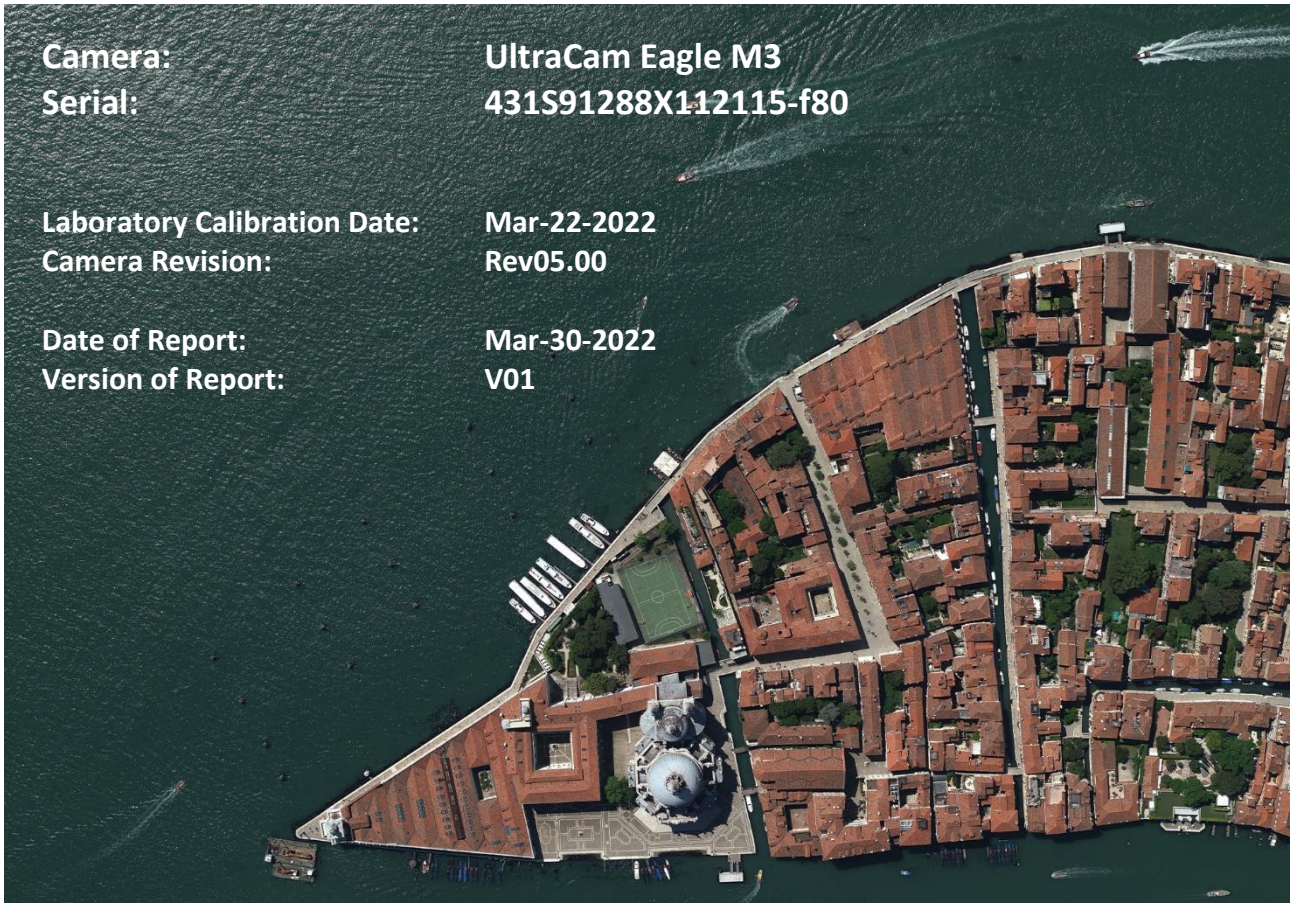
VEXCEL
IMAGING

ULTRACAM

Calibration Report



Venice, Italy

Photo on page 1 courtesy of Vexcel Imaging GmbH

ULTRACAM

Geometric Calibration

Camera:	**UltraCam Eagle M3**
Serial:	**431S91288X112115-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

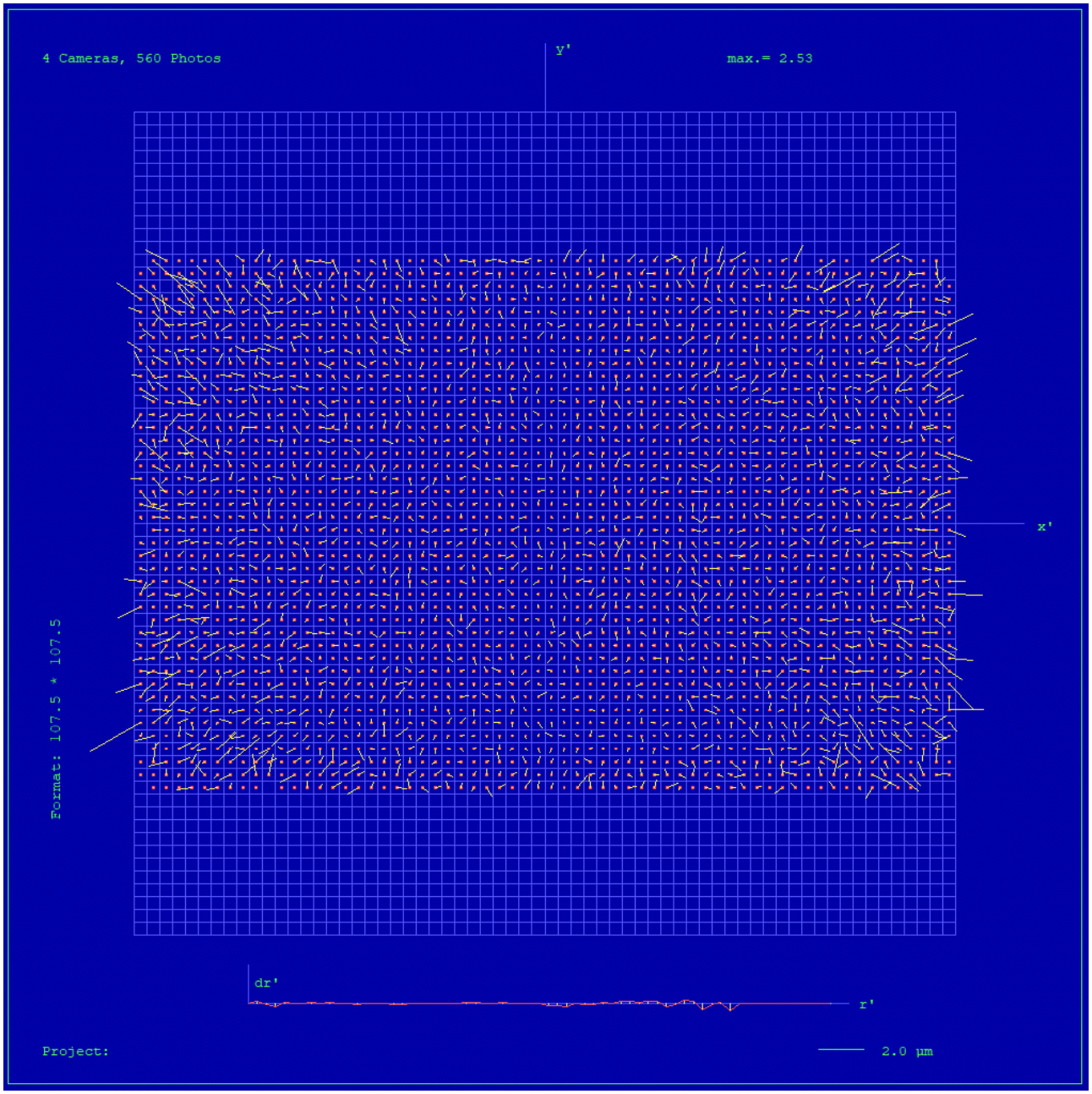
Image Format	long track cross track	68.016mm 105.840mm	17004pixel 26460pixel
Image Extent		(-34.008, -52.920)mm	(34.008, 52.920)mm
Pixel Size		4.000µm*4.000µm	
Focal Length	ck	79.800mm	± 0.002mm
Principal Point (Level 2)	X_ppa	0.000mm	± 0.002mm
	Y_ppa	0.000mm	± 0.002mm
Lens Distortion	Remaining Distortion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

