Getting Started with a Xenics XEVA Camera
User Notes

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1.0 Xenics XEVA Camera Installation

You must run the Xenics CD and install the Xeneth software and drivers. The camera cannot connect to BeamGage or BeamSquared unless the camera driver and calibration pack NUC files are available for software being used. The XEVA camera cannot be connected to both Xeneth and BeamGage at the same time.

Important: The correct version of Xeneth must be installed for proper operation.

1. Insert the Xenics CD into a CD Driver.
2. Open Windows Explorer and select the CD Driver.
3. Navigate to the folder 2_Software\Xeneth-SW_and_Manual\Xeneth_Advanced.
4. For 32-bit operating systems run Xeneth-Setup-Advanced.
5. For 64-bit operating systems run Xeneth-Setup-Advanced64.
6. Restart the computer. The camera cannot connect without a system restart.

The operating controls for XEVA model cameras are simplified to provide the best possible measurement accuracy for both the BeamGage and BeamSquared applications.

The InGaAs imager in the Xeva camera requires image correction processing to provide a useful image output. Xenics cameras, including Xeva, employ special NUC (non-uniformity correction) files that must be downloaded to the camera. These correction files are supplied by the manufacturer and are unique to each camera. NUC files provide gain, offset and bad pixel correction, for specific operating settings such as; exposure, gain, black level, imager temperature, etc. BeamGage and BeamSquared provide controls to employ the necessary NUC file.

There are two (2) types of NUC files, TrueNUC files and standard NUC files. Both can be used with Xeneth.

NUC files end with a file extension of .xca and are also referred to as "calibration packs" or "camera correction" files. Xenics provides a CD with each camera that contains the factory generated NUC and TrueNUC files as well as a utility called **Xeneth.** This utility allows the user to test the camera and make additional NUC files if necessary.

NUC and TrueNUC files fall into 2 general classes, High Gain (HG) and Low Gain (LG). For laser beam analysis the High Gain NUC files are most frequently employed. High Gain NUC files give exceptionally better response linearity than Low Gain.

TrueNUC files can be used over a broad exposure range and maintain good pixel correction. **Only the TrueNUC_HG file is recommended for use with BeamGage.**

Regular NUC files are specified for operation at or very near the preset exposure in effect when the NUC file was created. Using them outside of their set value degrades the camera's image correction performance.

1.1   Converting X-Control XCA files to Xeneth

Warning: **X-Control NUC files are not compatible with BeamGage v6.0 and above. You must convert NUC files supplied with cameras purchased prior to October 2013.**

Follow these instructions to convert X-Control XCA files for use with BeamGage v6.0 and above.

1. Copy the X-Control XCA files to the Xeneth calibration folder located at "C:\Program Files\Xeneth\Calibrations"

2. **Before** applying power to the camera, plug in the USB cable from the camera to the PC

3. Apply power to the camera

4. Start the Xeneth software

5. Select the camera and set "Calibration data" to "(none)"

6. In the File menu select "Settings"

7. Select the calibration file to convert

8. Click OK

9. In the Calibration menu select "Export calibration data".

10. Select a path. This can be any path, not necessarily the calibration folder.

11. Enter an appropriate file name by including Xeneth in the name

12. Click Save

13. Because of a bug in the Xeneth software, the converted calibration file will cause the camera background noise to be suppressed. This defeats the BeamGage UltraCal process and may cause inaccurate results. In order to correct for this problem you must perform a final conversion for use in BeamGage.

    a. Open the XEVA XCA File Converter utility installed with BeamGage.
        i. **Start Menu -> All Programs -> Spiricon -> BeamGage Professional -> Tools -> XEVA XCA File Converter**
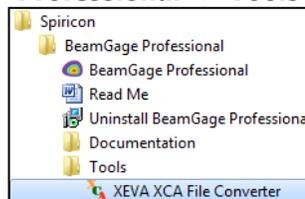
    b. Click the Browse button. A file selection dialog will open to the Xeneth\Calibrations directory from Step 1.
    c. Select the NUC file that has been processed by the Xeneth software in the previous steps.
    d. Click OK.
    e. Click Convert.

