

# Camera Calibration

Block Adjustment - Version 7.0.1.49528 (64bit), build #36 of 2015-10-13 09:46 at 22.12.2015 15:47

Camera: CM-10000\_20150508\_calibration\_15:29:02\_22/12/2015

Manufacturer: ~~UltraCamXP~~ x down

Ser.No.: 13-017-CM1-017

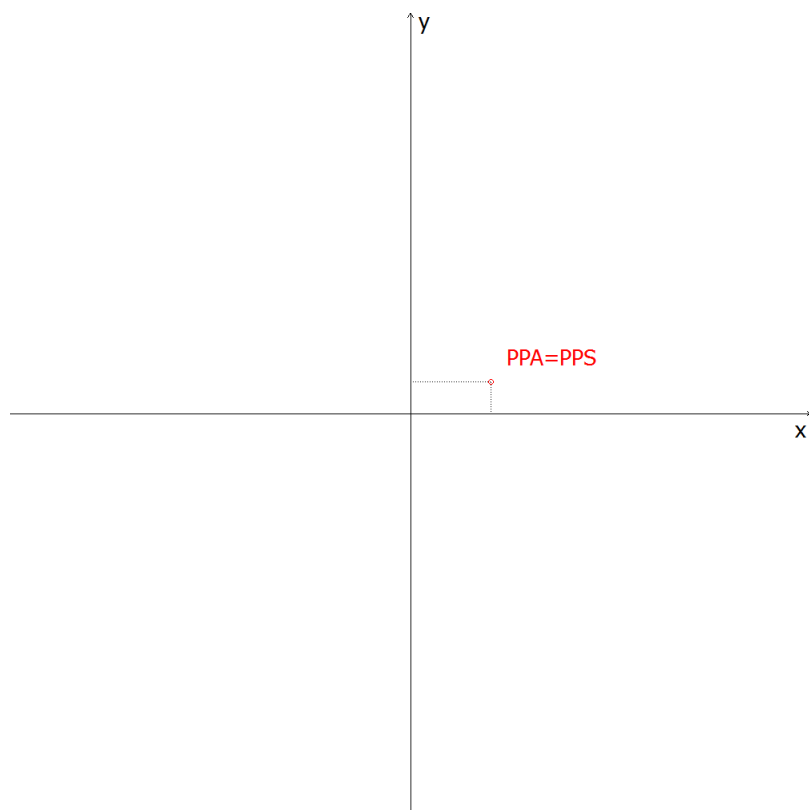
sensor width: 10328

sensor height: 7760

pixel size: 5.20 x 5.20 [ $\mu$ m]

## Internal Geometry

	original	calibrated	Std.Dev.
<b>Focal Length:</b>	51.4500 mm		
<b>Princ. Point x:</b>	0.3634 mm	0.3109 mm	+/- 0.8427 $\mu$ m
<b>Princ. Point y:</b>	0.0919 mm	0.1215 mm	+/- 0.8152 $\mu$ m



**Additional Parameters**

Physical

correction for radial distortion

$$DX = X * (K_0 + K_1 * R^2 + K_2 * R^4 + K_3 * R^6 + K_4 * R^8 + K_5 * R^{10} + K_6 * R^{12} + K_7 * R^{14})$$

$$DY = Y * (K_0 + K_1 * R^2 + K_2 * R^4 + K_3 * R^6 + K_4 * R^8 + K_5 * R^{10} + K_6 * R^{12} + K_7 * R^{14})$$

correction for decentering distortion

$$DX = P_1 * (R^2 + 2 * X^2) + 2 * P_2 * X * Y$$

$$DY = 2 * P_1 * X * Y + P_2 * (R^2 + 2 * Y^2)$$

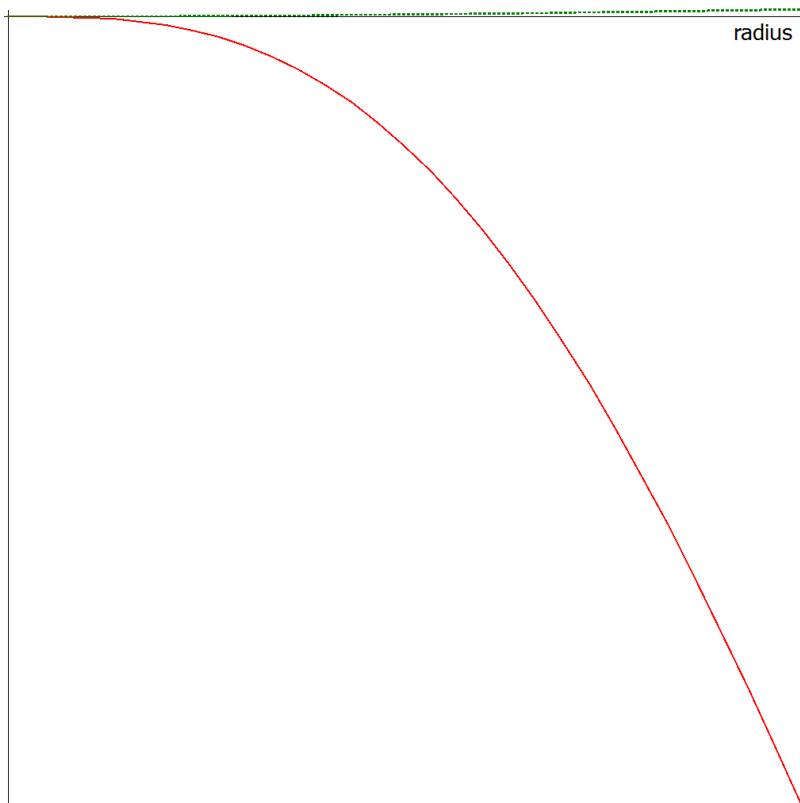
with  $R = (X * X + Y * Y)^{1/2}$ 

X and Y are with respect to principal point (PPA=PPS)

Parameter	Value	Std.Dev.
<b>K<sub>0</sub></b>	0.00000e+00	
<b>K<sub>1</sub></b>	-1.55958e-05	+/- 5.4e-08
<b>K<sub>2</sub></b>	4.59786e-09	+/- 1.1e-10
<b>K<sub>3</sub></b>	-4.63418e-13	+/- 6.9e-14
<b>P<sub>1</sub></b>	-2.57372e-06	+/- 1.3e-07
<b>P<sub>2</sub></b>	1.92536e-06	+/- 1.3e-07

Distortion Error of radial symmetric components of above parameters

Radius [mm]	Distortion [um]
0.0000	-0.0000
2.0000	-0.1246
4.0000	-0.9934
6.0000	-3.3331
8.0000	-7.8353
10.0000	-15.1406
12.0000	-25.8220
14.0000	-40.3708
16.0000	-59.1834
18.0000	-82.5503
20.0000	-110.6461
22.0000	-143.5240
24.0000	-181.1103
26.0000	-223.2043
28.0000	-269.4802
30.0000	-319.4926
32.0000	-372.6864
34.0000	-428.4105



The dashed green lines show the magnitude of the decentering distortions on the four image diagonals. This gives an impression of what will be missed if only radial distortion components are used.