VEXCEL
IMAGING

ULTRACAM

Calibration Report

Camera:	**UltraCam Eagle M3**
Serial:	**431S01298X310241-f210**
Laboratory Calibration Date:	**Dec-13-2023**
Camera Revision:	**Rev03.00**
Date of Report:	**Dec-15-2023**
Version of Report:	**V01**

Venice, Italy

Photo on page 1 courtesy of Vexcel Imaging GmbH

ULTRACAM

Geometric Calibration

Camera:	**UltraCam Eagle M3**
Serial:	**431S01298X310241-f210**
Panchromatic Camera:	**ck = 212.100 mm**
Multispectral Camera:	**ck = 212.100 mm**
PPA Information:	**X: 0.000mm**
	Y: 0.000mm

Panchromatic Camera

Large Format Panchromatic Output Image

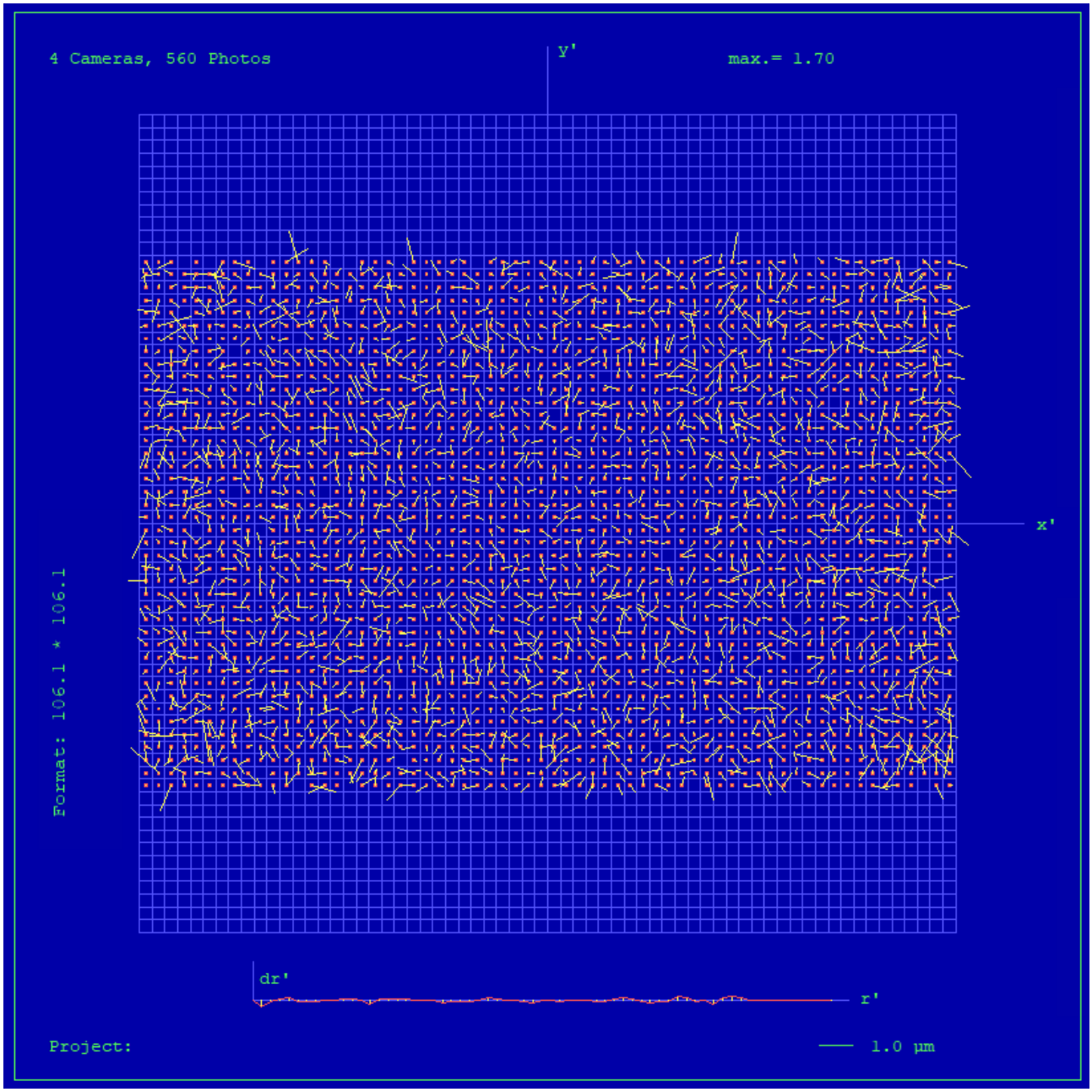
Image Format	long track cross track	68.016mm 105.840mm	17004pixel 26460pixel
Image Extent		(-34.008, -52.920)mm	(34.008, 52.920)mm
Pixel Size		4.000µm*4.000µm	
Focal Length	ck	212.100mm	± 0.002mm
Principal Point (Level 2)	X_ppa	0.000mm	± 0.002mm
	Y_ppa	0.000mm	± 0.002mm
Lens Distortion	Remaining Distortion less than 0.002mm		

Multispectral Camera

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

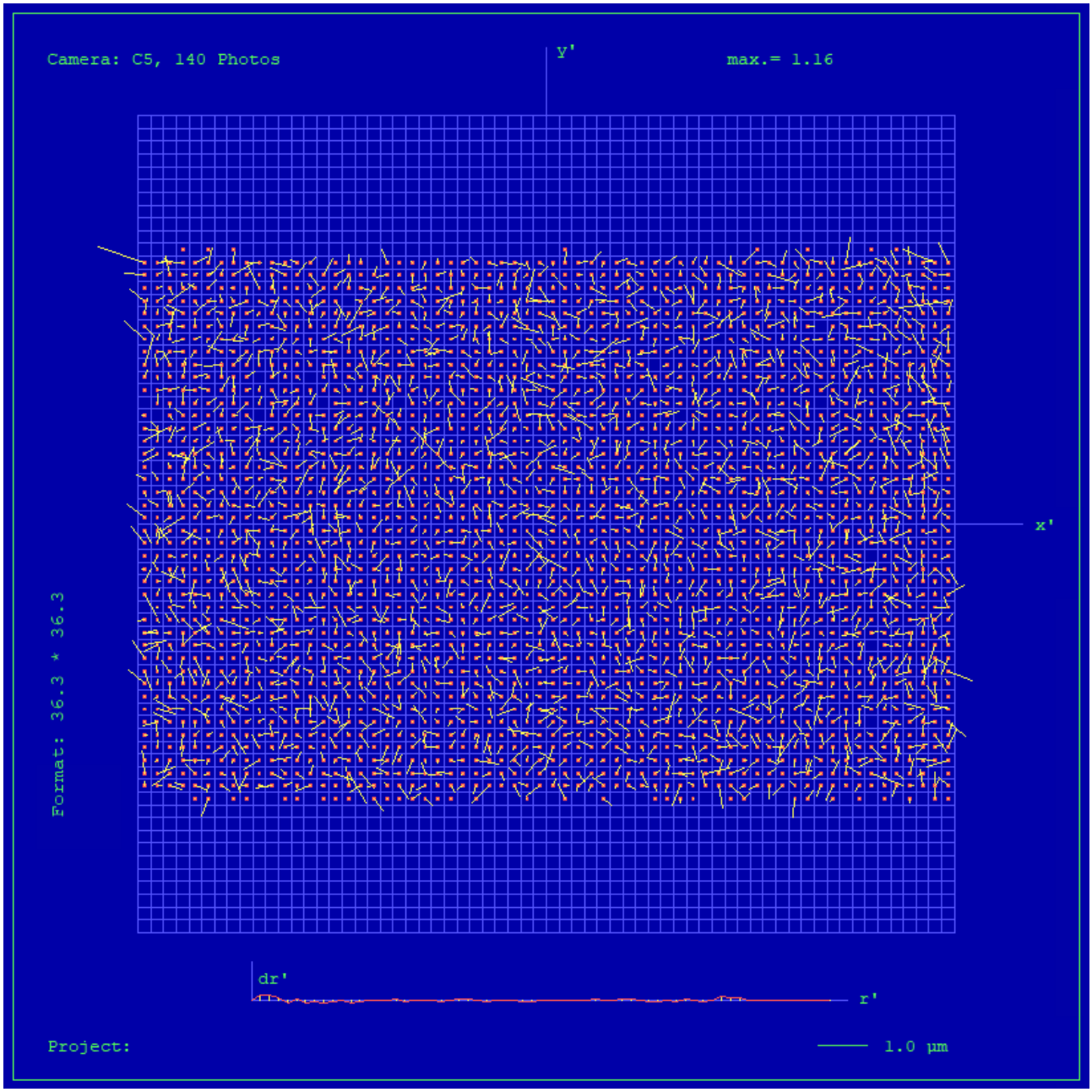
Image Format	long track cross track	68.016mm 105.840mm	5668pixel 8820pixel
Image Extent		(-34.008, -52.920)mm	(34.008, 52.920)mm
Pixel Size		12.000µm*12.000µm	
Focal Length	ck	212.100mm	± 0.002mm
Principal Point (Level 2)	X_ppa	0.000mm	± 0.002mm
	Y_ppa	0.000mm	± 0.002mm
Lens Distortion	Remaining Distortion less than 0.002mm		

