LASERPOINT

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Quick Start Guide

Quick Start Guide
Blink HS Pulse Controller

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1- INTRODUCTION

The **Blink HS** line includes a series of instruments for the measurement of laser pulse energy that combine both the sensor (**HS**) and the readout electronics (**HSM**) connected via microwave cable that together form a system named "**Pulse Controller**".
Laser measurement is done by connecting directly the instrument to a PC via Ethernet cable.
The **Blink HS Pulse Controller** system is supplied with LaserPoint user-friendly Graphics User Interface (GUI).
The platform is designed to measure the energy of pulsed light sources, from UV to far IR, in the range 1 kHz up to 0.8 MHz (depending on the model), and from (sub)µJ to mJ energy/pulse range (depending on the model).
The following sections describe the basic measurement functionality of **Blink HS Pulse Controller** system (**HS** sensor head and readout electronics, **HSM**, including the **G**raphic **U**ser **I**nterface).
Before using any product from the **Blink HS** line it is worth considering the following:

1. Laser Source: What specific laser has to be measured? Which sensor is the best suitable for that source, in terms of aperture, full scale, hardness of its absorber? What has to be measured: laser power or laser energy? Are the laser power, energy, and the power/energy densities exceeding the sensor ratings? (Please read carefully **Blink HS** sensor specs and do not hesitate to contact our local distributor or directly LaserPoint at sales@laserpoint.it)
2. Instrument Settings: What settings have to be configured (for example, statistics, energy threshold, wavelength, and so on)?

2- SAFETY NOTES

Before operating the sensor head **HS** and its associated readout electronics **HSM**, carefully read the safety information to avoid both personal injuries and to prevent damage to the instruments.
Measuring a laser's Pulse Energy, as well as the operation of a laser, is potentially dangerous. The instruments object of this manual may operate at high Energies and at wavelengths that may include non-visible laser radiation.

Warning: never touch the HS sensor head active area (accessible from Laser aperture, Figure 2)

● Proper operating practices, in accordance with laser manufacturer's recommendations, are crucial; to ensure that the correct operating procedures are followed, consult the laser manufacturer and your laser safety officer
● Eyewear and other personal protective equipment must be used in compliance with applicable laws and safety regulations

The user of this instrument must be trained in the use of lasers and their associated risks. LaserPoint is in no way liable for any damage resulting from misuse, carelessness, or use beyond the rated limits for the provided products.

Complete all the required safety procedures to work with laser beams and wear suitable appropriate personal protective equipment, such as laser goggles, protection glasses all the time while the laser is powered ON!

Before proceeding to measurements, check the cooling devices applied on the head.

● On heads with water cooling: Verify that water is flowing (when applicable) with the specified flux and temperature. Wait for at least 5 minutes to achieve the thermal stabilization of detectors and the maximum stability of electronics.

● On heads with forced air cooling: first connect the fan (when applicable) to the 12V DC power supply and wait for at least 5 minutes, after turn-on, to achieve the thermal stabilization of detectors and the maximum stability of electronics. Even at powers far lower than the head full scale, the fan must be connected and active.

Warning!

Specular and diffused back reflections. Always pay attention to the specular and diffused back reflections originating from laser absorbers. The percentage of absorption depends on each coating type and can vary between 30 % up to > 90 %, as a function of wavelength. The amount of radiation that is not absorbed is reflected or scattered following the Lambert Cosine Law. To avoid dangerous back reflections that can be returned to the laser cavity, or are back-focused by lenses, it is recommended to position the head with a small angle relative to the optical axis. The beam path must be fully enclosed using appropriate light blocking enclosures.

Warning!

CO2 laser reflectivity. The reflectance from the absorber at CO2 laser wavelength could be as much as 75% (depending on CO2 emission wavelength) and the reflected beam can be quite specular, so it is advisable to provide a beam stop for the reflected beam with the highest power lasers

External Sources. All thermal sensors, in particular those with broadband coatings that extend into IR, are very sensitive to heat regardless of its source. Extreme care must be taken to ensure that only the measured radiation reaches the sensor active surface.
Air currents, hands touching the detector, sun light, or other forms of heat will easily alter the measured value.

Detector temperature. Thermal heads, in particular those with convection-cooling, may become hot and cause burns if touched.

Do not operate the head and its associated meter in critical medical environments, in wet or damp conditions, or in an explosive atmosphere.

Do not operate the head and its associated meter if damage or potential failures are suspected to occur.
Contact LaserPoint for a qualified service inspection or to repair damaged equipment.

Follow all laser safety procedures. The laser must be blocked or switched OFF before beginning the measurement procedures described in the following sections**.**
Operate all instruments only within their specified range.

Do not exceed the power/energy density limits specified for each sensor.

3- BLINK HS OVERVIEW AND CONNECTIONS

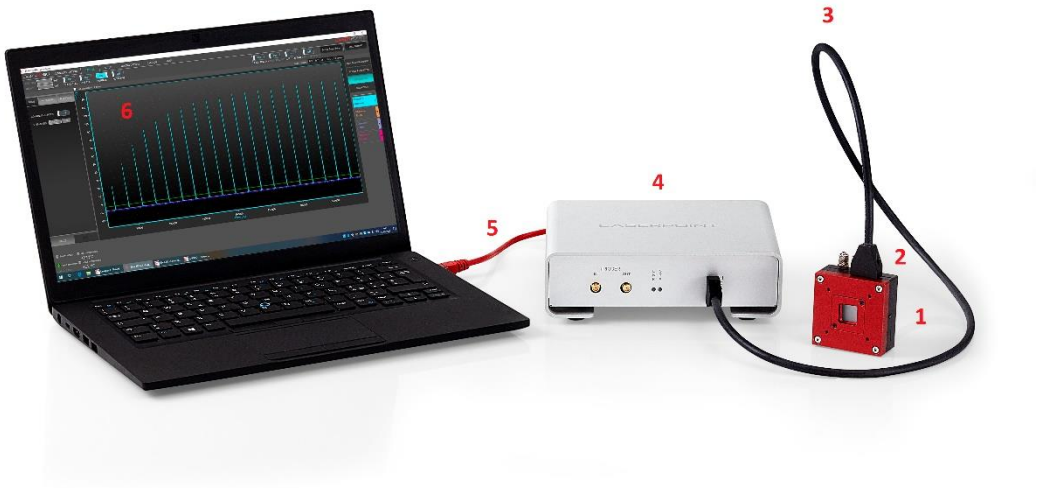


Figure 1: Blink HS system overview

1. **HS sensor head**
2. **Connector**
3. **Microwave cable**
4. **HSM readout electronics**
5. **PC Ethernet cable**
6. **Graphic User Interface**

4- COMPUTER MINIMUM SYSTEM REQUIREMENTS

- **PC Windows 10, 64bit**
- **Display resolution 1400 x 1050**
- **Processor Intel i7 @ 2GHz**
- **SSD disk, free space > 50 GB available**
- **8 GB RAM**
- **Gigabit Ethernet Lan**

5- INSTRUMENT SETUP

In order to setup the instrument ready for measurement please perform the following steps:

1. **Connect HS sensor head to water hoses (Figure 2), water flow according to specs**
2. **Connect the microwave cable to the HS sensor head (Figure 2)**

Warning!
The plug has a wedge, please connect carefully the connector to the HS sensor head (the wedge should be up-left)

Warning!
Never touch the HS sensor head active area (accessible from laser aperture, Figure 2)

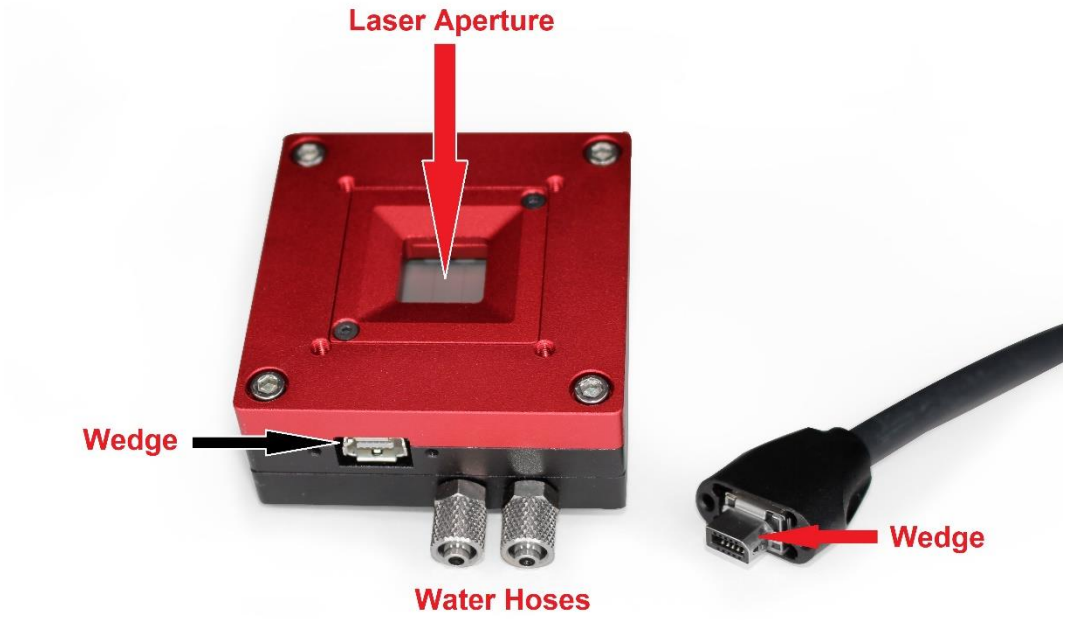


Figure 2: HS sensor head (water cooled in the picture) with microwave cable

3. **Connect the microvave cable to the HSM readout electronics (Figure 3)**

Warning!
The plug has a wedge, please connect carefully the connector to the readout electronics (the wedge should be down-left)

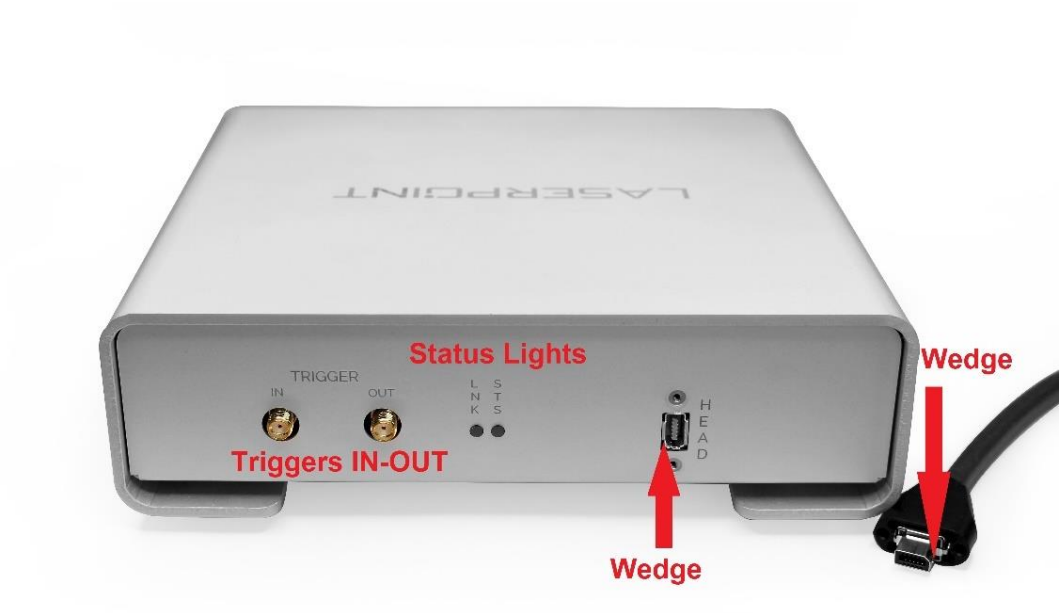


Figure 3: HSM readout electronics front side

4. **Plug the power supply to the HSM readout electronics (Figure 4)**
5. **Connect the Ethernet cable to the HSM readout electronics, PC connection (Figure 4)**
6. **Connect the Ethernet cable to the PC (Figure 1)**
7. **Screw the protection cap both on HS sensor head and HSM readout electronics side**
8. **Power the HSM readout electronics ON (Figure 4)**
9. **Wait until status lights (STS) switch from Red to Green**

Figure 4: HSM readout electronics rear side

The system is ready to be connected to the "Pulse Controller" for normal operation (Chapter 12 for detailed actions list sequence).

