Genika Trigger

User manual

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Release	Date	Author	Description
Initial	9 May 11	FJ	Initial release
	16 May 11	«	Beta2 new features
1.0	24 June 11	«	RC1 release
1.01	09 Sept 11	«	Entropy and GNK browser
1.1	18 Oct 11	«	Release 1.1 : TAOI
1.2	20 Dec 11	«	Release 1.2 : GPS and trigger control
1.3	21 Feb 12	«	Release 1.3
1.4	26 Mar 12	“	Release 1.4
1.5	10 Jul 12	“	Release 1.5
1.6	26 Oct 12	“	Release 1.6
1.7	08 Apr 13	“	Release 1.7
1.8	29 Oct 13	“	Release 1.8
2.0	21 Feb 14	“	Release 2.0 Direct X and Andor
2.2	11 Sep 14	“	Release 2.2 x64

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Introduction

Introduction

Genika Trigger is an advanced image acquisition software dedicated to science, industry and medicine applications using black and white cameras.

Supported cameras are:

- Basler IEEE1394, GigE and USB3 using Pylon
- AVT/Prosilica using UNI SDK
- IDS uEye USB and GigE
- Andor SDK3 sCMOS Neo and Zyla

The Trigger version targets scientific applications for which you need simple video acquisition software without any custom development. It provides you with several capture triggering modes, from the manual free run to advanced image structure analysis. Should you need a customized triggering mode, Airylab can include it inside a dedicated release for you under NDA.

This application aims at good performances. Nevertheless it embeds some heavy processing for some features and therefore a good hardware is required to get all the performances your camera can deliver: Code 2 duo CPU, fast disk and GE interface are preferable. Core i5 or i7 is required for high speed real time analysis or multiple instances.

Features

This Genika trigger release supports the following features:

Camera management

- AVT IEEE1394 and GigE B/W
- Basler IEEE1394 and GigE B/W
- IDS uEye USB and GigE B/W
- Andor Neo/Zyla CamLink sCMOS
- Multi-camera on the fly selector (one active at a time, multiple instances possible)
- IDS Pixel clock and shutter modes

Video stream

- Stream display in GDI or DirectX mode, spectrum ramp mode
- Exposure
- Gain
- Black level (except IDS)
- Gamma
- 8 bits or 12/16 bits Mode
- FPS and throughput display
- Zoom 25, 50,100 and 200%
- Binning 1, 2 and 3
- Lin/Log on IDS camera with E2V sensors
- Specific gains on Andor
- Histogram with min, median and max values. Refresh period customizable
- Selectable linescan histogram
- Camera forced FPS
- Image averaging

Areas of interest

- On screen AoI
- On screen Triggering AoI

Images to disk

- GNK, AVI, SER and TIFF format
- Integrated GNK file browser and TIFF conversion
- Separated GNK file browser for two simultaneous files
- GNK file's timestamps save to disk for further analysis
- Timestamping of the capture files and images (Windows clock, 100nS)
- Focal length, distance and pixel size saved in GNK file

Triggers

- Free run acquisition mode (frame number or time limit possible)

- Sequencer
- Hardware triggering In mode with burst size (no burst size on AVT)
- Histogram or high pixels triggering mode
- Center of gravity displacement triggering mode
- Deviant pixels triggering mode (Entropy)
- Particles count trigger
- Pulse trigger out if smart trigger matches

Tools

- Unattended start
- Focus assistant based on micro-contrast analysis
- NMEA GPS connectivity for frame geo-localization
- GPX export
- Google Earth COM integration
- On screen ruler
- GPS PPS Tracker on DCD serial pin for reference timestamp record
- Reticle with scale in pixels or real spatial sampling

Low cost Basler ACE GigE camera

Camera compatibility matrix

Feature	Andor CL	Basler GigE	Basler IEEE	Basler USB3	AVT GigE	AVT IEEE	IDS GigE	IDS USB
Hardware trigger out	N	Y	Y	Y	Y	Y[1]	Y	Y
Hardware trigger In	N	Y	Y	Y	Y	Y[1]	Y	Y
Trigger In Burst mode	N	Y	Y	Y	Y	Y	Y	Y
Standard triggers	N	Y	Y	Y	Y	Y	Y	Y
Smart triggers	Y	Y	Y	Y	Y	Y	Y	Y

(1) : not tested

Installation

Installation for Basler

Before installation, please insure that the Pylon 3.2 or above driver is installed and working using Pylon Viewer. **The Basler Pylon's .NET SDK must be installed.**

Installation for AVT

Before installation, please insure that the UNICam 2.1 driver is installed.

Installation for IDS uEye

Before installation, please insure that the uEye SDK release 4.03 or above is installed.

Installation for Andor

Before installation, please insure that the Andor SDK3 is installed. Genika trigger includes Andor's .NET DLL

Common requirement

Genika Trigger needs the Microsoft .NET 3.5 & 4 client.

http://www.microsoft.com/downloads/fr-fr/details.aspx?FamilyID=9b2da534-3e03-4391-8a4d-074b9f2bc1bf

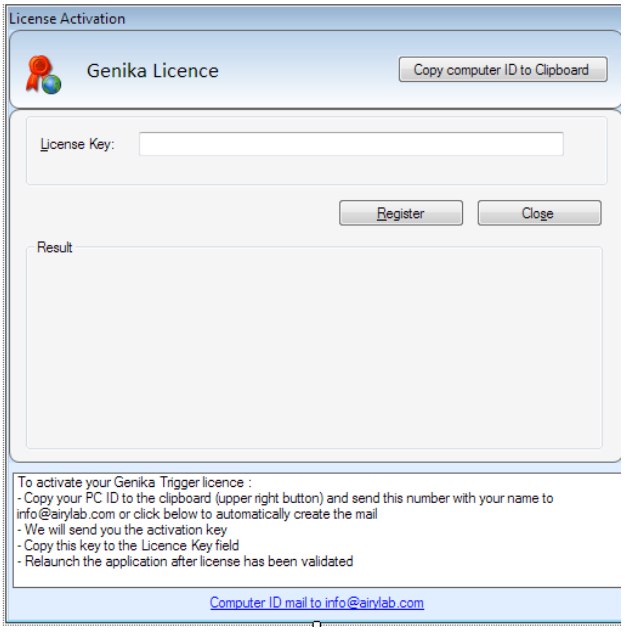
http://www.microsoft.com/downloads/en/details.aspx?FamilyID=5765d7a8-7722-4888-a970-ac39b33fd8ab

You can then install Genika Trigger.

Licensing

Genika embeds a license manager. During the first installation a window will ask for the license key. You can get it from us either sending the computer ID (top right button will copy it to the clipboard, or click on bottom email address to generate an automatic email).

We will then send you back the license key. This license is bound to the computer itself: you can use as many different cameras as you need. You can access the license manager with the about menu.


License Activation
Genika Licence
Copy computer ID to Clipboard
License Key:
Register
Close
Result
To activate your Genika Trigger licence :
- Copy your PC ID to the clipboard (upper right button) and send this number with your name to info@airylab.com or click below to automatically create the mail
- We will send you the activation key
- Copy this key to the Licence Key field
- Relaunch the application after license has been validated
Computer ID mail to info@airylab.com

Auto Update

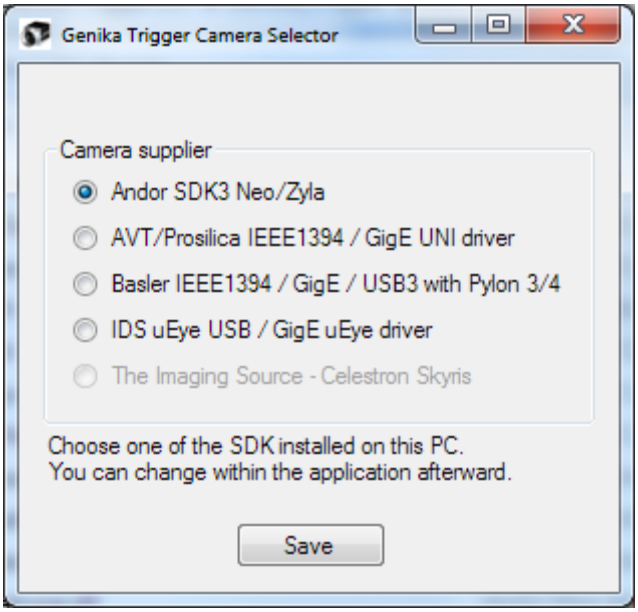
After installation you may launch to auto-updater to get the lastest release if there is one. In that case you will be prompted for update. Then Genika Trigger will close and be updated automatically.

You need an internet connection for this function.

Camera selection and parameters

Camera selection

You can select the camera manufacturer from the dedicated applet :

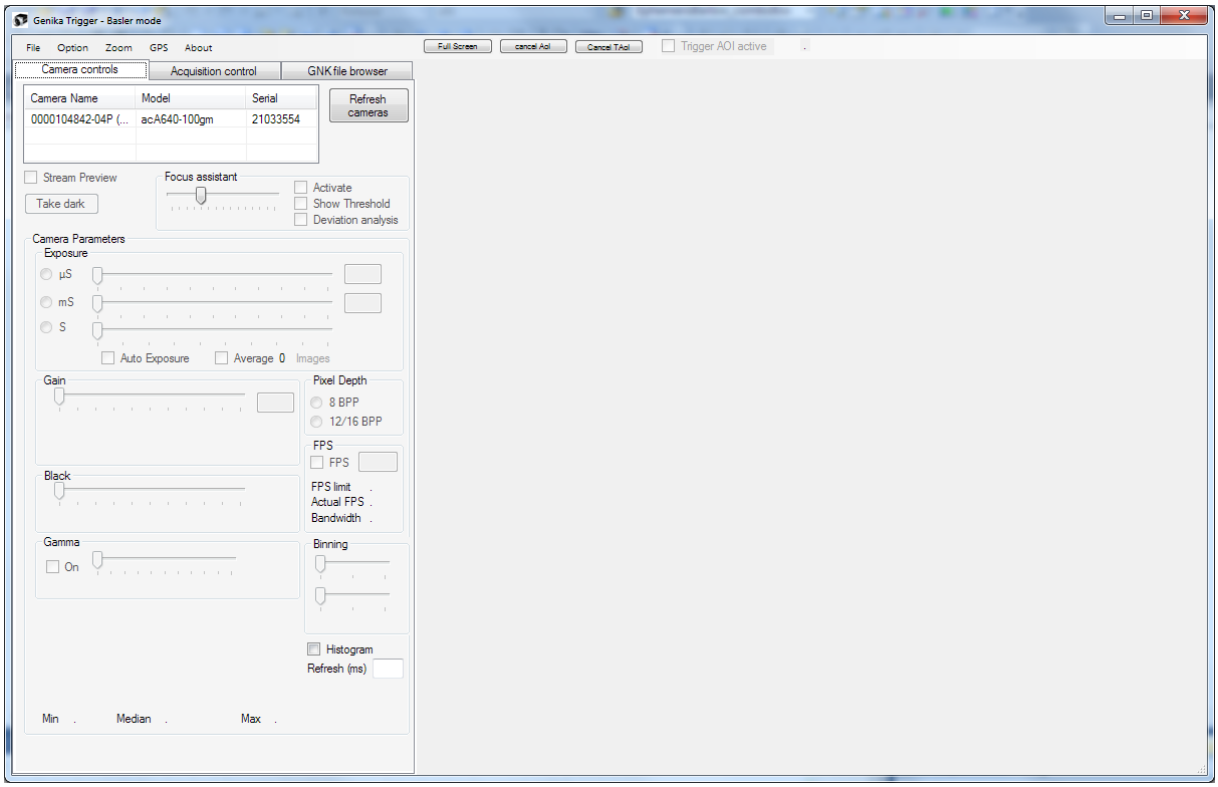


It can also be modified from the application option window.

Double click on the shortcut to launch Genika Trigger.

The main window will appear and the application will list the cameras visible on the Ethernet subnet or USB / IEEE bus automatically. Your cameras can be connected before or after you launch Genika, but the list may not refresh automatically depending on the camera SDK: you may use the *refresh* button. You can select the camera you want to work with. If this camera is already opened by another user, you have an error message.

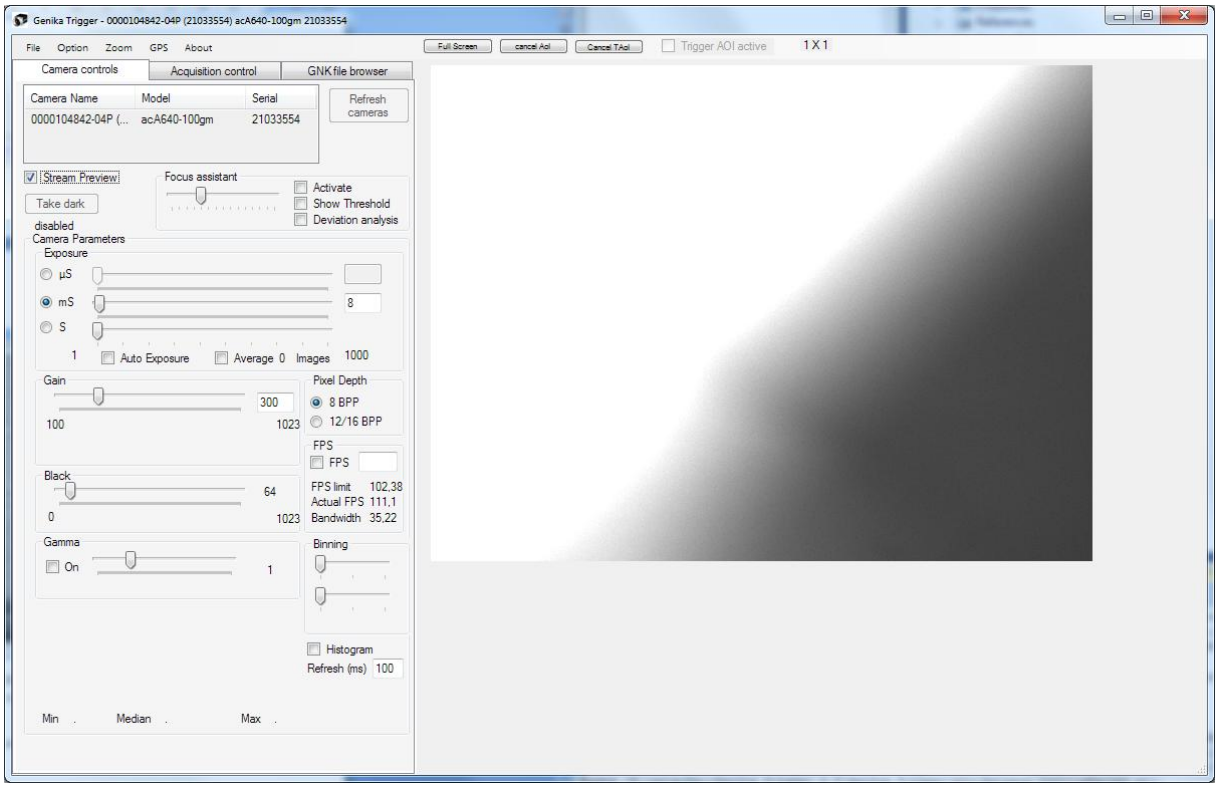
You can change of camera manufacturer from the *Options* window, change is applied immediately.



Once the camera is selected, its current acquisition parameters will load and the acquisition tab controls will initialize with the current camera parameters.

If you want to change of camera, then you can hit *refresh* once again and select another one.

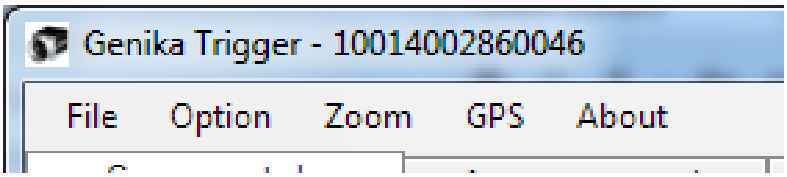
You can launch and display the video stream with the *preview* button:



Note: If your cameras are connected through a GE switch, the behavior is exactly the same as for a direct connection. Using your cameras behind a router would severely impact the performances and is not advised.

If the picture doesn't fit on your screen, you can use the zoom setting from the menu.

Application Menu

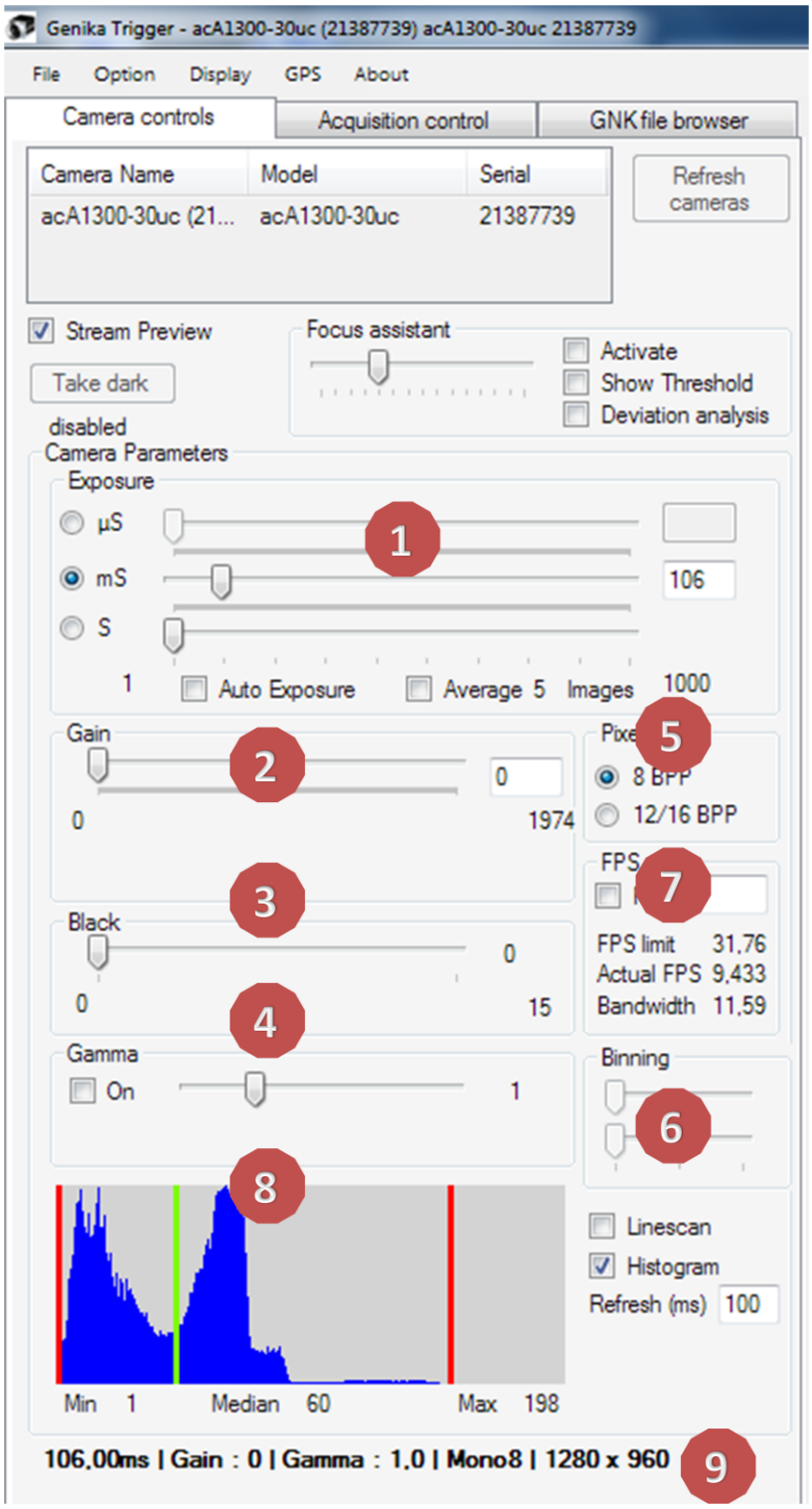


The application menu items are :

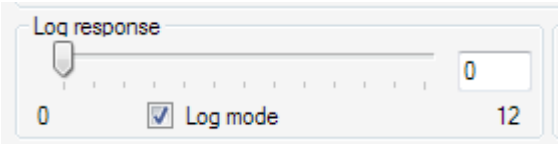
- File to load or save a camera configuration. The camera brand and model is checked before loading the configuration. It Is also possible to load/save application settings.
- Option to access to the application parameters (see below) and unattended start options.
- Zoom the change the display scale. Not that the 200% setting only show a part of the image in GDI mode.
- GPS to access to the geolocalization setting (see below).
- About screen, license manager and auto-update.

Acquisition settings

The left tab gives access to the acquisition controls through the native SDK.

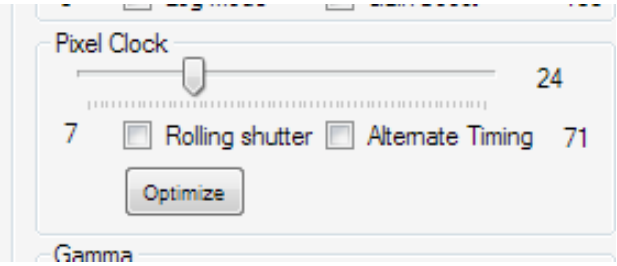


1. *Exposure:* Those controls allow selecting of the exposure time. Three track bars allow different precision (s, ms or µs). You can also use keyboard arrows to move all sliders. The slider is linked to the input area. You can use the slider for a quick selection, and the input area (or the keyboard arrow keys shortcuts) or fine tuning. The minimum and maximum ranges are automatically set depending on the camera model. The checkbox activates auto-exposure if supported. It is possible to activate image averaging; the number of image to be averaged is selected from the *Option* menu. *Note that certain camera models (Basler Scout for example) use exposure multiplier or time base. In that case the maximum exposure duration may be limited by the active time base. One way to switch to the correct time base is to activate autoexposure if supported.*
2. *Gain*: The slider allows gain setting. Note that the min and max values can change depending on your camera model and other settings such as the pixel depth. When using IDS camera with E2V sensors it is possible to toggle between the linear or logarithmic exposure with the check box. When the Log mode is activated the gain slider is used to control the log exposure value and the gain boost checkbox is inactive.



With some IDS cameras the gain boost checkbox is available. This checkbox amplify the gain value with a factor x1.5 or x2 depending on camera model. On Andor cameras the actual gain mode name is displayed in text as well.