14. Repeat steps 6-13 for each NUC file.

When loading a calibration pack in BeamGage be sure to specify the Xeneth converted NUC file. If you attempt to load an X-Control NUC file then BeamGage will display "Invalid Calibration!" in the Camera Correction File text box.

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Once you have installed all of the required software as above, do the following:

1. **Before** applying power to the camera, plug in the USB cable from the camera to the PC.
2. Apply power to the camera.
3. Open **BeamGage** or **BeamSquared**.
4. Go to the **Source** panel and Select **Local Detector** (**Connect** for BeamSquared)**,** select the camera and you will be prompted to enter a Camera License Key. BeamGage may go there automatically.
   (Note if the camera was shipped from Ophir-Spiricon it may already have the license key loaded and steps 4 thru 6 can be skipped)
5. Locate the camera license key supplied with the BeamGage CD or camera and enter this code. You must enter a license on each computer where the camera is used.
6. (Skip steps 6-8 with BeamSquared) Cycle the **Source** selector to **File Console** and then back to **Local Detector**.
7. The camera should start running and collecting frames.
8. In the **Source** ribbon select the **Pause** button.
9. Go to the **Camera Correction File** panel (**Correction** panel in BeamSquared) and select the drop down arrow (ellipses in BeamSquared, skip step 10).
10. Select **Browse...**
11. Go to the folder: C:\Program files\Xeneth\Calibrations\
12. Select an .xca file name that contains **TrueNUC_HG** and click **Open**
13. Click **Start** on the Source tab
14. The camera should now be collecting data frames with a well corrected image with a raised black level baseline.
15. The preset cooling temperature is normally 17$°$ C. Wait for the readout temperature to stabilize at this setting.
16. Once stabilized block the imager from stray radiation and perform an **Ultracal**
17. You are now ready to collect laser beam images in **CW** mode.
18. Attenuate the laser and adjust the **Exposure** time to an appropriate setting. You will need to re-UltraCal whenever the exposure time changes.

Important: To disconnect a XEVA camera always 1st remove power to the camera, then 2nd unplug the USB cable.

Warning: There is a known bug with the XEVA camera regarding unplugging the camera's USB cable with the camera under power. Doing so will crash the camera firmware. You must now power cycle the camera to restart it. When you re-plug the USB cable into the PC the camera will once again ask you to re-supply the Camera License Key in order to restore its operation with BeamGage. (Xenics has indicated that they are not going to fix this bug.)

Note: Custom NUC files created with Xeneth will operate correctly when used by BeamGage. And BeamSquared ?

# 3.0 Operation

3.1 Frame Format

While displaying an apparent set of options there are few actual choices to be made. The XEVA camera does not support binning, and because the imager is a 320X256 pixel format ROI adjustments are not needed.

This camera only operates in 12 bits per pixel mode.

The XEVA camera model has a spec'd frame rate of 100Hz. With NUC the rate drops to about 90Hz. Set the rate to 90Hz unless there is a need for longer integration times.

3.2 Exposure|Gain|Black Level
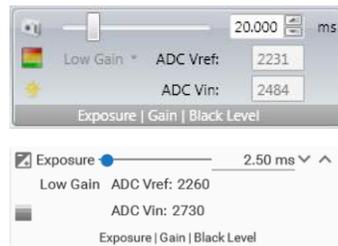
The following settings are preset in the TrueNUC or NUC files to optimize the camera dynamic range for best beam measurement accuracy when using BeamGage or BeamSquared. Only the Exposure setting can be altered by the user. The Exposure setting can also be saved into a setup file.

