3885
PIXEL: 3723/4378
PIXEL: 3723/4379
PIXEL: 3889/2474
PIXEL: 3900/2490
PIXEL: 4367/1840
PIXEL: 5087/6000

PIXEL: 5256/ 761
PIXEL: 5256/ 762
PIXEL: 5613/4941
PIXEL: 5788/2325
PIXEL: 5874/3294
PIXEL: 5908/ 325
PIXEL: 5925/1511
PIXEL: 6152/2239
PIXEL: 6655/4027
PIXEL: 6875/4073
PIXEL: 7283/3548
PIXEL: 7380/4587
PIXEL: 7896/ 237
PIXEL: 7968/4882
PIXEL: 8191/ 284
PIXEL: 8602/5484
PIXEL: 8786/4392
PIXEL: 44/3386
PIXEL: 146/ 79
PIXEL: 266/ 65
PIXEL: 293/2047
PIXEL: 366/4063
PIXEL: 433/ 515
PIXEL: 528/4679
PIXEL: 551/ 184
PIXEL: 1244/4865
PIXEL: 1349/5372
PIXEL: 1431/ 824
PIXEL: 1512/1680
PIXEL: 1801/ 474
PIXEL: 2252/3211
PIXEL: 6729/4800

C02-01

PIXEL: 401/1012
PIXEL: 1331/2986
PIXEL: 1592/5124
PIXEL: 2399/3935
PIXEL: 2687/1650
PIXEL: 3099/ 494
PIXEL: 4205/3268
PIXEL: 4258/4645
PIXEL: 4572/3583
PIXEL: 4869/1561
PIXEL: 5559/3430
PIXEL: 5568/ 763
PIXEL: 5842/3074
PIXEL: 6291/ 538
PIXEL: 6302/ 965
PIXEL: 6792/5235
PIXEL: 7673/5509
PIXEL: 7905/ 613
PIXEL: 7915/5079
PIXEL: 8095/ 812
PIXEL: 4012/2401
PIXEL: 4468/3804
PIXEL: 4468/4136
PIXEL: 4478/1924
PIXEL: 4481/1603
PIXEL: 4482/1522
PIXEL: 4484/1618
PIXEL: 5288/2069

PIXEL: 5540/2261
PIXEL: 5573/1159
PIXEL: 5647/2974
PIXEL: 5647/5792
PIXEL: 6147/1668
PIXEL: 6984/1062
PIXEL: 7382/4314
PIXEL: 7402/5204
PIXEL: 7495/2996
PIXEL: 7502/5968
PIXEL: 7622/1144
PIXEL: 7711/ 295
PIXEL: 7716/4578
PIXEL: 7782/5196
PIXEL: 8027/3584
PIXEL: 8141/1932
PIXEL: 8212/3552
PIXEL: 8221/3018
PIXEL: 8416/3097
PIXEL: 8517/ 98
PIXEL: 8672/2329
PIXEL: 8710/4651
PIXEL: 8765/1406
PIXEL: 8784/4479
PIXEL: 8825/1726
PIXEL: 8831/3817
PIXEL: 8925/1114
PIXEL: 8934/1145
PIXEL: 8963/3948
PIXEL: 8979/ 183
PIXEL: 9007/4097
PIXEL: 9037/2355
PIXEL: 9041/ 606

C03-00

PIXEL: 174/3037
PIXEL: 300/5581
PIXEL: 974/3552
PIXEL: 1287/3028
PIXEL: 1310/5556
PIXEL: 1632/5824
PIXEL: 1858/3755
PIXEL: 2554/4488
PIXEL: 3097/ 80
PIXEL: 3151/5370
PIXEL: 3215/5635
PIXEL: 3636/ 523
PIXEL: 3856/ 663
PIXEL: 4398/4245
PIXEL: 6612/2944
PIXEL: 6663/1379
PIXEL: 6905/1374
PIXEL: 7054/4113
PIXEL: 7300/2763
PIXEL: 7490/ 489
PIXEL: 8135/3073
PIXEL: 8556/3443
PIXEL: 948/ 558
PIXEL: 1151/ 715
PIXEL: 1152/ 715
PIXEL: 1152/ 716
PIXEL: 1210/2807

