



ELDIM
ELECTRONICS FOR DISPLAYS AND IMAGING DEVICES

Application Note: Auto Exposure

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Revision history

Version	Date	Content
0.1	2020/07/22	Initial version

ELDIM
1185 Rue d'Epron (Ancienne)
14200 Hérouville Saint-Clair
France

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1 Introduction

Measurement can be performed with Auto Exposure (command **MeasureAE**)
MeasureAE command works with several iterations and will take more time than Measure command.

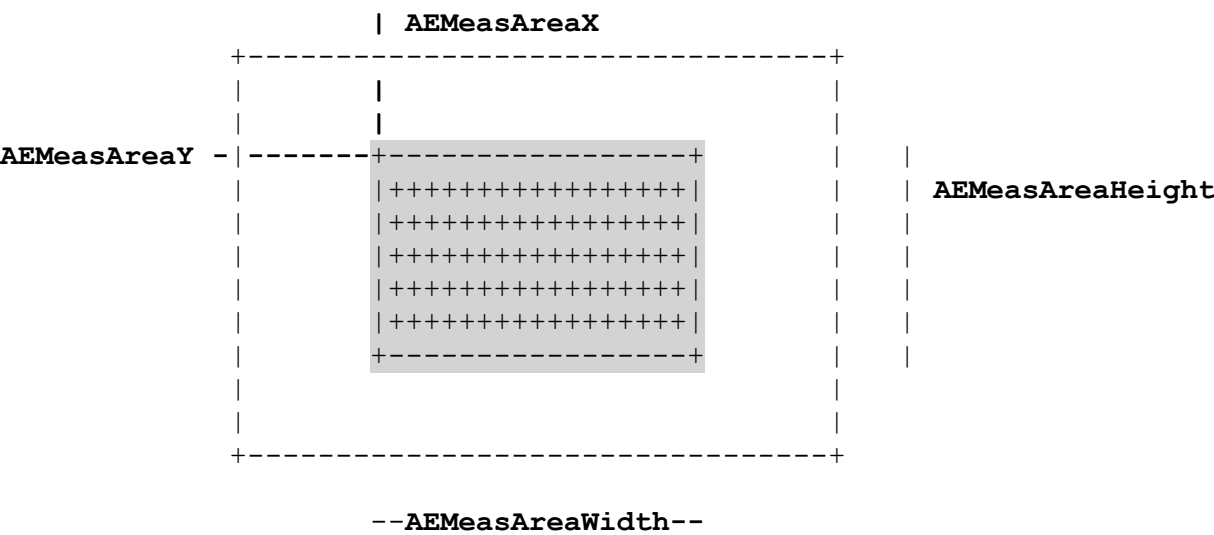
2 Mechanism

During the algorithm, an image is captured and processed (defect pixels only).
Then brightest pixel is measured and compared to a reference value.
Depending on the result of this measurement, exposure time is changed if the measurement does not fit the criteria or the capture is done.

The brightest pixel is picked inside the **measurement area**. The Smaller the area is, the faster the algorithm.

3 Measurement Area

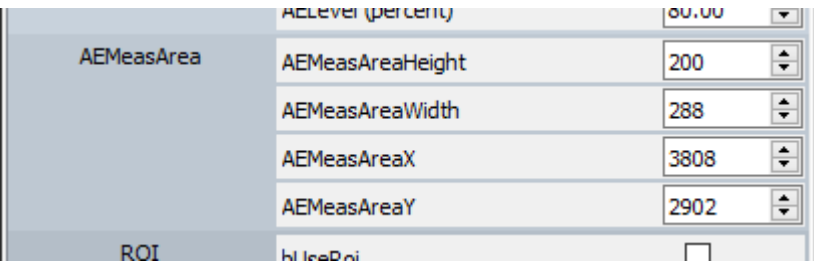
The area where the measurement is done for the auto exposure algorithm.
note: the bigger the area is, the slower the algorithm is.



3.1 Parameter range

Name	Min	Max	Alignment
AEMeasAreaHeight	0	6004	4
AEMeasAreaWidth	0	7920	16
AEMeasAreaX	0	7920	16
AEMeasAreaY	0	6004	2

Following is a 300*200 area in the center of the sensor



3.2 Measurement Area Disabling

if all the parameters are set to 0, the measurement area is the full sensor

	AELevel (percent)	80.00	▲▼
AEMeasArea	AEMeasAreaHeight	0	▲▼
	AEMeasAreaWidth	0	▲▼
	AEMeasAreaX	0	▲▼
	AEMeasAreaY	0	▲▼
ROI	hlIsRoi	<input type="checkbox"/>	

4 AutoExposure Usage

4.1 Configuration of criteria

In the algorithm, the brightest pixel is measured and compared to a reference value.

