

Technical Note:

HYPERION Peak Detection Settings

OVERVIEW

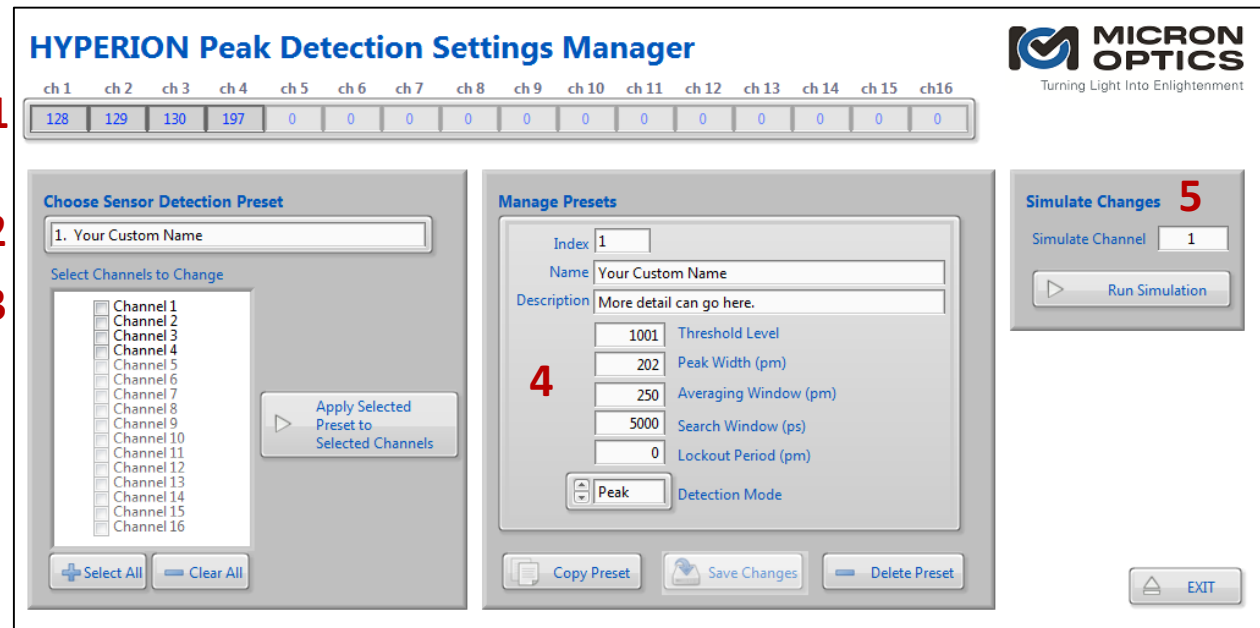
This document provides instructions on how to modify the peak detection settings on a HYPERION instrument, using the “Manage Detection Settings” PC application.

Each instrument can store and address 256 peak detection presets: 128 user configurable presets, plus 128 more factory settings. Individual channels on the instrument can be assigned different presets, which allows you to accommodate channels which may have sensors of different types that require different settings.

It’s worth noting, for the benefit of users of our older instruments, that the HYPERION instruments use a fundamentally different peak detection algorithm than the x25 or x30 interrogator cores. In HYPERION instruments, we wanted to provide a way to perform the peak detection right in the instrument, so that ENLIGHT wasn’t needed to find the peaks. We wanted to be able to stream the peak wavelengths for sensors on 16 channels, at up to 5 kHz. This means that we needed a more efficient method of peak detection. Some very innovative peak detection algorithms result in our ability to find the peaks faster, while maintaining the high level of precision you’ve come to expect from Micron Optics interrogators.

APPLICATION

This is the primary interface used to manage the detection settings for your instrument. The different areas of the interface are numbered and described below.