LED STATUS

Led LNK (Link)

- Yellow/Green → blinking every transmitted/received a PKT over Ethernet
- Blue → Trigger Active
- Red → Sync Alarm (ADC off-line, the system is unable to measure)

Led STS (Status)

- Red → Alarm (system failure)
- Green → HS sensor head connected

6- COMPUTER SETTINGS AND INSTALLATION OF THE GRAPHIC USER INTERFACE

In order to setup the instrument ready for measurement please perform the following steps:

1. **Install the Blink HS "Pulse Controller"**
2. **Set the TCP/IPv4 according to Figure 5**

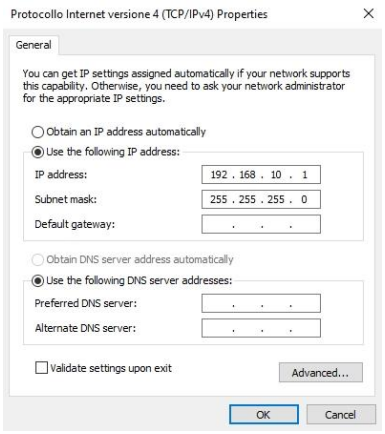


Figure 5: TCP/IPv4 settings

Warning!
It is mandatory to set properly the PC Antivirus and Windows Firewall, either by disabling them
OR
Setting to Trust Zone the Blink HS "Pulse Controller"
OR
Opening the 11000 communication port

3. **Example: How to Disable PC Windows Defender Firewall or Setting Blink HS to Trust Zone**

- To turn Microsoft Defender Firewall off:
- Select the Start button > Settings > Update & Security > Windows Security and then Firewall & network protection. Open Windows Security settings
- Select a network profile.
- Under Microsoft Defender Firewall, switch the setting to Off. Turning off Windows Defender Firewall could make your device (and network, if you have one) more vulnerable to unauthorized access. If there's an app you need to use that's being blocked, you can allow it through the firewall, instead of turning the firewall off.
- Select the "**Start**" button, then type "**firewall**".
- Select the "**Windows Defender Firewall**" option.
- Choose the "**Allow an app or feature through Windows Defender Firewall**" option

7- BLINK HS PULSE CONTROLLER OVERVIEW

The **Blink HS** system named "**Pulse Controller**" is based on **HS** sensor head and modified **HSM** readout electronics.

The **Pulse Controller** operates in three modes, i.e. Oscilloscope, Real Time, Missing Pulses

Oscilloscope mode

Pulse Controller has a built in Oscilloscope function that helps the correct instrument setting, by direct view of the **HS** sensor response to laser pulses.
The time span is defined by the number of samples, maximum = 1,048,576 ns, for a faster acquisition user can decrease the time span (Figure 8).

Real Time mode

The samples discretization is 1 ms; i.e. the **HS** system computes every pulse in the pulse train then averages the energy/pulse over 1 ms (displayed in the Graph area and in the GUI right side panel box) and frequency (in the GUI right side panel box).
The Graph refresh rate is 2 Hz.

Missing Pulses mode, this is the main operation mode of the system:

MAIN FEATURES

- Detection of EVERY missing pulse, i.e. pulse that has no sufficient energy to trigger (< "Trigger Start") the readout electronics.

Warning: this statement applies to **Sync mode** operation, **Gate mode** is intrinsecally less "rugged" and more prone to Missing Pulses detection misinterpretation. A Chapter explaining the ratio of the two modes will follow.

- Detection of EVERY low energy pulse, i.e. pulse that has a detected energy below user specified threshold, "Threshold Low"

Warning: this statement applies to **Sync mode** operation, **Gate mode** is intrinsecally less "rugged" and more prone to Missing Pulses detection misinterpretation. A Chapter explaining the ratio of the two modes will follow.

OPERATION MODES

Sync mode, that is based on comparison between a pulsed TTL electrical signal received by **HSM @Trig IN** (Figure 6) from Laser (machine) Under Test and pulse detection by **Blink HS Pulse Controller**.

Gate mode, that is based on comparison between expected pulse train at pre-defined reprate and pulse detection by **HS sensor head**: comparison starts at Gate signal high received by **HSM @Trig IN** (Figure 6) and ends at Gate signal low received by **HSM @Trig IN** (Figure 6).

DATA OUTPUT FORMAT

- Rolling graph and events counters (missing and low energy pulses) at GUI display
- Data log CSV file, including Events Time Stamp
- Missing or Low Energy TTL alarm signal at Trig OUT

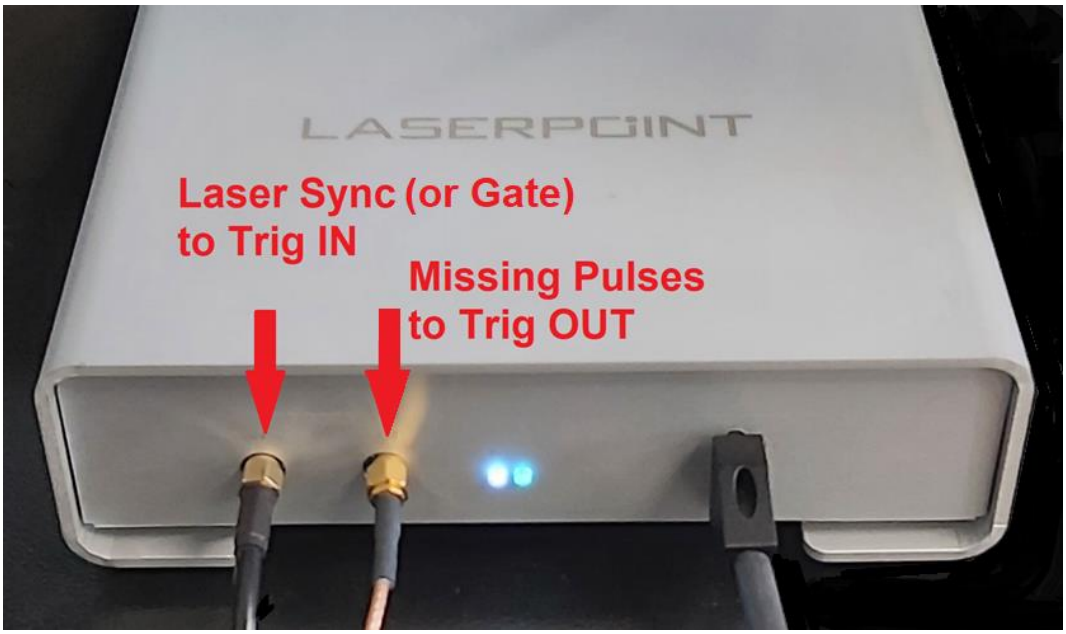


Figure 6: Trig IN and Trig OUT connections at HSM readout electronics

8- GRAPHIC USER INTERFACE

MAIN SCREEN

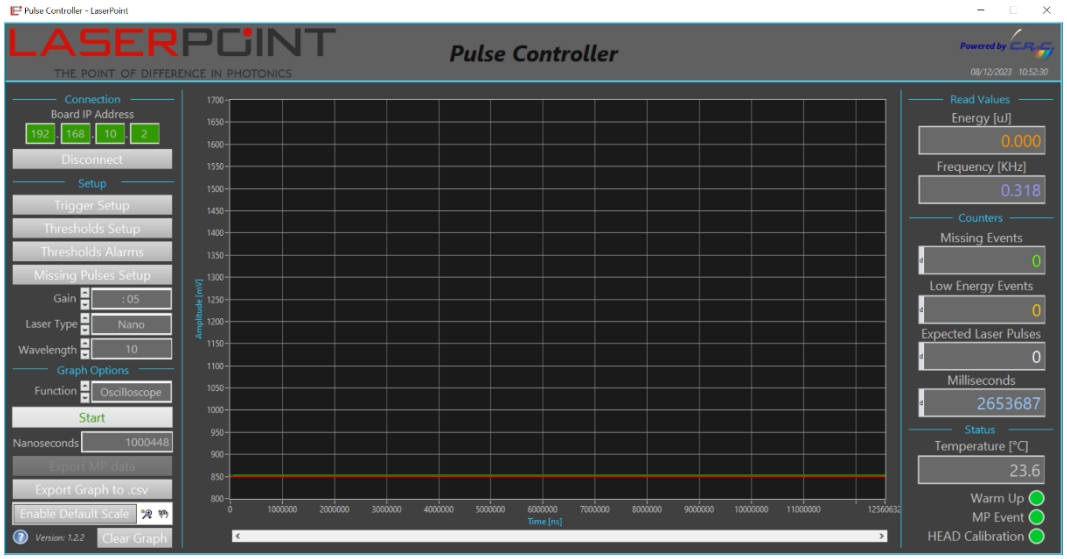
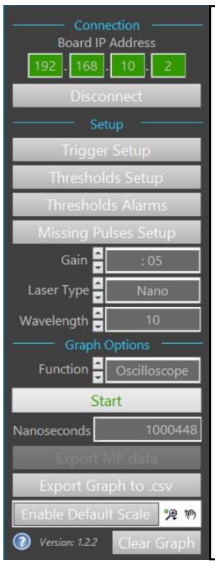


Figure 7: GUI – Main screen



IP Connection

Dedicated Panel for Setup:

- Oscilloscope Trigger (Figure 13)
- Level Thresholds (Figure 14)
- Energy Low Alarms (Figure 15)
- Missing Pulses Parameter Settings (Figures 16 A,B, C, D)

Gain Selection (Figure 10 A)
Laser Type Selection (Figure 10 B)
Wavelength Selection (see calibration certificate, Figure 45)

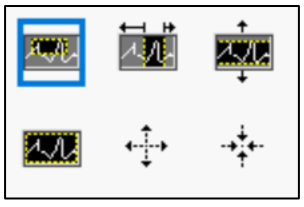
Mode of Operation Selection:

- Function Selection (Figure 10 C)

Start Measurement

- Oscilloscope Time Span (ns)
- Missing an Low Energy Buffer Export (Figure 43)
- Graph Data Export (Figure 44)
- Graph Display Options (Figure 10 D and Icons function description below)

System Info (Figure 12) and Graph Clear



Icons from left to right, from upper to lower row:
Graph selection, vertical slice selection, horizontal slice selection,
Fit to frame (last two icons not active).
To return to initial conditions toggle on/off **Enable Default Scale**.

