



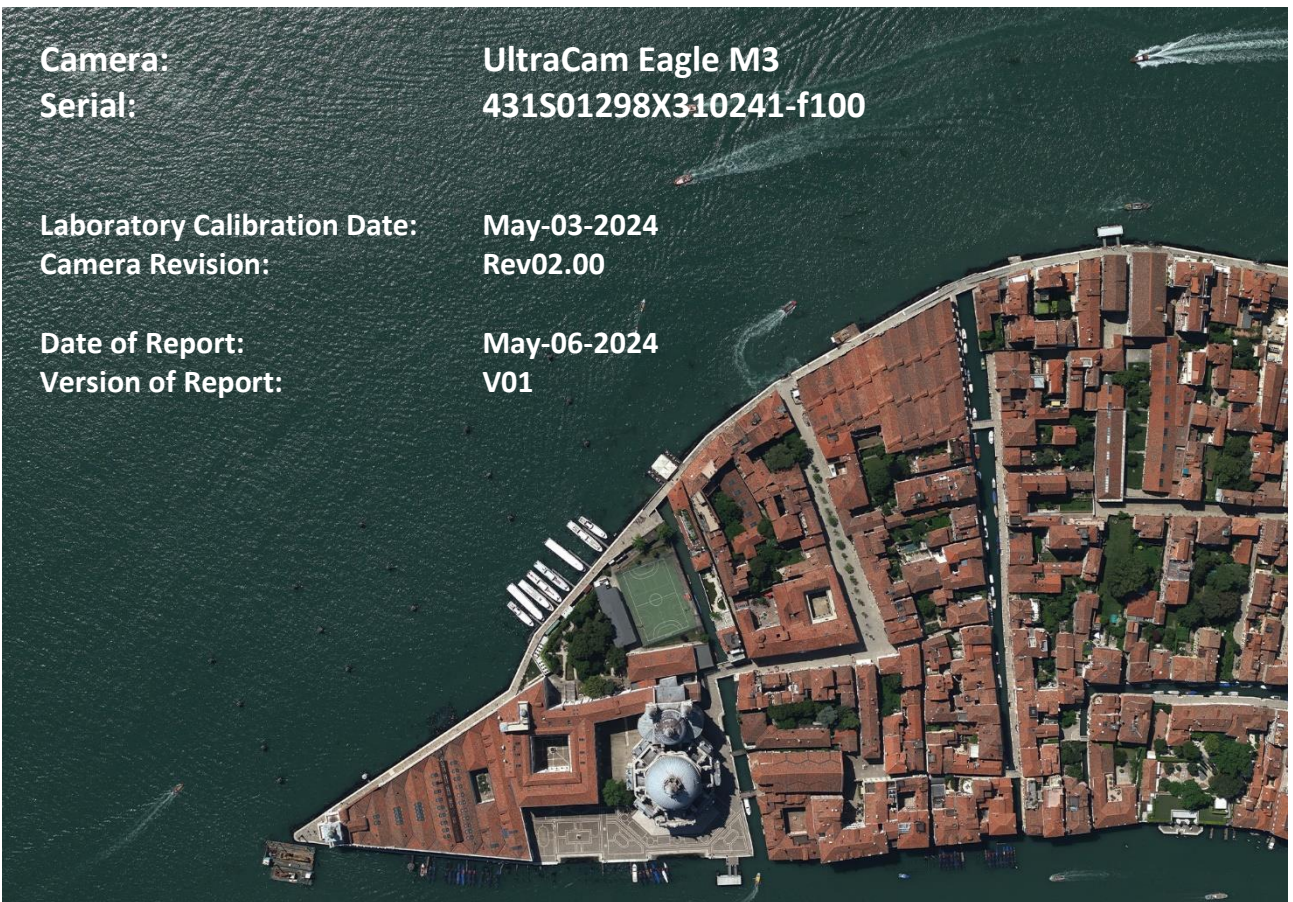
ULTRACAM

Calibration Report

Camera: UltraCam Eagle M3
Serial: 431S01298X310241-f100

Laboratory Calibration Date: May-03-2024
Camera Revision: Rev02.00

Date of Report: May-06-2024
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: 431S01298X310241-f100

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

PPA Information: X: -0.08 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		4.000 μ m*4.000 μ m	
Focal Length	ck	100.500mm	\pm 0.002mm
Principal Point (Level 2)	X_ppa	-0.08mm	\pm 0.002mm
	Y_ppa	0.000mm	\pm 0.002mm
Lens Distortion	Remaining Distortion less than 0.002mm		

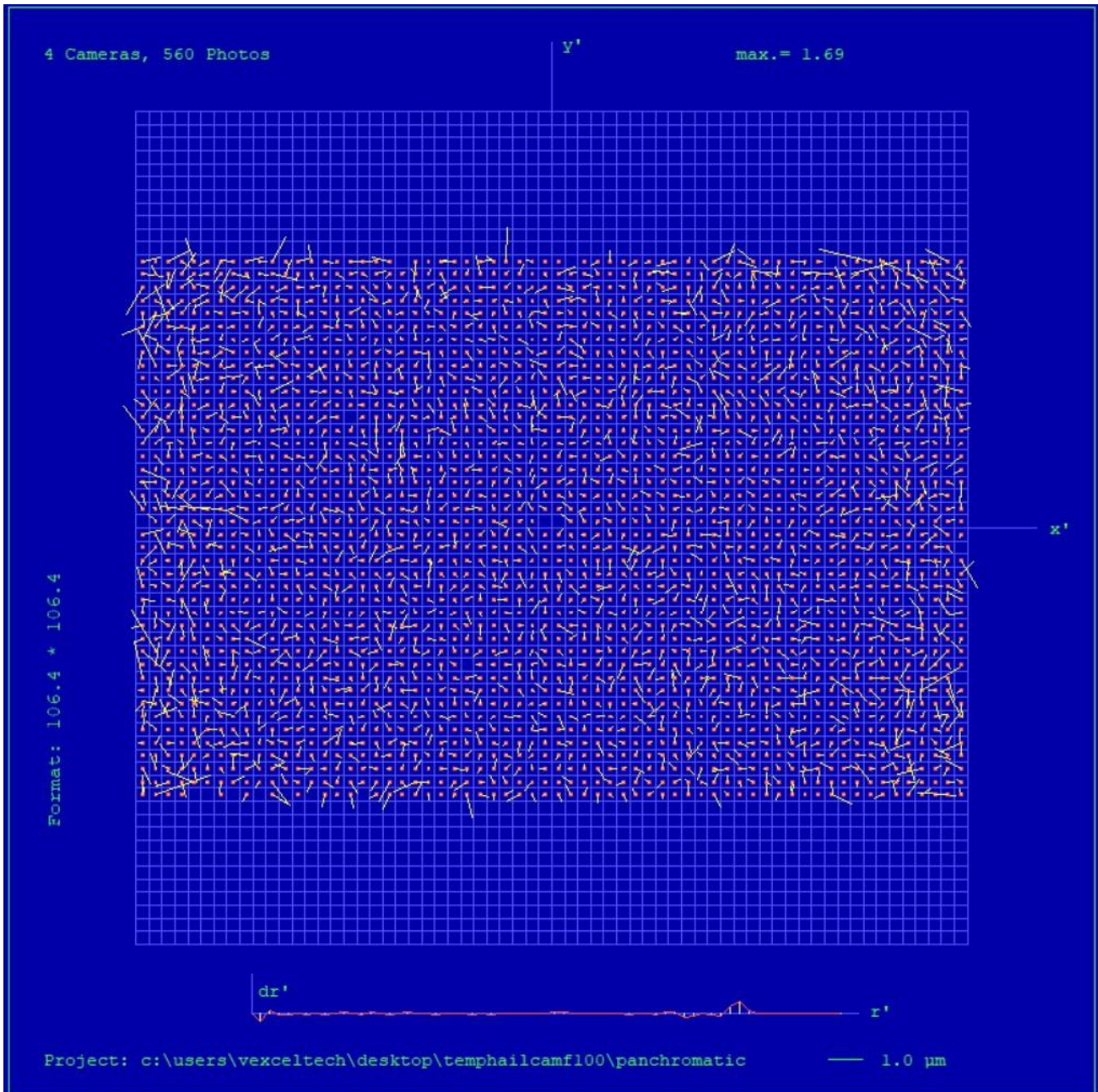
Multispectral Camera

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		12.000 μ m*12.000 μ m	
Focal Length	ck	100.500mm	\pm 0.002mm
Principal Point (Level 2)	X_ppa	-0.08mm	\pm 0.002mm
	Y_ppa	0.000mm	\pm 0.002mm
Lens Distortion	Remaining Distortion less than 0.002mm		



