# CLAS12-RICH SENSOR TESTS

**August 7th 2015**

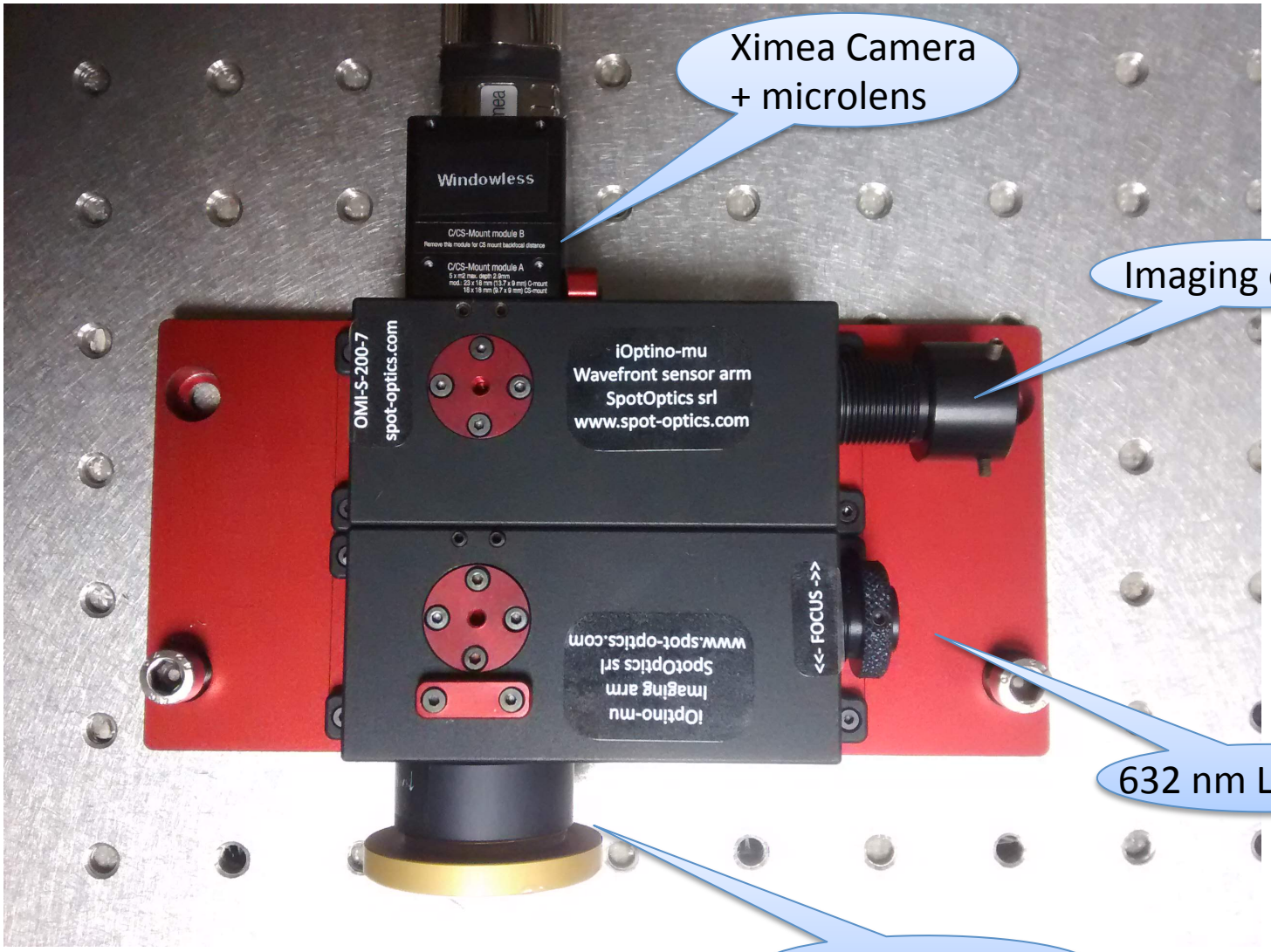
Shack Hartmann Sensor OPTINO delivered

* first measurements

XIMEA Camera Background Study @ 10 bit resolution

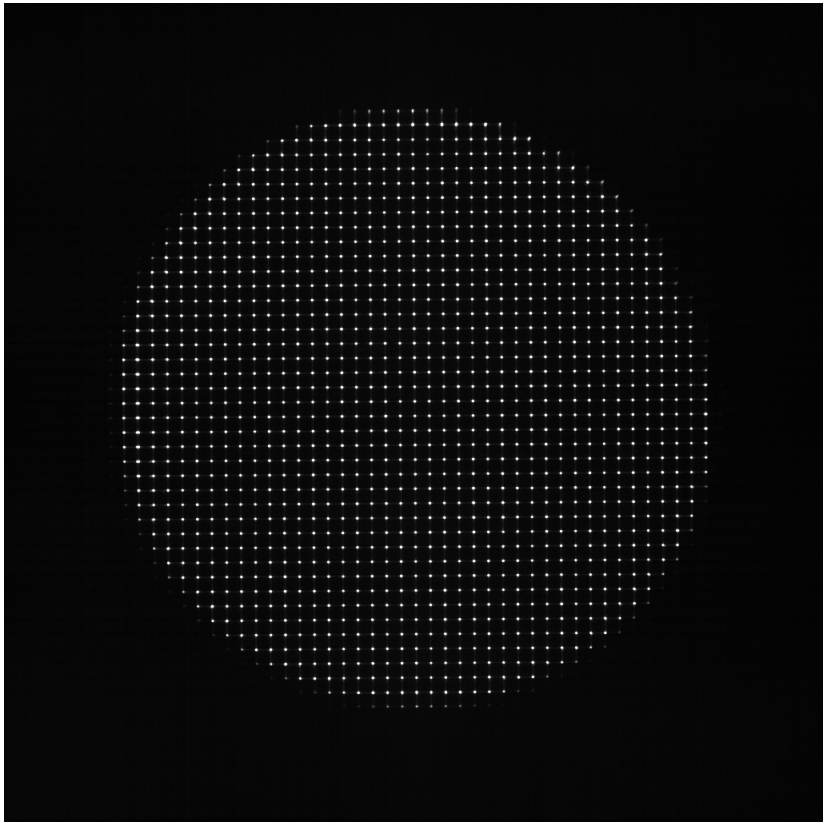
* prerequisite for D0 measurements

# Shack-Hartmann Optino

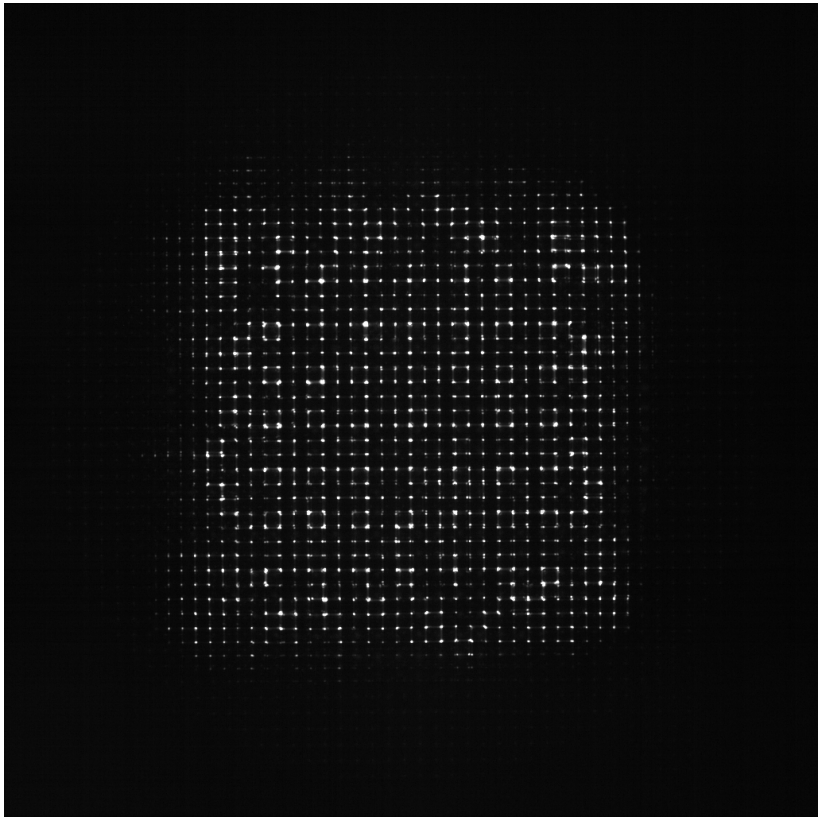


# SH Mirror Image

Edmund (coated)
R=180 cm, ⦸ 15 cm



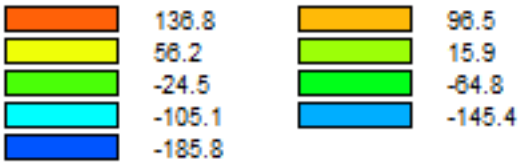
CMA2 (uncoated)
R=400 cm, L=24 cm

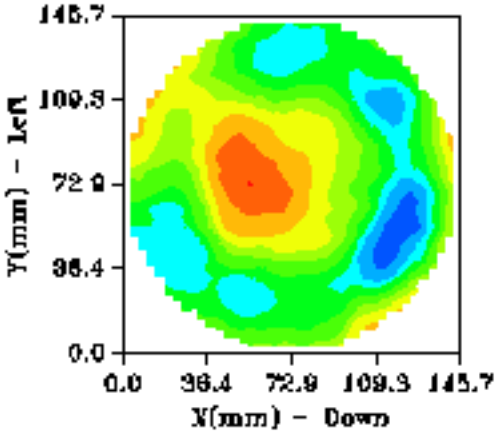


First attempt with (very) raw calibration