Full Panchromatic Image, Residual Error Diagram



Residual Error (RMS): **0.66 µm**

Green Cone (Cone 5), Residual Error Diagram



Residual Error (RMS): **0.53 µm**

Explanations

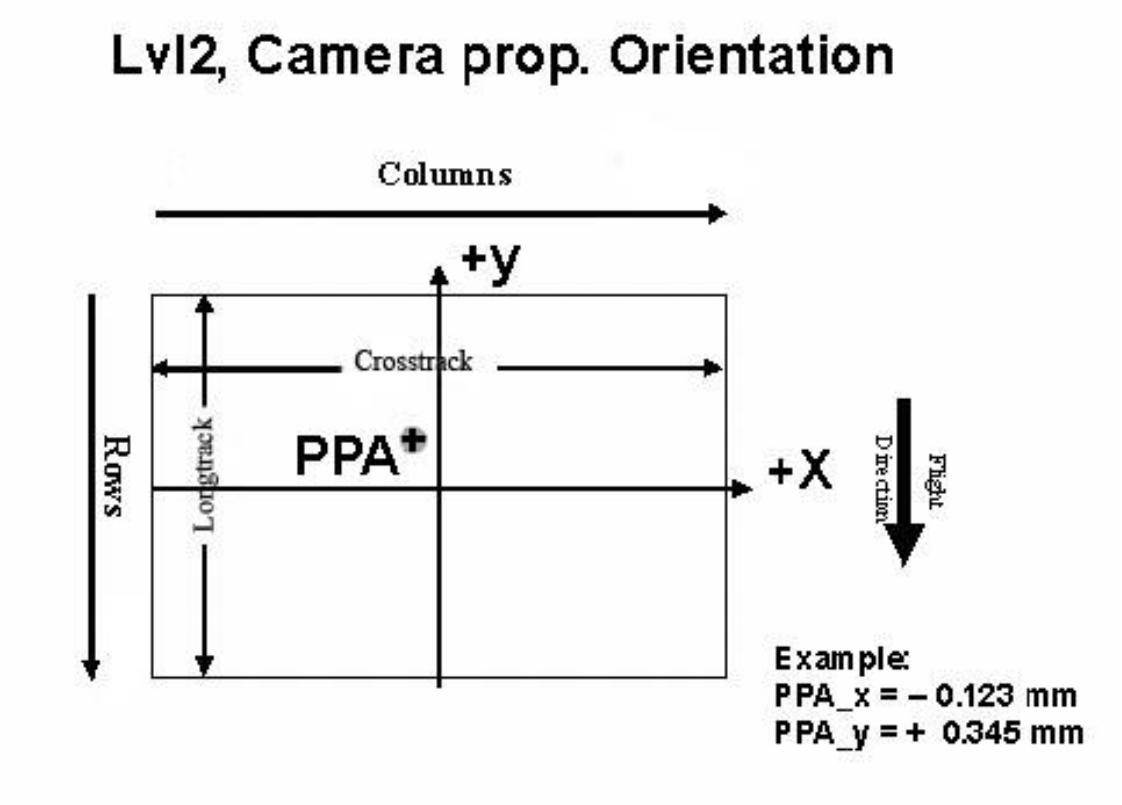
Calibration Method:

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

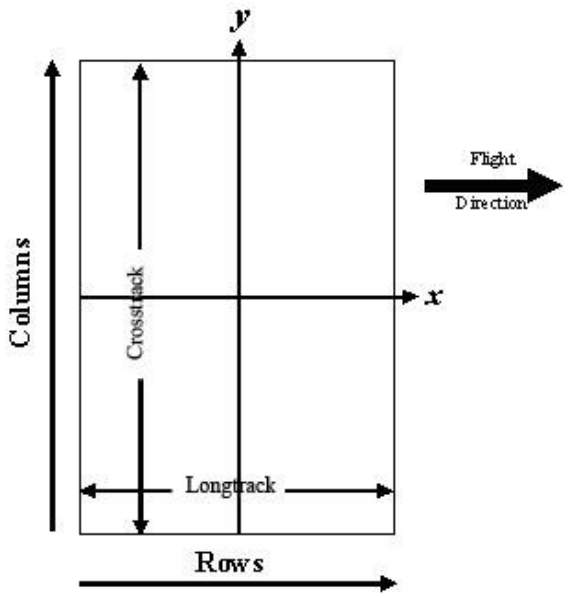
Determination of the image parameters by Least Squares Adjustment.
Software used for the adjustment: BINGO (GIP Eng. Aalen, Germany)

Level 2 Image Coordinate System:

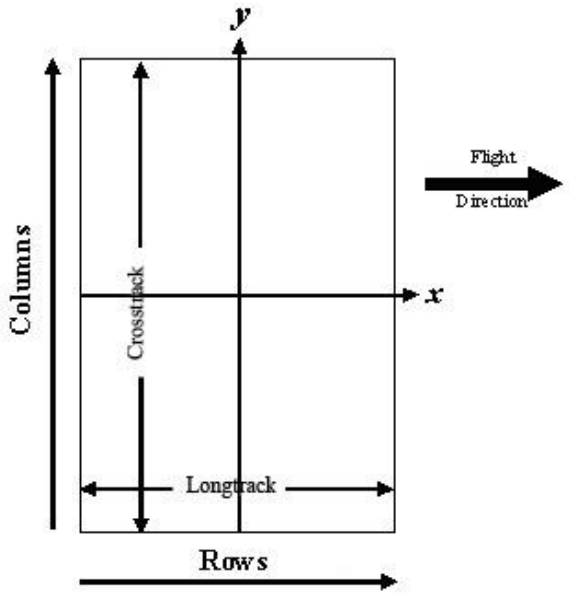


The image coordinate system of the Level 2 images is shown in the above figure. The basic image format and coordinate of the principal point in the level 2 image is given on page 4 of this report. The above figure shows the position of an example principal point at the coordinate (-0.123 / 0.345).