PIXEL: 4234/4781
PIXEL: 4235/4781
PIXEL: 4309/5101
PIXEL: 4724/5709
PIXEL: 5196/1640
PIXEL: 5196/1641
PIXEL: 8228/4295
PIXEL: 8432/1356
PIXEL: 8433/1356
PIXEL: 8569/2796
PIXEL: 8569/2797
PIXEL: 8636/4358

C04-00

PIXEL: 251/3590
PIXEL: 590/5475
PIXEL: 761/2149
PIXEL: 1068/1373
PIXEL: 1856/1958
PIXEL: 2333/ 501
PIXEL: 2457/5117
PIXEL: 2607/1000
PIXEL: 3035/2302
PIXEL: 3039/2567
PIXEL: 3634/3500
PIXEL: 3671/2899
PIXEL: 3711/5686
PIXEL: 4444/3930
PIXEL: 4449/2860
PIXEL: 4569/4978
PIXEL: 4694/3657
PIXEL: 4891/5498
PIXEL: 5011/ 242
PIXEL: 5207/1343
PIXEL: 5284/ 868
PIXEL: 5913/5090
PIXEL: 6104/5121
PIXEL: 6620/3783
PIXEL: 7036/ 863
PIXEL: 7473/5455
PIXEL: 7634/1655
PIXEL: 7976/5101
PIXEL: 490/ 976
PIXEL: 584/1015
PIXEL: 630/2074
PIXEL: 6947/2768
PIXEL: 8489/1729
PIXEL: 8936/2396
PIXEL: 8971/4604

C05-00

PIXEL: 1553/ 254
PIXEL: 3369/2827
PIXEL: 4163/5390
PIXEL: 4366/4354
PIXEL: 6421/3614
PIXEL: 6562/2630
PIXEL: 7001/2742
PIXEL: 7261/5257
PIXEL: 7554/3952
PIXEL: 7578/5501
PIXEL: 7602/5054

PIXEL: 7855/4518
PIXEL: 7944/3928
PIXEL: 8599/3950
PIXEL: 176/2094
PIXEL: 185/ 371
PIXEL: 318/2666
PIXEL: 746/3265
PIXEL: 746/3266
PIXEL: 924/4132
PIXEL: 1003/1167
PIXEL: 1308/2767
PIXEL: 1893/4882
PIXEL: 2245/3125
PIXEL: 2280/5550
PIXEL: 2280/5551
PIXEL: 2402/1452
PIXEL: 4280/ 158
PIXEL: 4361/4586
PIXEL: 6287/1643
PIXEL: 6287/1644
PIXEL: 6288/1643
PIXEL: 6288/1644
PIXEL: 8998/ 406

C06-00

PIXEL: 2178/5463
PIXEL: 3774/5219
PIXEL: 4038/1250
PIXEL: 5396/4814
PIXEL: 5537/ 18
PIXEL: 5642/ 412
PIXEL: 5642/2850
PIXEL: 5642/4340
PIXEL: 5642/4359
PIXEL: 5642/4409
PIXEL: 5642/4697
PIXEL: 5642/4786
PIXEL: 5642/4874
PIXEL: 5642/4875
PIXEL: 5642/5140
PIXEL: 5642/5882
PIXEL: 5642/5895
PIXEL: 5992/1247
PIXEL: 6900/1856
PIXEL: 8368/5853
PIXEL: 8995/5984
PIXEL: 91/3149
PIXEL: 410/5707
PIXEL: 430/5263
PIXEL: 433/3247
PIXEL: 566/1385
PIXEL: 584/5828
PIXEL: 649/2100
PIXEL: 669/3725
PIXEL: 1155/ 264
PIXEL: 1190/5774
PIXEL: 1542/3968
PIXEL: 1961/4654
PIXEL: 1964/1188
PIXEL: 2804/2493
PIXEL: 3155/ 111
PIXEL: 3628/4844