# Edmund Surface Analysis

Zonal WF - AQ, P-V=362.9, rms=76.6 nm




Contour of Modal wavefront - AQ (Tilt, Defocus subtracted) = 632.8 nm

P-V=420.0, rms=83.4nm

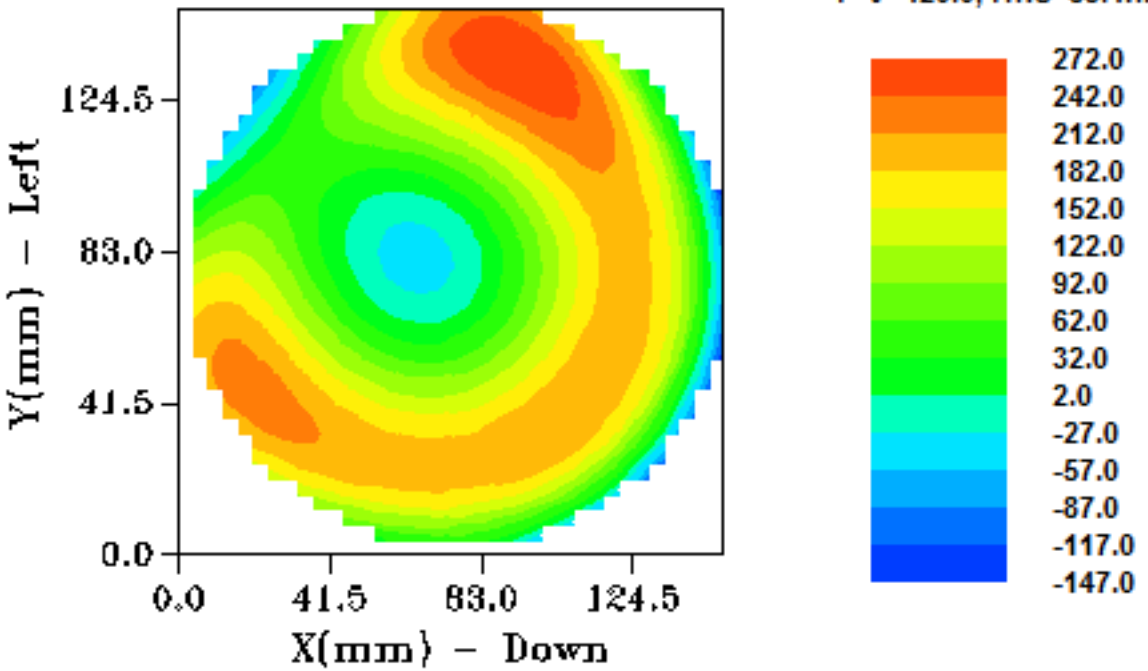


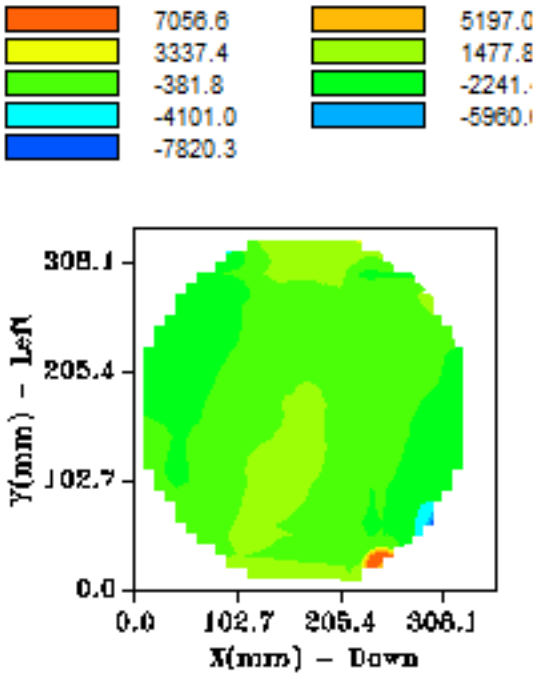

Image: edmund_100fl 06/08/2015 - Analyzed: 06/08/2015 - No. of spots 1317 (41x42)
Lens: Company/User: - - Instr: SpotOptics OptinoSensoft
Mirror at rad. curvature - SP. fl=1800mm, d=149.4mm, Coll: fl=100mm. Lenslet: (7mm, 0.2mm)

Standard Zernike coefficients (nm,°)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Defoc | -208.0 | Tilt | 8755.7,-177.5 | Ast3 | 79.9, 61.9 | TComa | 61.6, -40.0 | QAst | 14.9, 2.3 | Foil5 | --- |
| SA3 | -111.5 | Coma | 78.6, 161.7 | Ast5 (X) | 13.3, -78.9 | TCom5 | --- | QAst5 | --- | Foil6 | --- |
| SA5 (X) | 12.2 | Com5 (X) | 13.9, 0.5 | Ast7 | --- | TCom7 | --- | QAst7 | --- | Foil7 | --- |
| SA7 | --- | Com7 | --- | Ast9 | --- | TCom9 | --- | QAst9 | --- | Foil8 | --- |
| SA9 | --- | Com9 | --- | Ast11 | --- | TCom11 | --- | QAst11 | --- | | |
| SA11 | --- | Com11 | --- | Ast13 | --- | TCom13 | --- | | | | |
| SA13 | --- | Com13 | --- | Ast15 | --- | | | | | | |