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



Panchromatic Image Format



Multispectral Image Format

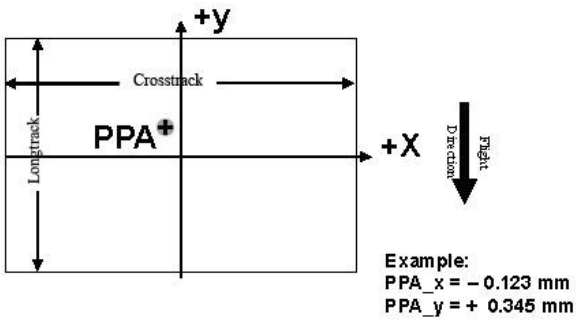
Position of Principal Point in Level 3 Image

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

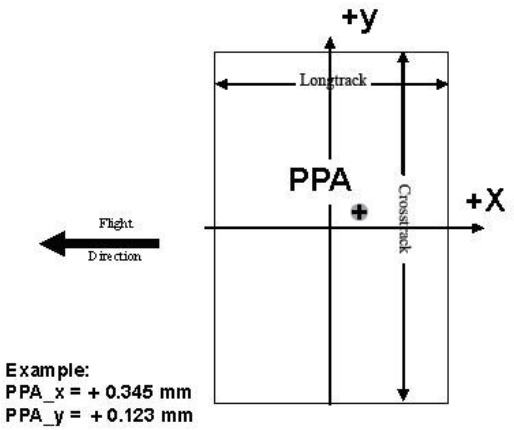
The coordinates in the figure below are only example values to illustrate the effect of image rotation on the principal point position, and do **not** correspond to the camera described in this report.

Lvl3, Rotation 0 deg clockwise



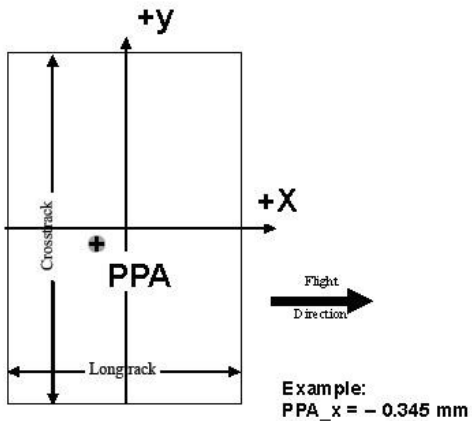
Example:
PPA_x = – 0.123 mm
PPA_y = + 0.345 mm

Lvl3, Rotation 90 deg clockwise



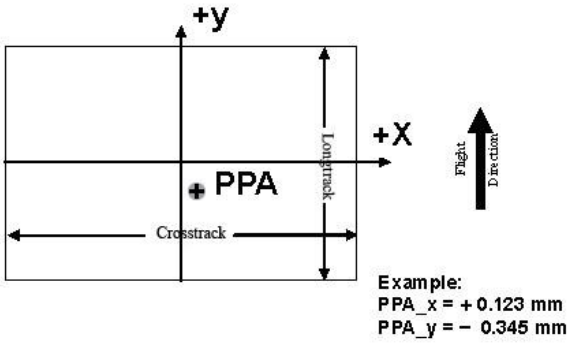
Example:
PPA_x = + 0.345 mm
PPA_y = + 0.123 mm

Lvl3, Rotation 270 deg clockwise



Example:
PPA_x = – 0.345 mm
PPA_y = – 0.123 mm

Lvl3, Rotation 180 deg clockwise



Example:
PPA_x = + 0.123 mm
PPA_y = – 0.345 mm

Lens Resolving Power

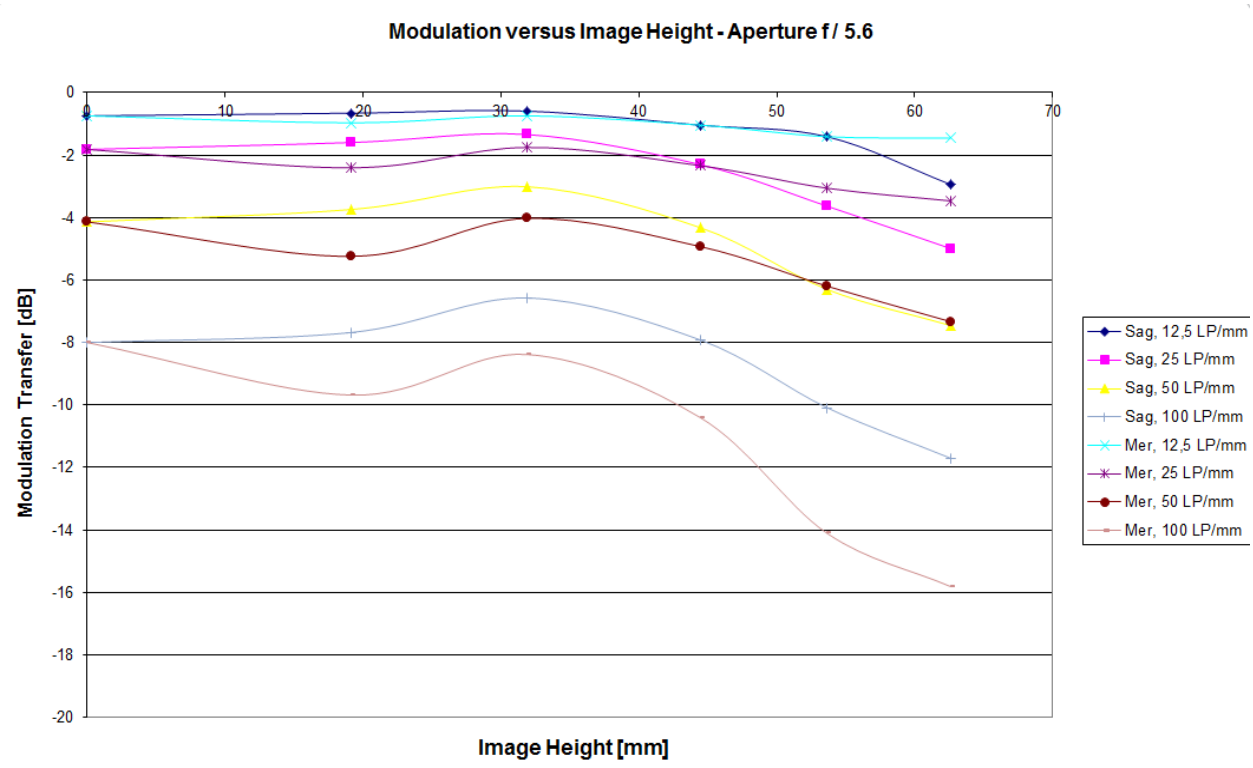
The following curves show the development of the modulation transfer function across different image heights of the panchromatic cones.
Please note that these values have been calculated and can vary up to 10% with optics from production (especially at high LP's).