Figure 8: GUI – Left side panel settings with comments

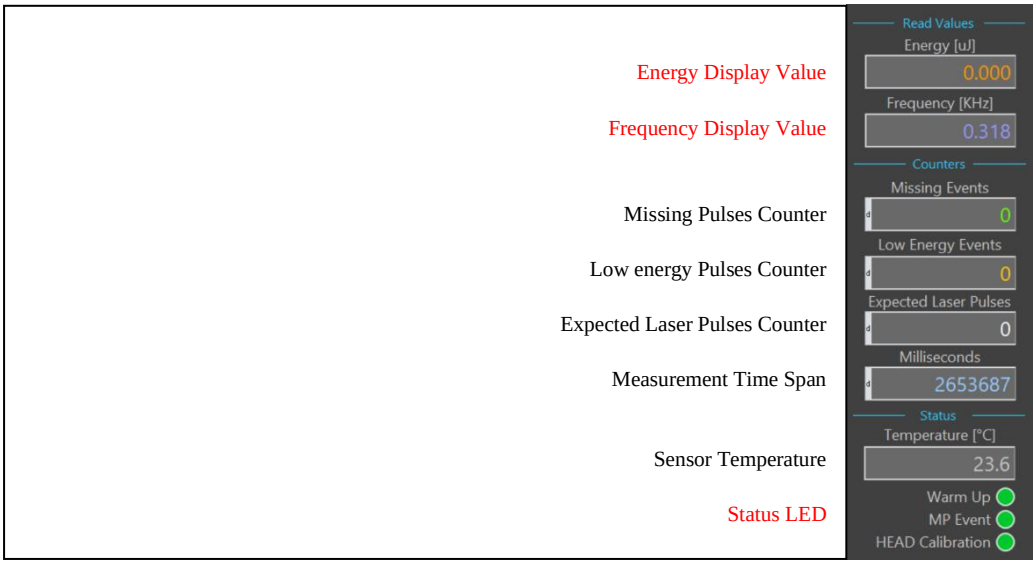
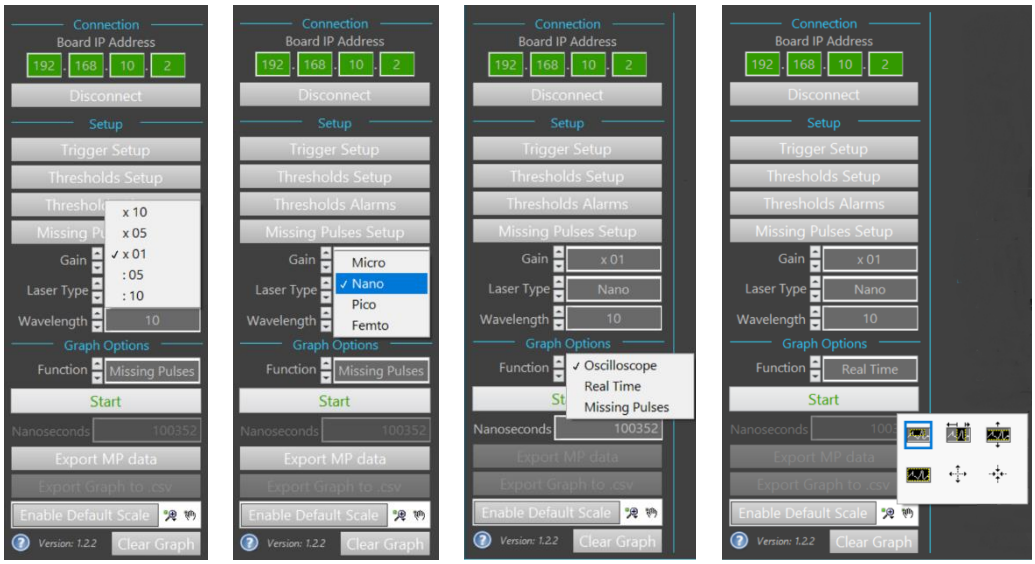


Figure 9: GUI – Right side panel with comments

GRAPHIC USER INTERFACE SETTINGS



A **B** **C** **D**

Figure 10: Left side panel settings

A = Click on the Gain box to select the value options (x10, x5, x1 standard, /5, /10)

Warning!
Every time the operator switches between Gain values the user has to perform the "Auto" setting of the Thresholds (see Figure 14) to ensure that the measures are performed with the specified accuracy (see calibration certificate for calibrated Gain of your Pulse Controller)

B = Click on the Laser Type box to select the pulse duration options (a correction factor is applied accordingly)
C = Click on the Function box to select the Pulse Controller operation mode (Oscilloscope, Real Time, Missing Pulses)
D = Click on the icon box to select the Graph display options (details in Figure 8)

Wavelength selection: see calibration certificate for calibrated Wavelength number (1064 nm, default value #10)

GRAPHIC USER INTERFACE DATA DISPLAY

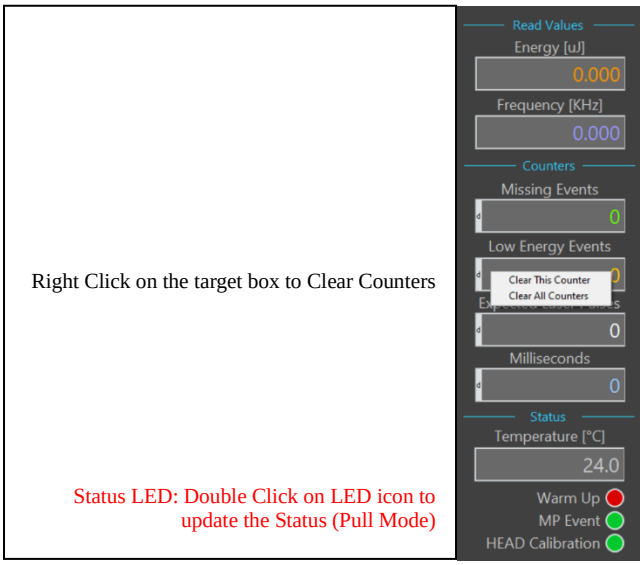


Figure 11: Right side panel with comments

SYSTEM INFO

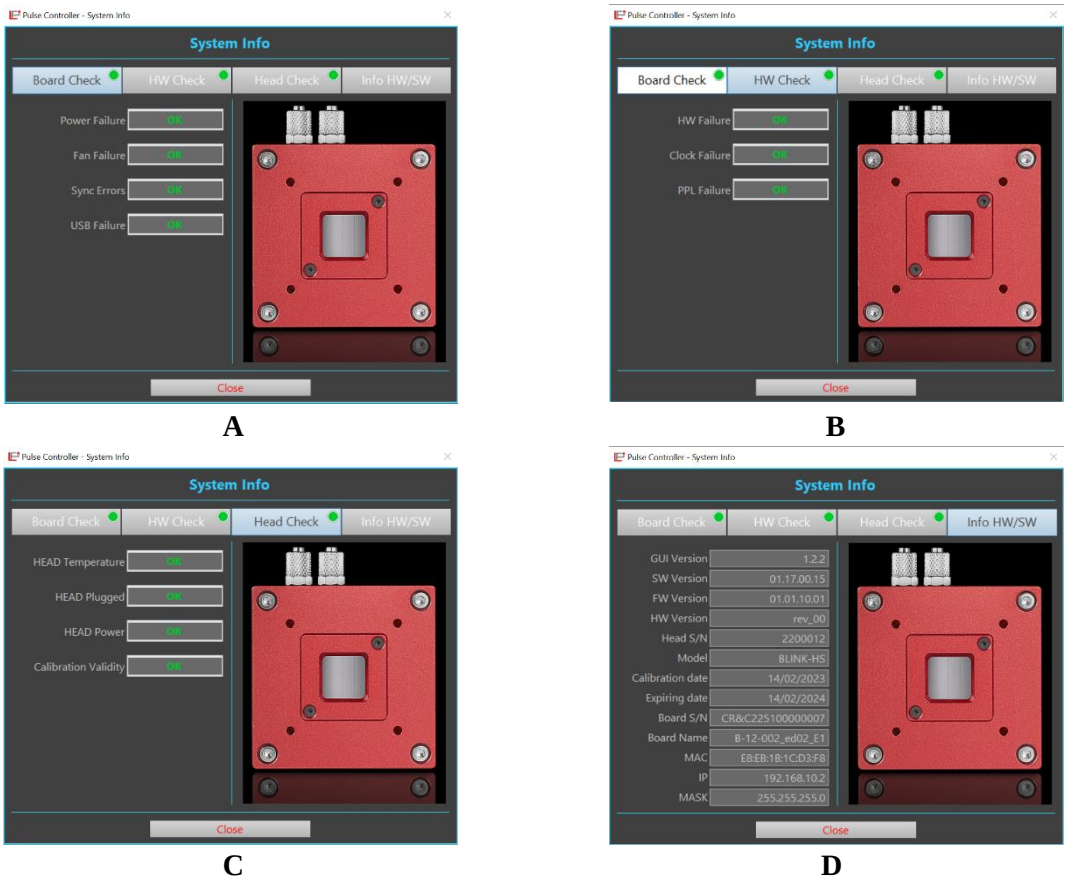


Figure 12: System Info

A, B, C = Diagnostic information panels of Board, HardWare, Head
D = Main information panel SW, FW, HW of Pulse Controller System

9- GRAPHIC USER INTERFACE BASIC SETUP

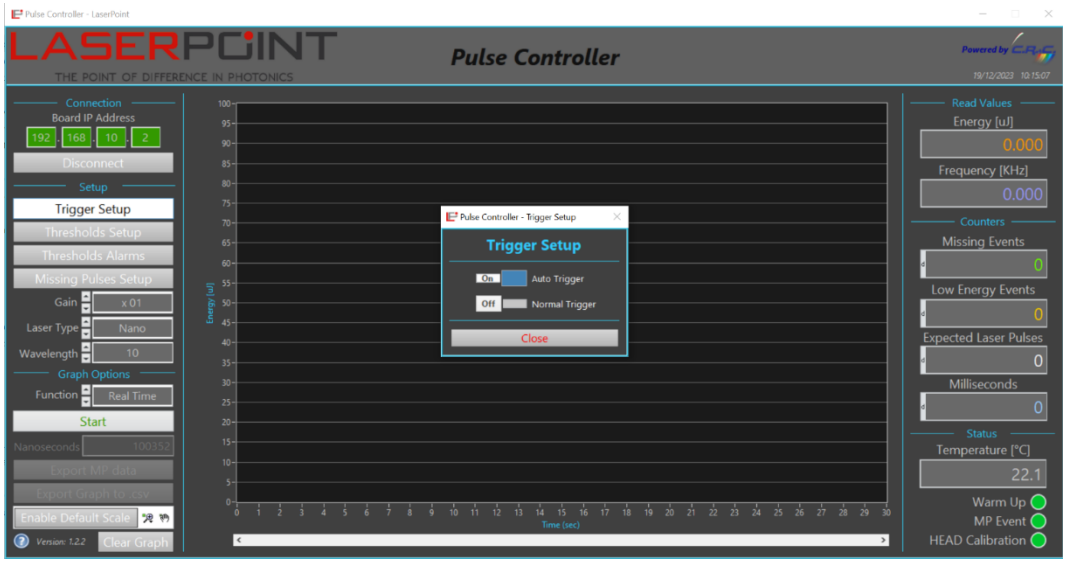


Figure 13: Trigger Setup: this panel allows selection of aTrigger mode, Auto and Normal
Auto Trigger, acquisition starts immediately on START
Normal Trigger, acquisition starts on signals above Trigger Start value defined in Triggers Setup