3. *Black:* you can set up the black level with this slider. For IDS camera this control is replaced with the pixel clock setting. On some uEye camera it is also possible to select the shutter mode (global or rolling). Genika also supports automatic pixel clock optimization for IDS. For IDS cameras the back setting and black reference mode for CMOSIS sensors are with the gamma settings.



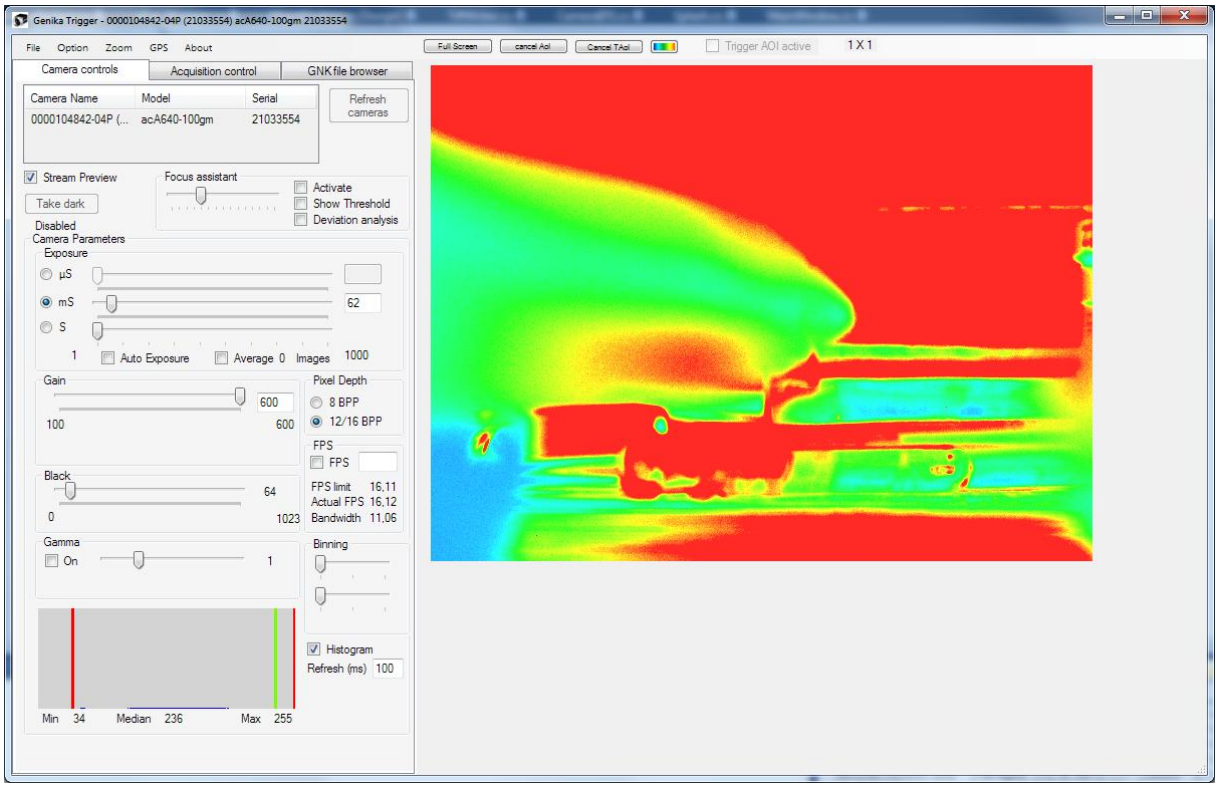
4. *Gamma:* Those two sliders control the black (IDS) and gamma level. Gamma has to be activated with the checkbox. This feature isn't available for AVT cameras.
5. *Bit depth 8/16 Bits*: This setting specifies the pixel depth. It doesn't reduce the FPS, but increases the file size and the dynamic. For most cameras, 16 bit mode range from 0 to 4095 (12 bits ADC). The real dynamic depends on the sensor.
6. *Binning*: Bin2 and Bin3 are available from this control for each axis. Binning will increase the acquisition rate of your camera and decrease the resolution. Sensitivity will as well increase as well charges are added to each other during read out (except on CMOS sensors).
7. FPS: depending on the camera, it is possible to force the FPS independently from the exposure time. In any case, it won't be possible to exceed 1/exposure though. The FPS limit and the effective FPS are

displayed as well. This area displays also the actual camera throughput. **It is important to keep it below the storage system performance maximum if you aim long acquisition.** This feature isn't available for AVT cameras. With IDS cameras the FPS may change when the pixel clock is modified. It is necessary to enter the FPS again after the clock has been changed.

8. *Histogram*: A histogram is available. You can change the refresh rate as histogram consumes some CPU resources. It gives the min, max and median as well. Those are drawn on the graph as well as vertical bars. If the total bandwidth exceeds a preset bandwidth threshold (40 MB/s per default), the histogram is calculated considering one pixel over 4. This threshold can be modified in the options window. If a TAoI is set, the histogram is calculated on the TAoI area only. A line scan histogram is available : level of the mid height line are displayed on the reticle. The line that is displayed can be change with a right mouse click on the image.
9. *Status :* The last line recap the main camera settings.

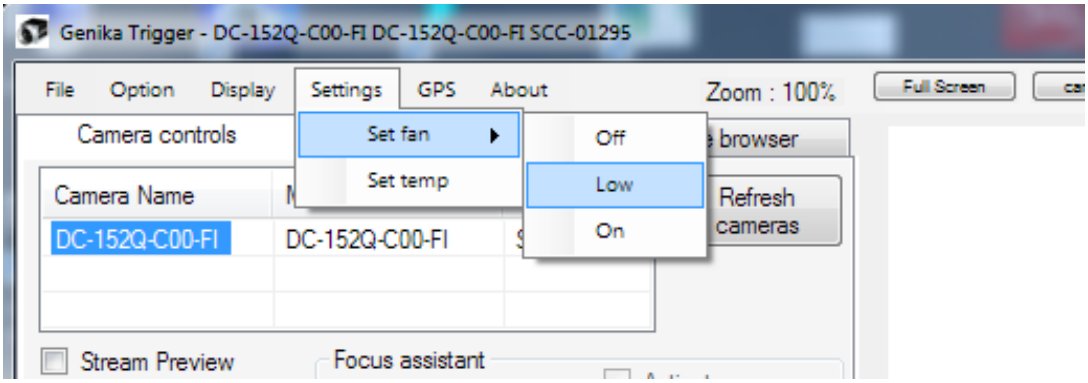
It is possible to save the camera setting from the file menu.

A spectrum palette for display with false colors :

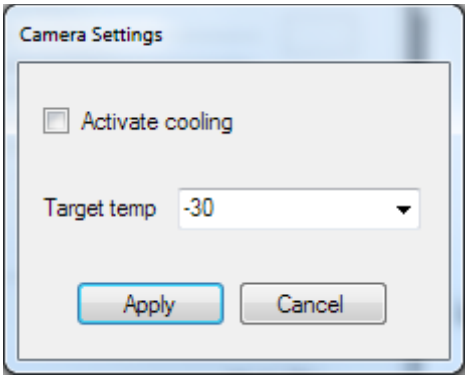


Andor Neo/Zyla specific settings

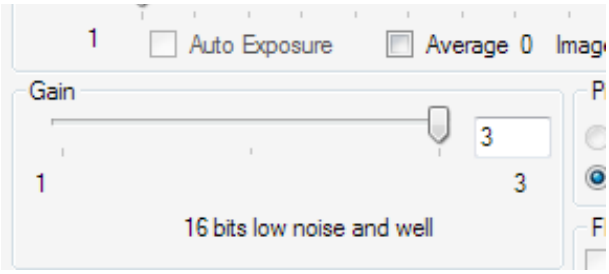
Andor cameras on Bitflow Camera Link frame have a specific gain/dynamic setting and can be cooled. Additionnal cooling/fan options are available through a dedicated menu *settings*



This menu allows you to choose the fan speed and the cooling temp and activity:



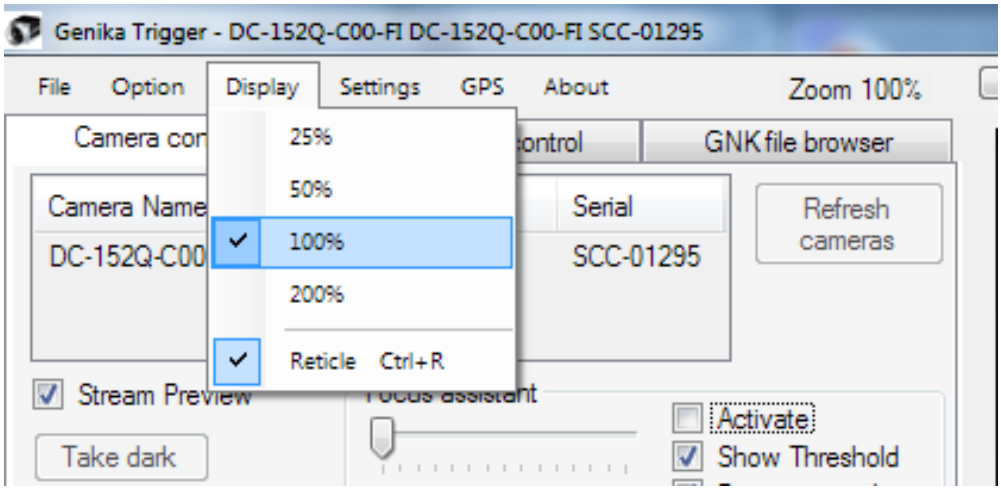
Actual Gain/well depth and dynamic are displayer in explicit text in the gain setting area :



The dynamic setting depends only on the acquisition mode (11/12/16 bits). In 11 bits mode (Neo) the recording is performed on a 12 bits base, but the display is scaled from 11 bits. A saturated area will read a value of 2048/4096 in the file, but is displayed as white.

Zoom

Zoom can be accessed through the view menu from 25 to 200%. It is possible to access directly to each zoom level with F1 to F4 keys.

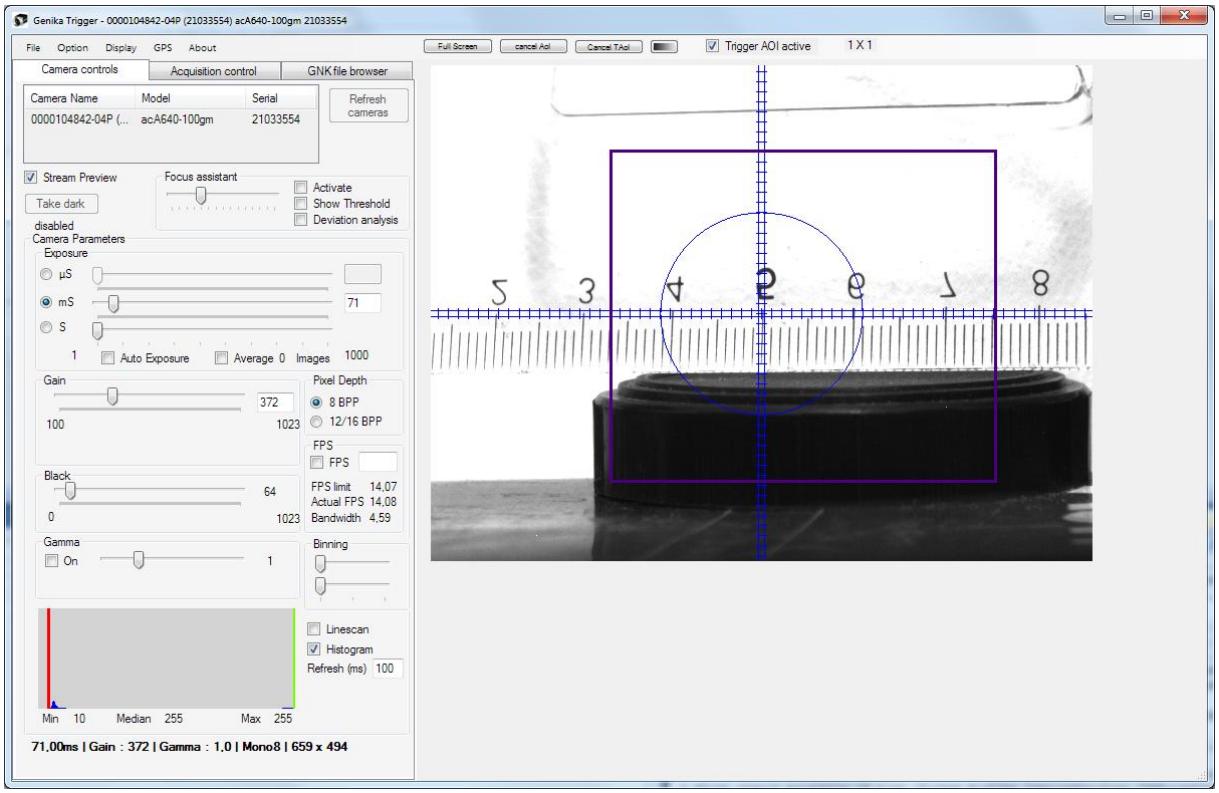


In DirectX mode, you can select more zoom levels by positioning the mouse over the image and using the mouse wheel or with page up/page down keys.
Current zoom level is indicated on the main window.

Reticle

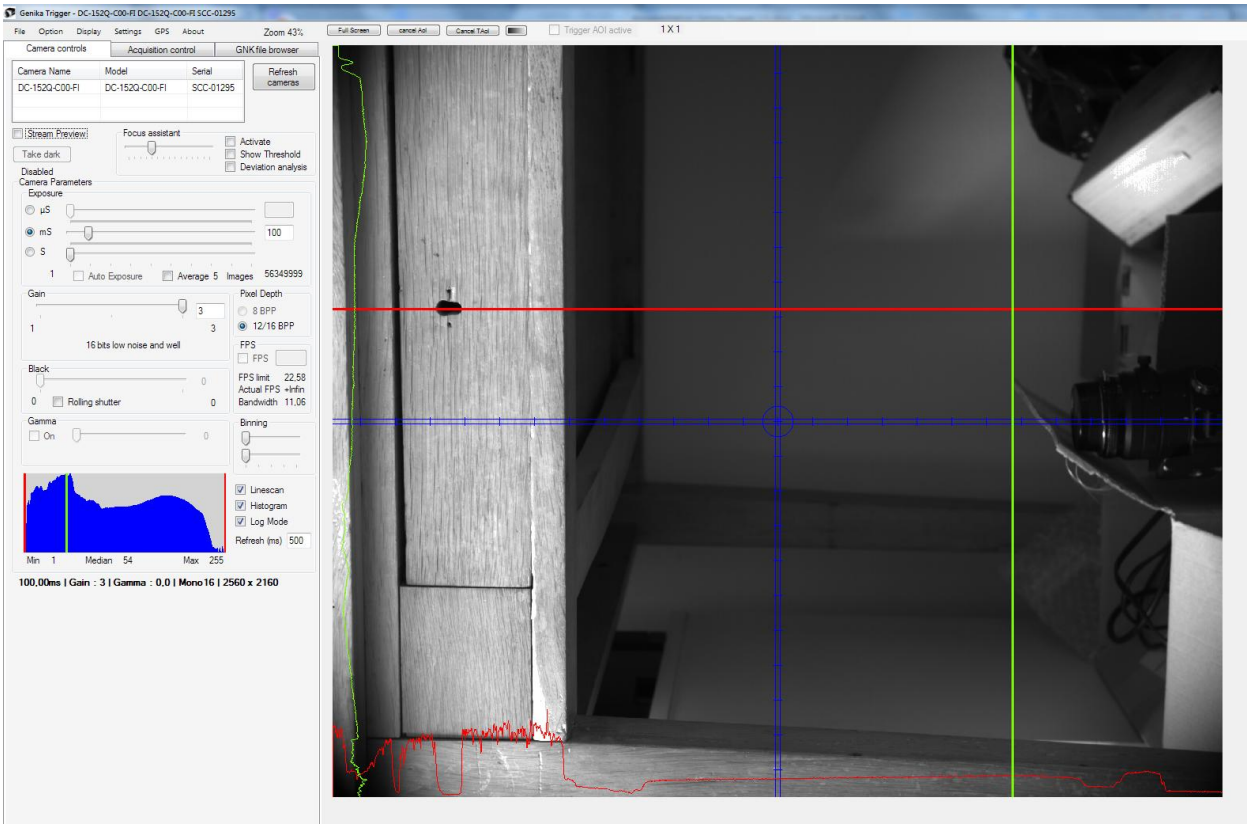
A reticle can be displayed on an overlay with Ctrl + R or from the *Display* menu. The reticle is composed of a double cross hair and a circle. Reticle scale is selected from the option window. It can be on a pixel scale or the real scale if the lens and sensor parameters are available. To switch to the real scale check the *mm* box.

If active, the Triggering AoI is displayed as a purple rectangle.


Genika Trigger - 0000104842-04P (21033554) acA640-100gm 21033554
File Option Display GPS About
Full Screen
cancel AoI
Cancel TAoi
Trigger AOI active
1 X 1
Camera controls
Acquisition control
GNK file browser
Camera Name Model Serial
0000104842-04P (... acA640-100gm 21033554
Refresh cameras
Stream Preview
Take dark
disabled
Focus assistant
Activate
Show Threshold
Deviation analysis
Camera Parameters
Exposure
µS
mS
S
71
1
Auto Exposure
Average 0 Images 1000
Gain
372
100
1023
Pixel Depth
8 BPP
12/16 BPP
FPS
FPS
FPS limit 14,07
Actual FPS 14,08
Bandwidth 4,59
Black
64
0
1023
Gamma
On
1
Binning
Linescan
Histogram
Refresh (ms) 100
Min 10 Median 255 Max 255
71,00ms | Gain : 372 | Gamma : 1,0 | Mono8 | 659 x 494

Linescan histogram

Genika can display horizontal and vertical levels on the image when selecting the linescan histogram checkbox. You can choose the line and column to be display by a right click on the image.

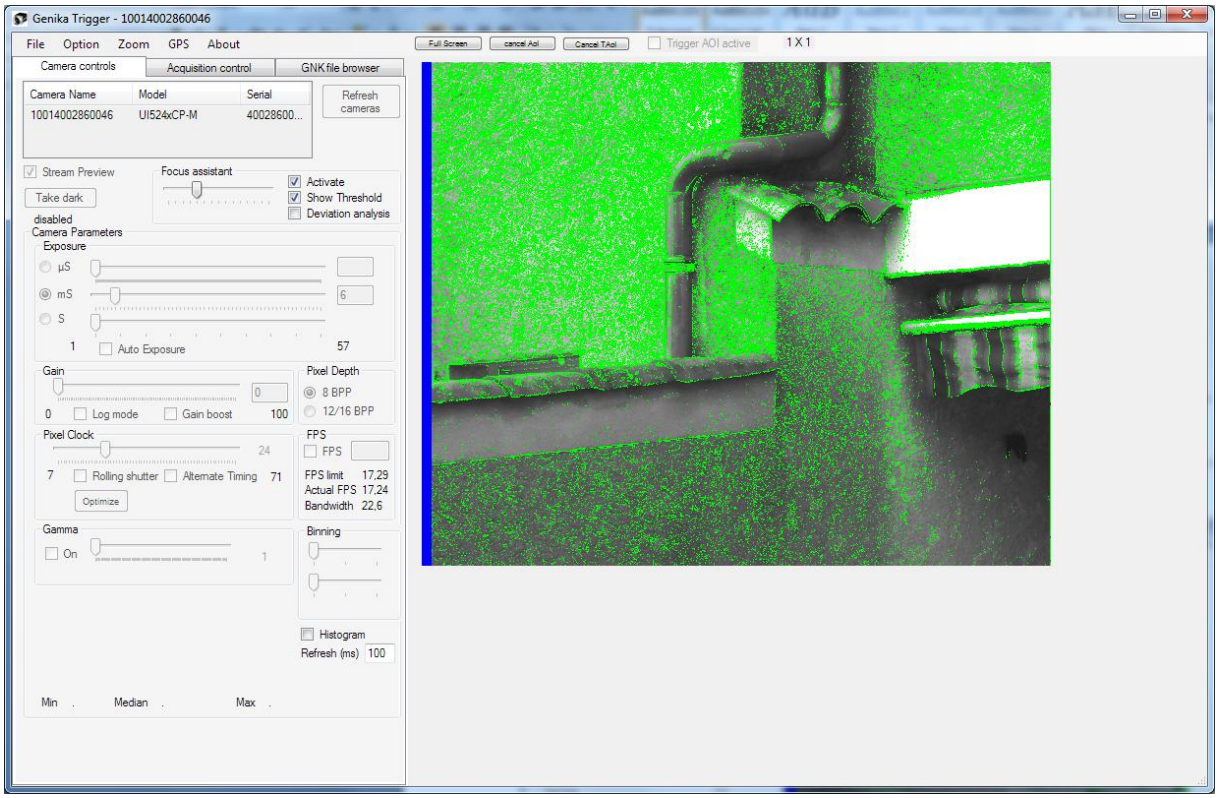


Focus assistant and noise estimator

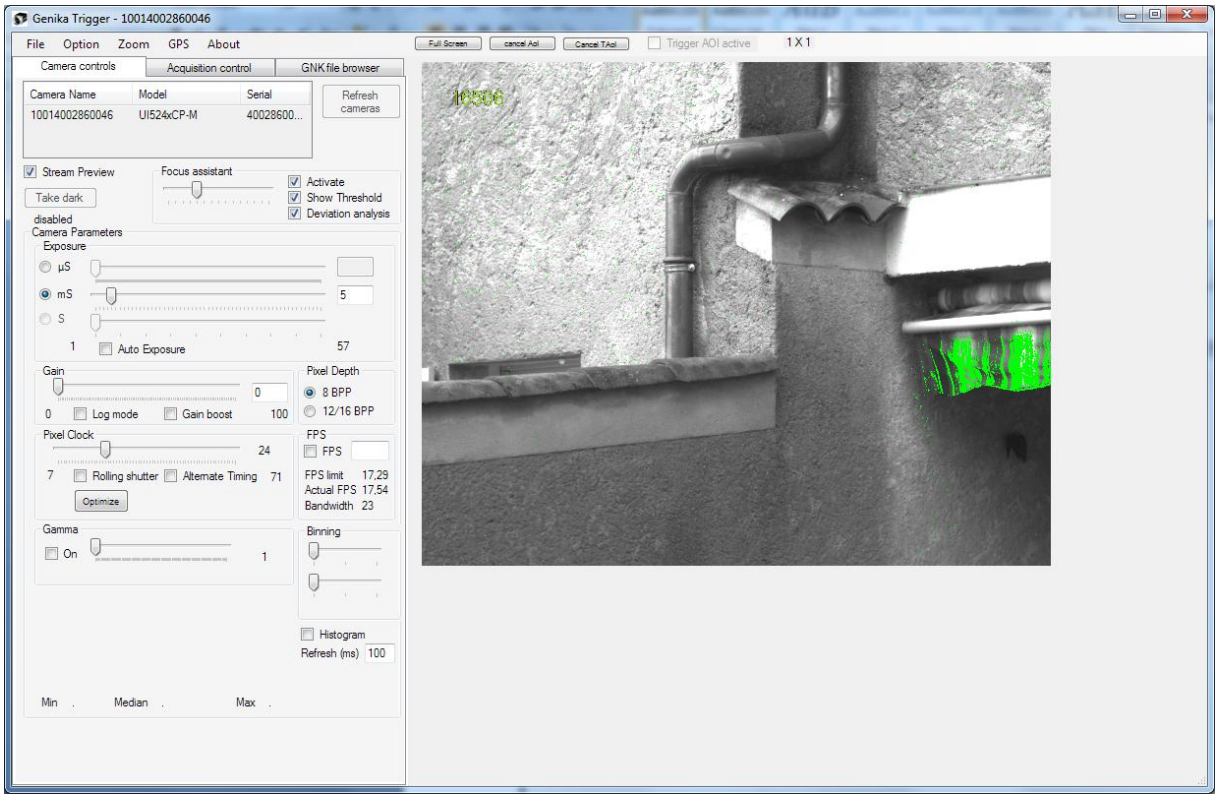
Genika integrates an assistant to the focusing by local contrast analysis. This algorithm is very efficient even with low contrast. It doesn't drive electrical focuser though.