Multispectral Camera

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

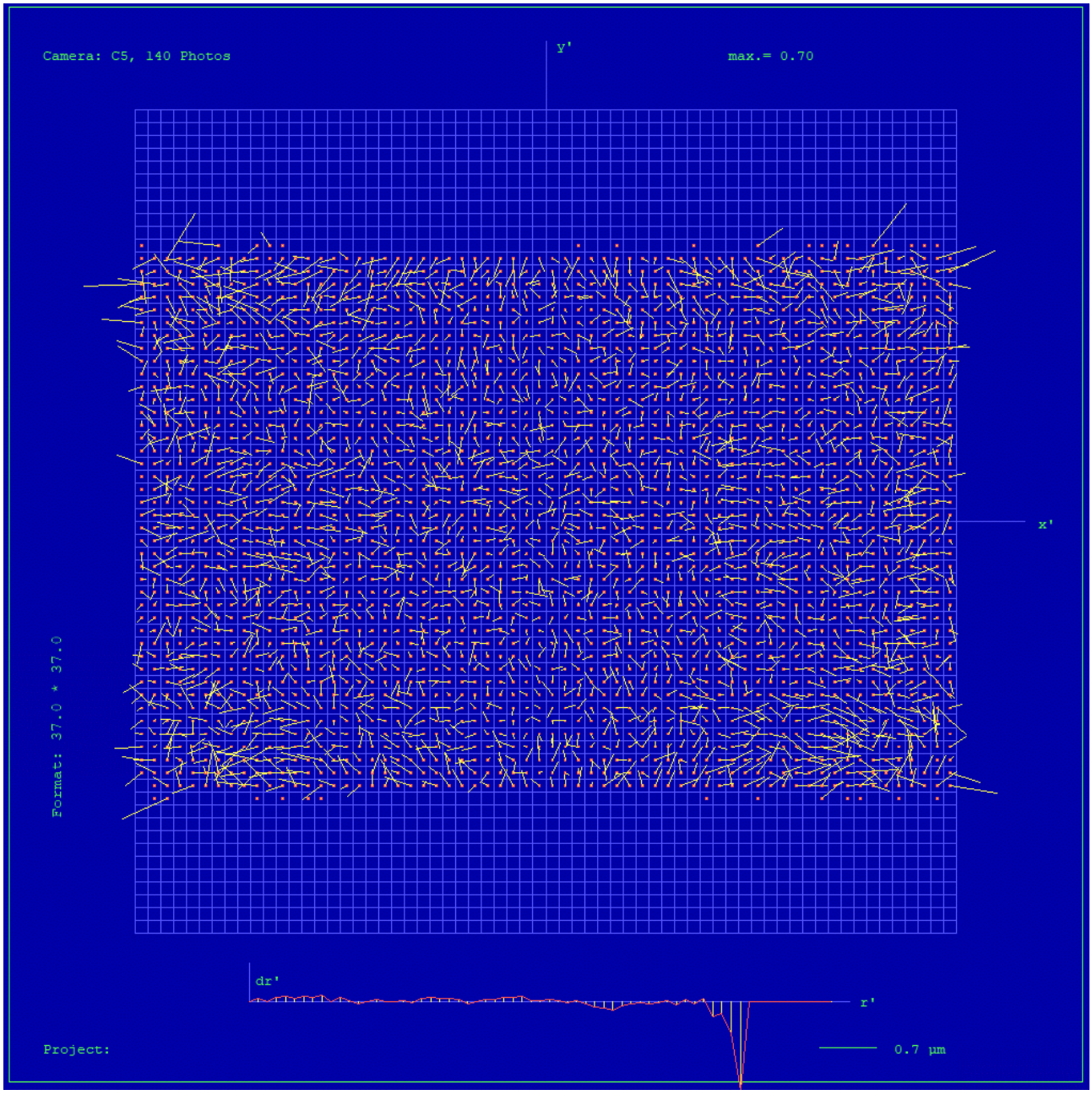
Image Format	long track cross track	68.016mm 105.840mm	5668pixel 8820pixel
Image Extent		(-34.008, -52.920)mm	(34.008, 52.920)mm
Pixel Size		12.000µm*12.000µm	
Focal Length	ck	79.800mm	± 0.002mm
Principal Point (Level 2)	X_ppa	0.000mm	± 0.002mm
	Y_ppa	0.000mm	± 0.002mm
Lens Distortion	Remaining Distortion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

