Using OverDrive Plus

OverDrive Plus is a method for significantly improving the response time of the spatial light modulator (SLM). OverDrive Plus uses GPU accelerated calculations and requires the following prerequisite software installed:

System with an AMD GPU or AMD APU:

- Latest AMD Catalyst drivers (available from amd.com)
- AMD APP SDK v2.9 or newer (available from amd.com)

System with an Intel CPU, Iris Graphics, HD Graphics, or Xeon Phi

- Latest Intel hardware drivers (available from your PC manufacturer's website)
- Intel OpenCL Runtime 14.2 or newer (available from software.intel.com)

System with an Nvidia GPU or Nvidia Tesla

- Latest Nvidia drivers (available from nvidia.com)
- Nvidia CUDA Toolkit 6 or newer (available from developer.nvidia.com)

OverDrive Plus is comprised of three parts: a phase-wrapping algorithm, an OverDrive voltage algorithm and a regional look-up table algorithm.
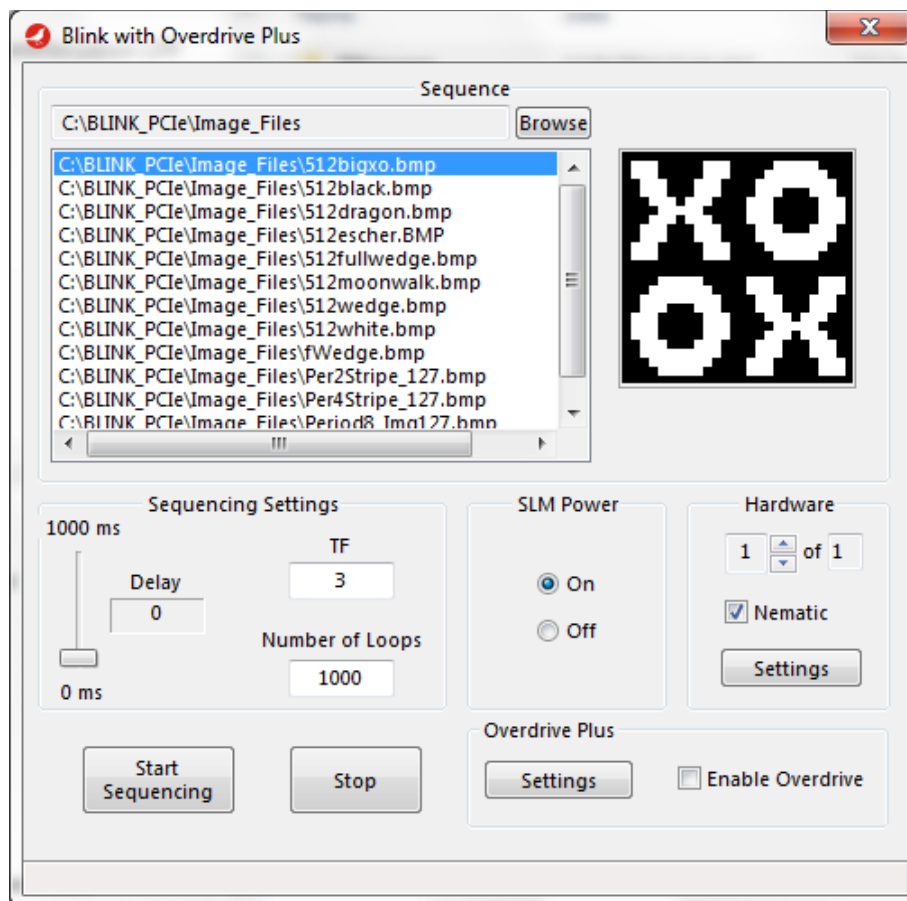

Figure 1 – Blink with OverDrive Plus GUI.

A screen capture of Blink with OverDrive Plus is shown in Figure 1. The software allows you to browse to a folder of images, to automatically sequence through the images at a user defined rate, and to enable or disable OverDrive switching.