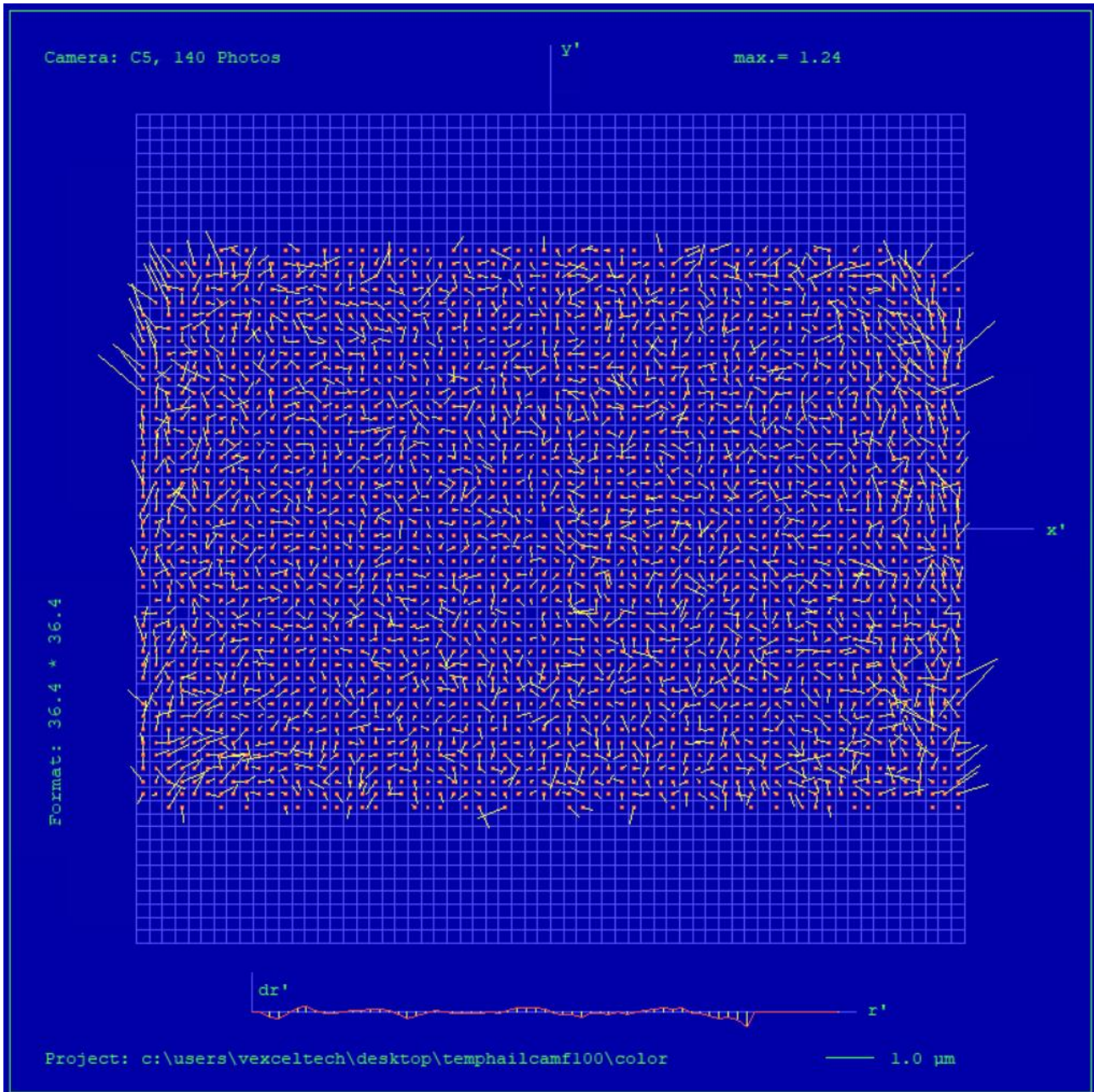
Full Panchromatic Image, Residual Error Diagram



Residual Error (RMS): **0.70 μ m**



Green Cone (Cone 5), Residual Error Diagram



Residual Error (RMS): **0.61 μm**



Explanations

Calibration Method:

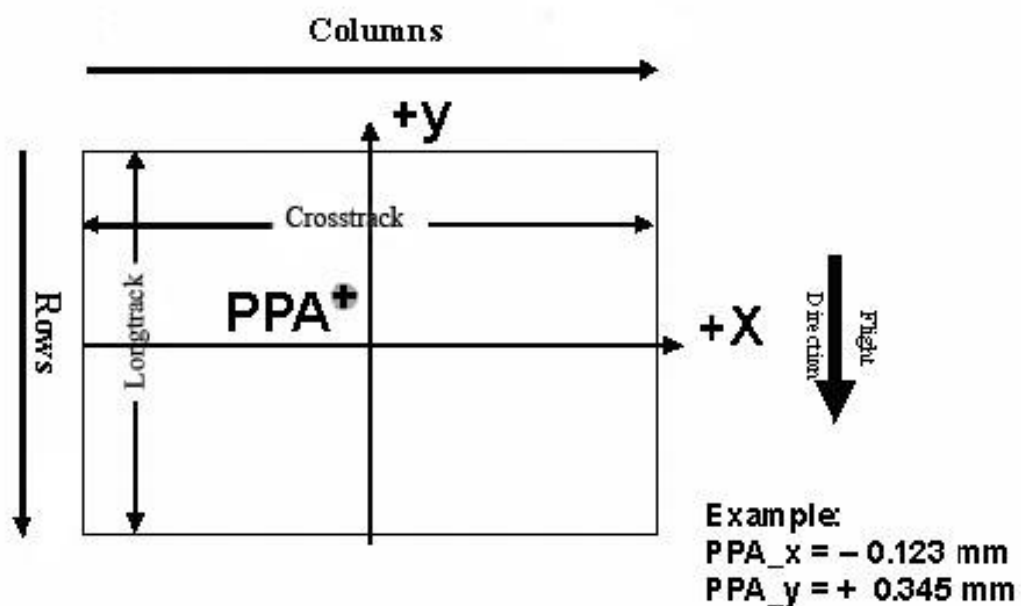
The geometric calibration is based on a set of 140 images of a defined geometry target with 394 GCPs.