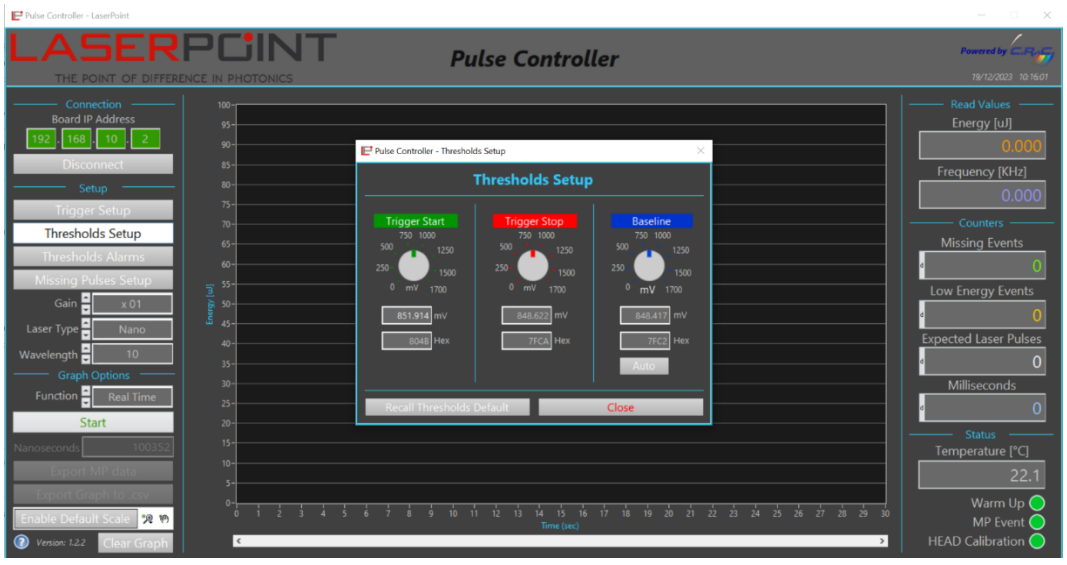


Figure 14: Thresholds Setup: this panel allows visualization and setting of Trigger Start (the level that determines the start of computation of the pulse energy by the HSM readout electronics), Trigger Stop (the level that determines the stop of computation of the pulse energy by the HSM readout electronics) and Baseline (the level that is subtracted in the computation of the pulse energy)

Auto: keeping the Laser Under Test OFF and pushing the button the Baseline is determined automaticaly, and Trigger Start and Trigger Stop set according to the values stored in HS eeprom

10- GRAPHIC USER INTERFACE MISSING PULSES AND LOW ENERGY SETUP

LOW ENERGY ALARMS SETTINGS

Figure 15: Threshold alarms are set for Energy "Threshold Low" value. The other Thresholds are intended for future releases use

SYNC MODE OPERATION

Figure 16 A: GUI – Operation Mode Selection Panel, where user selects the mode of operation of the Pulse Controller (Sync in the case depicted)

Figure 16 B: GUI – Sync Manager; this is the key panel for parameters setting of the instrument, in standard conditions toggle Sync Derivative and Sync Delay ON.

For detailed operation steps please read carefully Chapter 11, Chapter 12 and Chapter 13

GATE MODE

Figure 16 C: GUI – Operation Mode Selection Panel, where user selects the mode of operation of the Pulse Controller (Gate in the case depicted)

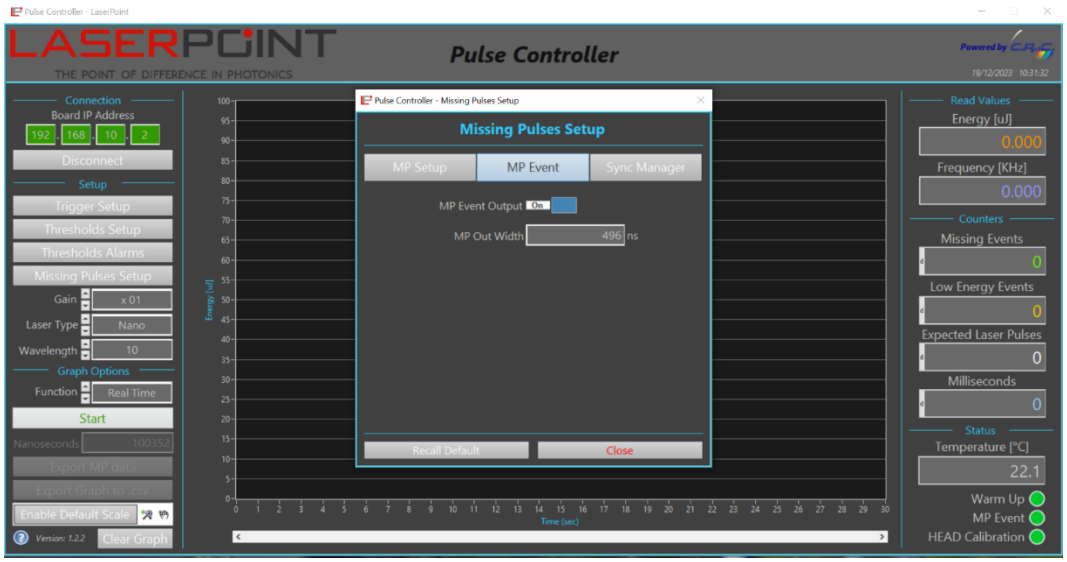


Figure 16 D: GUI – Missing and Low Energy Event Output; <u>at the occurrence of any MP-LE Event</u> the Pulse Controller send a TTL alarm signal at Trig OUT of the HSM readout electronics (Figure 6)

11- PULSE CONTROLLER MEASUREMENT PRINCIPLES

In this Chapter are described the basic operation principles of LaserPoint **Pulse Controller** system, to help the user to set correctly the instrument to perform at the specified Mode of Operation and target accuracy.
The **SYNC MODE** operation setting is described Step-by-Step in the following part of the Chapter.

Step 1: Measurement of Sync to Pulse delay

The following Figure 17 shows the relation between the Sync signal and the laser output, whose delay depends on Laser Under Test type.
The Pulse Controller measures continuously these values, as reported in the Missing Pulse Setup panel (Figure 16 B); the icon close to the boxes activates the data refresh.

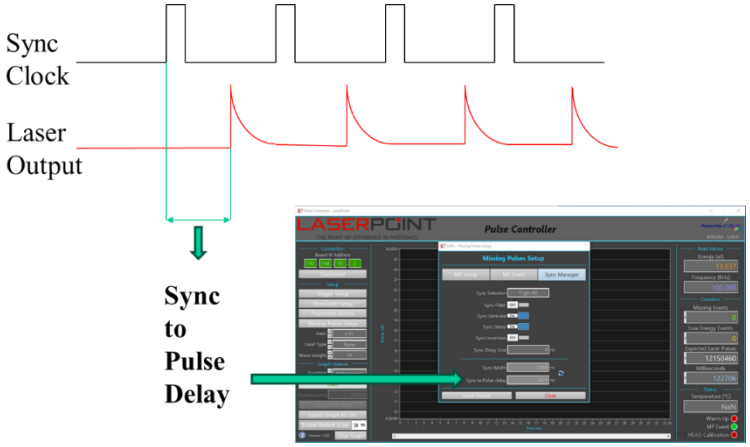


Figure 17: Sync to Pulse delay measurement

Step 2: Reduce the Sync to Pulse delay to **about 10%** of the original value

At this step the user has to input, at the Missing Pulse Setup panel (Figure 16 B and Figure 18), in the Sync Delay Line box, a value **about 90%** of the Sync to Pulse delay measured in the **Step 1.**

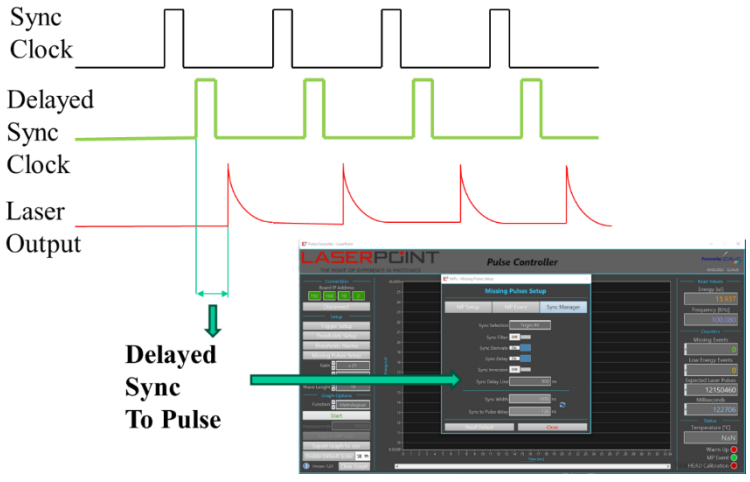


Figure 18: Set a delayed Sync to Pulse value

Step 3: Define the Pulse Controller observation mask (Jitter Mask)

To recap, in **Step 1** and **Step 2** the user defines the **starting time position** of the observation mask then, as final setting step, the **width** (ns) of the observation mask (Figure 16 A and Figure 19) is defined according to this rationale: the expected Laser Period (ns) is set, then Jitter Mask can be input (available values are 3/4, 1/2, 1/4, 1/8 of Laser Period).
Larger observation masks result in more tollerant measures respect to lasers with significant pulse jitters, smaller observation masks result in more stringent characterization criteria (in other words, some pulse might not be missing but just out of the observation window).

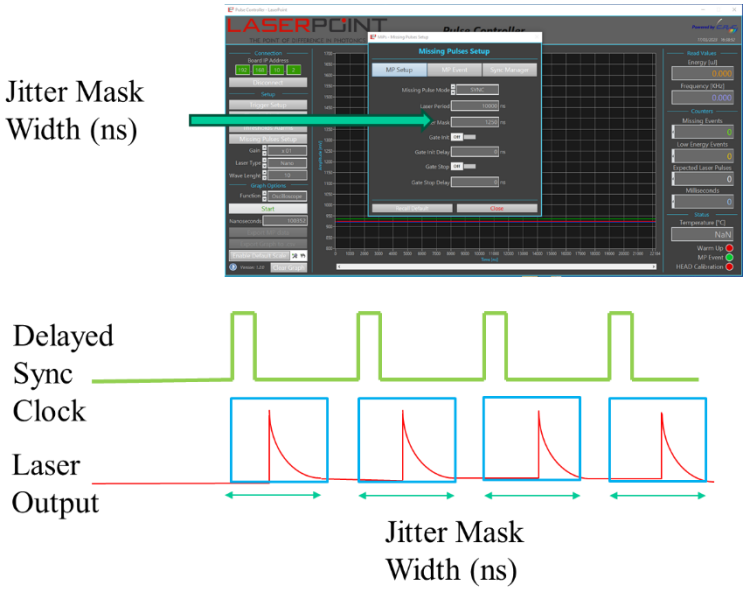


Figure 19: Set the observation mask (Jitter mask) width (ns)

The **GATE MODE** operation setting is described in the following part of the Chapter.
There are two basic parameters to be set (Figure 16 C), i.e. Laser Period and Jitter Mask.

Warning: the exact Laser Period definition is very important in Gate mode of operation, since since this is the only information that Pulse Controller has following Gate signal High in order to detect the laser pulses.

We advise to run the **Pulse Controller** first and to measure precisely the Frequency (Figure 9), in ordet to input an accurate value to Laser Period box.
The Jitter Mask has similar meaning to **Sync** mode, and observation starts at **Gate** rise.