This feature runs in a separate thread.

You can activate the assistant hitting the according checkbox. The threshold display shows the local contrasts in green overlay:



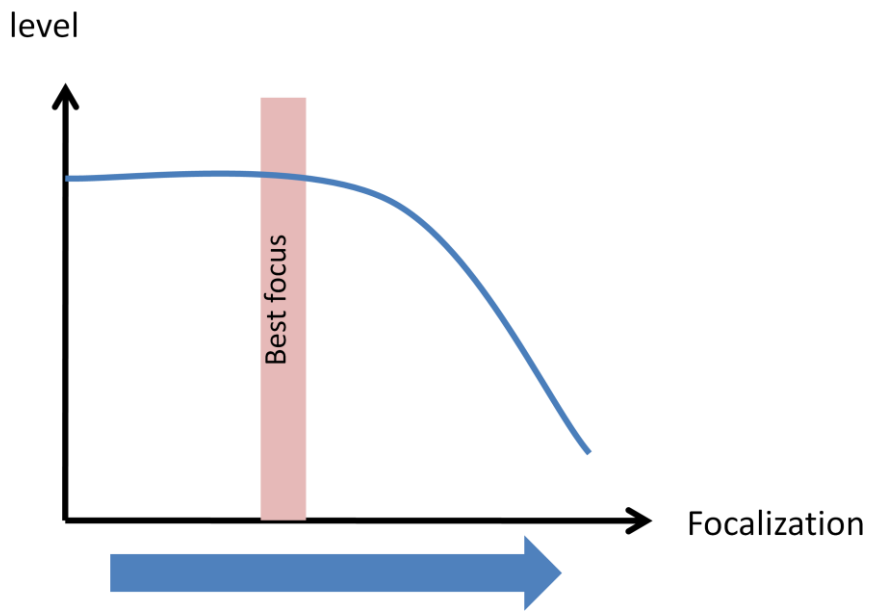
When *Deviation analysis* is selected, the green dots represent pixels that have changed mode than the focus assistant slider value between two frames. The total number is displayed as well. That can be use to optimize the parameters (gain, shutter mode…) to minimize the noise. That should be performed on the still image.



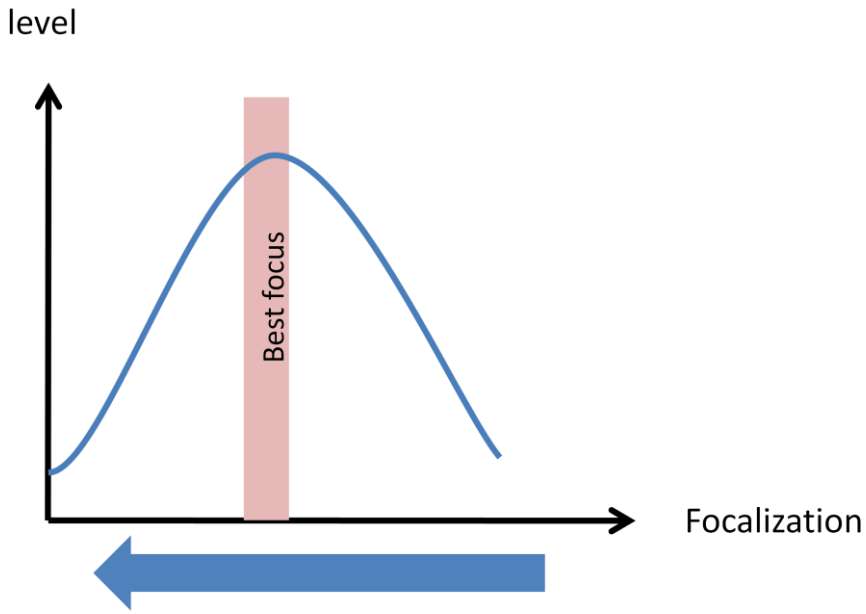
Focusing procedure :

The method used for analysis is relative and you need to browse the focus range to determine the best focus.

The first stage, after having opened the window, is to sweep the area your focuser. The blue bar on the left of the display stays at the maximum up to the focus, and then decrease then when the focus point is exceeded:



You can then go back until the bar returns to the maximum level: you're in this position at the best focus. You can refine this position by moving back and forth around this position.



This method works in both directions (extra to intra focal or the reverse direction). If your exposure time is long, you must move slowly on the axis of focus: Genika averages 4 images to reduce erratic movements of the focusing bar due to random noise.

To refine the measurement, you can chain several round trips. If you change of framing or if an object slides in or out the field of view, you must reset the process (uncheck and recheck the focusing assistant).

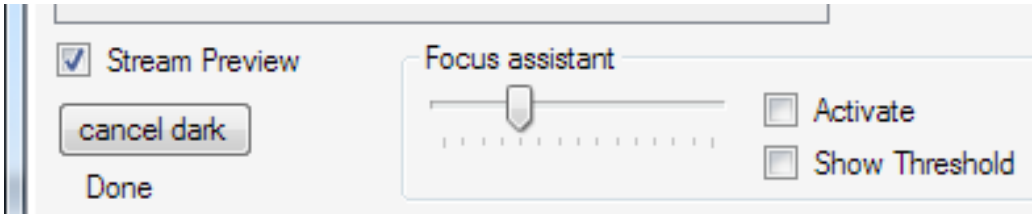
The slider set the sensitivity. The less contrast you have, the lower you set the slider. Moving the slider reset the procedure.

Note that if the sustained bandwidth from the camera is over the bandwidth threshold, the contrast levels are calculated on one every two pixels only to save CPU.

Dark frames

Long exposure (over 1 second) may show hot pixels, especially in warm environment and with ExView class sensors.

It is possible to create a dark frame using the *take dark* button (only when exposure is more than 1 second). When displayed, you must cover the sensor or the camera lens until indicated otherwise.



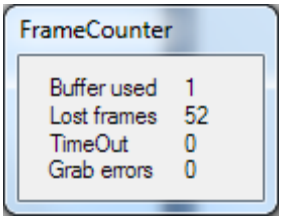
You can cancel the dark frame at anytime.

Genika uses a pure dark subtraction.

Sequence recording

Sequence acquisition

Counters window

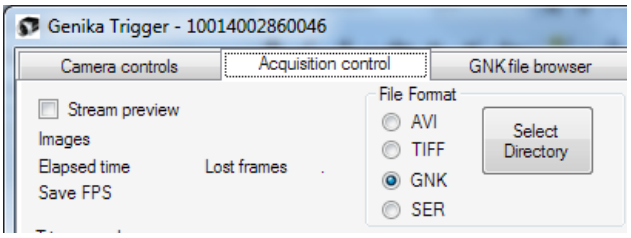


A performance counters windows is available as soon as the acquisition is running, even for display only.

- The *buffer used* figure indicates the number of frame buffer actually used. For nominal system load, it should be 1 or 2. If the system is struggling (disk writes slower than the camera output), this number will increase until it reaches the maximum (25). In that case, the application will have to drop frames until the buffers number gets back to 0. Genika can drop up to four time the complete 25 buffers, then the grab is stopped automatically and a message warn the user on the performance issue.
- *Lost frame* mention the number of frames lost during the current grab session.
- *TimeOut* counter indicates the camera grab time out events. No frame is lost whenever a Time out occurs.
- *Grab errors* indicate the number of corrupted frames. If this number gets high you should check the quality of your GigE or IEEE1394 connection or reduce the pixel clock on IDS cameras.

Files format

Is it possible to select the file format and the active directory from the *Acquisition* tab. This group shown as well the actual acquisition elapsed time, the number of images saved and the FPS. Note that the AVI mode isn't available for all trigger modes and not for 16 bits acquisition.



The dedicated GNK format is strongly advised for heavy throughput acquisition, strict time stamping or GPS tag recording.

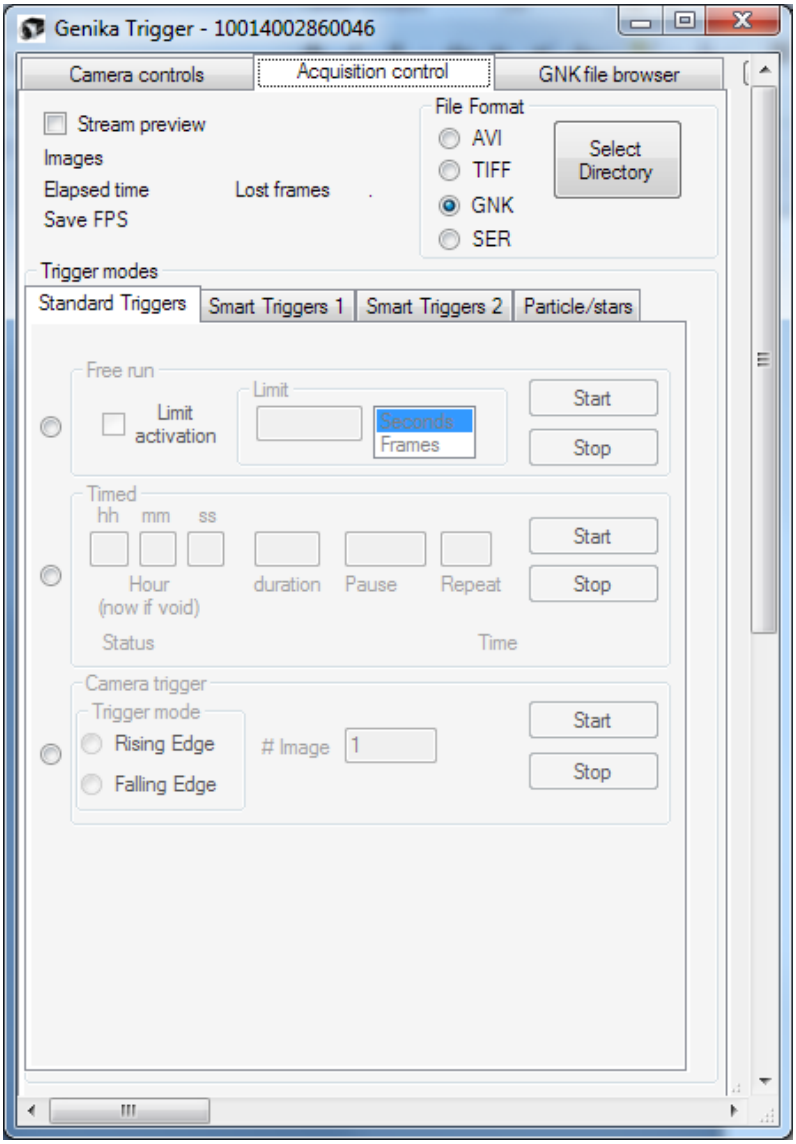
The SER format comes from astronomy applications. It can be read from the file converter application that comes with Genika Astro and Genika Trigger.

Note that the directory is saved in the application .ini form one session to another.

Standard triggers

Genika trigger can work as a basic user controlled video acquisition program. It offers in addition some advanced triggering mode to reduce the amount of images to those which are pertinent. You select the trigger you need with the radio button. Once a trigger is launched with the *start* button, it is not possible to change the camera parameters anymore.

The stream preview doesn't require to be active but for the barycenter detection.

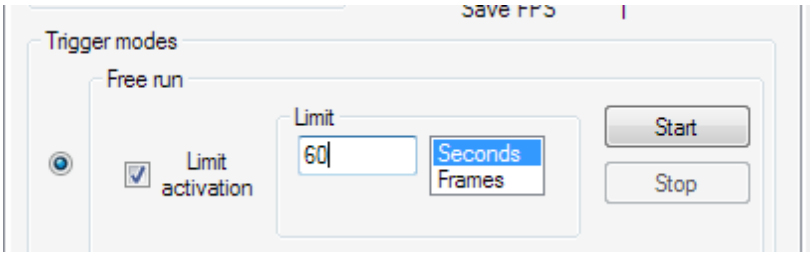


During acquisition it is possible to check the save FPS (may be biased for sporadic acquisitions), the number of image saved and the total elapsed time.

The lost frame counter take into account all frames lost either by lack of CPU resources or the disk being overloaded.

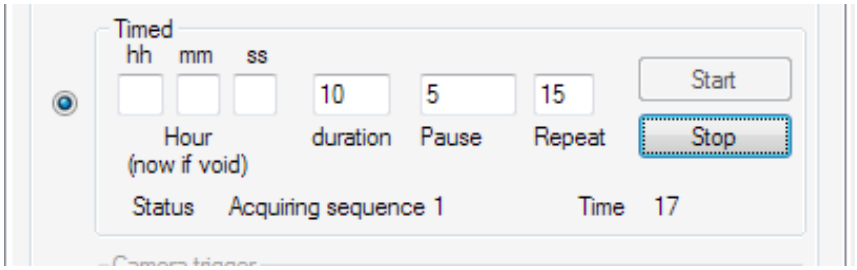
Standard triggers: Free run

The free run mode allows you to start and stop the acquisition whenever you want. The acquisition can last until you press the *stop* button, or be time or frame # limited:



AVI format may be used only with this triggering mode.

Standard triggers: Sequencer



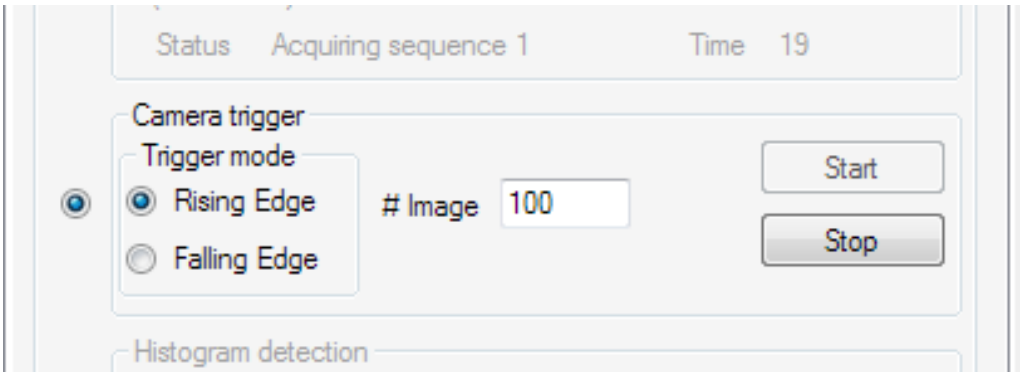
The second triggering mode is a complete sequencer. It defines:

- The acquisition start time (HH:MM:SS), **it starts as soon as you hit *start* if the fields are void**
- Each sequence duration
- Pause between sequences
- Number of sequences

Sequence # and the elapsed time are displayed.

Due to the sporadic nature of the capture, the only file formats available are the TIFF and GNK.

Standard triggers: External trigger



Acquisition may be triggered by the hardware line 1 trigger of the camera (HR6 or HR12 port). The triggering mode can be selected:

- Rising edge: when voltage increase above the trigger
- Falling edge: when the voltage switches from one status to the over (depends on camera specification).

It is also possible to select how many images are acquired up to 255 on Basler cameras and depending on the camera model for IDS and AVT products.

Note: Genika Trigger automatically sets the output trigger to *Exposure Active* mode on Basler and IDS cameras. That allows master/slave camera control through the input/output lines with multiple instances. This behavior can be changed from the option windows.

Due to the sporadic nature of the capture, the only file formats available are the TIFF and GNK.

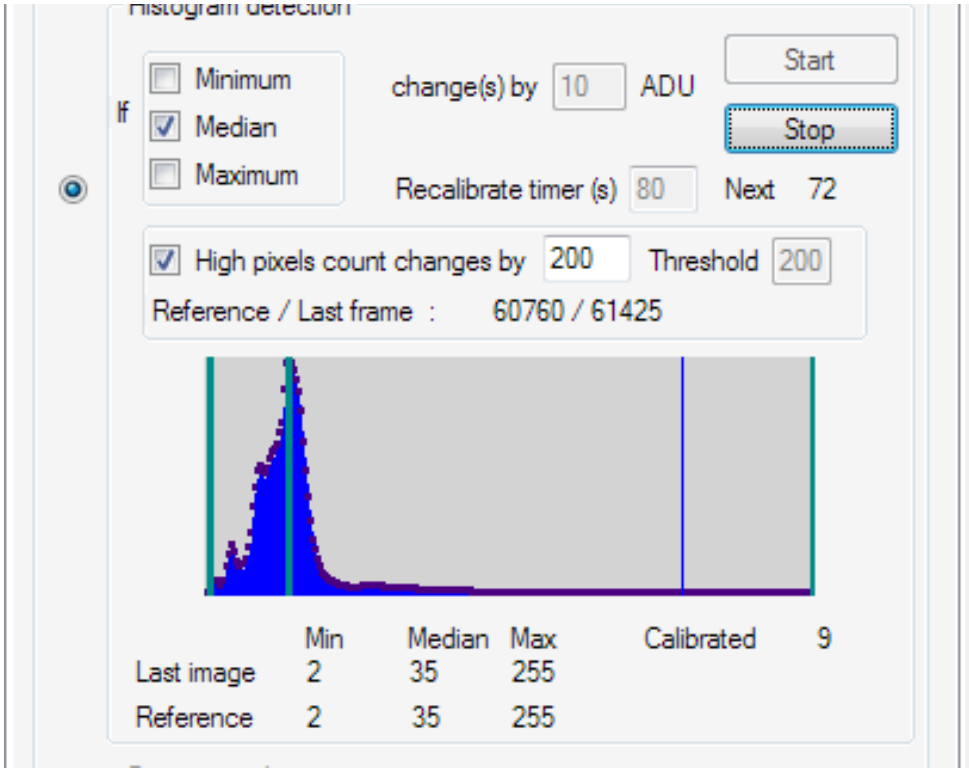
This mode disables the stream preview.

Smart triggers

Smart triggers perform an image analysis on the fly. If the image meets criteria it may be saved or Genika can send a trigger out through the camera.

Smart triggers: Histogram and high pixels detection

This mode is useful when trying to detect an event that will change the overall image luminosity or illuminate some pixels (ex: All sky camera that detects meteors traces, impact detection, aircraft signaling lights detection…).



This triggering mode saves images when the histogram profile or the number of high pixels changes above a limit.

Before starting the detection, Genika build a reference profile averaging 10 frames. This calibration can be periodically redone with the *recalibrate timer* value (in seconds). That allows Genika to compensate a slow image shift without triggering the acquisition.

Histogram

Three histogram values can be used to trigger acquisition: Min, Median and Max. It is possible to activate or de-activate the value(s) being watched during the acquisition at will, but not the value itself. If the total bandwidth exceeds the bandwidth threshold, the histogram is calculated considering one pixel over 4. That doesn't apply when using a Triggering Area of Interest. The *view Min/Max* check box overlays the pixel that are above or below the reference value in green.

High pixels

The number of pixels being above the defined threshold (in ADU) can trigger the acquisition when changing.

The reference and actual histograms are displayed along with the Min, Median and Max values in dotted line; the actual histogram is displayed in solid blue.

When using long (over one second) exposure, it is advised to use a dark frame to remove hot pixels.

Due to the sporadic nature of the capture, the only file formats available are the TIFF, SER and GNK.

In the example above, the calibration gave the following metrics:

- *Min : 2*
- *Median : 35*
- *Max : 255*
- *Pixels above 200 ADU : 60760*

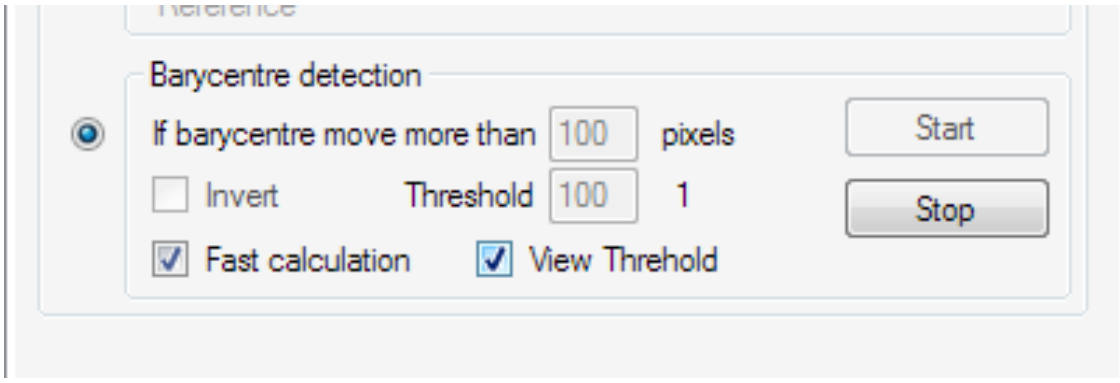
Acquisition will be triggered if:

- *Median changes by more than 10 ADU*
- *High pixel count changes by more than 200*

The reference will recalibrate every 80 seconds.