This reference value is a percentage of saturation and can be tuned with parameter **AELevel**

CONOSCOPE_DEMO - 0.11.29 (2020/07/02)

CONOSCOPE_LIB 0.12.39 (2020/07/21 debug_03)
PIPELINE LIB 0.4.9 (2020/07/01)

SetConfig

cfgPath E:\TmpConoscope\15\Cfg
capturePath ./capture
fileNamePrep
fileNameApp
exportFileNa
exportFormat bin
emulatedCamera
AE
AEMinExpoTimeUs 11
AEMaxExpoTimeUs 980000
AEEspoTimeGranularityUs 1
AELevel (percent) 80.00
AEMeasArea
AEMeasAreaHeight 0
AEMeasAreaWidth 0
AEMeasAreaX 0
AEMeasAreaY 0
ROI
bUseRoi
Open

Opened
[APP] Capture | CmdSetup Done
[APP] Capture | CmdMeasure 1000 us
[APP] Capture | CmdExportProcessed
[APP] Capture | filter Yb
[APP] Capture | CmdSetup Done
[APP] Capture | CmdMeasure 1000 us
[APP] Capture | CmdExportProcessed
[APP] Capture | filter Z
[APP] Capture | CmdSetup Done
[APP] Capture | CmdMeasure 1000 us
[APP] Capture | CmdExportProcessed
[APP] Capture | CaptureSequence DON
Worker : done
AppController : on r
AppController SM : proc
AppController SM : stat

4.2 MeasureAE

In **MeasureAE** command, parameter **exposureTimeUs** will be the starting point of the algorithm.

MeasureAE

exposureTimeUs 1000
nbAcquisition 1
ExportRaw
ExportProcessed
Close

The closer **exposureTimeUs** is to the target, the faster the algorithm will be.

For example:

if the target is around 1500 us.

When **exposureTimeUs** set to 1000, the algorithm will require 3 steps:

```
AppController      : MeasureAE Ok
AppController      : -> Ok
AppController      : -> TaktTimeMs 7
Worker             : done request [CmdMeasureAE] Ok
AppController      : on request done [CmdMeasureAE] Ok
[APP] Capture | [AutoExp] CmdMeasure expTime = 1000 us (1) pixelMax = 2173 Capture | UNLOCKED -> next expTime = 1543 us
[APP] Capture | [AutoExp] CmdMeasure expTime = 1543 us (1) pixelMax = 3092 Capture | UNLOCKED -> next expTime = 1637 us
[APP] Capture | [AutoExp] CmdMeasure expTime = 1637 us (1) pixelMax = 3258 Capture | LOCKED
Worker             : done request [EventMeasureAEDone] Ok
AppController      : on request done [EventMeasureAEDone] Ok
AppController SM   : process event [MeasureAEDone] in state [MeasuringAE]
AppController SM   : state change to [MeasureDone]
```

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When **exposureTimeUs** set to 100000, the algorithm will require 8 steps:

```
AppController      : MeasureAE Ok
                   : -> Ok
                   : -> TaktTimeMs      4
Worker             : done      request [CmdMeasureAE] Ok
AppController      : on request done [CmdMeasureAE] Ok
[APP] Capture | [AutoExp] CmdMeasure expTime = 100000 us (1) pixelMax = 4095 Capture | UNLOCKED -> next expTime = 50000 us
[APP] Capture | [AutoExp] CmdMeasure expTime = 50000 us (1) pixelMax = 4095 Capture | UNLOCKED -> next expTime = 25000 us
[APP] Capture | [AutoExp] CmdMeasure expTime = 25000 us (1) pixelMax = 4095 Capture | UNLOCKED -> next expTime = 12500 us
[APP] Capture | [AutoExp] CmdMeasure expTime = 12500 us (1) pixelMax = 4095 Capture | UNLOCKED -> next expTime = 6250 us
[APP] Capture | [AutoExp] CmdMeasure expTime = 6250 us (1) pixelMax = 4095 Capture | UNLOCKED -> next expTime = 3125 us
[APP] Capture | [AutoExp] CmdMeasure expTime = 3125 us (1) pixelMax = 4095 Capture | UNLOCKED -> next expTime = 1562 us
[APP] Capture | [AutoExp] CmdMeasure expTime = 1562 us (1) pixelMax = 3118 Capture | UNLOCKED -> next expTime = 1643 us
[APP] Capture | [AutoExp] CmdMeasure expTime = 1643 us (1) pixelMax = 3293 Capture | LOCKED
Worker             : done      request [EventMeasureAEDone] Ok
AppController      : on request done [EventMeasureAEDone] Ok
AppController SM   : process event [MeasureAEDone] in state [MeasuringAE]
AppController SM   : state change to [MeasureDone]
```

Note:

During MeasureAE processing, it is possible to know the status of the processing (**MeasureAEStatus**) and to stop the processing (**MeasureAECancel**)

4.3 CaptureSequence

Similarly to MeasureAE, it is possible to set starting point of the AE algorithm.

To set **exposureTimeUs**, follow those steps:

- configure the CaptureSequence without AE (uncheck **autoExpo** parameter)

CaptureSequence	sensorTemperature	25.00
waitForTemp		<input type="checkbox"/>
nd		0
irisIndex		5
autoExpo		<input type="checkbox"/>
useExpoFile		<input type="checkbox"/>
exposureTimeUs		1000
nbAcquisition		1
bSaveCaptures		<input checked="" type="checkbox"/>

- Set **exposureTimeUs**

- then enable AE by checking **autoExpo**.

CaptureSequence	sensorTemperature	25.00
waitForTemp		<input type="checkbox"/>
nd		0
irisIndex		5
autoExpo		<input checked="" type="checkbox"/>
nbAcquisition		1
bSaveCaptures		<input checked="" type="checkbox"/>

Then launch the capture by pressing **CaptureSequence**.