



VEXCEL
IMAGING

ULTRACAM

Calibration Report

Camera:
Serial:

UltraCam Eagle
UC-E-1-10019596-f100

Calibration Date:
Date of Report:
Camera Revision:
Version of Report:

Jan-16-2019
Feb-04-2019
Rev06.00
V01



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Bahia, Brasil 2013

Photo on page 1 courtesy of Hiparc Geotecnologia, Brasil

www.hiparc.com

UltraCam Lp, GSD25 cm, RGB



ULTRACAM

Geometric Calibration

Camera:	UltraCam Eagle
Serial:	UC-E-1-10019596-f100

Panchromatic Camera:	ck = 100.500 mm
Multispectral Camera:	ck = 100.500 mm

PPA Information:	X: 0.000 mm
	Y: 0.000 mm

Calibration Date:	Jan-16-2019
Date of Report:	Feb-04-2019
Camera Revision:	Rev06.00
Version of Report:	V01



Panchromatic Camera

Large Format Panchromatic Output Image

Image Format	long track	68.016mm	13080pixel
	cross track	104.052mm	20010pixel
Image Extent		(-34.008, -52.026)mm	(34.008, 52.026)mm
Pixel Size		5.200μm*5.200μm	
Focal Length	ck	100.500mm	± 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		

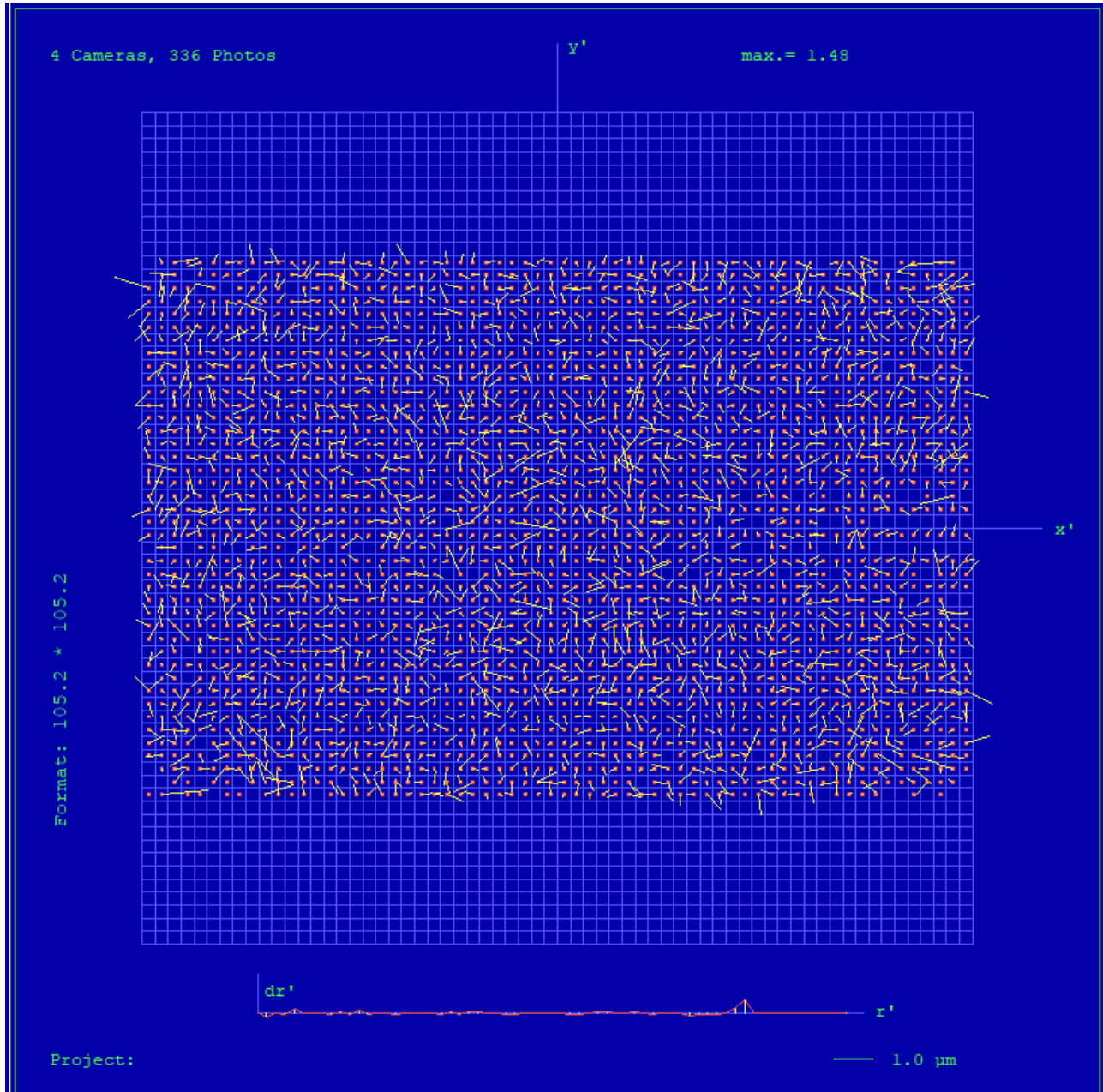
Multispectral Camera

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

Image Format	long track	68.016mm	4360pixel
	cross track	104.052mm	6670pixel
Image Extent		(-34.008, -52.026)mm	(34.008, 52.026)mm
Pixel Size		15.600μm*15.600μm	
Focal Length	ck	100.500mm	± 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		