Smart triggers: Center of gravity detection

This mode triggers the acquisition depending on the image center of gravity displacement.

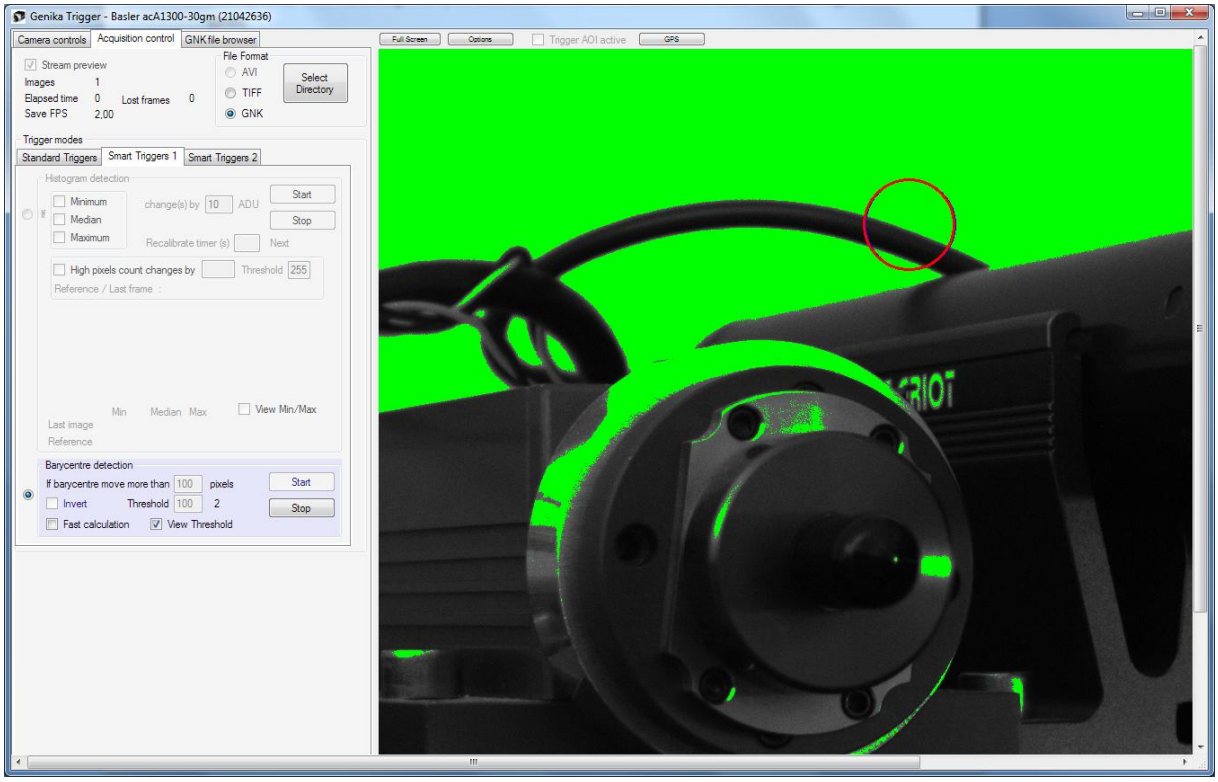


The center of gravity is calculated based on pixel values. A threshold can be applied to ignore pixel under a given value. In the example above, the barycenter is calculated taking into account only pixel above 100 ADU (255 being the maximum). Note that in 16 bits mode, the threshold scale remains on 8 bits (0-255). When selecting *invert*, the selection will take into account low tones instead of high tones.

Without invert : All pixels above 100 will be used, 100 being the lesser weight, 255 the higher weight.

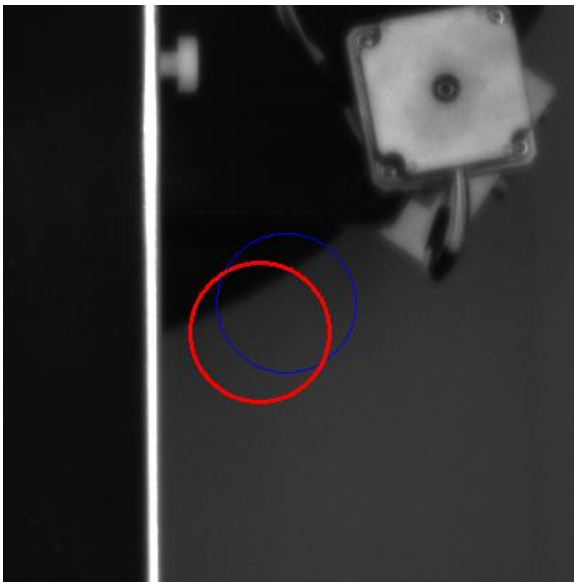
With Invert: All pixels below (255-100 = 155) will be used, 155 being the lesser weight and 0 the higher weight. If you want to be very selective on the threshold, you need to specify a value close to 255. For example setting 250 will select only levels between 0 and 4 for the calculation.

It is possible to view the areas used for the calculation by checking *View Threshold*. Those are then overlaid in green.



Fast calculation will calculate the barycenter using only a pixel over three to speed up the process if the TAoI isn't activated.

If the barycenter moves mores than N pixels from the original position, the capture will be triggered and run as long as this condition is verified. The distance between the actual center of gravity and the initial one is symbolized on the preview by two circles on overlay.

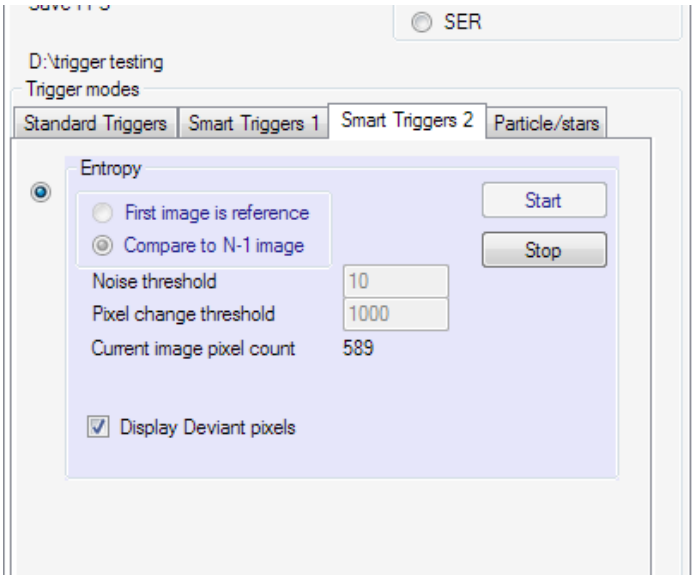


Trigger occurs when the circles get disjoint.

Smart triggers: Entropy change

Entropy trigger compares each pixel value to a reference build at the beginning of the process. This reference image is the average of 10 images for each pixel value. A second mode is available chere the image N is compared to N-1.

If the *Save reference Image position 1* is checked the last frame of the reference stack is saved as the first GNK image. You can use this frame during post-processing as a reference image without trigger condition being true.



A threshold can be applied to avoid non desirable detection due to image noise: *Noise Threshold*.

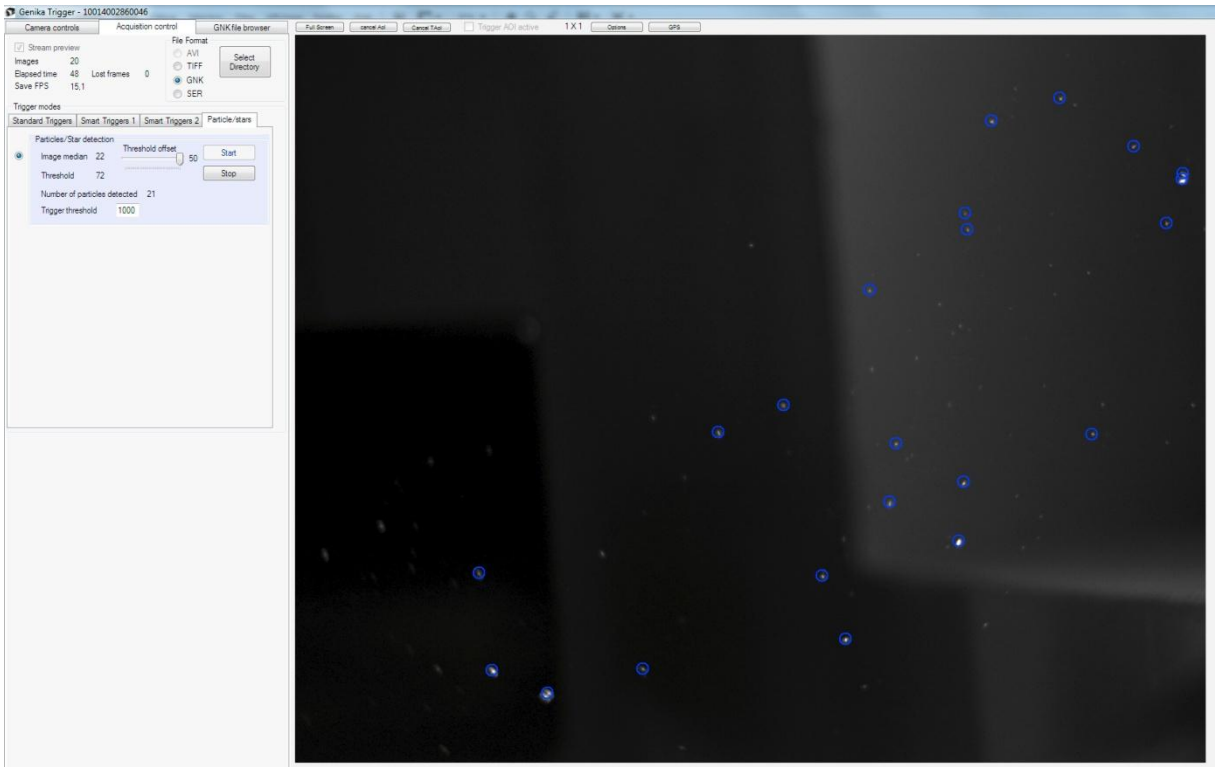
The image is saved if the number of pixels that exceed the threshold is above the value of the *Pixel change threshold*. It is possible to visualize the deviant pixels with the *Display deviant pixel* check box.

This triggering mode is more generalist than the detection mode and can be used to detect sudden image modifications.

If the total bandwidth exceeds the bandwidth threshold, both the averaged reference image and the number of deviant pixels are calculated considering one pixel over 4. That doesn't apply when TAoI is active.

Smart triggers: Particle/stars detection

This smart trigger counts individual particles, stars or white dots on every image. Particles are spotted with a blue circle on the display. The trigger activates when the count is above the specified threshold.



Is considered as a particle:

- An area that is brighter than the image median added with the threshold control value.
- An area that presents at least 4 pixels above the threshold value as defined above; but if all pixels are above this threshold the trigger won't set off.
- Particles are to be contained within a 9x9 pixels area
    - If more than on particle are inside this 9x9 area, it will count as one particle
    - If a particle is longer than 9x9 pixels it may be account for several times

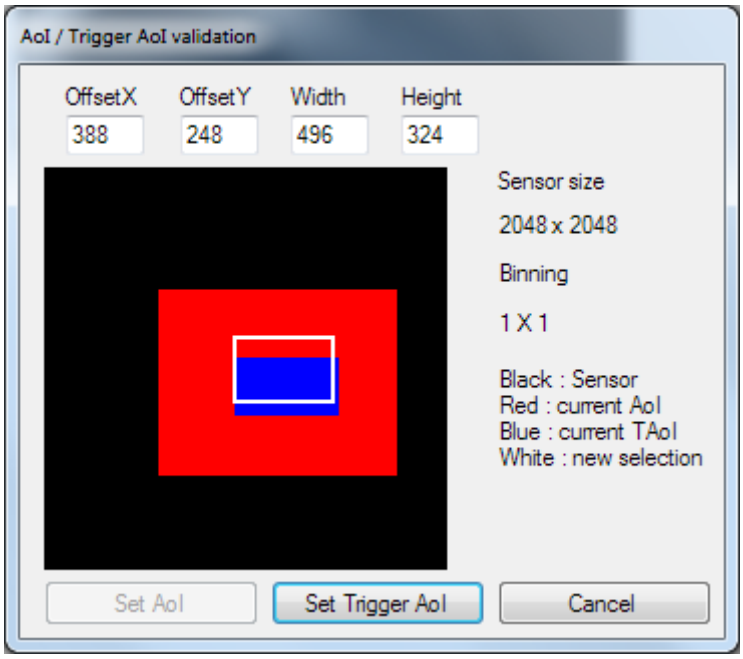
The particle smart trigger runs in its own thread. If the analysis is longer than the inter-frame delay some frames may be skipped. Note that this trigger can analyze several hundred particles per frame at 60 fps with a Core i5/i7 processor thanks to the multithreading capabilities.

Advices for efficient particles detection

- The contrast between particles and background should be optimal. This can be achieved with correct particle lighting and homogeneous background.
- With a good contrast the threshold offset should be set as low as possible
- Contrast can also be achieved by using the lens aperture to minimize depth of field

Area of Interest and Triggers Area of Interest

It is possible to limit the region acquired by the sensor using the Area of Interest (AoI) if the camera supports it. You can draw a rectangle over the image display to select the area and a window pops up to ask what this area defines and remind the actual setting:



- The black area is the maximum sensor size **unbinned**. Binning setting are NOT taken into account for this area.
- The Red area is the current camera's AoI.
- The Blue area is the current Trigger AoI. If not defines, TAoI = AoI and the AoI area appears blue.
- The White rectangle shows the current selection. Selection may be changed using the input areas.

Set AoI

It defines the camera AoI. It is possible to cancel it from the button above the image display.

Set Trigger AoI

By default the smart triggers analyze the entire image surface as defined by the binning and AoI settings. It is possible to reduce this area to a rectangle to optimize performances or limit the analyzed area.

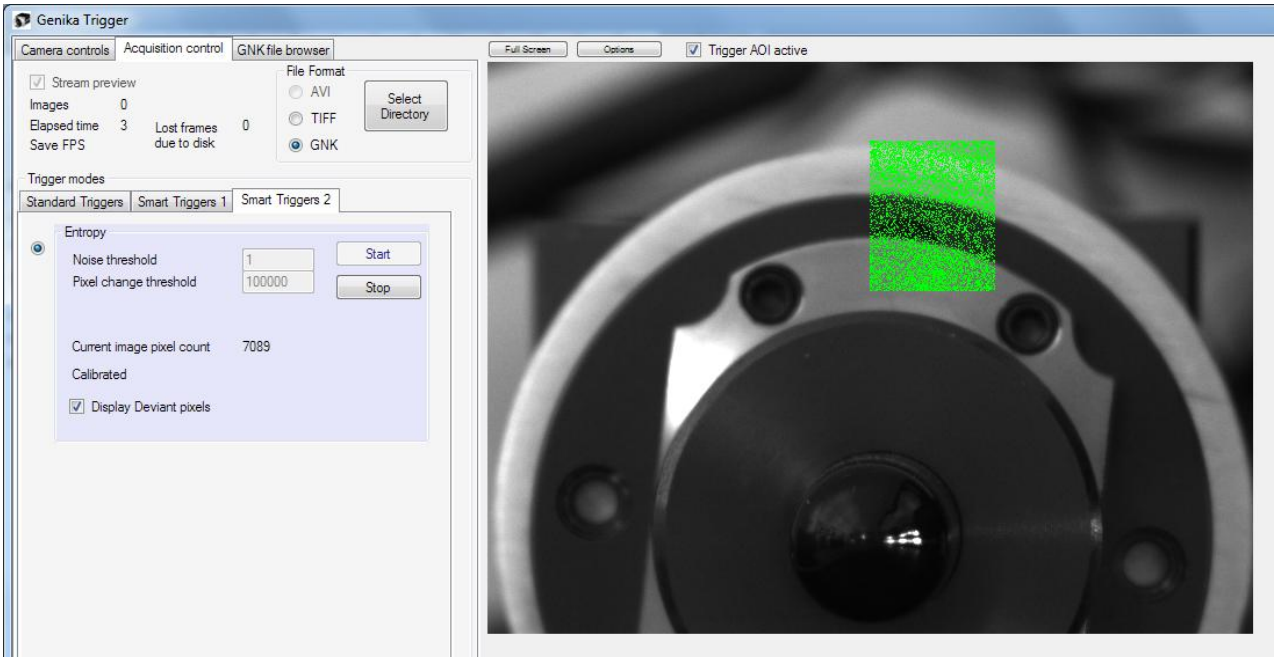
The TAoI activation is confirmed by the checkbox above the preview area :

It can be cancelled through the same process : click on *cancel*

Note : Trigger AoI is automatically disabled when changing Binning, AoI or bit Depth.

Changing the TAoI area is possible on the fly with the Detection and Entropy mode. In that case a new calibration is performed immediately. Note that the barycenter triggering mode requires the trigger to be stopped.

The trigger area can be displayed with the trigger visualization mode:



TAoI disable the bandwidth threshold and fast calculation mode.

Note : TAoI also applies to the histogram calculation.

For both AoI and TAoI use the buttons above the image display to cancel the rectangle. It is possible to define the TAoI without cancellation of the previous one. AoI must be cancel before being redefined.

GNK file format

GNK file format

Genika trigger can make very sporadic image acquisitions in detection, entropy and barycenter mode and those acquisitions may also run for a long period of time.

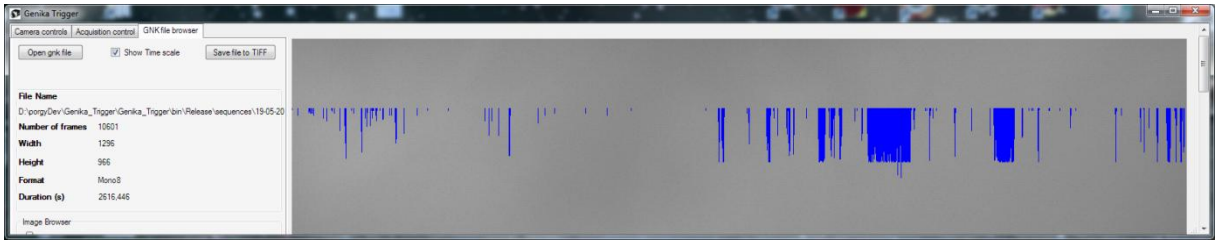
In case of an application interruption (crash, loss of power, loss of camera), it is mandatory that the file format won't get corrupted if the file wasn't closed properly. For example the AVI file format can get easily corrupted if the final amount of frames isn't set in the header. On another hand the TIFF individual files are a good solution but they put stress on the disk system at high speed.

Genika has its own file format with the .gnk extension. It provides several advantages:

- No file closing : the file won't get corrupted
- Individual frame time stamp (100ns)
- trigger event are recorded for each frame (smart triggers)
- 8 and 12 bits B/W
- GPS geo-localization information: latitude, longitude and altitude
- Focal length, focusing distance and pixel size information

The third tab provides with an integrated file browser and converter. The file data are displayed and the frame timestamp and trigger data are available.

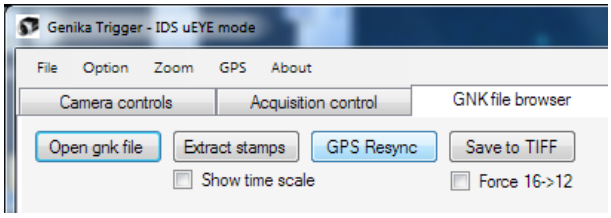
Note : If 16 bits images appear corrupted try to check the *Force 16bits -> 12* mode.



It is possible to check when the frames time distribution during the global run time with the *Show Time Scale* button (may takes some time depending on the file length). The graph overlays the picture display and each blue line indicates when an acquisition took place. The longer is the line, the more frames were acquired. Each tick shows (total duration/image width) amount of time.

You can also extract all the time stamps with the *extract stamps* button. It generates a txt file that can be opened with Excel (separator: spaces).

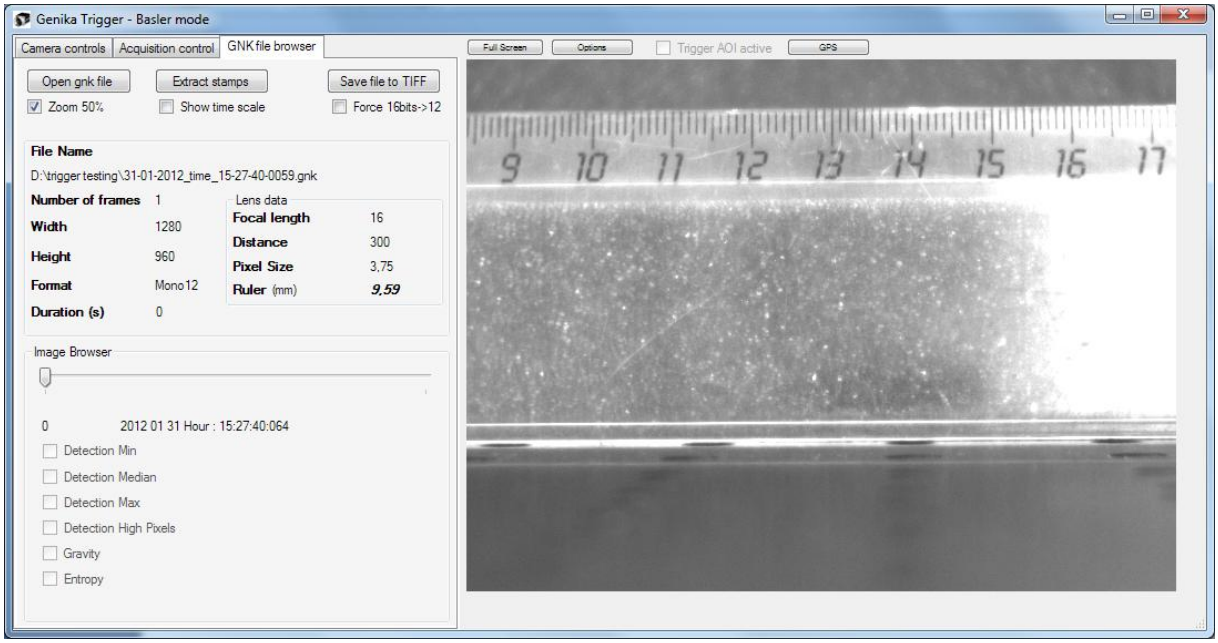
Timestamp in the file may be re-synchronized with a timing file generated by the PPS DCD Tracker applet. If such a file has been prepared you can use the *GPS Resync* button :



Please refer to the "*GNK timing synchronization through GPS reference*" application note at the end of this document for more details.