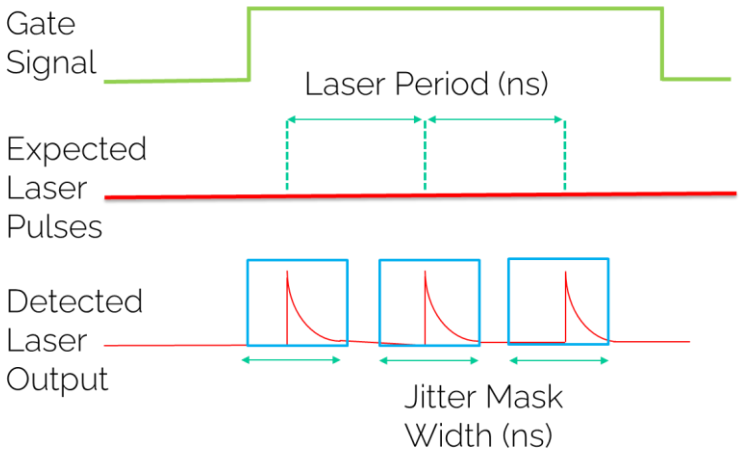


Figure 20: Set the observation mask (Jitter mask) width (ns)

12- PUT THE PULSE CONTROLLER INTO OPERATION

Please read and follow carefully the following actions list in order to put the Pulse Controller into operation:

1/ Plug the Power Supply to the **HSM** readout electronics, see Figure 4

2/ Connect the **HS** sensor to the **HSM** readout electronics (be careful to the Wedges of the connectors, see Figure 2 and Figure 3)

3/ Connect the Ethernet cable to **HSM** readout electronics and Computer, see Figure 4

4/ Verify that Computer Antivirus and Windows Firewall are set properly, see Figure 5

5/ Switch **HSM** readout electronics ON, see Figure 4

6/ Open **Pulse Controller** Software

7/ Wait until Status LED STS tuns green, see Figure 3

8/ Connect the **Pulse Controller**, see Figure 8

9/ Wait 20 min, then Double Click on Warmup LED (Figure 11), until it turns green; **the system is warmup and ready for parameters configuration**

10/ Keep the Laser Under Test OFF

11/ Open Trigger Setup and set to Auto Trigger (acquisition starts immediately on START) or Normal Trigger (acquisition starts on signals above Trigger Start value on Triggers Setup) see Figure 13 and Figure 14

12/ Open Thresholds Setup panel, and **perform Auto baseline**, see Figure 14

13/ Open Threshold Alarms panel, set low and high values, see Figure 15

14/ Set Function to Oscilloscope mode, see Figure 10 C, and perform acquistion

15/ Open Missing Pulses setup, choose Sync or Gate operation mode, see Figure 16 A and Figure 16 C

16/ Set Laser Period and Jitter Mask, available values are 3/4, 1/2, 1/4, 1/8 of Laser Period, see Figure 16 A and Figure 16 C

17/ Connect SMA cable to Trig IN, see Figure 6

18/ Switch Laser Under Test ON

19/ The **Pulse Controller** is ready to operate, user can move to the next steps of pulse detection optimization (e.g. measure Sync to Pulse delay, set delay line to about 90% of Sync to Pulse initial delay and define the Jitter Mask (see Step 1, Step 2 and Step 3 of PULSE CONTROLLER MEASUREMENT PRINCIPLES, Chapter 11).

From now on please read carefully the following Chapter 13, that will guide the user to operate with the Pulse Controller by mean of examples of lasers operating at different repetition rate.

13- QUICK GUIDE TO MEASUREMENT

This section provides a quick guide to perform basic measurements with the **Blink HS Pulse Controller** system.

We will guide you to perform Missing Pulses and Low Energy Pulses detection, by using the most standard and automatic procedure, expert users will find more many parameters to set to best fit characteristics of the system under test.
Please read carefully and follow step by step the measurement setup procedure.

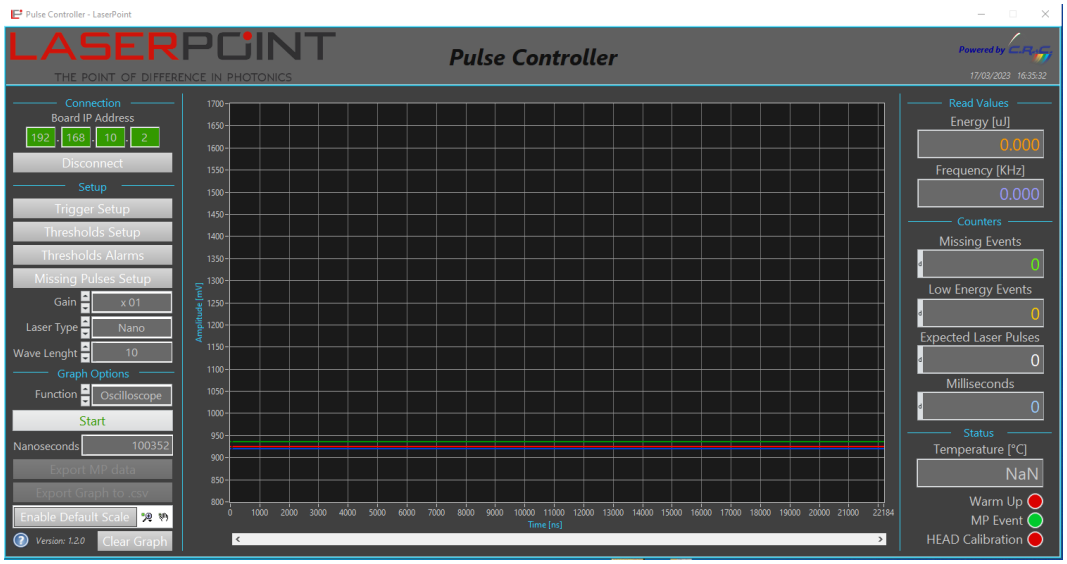


Figure 21: Homepage

1. **Run the Blink HS Pulse Controller**
2. **Then press “Connect” button**

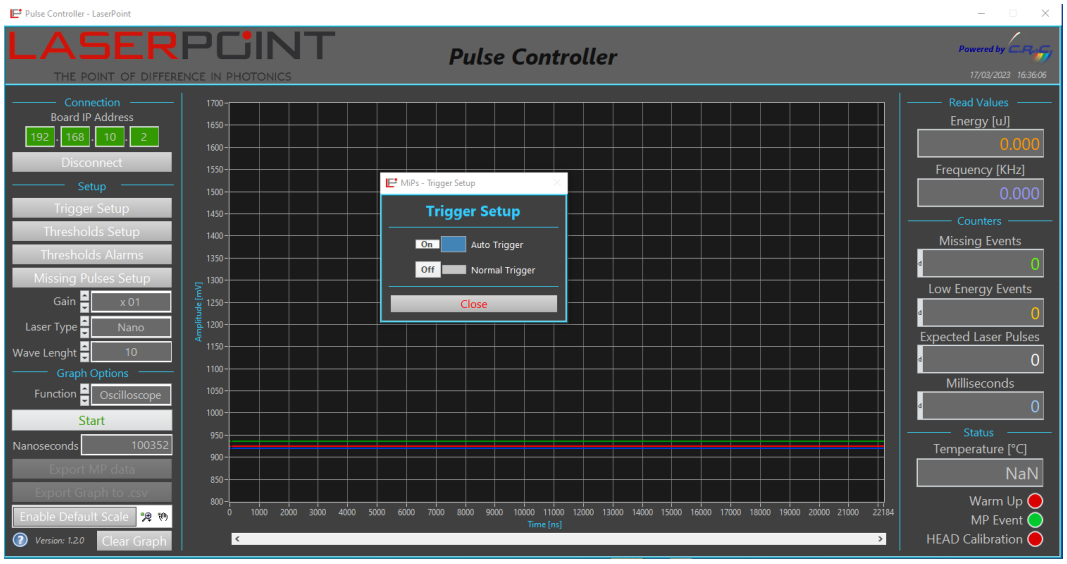


Figure 22: Trigger Setup (measure)

1. **Open the panel “Trigger Setup”**
2. **Set to Auto Trigger**

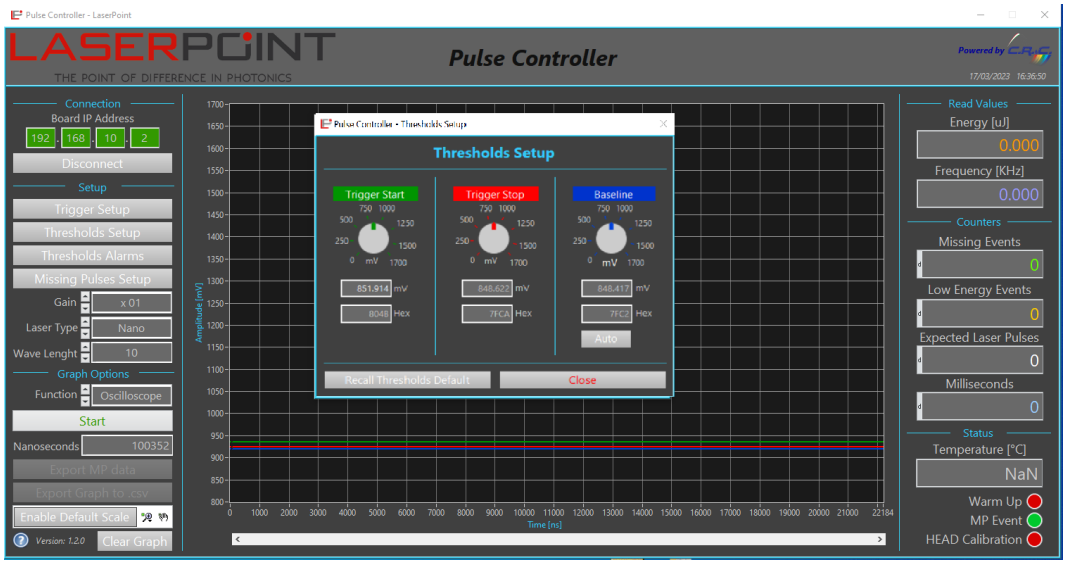


Figure 23: Thresholds Setup (measure)

1. **HSM Readout Electronics ON by at least 20 min, when system is warmed up a green led will light on Double Clicking on icon (Figure 11)**
2. **Set the Laser Under Test to OFF**
3. **Open the panel "Thresholds Setup"**
4. **Execute Auto (button at right-low side of the panel)**
5. **Baseline, Trigger Start, Trigger Stop are automatically set**
6. **The system is ready for measurement**

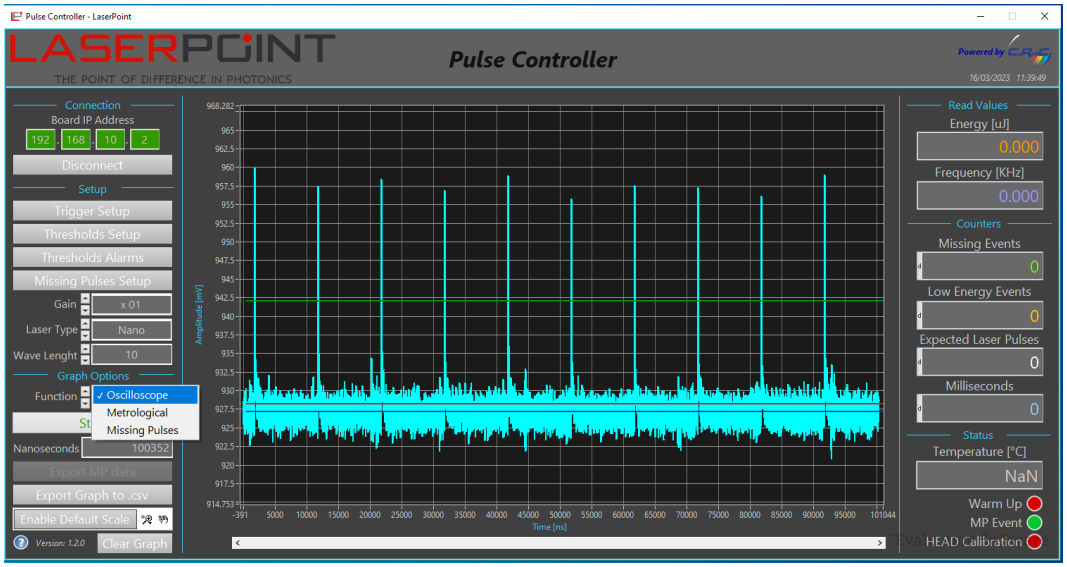


Figure 24: Function

1. **Set to Oscilloscope**
2. **Set the Laser to ON**
3. **Start acquisition**
4. **The result is shown in Graph Area**