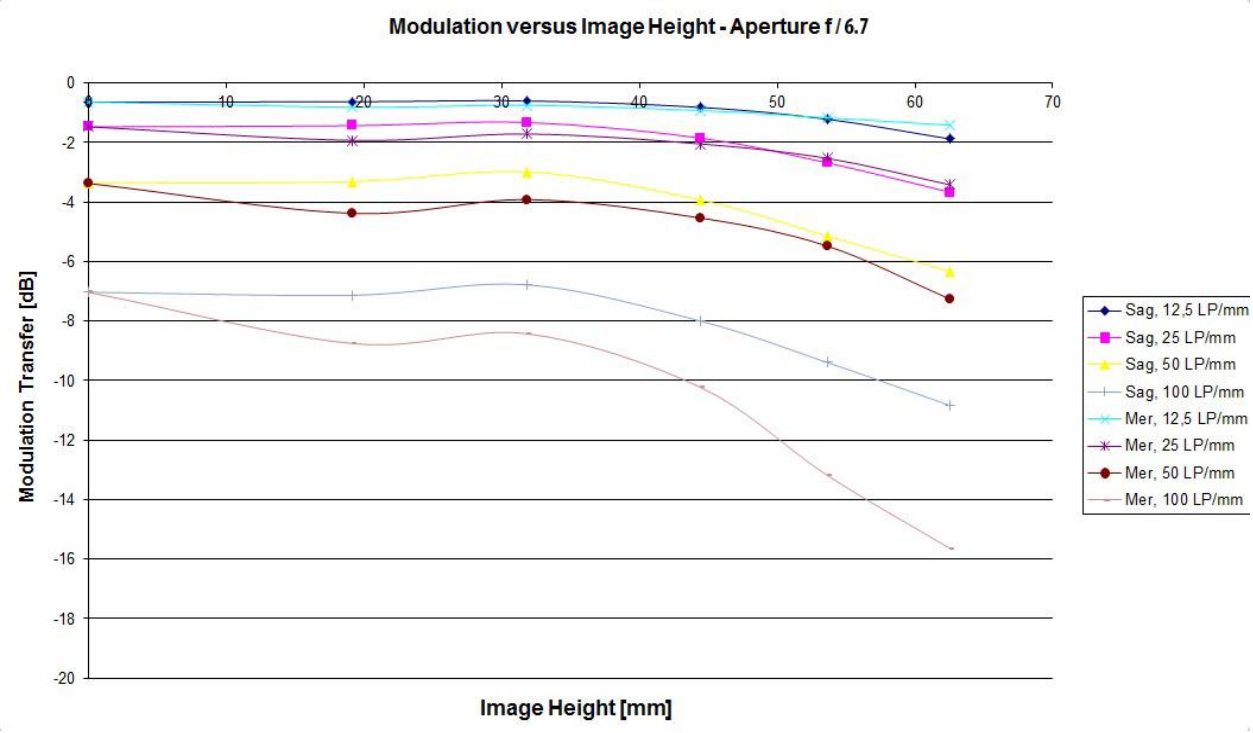
The curves are given for the meridonial (tangential) and sagital (radial) component of signals at frequencies of 12.5, 25, 50 and 100 line pairs per millimeter.

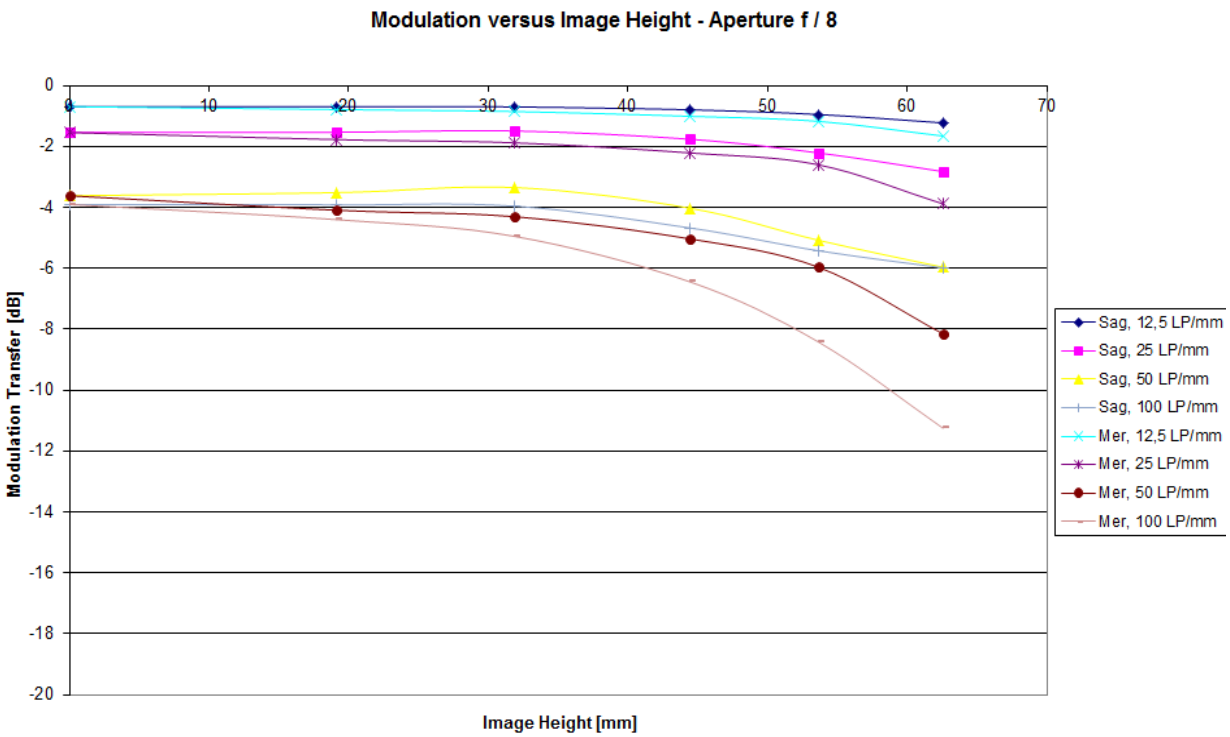
As the MTF is a function of the specific aperture size used, one set of curves is given for each aperture size.