1. Each channel of your instrument can utilize a different set of detection parameters. The top array of information shows which preset is currently assigned to each channel on the instrument.
2. Saved presets can be selected from this box. Click on the box to reveal a list of presets. The parameters of the preset are then displayed on the right (4).
3. The selected preset can be applied to any channels you prefer. Clicking the “Apply Selected...” button will assign the current setting to the channels selected by the checked boxes.
4. This area allows you to modify any of the parameters associated with a given preset. To create your first custom preset, you’ll need to press “Copy Preset” to copy the current preset into a new preset index; it will default to 1. When you are happy with the new name, description, and parameters, press the “Save Changes” button to commit the changes to the instrument. You’ll then need to apply your new preset to your desired channels. “Delete Presets” will remove unwanted user presets.
5. The simulation area allows you to change the parameters and see how those parameters would affect one of your current channels. Note that these changes will not be saved unless you exit the simulation and click “Save Changes”. Clicking “Run Simulation” will take you to a new screen called “Parameter Simulation”; see next section.

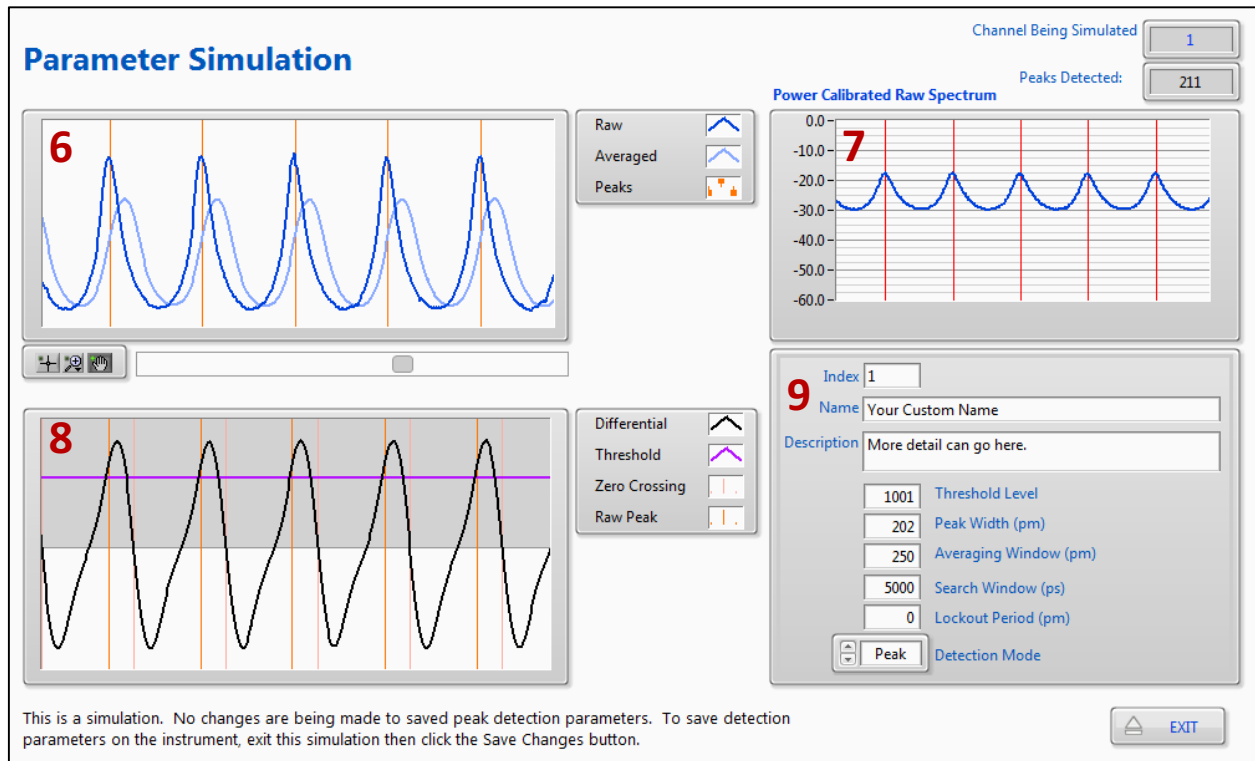
DEFINITIONS

The following table provides further details about the terms used in regard to the detection parameters.