It is possible to convert the file in individual TIFF frames in a dedicated directory. That gives the same result than as a TIFF acquisition. The TIFF file name includes the time stamp.

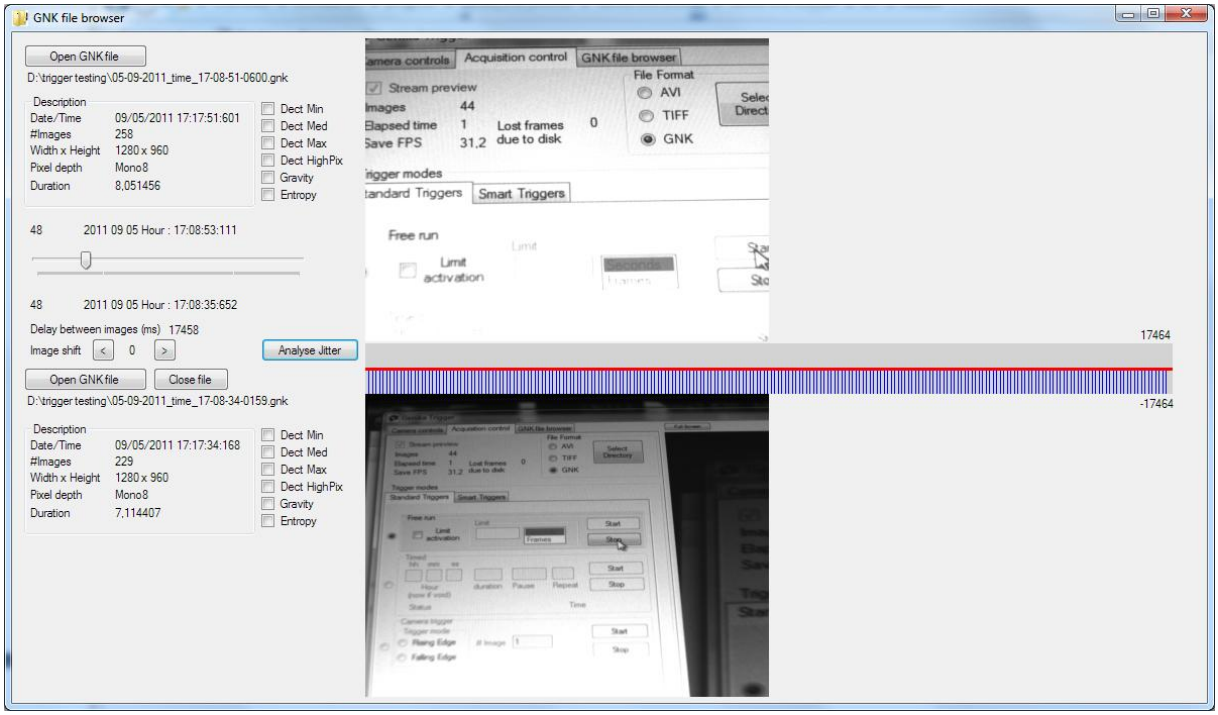
If the spatial metrics have been specified during the acquisition they are displayed on the screen and a ruler is available (left click on image then release) :



For the GPS options please refer to the GPS section.

External GNK file browser

The GNK file browser is an independent application that allows to browse files and to compare two files side by side.



For both opened file the application recaps the following data:

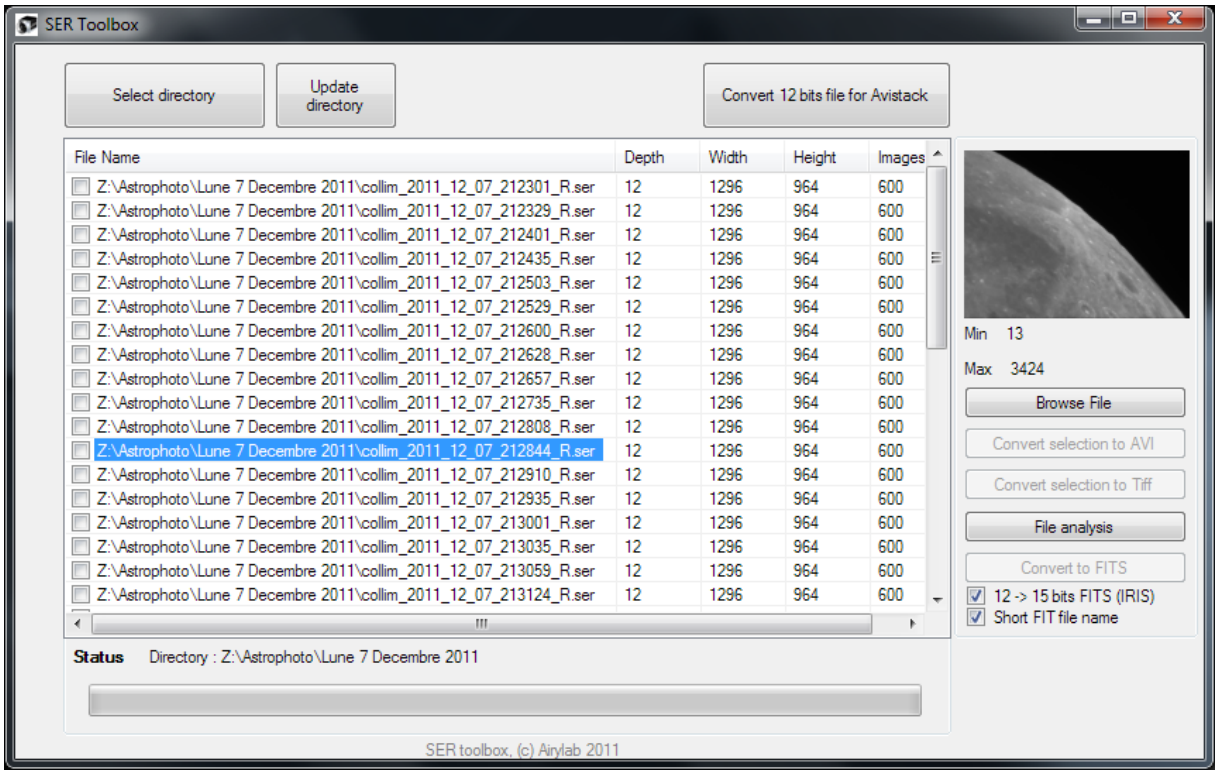
- File path
- First image time stamp
- Number of images
- Resolution
- Pixel depth
- Duration
- Trigger event for each image
- Current image timestamp

It is possible to browse both file at the same time with a central slider. An offset can be set to the second file in both directions.

The *analyze jitter* calculate the timestamp difference of all images (taking into account the offset) and build a graph between the two images.

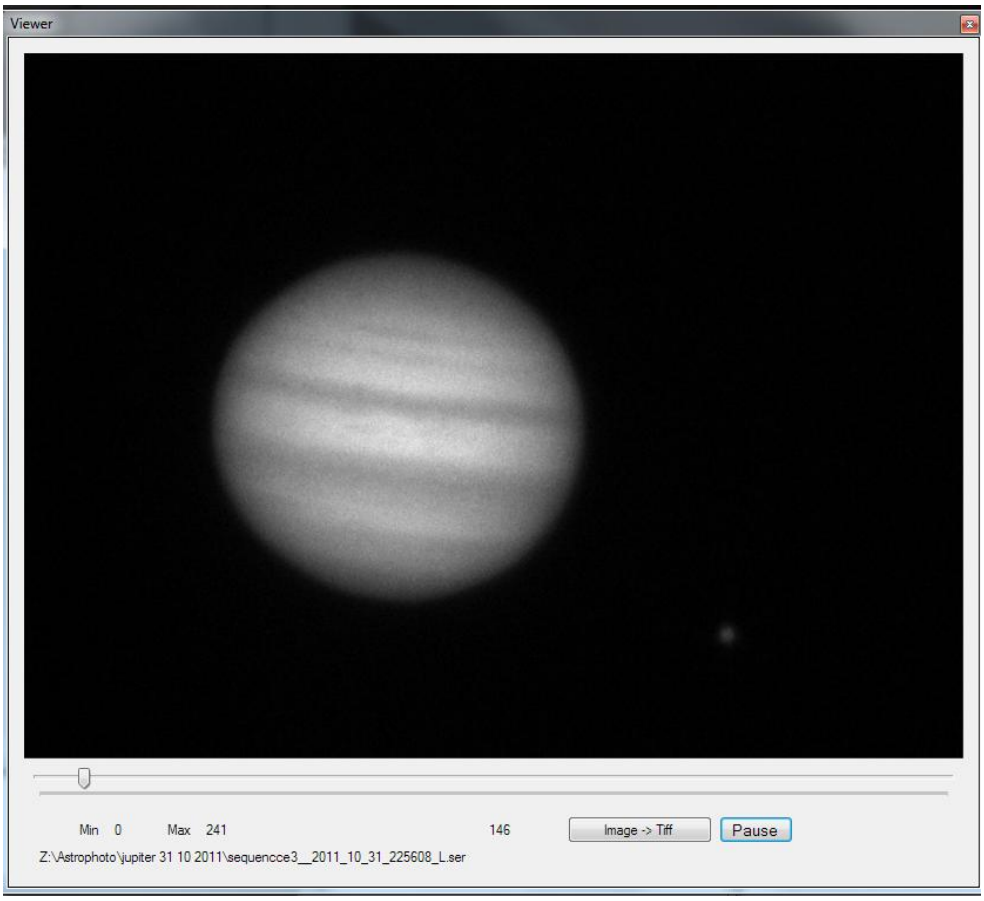
External SER toolbox

A tool dedicated to the SER files management is available.



Using this module, you can :

- List all SER files in a directory. You'll see their dimensions, images count and pixel depth
- Get a preview of the first image with its minimum and maximum pixel value.
- Browse the file and save a individual Tiff image
- Convert all 12 bits file in the directory to 16 bits for Avistack processing. Original files are kept.
- Convert 8bits files to AVI format, and 8 bits or 16 bits files to individual TIFF or FITS images stored in an automatically created directory.
- Analyze a file: a text file with all images information will be created.



Note that the viewer resize the frame to a fixed file for display, it is not the acquisition size present on the disk.

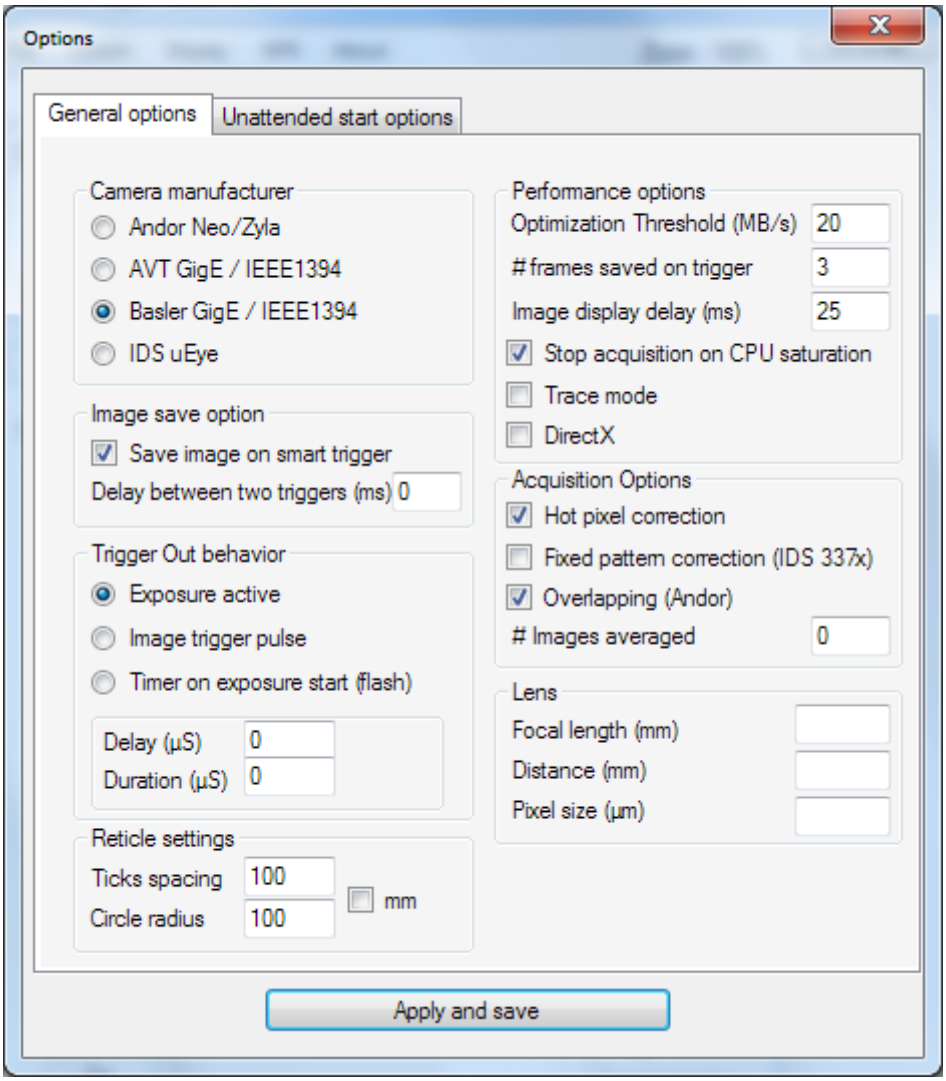
You can play the current SER file at 10 fps.

Note for IRIS users: you can have a simple name convention for FIT files : “I”+image number. That makes command line in Iris easier.

Application settings and GPS support

General settings (first tab)

Application wide general options can be accessed from the *Options* menu.



Camera manufacturer

Camera manufacturer: select the camera model you want to use with Genika Trigger. This setting applies also immediately. If a camera was connected, it will be disconnected.

Image save option

Save image on trigger: by default Genika saves an image when the smart trigger set off. If the camera is used for detection or system control through the camera's trigger out line, it may not be needed to record the frame. In that case it is possible to disable this behavior with this option.

Delay between two triggers(ms) : This field limits the number of triggers that can be set off. When a delay in ms is specified (different than 0) no trigger can set off until this delay is past. <u>This setting supersede the *#frames saved on trigger* setting.</u>

Performance options

Optimization threshold: this setting specifies the bandwidth threshold that applies when using focus assistant and smart triggers. Unit is MB/s.

#frames saved on trigger: it is possible to bypass the smart triggers analysis when it has been trigged by a video frame. In that case Genika records N frames automatically. This field specifies the number of frames to be recorded after the first one that trigged the recording.

Image display delay: set up the display refresh delay. By default it is set to 25ms (20 frame per second). That does change the real acquisition rate and can save CPU load.

Trace mode: this is a specific option for troubleshooting and should be activated when requested by Airylab support.

DirectX : Switch between the DirectX and GDI display mode. For performance, DirectX mode is always the preferred choice.

Acquisition option

Hot pixel correction: activates camera hot pixel correction map if available.

Fixed pattern correction: activates offset correction if available.

 # images averaged: select the number of image that are averaged when this option is selected in the acquisition parameters tab. Images are averaged to improve the SNR.

Overlapping: activates the overlapping mode (exposure of the next frame meanwhile the previous one is still being read). In this mode the throughput is higher on Andor camera but the camera may exceed the frame grabber bandwidth and latency occurs.

Trigger out behavior

Trigger out behavior: This option set up the external line 1. The line edge raises either during frame exposure or if smart trigger has set off. In case of Basler cameras, it is possible to add a delay between the exposure start and the trigger out up to 4096µS. This is very useful when triggering a ligh system to be sure that the exposure is started before setting off a flash.

Note: the *#frames saved on trigger* value is ignored if *Save Image on smart Trigger* is set to off. All images are analyzed in that case.

It is possible to customize the camera trigger out line 1 behavior from the application.

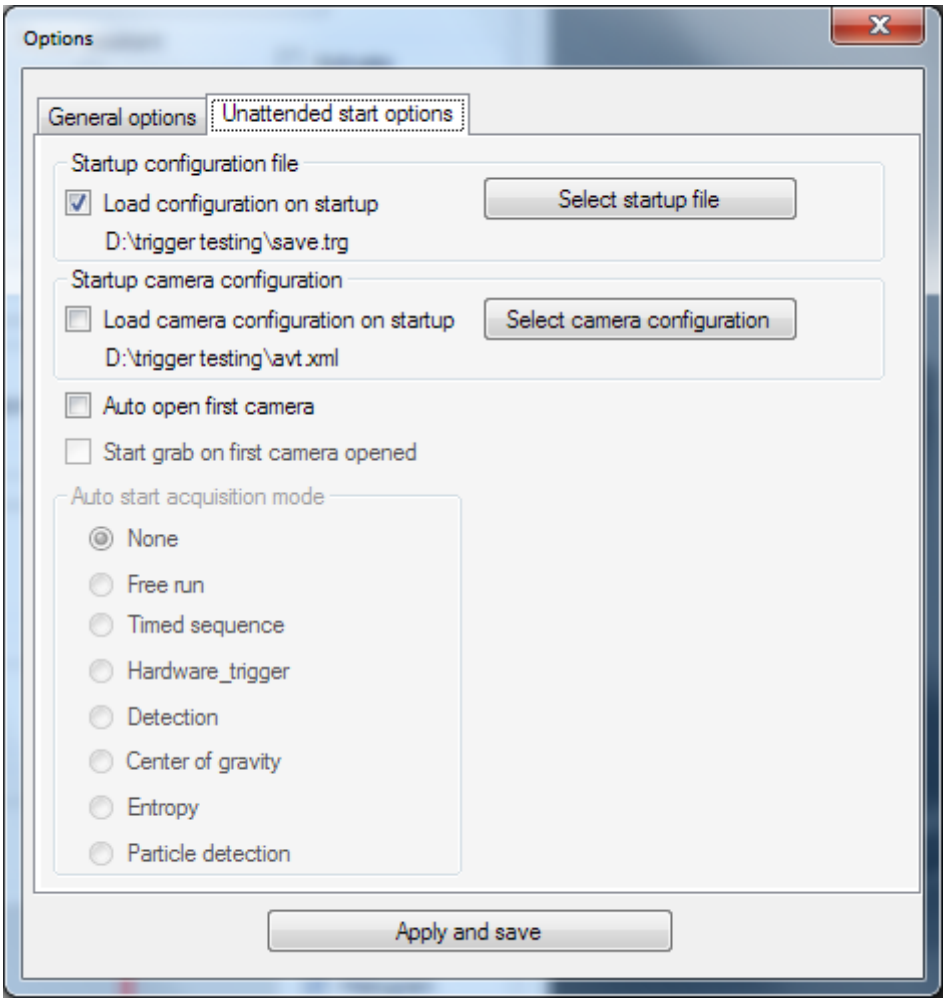
Reticle settings

Reticle: A reticle can be displayed on top of the live stream. It can be graduated in pixels or mm if the lens characteristics have been specified.

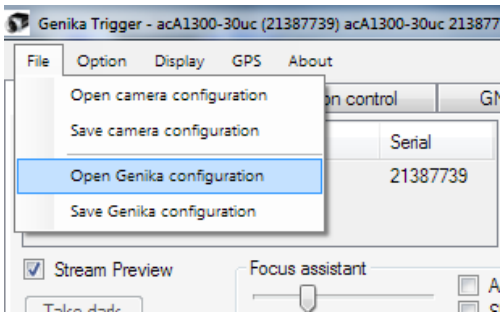
New settings apply immediately after saving the changes. The configuration is saved for further sessions.

You can also enter your lens focal length, pixel size and focalization distance. This information can be used for the GNK browser ruler and further analysis.

Unattended start settings (second tab)



Genika Trigger can start completely unattended. A default configuration file is required to do so, this file can be created from the *file* menu:



A configuration file contains all the trigger settings, its extension is *.trg*

A camera configuration can also be loaded automatically. If the camera model doesn't match the camera configuration file, it is ignored.

The first camera found may be open automatically, and the grab may also be started. Note that for most trigger it is not required to launch the grab: the trigger start would perform this step.

Then a trigger can be launched once the camera is connected.

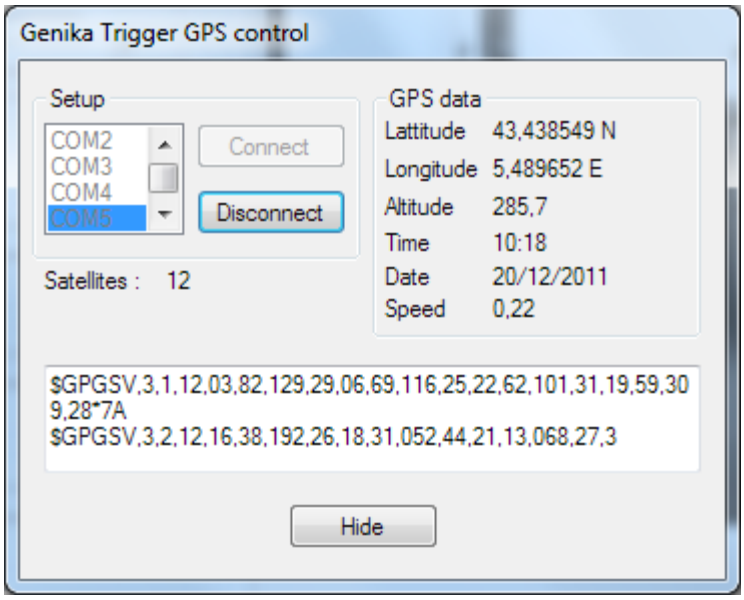
Note that it is not possible to connect automatically a GPS at this time.

GPS and geo-localization

Application NMEA support

Genika trigger can record the video frame position when using a NMEA GPS and the GNK file format.

The GPS configuration can be achieved using the GPS button :

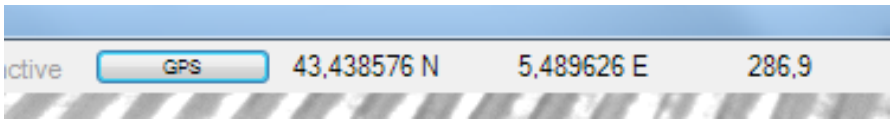


GPS protocol used by Genika Trigger is NMEA through serial port (serial, embedded or Bluetooth receiver).