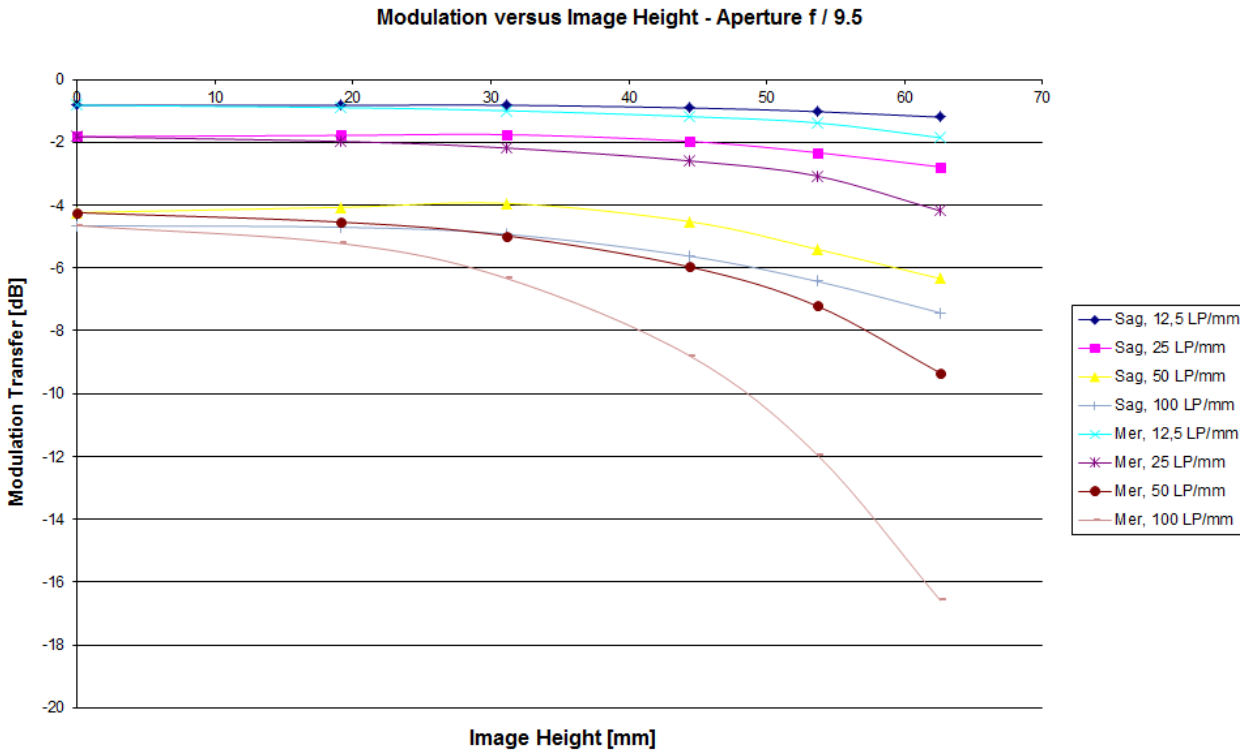
Lens types

Cone	Lens
C0 (PAN)	Qioptic Vexcel HR Digaron 1:8,6/210mm, Qioptic GmbH, Germany
C1 (PAN)	Qioptic Vexcel HR Digaron 1:8,6/210mm, Qioptic GmbH, Germany
C2 (PAN)	Qioptic Vexcel HR Digaron 1:8,6/210mm, Qioptic GmbH, Germany
C3 (PAN)	Qioptic Vexcel HR Digaron 1:8,6/210mm, Qioptic GmbH, Germany
C4 (RED)	Qioptic Vexcel HR Digaron 1:5.6/70mm, Qioptic GmbH, Germany
C5 (GREEN)	Qioptic Vexcel HR Digaron 1:5.6/70mm, Qioptic GmbH, Germany
C6 (BLUE)	Qioptic Vexcel HR Digaron 1:5.6/70mm, Qioptic GmbH, Germany
C7 (NIR)	Qioptic Vexcel HR Digaron 1:5.6/70mm, Qioptic GmbH, Germany

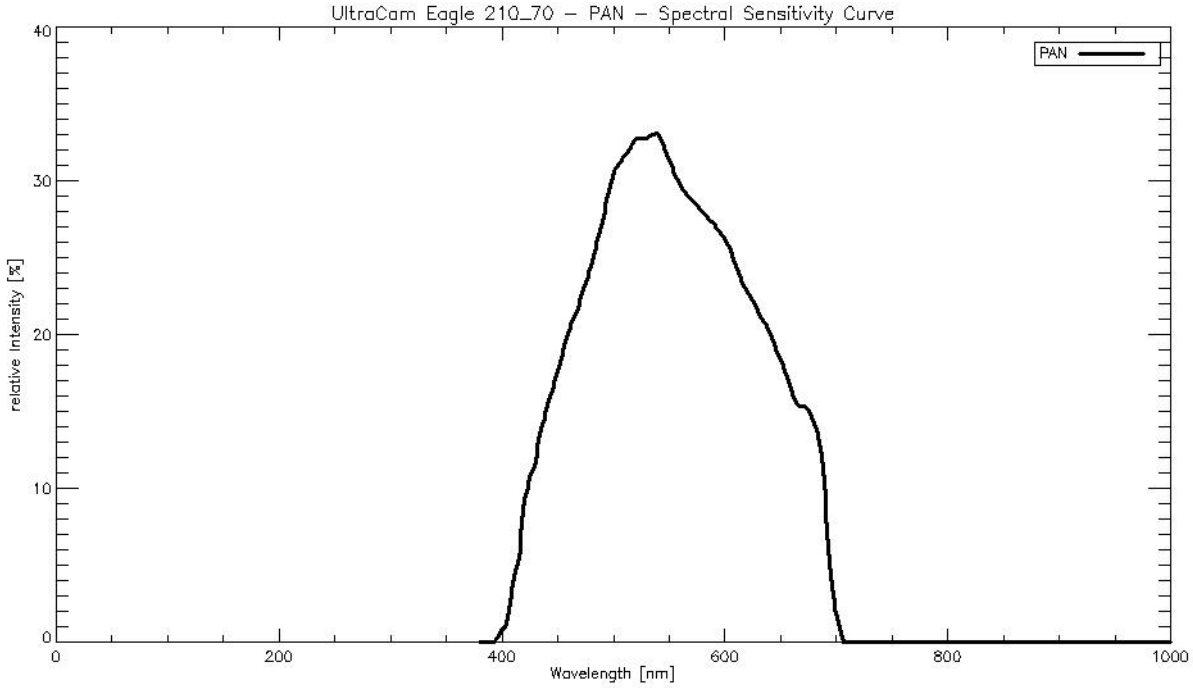

Modulation versus Image Height - Aperture f / 5.6
Modulation Transfer [dB]
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
0
10
20
30
40
50
60
70
Image Height [mm]
Sag, 12,5 LP/mm
Sag, 25 LP/mm
Sag, 50 LP/mm
Sag, 100 LP/mm
Mer, 12,5 LP/mm
Mer, 25 LP/mm
Mer, 50 LP/mm
Mer, 100 LP/mm

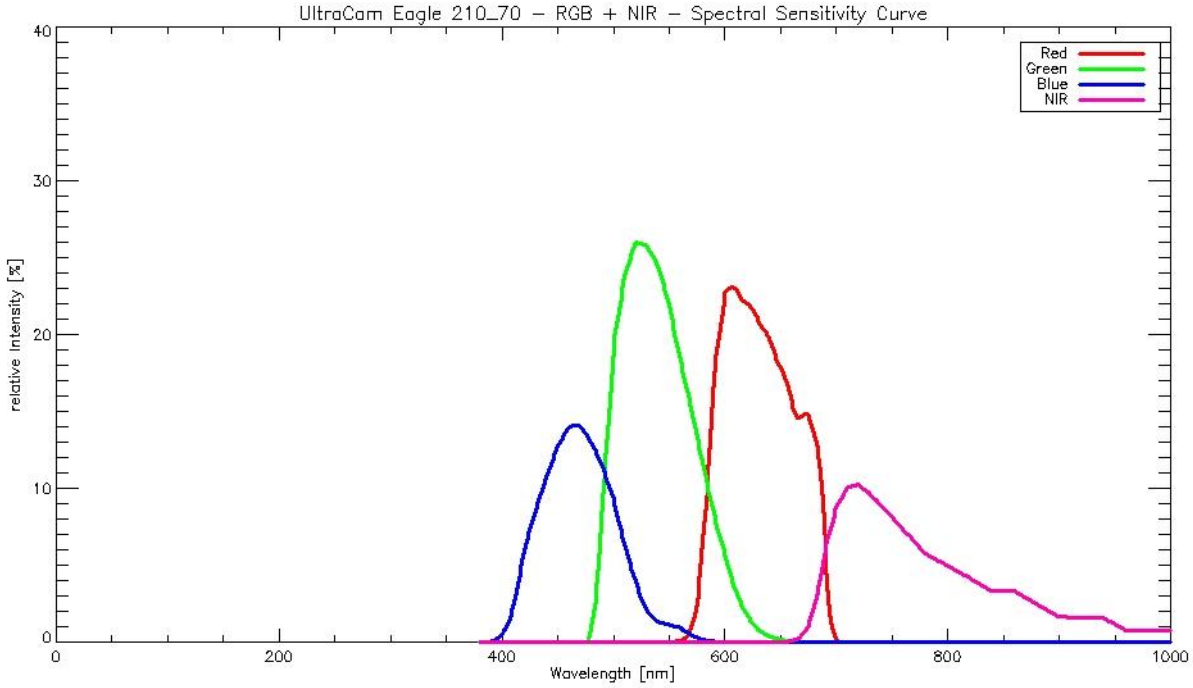

Modulation versus Image Height - Aperture f / 6.7
Modulation Transfer [dB]
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
0
10
20
30
40
50
60
70
Image Height [mm]
Sag, 12,5 LP/mm
Sag, 25 LP/mm
Sag, 50 LP/mm
Sag, 100 LP/mm
Mer, 12,5 LP/mm
Mer, 25 LP/mm
Mer, 50 LP/mm
Mer, 100 LP/mm