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:

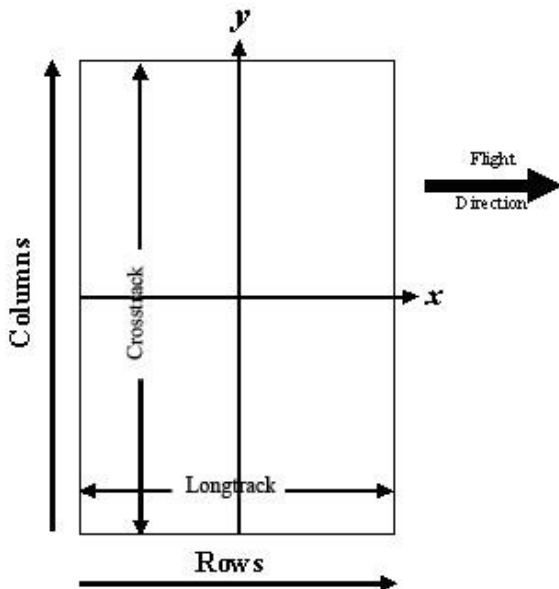
Lvl2, Camera prop. Orientation



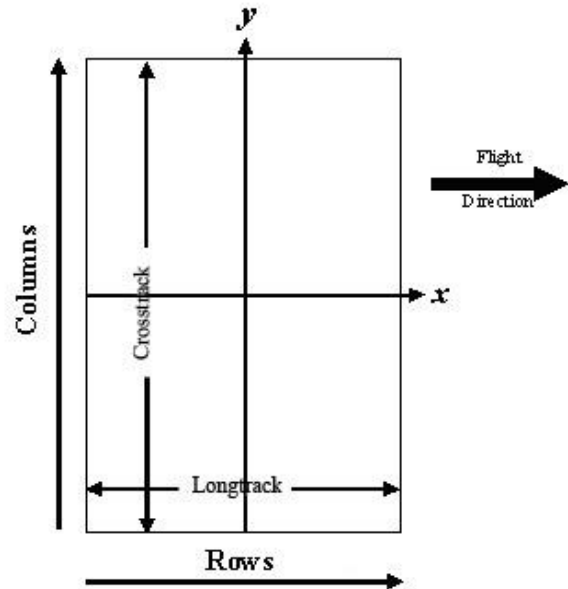
The image coordinate system of the Level 2 images is shown in the above figure. The basic image format and coordinate of the principal point in the level 2 image is given on page 4 of this report. The above figure shows the position of an example principal point at the coordinate (-0.123 / 0.345).



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



Panchromatic Image Format



Multispectral Image Format

Position of Principal Point in Level 3 Image

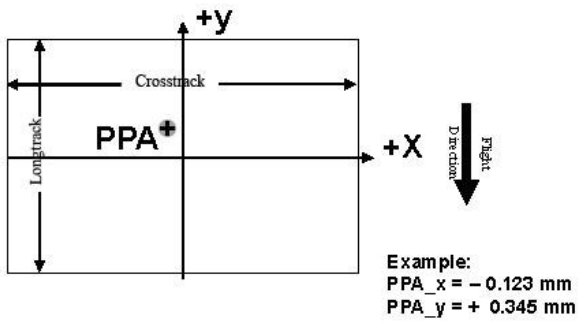
The position of the principal point in the level 3 image depends on the “rotation” setting used in UltraMap during the pan-sharpening step. The exact position relative to the image center is given in the table below as a function of the rotation setting used in UltraMap. The coordinates are specified 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	-	-0.080	0.000
Level 3	0	-0.080	0.000
Level 3	90	0.000	0.080
Level 3	180	0.080	0.000
Level 3	270	0.000	-0.080

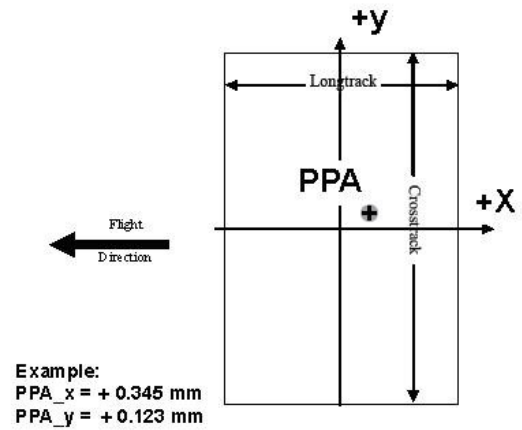


The coordinates in the figure below are only example values to illustrate the effect of image rotation on the principal point position, and do **not** correspond to the camera described in this report.

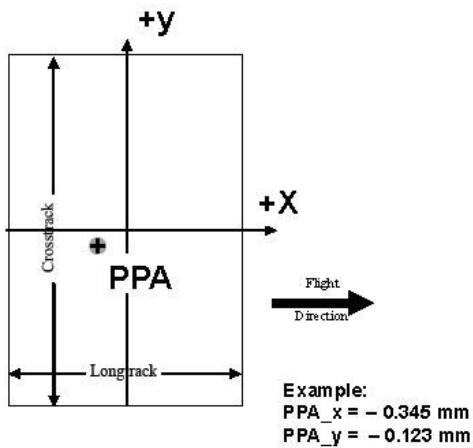
Lvl3, Rotation 0 deg clockwise



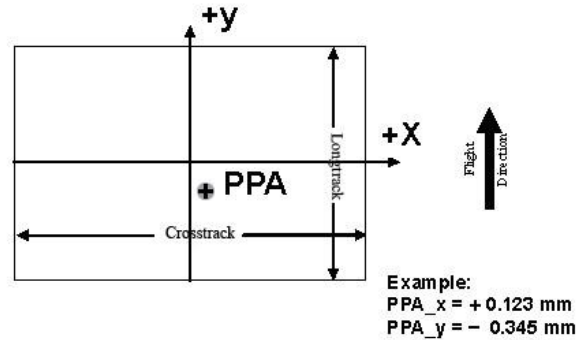
Lvl3, Rotation 90 deg clockwise



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.

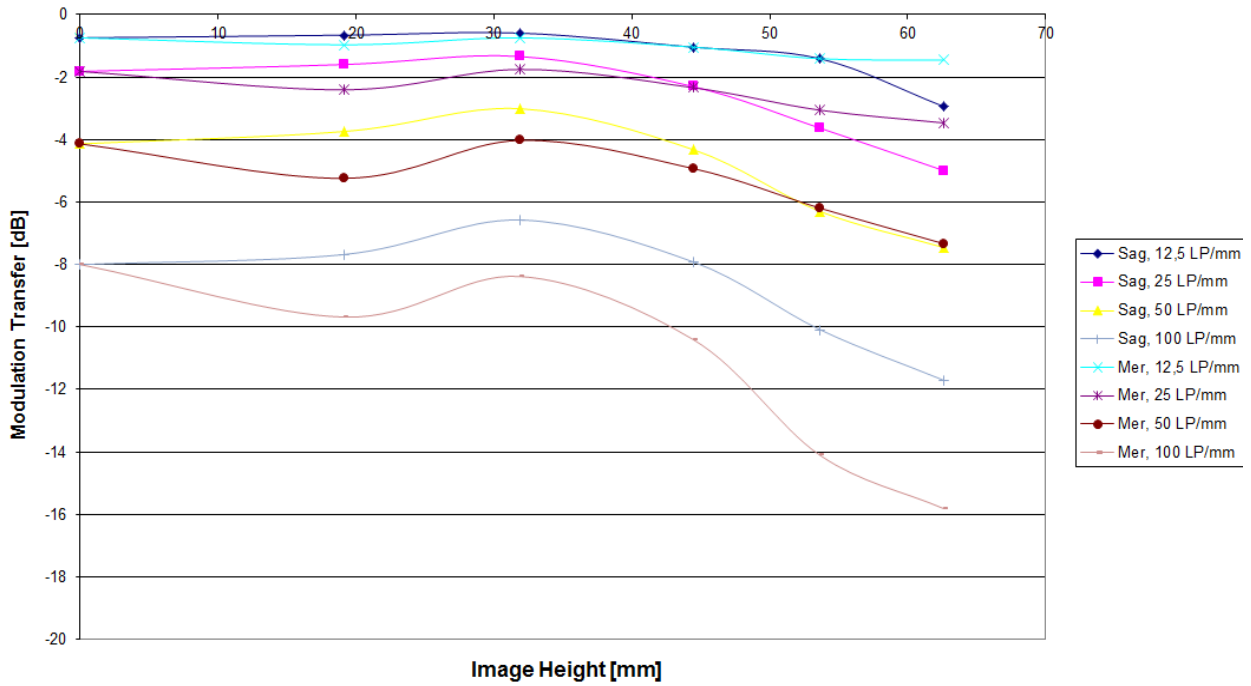
As the MTF is a function of the specific aperture size used, one set of curves is given for each aperture size.