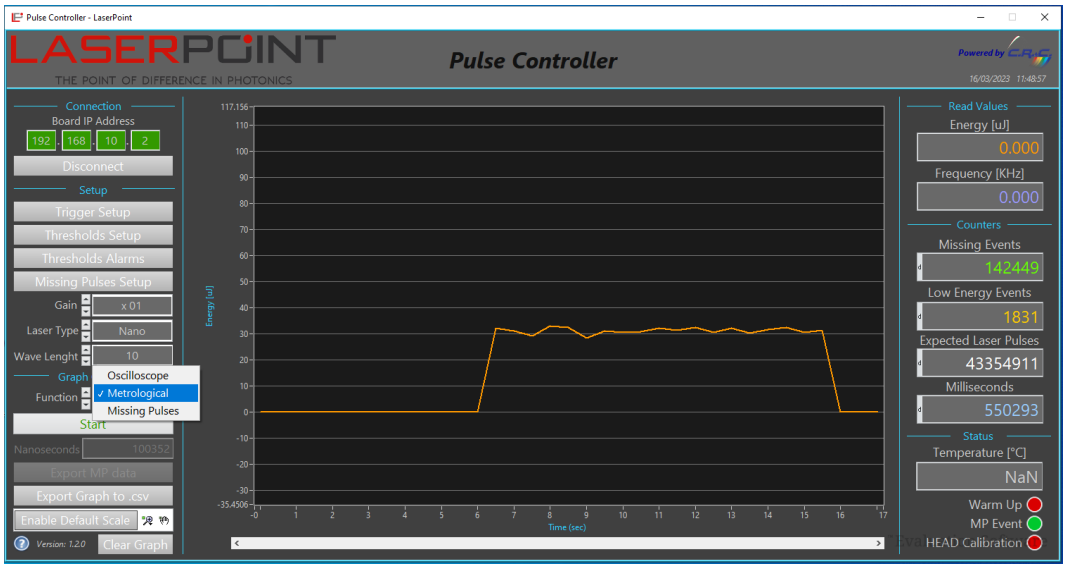


Figure 25: Function

1. **Set to Metrological**
2. **Start acquisition**
3. **Energy/pulse (data refresh rate 2 Hz) is continuously displayed in Graph Area**

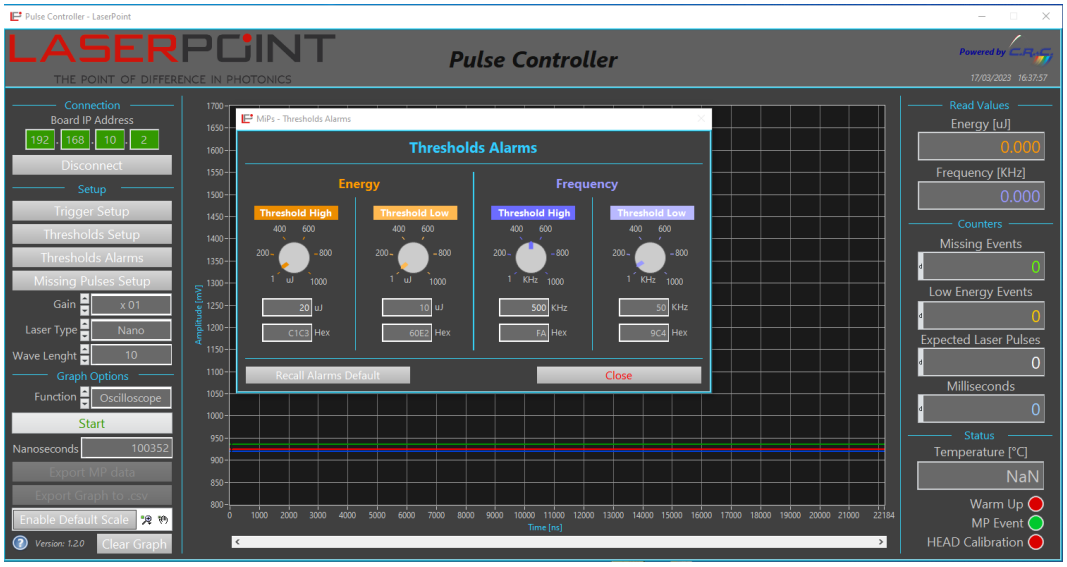


Figure 26: Thresholds Alarms

1. **Set Energy and Frequency threshold alarms**
2. **Energy Threshold Low will be used to detect low energy pulses**

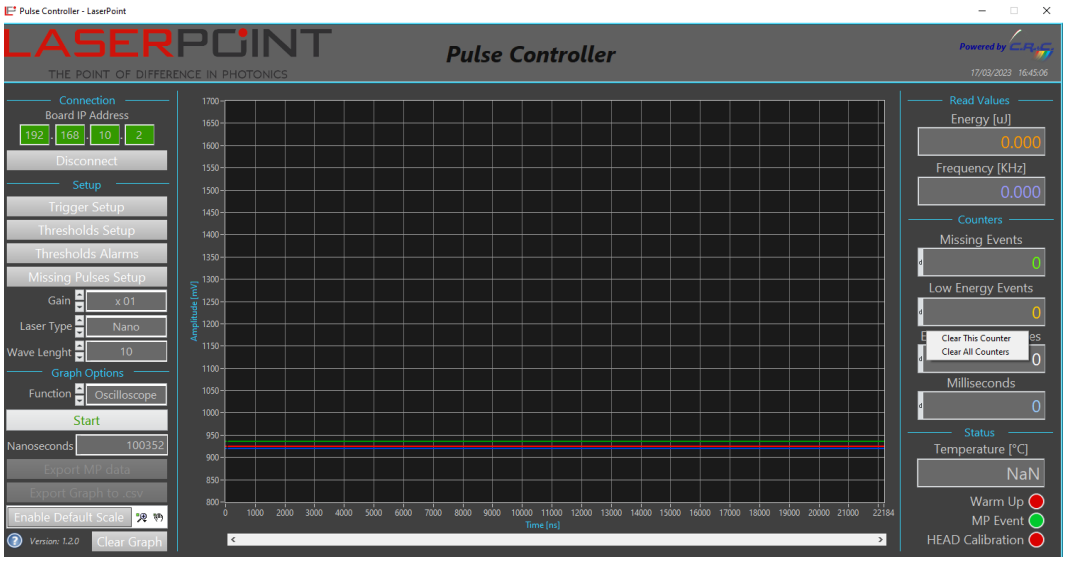


Figure 27: Counters and Graph Clear

1. **Use Righ Click button to open panel to clear the counters (Figure 11)**
2. **Push Clear Graph button to clear (Figure 8)**

14- SYNC MODE APPLICATION EXAMPLE: 100 KHZ LASER

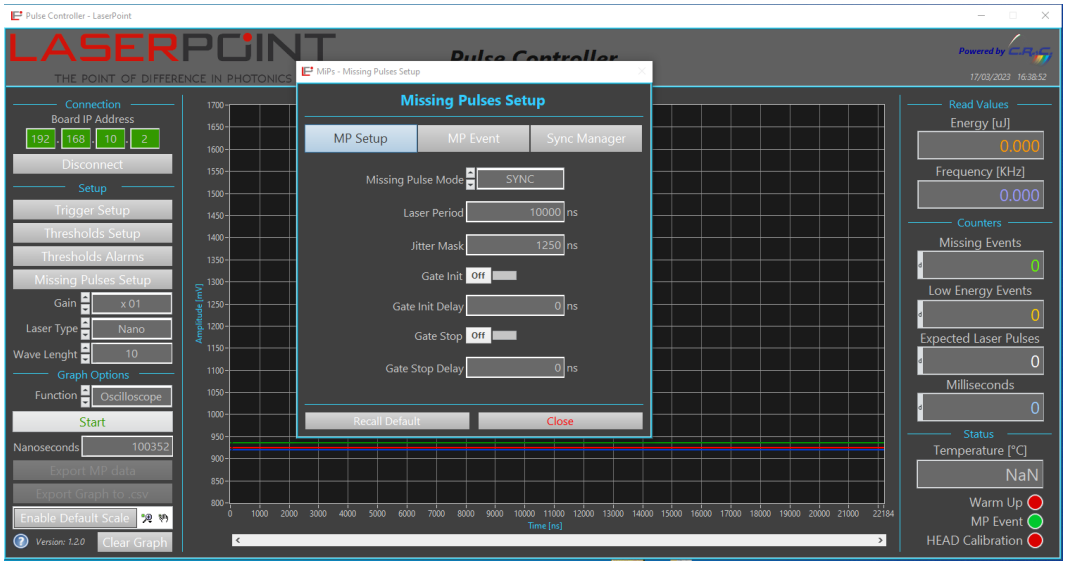


Figure 28: Missing Pulses Setup

1. **Press MP Setup button**
2. **Set laser period to 10,000 ns**
3. **Set Jitter Mask (1/8 laser period in this case, please read carefully Step 3 at Chapter 11 for more details on Jitter Mask value meaning)**

Figure 29: Missing Pulses Setup

1. **Press Sync Manager Setup button**
2. **Measure Sync to Pulse Delay**

Figure 30: Missing Pulses Setup

1. **Set Sync Delay Line at about 90% of the Sync to Pulse Delay**
2. **The system is ready to measure Missing Pulses and Low Energy Pulses**

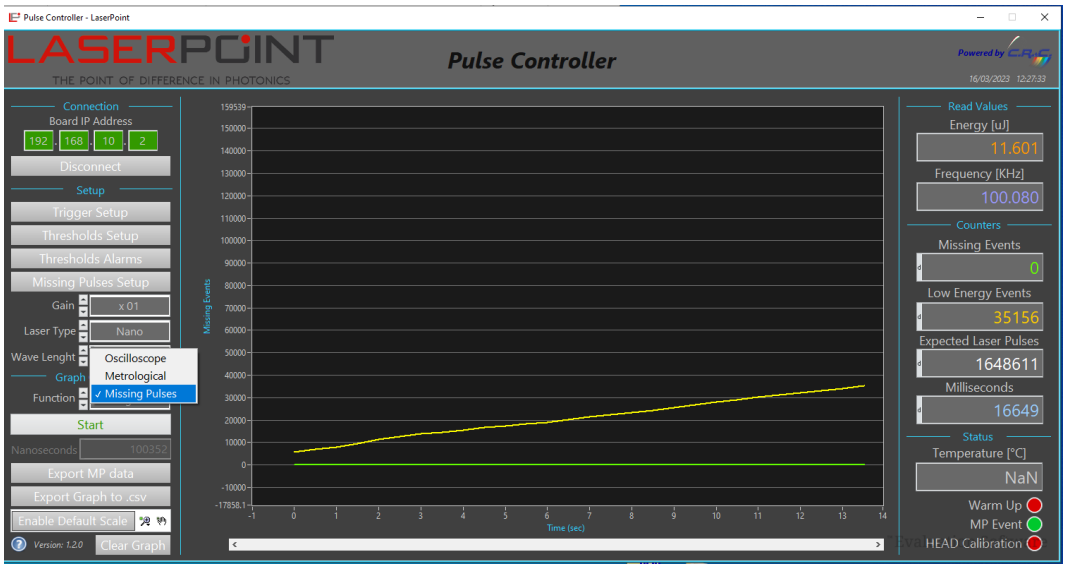


Figure 31: Function

1. **Set to Missing Pulses**
2. **Start: in this example a LaserPoint tool named "Pulse Eraser" (not described in this document, and whose function is to cancel selectively emitted laser pulses for characterization purposes) is OFF, there are just Low Energy events detected, according to the settings of Energy Threshold Low alarm**