# CMA2 Surface Analysis

Zonal WF - AQ, P-V=16736.4, rms=1131.1 nm




Contour of Modal wavefront - AQ (Tilt, Defocus subtracted) = 632.8 nm

P-V=5894.7, rms=1001.4nm

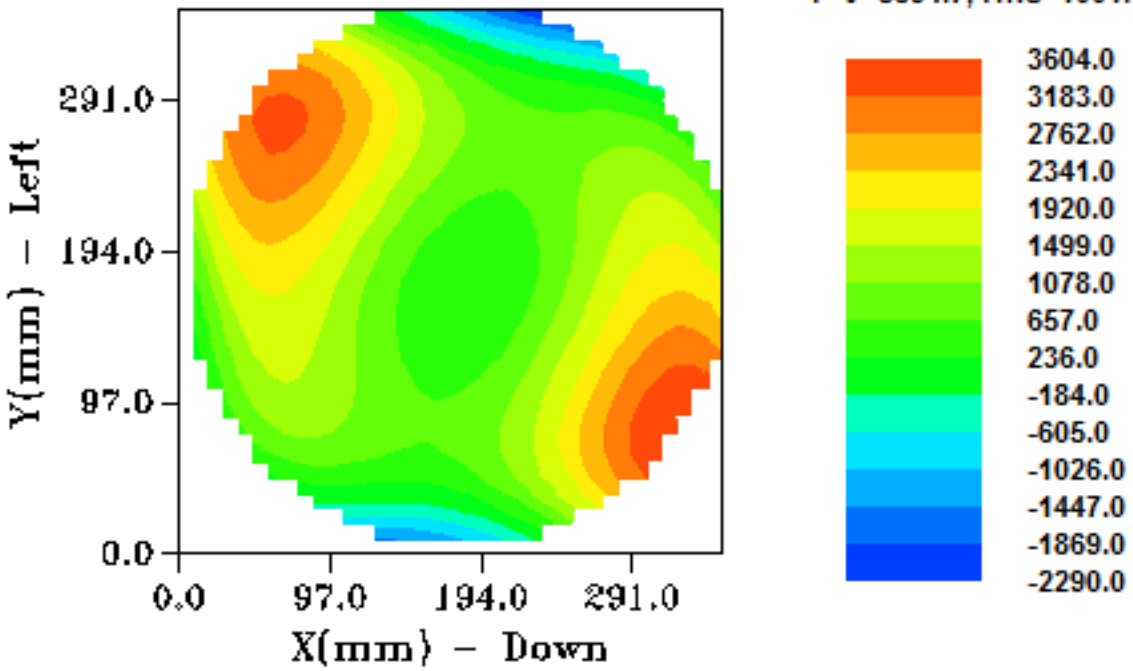



Image: CMA2_100fl_6Volt 06/08/2015 - Analyzed: 06/08/2015 - No. of spots 895 (34x34)
Lens: Company/User: - - Instr: SpotOptics OptinoSensoft
Mirror at rad. curvature - SP. fl=4000mm, d=349.2mm, Coll: fl=100mm. Lenslet: (7mm, 0.2mm)

Standard Zernike coefficients (nm,°)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Defoc | -203.4 | Tilt | 20699.6,149.8 | Ast3 | 1714.3,-25.3 | TComa | 313.4,-6.0 | QAst | 681.1,44.4 | Foil5 | --- |
| SA3 | -793.6 | Coma | 282.7,-41.1 | Ast5 (X) | 205.0,-84.9 | TCom5 | --- | QAst5 | --- | Foil6 | --- |
| SA5 (X) | -110.4 | Com5 (X) | 84.0,-15.1 | Ast7 | --- | TCom7 | --- | QAst7 | --- | Foil7 | --- |
| SA7 | --- | Com7 | --- | Ast9 | --- | TCom9 | --- | QAst9 | --- | Foil8 | --- |
| SA9 | --- | Com9 | --- | Ast11 | --- | TCom11 | --- | QAst11 | --- | | |
| SA11 | --- | Com11 | --- | Ast13 | --- | TCom13 | --- | | | | |
| SA13 | --- | Com13 | --- | Ast15 | --- | | | | | | |

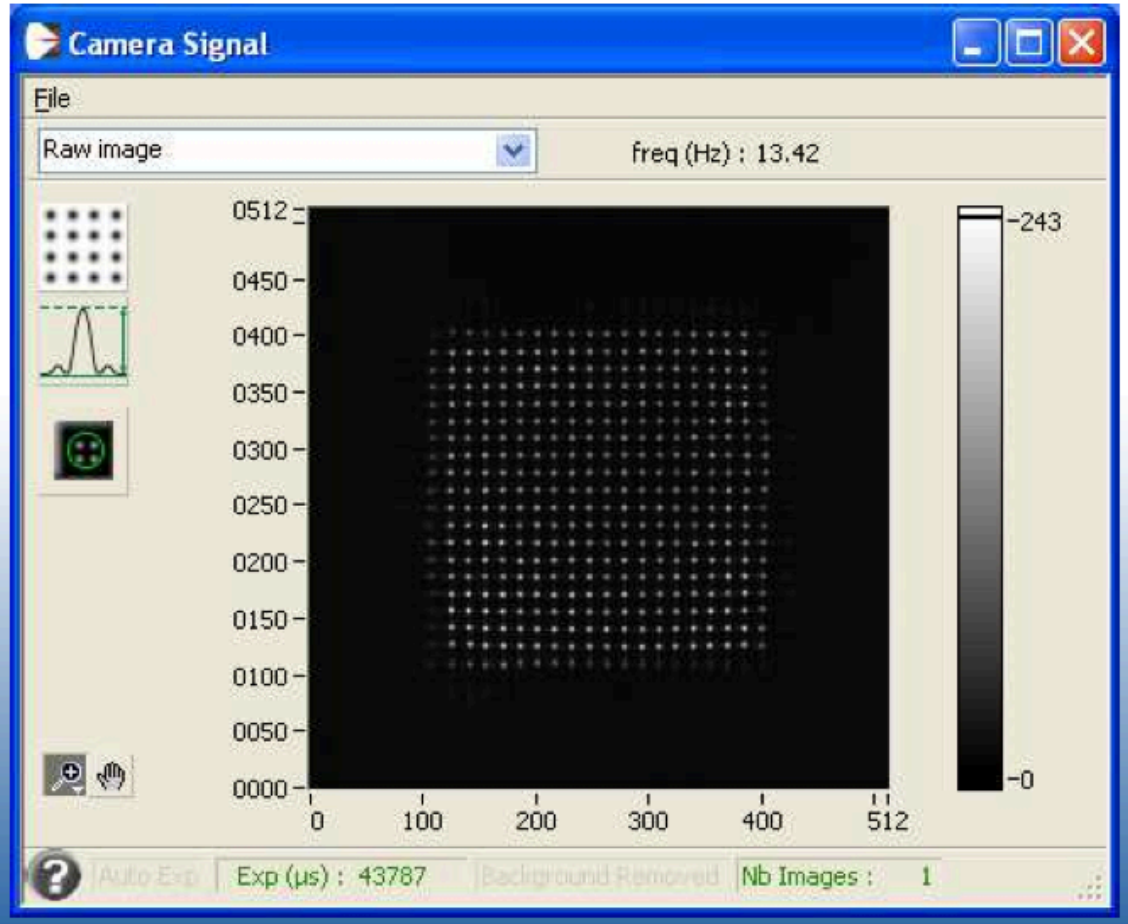
# Photon Path Length

## Surface Data

### Full Aperture – 300 mm

Composite Mirror Applications Inc.

Camera signal showing the microlens array for slope measurements.




Camera Image, Raw data of full aperture of the CFRP mirror.