Full Panchromatic Image, Residual Error Diagram



Residual Error (RMS): **0.67 µm**

Green Cone (Cone 5), Residual Error Diagram



Residual Error (RMS): **0.45 µm**

Explanations

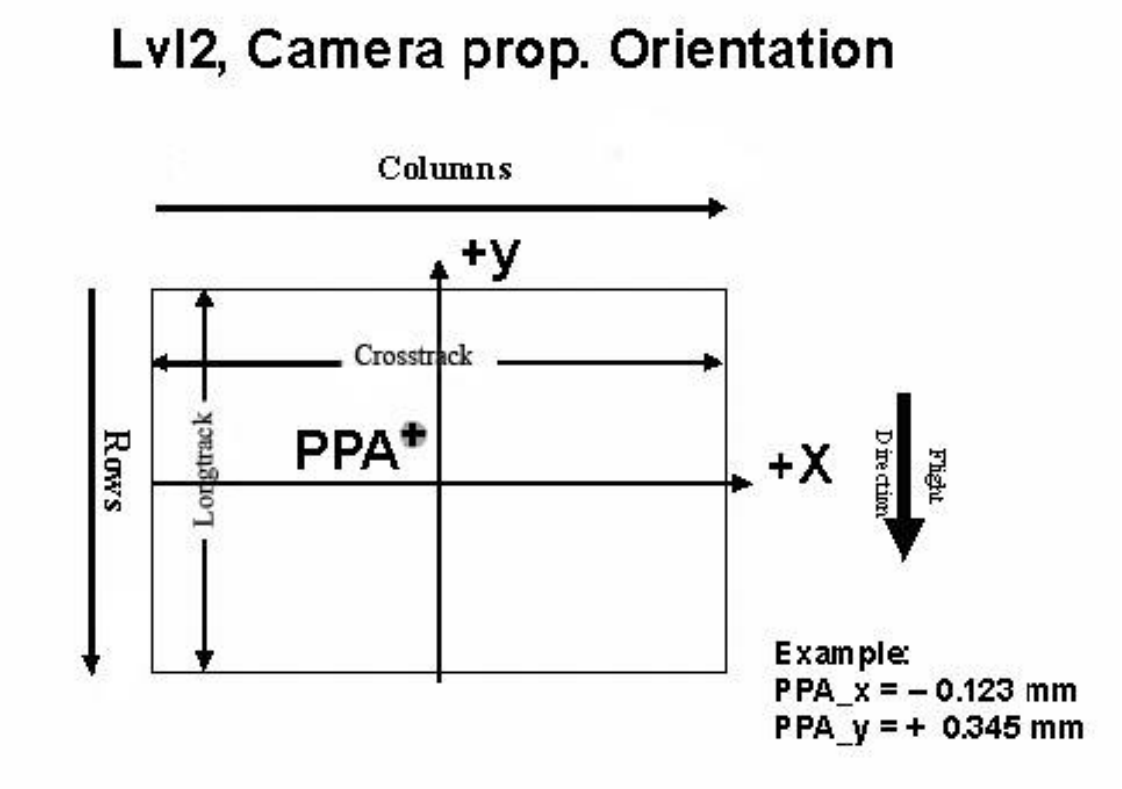
Calibration Method:

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

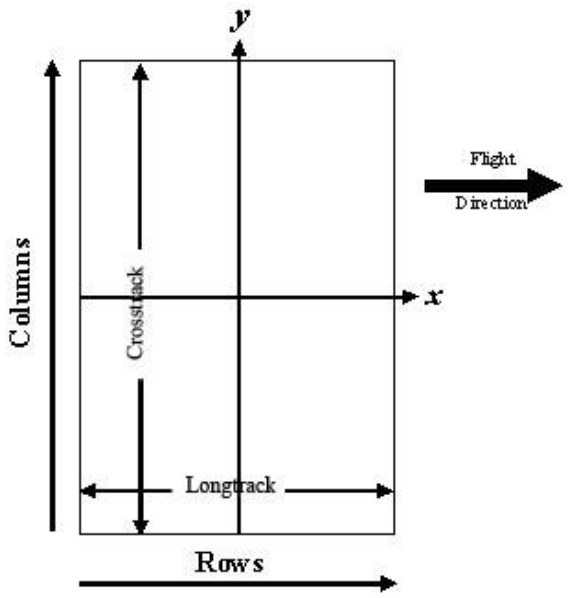
Determination of the image parameters by Least Squares Adjustment.
Software used for the adjustment: BINGO (GIP Eng. Aalen, Germany)

Level 2 Image Coordinate System:

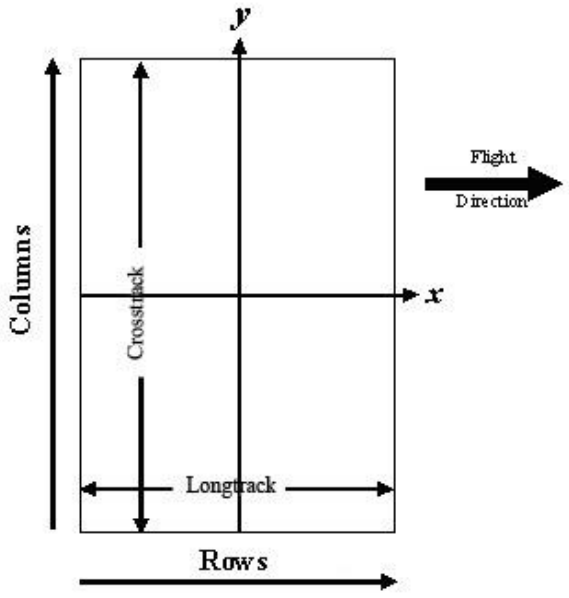


The image coordinate system of the Level 2 images is shown in the above figure. The basic image format and coordinate of the principal point in the level 2 image is given on page 4 of this report. The above figure shows the position of an example principal point at the coordinate (-0.123 / 0.345).

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



Panchromatic Image Format



Multispectral Image Format

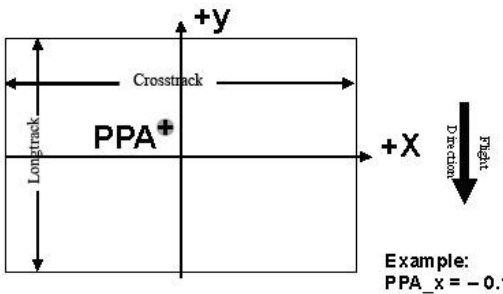
Position of Principal Point in Level 3 Image

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

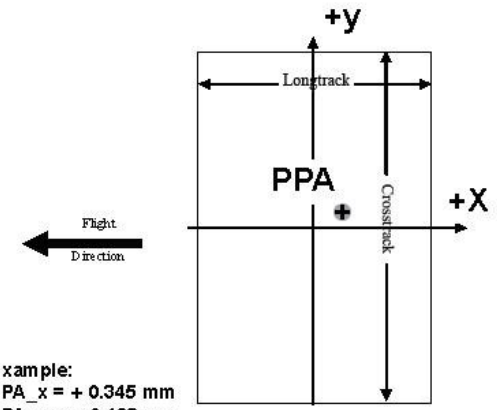
The coordinates in the figure below are only example values to illustrate the effect of image rotation on the principal point position, and do **not** correspond to the camera described in this report.

