Peak detector:

The peak detection block gets input data stream signal from the moving average filter and generates 2 data numbers, 30 bits width each, at peak_valid when enabled. Those 2 numbers are the enumerator and the denominator of center of mass following equation(it should be used to get the peak pixel index number).

6 x 10 bits of peak is forward out, 30 bits enumerator (integer) and 30 bits denominator (integer). The first integer (enumerator) is sent with 3 chunks (clocks) of 10 bits [29:0]; 9:0 send first, 19:10 send second, 29:20 send third. The second integer (denominator) is sent with the same order as the first on the last 3 chunks.

Peak index number can be calculated by enumerator of 30 bits divide by denominator of 30 bits at chip data out.

When moving average block is disabled, the peak detection gets the data signal direct from the driver.

Important signals:

Control Register Name	Description
MAVG_EN	Filter enabled/disabled.
MVAVGWIN_SEL	Selects the window for filter calculate average out. Average window values supports: 2,4,8,16.

Algorithm Equation for center of mass

The center of mass index C_x is calculated from the pixel index C_{i_x} and the pixel intensity A_i.

The Formula is:

$$C_x = \frac{\sum C_{i_x} A_i}{\sum A_i}$$

Pixels' data will not be inserted to peak calculation in one of the next cases:

1. when pixels are out of WOI range in row.
2. Pixel data value is lower than threshold parameter.

Moving average:

The moving average block is a noise filter used for smoothing the measured signal. This functionality is beneficial for getting cleaner data signal to the system, reducing the requirement of the system to do its own filtering on the incoming data, in addition it also improves the peak detector block output by removing noise that might influence peak detection calculation. This filter depth can be configured by the system to tailor it to the specific needs of the system.

The filter makes its calculations only on WOI (window of interest) pixels in row.

Important signals:

Control Register Name	Description
MAVG_EN	Filter enabled/disabled.
MVAVGWIN_SEL	Selects the window for filter calculate average out. Average window values supports: 2,4,8,16.

Moving Average Algorithm

The moving average block implements the SMA (Simple Moving Average) algorithm:

$$\bar{P}[k] = \frac{\sum_{i=0}^{n-1} P_{[k-i]}}{n}$$

Where:

n – The number of samples in filter (window size).

k – The pixel number

P[k] – The kth pixel sample value.

$\bar{P}[k]$ – The moving average result for pixel k.

In essence the algorithm performs an average on the (last n pixels - window size -1) pixels. For the first pixels in the line with pixel indexes that are smaller than the window size the average is performed with zero value samples.

 For example: if window size is 4 then pixels 0,1,2 are equal zero value.

pixel 3 – see the following equation.

$$\bar{P}[3] = \frac{P[0] + P[1] + P[2] + P[3]}{4}$$