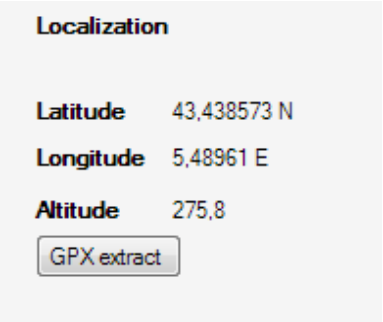
- Set up the serial port number
- Click on *connect*

When the fix is done this window displays the GPS data, number of satellites acquired and the NMEA sequences. The window can be hidden.

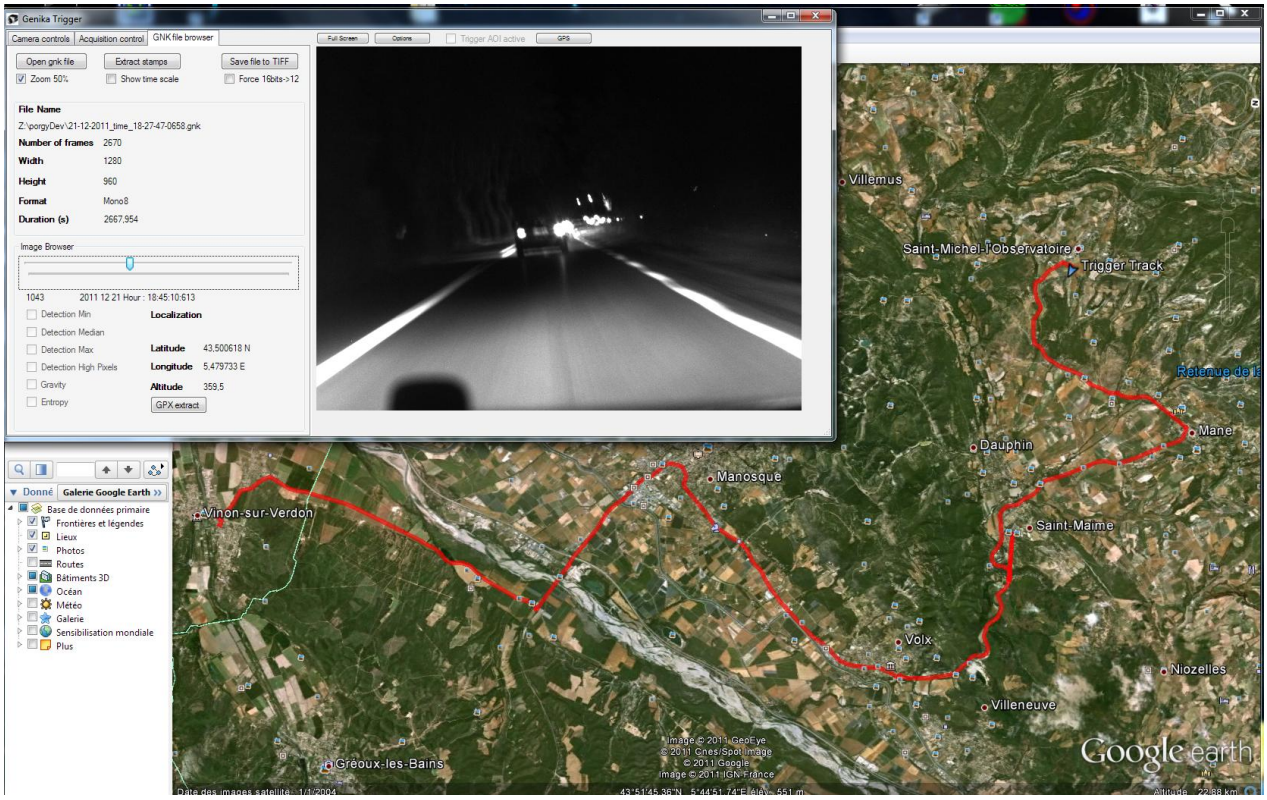
The latitude, longitude and altitude are displayed on the main window and recorded in the GNK file during acquisition:



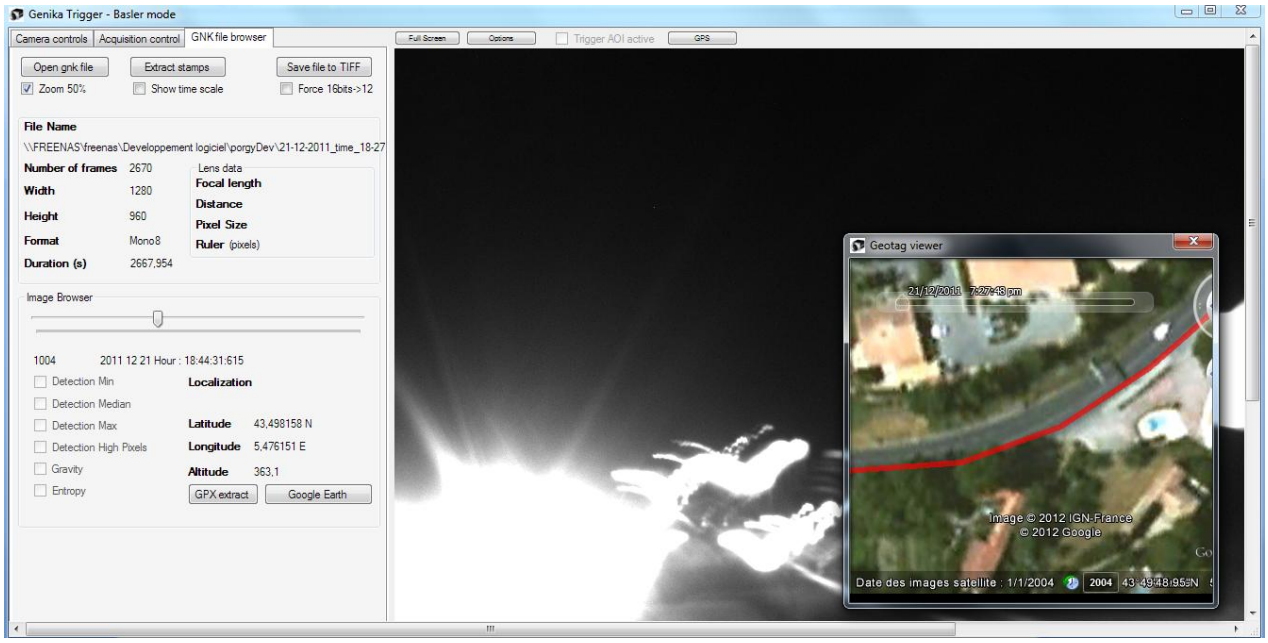
When browsing the GNK file, current image GPS information is displayed.



It is possible to export GPS information in a GPX file.



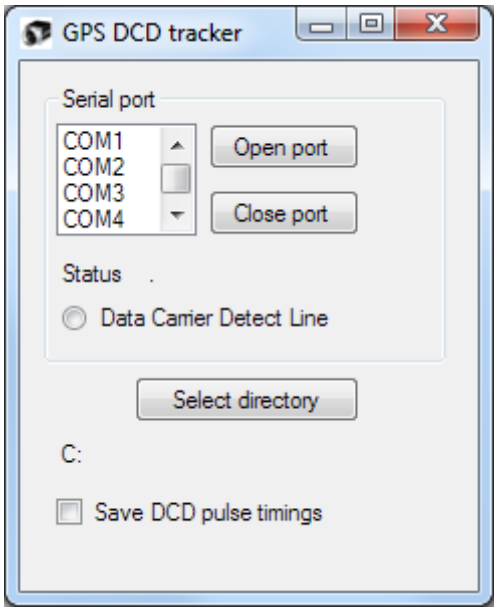
You can also open a Google Earth view inside Genika Trigger (Google Earth has to be installed).



The Google Earth view is automatically updated when you browse images with the track bar.

GPS DCD tracker application

A specific application allows capturing the Pulse Per Second signal from a GPS receiver when it is passed by the Data Carrier Connect (DCD) serial pin. This status line is decoded by the serial stream and therefore induces minimal latency.



This tool allows saving in a text file of the system time for each second PPS when the *save DCD pulse timings* checkbox is selected.

The text file records :

- Date, time

- System ticks (100ns step)
- The offset to the next plain second that matches the PPS input
- The jitter in 100ns steps between two PPS

Date, Time, Ticks, Offset to plain second in ms, jitter in 100ns

28-06-2012,11-57-34-0561,634764814545614695,439 , 6,34764814545615E+17

28-06-2012,11-57-35-0556,634764814555567749,444 , 9953024

28-06-2012,11-57-36-0556,634764814565568125,444 , 10000384

28-06-2012,11-57-37-0556,634764814575560984,444 , 9992832

28-06-2012,11-57-38-0556,634764814585569055,444 , 10008064

28-06-2012,11-57-39-0556,634764814595564417,444 , 9995392

28-06-2012,11-57-40-0555,634764814605557285,445 , 9992832

28-06-2012,11-57-41-0556,634764814615567849,444 , 10010624

28-06-2012,11-57-42-0556,634764814625560709,444 , 9992832

Performances

Notes about performances

CPU performances

Some triggering mode such as the barycenter, entropy and the histogram detection can generate high load when running at high FPS. An Intel Core i5 or i7 is strongly advised if you target such purpose.

Genika Trigger uses multithreading and takes benefit of a multicore architecture. Focusing, noise estimation and particle trigger uses their own dedicated thread.

Some heavy duty tasks (such as histogram calculation or focusing) implement a degraded mode when the throughput exceeds the bandwidth threshold. This threshold can be changed from the *options* window.

Take care to de activate the overlay preview features before real acquisition (Min/Max detection preview, Barycenter preview…).

You can also change the display rate. By default it is set to 25ms (40 fps), setting longer delay decreases the CPU load.

Note that performances for Andor cameras are limited due to the necessity to convert 16 bits images to 8 bits for analysis purpose. For high speed acquisition with Andor Neo/Zyla without smart triggering need, we recommend to use the Genika Astro application instead.

Display performances

Genika display image with two modes : GDI+ and DirectX. The DirectX mode uses your GPU for hardware accelerated rendering and reduce the CPU load by 30 to 50%. This mode should be used whenever it is possible.

Disk Performances

Your camera delivers high bandwidth that can overtake your hard drive. Basler Ace aca1300-30gm model will deliver over 84 MB/s using 16 bits and E2V sensors can deliver close to 160 MB/s. It's usually more than most 5400 rd/mn hard disk can handle.

Genika Trigger has been optimized to deliver the best performances possible. Nevertheless at some stage, when the system cache is full, it cannot go faster than your drive. Usually you will have no issue using 8 bits mode. Trouble comes with long 16 bits full speed acquisition. If you use your camera that way, you may have to use SSD, or Raid system to increase the disk performances.

Optimization tips are:

- Trim or defragment your SSD or HD before acquisition. File being very large (5GB for a 60s 16 bits capture with the Ace 1300-30gm model), the file system may waste some time searching for free clusters
- More RAM is better for it means more system cache. Note that CPU isn't critical for freerun, sequencer or triggered acquisition. Any C2D will do.
- For very high performances, use a RAID system for laptop (such as in the Sony Vaio VPC-Z13 series) or a hardware desktop RAID PC.
- Use 64 bits OS to address more than 3 GB of memory

If the difference of speed between the HD and the camera capabilities are too important, that may lead to frames being dropped. In that case it is strongly advised to limit the FPS to a compatible value.

Genika Trigger successfully acquired for 3 minutes 160 Mo/s without a single frame loss using a Crucial M4 SSD.

GigE Performances

Sometimes the video stream will lose a frame due to a transmission error over the GE link. For most application it is not important and Genika has been written to handle those errors by ignoring them.

Nevertheless some applications cannot stand such errors. It is possible to optimize the transfer by network optimization as follow:

- If you have an Intel Pro1000 compatible NIC (Intel chipset for example), use the dedicated Basler performance driver. It can handle frame retransmission.
- Configure your NIC has follow :
    - Switch on *Jumbo Frames* with the maximal size, usually 9000 is fine,
    - Increase *transmission buffers* and *reception buffers* value,
- Increase the *interpacket delay* value on the camera side using the Pylon Viewer. You'll find an optimal value at some stage. Note that above this value, speed will decrease again.
- Use a Cat6 Ethernet cable,
- **Switch off power saving on the Ethernet port,**
- **Switch off antivirus for the disk and the Ethernet port.**

Performances assessment

Understanding the Genika thread structure can help you to tweak the system to get the performances you need. Up to four threads are used during an acquisition:

Thread	Role	Performance issue	Is crashed?	What can solve the issue
GUI/Triggers thread	Application controls, triggers analysis, image display	Application gets stuck: no control and image refresh. Buffers # on counters window goes up to 25	No. GUI freezes but the triggers keep running	Disable preview Disable 50% zoom Decrease FPS when triggering Increase bandwidth threshold to activate optimized mode Increase CPU speed or select a trigger AoI
Counters window	Gives buffer counters	None	NA	NA
Grab Thread	Grab frames from the camera, build bitmaps, buffers and timestamps	None except on very slow CPU	No	Get CPU up to minimal specs
Save thread	Save images	The lost images counter increases at fast rate	Not crashed but frames are being lost	Increase disk system throughput, increase RAM (cache)

Optimization hints:

If you reach over 25 buffers used in the counters window you have a bottleneck in the main thread.

When Genika reach 25 buffers it drops them all. After five or ten successive buffers drop the grab is stopped and a message warn the user. The number depends on the exposure time.

Actions may be:

- Smart triggers treatment is too heavy : reduce the bandwidth threshold, activate the TAoI or limit FPS/Picture size
- Deactivate preview or/and don't use the 50% zoom mode (may save over 10% CPU)
- Use a higher threshold in the barycenter detection trigger
- Use barycenter fast calculation
- Deactivate histogram

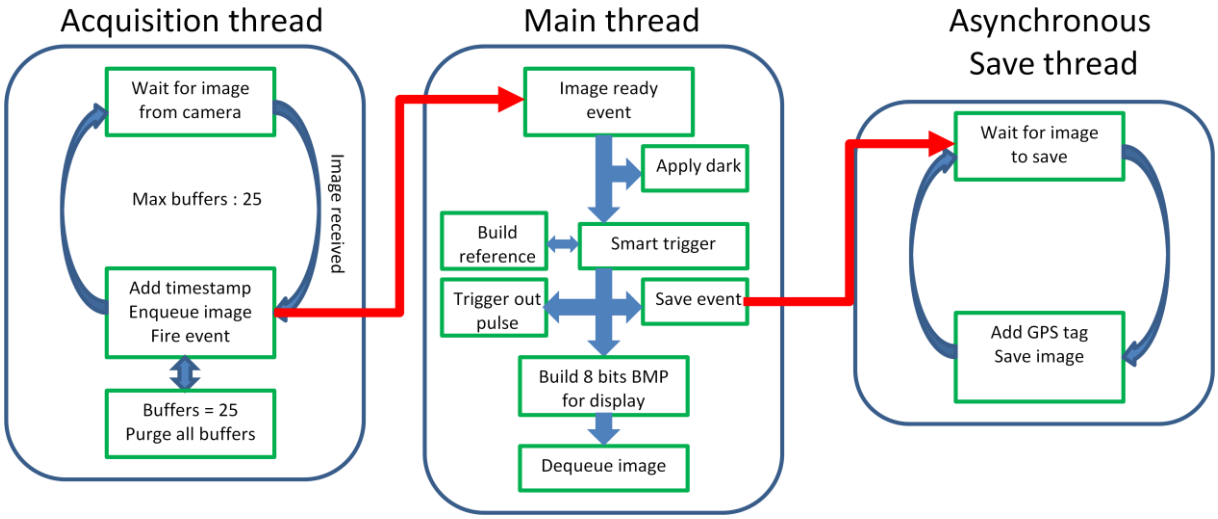
If you lose images in the trigger windows, problem is with the disk throughput.

- Increase RAM if you use short burst
- Increase HDD throughput
    - SSD

    - 7200 rd/mn
    - HDD RAID Array
    - Use different disk for each Genika Trigger instance (multiple cameras)
- Reduce throughput requirement (AOI, 8 bits mode, FPS…)
- Check settings (antivirus, firewall, fragmentation…)

Application implementation and application notes

High level application synopsis



Note that the time stamp is generated and associated to the image as soon as the image comes from the camera to ensure minimal delay between the image and its timestamp.

Note : the asynchronous save thread concerns only the GNK file format. AVI and TIFF use synchronous recording and are not advised for high speed acquisition.

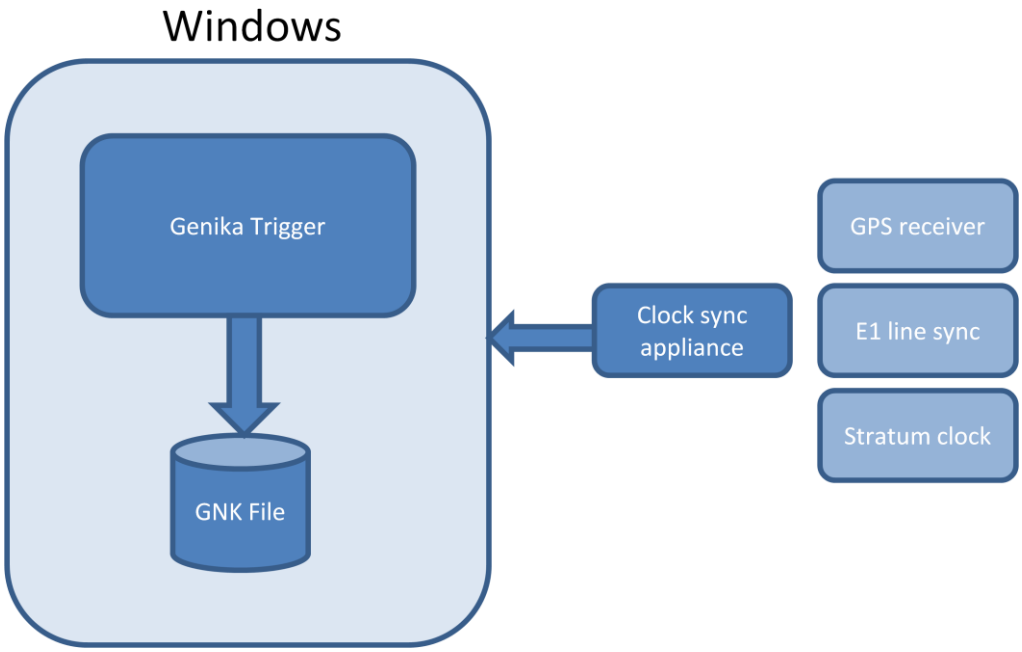
Application note: external Timestamping

Some applications may require a more stringent time stamping than Windows internal clock. Windows clock may drift unpredictably and may hinder time stamps pertinence over time. It is possible to asset the Windows clock drift using the GPS PPS DCD tool included in the GPS DCD tracker application.

There are two approaches to solve this issue: either to correct Windows clock or to rely on an external clock.

Case 1: Windows clock drift control.

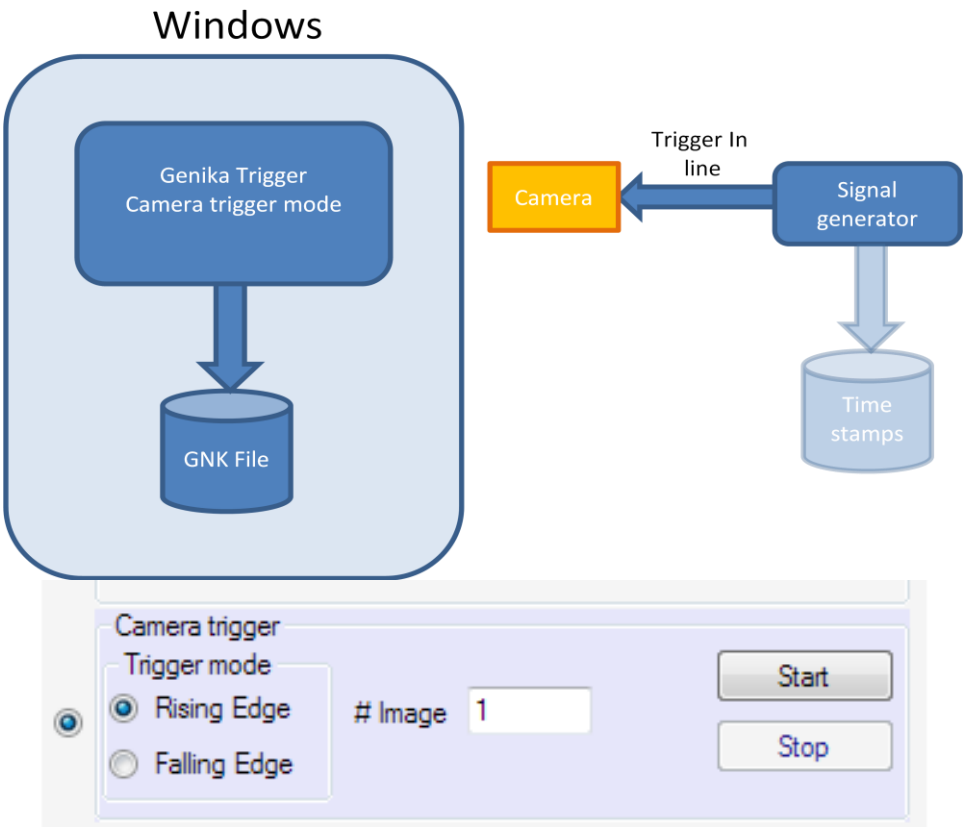
In that case an external device synchronize Windows clock to avoid drift. Time stamps are generated by Genika Trigger.



Note: Sync with Internet NTP doesn't provide high precision clocking.