Lvl3, Rotation 0 deg clockwise



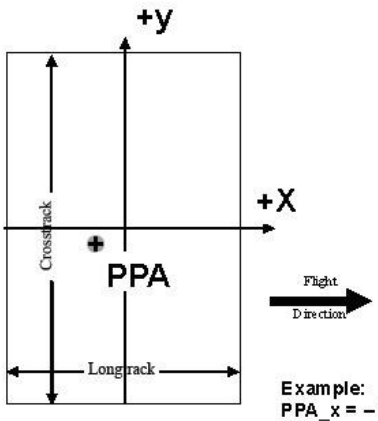
Example:
PPA_x = – 0.123 mm
PPA_y = + 0.345 mm

Lvl3, Rotation 90 deg clockwise



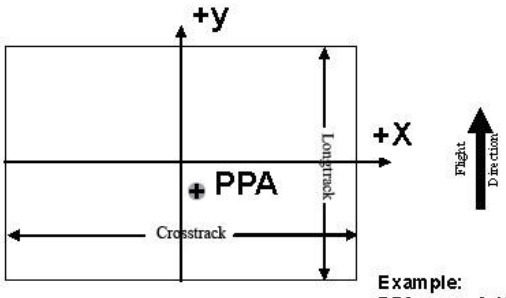
Example:
PPA_x = + 0.345 mm
PPA_y = + 0.123 mm

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

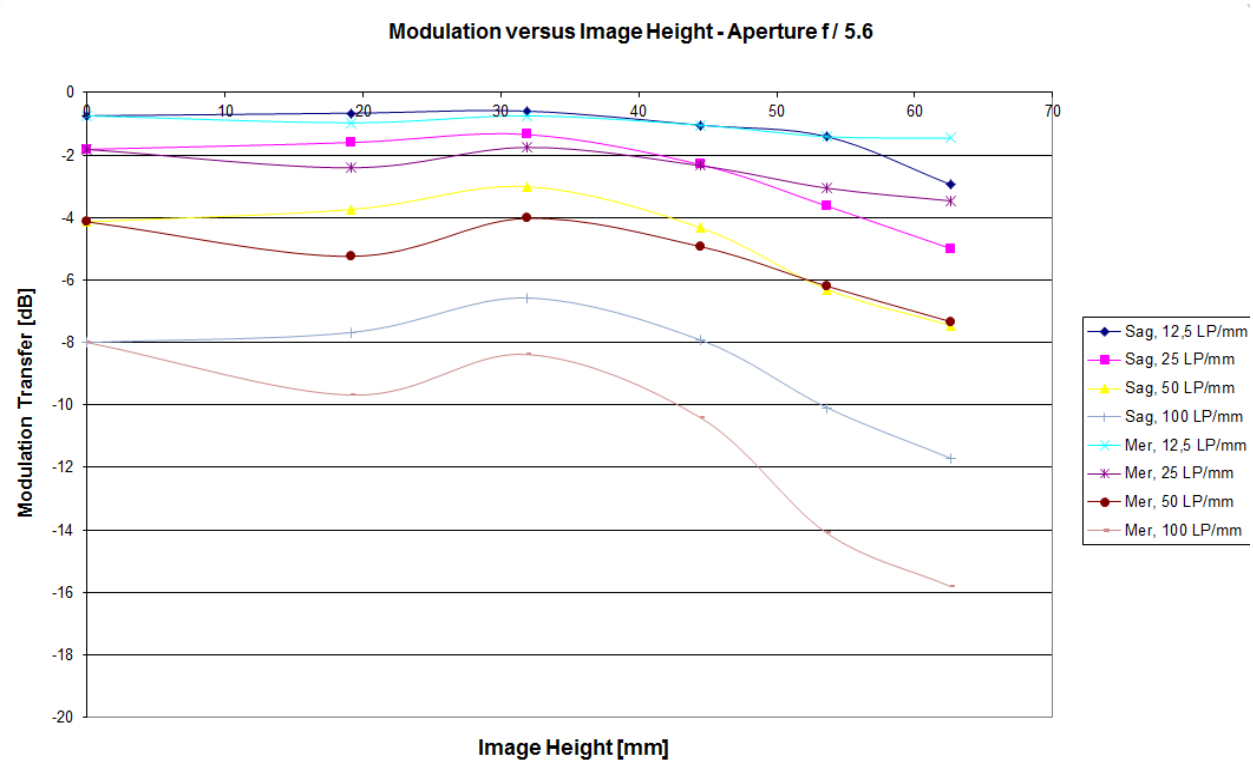
The following curves show the development of the modulation transfer function across different image heights of the panchromatic cones.
Please note that these values have been calculated and can vary up to 10% with optics from production (especially at high LP's).

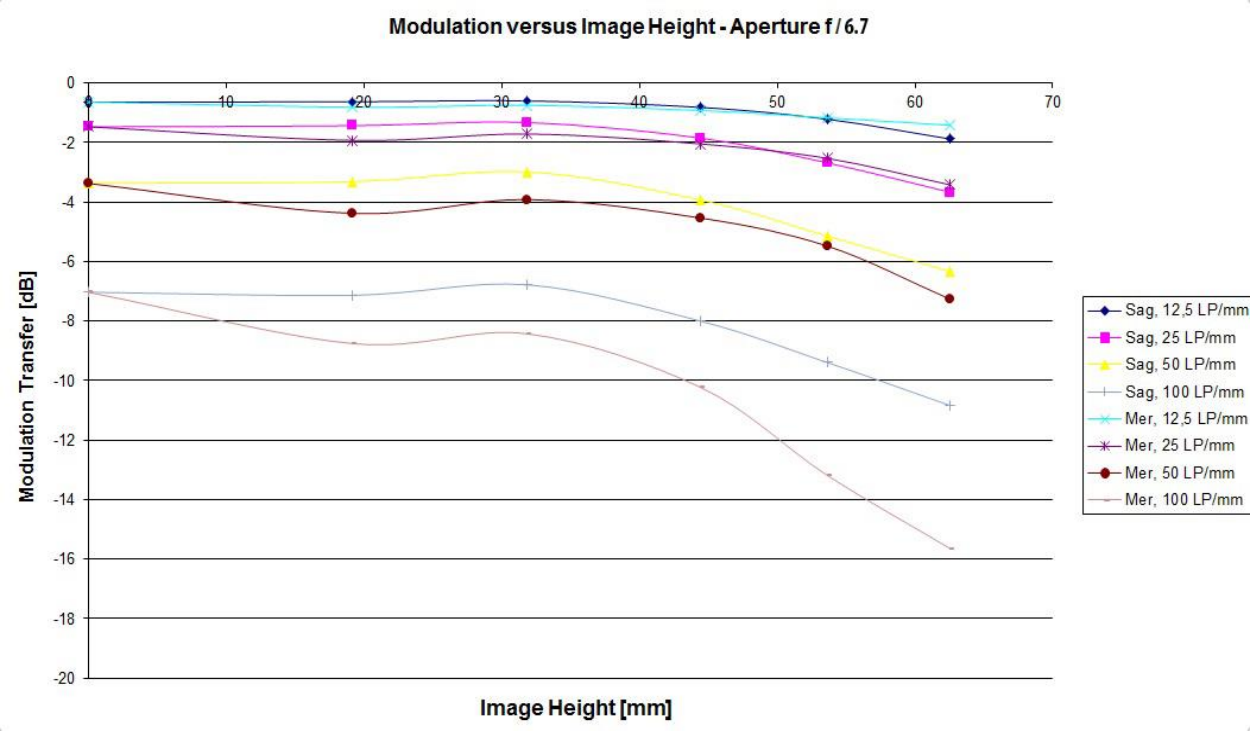
The curves are given for the meridonial (tangential) and sagital (radial) component of signals at frequencies of 12.5, 25, 50 and 100 line pairs per millimeter.