~20X20 measurement points for a resolution of 15 mm on the surface.

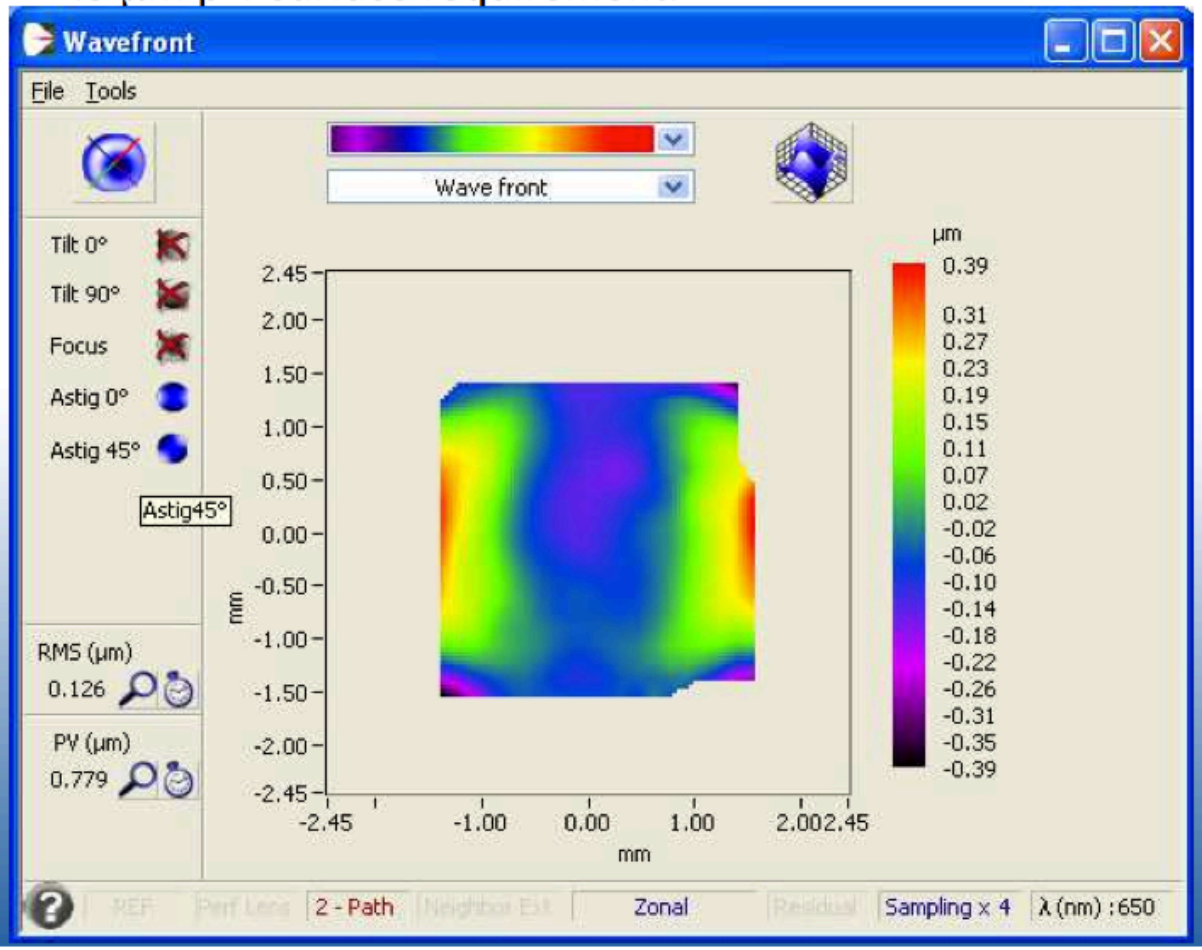
# Photon Path Length

## Surface Data

### Full Aperture – 300 mm

Composite Mirror Applications Inc.

Surface map of the CFRP mirror shows errors of 0.78 μm p-v surface, below the 2.5 μm p-v surface requirement.