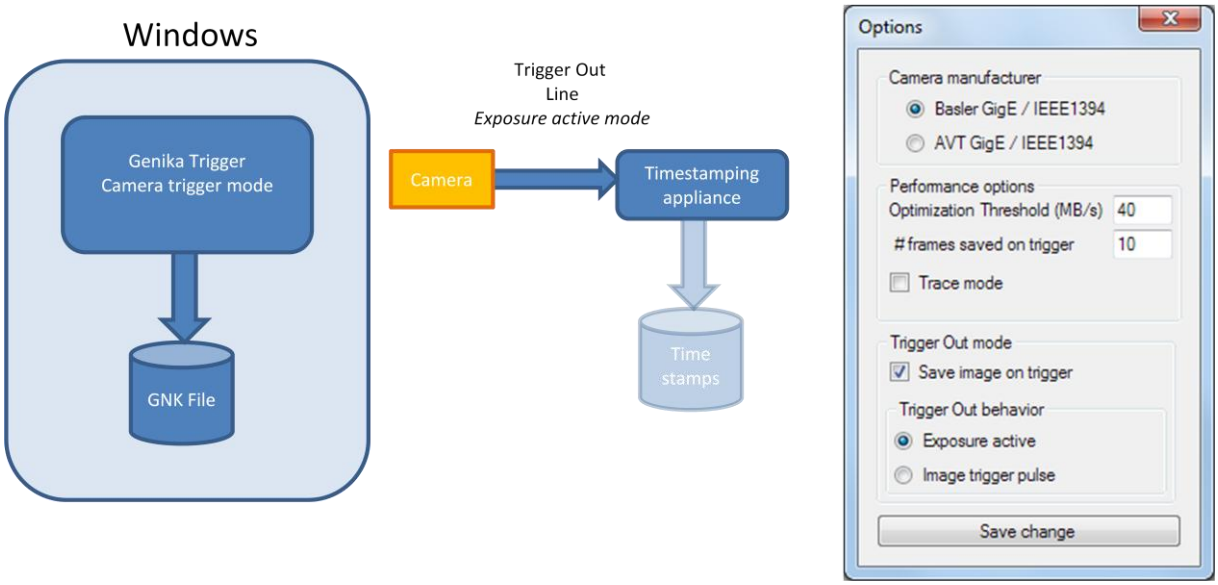
Case 2: External trigger generator.

In this second case an external generator with a reliable clock can either trig the camera shutter and save a time stamp or let Genika Trigger handle the time stamp. In that case the frame sequencing is key information to find back the real time stamping information.



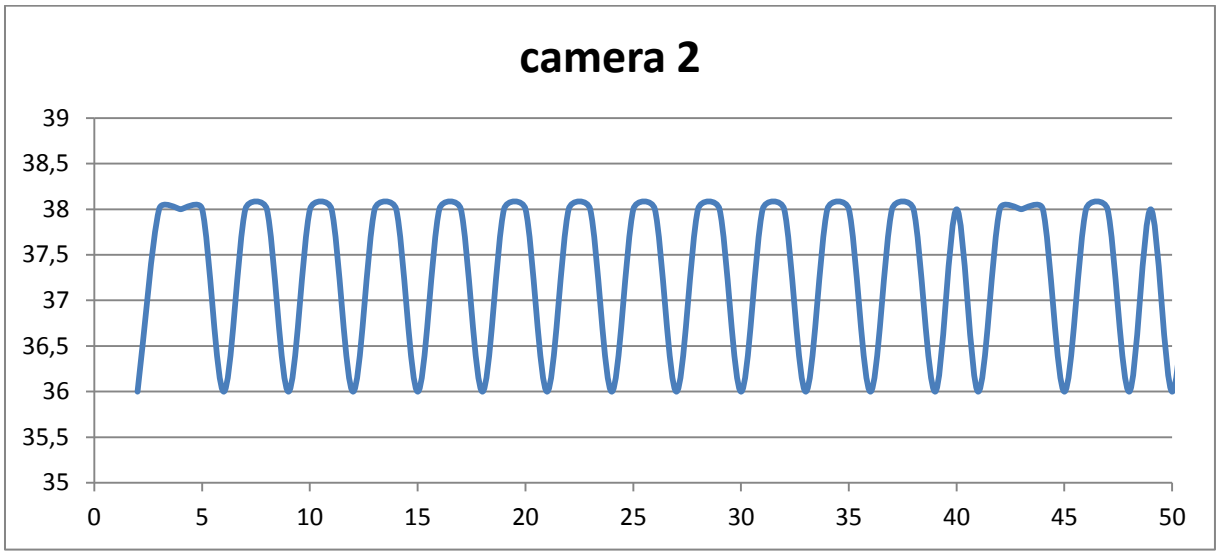
Case 3: External time stamping appliance

Another solution is to intercept the *trigger out* line of the camera that set off when starting exposure and shut down when exposure is over.



Typical Genika Trigger jitter

Typical graph of the time stamps in a GNK file using an external signal generator (graph show the jitter : inter frame delay, scale is ms/frame number) :



Expected time stamp jitter is about 1ms. If the precision required is better, then it is advisable to use an external time stamping device.

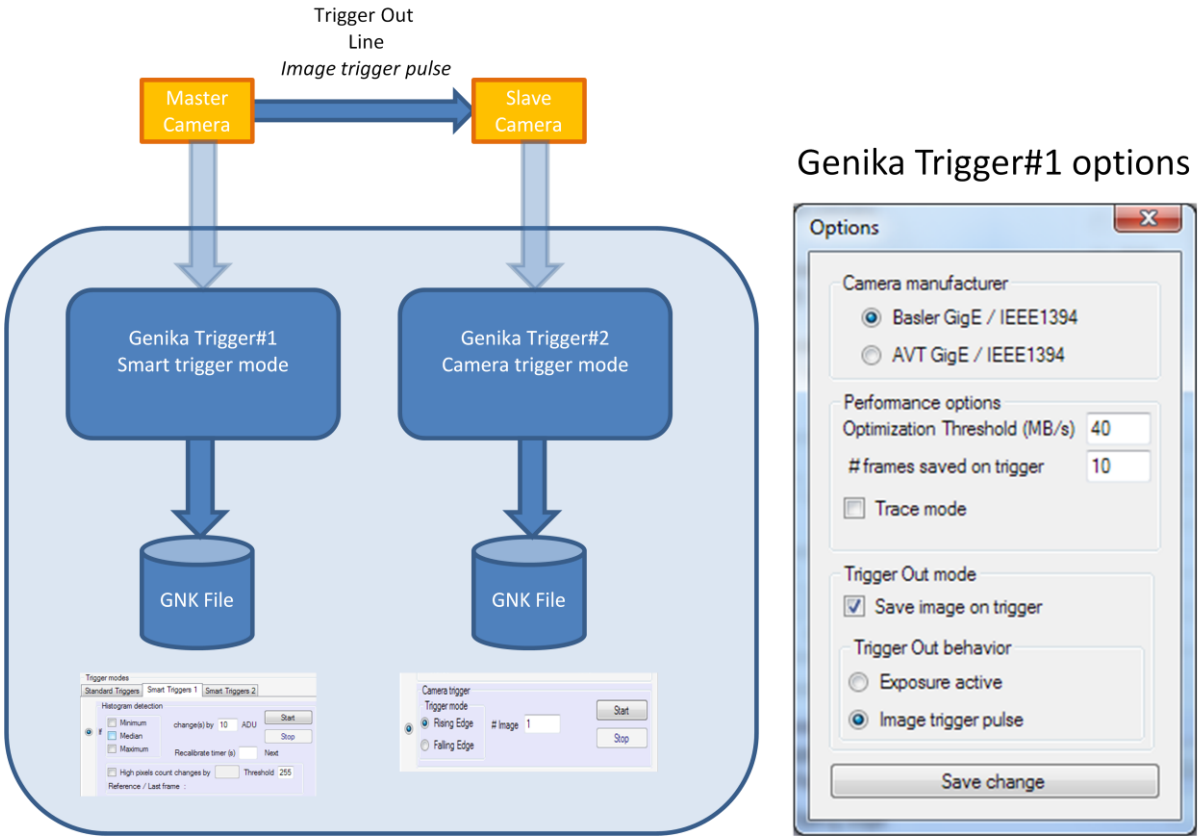
Application note: multiple cameras

Genika trigger can handle only one camera per instance but multiple instances can be used at the same time to managed more than one camera.

Nevertheless it is advised to have only smart trigger function active at the same time on a single PC.

Typical master/slave camera

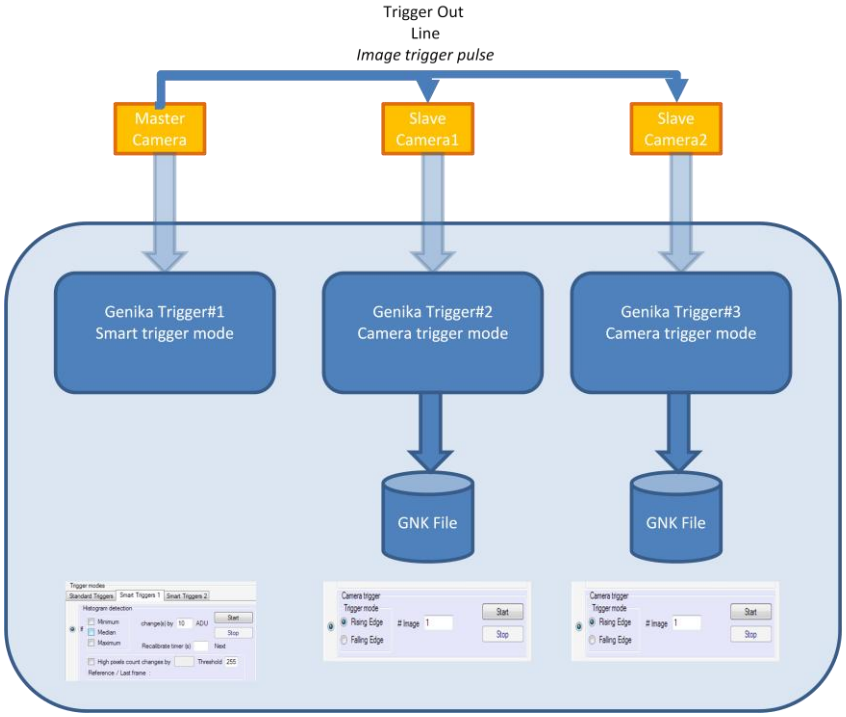
In this set up on camera runs a smart trigger and the other get triggered in a slave mode. This is a typical stereoscopic or multiple angle of view application.



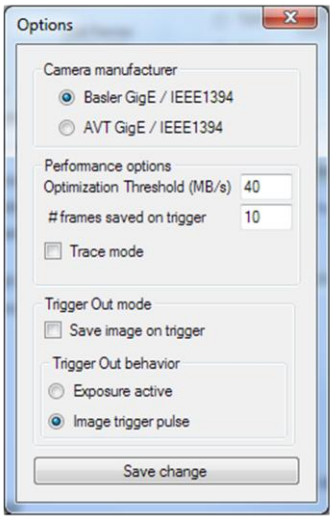
This mode induced a delay between the master and slaves camera image: Genika Trigger instance 1 need to perform the smart trigger processing before sending the trigger command from the master camera line out. In this mode the slave cameras are set off only if the smart trigger decides than the master camera image is eligible.

Stringent master/slave camera

To avoid delay between frames and use smart triggers, the solution is to dedicate one camera to the frame analysis, all other camera being set off by this one at the same time. The master camera doesn't generate any file and the overall system load is the same as the first solution.



Genika Trigger#1 options



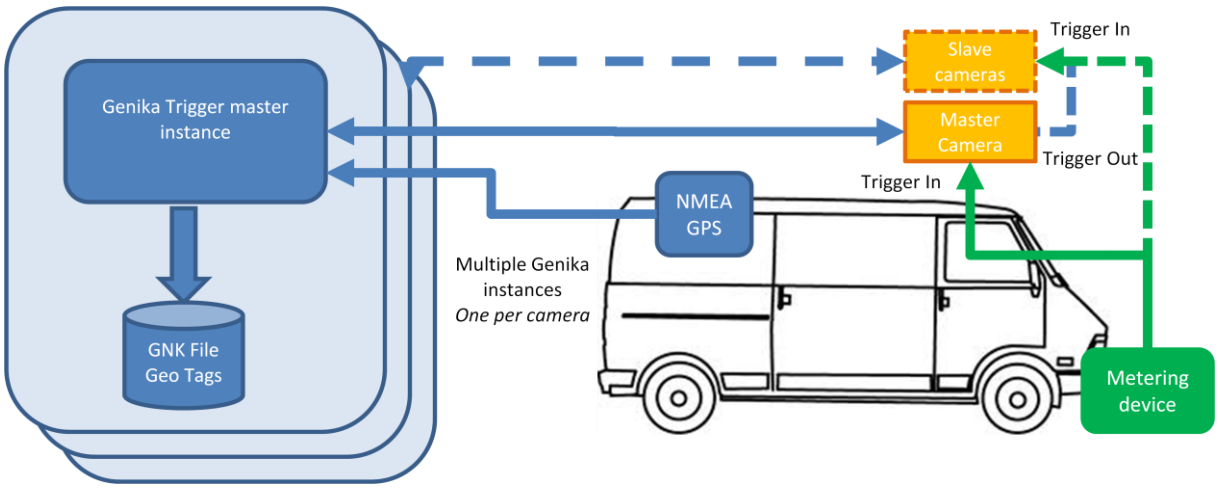
Application note: Geo localization

Genika trigger supports NMEA GPS for frame geo localization. The GPS information (latitude, longitude and altitude) are stored in the GNK file along with each frame.

This GPS support is convenient for geographical automatic survey done from a moving vehicle.

The video acquisition can follow different strategies:

- Free run mode with a fixed FPS selected from Genika Trigger
- Smart triggering mode from Genika Trigger : light conditions, vehicle crossing, landscape survey …
- External distance meter
- External sync

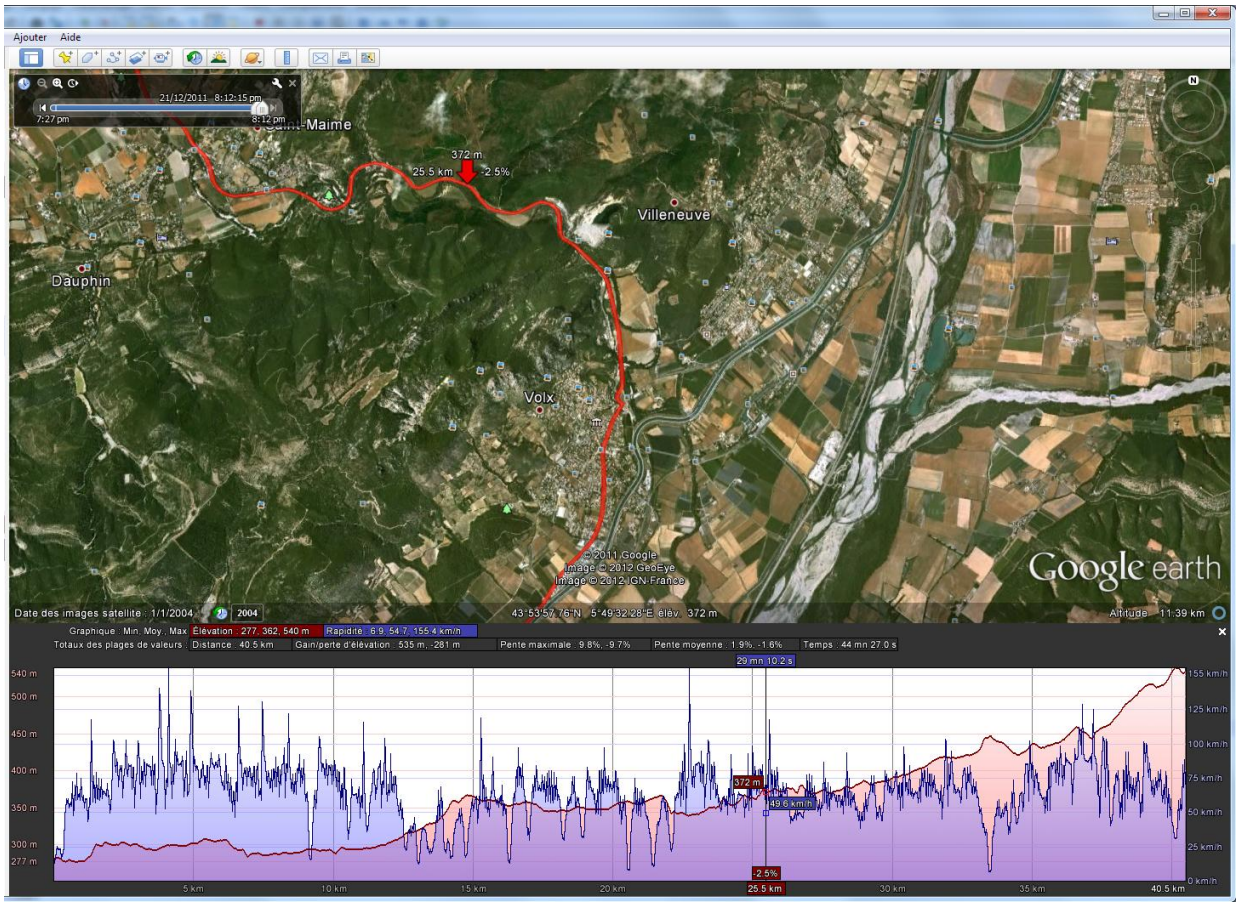


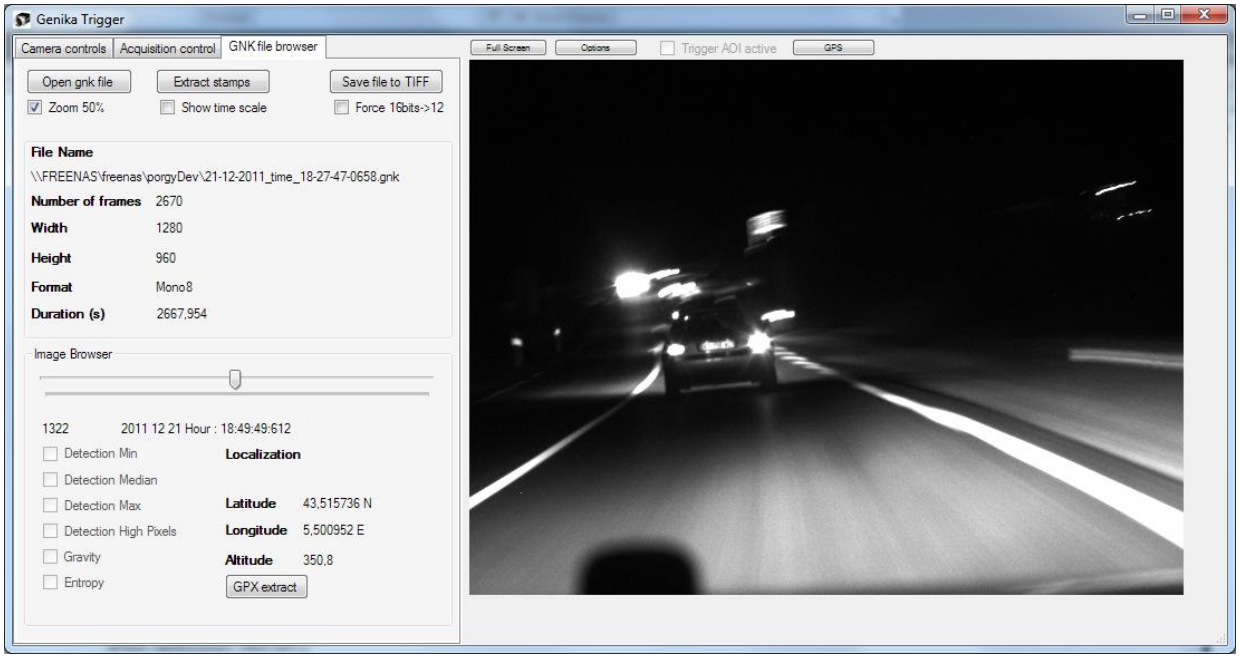
Geo tagging precision depends on the GPS device. Genika Trigger refreshes GPS information three times per second.

Smart triggers can be used to avoid useless image recording or to count events:

- Automatic tree detection on road side
- Automatic pylon image recording
- Car density survey
- Street light survey (high/low light detection)

GPS information can be extracted to a GPX file that can be further analyzed with a geographical database such as Garmin Mapsource or Google Earth.


Ajouter Aide
21/12/2011 8:12:15 pm
7:27 pm
8:12 pm
Maime
372 m
25.5 km
-2.5%
Villeneuve
Dauphin
Volx
© 2011 Google
Image © 2012 GeoEye
Image © 2012 IGN France
Google earth
Date des images satellite : 1/1/2004
2004
43°53'57.76"N 5°49'32.28"E élév. 372 m
Altitude 11.39 km
Graphique Min, Moy, Max Élévation : 277, 362, 540 m Rapidité : 6.9, 54.7, 155.4 km/h
Totaux des plages de valeurs : Distance : 40.5 km Gain/perte d'élévation : 535 m, -281 m Pente maximale : 9.8%, -9.7% Pente moyenne : 1.9%, -1.6% Temps : 44 mn 27.0 s
29 mn 10.2 s
540 m
500 m
450 m
400 m
350 m
300 m
277 m
155 km/h
125 km/h
100 km/h
75 km/h
50 km/h
25 km/h
0 km/h
372 m
49.6 km/h
-2.5%
5 km
10 km
15 km
20 km
25.5 km
30 km
35 km
40.5 km


Genika Trigger
Camera controls
Acquisition control
GNK file browser
Full Screen
Options
Trigger AOI active
GPS
Open gnk file
Extract stamps
Save file to TIFF
Zoom 50%
Show time scale
Force 16bits->12
File Name
\\FREENAS\freenas\porgyDev\21-12-2011_time_18-27-47-0658.gnk
Number of frames 2670
Width 1280
Height 960
Format Mono8
Duration (s) 2667,954
Image Browser
1322 2011 12 21 Hour : 18:49:49:612
Detection Min
Detection Median
Detection Max
Detection High Pixels
Gravity
Entropy
Localization
Latitude 43,515736 N
Longitude 5,500952 E
Altitude 350,8
GPX extract

Application note: *GNK timing synchronization through GPS reference*

By default Genika Trigger uses Windows internal clock to generate time stamp with 100ns granularity. Some applications may require a more stringent time stamping than Windows internal clock. Windows clock drifts unpredictably and may hinder time stamps pertinence over time. On another hand a stratum 1 clock (ANSI/T1.101-1987) is available with a low cost GPS receiver.

It's possible to use this kind of GPS clock to sync the PC and therefore Genika Trigger time stamps as discussed in the *Time stamping strategies* application note. This requires a GPS card such as Meinberg products.

Another way is to use a GPS or IRIG appliance to get high precision time tamps.

Both solutions above provide a high precision synchronization at the µS scale.

Starting from release 1.7 Genika Trigger provides an inexpensive way to synchronize GNK file with a GPS receiver within a few ms tolerance.

Acquiring a reliable GPS clock

The main communication protocol with GPS is NMEA. NMEA transmits once per second the complete GPS information including the UTC time. Nevertheless this protocol is very slow and it is not designed for high precision system synchronization on the GPS clock. Genika Trigger already uses this protocol for image geotagging only.