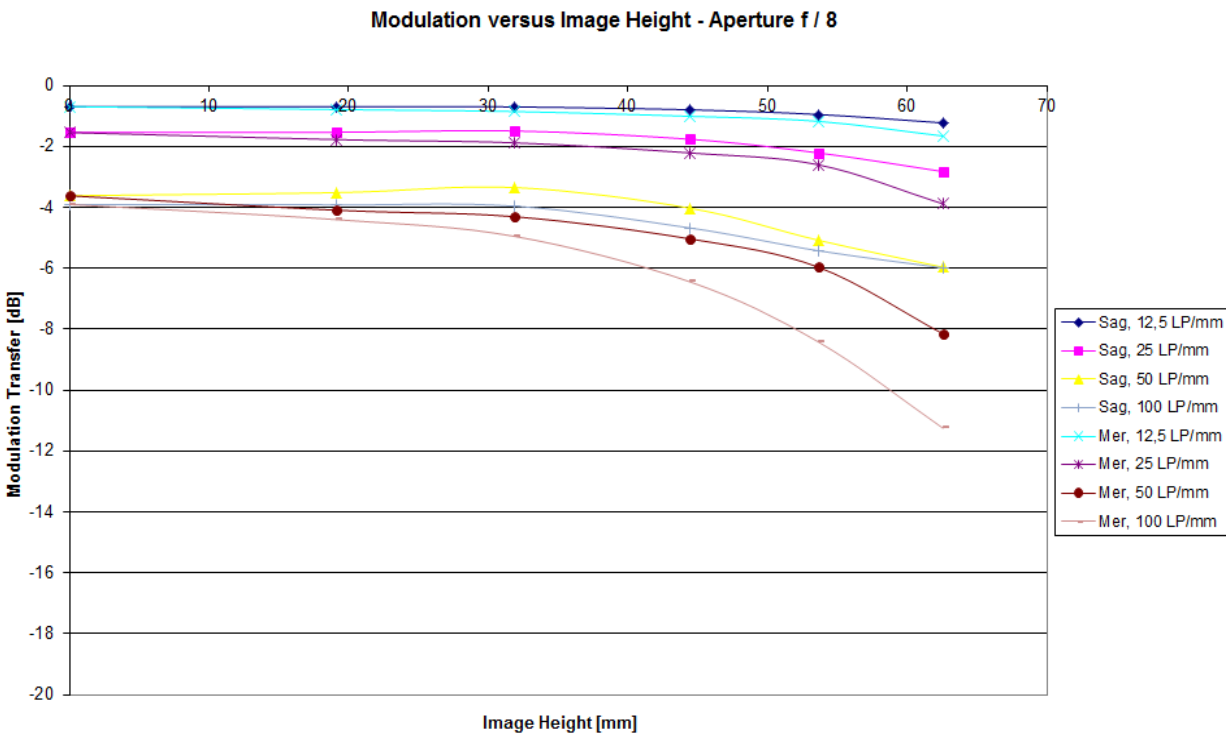
As the MTF is a function of the specific aperture size used, one set of curves is given for each aperture size.

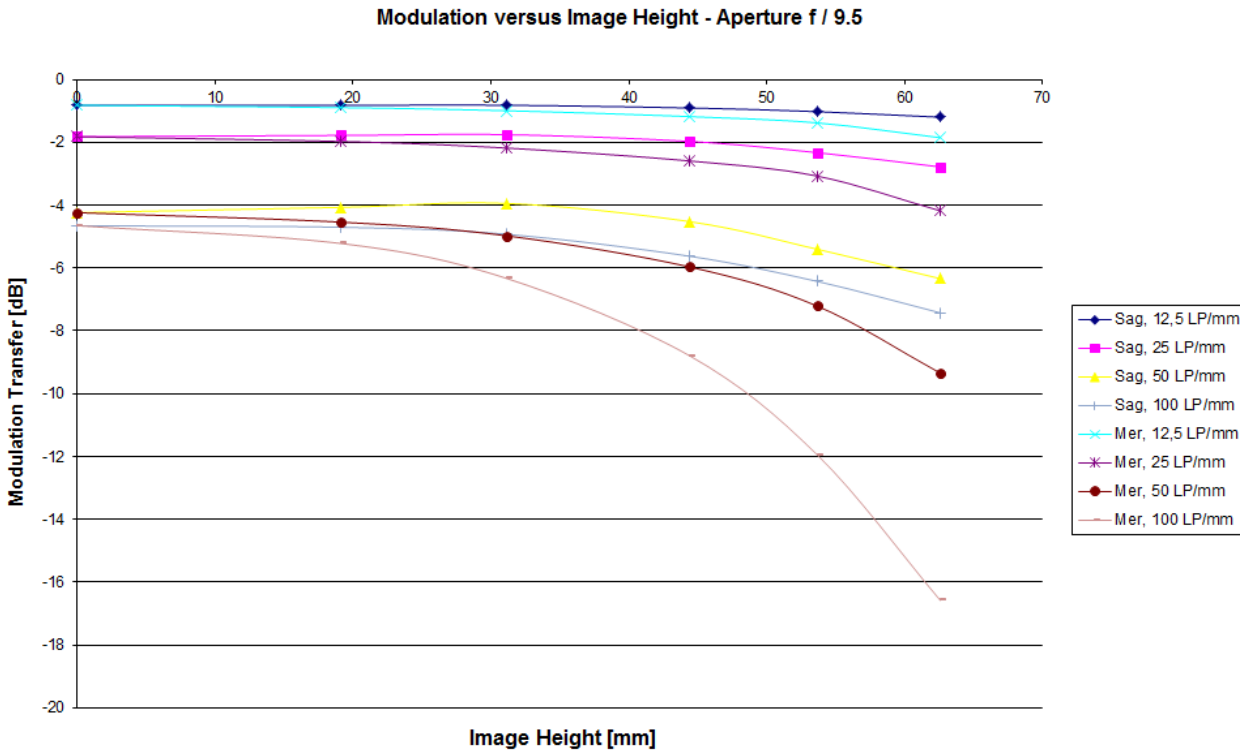
Lens types

Cone	Lens
C0 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/80mm, 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