Lens types

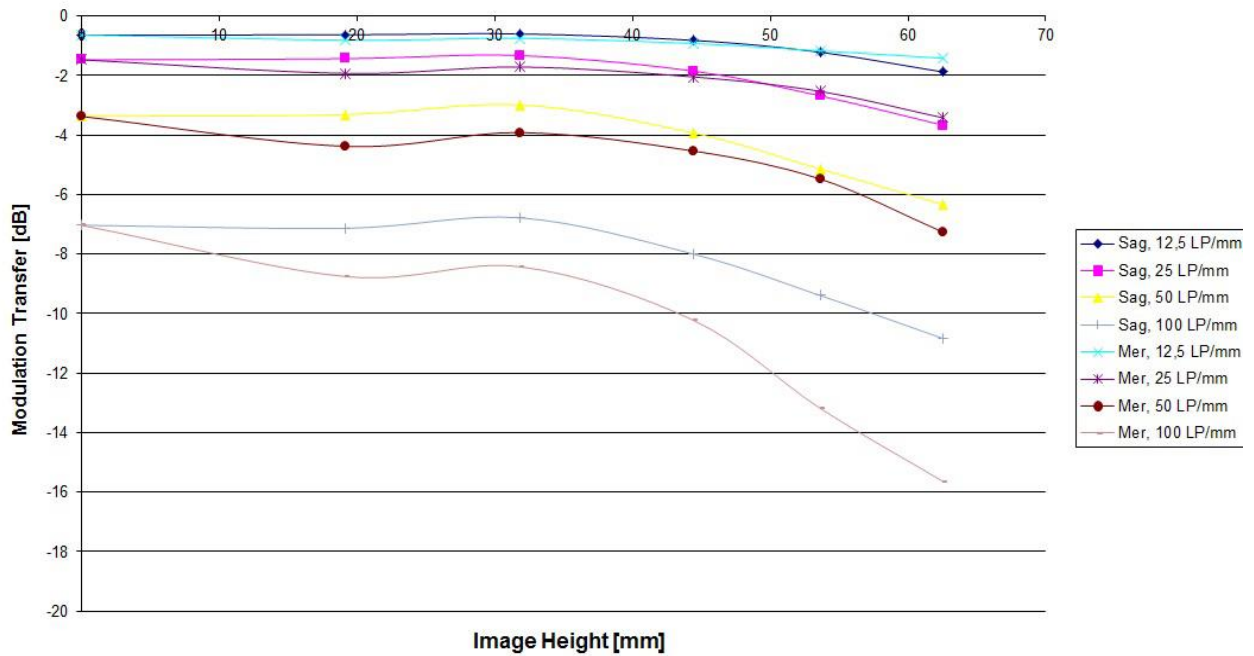
Cone	Lens
C0 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/100mm, Qioptic GmbH, Germany
C1 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/100mm, Qioptic GmbH, Germany
C2 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/100mm, Qioptic GmbH, Germany
C3 (PAN)	Qioptic Vexcel HR Digaron 1:5,6/100mm, Qioptic GmbH, Germany
C4 (RED)	Qioptic 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