Parameter	Description
Index	This is the preset identification number. Users can customize 1-127, and 128-256 are reserved for factory use.
Name	This text field should be kept to a maximum of 25 characters to ensure it is presented clearly.
Description	User configurable field, which is only displayed in the configuration tool, not in ENLIGHT.
Threshold Level	This is the threshold above which a peak must rise before the peak detection algorithm is applied. The purpose is to avoid looking for peaks in the noise floor. This value is dimensionless, and applies to the differential trace. Consider starting with a value of 1000 for our standard instruments, and 10,000 for EV instruments.
Averaging Window (pm)	In order to reduce noise, we recommend use of an averaging window that is approximately as wide as the feature you're trying to detect. So a 250 pm wide peak would use a 250 pm window.
Peak Width (pm)	This is the width over which the center of the peak is found. This should nominally be set to the 3 dB width of the peak you're trying to locate.
Search Window (pm)	This defines the maximum width over which the algorithm will continue searching for a peak, beginning as the signal crosses your defined threshold.
Lockout Period (pm)	This is a hold-off period which delays the peak detection algorithm for a period after the differential signal crosses the threshold. The goal here is to prevent low-level side-modes from being detected as peaks. This should be left at 0 unless the Averaging Window and Peak Width settings can't help.
Detection Mode	The HYPERION firmware can detect either peaks or valleys.

SIMULATION

To assist with choosing the best parameters for your specific sensors, we have created a “simulation” tool which allows you to see the effects of changes to the peak detection parameters before actually applying those changes to the instrument.



6. The raw spectral data is plotted in dark blue. The averaged trace is in light blue. The detected peaks are identified with orange lines. As you increase the **averaging width**, you’ll notice the light blue trace become wider and lower. The y-axis is in raw counts from the detector’s analog to digital converter (ADC). You can use the graph controls under the plot to zoom in to your desired level, and this level of zoom transfers to plots 7 & 8 also.

7. The “power calibrated raw spectrum” simply shows the raw spectrum in units of dBm instead of raw counts on the ADC that are shown in the plot above (6).

8. This is where the parameters really become clear; this is the trace upon which peak detection decisions are made. You can tweak the parameters and see how they affect the peaks detected. The **differential signal** shows the slope of the averaged trace (light blue in Plot 1). The Peaks and Zero Crossings (where the slope goes to zero at the top/bottom of a peak/valley) are marked in orange.

The **threshold** is shown as a purple horizontal line. The **search window** is shaded light gray. The **lockout width** is shown in dark gray (when set >0). The **Detection Mode** allows you to switch between peak and valley detection. The vertical markers indicate the low edge of the detected peak (defined by the peak width parameter).

9. You can modify parameters here to see their effect on the peaks. You’ll want to confirm that all of your peaks are identified and properly located in the top-left plot. You can also review the “Peaks

Detected” indicator (in the top right corner) to be sure that all peaks are detected with the current settings.

When you exit the simulation, the parameters are copied to the main screen. You can choose to save these, or discard them.

FACTORY PRESETS

Presets numbered 128-256 are reserved for factory use. The following table lists those factory presets.

Preset #	Name
128	0.25 nm Peak
129	0.5 nm Peak
130	1.0 nm Peak
131	0.25 nm Peak (EV)
132	0.5 nm Peak (EV)
133	1.0 nm Peak (EV)
134	0.25 nm Peak (LT)
135	0.5 nm Peak (LT)
136	1.0 nm Peak (LT)
196	0.25 nm Valley
197	0.5 nm Valley
198	1.0 nm Valley
199	0.25 nm Valley (EV)
200	0.5 nm Valley (EV)
201	1.0 nm Valley (EV)
202	0.25 nm Valley (LT)
203	0.5 nm Valley (LT)
204	1.0 nm Valley (LT)

Presets 128-130 will work for most instruments and most sensors.

“EV” presets are designed to be used with our Enhanced Visibility instruments, which have a greater dynamic range.

“LT” presets are designed to be used in “Low Threshold” situations, where the sensor peaks are very close to the noise floor, requiring a very low threshold parameter.

ENLIGHT INTEGRATION

For users utilizing ENLIGHT, the peak detection presets can be selected on the “Acquisition” tab in the Group boxes at the bottom. The drop-down list is populated with the factory presets, in addition to any custom presets that have been defined on that instrument.



API INTEGRATION

Custom peak detection presets must be created using this executable tool, but the saved presets can be selected via software control. The HYPERION software APIs have been updated to include commands for defining and selecting presets. Please consult the software section of the HYPERION manual for details.

SUPPORT

If you need additional support, please contact support@micronoptics.com