

**Application Note: Capture Sequence**

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| Abstract | This documents is an application note |
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Revision history

|  |  |  |
| --- | --- | --- |
| Version | Date | Content |
| 0.1 | 2020/07/22 | Initial version |
| 0.2 | 2020/07/23 | Add chapter about X, Y, Z images |
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# Introduction

Capture sequence captures necessary images to generate X, Y, Z images.

5 capture are used:

- filter X

- filter Xz

- filter Ya

- filter Yb

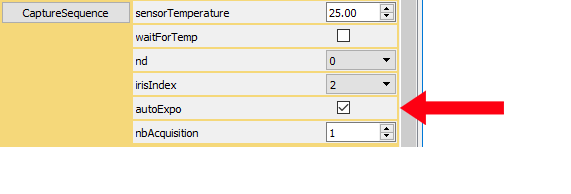
- filter Z

# Exposure time configuration

Capture Sequence exposure time has 3 configurations:  
- AutoExposure  
- All the capture have the same exposure time  
- Exposure time are defined in a json file

## Auto Exposure

Check “**autoExpo**” so the exposure is calculated during the capture processing

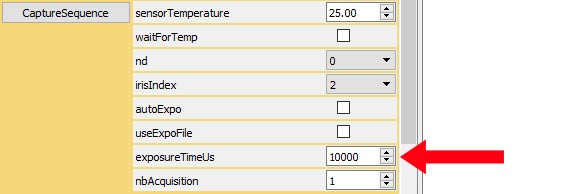


## Manual Exposure

Uncheck “autoExpo” and uncheck “useExpoFile”

Set exposure time in “exposureTimeUs” control.

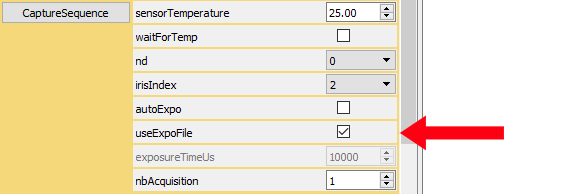
All the captures are done with this exposure time



## Exposure File

Uncheck “autoExpo” and check “useExpoFile”

File “CaptureSequenceExposureTime.json” is used to retrieve the exposure time



If “CaptureSequenceExposureTime.json” does not exist, it is created with default values.

CaptureSequenceExposureTime.json example:

{

"ExposureTimeUs": {

"Filter\_X": 10001,

"Filter\_Xz": 10002,

"Filter\_Ya": 10003,

"Filter\_Yb": 10004,

"Filter\_Z": 10005

}

}

# Timing measurement

## Capture Sequence

Following table lists the steps required in the capture sequence:

|  |  |  |  |
| --- | --- | --- | --- |
|  | step | Step detail |  |
| 1 | Capture image X | Setup | Moves the filters |
|  |  | Measure | use AE or not, saved capture or not |
|  |  | Process |  |
| 2 | Capture image Xz | Setup | Moves the filters |
|  |  | Measure | use AE or not, saved capture or not |
|  |  | Process |  |
| 3 | Capture image Ya | Setup | Moves the filters |
|  |  | Measure | use AE or not, saved capture or not |
|  |  | Process |  |
| 4 | Capture image Yb | Setup | Moves the filters |
|  |  | Measure | use AE or not, saved capture or not |
|  |  | Process |  |
| 5 | Capture image Z | Setup | Moves the filters |
|  |  | Measure | use AE or not, saved capture or not |
|  |  | Process |  |
| 6 | Generate X, Y, Z |  |  |

## Measurement

Measurement depends on the PC performance for **Process** steps.

**Setup** duration is fixed and constrained by HW

Following figures are done for an exposure time of 1000us. (**Measure** duration will increase with exposure time)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | step | Step detail | No AE | AE meas area: 300x200 | AE meas area: full sensor |
|  |  |  |  | Measure is done in several steps of the AE algo |  |
| 1 | image X | Setup | 2.5 | 2.5 | 2.5 |
|  |  | Measure | 0.5 | 0.5 | 1.2 |
|  |  |  | 0.5 | 1.2 |
|  |  |  | 0.5 | 1.2 |
|  |  | Process | 1.8 | 2.2 | 1.8 |
| 2 | image Xz | Setup | 2.5 | 2.5 | 2.5 |
|  |  | Measure | 0.5 | 0.5 | 1.2 |
|  |  |  | 0.5 | 1.2 |
|  |  |  | 0.5 | 1.2 |
|  |  | Process | 1.8 | 2.2 | 1.9 |
| 3 | image Ya | Setup | 2.5 | 2.5 | 2.5 |
|  |  | Measure | 0.5 | 0.5 | 1.2 |
|  |  |  | 0.5 | 1.2 |
|  |  |  | 0.5 | 1.2 |
|  |  | Process | 1.8 | 2.1 | 1.8 |
| 4 | image Yb | Setup | 2.5 | 2.5 | 2.5 |
|  |  | Measure | 0.5 | 0.5 | 1.2 |
|  |  |  | 0.5 | 1.2 |
|  |  |  | 0.5 | 1.2 |
|  |  | Process | 1.8 | 2.5 | 1.9 |
| 5 | image Z | Setup | 2.5 | 2.5 | 2.5 |
|  |  | Measure | 0.5 | 0.5 | 1.2 |
|  |  |  | 0.5 | 1.2 |
|  |  |  | 0.5 | 1.2 |
|  |  | Process | 1.8 | 2.2 | 1.9 |
| 6 | Generate X, Y, Z |  |  |  |  |
|  | **Total** |  | **24** | **33** | **40** |