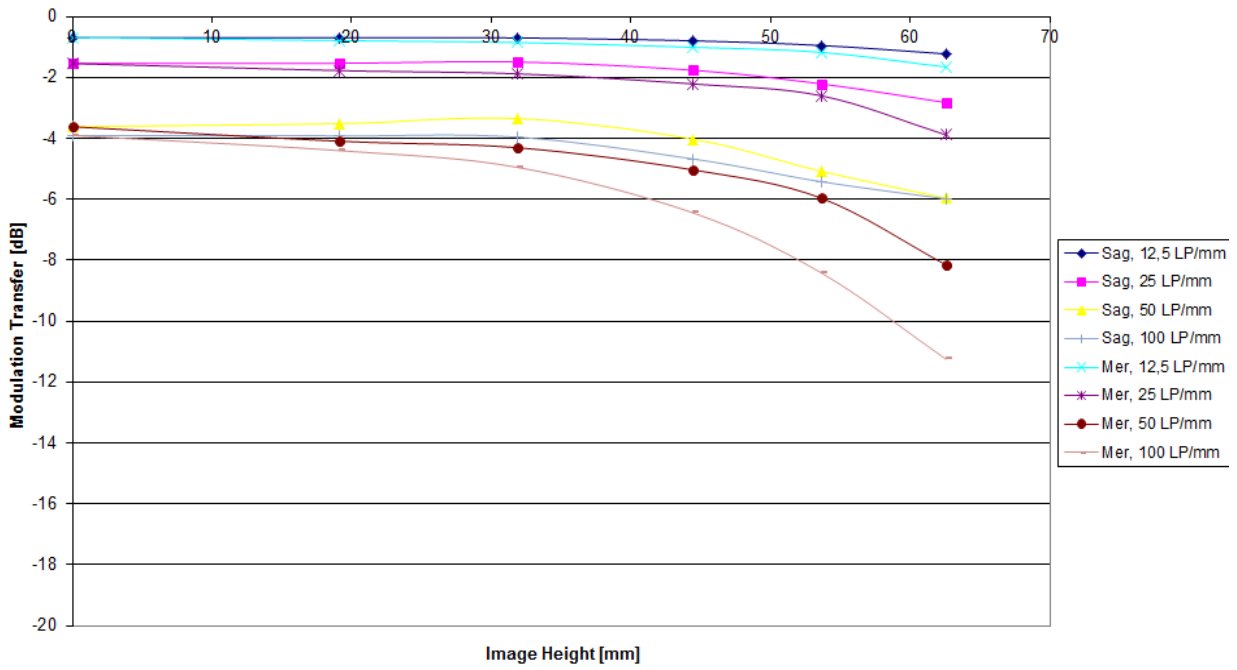


Modulation versus Image Height - Aperture f / 6.7

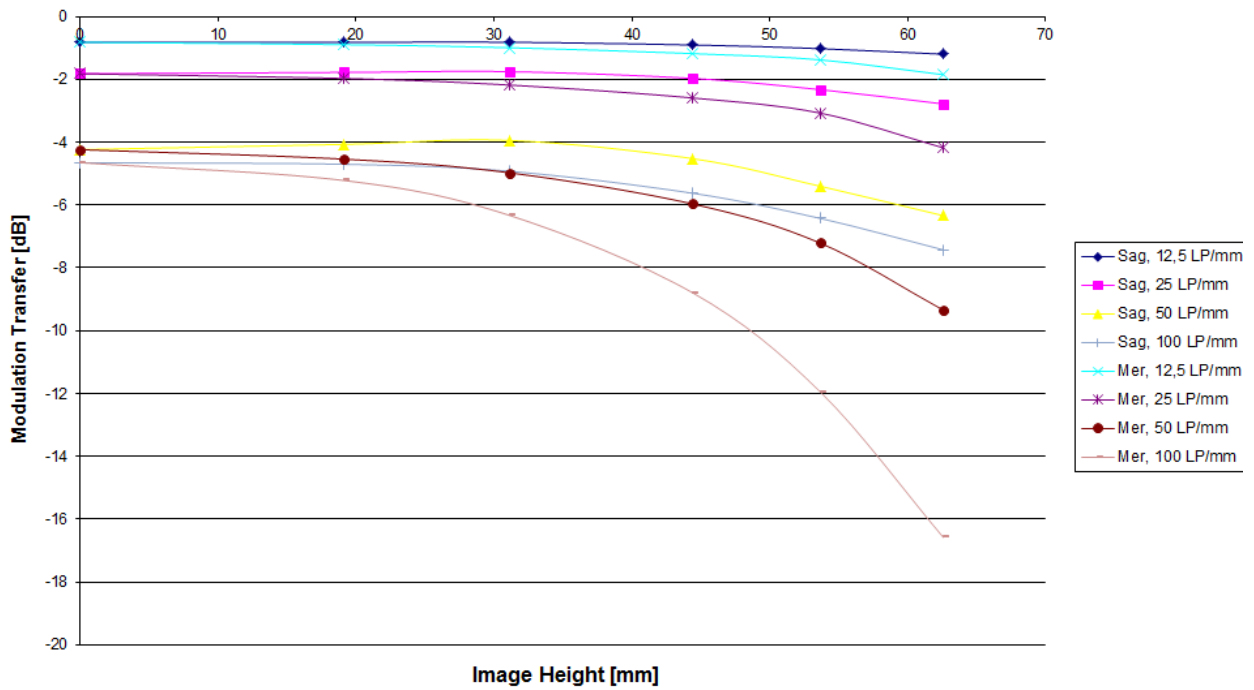




Modulation versus Image Height - Aperture f / 8

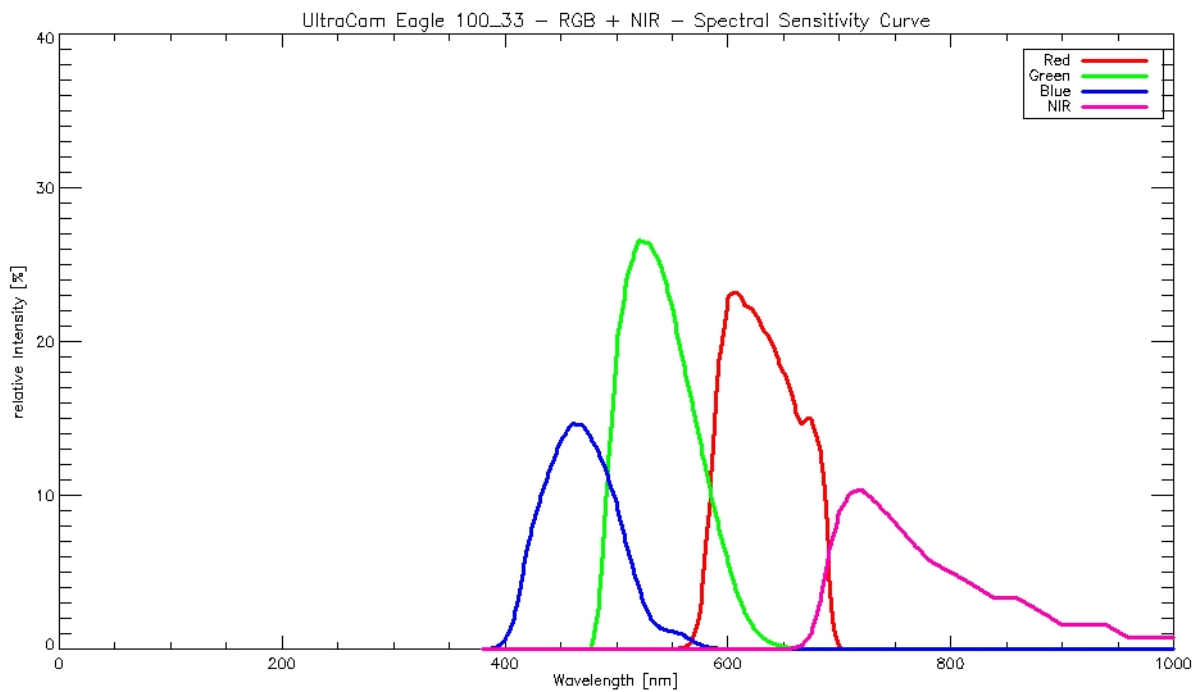
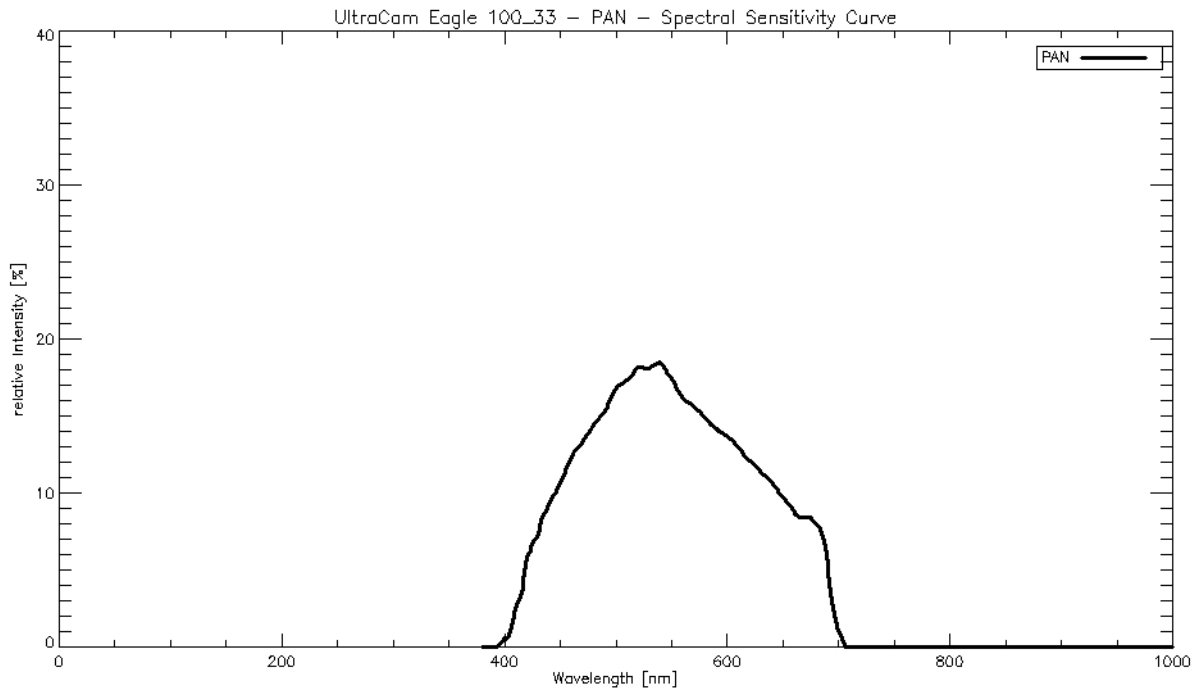


Modulation versus Image Height - Aperture f / 9.5





Spectral Sensitivity





ULTRACAM

Radiometric Calibration

Camera: UltraCam Eagle M3
Serial: 431S01298X310241-f100

	PAN	R, G, NIR	B
Used Apertures	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