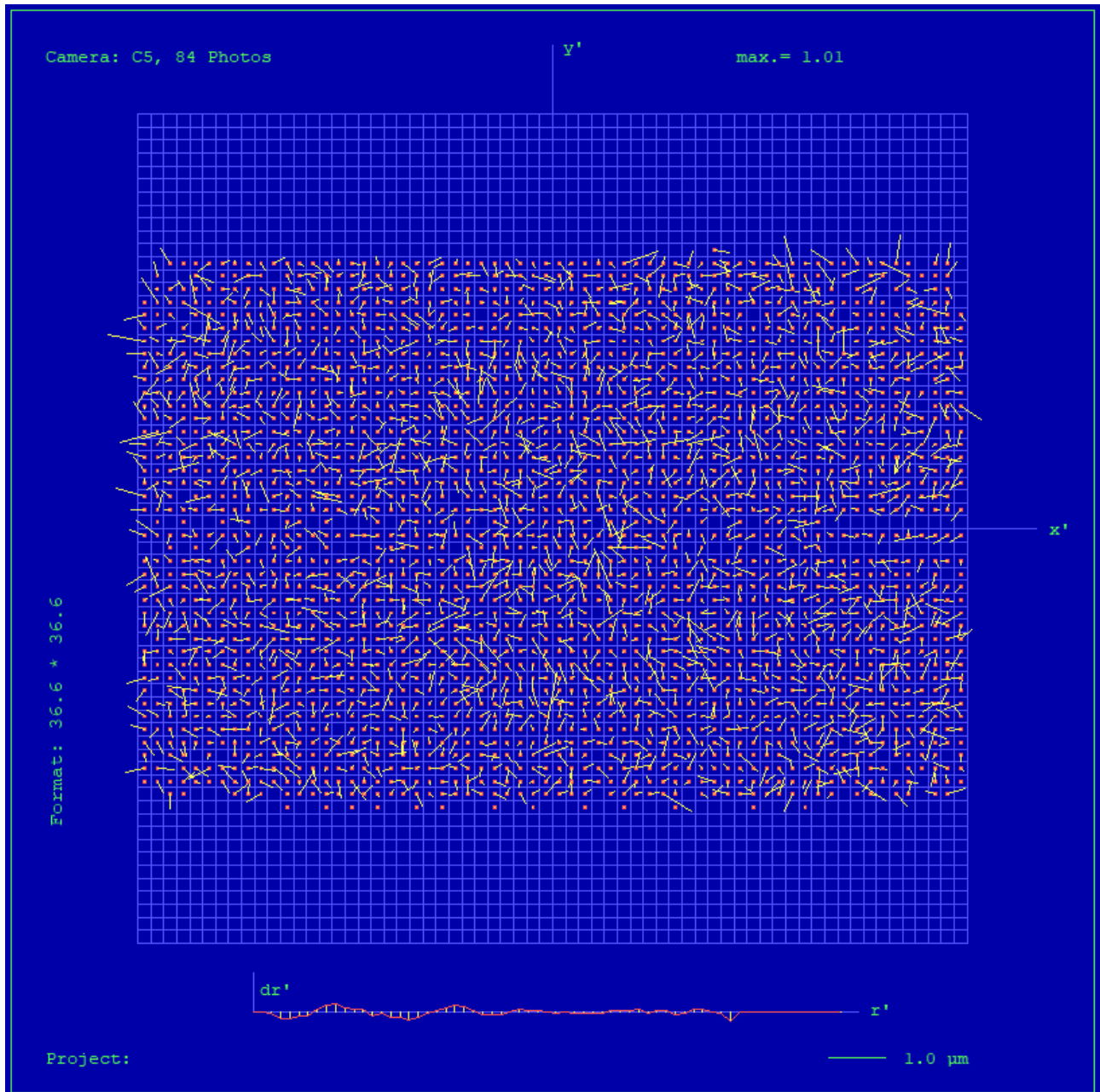
Full Panchromatic Image, Residual Error Diagram



Residual Error (RMS): 0.63 μm



Green Cone (Cone 5), Residual Error Diagram



Residual Error (RMS): **0.52 μm**



Explanations

Calibration Method:

The geometric calibration is based on a set of 84 images of a defined geometry target with 394 GCPs.

Number of point measurements for the panchromatic camera : >16000

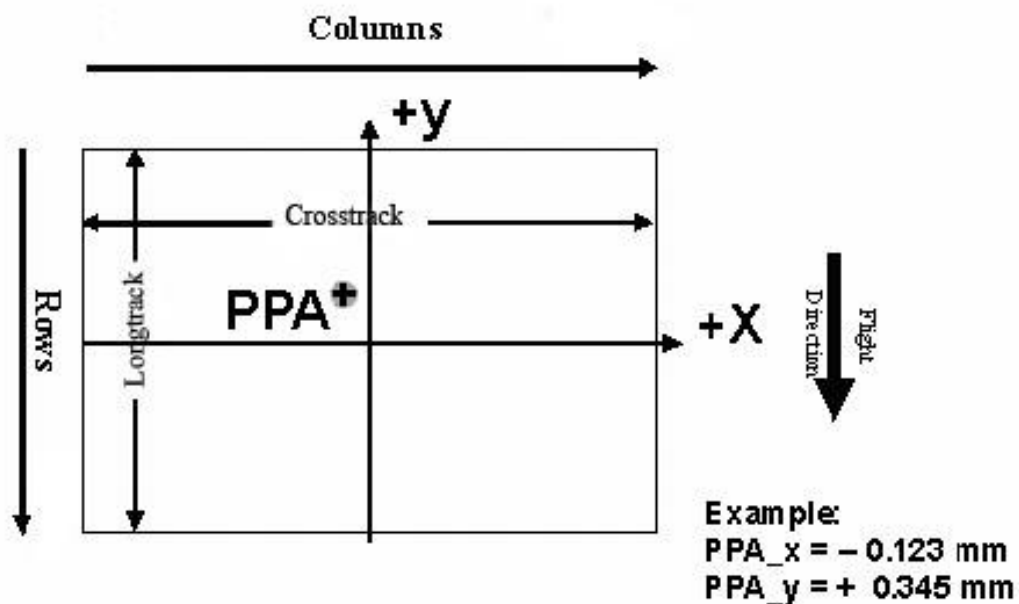
Number of point measurements for the multispectral camera : >60000

Determination of the image parameters by Least Squares Adjustment.

Software used for the adjustment: BINGO (GIP Eng. Aalen, Germany)

Level 2 Image Coordinate System:

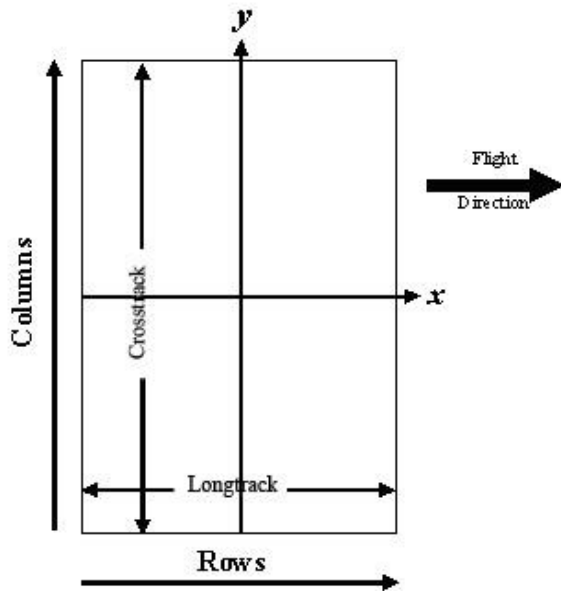
Lvl2, Camera prop. Orientation



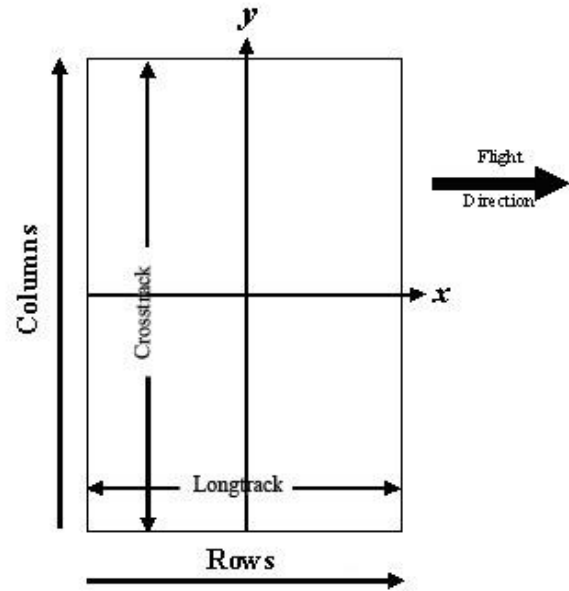
The image coordinate system of the Level 2 images is shown in the above figure. The basic image format and coordinate of the principal point in the level 2 image is given on page 4 of this report. The above figure shows the position of an example principal point at the coordinate (-0.123 / 0.345).



