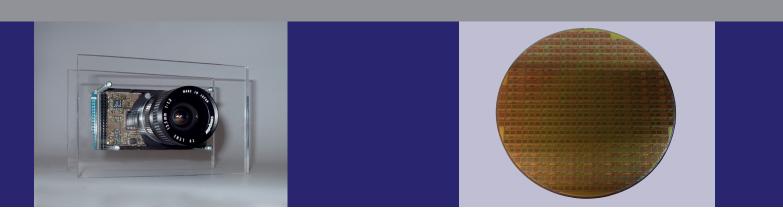


#### FRAUNHOFER INSTITUTE FOR MICROELECTRONIC CIRCUITS AND SYSTEMS IMS



- 1 Eval-Kit camera system.
- 2 Wafer carrying linear sensors.

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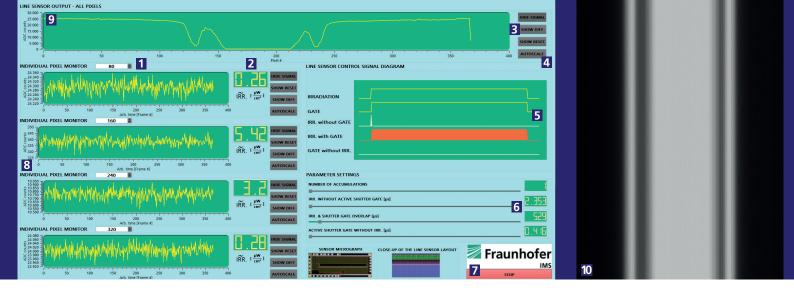
# EVALUATION KIT FOR LINEAR SPECTROSCOPY SENSORS

Our new EvalKit for linear spectroscopy sensors supports product managers and R&D departments in their development tasks. You will have a complete spectroscopy camera system, which enables testing the functionality and performance of our linear sensors. Adjustments to customer's applications are possible within a wide range of flexibility.

The EvalKit for the spectroscopy line sensor is used for raw data image acquisition in time-gated measurements. The designed detector exhibits a very high sensitivity in a broad spectral range, starting from the UV up to the NIR, as it is required in dedicated applications. The photogenerated charge is accumulated over several programmable measurement cycles without the need of resetting, thanks to the very low dark current profile of the linear sensors. In our sensor family, a high dynamic range and pulse gated image acquisition has been realized along with the non-destructive readout and in-pixel accumulation possibilities. This makes the EvalKit for spectroscopy line sensors an ideal candidate for optical emission spectroscopy applications.

With the EvalKit software it is possible to display raw line sensor pixel signals, as well as corrected signals utilizing digital double sampling. The analog to digital conversion is performed by a high performance 16bit 10MHz A/D converter, enabling noise measurements for sensor characterization. The image output is available in spatial representation of the integrated, 368 spectroscopy pixel line with an option to display additional waveforms of 4 arbitrary pixel signals. In addition, a FIFO based waterfall like visualization of the sensor pixel signals with a memory of the last 50 lineframes is also available in the software.

By employing the acquisition control signals represented by different sliders in the EvalKit GUI, a user has an option to realize a large variety of pulse illuminated measurements, which are capable of capturing the pulse shape of the illumination source for calibration and / or measurement purposes. Moreover, the effective dynamic range of the sensor can be adapted to the illumination conditions by adjusting the number of accumulations.



#### **EvalKit Specifications**

#### **Evaluation Kit**

Supply voltage 12 V/1 A via wall power supply

Power consumption 3W

Lens Standard C-Mount 1/3" (not included)

Board dimensions  $98.9 \,\mathrm{mm} \times 53 \,\mathrm{mm}$  Operating temperature  $-20 \,^{\circ}\mathrm{C}$  up to  $+60 \,^{\circ}\mathrm{C}$ 

Standard accessory

USB driver FTDS, Visualization
Sensor

368 × 1 Pixel CMOS LDPD

Line rate 25 Hz

Data format 16 bit / 100 kHz

Interface USB 2.0 (Raw sensor data, configuration and control)

Illumination gate signal LV CMOS 3.3 V output Configuration software Arduino, openCV, Qt System requirements Windows 7 PC Operating manual Included

(development source upon customer request)

## **CMOS Spectroscopy linear sensor**

Spatial resolution 368 x 1

Pixel pitch/size 10 μm \* 200 μm

Conversion gain  $17 \,\mu\text{V/e}^{-}$ 

Spectral range 250 nm up to 1000 nm

Responsivity @ 525 nm 530  $V/(\mu J/cm^2)$ 

Quantum efficiency @ 525 nm 60 % 0.5 % Linearity Saturation capacity 59 ke<sup>-</sup> Sense node capacitance 7.50 fF Signal-to-noise ratio 47 dB Dynamic range 63 dB Read noise 38e-DSNU1288 7.5 mV PRNU1288 1.6% Electrical crosstalk < 4 % Dark signal (T≈22°C) 75 mV/s

Process 0.35 µm CMOS + LDPD + UV-Transparent Passivation

## 3 Layout items of Graphical User Interface (GUI):

- **1** Geometrical position of the pixel on the line sensor (i.e. pixel select)
- 2 Calculated irradiance for selected pixel
- Buttons enable/disable monitoring of individual pixel parameters
- 4 Autoscale switch for the Y axis
- A display to monitor temporal relation of sensor digital control signals with respect to each other
- 6 Sensor digital control signal timing configuration
- 7 Start sensor readout
- 8 Four displays to track evolution of the pixel parameters for individual (selected ) pixels
- 9 Displays instantaneous pixel parameter values of the whole line sensor
- Waterfall visualization of last 50 lines in separate window