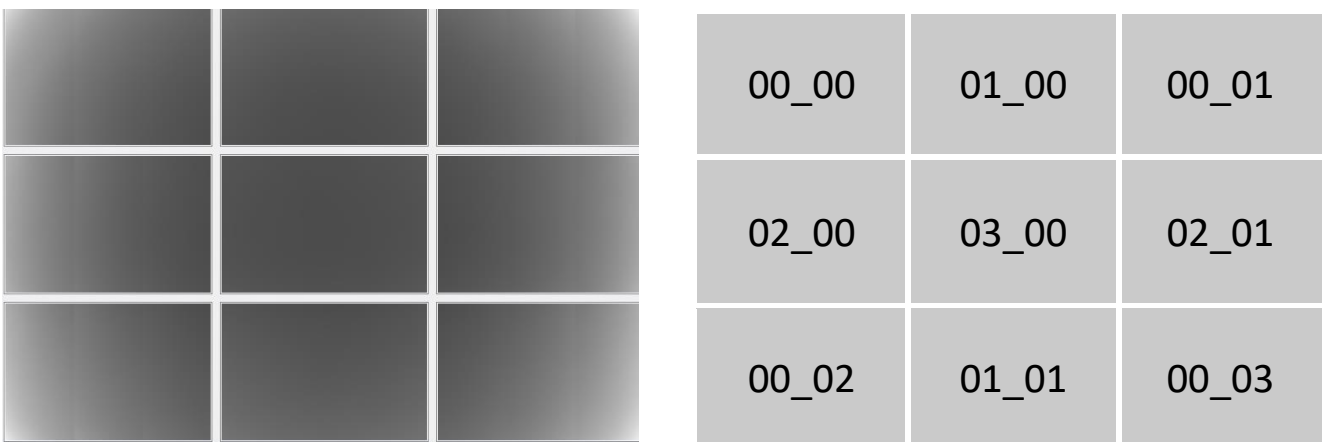
Dead Pixel Report: see Appendix I



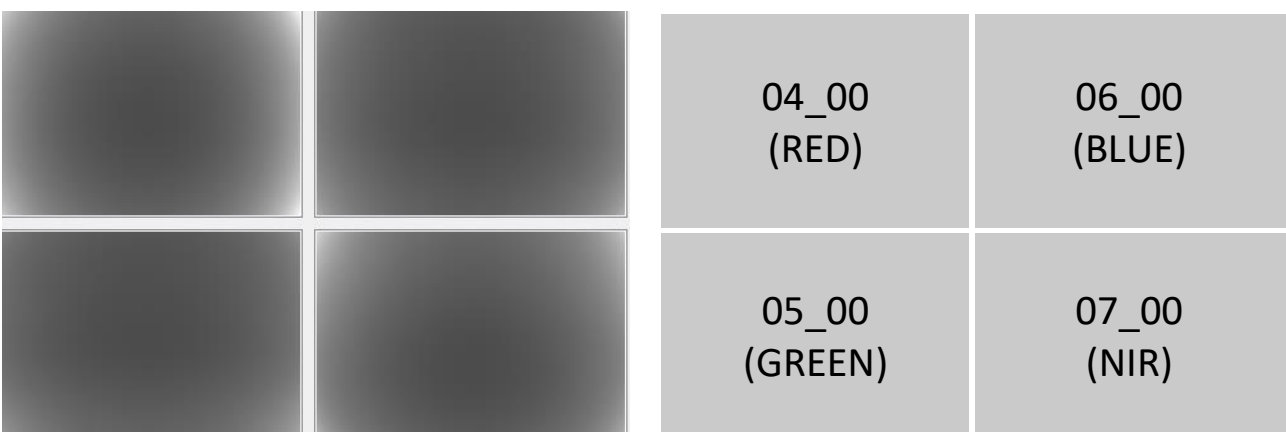
Calibration of Vignetting for working Aperture F6.7

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

Graphical Overview of Pan Sensors:



Graphical Overview of Multispectral Sensors:





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-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 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 48 13 03	6.43	6.61	6.87	7.10	7.27	7.40	7.56	7.87	+/- 0.2
C1 (Pan)	12 48 13 14	6.47	6.72	7.03	7.29	7.47	7.60	7.76	8.08	+/- 0.2
C2 (Pan)	12 48 13 02	6.36	6.54	6.82	7.06	7.23	7.36	7.57	7.84	+/- 0.2
C3 (Pan)	12 48 13 05	6.46	6.76	7.06	7.32	7.51	7.66	7.84	8.16	+/- 0.2
C4 (Red)	12 47 31 60	7.24	7.35	7.54	7.63	7.74	7.89	8.02	8.09	+/- 0.2
C5 (Green)	12 47 31 83	6.92	7.04	7.21	7.33	7.43	7.58	7.73	7.85	+/- 0.2
C6 (Blue)	12 47 31 80	6.88	6.90	6.90	7.03	7.19	7.32	7.41	7.69	+/- 0.2
C7 (NIR)	12 47 31 71	7.21	7.42	7.60	7.76	7.90	8.02	8.14	8.35	+/- 0.2



ULTRACAM

Electronics and Sensor Calibration

Camera: UltraCam Eagle M3
Serial: 431S01298X310241-f100

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	13470	12410
00_01	FTF9060-M	19 6255/007	13450	12540
00_02	FTF9060-M	20 1289/110	13350	12430
00_03	FTF9060-M	19 7663/011	13450	12680
01_00	FTF9060-M	19 6257/012	12960	12440
01_01	FTF9060-M	19 6255/023	13180	12330
02_00	FTF9060-M	19 6255/008	13310	12650
02_01	FTF9060-M	19 6255/044	13000	12390
03_00	FTF9060-M	19 6255/009	13130	12600
04_00 (red)	FTF9060-M	19 6255/049	13430	12540
05_00 (green)	FTF9060-M	19 6255/012	13300	12340
06_00 (blue)	FTF9060-M	19 6256/025	13270	12270
07_00 (NIR)	FTF9060-M	19 6257/015	13510	12690



ULTRACAM

Summary

Camera:	UltraCam Eagle M3
Serial:	431S01298X310241-f100
Laboratory Calibration Date:	May-03-2024
Camera Revision:	Rev02.00
Date of Report:	May-06-2024
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: 4130/ 882	PIXEL: 3628/ 897
	PIXEL: 8758/1152	PIXEL: 5075/1279	PIXEL: 1347/1372
	PIXEL: 7289/1409	PIXEL: 368/1649	PIXEL: 6322/1813
	PIXEL: 8855/2222	PIXEL: 5741/2228	PIXEL: 7458/2323
	PIXEL: 3528/2931	PIXEL: 4751/3114	PIXEL: 2042/3162
	PIXEL: 3055/3405	PIXEL: 2606/3441	PIXEL: 6629/3529
	PIXEL: 3536/3560	PIXEL: 1953/3840	PIXEL: 7630/3847
	PIXEL: 5521/4213	PIXEL: 8869/4225	PIXEL: 851/4348
	PIXEL: 1231/4441	PIXEL: 2465/4526	PIXEL: 5021/4544
	PIXEL: 8872/4779	PIXEL: 2597/4882	PIXEL: 2297/5035
	PIXEL: 6120/5414	PIXEL: 5238/5666	PIXEL: 8685/5923
	PIXEL: 6639/1456	PIXEL: 6364/1721	PIXEL: 7545/2377
	PIXEL: 1569/2438	PIXEL: 1570/2438	PIXEL: 1194/5894
			PIXEL: 443/ 599
			PIXEL: 6999/1041
			PIXEL: 2733/1377
			PIXEL: 6120/2193
			PIXEL: 8949/2511
			PIXEL: 6596/3341
			PIXEL: 5296/3532
			PIXEL: 6098/3896
			PIXEL: 904/4437
			PIXEL: 7169/4634
			PIXEL: 3599/5150
			PIXEL: 5315/5941
			PIXEL: 1569/2437
C00-01			
	PIXEL: 7715/ 281	PIXEL: 825/ 395	PIXEL: 2065/ 747
	PIXEL: 8071/ 794	PIXEL: 4032/1087	PIXEL: 7326/1297
	PIXEL: 1411/2017	PIXEL: 5342/2331	PIXEL: 3990/2501
	PIXEL: 3311/2611	PIXEL: 5620/2638	PIXEL: 5332/3236
	PIXEL: 5802/3581	PIXEL: 8633/3592	PIXEL: 926/3662
	PIXEL: 6570/3851	PIXEL: 8983/3869	PIXEL: 3846/4063
	PIXEL: 1061/4091	PIXEL: 8972/4103	PIXEL: 6455/4109
	PIXEL: 5121/4291	PIXEL: 118/4343	PIXEL: 104/4417
	PIXEL: 4811/4796	PIXEL: 4811/4797	PIXEL: 4191/4823
	PIXEL: 1963/5317	PIXEL: 6500/5496	PIXEL: 8931/5571
	PIXEL: 1048/5638	PIXEL: 5896/ 179	PIXEL: 5895/ 180
	PIXEL: 5897/ 180	PIXEL: 5896/ 181	PIXEL: 8602/1939
	PIXEL: 7166/3140	PIXEL: 2022/3305	PIXEL: 5314/4105
	PIXEL: 5313/4106	PIXEL: 5314/4106	PIXEL: 5315/4106
	PIXEL: 2184/4152	PIXEL: 433/4826	PIXEL: 150/4893
	PIXEL: 7545/5588		PIXEL: 2798/5194