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



Panchromatic Image Format



Multispectral Image Format

Position of Principal Point in Level 3 Image

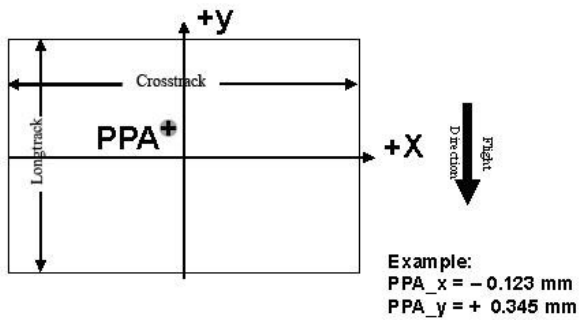
The position of the principal point in the level 3 image depends on the “rotation” setting used in UltraMap during the pan-sharpening step. The exact position relative to the image center is given in the table below as a function of the rotation setting used in UltraMap. The coordinates are specified 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

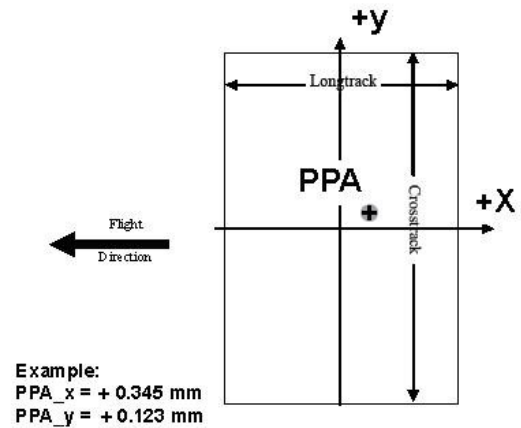


The coordinates in the figure below are only example values to illustrate the effect of image rotation on the principal point position, and do **not** correspond to the camera described in this report.

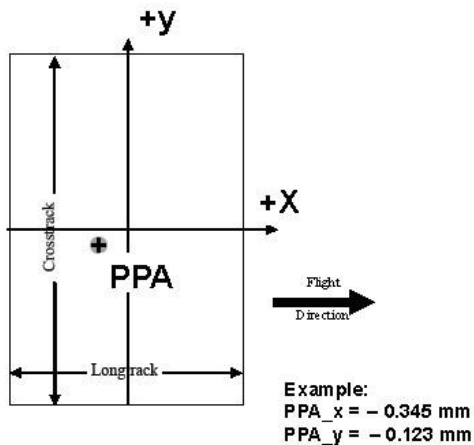
Lvl3, Rotation 0 deg clockwise



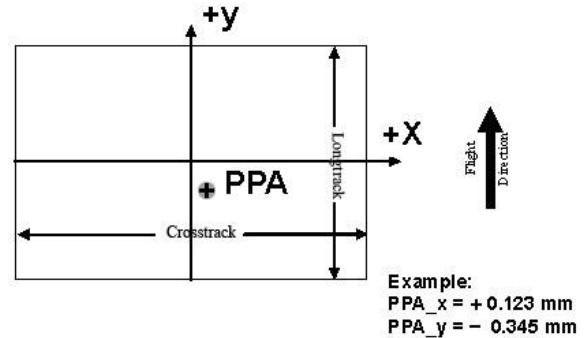
Lvl3, Rotation 90 deg clockwise



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 sagital (radial) component of signals at frequencies of 12.5, 25, 50 and 100 line pairs per millimeter.

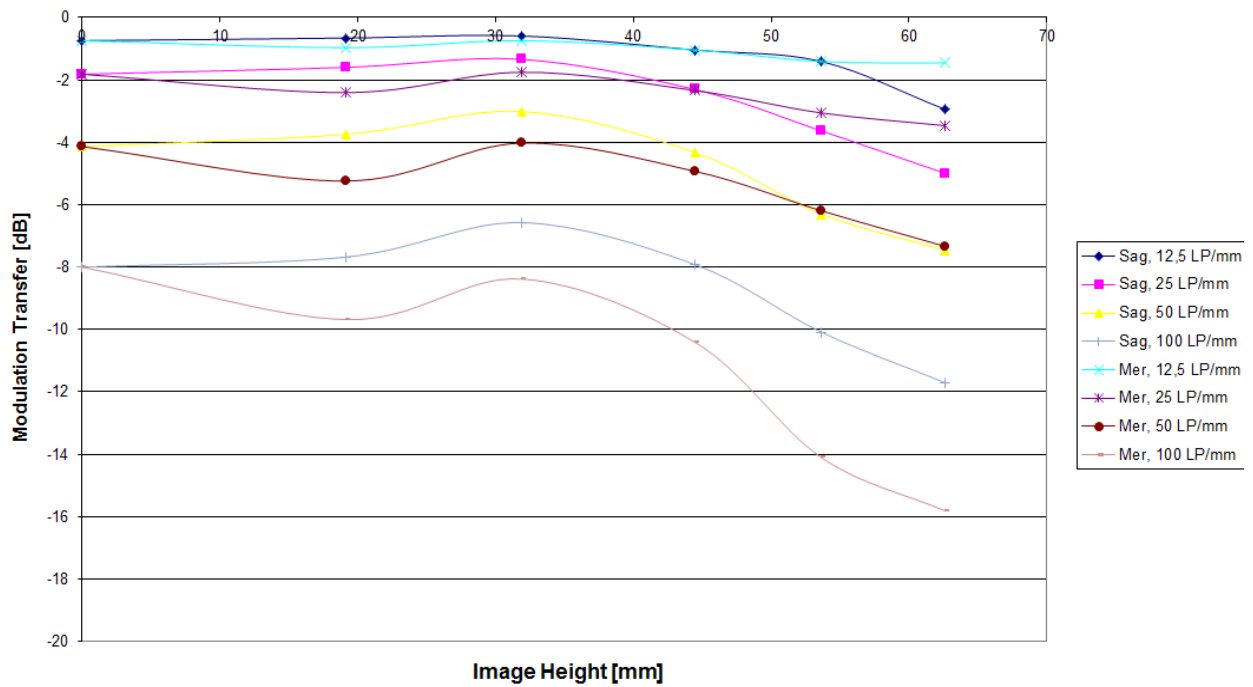
As the MTF is a function of the specific aperture size used, one set of curves is given for each aperture size.