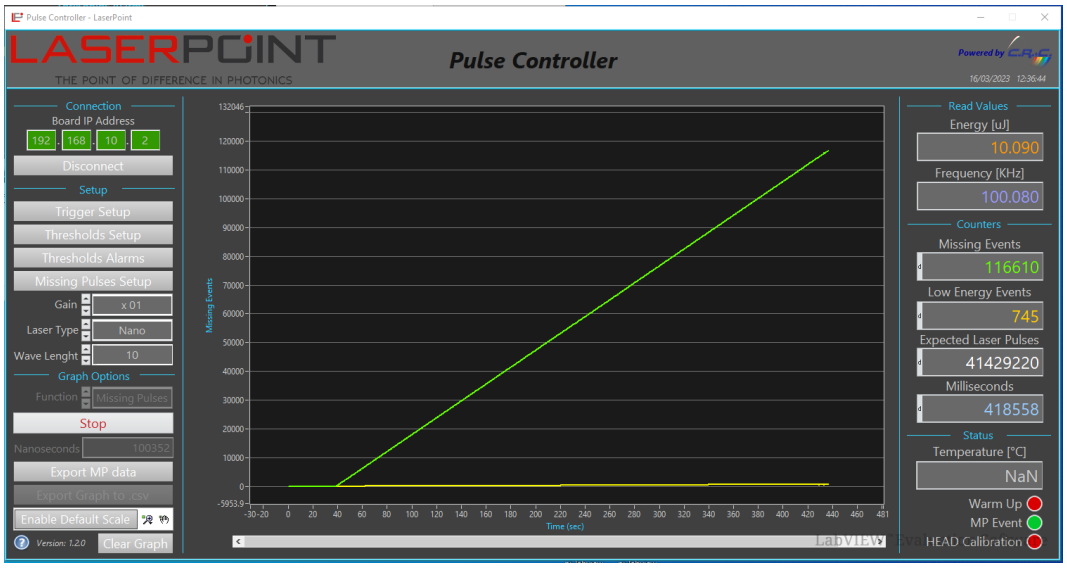


Figure 32: Function

1. **"Pulse Eraser" tool ON at 6500 rpm**
2. **Start: in this example the "Pulse Eraser" tool is ON, Missing Pulses and Low Energy events detected, according to the settings of Energy Threshold Low alarm**

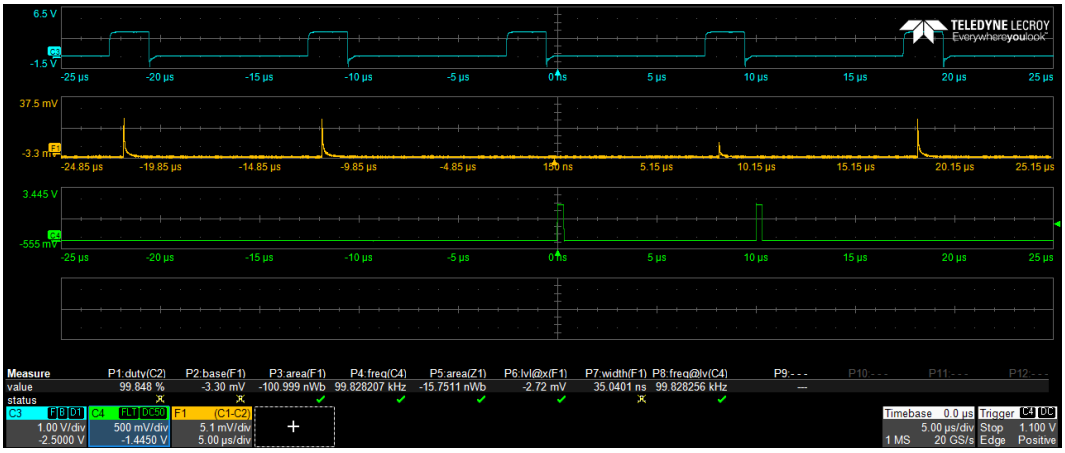


Figure 33: Oscilloscope (external) screenshot

1. **Sky Blue line: Sync signal at Trig IN**
2. **Yellow line: Blink HS pulses detection**
3. **Green line: Trig OUT showing 1 Missing Pulse and 1 Low Energy event**

15- SYNC MODE APPLICATION EXAMPLE: 500 KHZ LASER

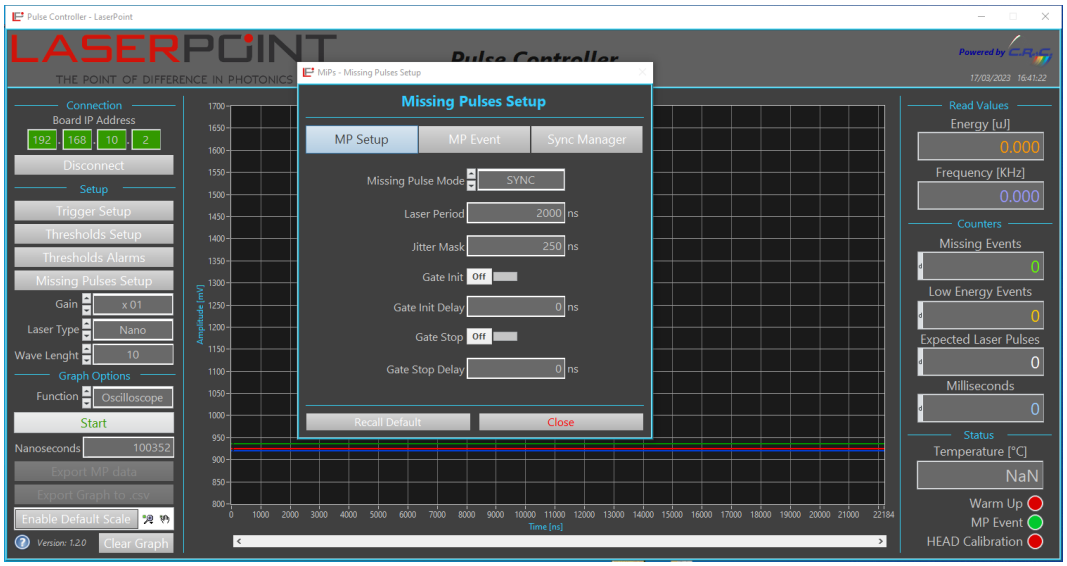


Figure 34: Missing Pulses Setup

1. **Press MP Setup button**
2. **Set laser period to 2,000 ns**
3. **Set Jitter mask to maximum value (3/4 laser period)**

Figure 35: Missing Pulses Setup

1. **Press Sync Manager Setup button**
2. **Measure Sync to Pulse Delay**

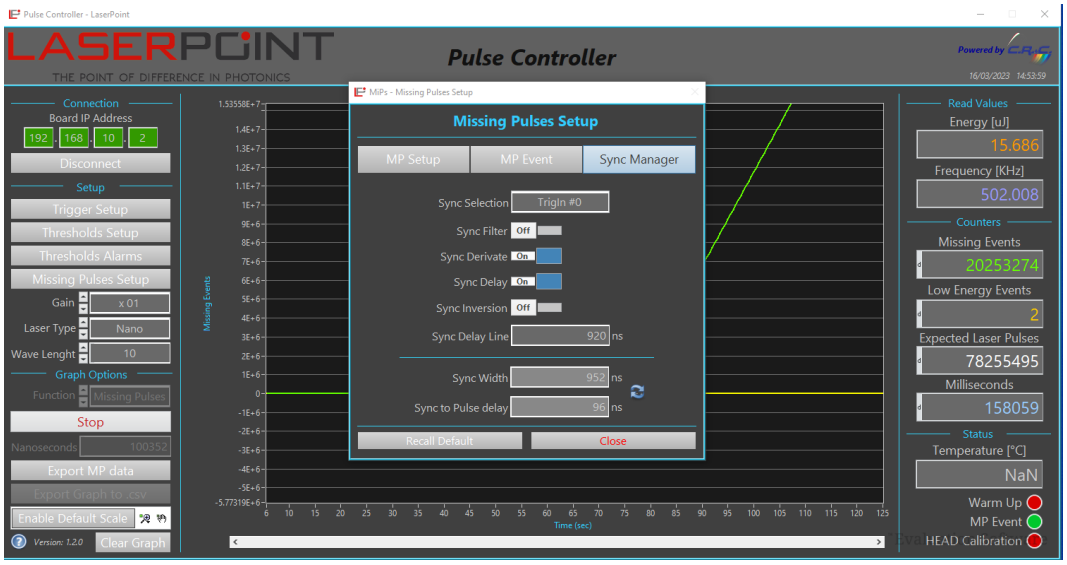


Figure 36: Missing Pulses Setup

1. **Set Sync Delay Line at about 90% of the Sync to Pulse delay**
2. **The system is ready to measure Missing Pulses and Low Energy Pulses**

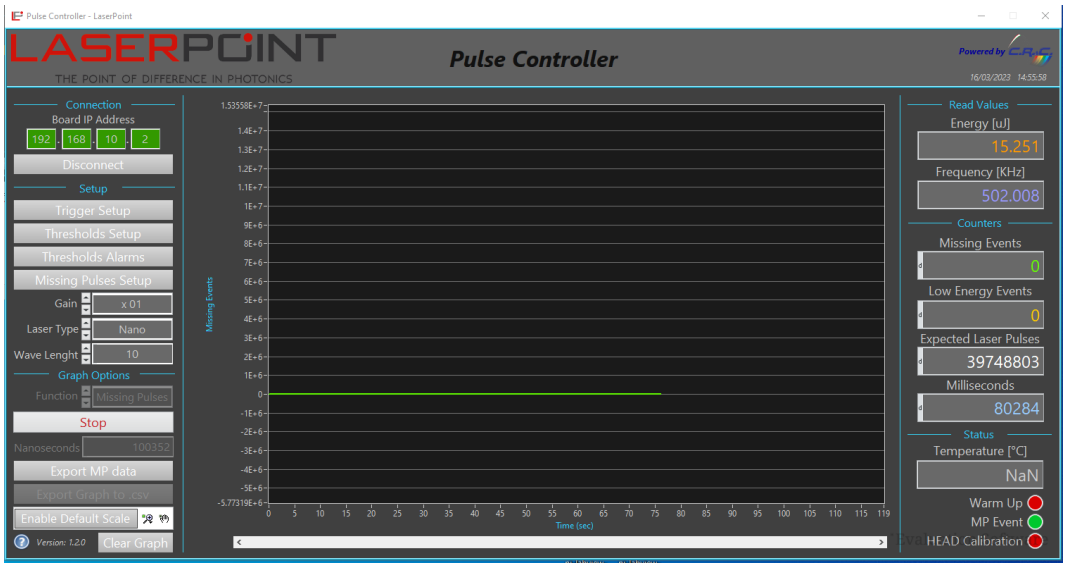


Figure 37: Function

1. **Set to Missing Pulses**
2. **Start: in this example the "Pulse Eraser" tool is OFF, there are no Low Energy events detected, according to the settings of Energy Threshold Low alarm**