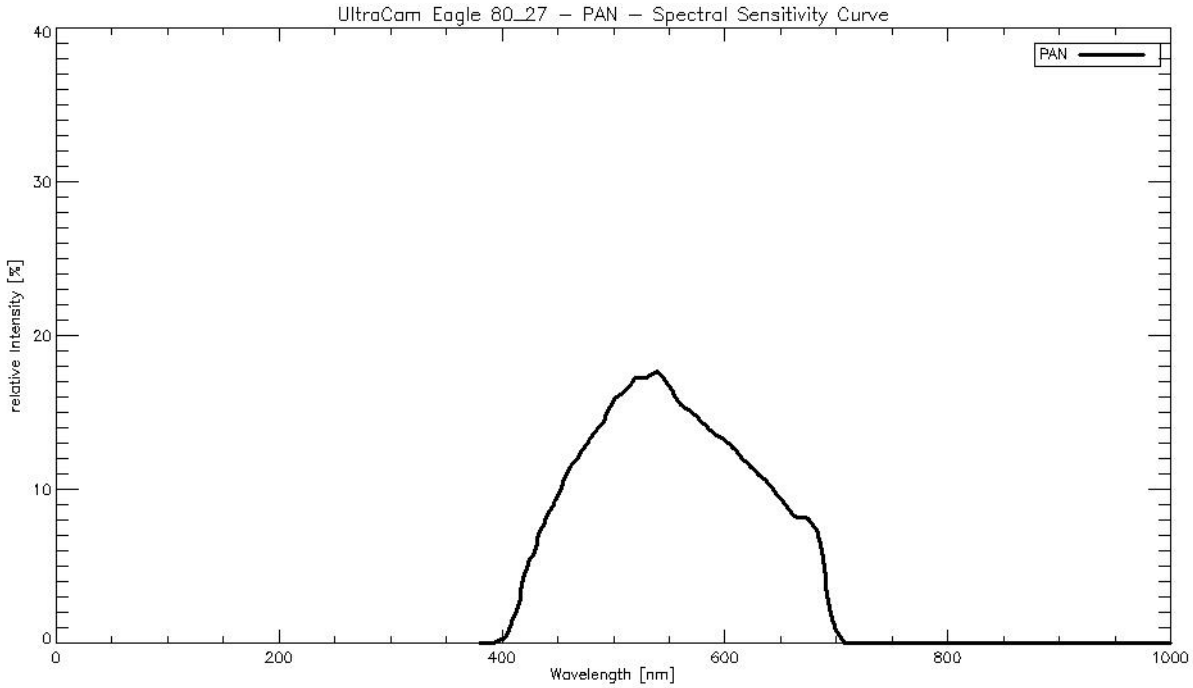

Modulation versus Image Height - Aperture f / 5.6
Modulation Transfer [dB]
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
0
10
20
30
40
50
60
70
Image Height [mm]
Sag, 12,5 LP/mm
Sag, 25 LP/mm
Sag, 50 LP/mm
Sag, 100 LP/mm
Mer, 12,5 LP/mm
Mer, 25 LP/mm
Mer, 50 LP/mm
Mer, 100 LP/mm

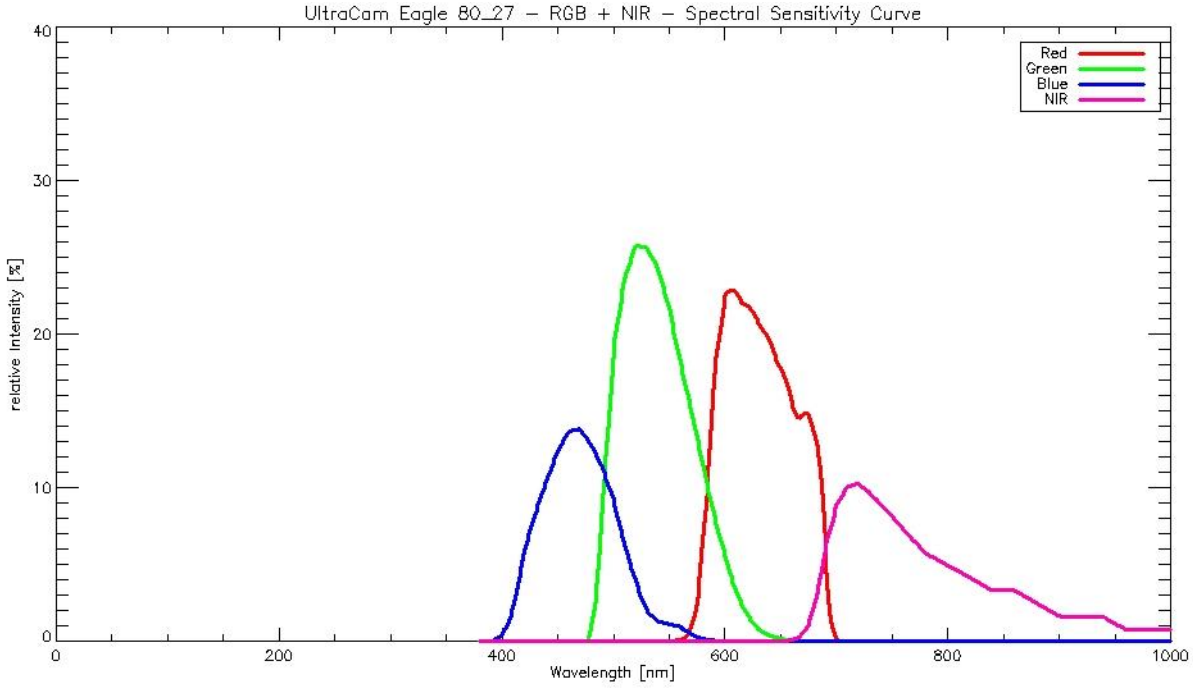

Modulation versus Image Height - Aperture f / 6.7
Modulation Transfer [dB]
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
0
10
20
30
40
50
60
70
Image Height [mm]
Sag, 12,5 LP/mm
Sag, 25 LP/mm
Sag, 50 LP/mm
Sag, 100 LP/mm
Mer, 12,5 LP/mm
Mer, 25 LP/mm
Mer, 50 LP/mm
Mer, 100 LP/mm


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: **431S91288X112115-f80**

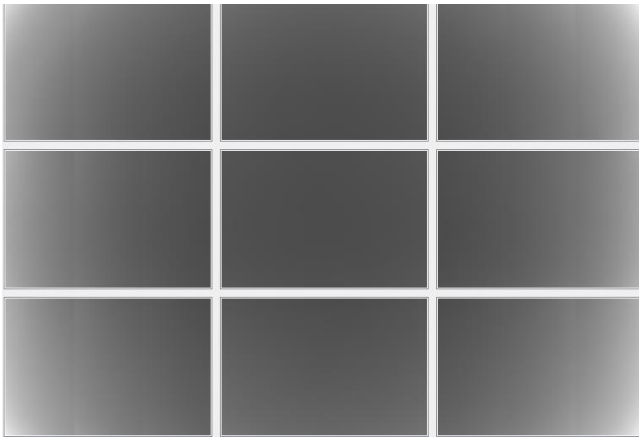
	PAN	R, G, NIR	B
Used Apertures	F5.6	F4.8	F4.8
	F6.7	F5.4	F4.8
	F8	F6.7	F4.8
	F9.5	F8	F5.6
	F11	F9.5	F6.7
	F13	F11	F8
	F16	F13	F9.5
	F22	F19	F13