Lens types

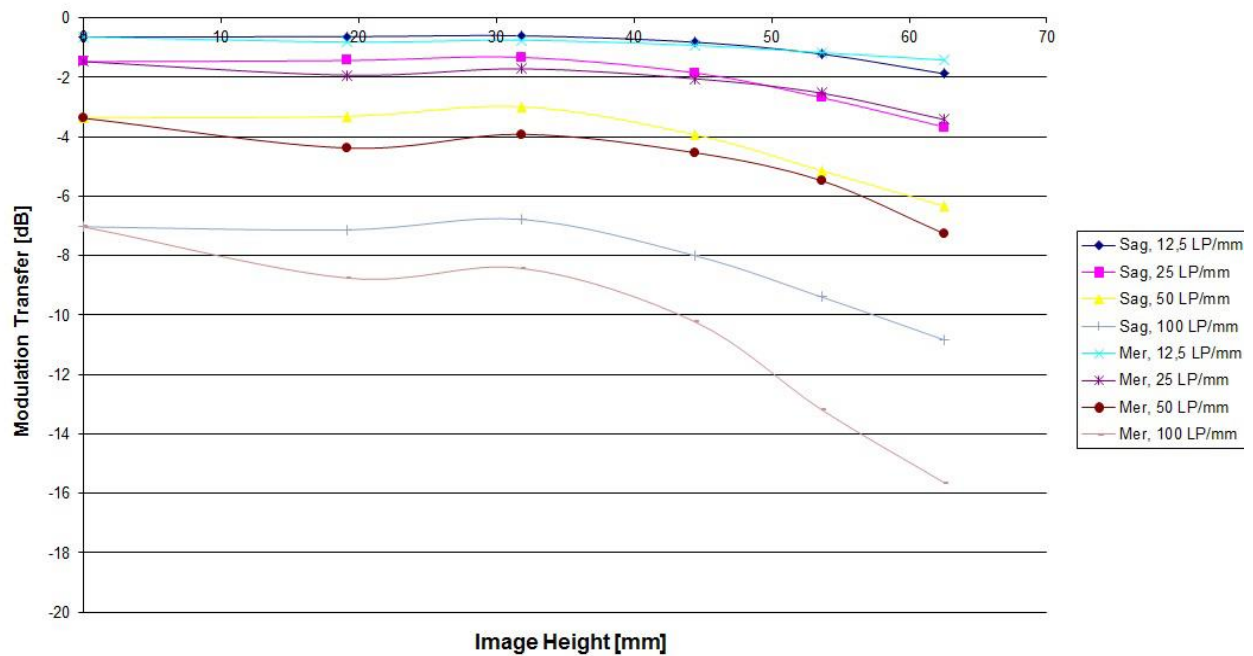
Cone	Lens
C0 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/100mm, Qioptic GmbH, Germany
C1 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/100mm, Qioptic GmbH, Germany
C2 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/100mm, Qioptic GmbH, Germany
C3 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/100mm, Qioptic GmbH, Germany
C4 (RED)	Qioptic Vexcel HR Digaron 1:4/33mm, Qioptic GmbH, Germany
C5 (GREEN)	Qioptic Vexcel HR Digaron 1:4/33mm, Qioptic GmbH, Germany
C6 (BLUE)	Qioptic Vexcel HR Digaron 1:4/33mm, Qioptic GmbH, Germany
C7 (NIR)	Qioptic Vexcel HR Digaron 1:4/33mm, Qioptic GmbH, Germany