All sequences have been done in the same conditions.

AE exposure has been configured to be locked within 2 captures.

# X, Y, Z images génération

From the 5 pictures captures during the sequence, X, Y, Z are calculated by applying the calibration factor that have been calculated during the calibration.

## Calibration data

From file **OpticalColumn.xml**, ColorCoefComp and ColorCoefCorr are used

Note ColorCoefComp may be replaced by ColorCoef for older version (Unit1)

Calibration data are stored in an array

colorCoefComp[irisIndex][composantType][filterIndex]

where irisIndex is the index of the iris mounted on the taprisiot [2, 3, 4, 5]

composantType is the type of the image [X, Y, Z]

filterIndex is the filter setup [X, Xz, Ya, Yb, Z]

colorCoefCorr[filterIndex][ndIndex]

where filterIndex is the filter setup [X, Xz, Ya, Yb, Z]

NdIndex is the nd setup [0, 1, 2, 3, 4]

## Processing

irisIndex and NdIndex are the configuration of the Taprisiot

comp\_X = img\_X \* cX +

img\_Xz \* cXz +

img\_Ya \* cYa +

img\_Yb \* cYb +

img\_Z \* cZ

Where cX = CoefComp[irisIndex][X][filter\_X] \* CoefCorr[filter\_X] [NdIndex] / exp(img\_X)

cXz = CoefComp[irisIndex][X][filter\_Xz] \* CoefCorr[filter\_Xz][NdIndex] / exp(img\_Xz)

cYa = CoefComp[irisIndex][X][filter\_Ya] \* CoefCorr[filter\_Ya][NdIndex] / exp(img\_Ya)

cYb = CoefComp[irisIndex][X][filter\_Yb] \* CoefCorr[filter\_Yb][NdIndex] / exp(img\_Yb)

cZ = CoefComp[irisIndex][X][filter\_Z] \* CoefCorr[filter\_Z] [NdIndex] / exp(img\_Z)

comp\_Y = img\_X \* cX +

img\_Xz \* cXz +

img\_Ya \* cYa +

img\_Yb \* cYb +

img\_Z \* cZ

Where cX = CoefComp[irisIndex][Y][filter\_X] \* CoefCorr[filter\_X] [NdIndex] / exp(img\_X)

cXz = CoefComp[irisIndex][Y][filter\_Xz] \* CoefCorr[filter\_Xz][NdIndex] / exp(img\_Xz)

cYa = CoefComp[irisIndex][Y][filter\_Ya] \* CoefCorr[filter\_Ya][NdIndex] / exp(img\_Ya)

cYb = CoefComp[irisIndex][Y][filter\_Yb] \* CoefCorr[filter\_Yb][NdIndex] / exp(img\_Yb)

cZ = CoefComp[irisIndex][Y][filter\_Z] \* CoefCorr[filter\_Z] [NdIndex] / exp(img\_Z)

comp\_Z = img\_X \* cX +

img\_Xz \* cXz +

img\_Ya \* cYa +

img\_Yb \* cYb +

img\_Z \* cZ

Where cX = CoefComp[irisIndex][Z][filter\_X] \* CoefCorr[filter\_X] [NdIndex] / exp(img\_X)

cXz = CoefComp[irisIndex][Z][filter\_Xz] \* CoefCorr[filter\_Xz][NdIndex] / exp(img\_Xz)

cYa = CoefComp[irisIndex][Z][filter\_Ya] \* CoefCorr[filter\_Ya][NdIndex] / exp(img\_Ya)

cYb = CoefComp[irisIndex][Z][filter\_Yb] \* CoefCorr[filter\_Yb][NdIndex] / exp(img\_Yb)

cZ = CoefComp[irisIndex][Z][filter\_Z] \* CoefCorr[filter\_Z] [NdIndex] / exp(img\_Z)