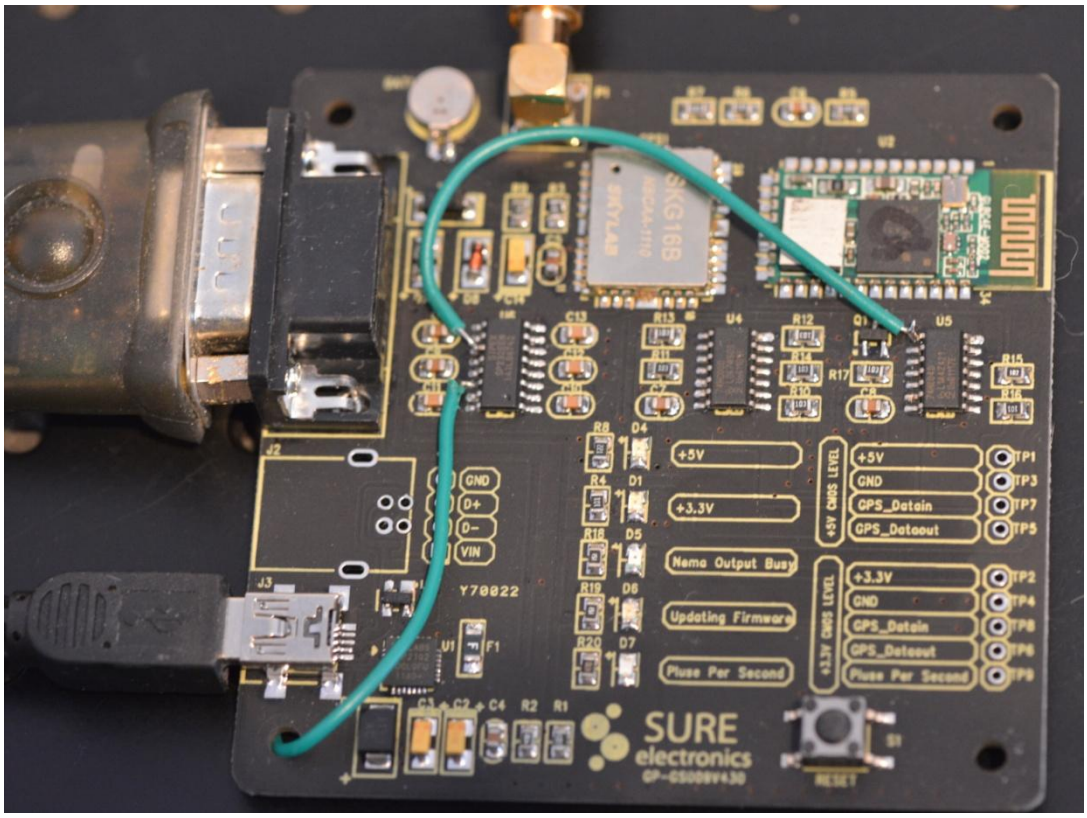
In addition some GPS receivers provide a high precision Pulse per Second line that can be used to mark the beginning on the actual second.

We use this PPS signal to generate a synchronization file between the Windows clock and the GPS Stratum 1 clock.

This signal shouldn't be acquired through a slow protocol stack such as the serial protocol. We use instead inputs that raise immediate events in Windows. One of them is the Data Carrier Detect on a serial input line.

Basically we re-route the PPS signal to the TTL DCD line of a serial port, this port can be native or goes through a serial to USB converter.

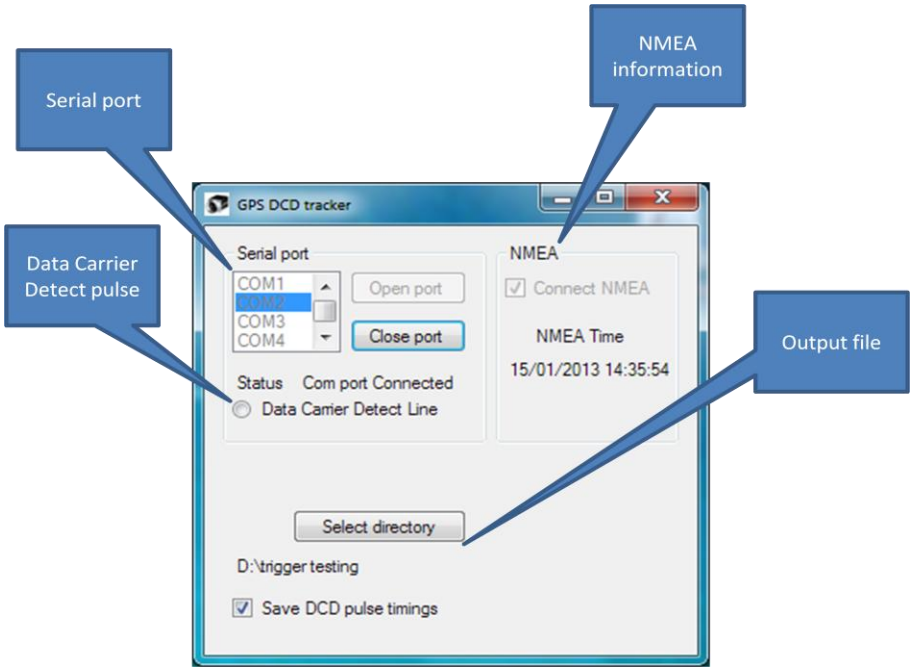
For this example we use a Sure Electronic GPS board:



Some modifications are performed on the board in order to inject the 3.3V CMOS level PPS signal to the serial TTL DCD pin. The CMOS is converted to TTL using a free line on MAX232 board chip.

Reference timing acquisition

Genika Trigger comes with a dedicated utility to capture this PPS signal and keep a trace in regard with the windows ticks : GPS DCD Tracker.



This application connects to the GPS :

- Using NMEA to get the UTC with one second precision
- Using the DCD line to intercept the GPS Pulse Per Second

When a PPS is detected the application saves the following information in a .stp file (text structure):

```
Genika Trigger PPS log file
**************************

Date, Time, Ticks, Offset to plain second in ms, jitter in 100ns, NMEA date/time
11-01-2013 , 10-47-39-0442 , 634934980594428071 , 442 , 6,34934980594428E+17 ,  01/01/0001 00:00:00
11-01-2013 , 10-47-40-0440 , 634934980604408642 , 440 , 9980672 ,  11/01/2013 09:47:38
11-01-2013 , 10-47-41-0440 , 634934980614409214 , 440 , 10000512 ,  11/01/2013 09:47:39
11-01-2013 , 10-47-42-0440 , 634934980624409786 , 440 , 10000512 ,  11/01/2013 09:47:40
11-01-2013 , 10-47-43-0441 , 634934980634410358 , 441 , 10000640 ,  11/01/2013 09:47:41
11-01-2013 , 10-47-44-0441 , 634934980644410930 , 441 , 10000512 ,  11/01/2013 09:47:42
11-01-2013 , 10-47-45-0441 , 634934980654411502 , 441 , 10000640 ,  11/01/2013 09:47:43
11-01-2013 , 10-47-46-0441 , 634934980664412074 , 441 , 10000512 ,  11/01/2013 09:47:44
11-01-2013 , 10-47-47-0441 , 634934980674412646 , 441 , 10000640 ,  11/01/2013 09:47:45
11-01-2013 , 10-47-48-0441 , 634934980684413218 , 441 , 10000512 ,  11/01/2013 09:47:46
11-01-2013 , 10-47-49-0441 , 634934980694413790 , 441 , 10000640 ,  11/01/2013 09:47:47
11-01-2013 , 10-47-50-0441 , 634934980704414362 , 441 , 10000512 ,  11/01/2013 09:47:48
11-01-2013 , 10-47-51-0441 , 634934980714414934 , 441 , 10000640 ,  11/01/2013 09:47:49
11-01-2013 , 10-47-52-0441 , 634934980724415506 , 441 , 10000512 ,  11/01/2013 09:47:50
11-01-2013 , 10-47-53-0441 , 634934980734416078 , 441 , 10000640 ,  11/01/2013 09:47:51
11-01-2013 , 10-47-54-0440 , 634934980744406650 , 440 , 9990528 ,  11/01/2013 09:47:52
11-01-2013 , 10-47-55-0440 , 634934980754407222 , 440 , 10000512 ,  11/01/2013 09:47:53
11-01-2013 , 10-47-56-0440 , 634934980764407794 , 440 , 10000640 ,  11/01/2013 09:47:54
11-01-2013 , 10-47-57-0440 , 634934980774408366 , 440 , 10000512 ,  11/01/2013 09:47:55
11-01-2013 , 10-47-58-0440 , 634934980784408938 , 440 , 10000640 ,  11/01/2013 09:47:56
11-01-2013 , 10-47-59-0440 , 634934980794409510 , 440 , 10000512 ,  11/01/2013 09:47:57
11-01-2013 , 10-48-00-0441 , 634934980804410082 , 441 , 10000640 ,  11/01/2013 09:47:58
11-01-2013 , 10-48-01-0441 , 634934980814410654 , 441 , 10000512 ,  11/01/2013 09:47:59
11-01-2013 , 10-48-02-0441 , 634934980824411226 , 441 , 10000640 ,  * 11/01/2013 09:48:00
11-01-2013 , 10-48-03-0441 , 634934980834411798 , 441 , 10000512 ,  11/01/2013 09:48:01
11-01-2013 , 10-48-04-0441 , 634934980844412370 , 441 , 10000640 ,  11/01/2013 09:48:02
```

Windows clock at the reception of the PPS signal : Date, Time, Tick (100ns granularity) and offset to the next plain second,

Jitter of Windows clock in 100ns : that gives the window's clock drift,

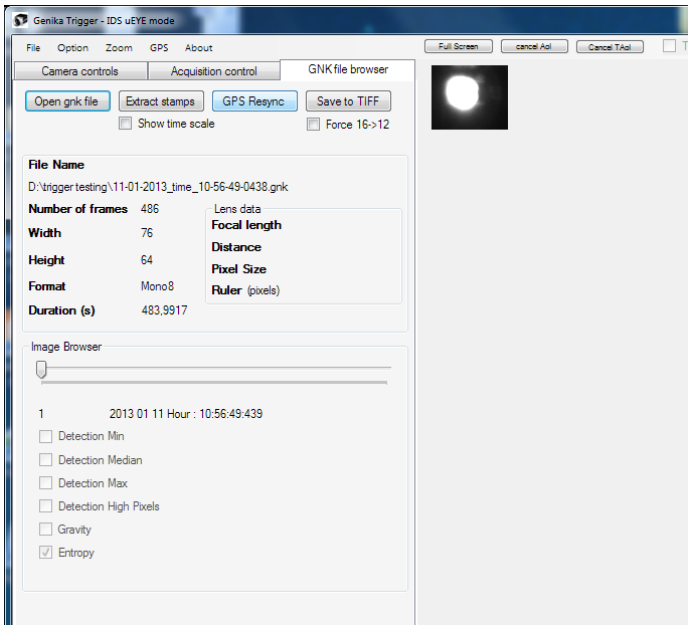
GPS Date and time at the PPS : Milliseconds are not given as the information is saved at the PPS reception (i.e. plain second) and NMEA doesn't provide more precise information.

Important note about NMEA time : some GPS receivers may deliver NMEA information less often than once per second. The GPS DCD Tracker looks for NMEA updates twice per second. If the UTC time hasn't been updated between two PPS reception, the actual UTC time is interpolated by the application. Such occurrences are marked with a (*) in front of the GPS UTC NMEA time.

GNK file re-synchronization

GNK file resynchronization is automatically done by Genika Trigger since release 1.7. To achieve this synchronization a stp GPS PPS timing file overlapping the GNK file duration is required.

Once the GNK file has been opened in Genika Trigger it is possible to select a stp file with the *GPS Resync* button :



Genika Trigger checks if the file does overlap with the GNK file and if the stp file contains incoherent timings. Genika Trigger duplicate the GNK file and readjust timing according to the stp file. The new GNK file is automatically opened after the job is done. Timestamps can then be extracted using the *extract stamps* button.

Results

The following test has been performed as described below :

- Sure GPS card connected through a serial to USB adapter. NMEA and PPS connection to the GPS DCD Tracker application.
- Basler aca640-100gm with AoI running at 565 frames per second, 333µS exposure time
- Genika Trigger in Entropy smart trigger mode, the camera targets the PPS LED of the GPS receiver. Lapse between two triggers set at 500ms

This configuration makes Genika Trigger to detect the PPS LED signal and save one image per second when the light is first detected.

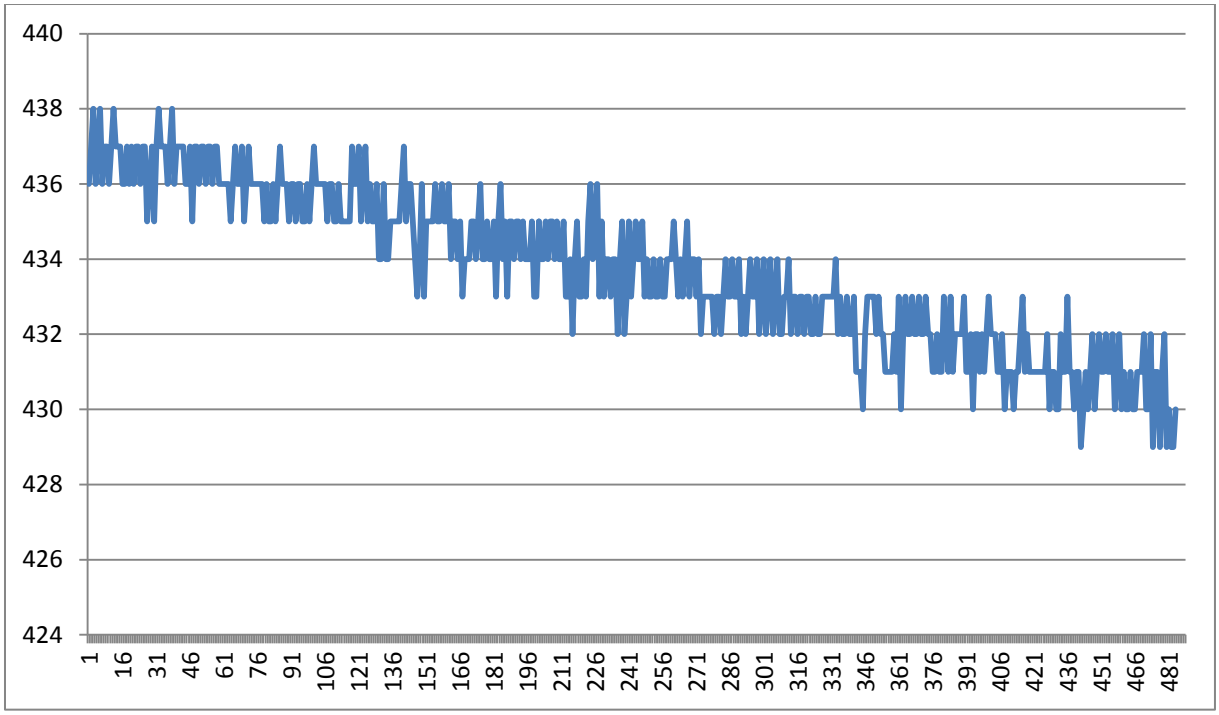
The source of delay between the image timestamp and the PPS second are the following:

- Delay between the PPS reception and the LED flash
- Windows clock error (what we are looking for),
- Exposure time (333µS) and transmission delay until the image is received by Genika Trigger,
- Interframe delay depending on the camera fps (about 2ms at 500 fps)

Genika Trigger smart trigger analysis time is not accounted as the time stamp is generated at frame reception before any processing.

All those factors give a theoretical delay/jitter between the PPS plain second and the frame timing of 2/3ms + windows clock error.

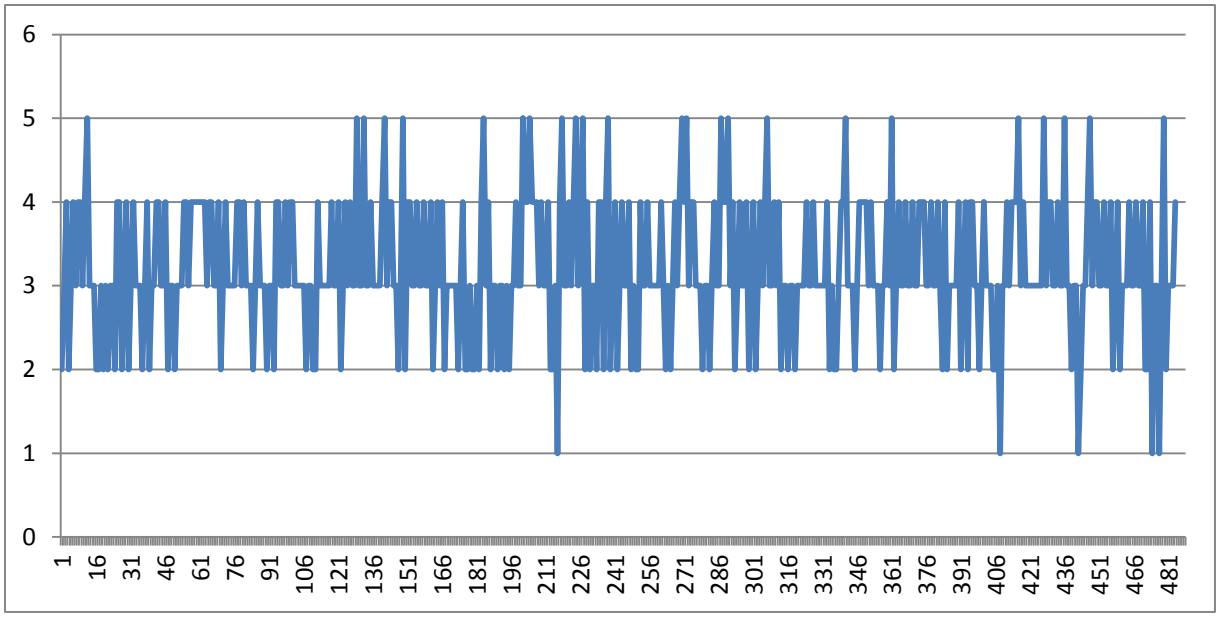
500s acquisition without re-sync



Delay between plain second and timestamp : about 438ms with a $1.2.10^{-5}$s drift.

Maximum jitter : 3ms

500s acquisition without re-sync

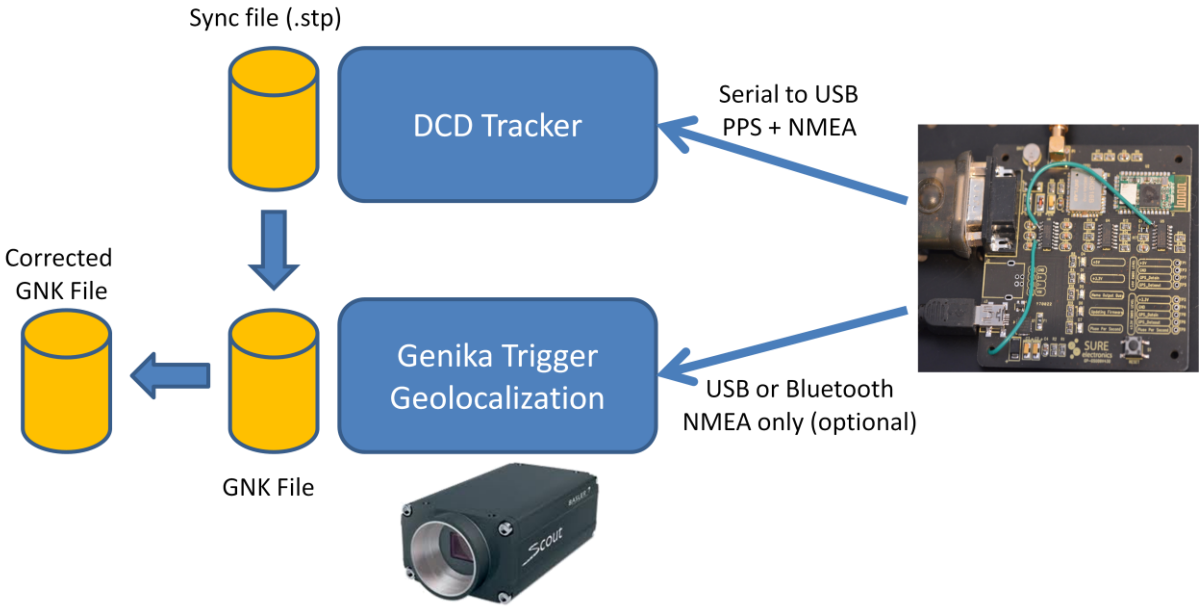


Delay between plain second and timestamp : 1 to 2ms, no drift

Maximum jitter : 3ms

As seen before the acquisition method gives an expected jitter/delay that matches with the results. The windows drift is completely correctly by the GPS re-sync with the timing issued from the PPS signal.

Setup with the Sure GPS card



References

GNK file format description

File Header

0	Entrypoint	Char “
1	Application name	*string[35]“Genika Trigger timestamped format”*
35	Image width	*long*
43	Image height	*long*
52	Pixel depth	*string[6] (ex : Mono8, Mono16…)*
58	Packet12	*bool*
59	GPS information	*bool*
60	Distance (mm)	*float*
66	Focal length (mm)	*float*
70	Pixel size (µm)	*float*
72	Reserved	*99 bytes*

Payload per frame

Payload	*byte(8 bits : 1 byte, 12 and 16 bits : 2 bytes)*

Timestamp and GPS per frame

0		*String “Num”*
3	Image number	*int*
7		*String “ SRC”*
11	Image source	*byte*
12		*String “ Day”*
17	Time stamp day	*String* 0:00
19		*String “ Mon”*
24	Time stamp month	*String* 0:00
26		*String “ Yr ”*
31	Time stamp year	*String* 0:0000
35		*String “ Hr ”*
40	Time stamp hour	*String* 0:00
43		*String “ Min”*
48	Time stamp minute	*String* 0:00
51		*String “ Sec”*
56	Time stamp seconds	*String* 0:00
58		*String “ Ms”*
63	Time stamp ms	*String* 0:0000
67	Time stamp ticks	*long*
76	Latitude	*String[14]*
91	Longitude	*String[14]*
106	Altitude	*String[9]*
115	Reserved	*byte[60]*

The GNK format does not include a frame count in the header.

Release notes

V 2.2

- x64 version replace the 32 bits
- added Basler trigger out delay

End of document