Modulation versus Image Height - Aperture f/ 5.6

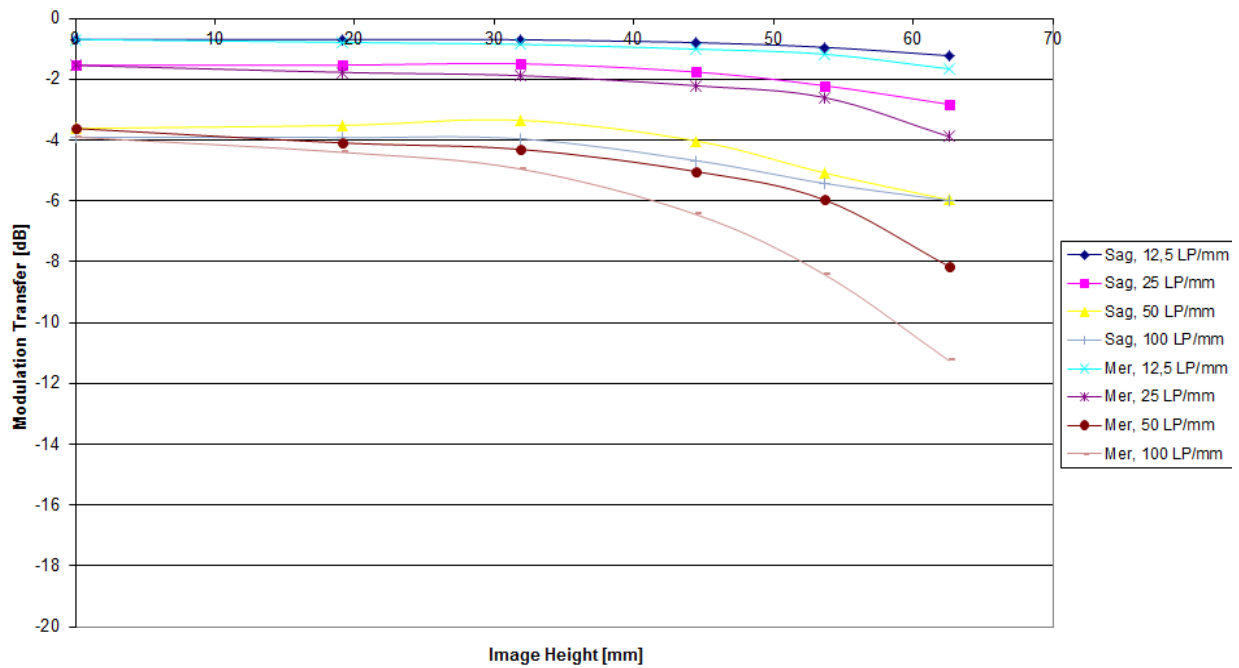


Modulation versus Image Height - Aperture f/ 6.7

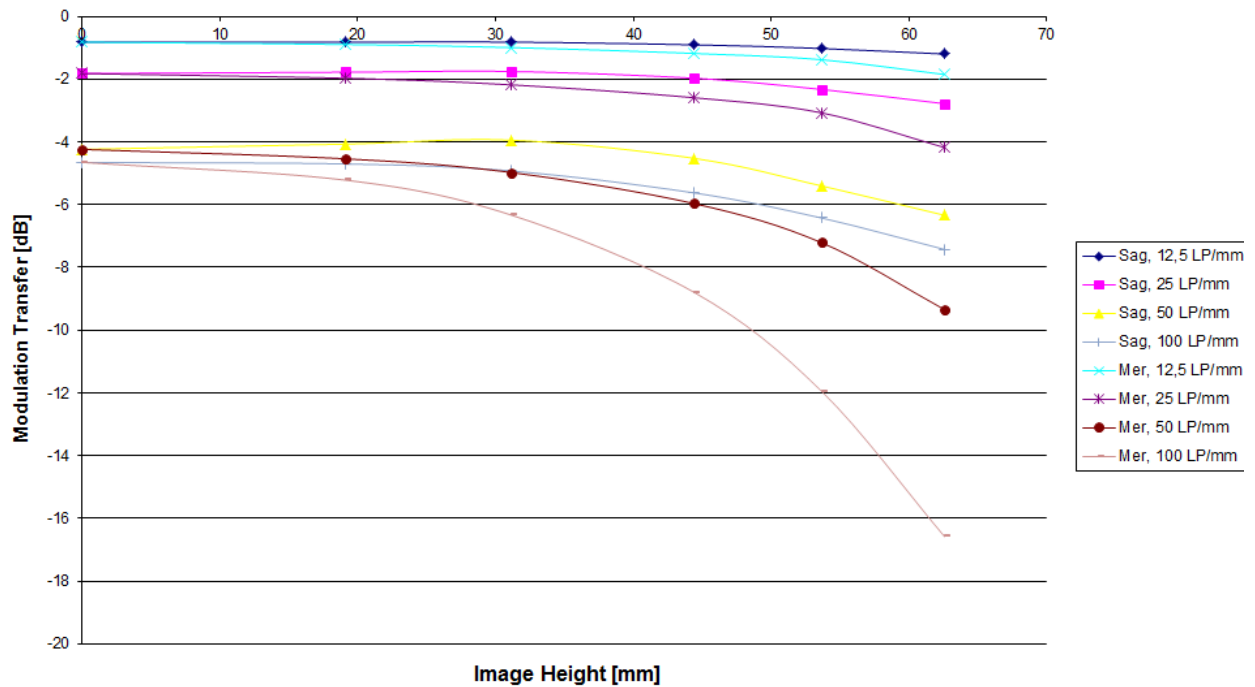




Modulation versus Image Height - Aperture f / 8

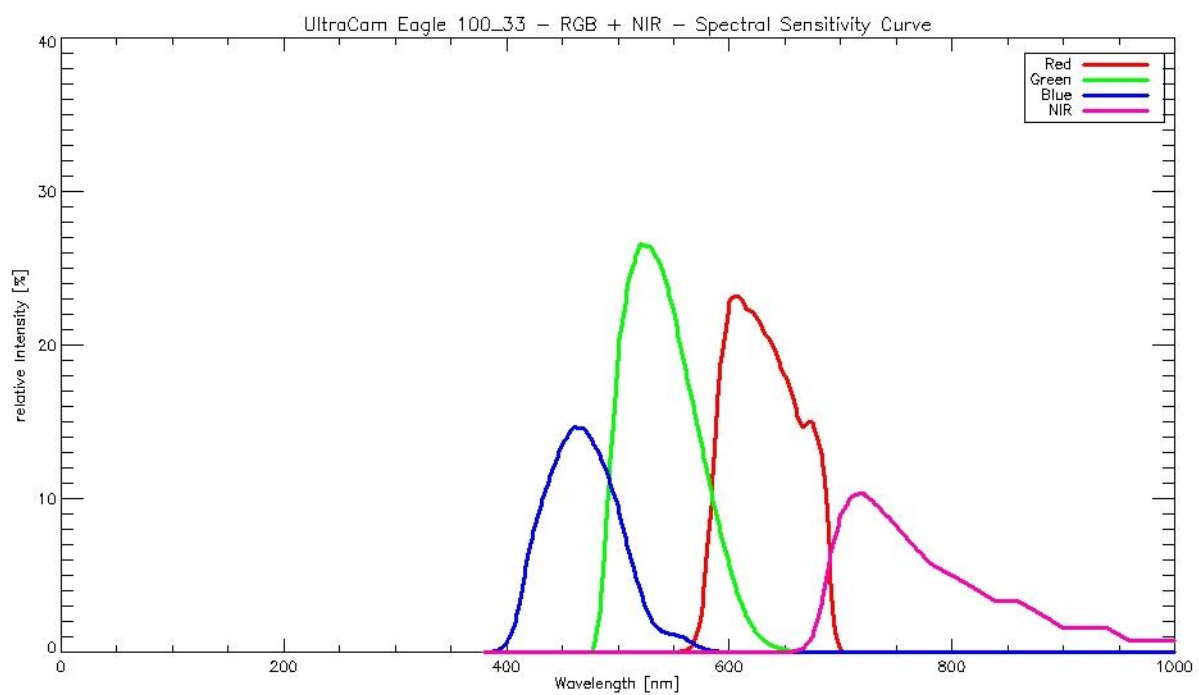
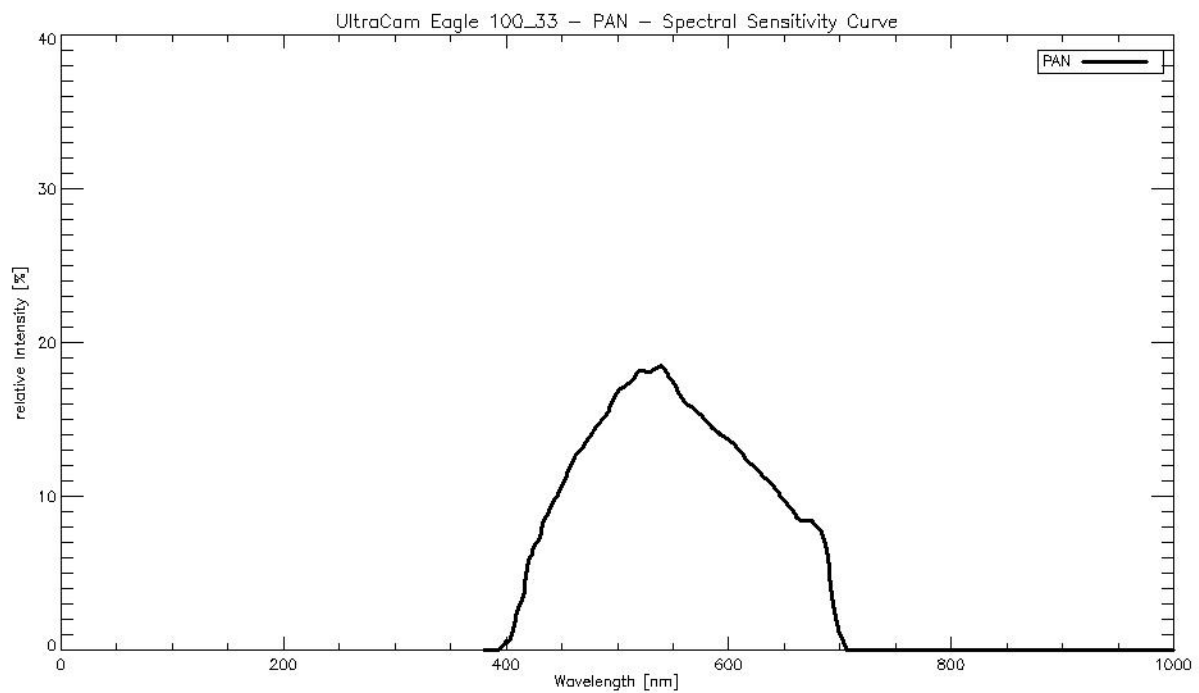


