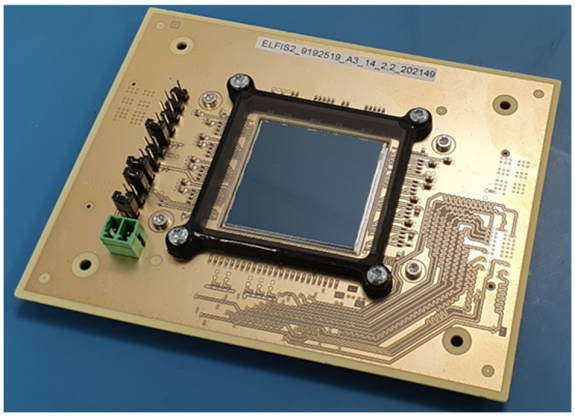
CAE303 “ELFIS2”



As successor of the ELFIS the “ELFIS2” image sensor combines a unique set of desired image sensor features, the result of Caeleste’s “beyond state of the art” design legacy and LFoundry’s LF11IS technology with BSI.

Features

- (N*512)*(M*1024) pixels.
  Stitching of unit pixel block from minimal 512x1024 pixels to wafer scale.
- 15 µm pixel pitch
- 12µm epi layer
- Global shutter using a “GS” CMOS technology with buried storage node
- TID, SEU and SEL rad-hard
- QE > 90% by backside illumination
- Dual Gain:
  - High Gain: Q_{FW} = 6ke$^-$
  - Low Gain: Q_{FW} = 300ke$^-$ (ITR) or 150ke$^-$ (IWR)
- “True” (motion artifact free) High Dynamic Range method based on the patented “3-level TG” method, reaching a single exposure, single integration time, synchronous dynamic range > 100dB
- Image Lag < 0.5%
- PLS 1/500 at 830nm
- $MTF_{Nyquist}$ 0.6[1]
- Read noise using CDS <5.5e$^-_{RMS}$ (nominal) <2.5e$^-_{RMS}$ (low noise mode)
- 141 frames/second for 2k x 2k pixels at 40MHz pixel rate, single pass.

Application

Space based remote sensing
Space and earth based astronomy
Scientific imaging
Imaging in nuclear environment

More Information

sales@caeleste.be
see also http://caeleste.be/white papers ELFIS

[1] Information on thicker epi material on request

Speed estimates for ELFIS2

Nominal or maximal full frame rate is obtained with

- ⇒ all outputs running at nominal speed of 40Mpix/s
- ⇒ a single pass, i.e. no HDR mode, reading a single “range”, with or without CDS.
- ⇒ a row overhead time of 3µs is assumed (*) and 100µs frame overhead time.

When using ROI (region of interest) in Y-direction

- ⇒ the frame time reduces proportionally with the ROI size in Y
- ⇒ there is not speed advantage in using X-direction ROIC.

When operating in HDR mode

- ⇒ one reads each frame in two passes, hence this halves the frame rate

When operating in low noise mode

- ⇒ The output runs at half the speed, the frame rate roughly halves

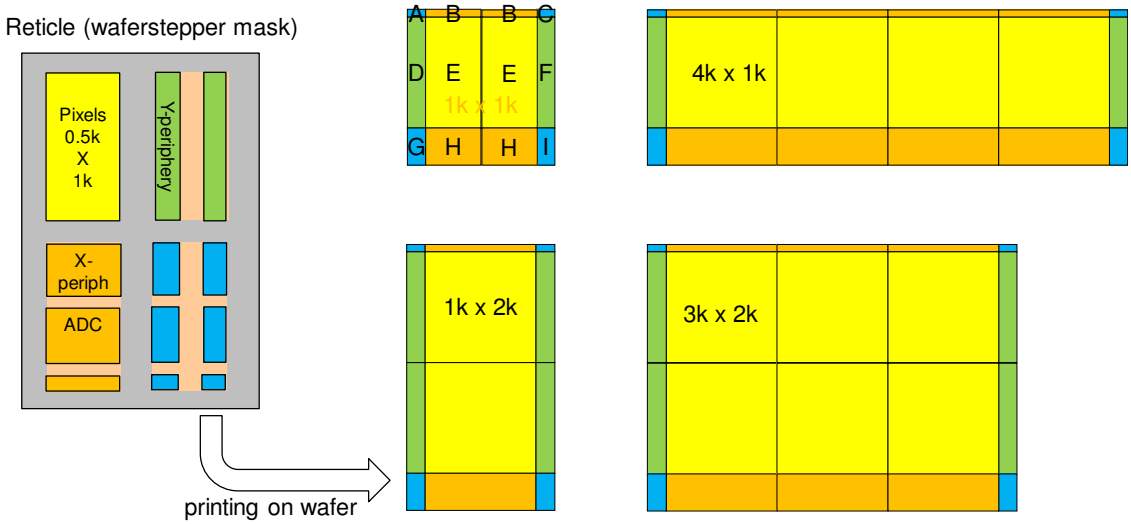
When enhancing the low noise mode with oversampling

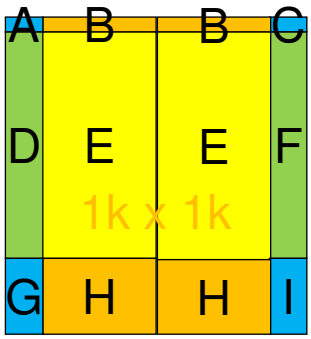
- ⇒ The frame rate is divided worse case by the oversampling factor. Worse case because the row overhead time does not increase.

X pixels	Y pixels	Nominal frame rate [fps]
2k	500	560
2k	1k	280
2k	2k	141
4k	4k	72 (*)
8k	8k	35 (*)

(*) row overhead time is needed to allow settling of pixel controls and outputs. Larger stitched arrays may require much longer settling times: the quoted frame rates are thus overestimations. These values must be updated after design.

Stitching and geometry





	A	B	C
X size in µm	1570	7680	1570
Y size in µm	1040	1040	1040
	D	E	F
	1570	7680	1570
	15360	15360	15360
	G	H	I
	1570	7680	1570
	2200	2200	2200

Calculation Example for the size of a 4k x 4k device.

actual device		
X blocks	8	
Y blocks	4	
X pixels	4096	
Y pixels	4096	
X dimension	64580	µm
Y dimension	64680	µm