The **Exposure** control operates much like any other type of camera. It sets the exposure duration in milliseconds during which time the camera integrates light. When operating in external trigger mode, the exposure time begins upon receipt of the electronic trigger pulse. When using a regular NUC file (not a TrueNUC) the exposure setting should not be changed.

The **Gain** indicator follows the setting pre-programmed into the TrueNUC/NUC file. The setting can be either **High** or **Low**.

The **Black Level** indicator is also preset to the value that corresponds to the TrueNUC/NUC file.   In X-Control this setting is called ADC Vin. It is displayed here only for verification purposes.

The **ADC Vref** indicator is also preset to the value that corresponds to the TrueNUC/NUC file. It is displayed here only for verification purposes.

3.3   Cooling/Temperature
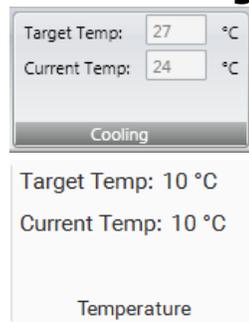
The XEVA camera has a thermoelectric cooler that is used to stabilize the imager temperature. The InGaAs imager is very sensitive to changes in temperature. To ensure a stable image baseline the temperature should be set to a value below the room temperature. Since 300° Kelvin is a nominal room temperature, and an operating camera will warm somewhat above this, all TrueNUC files force a temperature value of 17°C.

The camera has a cooler that can lower the imager temperature, but relies on normal heating of the camera to raise it. The readout from the camera indicates that the cooler is functioning and tracking to the pre-set value. There is a nominal

error between the set and the reported value from the camera. This error is compensated for in the TrueNUC/NUC file.

3.4   Camera Correction File
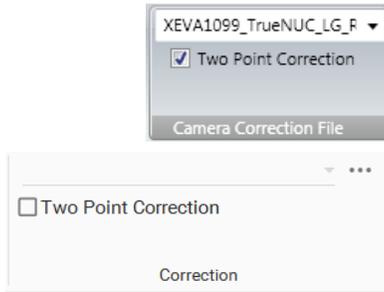
To successfully use an InGaAs camera, such as the XEVA, a camera correction file must be applied. The file must match how the camera is setup for use. When the Xeneth software is installed it copies the camera correction NUC files into a folder called:

C:\Program files\Xeneth\CalibrationPacks\...

This folder contains 2 or more .xca NUC files specific to each camera's serial number. The name of the file gives details about when it should be applied. A file that contains the letters LG or HG is for low gain/high gain settings respectively.

To load a NUC file select the dropdown arrow (Ellipses in BeamSquared) and browse to the folder shown above. Select the appropriate TrueNUC/NUC .xca file and click **Open**.

The **Two Point Correction** box should also always be checked to operate with the NUC table applied. If unchecked you can observe what the camera output looks like w/o NUC.

This file name will be saved in a setup file and automatically applied to the camera upon opening the setup if the camera is already attached. If the camera was not connected then you may need to manually restore it.

Note: Use of the NUC file reduces the maximum frame rate of the camera by an amount corresponding to the impact of the NUC correction effort required. Typically this yields a 10-20% reduction in maximum frame rate.

3.5   Trigger
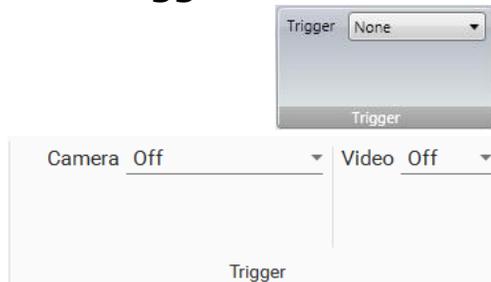
The XEVA camera is supplied with an external trigger input cable. The required input to this cable is a standard TTL level positive going pulse. The camera will trigger, and begin integrating light on the rising edge. A trigger pulse must be at least 5us in duration.