Modulation versus Image Height - Aperture f / 9.5





Spectral Sensitivity





ULTRACAM

Radiometric Calibration

Camera: UltraCam Eagle
Serial: UC-E-1-10019596-f100

Used Apertures	PAN	R, G, NIR	B
	F5.6	F4.8	F4.8
	F6.7	F5.6	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

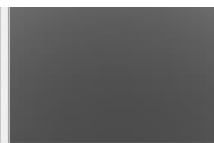
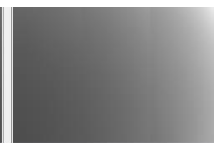
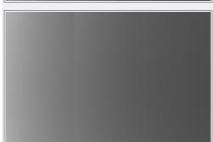
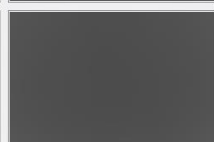
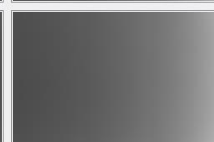
Calibration Date: Jan-16-2019
Date of Report: Feb-04-2019
Camera Revision: Rev06.00
Version of Report: V01



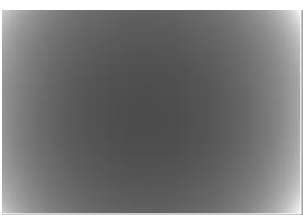
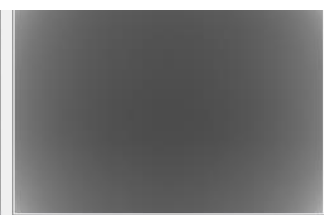
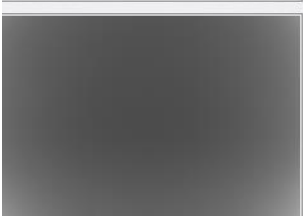
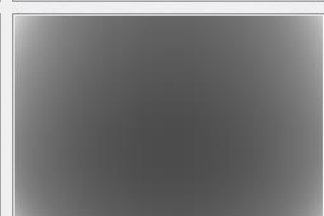
Calibration of Vignetting for working Aperture F6.7

	PAN	R, G, NIR	B
Aperture	F6.7	F5.6	F4.8

Graphical Overview of Pan Sensors:

Graphical Overview of Multispectral Sensors:



Dead Pixel Report:

Sensor number		
Anomaly type	X-Coordinate	Y-Coordinate

C00-00

PIXEL: 55/3600
PIXEL: 530/2332
PIXEL: 945/2444
PIXEL: 974/3008
PIXEL: 1214/ 401
PIXEL: 1436/4570
PIXEL: 1550/ 784
PIXEL: 1659/3349
PIXEL: 1764/3132
PIXEL: 2050/3738
PIXEL: 2056/3056
PIXEL: 2156/ 482
PIXEL: 2522/4598
PIXEL: 2889/1634
PIXEL: 3279/3267
PIXEL: 3679/2007
PIXEL: 3999/3129
PIXEL: 4002/2253
PIXEL: 4140/1094
PIXEL: 4327/ 73
PIXEL: 5399/1252
PIXEL: 5504/1582
PIXEL: 6241/4042
PIXEL: 6444/4590
PIXEL: 6718/2374
PIXEL: 6756/1875
PIXEL: 6795/1238
PIXEL: 1648/ 139
PIXEL: 3164/2269
PIXEL: 4601/3273
PIXEL: 6149/4092
PIXEL: 6150/4092
PIXEL: 6609/ 554
PIXEL: 6780/2848
PIXEL: 1649/ 139
PIXEL: 1648/ 138
PIXEL: 3164/2270
PIXEL: 6150/4091
PIXEL: 6149/4093
PIXEL: 6779/2848



C00-01

PIXEL: 985/1414
PIXEL: 1378/3087
PIXEL: 1597/ 975
PIXEL: 1890/2457
PIXEL: 1981/2448
PIXEL: 2590/4047
PIXEL: 2653/3014
PIXEL: 2681/1137
PIXEL: 2695/1055
PIXEL: 3332/2430
PIXEL: 3581/1876
PIXEL: 3626/2318
PIXEL: 3976/4206
PIXEL: 4083/1616
PIXEL: 4862/ 818
PIXEL: 5333/1648
PIXEL: 5371/2666
PIXEL: 5910/4005
PIXEL: 3270/1081
PIXEL: 6661/ 497
PIXEL: 3270/1082
PIXEL: 3270/1083

C00-02

PIXEL: 183/1120
PIXEL: 189/4320
PIXEL: 240/1685
PIXEL: 438/2738
PIXEL: 637/3574
PIXEL: 899/3234
PIXEL: 936/ 16
PIXEL: 1043/4209
PIXEL: 1167/ 148
PIXEL: 1660/3316
PIXEL: 2057/2303
PIXEL: 2204/3746
PIXEL: 2330/ 608
PIXEL: 2334/2443
PIXEL: 2561/2587
PIXEL: 2652/2330
PIXEL: 2653/2329
PIXEL: 2653/2330
PIXEL: 2654/2328
PIXEL: 2654/2329
PIXEL: 2654/2330
PIXEL: 2655/2328
PIXEL: 2655/2329
PIXEL: 2655/2330