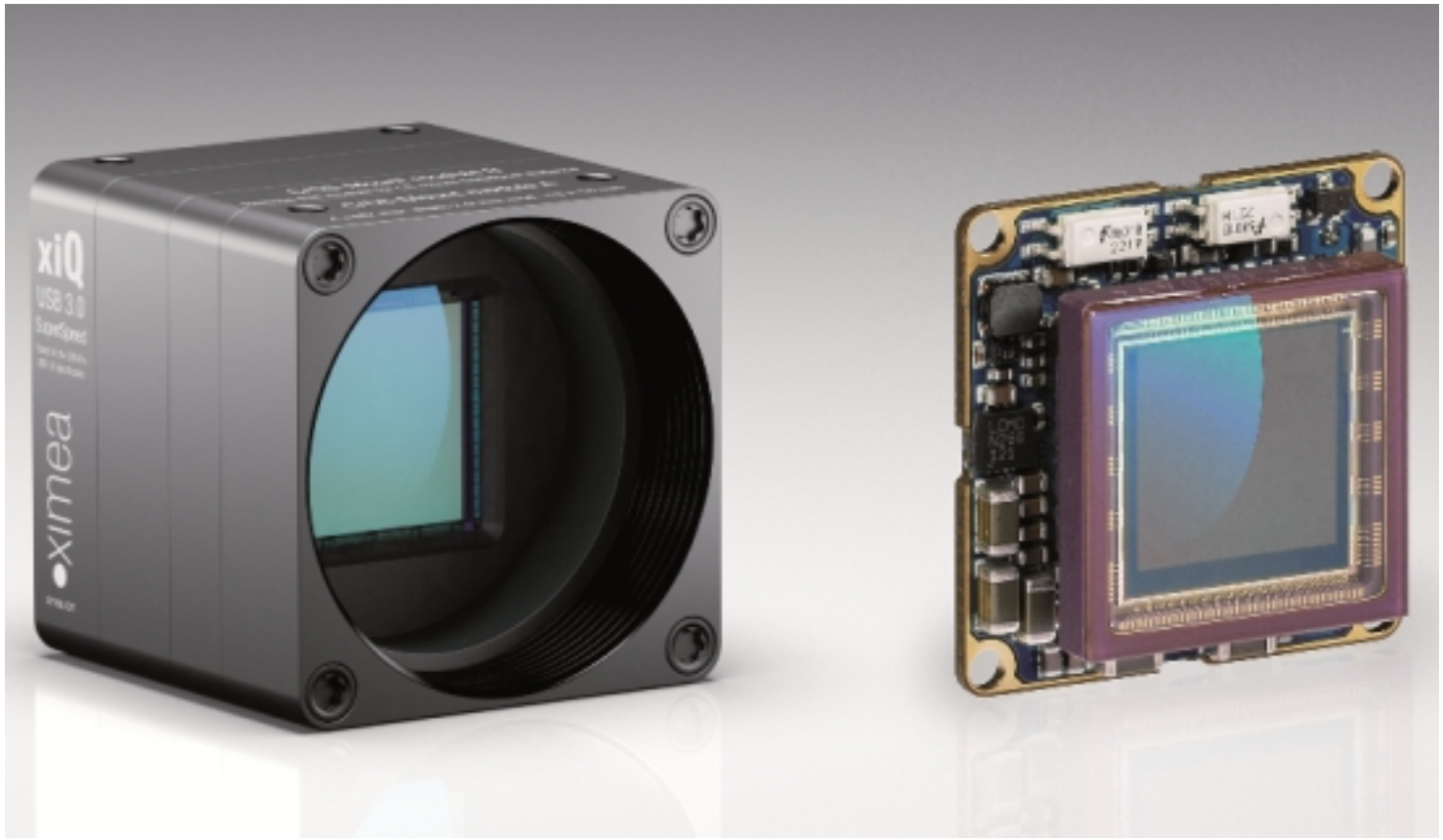

Surface Map of the full aperture of the CFRP mirror. Only tip, tilt and focus removed.

Error is 0.78 μm p-v on the surface.

# XIMEA Electronic Background

USB3.0 drive

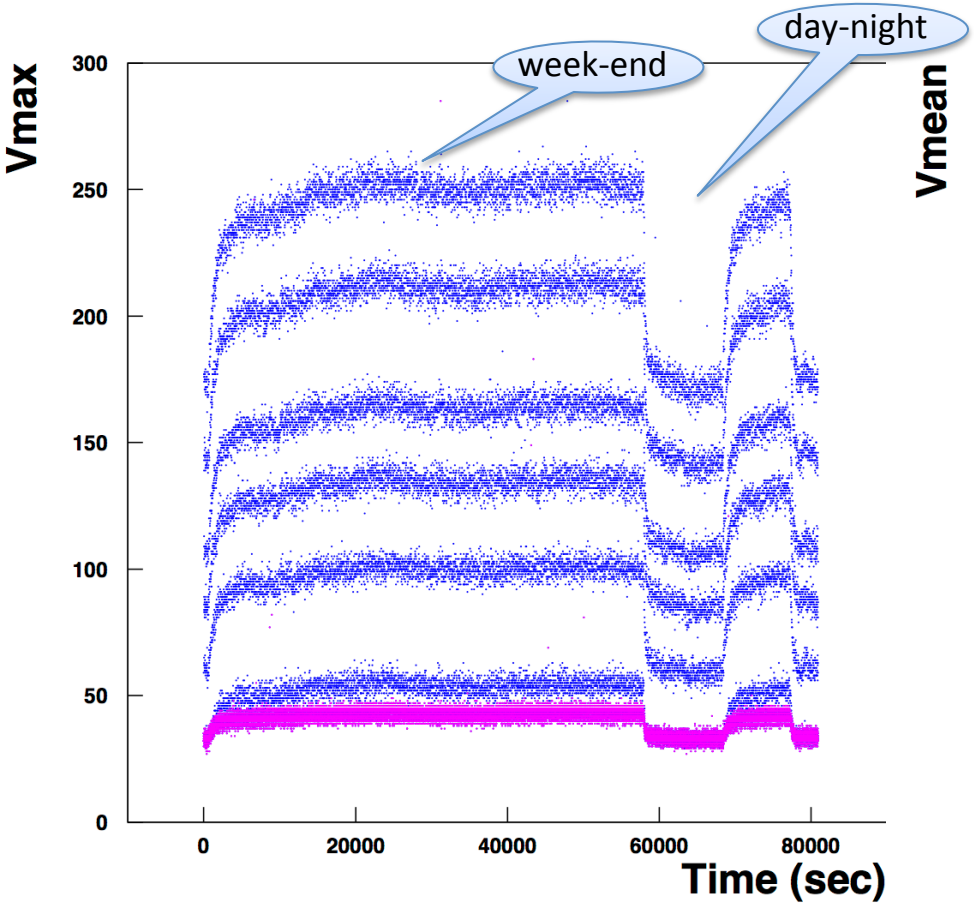
CMOSIS 4-Mpixel, 1 $cm^2$
10-bit resolution
with Temperature sensor