Modulation versus Image Height - Aperture f / 8
Modulation Transfer [dB]
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
0
10
20
30
40
50
60
70
Image Height [mm]
Sag, 12,5 LP/mm
Sag, 25 LP/mm
Sag, 50 LP/mm
Sag, 100 LP/mm
Mer, 12,5 LP/mm
Mer, 25 LP/mm
Mer, 50 LP/mm
Mer, 100 LP/mm


Modulation versus Image Height - Aperture f / 9.5
Modulation Transfer [dB]
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
0
10
20
30
40
50
60
70
Image Height [mm]
Sag, 12,5 LP/mm
Sag, 25 LP/mm
Sag, 50 LP/mm
Sag, 100 LP/mm
Mer, 12,5 LP/mm
Mer, 25 LP/mm
Mer, 50 LP/mm
Mer, 100 LP/mm

Spectral Sensitivity





ULTRACAM

Radiometric Calibration

Camera: **UltraCam Eagle M3**
Serial: **431S01298X310241-f210**

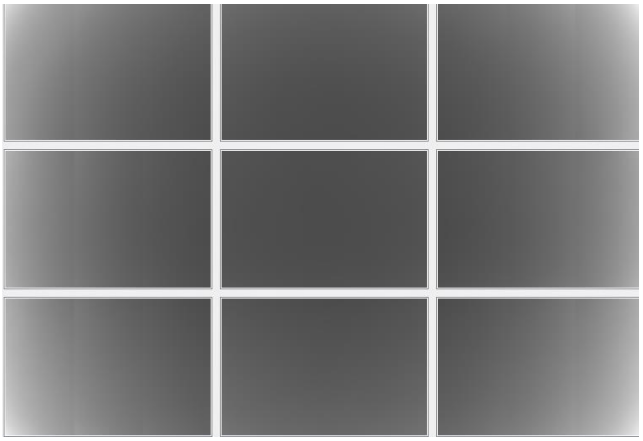
	PAN	R, G, NIR	B
Used Apertures	F7.8	F5.6	F5.6
	F9.5	F6.7	F5.6
	F11	F8	F5.6
	F13	F9.5	F6.7
	F16	F11	F8
	F22	F16	F11

Dead Pixel Report: see Appendix I

Calibration of Vignetting for working Aperture F8

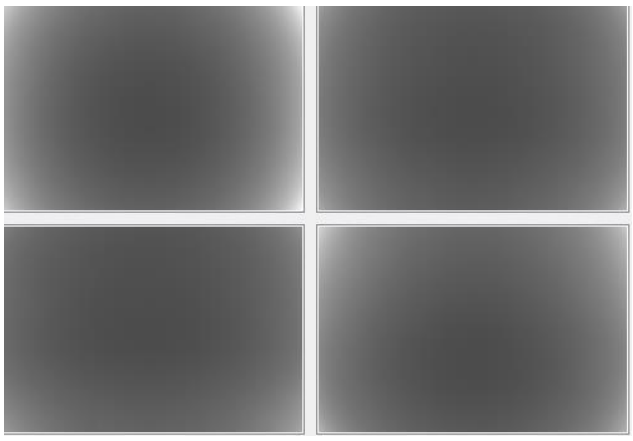
	PAN	R, G, NIR	B
Aperture	F7.8	F5.6	F5.6

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:	**431S01298X310241-f210**
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 F8 [ms]	SRT F9.5 [ms]	SRT F11 [ms]	SRT F13 [ms]	SRT F16 [ms]	SRT F22 [ms]	Measurement Tolerance [ms]
C0 (Pan)	12 48 13 03	5.56	5.71	6.16	6.51	6.83	7.18	+/- 0.2
C1 (Pan)	12 48 13 14	5.67	5.82	6.35	6.73	7.05	7.43	+/- 0.2
C2 (Pan)	12 48 13 02	5.51	5.67	6.15	6.48	6.76	7.17	+/- 0.2
C3 (Pan)	12 48 13 05	5.73	5.98	6.49	6.92	7.23	7.70	+/- 0.2
C4 (Red)	12 47 31 60	7.17	7.30	7.58	7.76	8.00	8.28	+/- 0.2
C5 (Green)	12 47 31 83	6.58	6.78	7.00	7.14	7.29	7.63	+/- 0.2
C6 (Blue)	12 47 31 80	6.52	6.52	6.52	6.71	6.91	7.19	+/- 0.2
C7 (NIR)	12 47 31 71	6.76	6.99	7.23	7.42	7.58	7.83	+/- 0.2

ULTRACAM

Electronics and Sensor Calibration

Camera:	**UltraCam Eagle M3**
Serial:	**431S01298X310241-f210**
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	19 6255/005	21.80	6.33
00_01	FTF9060-M	19 6255/007	22.00	6.61
00_02	FTF9060-M	20 1289/110	21.40	6.35
00_03	FTF9060-M	19 7663/011	21.80	5.93
01_00	FTF9060-M	19 6257/012	22.00	5.69
01_01	FTF9060-M	19 6255/023	22.00	6.03
02_00	FTF9060-M	19 6255/008	21.80	6.17
02_01	FTF9060-M	19 6255/044	22.00	6.93
03_00	FTF9060-M	19 6255/009	22.00	6.01
04_00 (red)	FTF9060-M	19 6255/049	22.00	6.60
05_00 (green)	FTF9060-M	19 6255/012	22.20	6.31
06_00 (blue)	FTF9060-M	19 6256/025	21.80	7.32
07_00 (NIR)	FTF9060-M	19 6257/015	21.20	6.06

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	19 6255/005	13490	12420
00_01	FTF9060-M	19 6255/007	13470	12560
00_02	FTF9060-M	20 1289/110	13380	12440
00_03	FTF9060-M	19 7663/011	13460	12710
01_00	FTF9060-M	19 6257/012	12980	12450
01_01	FTF9060-M	19 6255/023	13180	12330
02_00	FTF9060-M	19 6255/008	13310	12640
02_01	FTF9060-M	19 6255/044	13010	12400
03_00	FTF9060-M	19 6255/009	13140	12600
04_00 (red)	FTF9060-M	19 6255/049	13390	12510
05_00 (green)	FTF9060-M	19 6255/012	13280	12320
06_00 (blue)	FTF9060-M	19 6256/025	13250	12240
07_00 (NIR)	FTF9060-M	19 6257/015	13490	12650

ULTRACAM

Summary

Camera:	**UltraCam Eagle M3**
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Laboratory Calibration Date:	**Dec-13-2023**
Camera Revision:	**Rev03.00**
Date of Report:	**Dec-15-2023**
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 Imaging GmbH.