PIXEL: 3094/3301
PIXEL: 3149/ 423
PIXEL: 3245/3605
PIXEL: 3407/2405
PIXEL: 3719/3555
PIXEL: 4036/2579
PIXEL: 4058/3935
PIXEL: 4234/4297
PIXEL: 4268/ 927
PIXEL: 4484/3816
PIXEL: 4749/1518
PIXEL: 4874/2145
PIXEL: 5422/2797
PIXEL: 5884/3442
PIXEL: 6108/4140
PIXEL: 6311/ 562
PIXEL: 6315/2945
PIXEL: 6333/1547
PIXEL: 6407/4350
PIXEL: 858/3374
PIXEL: 2039/2011
PIXEL: 2040/2010
PIXEL: 2040/2011
PIXEL: 5074/3642

C00-03

PIXEL: 524/ 572
PIXEL: 583/3072
PIXEL: 595/2730
PIXEL: 920/1581
PIXEL: 2688/3536
PIXEL: 4810/2905
PIXEL: 5077/3551
PIXEL: 6783/2461
PIXEL: 2794/3663
PIXEL: 2794/3664
PIXEL: 3763/ 259
PIXEL: 4195/1331

C01-00

PIXEL: 104/1042
PIXEL: 156/ 720
PIXEL: 1039/ 823
PIXEL: 1107/2003
PIXEL: 1590/3339
PIXEL: 1696/2574
PIXEL: 1847/3309
PIXEL: 1905/ 263
PIXEL: 2276/1058
PIXEL: 2545/ 408



PIXEL: 2885/ 486
PIXEL: 3146/1268
PIXEL: 3211/ 350
PIXEL: 3402/ 624
PIXEL: 3636/ 845
PIXEL: 3694/2357
PIXEL: 4270/2456
PIXEL: 4705/2222
PIXEL: 4788/1042
PIXEL: 5092/2154
PIXEL: 5124/ 768
PIXEL: 5203/2395
PIXEL: 5818/2739
PIXEL: 5966/ 454
PIXEL: 5974/1877
PIXEL: 6080/3345
PIXEL: 6217/3347
PIXEL: 6689/ 846
PIXEL: 6932/3182
PIXEL: 3372/ 18
PIXEL: 3372/ 19
PIXEL: 4453/2674
PIXEL: 4454/2674
PIXEL: 5556/1411
PIXEL: 6632/ 497
PIXEL: 3373/ 19
PIXEL: 3373/ 17
PIXEL: 3373/ 18
PIXEL: 3371/ 18
PIXEL: 3372/ 17
PIXEL: 4454/2675

C01-01

PIXEL: 1097/4217
PIXEL: 1204/1509
PIXEL: 1254/ 668
PIXEL: 1506/3607
PIXEL: 2182/ 785
PIXEL: 2380/2561
PIXEL: 3866/ 633
PIXEL: 4645/1735
PIXEL: 4695/1764
PIXEL: 4730/ 560
PIXEL: 4797/3031
PIXEL: 5272/2027
PIXEL: 5549/1954
PIXEL: 6019/ 994
PIXEL: 6161/3331
PIXEL: 6350/2371
PIXEL: 6612/1239



PIXEL: 6835/ 861
PIXEL: 2713/4499
PIXEL: 3657/ 381
PIXEL: 6922/4154
PIXEL: 2713/4498
PIXEL: 2714/4498
PIXEL: 6922/4155
PIXEL: 6923/4154

C02-00

PIXEL: 641/4419
PIXEL: 963/1958
PIXEL: 1100/ 989
PIXEL: 1351/ 320
PIXEL: 2908/ 634
PIXEL: 3608/ 438
PIXEL: 4589/1765
PIXEL: 4709/2869
PIXEL: 5601/3535
PIXEL: 6625/ 92
PIXEL: 6757/1923
PIXEL: 3479/3569
PIXEL: 4914/ 308
PIXEL: 6308/1807
PIXEL: 6621/1930
PIXEL: 4913/ 308

C02-01

PIXEL: 556/2528
PIXEL: 1593/3324
PIXEL: 1626/4614
PIXEL: 4843/3140
PIXEL: 6669/3511
PIXEL: 1254/ 377
PIXEL: 3681/3119
PIXEL: 3682/3119
PIXEL: 4926/1489

C03-00

PIXEL: 136/2313
PIXEL: 435/4286
PIXEL: 503/2945
PIXEL: 758/4561
PIXEL: 842/1796
PIXEL: 1710/3044
PIXEL: 2319/3545
PIXEL: 2695/1536
PIXEL: 3424/3142
PIXEL: 3686/4324



PIXEL: 4878/ 625
PIXEL: 5378/2697
PIXEL: 5548/2315
PIXEL: 6243/3197
PIXEL: 2659/4404
PIXEL: 3208/3653
PIXEL: 3208/3654
PIXEL: 3209/3653
PIXEL: 3209/3654
PIXEL: 5680/4130

C04-00

PIXEL: 224/ 251
PIXEL: 266/3772
PIXEL: 519/4522
PIXEL: 726/1715
PIXEL: 928/2791
PIXEL: 931/3612
PIXEL: 2634/2271
PIXEL: 3307/3488
PIXEL: 3528/3076
PIXEL: 4549/3509
PIXEL: 5116/3945
PIXEL: 5138/4054
PIXEL: 5296/ 392
PIXEL: 5720/3048
PIXEL: 1344/2665
PIXEL: 3411/2217
PIXEL: 3412/2217
PIXEL: 6506/4487
PIXEL: 3411/2218
PIXEL: 6506/4488

C05-00

PIXEL: 71/2201
PIXEL: 1056/2340
PIXEL: 1177/3918
PIXEL: 1911/1901
PIXEL: 1965/3440
PIXEL: 3531/4397
PIXEL: 3624/1470
PIXEL: 5724/1264
PIXEL: 5864/2244
PIXEL: 6470/ 568
PIXEL: 85/3757
PIXEL: 85/3758
PIXEL: 117/3648
PIXEL: 605/ 178
PIXEL: 712/2301
PIXEL: 712/2302



PIXEL: 713/2302
PIXEL: 753/2350
PIXEL: 754/2349
PIXEL: 754/2350
PIXEL: 759/2359
PIXEL: 769/2418
PIXEL: 1002/3227
PIXEL: 2157/4611
PIXEL: 3234/4133
PIXEL: 3333/3663
PIXEL: 3693/ 812
PIXEL: 3697/ 811
PIXEL: 3819/3173
PIXEL: 3843/ 686
PIXEL: 4022/2811
PIXEL: 4220/3253
PIXEL: 4220/3254
PIXEL: 4265/2618
PIXEL: 4276/2592
PIXEL: 4276/2593
PIXEL: 4325/3148
PIXEL: 4372/2502
PIXEL: 4372/2503
PIXEL: 4390/2452
PIXEL: 4390/2453
PIXEL: 4395/3120
PIXEL: 4396/3120
PIXEL: 4427/2401
PIXEL: 4443/2437
PIXEL: 4721/2414
PIXEL: 4729/2880
PIXEL: 4747/2051
PIXEL: 4877/3393
PIXEL: 4882/3395
PIXEL: 4886/3377
PIXEL: 4886/3378
PIXEL: 4895/3388
PIXEL: 4897/3392
PIXEL: 4899/3384
PIXEL: 4957/3334
PIXEL: 5144/3202
PIXEL: 5145/3201
PIXEL: 5187/2245
PIXEL: 5241/3126
PIXEL: 5523/2925
PIXEL: 5698/1396
PIXEL: 5948/1822
PIXEL: 5983/1006
PIXEL: 6049/3254
PIXEL: 6084/1563
PIXEL: 6091/1110