Dead Pixel Report: see Appendix I

Calibration of Vignetting for working Aperture F6.7

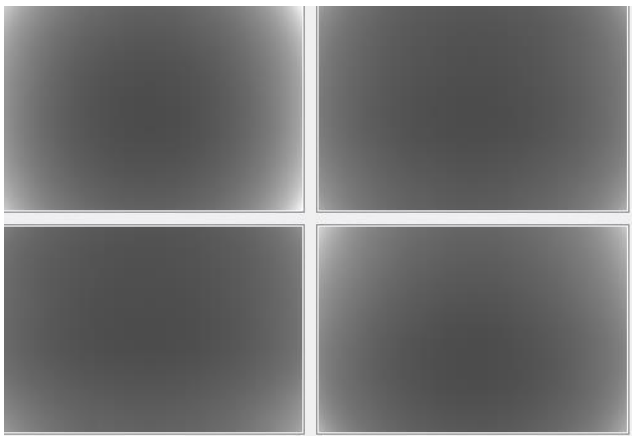
	PAN	R, G, NIR	B
Aperture	F6.7	F5.4	F4.8

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:	**431S91288X112115-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 09 99 26	6.66	6.94	7.15	7.37	7.58	7.62	7.91	8.17	+/- 0.2
C1 (Pan)	12 09 99 31	7.18	7.44	7.76	7.92	8.11	8.19	8.37	8.66	+/- 0.2
C2 (Pan)	12 09 99 30	6.50	6.67	6.99	7.27	7.45	7.60	7.79	8.12	+/- 0.2
C3 (Pan)	12 09 99 25	6.49	6.70	7.02	7.21	7.44	7.48	7.66	7.95	+/- 0.2
C4 (Red)	12 09 99 36	7.59	7.71	7.86	7.99	8.08	8.22	8.40	8.60	+/- 0.2
C5 (Green)	12 09 99 38	7.35	7.47	7.70	7.80	7.83	7.94	8.13	8.25	+/- 0.2
C6 (Blue)	12 09 99 37	7.77	7.77	7.77	7.87	8.02	8.16	8.19	8.58	+/- 0.2
C7 (NIR)	12 09 99 34	8.14	8.17	8.34	8.46	8.72	8.87	8.90	9.36	+/- 0.2

ULTRACAM

Electronics and Sensor Calibration

Camera:	**UltraCam Eagle M3**
Serial:	**431S91288X112115-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 7966/003	22.40	6.33
00_01	FTF9060-M	18 7966/034	22.80	6.78
00_02	FTF9060-M	18 4458/052	22.00	6.68
00_03	FTF9060-M	18 4458/056	22.40	5.98
01_00	FTF9060-M	18 4458/041	22.20	6.25
01_01	FTF9060-M	18 4458/051	22.80	6.59
02_00	FTF9060-M	18 7966/069	22.40	6.32
02_01	FTF9060-M	18 4458/044	22.20	6.35
03_00	FTF9060-M	18 7966/050	22.40	6.35
04_00 (red)	FTF9060-M	18 4458/037	22.00	6.32
05_00 (green)	FTF9060-M	18 4458/060	22.40	6.14
06_00 (blue)	FTF9060-M	18 4458/047	22.00	6.11
07_00 (NIR)	FTF9060-M	18 7966/059	22.40	6.37

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 7966/003	13510	12470
00_01	FTF9060-M	18 7966/034	13380	12600
00_02	FTF9060-M	18 4458/052	13600	12740
00_03	FTF9060-M	18 4458/056	13490	13110
01_00	FTF9060-M	18 4458/041	13490	12490
01_01	FTF9060-M	18 4458/051	12860	12040
02_00	FTF9060-M	18 7966/069	13780	12930
02_01	FTF9060-M	18 4458/044	13480	12660
03_00	FTF9060-M	18 7966/050	13890	13050
04_00 (red)	FTF9060-M	18 4458/037	13520	12720
05_00 (green)	FTF9060-M	18 4458/060	13450	12540
06_00 (blue)	FTF9060-M	18 4458/047	13490	12570
07_00 (NIR)	FTF9060-M	18 7966/059	13350	12470

ULTRACAM

Summary

Camera:	**UltraCam Eagle M3**
Serial:	**431S91288X112115-f80**
Laboratory Calibration Date:	**Mar-22-2022**
Camera Revision:	**Rev05.00**
Date of Report:	**Mar-30-2022**
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: 1189/ 53
PIXEL: 7428/ 185
PIXEL: 1141/1165
PIXEL: 1469/1419
PIXEL: 1724/1932
PIXEL: 5839/2056
PIXEL: 3113/2308
PIXEL: 5060/2687
PIXEL: 6848/2741
PIXEL: 6952/2808
PIXEL: 3637/2924
PIXEL: 4194/2958
PIXEL: 1564/3203
PIXEL: 8089/3437
PIXEL: 3904/4241
PIXEL: 3974/4363
PIXEL: 147/4647
PIXEL: 5843/4953
PIXEL: 5843/4954
PIXEL: 3489/ 82
PIXEL: 224/ 487
PIXEL: 390/ 490
PIXEL: 915/ 558
PIXEL: 611/ 700
PIXEL: 468/ 937
PIXEL: 954/1025
PIXEL: 697/1096
PIXEL: 789/1298
PIXEL: 379/1432
PIXEL: 3125/1693
PIXEL: 3489/3631
PIXEL: 2985/4549

C00-01

PIXEL: 937/ 327

PIXEL: 6508/ 672
PIXEL: 6555/ 986
PIXEL: 3047/1153
PIXEL: 943/1463
PIXEL: 7204/1947
PIXEL: 5136/2130
PIXEL: 4285/2349
PIXEL: 6181/2868
PIXEL: 7781/3556
PIXEL: 3903/3609
PIXEL: 3986/3857
PIXEL: 1944/3938
PIXEL: 3498/4232
PIXEL: 7597/4244
PIXEL: 7865/4563
PIXEL: 5823/4595
PIXEL: 5328/4598
PIXEL: 8812/4999
PIXEL: 4705/5099
PIXEL: 6016/5470
PIXEL: 2622/5599
PIXEL: 6749/5639
PIXEL: 5624/5680
PIXEL: 6965/ 207
PIXEL: 7340/ 370
PIXEL: 8167/ 574
PIXEL: 8987/1037
PIXEL: 8917/1430
PIXEL: 3072/4198
PIXEL: 3072/4199
PIXEL: 7639/4598
PIXEL: 7640/4598
PIXEL: 8935/4941
PIXEL: 6682/5158
PIXEL: 4217/5254
PIXEL: 4217/5255
PIXEL: 935/5358
PIXEL: 1003/5645
PIXEL: 52/5886
PIXEL: 9022/5890
PIXEL: 3071/4198
PIXEL: 7640/4597