If the "Enable OverDrive" checkbox is checked, then OverDrive is applied. A regional LUT file is utilized when OverDrive is enabled. The LUT can be selected by clicking on the OverDrive Plus Settings Button, as shown in Figure 2. If OverDrive is not enabled, then our traditional global LUT is utilized. This can be selected by clicking on the "Hardware Settings" button, as shown in Figure 3.
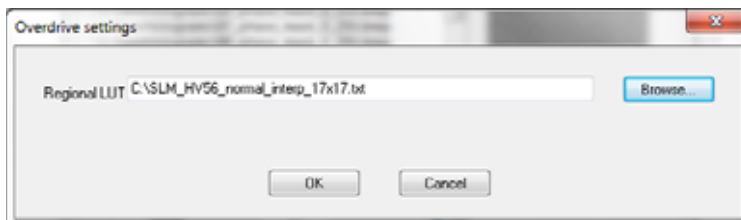

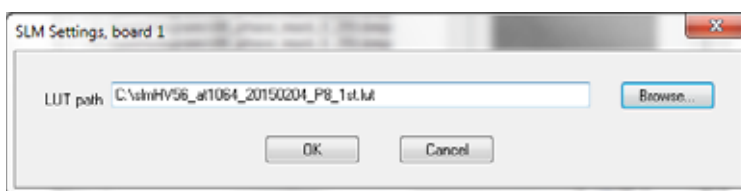Figure 2 – Browsing to an Overdrive LUT file that is only utilized when OverDrive is enabled.

Figure 3 – Browsing to a global LUT which is only utilized when OverDrive is disabled.

The OverDrive Regional LUT file

The LUT file is a text file that is utilized when OverDrive is enabled. The file contains a header, followed by a block of electro-optic characterization data. Note: do not open the Regional LUT file with Notepad. This will render the characterization data unreadable. We recommend Notepad++.

Editing OverDrive Regional LUT Parameters

Parameters stored in the header of the OverDrive Regional LUT (look-up table) file control phase wrapping thresholds, how long the OverDrive voltages are applied to the affected pixels, and where the addressable 2π of phase is placed within the device's available stroke. These values are tuned by Meadowlark to be balanced and may be tuned to improve application-specific performance.

The header data are stored in a key=value format. Keys which are not understood are ignored, allowing for insertion of comments, or for inclusion of information that is not explicitly used but which may have utility in the future. An example of a header is shown here:

[Overdrive_parameters]

coverglass_flipping=1

n_lut_values_horizontal=17

n_lut_values_vertical=17

n_lut_planes=256

n_waves=1.5

table_offset=0.2

tau_up=2.2

tau_down=0.8

wrap_rising_threshold=0.625

wrap_falling_threshold=-0.65

slm_name=unknown

slm_pixel_width=512

slm_pixel_height=512

wavelength_nm=1064

Parameter Descriptions

Due to device-to-device variation, the following parameters may be adjusted for best speed performance.

• table_offset – This parameter contains an offset, in waves, on which the user-requested modulation is placed. For the above example, if the device was characterized with 1.5 waves (3π) of modulation then the user's input range would be mapped onto the range of 0.2 to 1.2 waves.

• tau_up – This is the time constant used to determine the duration of the OverDrive-up period. Note that this parameter does not control the rising edge of a 'scope trace when a hologram is being formed any more than the tau-down parameter does. In general, an adjustment to table_offset is likely to require a change to tau-up. The "up" in the name of this parameter refers to the LC's relaxation to increasing retardation (going from high voltage to low voltage).

• tau_down – The time constant used to determine the duration of the OverDrive-down period.

• wrap_rising_threshold – The threshold, in waves, that a rising transition must exceed before the algorithm attempts to perform phase-wrapping. A higher value causes wrapping to be used for fewer (large) transitions, and so may result in fewer "wrap" artifacts in low spatial-frequency patterns. Rising phase wrapping can be suppressed by increasing this number to a large value (such as 2.0).

• wrap_falling_threshold – The threshold, in waves, that a falling transition must exceed before the algorithm attempts to perform phase-wrapping. Wrapping can be suppressed by a large negative value (such as -2.0).