PIXEL: 6092/1110
PIXEL: 6166/1432
PIXEL: 6226/1353
PIXEL: 6556/1207
PIXEL: 6557/1206
PIXEL: 6784/3445
PIXEL: 6785/3445
PIXEL: 6825/1877
PIXEL: 118/3648
PIXEL: 714/2303
PIXEL: 713/2300
PIXEL: 758/2359
PIXEL: 761/2360
PIXEL: 760/2349
PIXEL: 762/2347
PIXEL: 3694/ 813
PIXEL: 3835/ 678
PIXEL: 3835/ 677
PIXEL: 4037/2825
PIXEL: 4029/2811
PIXEL: 4012/2857
PIXEL: 4318/2576
PIXEL: 4339/2529
PIXEL: 4399/2470
PIXEL: 4896/3390
PIXEL: 4897/3391
PIXEL: 4899/3388
PIXEL: 4880/3377
PIXEL: 4882/3377
PIXEL: 4877/3401
PIXEL: 4879/3396
PIXEL: 4883/3395
PIXEL: 4876/3393
PIXEL: 4884/3396
PIXEL: 4872/3403
PIXEL: 4882/3402
PIXEL: 4895/3386
PIXEL: 5948/1821
PIXEL: 5925/1825
PIXEL: 5964/1019
PIXEL: 6094/1548
PIXEL: 6093/1548
PIXEL: 6218/1377

C06-00

PIXEL: 2163/ 569
PIXEL: 4459/2708
PIXEL: 5136/1230
PIXEL: 5143/3535
PIXEL: 5522/ 801



PIXEL: 6527/3111
PIXEL: 546/ 332
PIXEL: 555/ 328
PIXEL: 791/3216
PIXEL: 2868/ 217
PIXEL: 3330/ 917
PIXEL: 4131/1853
PIXEL: 4158/1139
PIXEL: 4328/ 496
PIXEL: 4329/ 496
PIXEL: 6472/2725
PIXEL: 6473/2725
PIXEL: 554/ 328
PIXEL: 555/ 327
PIXEL: 2865/ 223
PIXEL: 2865/ 222
PIXEL: 2859/ 217
PIXEL: 2859/ 216
PIXEL: 2862/ 216
PIXEL: 2868/ 218
PIXEL: 4131/1854
PIXEL: 4131/1856
PIXEL: 4329/ 498

C07-00

PIXEL: 2687/ 177
PIXEL: 3169/1814
PIXEL: 5915/3287
PIXEL: 6056/1950

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).



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
Serial: UC-E-1-10019596-f100

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 Date: Jan-16-2019
Date of Report: Feb-04-2019
Camera Revision: Rev06.00
Version of Report: V01



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.

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 22 11 18	6.82	6.95	7.14	7.39	7.59	7.71	7.82	8.04	+/- 0.2
C1 (Pan)	12 27 38 41	6.49	6.66	6.89	7.06	7.24	7.36	7.52	7.7	+/- 0.2
C2 (Pan)	12 27 38 38	6.96	7.02	7.21	7.43	7.59	7.73	7.88	7.96	+/- 0.2
C3 (Pan)	12 27 38 33	6.31	6.49	6.74	6.89	7.08	7.25	7.38	7.47	+/- 0.2
C4 (Red)	12 24 50 26	7.02	7.03	7.14	7.14	7.29	7.44	7.44	7.52	+/- 0.2
C5 (Green)	12 24 50 19	7.39	7.39	7.44	7.53	7.65	7.7	7.84	7.89	+/- 0.2
C6 (Blue)	12 24 50 22	6.86	6.86	6.86	7.01	7.12	7.26	7.34	7.44	+/- 0.2
C7 (NIR)	12 24 50 21	7.11	7.22	7.38	7.48	7.62	7.64	7.66	7.82	+/- 0.2



ULTRACAM

Electronics and Sensor Calibration

Camera: UltraCam Eagle
Serial: UC-E-1-10019596-f100

Panchromatic Camera: 9 * FTF7046-M Area CCD Sensor by DALSA
Multispectral Camera: 4 * FTF7046-M Area CCD Sensor by DALSA

Calibration Date: Jan-16-2019
Date of Report: Feb-04-2019
Camera Revision: Rev06.00
Version of Report: V01



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.

Cone_Sensor	Sensor Type	Sensor Serial Number	VNS Voltage [V]
00_00	FTF7046-M	16 2469/016	24.40
00_01	FTF7046-M	16 0872/127	23.40
00_02	FTF7046-M	16 2469/025	24.40
00_03	FTF7046-M	16 2469/067	24.40
01_00	FTF7046-M	16 2469/028	24.80
01_01	FTF7046-M	16 2469/037	24.60
02_00	FTF7046-M	16 2469/021	24.60
02_01	FTF7046-M	16 0872/046	23.80
03_00	FTF7046-M	16 2469/009	24.40
04_00 (red)	FTF7046-M	16 2469/014	24.60
05_00 (green)	FTF7046-M	16 2469/005	24.60
06_00 (blue)	FTF7046-M	16 2469/003	24.60
07_00 (NIR)	FTF7046-M	16 2469/013	24.60



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.

Cone_Sensor	Sensor Type	Sensor Serial Number	Intensity Threshold [DN]
00_00	FTF7046-M	16 2469/016	14080
00_01	FTF7046-M	16 0872/127	12530
00_02	FTF7046-M	16 2469/025	13300
00_03	FTF7046-M	16 2469/067	14090
01_00	FTF7046-M	16 2469/028	13560
01_01	FTF7046-M	16 2469/037	13430
02_00	FTF7046-M	16 2469/021	13580
02_01	FTF7046-M	16 0872/046	12730
03_00	FTF7046-M	16 2469/009	13160
04_00 (red)	FTF7046-M	16 2469/014	14110
05_00 (green)	FTF7046-M	16 2469/005	13350
06_00 (blue)	FTF7046-M	16 2469/003	13580
07_00 (NIR)	FTF7046-M	16 2469/013	13580



ULTRACAM

Summary

Camera:	UltraCam Eagle
Serial:	UC-E-1-10019596-f100
Calibration Date:	Jan-16-2019
Date of Report:	Feb-04-2019
Camera Revision:	Rev06.00
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.

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