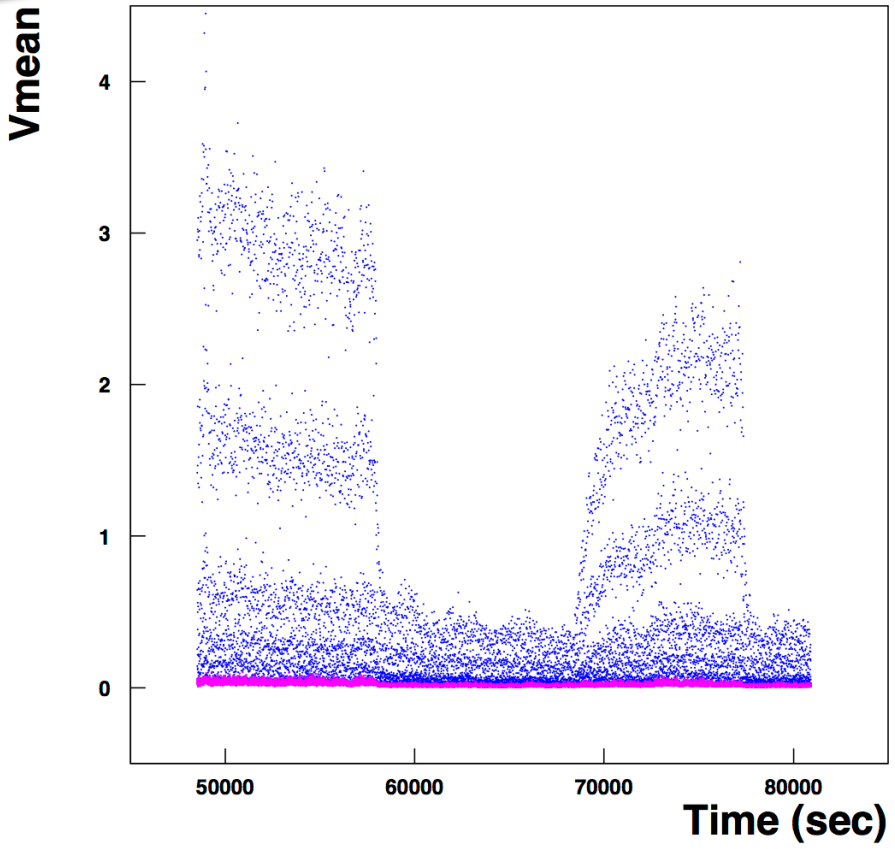


# XIMEA Electronic Background

Recorded Signal with Camera plugged and various exposition times

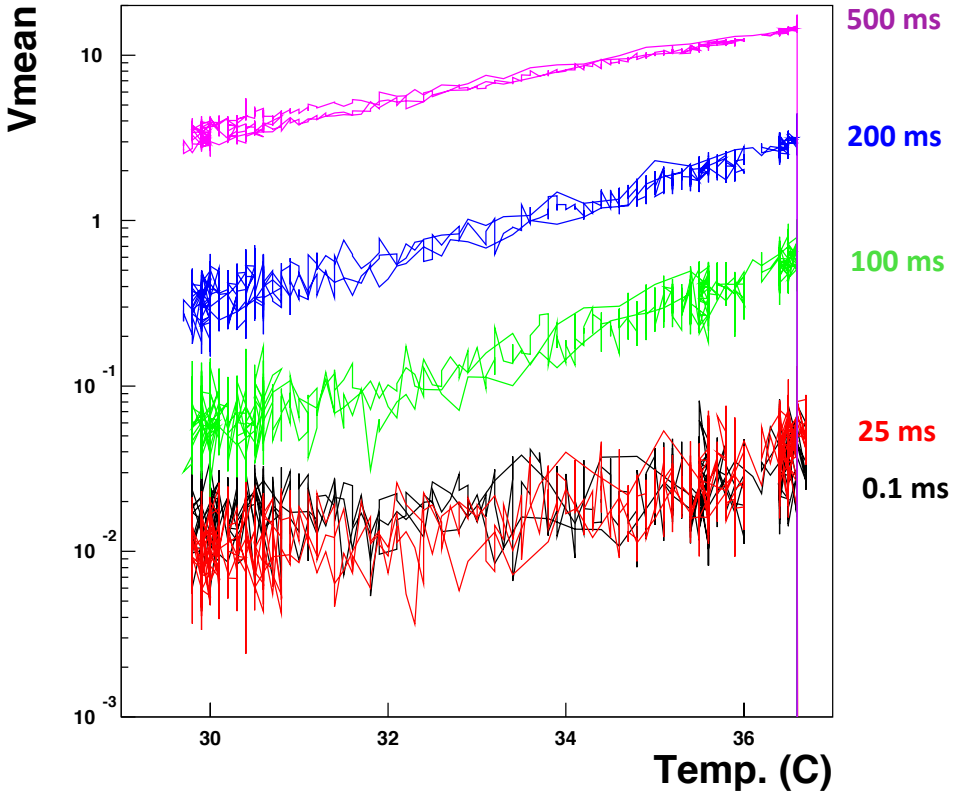
< 20 ms, from 25 up to 200 ms

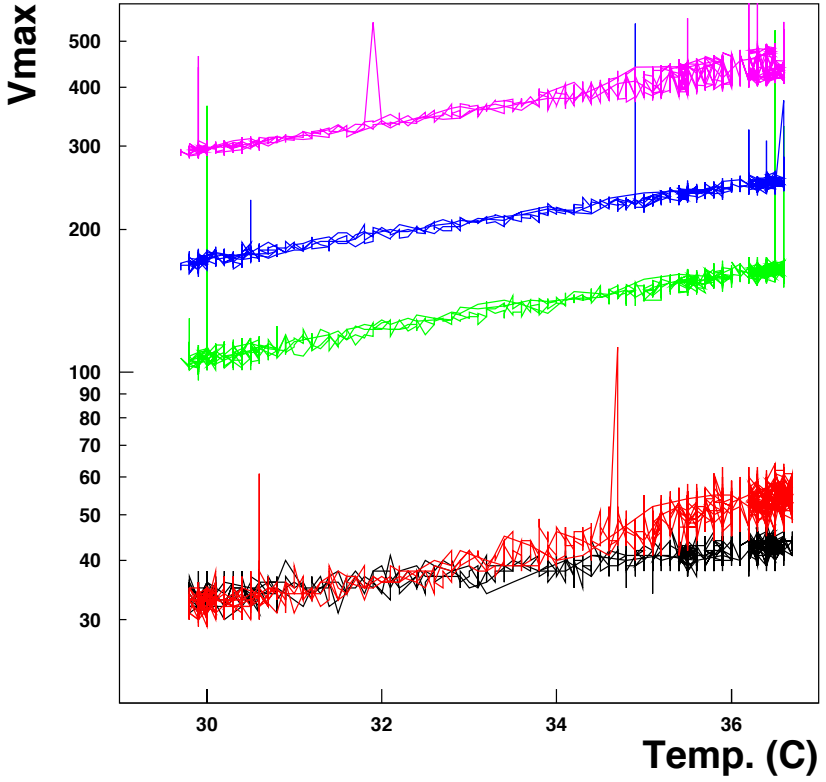


