APN-002
InGaAs sensor selection

Overview

InGaAs sensors cover the spectral range of 900 to 2550 nm:

- NIR: 780 to 1400 nm

- SWIR: 1400 to 3000 nm

When selecting an InGaAs sensor the following should be considered:

- TE-cooled vs. non-cooled

- Extended spectral range

- Number of pixels and line rate

TE-cooled vs. non-cooled

Non-cooled

Non-cooled sensors have a larger dark current and are limited to the NIR spectral range. The following needs to be considered:

- Cheaper compared to TE-cooled sensors

- Spectral range up to 1700 nm

- Large dark current limit the integration times (>10 ms)

- Uses standard camera enclosure

Non-cooled sensors are recommended for the following applications:

- Measurements in the NIR spectral range up to 1700 nm

- Short integration times (<1 ms)

- Uses the same small enclosure as our CMOS cameras and can be mounted standalone

TE-cooled

TE-cooled sensors extend the spectral range into SWIR range. The following needs to be considered:

- Between 2 and 3 times more expensive than non-cooled sensors

- Spectral range up to 2550 nm

- Low dark current and allows long integration times (>1 s)

- Requires TE-cooling and the camera is bigger

TE-cooled sensors are recommended for the following applications:

- Measurements in the SWIR spectral range up to 2550 nm

- Handles long integration times if required (>1 s)

- Mounted onto a spectrometer (e.g. Andor Shamrock)

Extended spectral range

Typical InGaAs sensors cannot measure below 900 nm. TE-cooled sensors extend the spectral range into the SWIR (900 to 2550 nm). However, Hamamatsu also offers non-cooled sensors that have a wider spectral range and also cover part of the visible spectrum. For extended spectral range we can recommend:

- G11608

- Spectral range: 500 to 1700 nm

Number of pixels and line rate

Most Hamamatsu CMOS sensors use a pixel clock of 20 MHz. InGaAs sensors use a pixel clock of 10 MHz. As a result, InGaAs sensors have a lower line rate compared to CMOS sensors. To get around this problem, some InGaAs sensors can have more than one readout port. For example, the G11478-512WB has two readout ports - one for even and one for odd pixels. The Glaz LineScan can handle up to two readout ports. The two readout ports are not identical and have different readout offsets. It is important to do background subtraction to get the best results.

Summary

Below is a summary of available sensors:

Sensor	Type	Pixels	Spectral range	Line rate
G11620-512DA	Standard	512	915-1700 nm	9100 lines/s
G11620-256DA	Standard	256	915-1700 nm	15000 lines/s
G11608-256DA	Wide range	256	500-1700 nm	15000 lines/s
G11478-512WB	TE-cooled	512	900-2550 nm	9000 lines/s