Dr. Michael Gruber
Chief Scientist, Photogrammetry
Vexcel Imaging GmbH

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

Appendix I

Dead Pixel Report:

Sensor number			
Anomaly type	X-Coordinate	Y-Coordinate	

C00-00

PIXEL: 4619/ 88	PIXEL: 3897/ 178	PIXEL: 1221/ 396	
PIXEL: 8601/ 412	PIXEL: 5022/ 451	PIXEL: 2131/ 592	PIXEL: 2307/ 811
PIXEL: 3628/ 897	PIXEL: 8758/1152	PIXEL: 1347/1372	PIXEL: 7289/1409
PIXEL: 6120/2193	PIXEL: 5741/2228	PIXEL: 8949/2511	PIXEL: 2042/3162
PIXEL: 6629/3529	PIXEL: 1953/3840	PIXEL: 6098/3896	PIXEL: 8869/4225
PIXEL: 904/4437	PIXEL: 8777/4919	PIXEL: 3599/5150	PIXEL: 8685/5923
PIXEL: 6639/1456	PIXEL: 6364/1721	PIXEL: 7545/2377	PIXEL: 1569/2437
PIXEL: 1569/2438	PIXEL: 1570/2438	PIXEL: 1194/5894	

C00-01

PIXEL: 2065/ 747	PIXEL: 4032/1087	PIXEL: 5434/1756	
PIXEL: 2836/1975	PIXEL: 5342/2331	PIXEL: 3542/2508	PIXEL: 6048/2854
PIXEL: 7166/3140	PIXEL: 5332/3236	PIXEL: 8633/3592	PIXEL: 6570/3851
PIXEL: 8983/3869	PIXEL: 6455/4109	PIXEL: 2608/4359	PIXEL: 104/4417
PIXEL: 4811/4796	PIXEL: 4811/4797	PIXEL: 1963/5317	PIXEL: 8931/5571
PIXEL: 8925/5573	PIXEL: 6148/ 66	PIXEL: 5896/ 179	PIXEL: 5895/ 180
PIXEL: 5896/ 180	PIXEL: 5896/ 181	PIXEL: 8602/1939	PIXEL: 3510/2340
PIXEL: 2023/3305	PIXEL: 5314/4105	PIXEL: 5315/4105	PIXEL: 5313/4106
PIXEL: 5314/4106	PIXEL: 5315/4106	PIXEL: 5314/4107	PIXEL: 2184/4152
PIXEL: 433/4826	PIXEL: 2798/5194	PIXEL: 7545/5588	

C00-02

PIXEL: 3946/4436	PIXEL: 3946/4437	PIXEL: 8111/ 497	
PIXEL: 2691/ 524	PIXEL: 937/ 592	PIXEL: 6058/1001	PIXEL: 7077/1037
PIXEL: 5856/1366	PIXEL: 1532/1509	PIXEL: 424/1774	PIXEL: 8989/1952
PIXEL: 8680/2028	PIXEL: 649/2136	PIXEL: 8408/2204	PIXEL: 3801/2546
PIXEL: 6066/3069	PIXEL: 6559/3329	PIXEL: 7418/3747	PIXEL: 841/3825
PIXEL: 8658/3911	PIXEL: 4898/3937	PIXEL: 1059/4121	PIXEL: 638/5358
PIXEL: 2250/5364	PIXEL: 788/5686	PIXEL: 7052/ 608	PIXEL: 5101/1059
PIXEL: 3947/4436	PIXEL: 3947/4437	PIXEL: 1737/5312	

C00-03

PIXEL: 7647/ 738	PIXEL: 8606/ 929	PIXEL: 8143/1616	
PIXEL: 5182/1780	PIXEL: 6663/1876	PIXEL: 6225/2123	PIXEL: 5797/2878
PIXEL: 1369/2964	PIXEL: 4803/3149	PIXEL: 1009/3593	PIXEL: 5092/3836
PIXEL: 1075/3973	PIXEL: 1491/4680	PIXEL: 2804/4838	PIXEL: 5650/5137
PIXEL: 6238/5200	PIXEL: 5175/5435	PIXEL: 3072/5446	PIXEL: 2974/5738
PIXEL: 3867/5744			

C01-00
PIXEL: 7300/ 38
PIXEL: 1991/ 303 PIXEL: 7971/ 512 PIXEL: 6579/ 541 PIXEL: 8435/ 564
PIXEL: 6278/ 691 PIXEL: 7629/ 754 PIXEL: 634/1083 PIXEL: 914/1152
PIXEL: 1319/1283 PIXEL: 5855/1606 PIXEL: 7060/1937 PIXEL: 3750/2319
PIXEL: 2981/2369 PIXEL: 8408/2391 PIXEL: 7263/2649 PIXEL: 6982/2732
PIXEL: 7356/3214 PIXEL: 5497/3260 PIXEL: 2981/3511 PIXEL: 7014/3603
PIXEL: 536/3638 PIXEL: 8081/3642 PIXEL: 6402/3817 PIXEL: 2095/3854
PIXEL: 2981/4665 PIXEL: 4433/4789 PIXEL: 2981/4798 PIXEL: 2981/5173
PIXEL: 5470/5285 PIXEL: 2981/5286 PIXEL: 3491/5340 PIXEL: 3897/5429
PIXEL: 1491/5484 PIXEL: 2981/5548 PIXEL: 2981/5661 PIXEL: 2981/5763
PIXEL: 5026/ 390 PIXEL: 6011/1950 PIXEL: 7072/3644 PIXEL: 617/5473
PIXEL: 616/5474

C01-01
PIXEL: 6515/ 35
PIXEL: 5078/ 302 PIXEL: 519/ 834 PIXEL: 1607/1048 PIXEL: 644/1526
PIXEL: 9027/2010 PIXEL: 2651/2045 PIXEL: 1452/2091 PIXEL: 7351/2619
PIXEL: 1564/2769 PIXEL: 5827/2882 PIXEL: 6672/3158 PIXEL: 1381/3404
PIXEL: 2749/3493 PIXEL: 6421/3514 PIXEL: 1534/3735 PIXEL: 3194/3862
PIXEL: 1010/4313 PIXEL: 835/4357 PIXEL: 7050/4427 PIXEL: 7395/4914
PIXEL: 1070/5112 PIXEL: 3454/5284 PIXEL: 8593/5375 PIXEL: 8530/5882
PIXEL: 7993/5917 PIXEL: 548/2602 PIXEL: 7559/2872 PIXEL: 7559/2873
PIXEL: 109/3466 PIXEL: 7526/3762 PIXEL: 8070/4307 PIXEL: 2051/5831

C02-00
PIXEL: 6548/1054 PIXEL: 749/1307
PIXEL: 7036/1565 PIXEL: 6093/2725 PIXEL: 7482/2988 PIXEL: 7087/3009
PIXEL: 7087/3010 PIXEL: 1583/3270 PIXEL: 3944/3319 PIXEL: 7635/3380
PIXEL: 3660/3659 PIXEL: 8229/3778 PIXEL: 1381/3841 PIXEL: 6965/3912
PIXEL: 2413/3984 PIXEL: 5629/4132 PIXEL: 5829/4591 PIXEL: 6093/4670
PIXEL: 3965/5897 PIXEL: 3991/5898 PIXEL: 8077/ 931 PIXEL: 8076/ 932
PIXEL: 8077/ 932 PIXEL: 8078/ 932 PIXEL: 831/1225 PIXEL: 832/1225
PIXEL: 833/1225 PIXEL: 831/1226 PIXEL: 832/1226 PIXEL: 833/1226
PIXEL: 1736/2723 PIXEL: 4251/2770 PIXEL: 8949/3084 PIXEL: 8950/3084
PIXEL: 8951/3084 PIXEL: 8950/3085 PIXEL: 8951/3085 PIXEL: 7893/3755
PIXEL: 7893/3756 PIXEL: 3928/3968 PIXEL: 3929/3968 PIXEL: 8384/5897

