

Interpolative Blemish Corrections on sCMOS - How to switch ON/OFF

Technical Article

Classification, Identification and Filtering of Blemish Pixels

Andor's Neo and Zyla cameras are equipped with considerable FPGA processing power which is utilized to filter the small percentage of blemishes from the image sensor. This filter identifies and compensates for three types of blemishes which are corrected for during the FPGA processing step:

1. 'Hot Pixels' – These are pixels with darkcurrent significantly above the average. To identify, Andor take a long exposure image and create a map of dark current across the image. Pixels that have a dark current value above a set threshold are labelled as 'Hot Pixels'.
2. 'Noisy Pixels' – These are pixels with read noise significantly above the average. To identify, Andor create a map of read noise for every pixel in the sensor. Pixels that have a read noise value above a set threshold are labelled as 'Noisy Pixels'.
3. 'Variable Responsivity Pixels' - Andor take a uniformly illuminated image at half well depth. This image is flat fielded to correct for any illumination non-uniformity. Pixels that have responsivity less than 75%, or greater than 125% of the global average are labelled as 'Variable Responsivity Pixels'.

The above blemish types are processed in the FPGA of the camera in real time, using an Interpolative Filter. This filter works by calculating the mean of the surrounding 8 pixel values and replacing this central blemish pixel with this mean value.

However, such interpolation over pixel blemishes can be considered detrimental in some specific applications that depend on total quantitative integrity over a limited set of pixels, for example in localization based super-resolution microscopy (such as PALM and STORM techniques) and astronomy. In these applications it can be beneficial for the user to be able to switch off interpolative corrections, which Andor have made possible. In this technical note, the instructions for turning this correction switch on/off are described for both Andor Solis acquisition software and Andor SDK3.

Turning Blemish Corrections ON/OFF

From the latest general release of Andor SDK3 (minimum version 3.7.30004) and Solis (minimum version 4.24.30004) this blemish correction can be switched on and off by the user.

SDK3

In SDK3 the Boolean feature is named StaticBlemishCorrection. Details of SDK3 feature control can be found in the Andor SDK3 manual.

Feature	Type	Description	Availability
StaticBlemishCorrection	Boolean	Enables or Disables Static Blemish Correction	Neo, Zyla

Solis

In Solis the user can switch this feature on and off using the following command in Andor basic:

`booleanfeatureenable("StaticBlemishCorrection", 0)` This Turns off Static Blemish Corrections

`booleanfeatureenable("StaticBlemishCorrection", 1)` This Turns on Static Blemish Corrections

Access to Hot Pixel Maps

Some applications can be particularly susceptible to hot pixel blemishes. Thermoelectric cooling of the sensor (e.g. to -30oC in the Neo), is instrumental in dramatically minimizing the occurrence of such hot pixels within the sensor, meaning that these pixels can still be used for useful quantitative imaging. However, knowledge of the location of the remaining hot pixel population can still be useful to some users, such that they can account for them in their processing stages.

Andor can work with the end user to generate a bespoke 'hot pixel map' of their sCMOS sensor. This map will be generated based on the experimental conditions outlined by the end user, such as exposure conditions and intensity threshold.