C00-02

PIXEL: 3946/4436			
PIXEL: 3946/4437	PIXEL: 5119/ 294	PIXEL: 8111/ 497	PIXEL: 4248/ 578
PIXEL: 937/ 592	PIXEL: 6058/1001	PIXEL: 7555/1030	PIXEL: 7077/1037
PIXEL: 2916/1205	PIXEL: 1532/1509	PIXEL: 8189/1618	PIXEL: 424/1774
PIXEL: 3872/1805	PIXEL: 8921/1848	PIXEL: 8989/1952	PIXEL: 7373/1979
PIXEL: 5686/1988	PIXEL: 8680/2028	PIXEL: 649/2136	PIXEL: 8408/2204
PIXEL: 2097/2472	PIXEL: 6066/3069	PIXEL: 37/3264	PIXEL: 841/3825
PIXEL: 8658/3911	PIXEL: 4898/3937	PIXEL: 1059/4121	PIXEL: 3855/4545
PIXEL: 5901/4698	PIXEL: 2591/4769	PIXEL: 8226/4810	PIXEL: 638/5358
PIXEL: 788/5686	PIXEL: 2782/5855	PIXEL: 7052/ 608	PIXEL: 5101/1059
PIXEL: 4390/1773	PIXEL: 3947/4436	PIXEL: 1737/5312	PIXEL: 1738/5350
PIXEL: 2250/5364	COLUMN: 6559/3329		

C00-03

PIXEL: 7647/ 738	PIXEL: 8606/ 929	PIXEL: 2270/1373	PIXEL: 8143/1616
PIXEL: 6737/1711	PIXEL: 5182/1780	PIXEL: 6663/1876	PIXEL: 8383/2035
PIXEL: 6225/2123	PIXEL: 6563/2660	PIXEL: 1369/2964	PIXEL: 6701/3136
PIXEL: 4547/3164	PIXEL: 4442/3186	PIXEL: 2196/3634	PIXEL: 4282/3641
PIXEL: 5092/3836	PIXEL: 1075/3973	PIXEL: 246/4034	PIXEL: 7541/4072
PIXEL: 2419/4127	PIXEL: 3511/4325	PIXEL: 6358/4395	PIXEL: 1918/4418
PIXEL: 991/4526	PIXEL: 4661/4761	PIXEL: 2804/4838	PIXEL: 2439/5104
PIXEL: 6238/5200	PIXEL: 4490/5241	PIXEL: 7031/5356	PIXEL: 2286/5399
PIXEL: 719/5435	PIXEL: 5175/5435	PIXEL: 3072/5446	PIXEL: 6462/5528
PIXEL: 2974/5738	PIXEL: 3867/5744	PIXEL: 7788/5746	PIXEL: 3543/5813
COLUMN: 5650/5137			

C01-00

PIXEL: 7300/ 38			
PIXEL: 1991/ 303	PIXEL: 7971/ 512	PIXEL: 6579/ 541	PIXEL: 8435/ 564
PIXEL: 6278/ 691	PIXEL: 7629/ 754	PIXEL: 6156/ 952	PIXEL: 634/1083
PIXEL: 914/1152	PIXEL: 1319/1283	PIXEL: 4589/1550	PIXEL: 5855/1606
PIXEL: 5944/1659	PIXEL: 7060/1937	PIXEL: 3750/2319	PIXEL: 8408/2391
PIXEL: 7263/2649	PIXEL: 6982/2732	PIXEL: 6886/2738	PIXEL: 7356/3214
PIXEL: 5497/3260	PIXEL: 8737/3267	PIXEL: 6909/3485	PIXEL: 7014/3603
PIXEL: 536/3638	PIXEL: 8081/3642	PIXEL: 7603/3662	PIXEL: 2095/3854
PIXEL: 1274/3857	PIXEL: 4744/4198	PIXEL: 5461/4268	PIXEL: 4456/4348
PIXEL: 4376/4481	PIXEL: 8847/4615	PIXEL: 4433/4789	PIXEL: 4695/4819
PIXEL: 2528/4942	PIXEL: 8145/5197	PIXEL: 5005/5265	PIXEL: 3491/5340
PIXEL: 5338/5361	PIXEL: 3897/5429	PIXEL: 1491/5484	PIXEL: 8091/5490
PIXEL: 6750/5548	PIXEL: 5448/5618	PIXEL: 5722/5648	PIXEL: 1478/5665
PIXEL: 5026/ 390	PIXEL: 7072/3644	PIXEL: 616/5473	PIXEL: 617/5473
PIXEL: 616/5474	COLUMN: 2981/2369		

C01-01

PIXEL: 6515/ 35	PIXEL: 8386/ 555	PIXEL: 519/ 834	PIXEL: 1607/1048
PIXEL: 6753/1227	PIXEL: 644/1526	PIXEL: 2534/1838	PIXEL: 9027/2010
PIXEL: 2651/2045	PIXEL: 1452/2091	PIXEL: 7921/2348	PIXEL: 1566/2430
PIXEL: 3781/2733	PIXEL: 7470/2816	PIXEL: 6393/2877	PIXEL: 5827/2882
PIXEL: 1381/3404	PIXEL: 2749/3493	PIXEL: 6421/3514	PIXEL: 6352/3547
PIXEL: 2667/3630	PIXEL: 1534/3735	PIXEL: 3194/3862	PIXEL: 1010/4313



PIXEL: 7050/4427	PIXEL: 3771/4493	PIXEL: 1782/4572	PIXEL: 6823/4740
PIXEL: 7395/4914	PIXEL: 8278/5103	PIXEL: 1070/5112	PIXEL: 6125/5115
PIXEL: 2562/5117	PIXEL: 3454/5284	PIXEL: 2792/5349	PIXEL: 8593/5375
PIXEL: 3080/5396	PIXEL: 6581/5845	PIXEL: 8530/5882	PIXEL: 1140/5912
PIXEL: 7993/5917	PIXEL: 7462/ 283	PIXEL: 8732/ 618	PIXEL: 548/2602
PIXEL: 7559/2872	PIXEL: 7559/2873	PIXEL: 109/3466	PIXEL: 7526/3762
PIXEL: 2051/5831	COLUMN: 5078/ 302		

C02-00

PIXEL: 1668/ 332	PIXEL: 5285/ 386	PIXEL: 7249/1145	PIXEL: 6324/1176
PIXEL: 3067/1479	PIXEL: 7036/1565	PIXEL: 6878/1644	PIXEL: 7250/1702
PIXEL: 6921/1885	PIXEL: 4860/1909	PIXEL: 8671/2819	PIXEL: 7482/2988
PIXEL: 7087/3009	PIXEL: 1583/3270	PIXEL: 3944/3319	PIXEL: 7635/3380
PIXEL: 973/3680	PIXEL: 8229/3778	PIXEL: 1398/3836	PIXEL: 1381/3841
PIXEL: 6965/3912	PIXEL: 2413/3984	PIXEL: 5629/4132	PIXEL: 419/4408
PIXEL: 89/4413	PIXEL: 5829/4591	PIXEL: 5886/5069	PIXEL: 2663/5158
PIXEL: 3991/5898	PIXEL: 714/5924	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: 2815/2477	PIXEL: 1736/2723	PIXEL: 4251/2770	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: 8385/5898
COLUMN: 6093/2725			