C02-01
PIXEL: 972/ 20 PIXEL: 1581/ 98
PIXEL: 8580/ 324 PIXEL: 2419/ 900 PIXEL: 7657/ 914 PIXEL: 4431/1144
PIXEL: 6724/1193 PIXEL: 2473/1417 PIXEL: 6657/1452 PIXEL: 121/2052
PIXEL: 4132/2429 PIXEL: 540/2491 PIXEL: 4392/2936 PIXEL: 7805/3049
PIXEL: 8133/3088 PIXEL: 5679/3287 PIXEL: 55/3514 PIXEL: 3843/3516
PIXEL: 709/3884 PIXEL: 3494/4062 PIXEL: 1699/4244 PIXEL: 5418/4310
PIXEL: 5810/4974 PIXEL: 5810/4975 PIXEL: 8336/5189 PIXEL: 5483/5216
PIXEL: 8970/5309 PIXEL: 2259/5728 PIXEL: 4186/5781 PIXEL: 4132/5785
PIXEL: 2266/5895 PIXEL: 8906/ 217 PIXEL: 8511/ 457 PIXEL: 8773/ 559
PIXEL: 1000/ 643 PIXEL: 855/ 650 PIXEL: 8545/ 828 PIXEL: 4502/1407
PIXEL: 4393/1562 PIXEL: 5460/4465 PIXEL: 8605/4528

C03-00
PIXEL: 1061/ 170 PIXEL: 8911/ 915 PIXEL: 8076/1545
PIXEL: 8437/1595 PIXEL: 2640/1891 PIXEL: 4130/3118 PIXEL: 5363/3385
PIXEL: 5451/3454 PIXEL: 149/3700 PIXEL: 3568/3823 PIXEL: 5477/4426
PIXEL: 5477/4427 PIXEL: 480/5191 PIXEL: 5290/5855 PIXEL: 2701/ 54

PIXEL: 8839/2846 PIXEL: 8840/2846 PIXEL: 2538/3515 PIXEL: 7182/5907
PIXEL: 7182/5908

C04-00
PIXEL: 7958/1337
PIXEL: 6040/1426 PIXEL: 8416/1967 PIXEL: 2374/2061 PIXEL: 4675/2198
PIXEL: 5667/2399 PIXEL: 6438/2407 PIXEL: 2120/2822 PIXEL: 1080/2891
PIXEL: 1110/2975 PIXEL: 8864/3141 PIXEL: 4836/3154 PIXEL: 3560/3510
PIXEL: 7050/4036 PIXEL: 755/5212 PIXEL: 8242/5243 PIXEL: 5274/5719
PIXEL: 5251/5948 PIXEL: 9011/ 247 PIXEL: 1598/ 909 PIXEL: 1598/ 910
PIXEL: 5875/1211 PIXEL: 3405/1949 PIXEL: 4146/2027 PIXEL: 1054/2691
PIXEL: 1054/2692 PIXEL: 661/3982 PIXEL: 704/4978 PIXEL: 8843/5552
PIXEL: 8844/5552 PIXEL: 494/5649

C05-00
PIXEL: 2216/ 560 PIXEL: 816/ 630 PIXEL: 8876/ 735 PIXEL: 6259/2185
PIXEL: 1435/2191 PIXEL: 3121/2368 PIXEL: 5960/2565 PIXEL: 5155/2619
PIXEL: 1750/2701 PIXEL: 3509/2957 PIXEL: 7492/4095 PIXEL: 6198/4525
PIXEL: 4178/4847 PIXEL: 3988/4970 PIXEL: 8886/5119 PIXEL: 8705/5721
PIXEL: 4486/ 356 PIXEL: 4487/ 356 PIXEL: 4486/ 357 PIXEL: 4487/ 357
PIXEL: 2544/2161 PIXEL: 8350/3267 PIXEL: 7237/3667 PIXEL: 8890/4541
PIXEL: 495/5063 PIXEL: 931/5332 PIXEL: 338/5593 PIXEL: 461/5897

C06-00
PIXEL: 5633/1171 PIXEL: 314/1305
PIXEL: 1853/3717 PIXEL: 2264/4315 PIXEL: 3332/4521 PIXEL: 5730/4528
PIXEL: 4437/4577 PIXEL: 1447/ 40 PIXEL: 1970/ 99 PIXEL: 4695/ 148
PIXEL: 5101/ 191 PIXEL: 1349/ 215 PIXEL: 8212/ 338 PIXEL: 5420/ 636
PIXEL: 8577/ 715 PIXEL: 5895/ 827 PIXEL: 5896/ 827 PIXEL: 685/ 890
PIXEL: 2807/ 979 PIXEL: 6610/1081 PIXEL: 2473/1084 PIXEL: 8945/1166
PIXEL: 2429/1205 PIXEL: 8168/1300 PIXEL: 809/1314 PIXEL: 8706/1520
PIXEL: 5997/1540 PIXEL: 4212/1843 PIXEL: 7422/1866 PIXEL: 7583/1901
PIXEL: 765/2220 PIXEL: 1964/2353 PIXEL: 1395/2366 PIXEL: 6977/2886
PIXEL: 7465/2900 PIXEL: 517/2969 PIXEL: 7985/3058 PIXEL: 1523/3075
PIXEL: 722/3154 PIXEL: 6668/3302 PIXEL: 3767/3354 PIXEL: 8572/3384
PIXEL: 5026/3411 PIXEL: 7994/3468 PIXEL: 1170/3501 PIXEL: 3811/3629
PIXEL: 9037/3675 PIXEL: 1051/3726 PIXEL: 28/3754 PIXEL: 4795/3843
PIXEL: 6324/3955 PIXEL: 8857/4108 PIXEL: 130/4183 PIXEL: 6591/4199
PIXEL: 1686/4279 PIXEL: 710/4363 PIXEL: 5006/4428 PIXEL: 7379/4462
PIXEL: 3379/4464 PIXEL: 149/4596 PIXEL: 1075/5056 PIXEL: 5685/5148
PIXEL: 59/5162 PIXEL: 5028/5164 PIXEL: 8611/5166 PIXEL: 4823/5228
PIXEL: 529/5239 PIXEL: 7466/5253 PIXEL: 4990/5388 PIXEL: 9043/5400
PIXEL: 4362/5540 PIXEL: 5489/5651 PIXEL: 6526/5763 PIXEL: 1188/5801
PIXEL: 9005/5864 PIXEL: 6104/5971 PIXEL: 2367/6015 COLUMN: 3637/ 566

C07-00
PIXEL: 1744/ 100 PIXEL: 3191/ 120
PIXEL: 2361/ 509 PIXEL: 2966/ 799 PIXEL: 969/ 950 PIXEL: 1716/1097
PIXEL: 1029/1161 PIXEL: 4211/1408 PIXEL: 6797/2111 PIXEL: 4473/3536
PIXEL: 882/3797 PIXEL: 5909/4079 PIXEL: 1413/ 475 PIXEL: 2506/ 481
PIXEL: 530/ 664 PIXEL: 8399/ 688 PIXEL: 407/ 718 PIXEL: 677/1106
PIXEL: 72/1496 PIXEL: 8057/1552 PIXEL: 8806/3112 PIXEL: 7340/3137
PIXEL: 741/4160 PIXEL: 3391/4318 PIXEL: 3391/4319 PIXEL: 8729/5386

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	**13.Dec.2023**		
Radiometric Calibration	**13.Dec.2023**		
Shutter Calibration	**13.Dec.2023**		
Electronics and Sensor Calibration	**13.Dec.2023**		

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