



Application Note: Capture Sequence

Abstract This documents is an application note

Version 0.2
Status Draft 2020/07/23

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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1 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

2 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

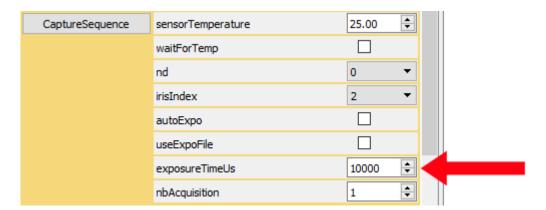
2.1 Auto Exposure

Check "autoExpo" so the exposure is calculated during the capture processing



2.2 Manual Exposure

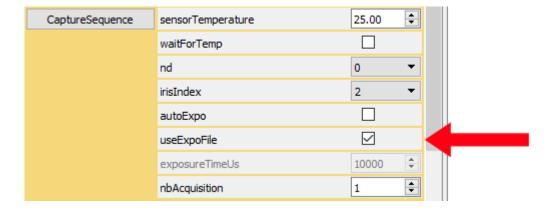
Uncheck "autoExpo" and uncheck "useExpoFile" Set exposure time in "exposureTimeUs" control. All the captures are done with this exposure time



2.3 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
    }
}
```

3 Timing measurement

3.1 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		Setup	Moves the filters	
		Measure	use AE or not, saved capture or not	
		Process		
3 Capture image Ya Setup		Setup	Moves the filters	
		Measure	use AE or not, saved capture or not	
		Process		
4 Capture image Yb Setup		Setup	Moves the filters	
		Measure	use AE or not, saved capture or not	
		Process		
5 Capture image Z Setup		Setup	Moves the filters	
		Measure	use AE or not, saved capture or not	
		Process		
6	Generate X, Y, Z			

3.2 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	AE
				meas area: 300x200	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.

4 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.

4.1 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]
```

4.2 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)
```