# XIMEA Electronic Background

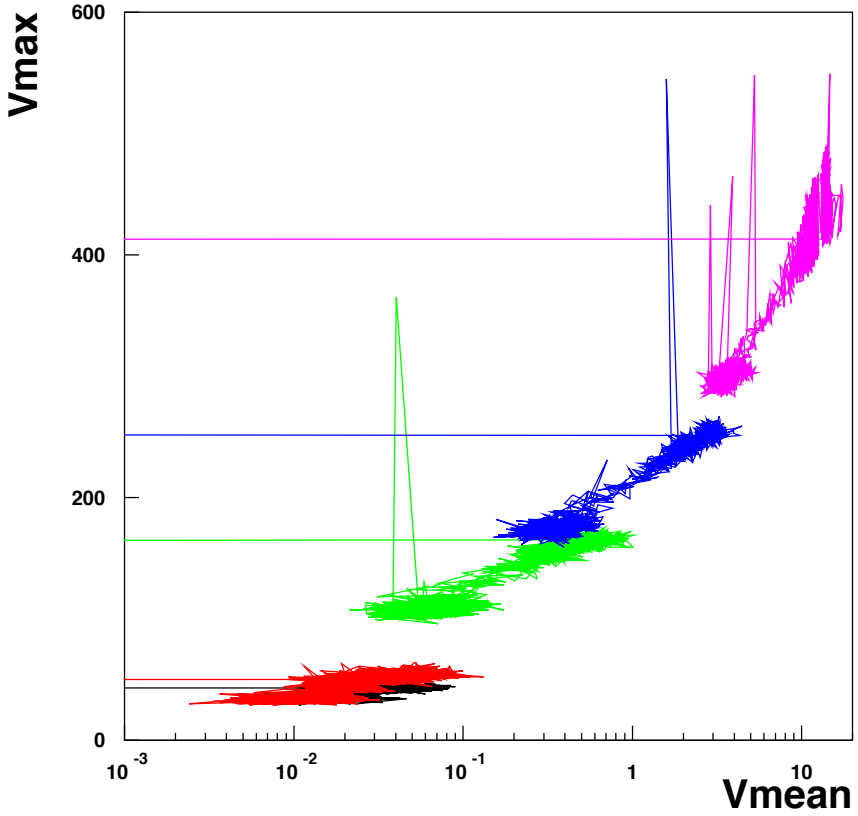
Temperature Scan

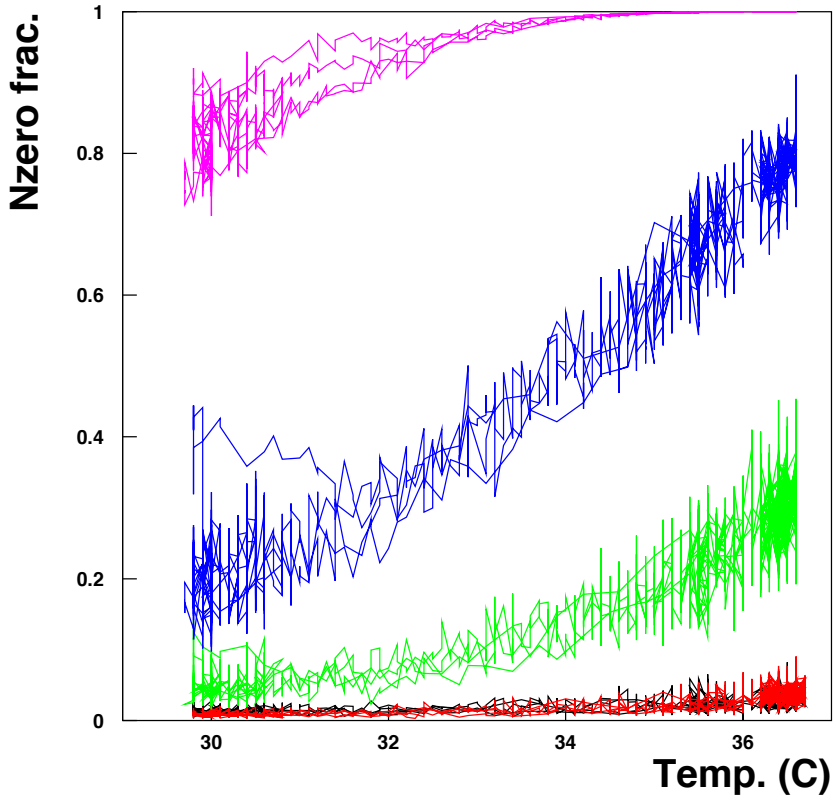


# XIMEA Electronic Background

Temperature Scan



# XIMEA Electronic Background

Exposition Time Scan at 31°

Stable conditions up to 20 ms