C02-01

PIXEL: 972/ 20			
PIXEL: 5034/ 67	PIXEL: 6613/ 195	PIXEL: 8580/ 324	PIXEL: 5400/ 714
PIXEL: 9022/ 772	PIXEL: 2419/ 900	PIXEL: 7657/ 914	PIXEL: 1884/1110
PIXEL: 4431/1144	PIXEL: 6724/1193	PIXEL: 3524/1293	PIXEL: 2473/1417
PIXEL: 6657/1452	PIXEL: 4890/1603	PIXEL: 3003/1844	PIXEL: 121/2052
PIXEL: 4132/2429	PIXEL: 7770/2895	PIXEL: 4392/2936	PIXEL: 945/3028
PIXEL: 7805/3049	PIXEL: 8133/3088	PIXEL: 5679/3287	PIXEL: 55/3514
PIXEL: 3843/3516	PIXEL: 4521/3686	PIXEL: 1783/3824	PIXEL: 709/3884
PIXEL: 4888/3910	PIXEL: 1020/4019	PIXEL: 3494/4062	PIXEL: 1699/4244
PIXEL: 278/4603	PIXEL: 3749/4912	PIXEL: 5810/4974	PIXEL: 5810/4975
PIXEL: 6585/5053	PIXEL: 7155/5140	PIXEL: 8336/5189	PIXEL: 2690/5214
PIXEL: 8970/5309	PIXEL: 2011/5663	PIXEL: 2259/5728	PIXEL: 4186/5781
PIXEL: 4132/5785	PIXEL: 3447/5892	PIXEL: 2266/5895	PIXEL: 6493/5951
PIXEL: 8906/ 217	PIXEL: 8773/ 559	PIXEL: 1000/ 643	PIXEL: 855/ 650
PIXEL: 8545/ 828	PIXEL: 4502/1407	PIXEL: 5460/4465	PIXEL: 8605/4528

C03-00

PIXEL: 8911/ 915	PIXEL: 5668/1259		
PIXEL: 9010/1314	PIXEL: 8437/1595	PIXEL: 4111/1901	PIXEL: 4600/3114
PIXEL: 8771/3177	PIXEL: 4258/3706	PIXEL: 6845/3753	PIXEL: 3568/3823
PIXEL: 6802/4205	PIXEL: 6704/4681	PIXEL: 480/5191	PIXEL: 5290/5855
PIXEL: 2701/ 54	PIXEL: 2701/ 55	PIXEL: 7108/ 475	PIXEL: 7323/1240
PIXEL: 8839/2846	PIXEL: 8840/2846	PIXEL: 2538/3515	PIXEL: 138/5410
PIXEL: 7182/5907	PIXEL: 7182/5908	PIXEL: 8633/5982	COLUMN: 5477/4426
COLUMN: 5451/3454	COLUMN: 5363/3385	COLUMN: 2640/1891	



C04-00

PIXEL: 8603/ 744	PIXEL: 3028/1289	PIXEL: 7958/1337	
PIXEL: 6040/1426	PIXEL: 8416/1967	PIXEL: 2374/2061	PIXEL: 4675/2198
PIXEL: 6438/2407	PIXEL: 2120/2822	PIXEL: 1080/2891	PIXEL: 4836/3154
PIXEL: 6587/3394	PIXEL: 75/3482	PIXEL: 3560/3510	PIXEL: 6902/3530
PIXEL: 7586/3989	PIXEL: 7050/4036	PIXEL: 755/5212	PIXEL: 8242/5243
PIXEL: 5251/5948	PIXEL: 1598/ 909	PIXEL: 1598/ 910	PIXEL: 5875/1211
PIXEL: 8946/1487	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	COLUMN: 8864/3141	

C05-00

PIXEL: 2216/ 560	PIXEL: 816/ 630	PIXEL: 3603/ 709	
PIXEL: 2913/1474	PIXEL: 3121/2368	PIXEL: 5960/2565	PIXEL: 5155/2619
PIXEL: 1750/2701	PIXEL: 3509/2957	PIXEL: 5084/3350	PIXEL: 7492/4095
PIXEL: 6198/4525	PIXEL: 4178/4847	PIXEL: 8227/4871	PIXEL: 3988/4970
PIXEL: 8886/5119	PIXEL: 8705/5721	PIXEL: 8702/ 82	PIXEL: 4486/ 356
PIXEL: 4487/ 356	PIXEL: 4486/ 357	PIXEL: 4487/ 357	PIXEL: 2544/2161
PIXEL: 8350/3267	PIXEL: 7237/3667	PIXEL: 560/4262	PIXEL: 4556/4586
PIXEL: 495/5063	PIXEL: 931/5332	PIXEL: 338/5593	PIXEL: 461/5897
PIXEL: 151/5940	COLUMN: 6259/2185		

C06-00

PIXEL: 276/ 648	PIXEL: 2498/1001	PIXEL: 3753/2823	PIXEL: 7985/3058
PIXEL: 1853/3717	PIXEL: 5006/4428	PIXEL: 3332/4521	PIXEL: 1952/5850
PIXEL: 1447/ 40	PIXEL: 1970/ 99	PIXEL: 1349/ 215	PIXEL: 8212/ 338
PIXEL: 8577/ 715	PIXEL: 5895/ 827	PIXEL: 5896/ 827	PIXEL: 685/ 890
PIXEL: 2807/ 979	PIXEL: 2472/1084	PIXEL: 2473/1084	PIXEL: 2429/1205
PIXEL: 314/1305	PIXEL: 8706/1520	PIXEL: 7422/1866	PIXEL: 1964/2353
PIXEL: 6977/2886	PIXEL: 7465/2900	PIXEL: 517/2969	PIXEL: 722/3154
PIXEL: 3767/3354	PIXEL: 5026/3411	PIXEL: 1170/3501	PIXEL: 9037/3675
PIXEL: 28/3754	PIXEL: 4795/3843	PIXEL: 130/4183	PIXEL: 5730/4528
PIXEL: 4437/4577	PIXEL: 149/4596	PIXEL: 5685/5148	PIXEL: 8611/5166
PIXEL: 6193/5238	PIXEL: 7466/5253	PIXEL: 9043/5400	PIXEL: 8423/5498
PIXEL: 7429/5611	PIXEL: 7430/5611	PIXEL: 9005/5864	COLUMN: 3637/ 566

C07-00

PIXEL: 1744/ 100	PIXEL: 3191/ 120		
PIXEL: 407/ 718	PIXEL: 2966/ 799	PIXEL: 969/ 950	PIXEL: 1029/1161
PIXEL: 2245/1867	PIXEL: 325/2037	PIXEL: 732/2088	PIXEL: 6797/2111
PIXEL: 4473/3536	PIXEL: 8393/3674	PIXEL: 882/3797	PIXEL: 5909/4079
PIXEL: 4468/4475	PIXEL: 4146/5745	PIXEL: 1413/ 475	PIXEL: 2506/ 481
PIXEL: 530/ 664	PIXEL: 8399/ 688	PIXEL: 1716/1097	PIXEL: 3308/1119
PIXEL: 72/1496	PIXEL: 8057/1552	PIXEL: 8806/3112	PIXEL: 741/4160
PIXEL: 3391/4318	PIXEL: 3391/4319	PIXEL: 8729/5386	COLUMN: 2361/ 509
COLUMN: 4211/1408			



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	03.May.2024		
Radiometric Calibration	03.May.2024		
Shutter Calibration	03.May.2024		
Electronics and Sensor Calibration	03.May.2024		

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.