PIXEL: 3819/4673
PIXEL: 3958/2622
PIXEL: 4208/5040
PIXEL: 4232/5750
PIXEL: 4677/4301
PIXEL: 5047/1065
PIXEL: 5700/2851
PIXEL: 6293/3834
PIXEL: 6362/3366
PIXEL: 6362/3367
PIXEL: 6422/1044
PIXEL: 6616/5416
PIXEL: 6729/5017
PIXEL: 7025/ 585
PIXEL: 7107/3592
PIXEL: 7446/ 110
PIXEL: 7471/5079
PIXEL: 7472/5079
PIXEL: 7797/ 524
PIXEL: 8054/4161
PIXEL: 8127/1425
PIXEL: 8414/4001
PIXEL: 8514/1099
PIXEL: 8590/5026
PIXEL: 8630/1635
PIXEL: 8716/ 469
PIXEL: 8732/2244
PIXEL: 8851/5981
PIXEL: 8855/5484
PIXEL: 9015/5495

C07-00

PIXEL: 375/2247
PIXEL: 425/2671
PIXEL: 752/ 483
PIXEL: 868/1203
PIXEL: 966/5859
PIXEL: 1370/2813
PIXEL: 1527/3048
PIXEL: 1989/3258
PIXEL: 2131/5098
PIXEL: 2182/5665
PIXEL: 3105/ 615
PIXEL: 3210/ 203
PIXEL: 3776/ 499
PIXEL: 3881/4514
PIXEL: 4009/4546
PIXEL: 4630/2296
PIXEL: 5251/5024
PIXEL: 5777/4167
PIXEL: 5914/1568
PIXEL: 6159/3333
PIXEL: 6186/1685
PIXEL: 6420/2010
PIXEL: 6602/ 923
PIXEL: 7310/2659
PIXEL: 8219/3707
PIXEL: 8288/4675
PIXEL: 8584/5546
PIXEL: 149/3215
PIXEL: 158/3536
PIXEL: 464/2361

PIXEL: 922/ 983
PIXEL: 1596/1546
PIXEL: 1658/3863
PIXEL: 1704/ 956
PIXEL: 1724/ 829
PIXEL: 2475/ 434
PIXEL: 7245/ 61
PIXEL: 7435/5956
PIXEL: 7599/2712
PIXEL: 8100/2530
PIXEL: 8179/1622
PIXEL: 8369/ 613
PIXEL: 8403/6010
PIXEL: 8476/4603
PIXEL: 8502/ 274
PIXEL: 8521/ 702
PIXEL: 8703/5791
PIXEL: 8705/5995
PIXEL: 8822/5257
PIXEL: 8901/ 479
PIXEL: 9002/ 79
PIXEL: 9008/ 105
PIXEL: 9008/4473
PIXEL: 2043/2453

Notes

COLUMN anomaly: all pixels below the Qmax detector at location (X,Y) may be affected.
PIXEL anomaly: single detector at location (X,Y) is not functioning within normal range

The Level0 coordinates exclude the two leftmost pixels containing the line index: the corresponding pixel can therefore be located at column (X+2,Y).

Appendix II

Calibration and Modification Dates

Type of Calibration	Laboratory Calibration Date	Modification Date	Modification Reason
Geometric Calibration	11.Dec.2020		
Radiometric Calibration	11.Dec.2020		
Shutter Calibration	11.Dec.2020		
Electronics and Sensor Calibration	11.Dec.2020		

Note: The above-mentioned Laboratory Calibration Dates represent the dates the camera was calibrated in one of our calibration labs for a full Laboratory Calibration. The Modification date represents a date on which the calibration has been modified due to a calibration enhancement or part exchange. It is an additional information and does not replace the Laboratory Calibration date in any way. With the Modification Reason, always the last modification to the calibration is highlighted