To operate in external trigger mode you must set this control to **Trigger In/In**. Select **None/Off** when operating in CW mode.
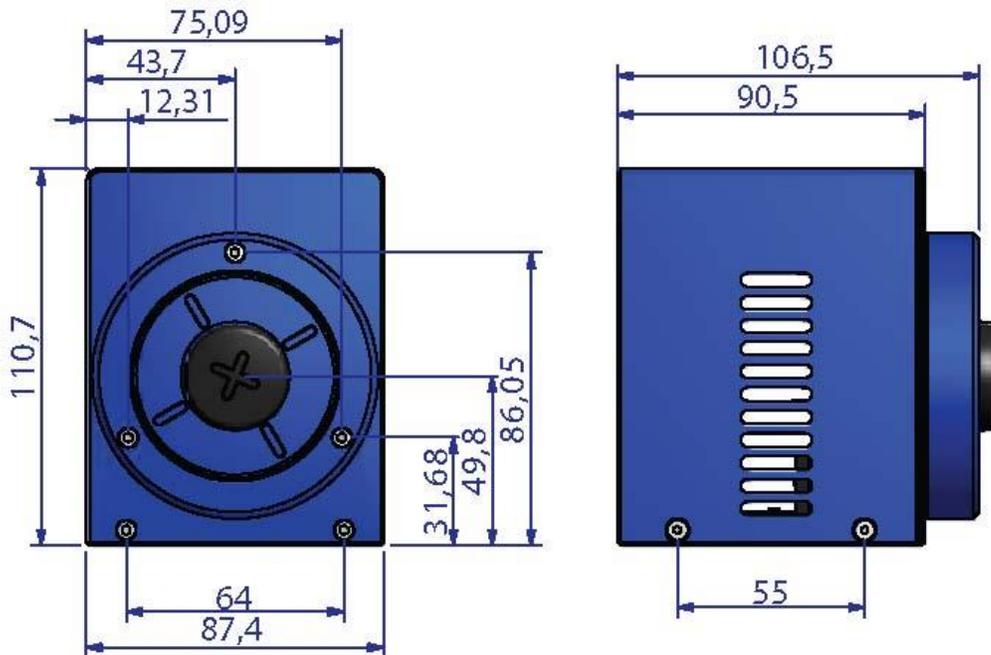
3.6 Capture/Gamma
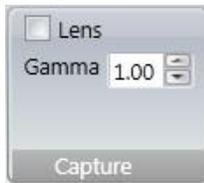
These panels contain image processing features. They do not affect the hardware, but do affect how the software processes images. The **Lens** setting is exclusive to BeamGage, and should be checked when using an imaging lens. When enabled, the 2D display is from the perspective of the camera. **Gamma** correction adjusts how the camera responds to light and shadows. Gamma correction is not required for this InGaAs camera. The Gamma must be set to 1.00 when using this camera with BeamGage or BeamSquared.

Exhibit A   Xenics InGaAs Camera Specifications

Model XEVA XC-130	Description
Application:	NIR wavelengths, high resolution, ROI and binning
Spectral response:	900-1700nm (consult factory for other options)
Element pitch:	30µm square
Number or elements:	320 x 256
Area:	9.6 x 7.6mm
Lens:	C-mount, (Optional)
Minimum system dynamic range:	low gain 68dB, high gain 60dB
Frame rate:	100 Hz [1]
Non-uniformity correction:	2-Point correction plus bad pixel correction, NUC files provided
Snap-shot mode:	Rising edge TTL trigger, 5us min pulse width, cable provided
Exposure control:	1us to 400 sec in Low Gain mode
Camera Cooling:	Thermoelectric cooler plus forced convection
Ambient operating temperature:	0 - 50° C
Dimensions, mm, HxWxD:	111 x 87 x 107 mm
Weight, camera head:	approx. 1.8 kg
Software supported:	BeamGage
PC interface:	USB 2.0, special cable provided

[1] The uncorrected rate, final corrected rate will be less.