C00-02

PIXEL: 8355/ 125
PIXEL: 2551/ 461
PIXEL: 7242/1176
PIXEL: 8730/1223
PIXEL: 121/1716
PIXEL: 3080/1743

PIXEL: 509/1914
PIXEL: 3633/2986
PIXEL: 6985/3085
PIXEL: 8996/3118
PIXEL: 2916/3848
PIXEL: 95/5408
PIXEL: 3184/5843
PIXEL: 8467/ 808
PIXEL: 212/1595
PIXEL: 791/2804
PIXEL: 624/2911
PIXEL: 733/3415
PIXEL: 5110/4223
PIXEL: 774/4617
PIXEL: 4530/5282
PIXEL: 8805/5533
PIXEL: 2425/5610
PIXEL: 8722/5786
PIXEL: 9024/5925

C00-03

PIXEL: 2942/ 58
PIXEL: 2657/ 464
PIXEL: 1714/ 690
PIXEL: 7356/ 955
PIXEL: 5122/1503
PIXEL: 7879/1776
PIXEL: 6505/2378
PIXEL: 7862/3433
PIXEL: 1569/4051
PIXEL: 7313/4253
PIXEL: 2352/4445
PIXEL: 6428/4499
PIXEL: 6264/4566
PIXEL: 6197/4640
PIXEL: 3772/4754
PIXEL: 8176/4760
PIXEL: 3166/4924
PIXEL: 7695/5169
PIXEL: 5699/5436
PIXEL: 9043/ 18
PIXEL: 2581/1746
PIXEL: 1413/1915
PIXEL: 2655/2505
PIXEL: 3906/5979
PIXEL: 3906/5980
PIXEL: 2656/2505
PIXEL: 2580/1746

C01-00

PIXEL: 3515/ 628
PIXEL: 142/ 839
PIXEL: 6694/1167
PIXEL: 3965/1231
PIXEL: 74/1632
PIXEL: 5119/1864
PIXEL: 1371/2744
PIXEL: 4555/3170
PIXEL: 5808/3542
PIXEL: 327/3558
PIXEL: 4504/4423
PIXEL: 3487/4466
PIXEL: 7945/4834
PIXEL: 1371/5315
PIXEL: 7380/5766
PIXEL: 7026/5782
PIXEL: 346/5922
PIXEL: 4546/1653
PIXEL: 188/3328
PIXEL: 4886/3928
PIXEL: 8360/5117
PIXEL: 7668/5373

C01-01

PIXEL: 3729/2119
PIXEL: 3511/2310
PIXEL: 4665/2537
PIXEL: 4666/2537
PIXEL: 4662/2538
PIXEL: 7193/2860
PIXEL: 1137/2887
PIXEL: 8672/3295
PIXEL: 7816/3504
PIXEL: 4571/3564
PIXEL: 495/3597
PIXEL: 6322/3744
PIXEL: 7088/3788
PIXEL: 7010/4806
PIXEL: 4786/5006
PIXEL: 1106/5298
PIXEL: 199/5311
PIXEL: 8847/5471
PIXEL: 6024/5587
PIXEL: 9022/ 93
PIXEL: 459/5075
PIXEL: 2712/5215
PIXEL: 1064/5672
PIXEL: 8870/5679
PIXEL: 476/5085

PIXEL: 459/5076
PIXEL: 8849/5691

C02-00

PIXEL: 1777/ 527
PIXEL: 8930/ 792
PIXEL: 4517/1628
PIXEL: 2043/1695
PIXEL: 1800/1829
PIXEL: 4169/1918
PIXEL: 7202/2074
PIXEL: 407/2395
PIXEL: 5339/2796
PIXEL: 4133/3452
PIXEL: 5100/4265
PIXEL: 1668/4605
PIXEL: 961/4810
PIXEL: 6357/5986

C02-01

PIXEL: 1514/ 232
PIXEL: 4585/1101
PIXEL: 5808/1232
PIXEL: 4334/1554
PIXEL: 6806/2058
PIXEL: 6463/2313
PIXEL: 8792/2441
PIXEL: 473/2513
PIXEL: 5722/2637
PIXEL: 3693/3797
PIXEL: 1183/4437
PIXEL: 7513/4551
PIXEL: 3832/4614
PIXEL: 8593/4763
PIXEL: 6285/5124
PIXEL: 65/5297
PIXEL: 2104/5432
PIXEL: 3824/5649
PIXEL: 6070/5875
PIXEL: 8728/ 355
PIXEL: 3855/1520

C03-00

PIXEL: 7293/ 408
PIXEL: 3180/1428
PIXEL: 5981/2682
PIXEL: 3701/3049
PIXEL: 3353/3769
PIXEL: 4621/4052
PIXEL: 3757/4283

PIXEL: 3361/5340
PIXEL: 8747/5584
PIXEL: 562/5856
PIXEL: 314/4831
PIXEL: 315/4831
PIXEL: 315/4832

C04-00

PIXEL: 5786/ 19
PIXEL: 203/ 40
PIXEL: 7644/ 773
PIXEL: 5342/1069
PIXEL: 2161/2238
PIXEL: 2126/3583
PIXEL: 5730/4323

C05-00

PIXEL: 8153/ 909
PIXEL: 3488/1882
PIXEL: 3488/1883
PIXEL: 8558/1963
PIXEL: 7916/2166
PIXEL: 508/3297
PIXEL: 2337/4153
PIXEL: 609/ 342
PIXEL: 3195/ 629
PIXEL: 3884/ 792
PIXEL: 5624/1014
PIXEL: 28/1542
PIXEL: 803/2285
PIXEL: 4696/4247
PIXEL: 3194/ 629

C06-00

PIXEL: 8959/4168
PIXEL: 4615/ 54
PIXEL: 4935/ 62
PIXEL: 730/1047
PIXEL: 7841/1185
PIXEL: 8148/1228
PIXEL: 8456/3612
PIXEL: 1698/4368
PIXEL: 1836/4511
PIXEL: 1048/5160
PIXEL: 6836/5855
PIXEL: 7877/2486
PIXEL: 8958/4168
PIXEL: 3157/5930
PIXEL: 3158/5930
PIXEL: 3157/5931

COLUMN: 1870/ 211

C07-00

PIXEL: 3887/ 314
PIXEL: 4821/1641
PIXEL: 2276/1687
PIXEL: 2916/1745
PIXEL: 8942/1752
PIXEL: 8038/1890
PIXEL: 4840/1998
PIXEL: 4840/1999
PIXEL: 3593/2363
PIXEL: 486/2742
PIXEL: 376/4315
PIXEL: 8637/4329
PIXEL: 106/5976
PIXEL: 192/1365
PIXEL: 6115/1746
PIXEL: 8210/2004
PIXEL: 6986/3635
PIXEL: 6987/3635
PIXEL: 4956/5595
PIXEL: 4957/5595
PIXEL: 6986/3636

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	**22.03.2022**		
Radiometric Calibration	**22.03.2022**		
Shutter Calibration	**22.03.2022**		
Electronics and Sensor Calibration	**22.03.2022**		

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