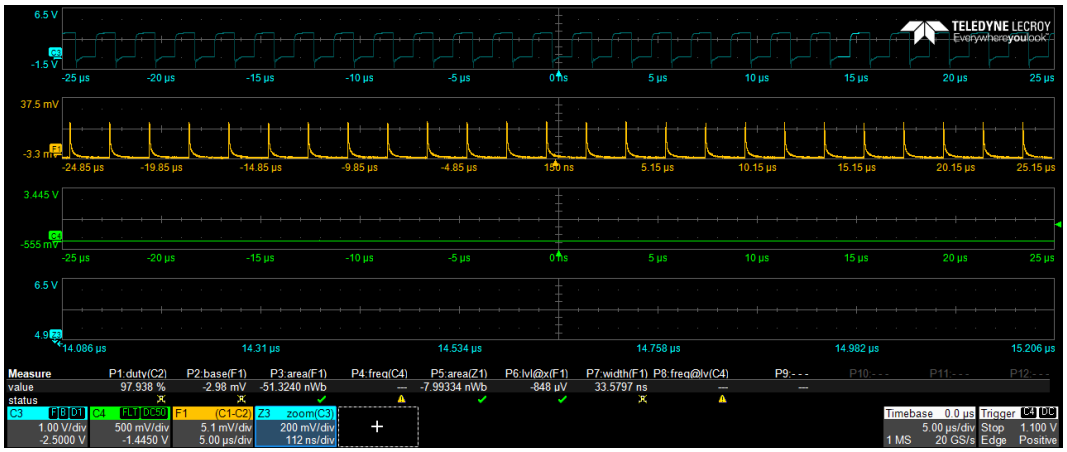


Figure 38: Oscilloscope screenshot

1. **Sky Blue line: Sync signal at Trig IN**
2. **Yellow line: Blink HS pulses detection**
3. **Green line: Trig OUT showing 0 Missing Pulse and 0 Low Energy event**

16- SYNC MODE APPLICATION EXAMPLE: 800 KHZ LASER

In the following is shown and example of **Pulse Controller** operation sensing a Laser Under Test operating at (nominal) 800 kHz.

Pulse Controller was set in **SYNC MODE**, and parameters were optimized according to explainations that user can find in the previous Chapters of this document.

Trigger Start = + 3.5 mV respect to Baseline
Trigger Stop = + 0.5 mV respect to Baseline
Sync Delay Line = 900 ns
Laser Period = 1250 ns
Jitter Mask = 936 ns (3/4 of Laser Period)
Laser UNDER TEST ON time = 500 microseconds
Expeted Laser Pulses = 400

The Laser Under Test shows a pretty unstable behaviour in the initial 50 microseconds of emission (high number of missing pulses, frequency instability), and stabilized from 50 microsecons on.

In the following Figures the Oscilloscope (external) traces and snapshot of the missing pulse panel are shown.

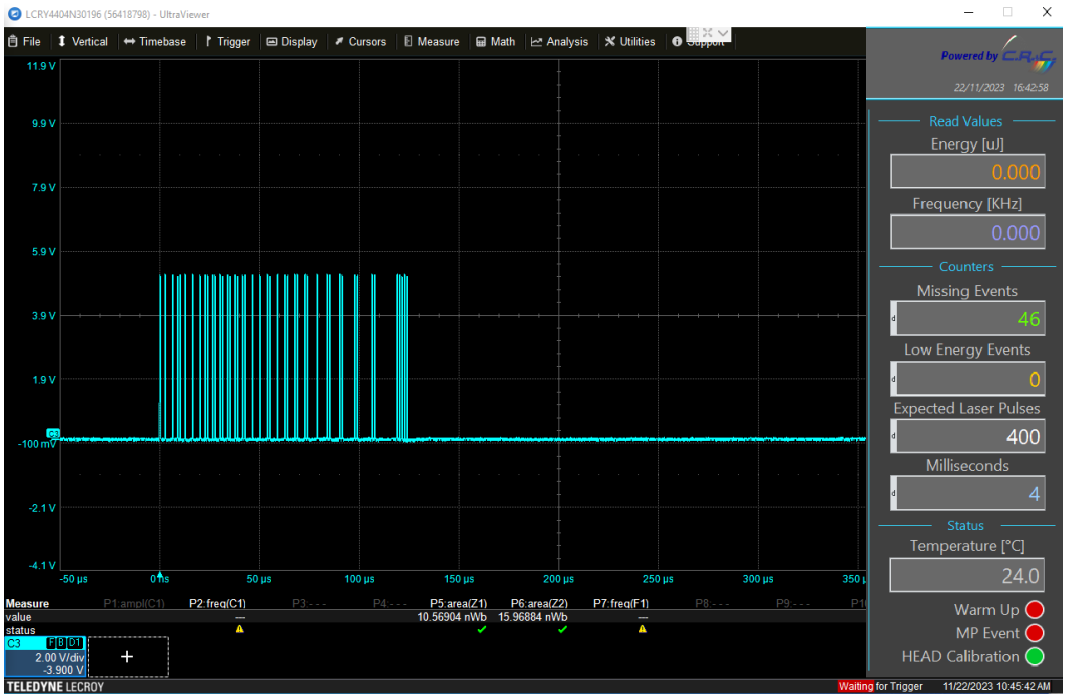


Figure 39: Oscilloscope (external) output at HSM Trig OUT (Figure 6), showing high number of Missing Pulses, and screenshot of the Pulse Controller Right side panel (Figure 9)

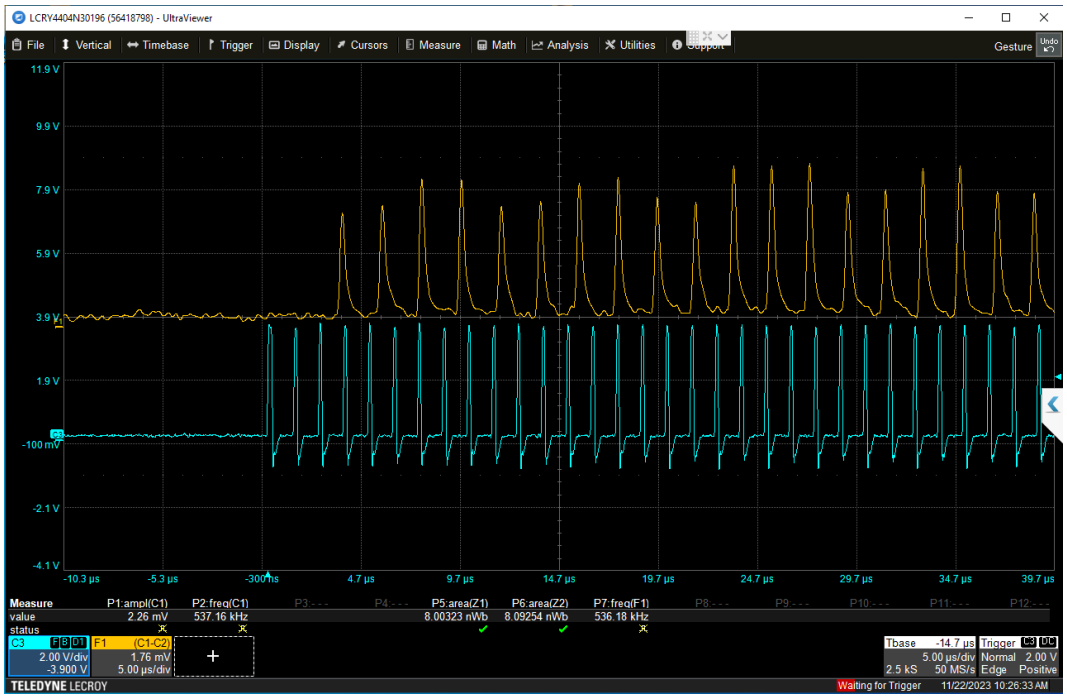


Figure 40: Oscilloscope (external) traces of the laser SYNC signal (Sky Blue line) and HS sensor output (Yellow line).
The initial 40 microseconds from Laser Under Test start are shown

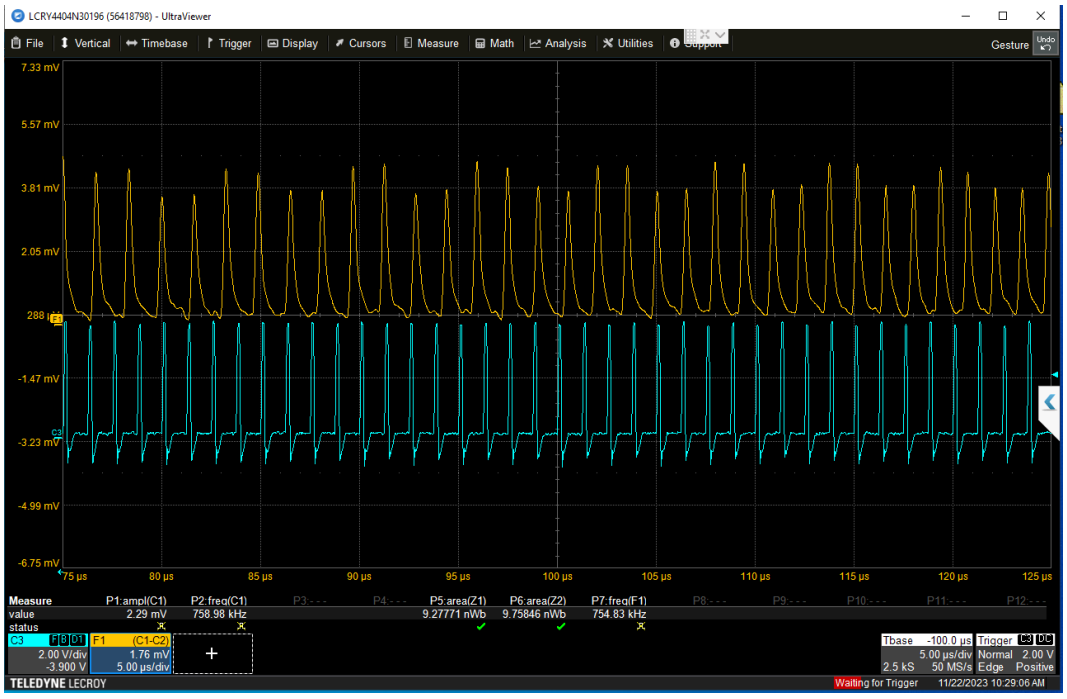


Figure 41: Oscilloscope (external) traces of the laser SYNC signal (sky blue line) and HS sensor output (yellow line).
The 50 microseconds emission of the Laser Under Test (100 microseconds from start) are shown

Figure 42: Oscilloscope (external) traces of the laser SYNC signal (Sky Blue line) and HS sensor output (Yellow line).
The 50 microseconds emission of the Laser Under Test (200 microseconds from start) are shown

17-DATA EXPORT .CSV FILES

RECORD_ID	TIME(ms)	PULSES_CNT	Missing_Type	HSM_STatus	Column1
0	0	1	MisP	1	
1	3030	120002	MisP	1	
2	3033	120003	MisP	1	
3	6063	240004	MisP	1	

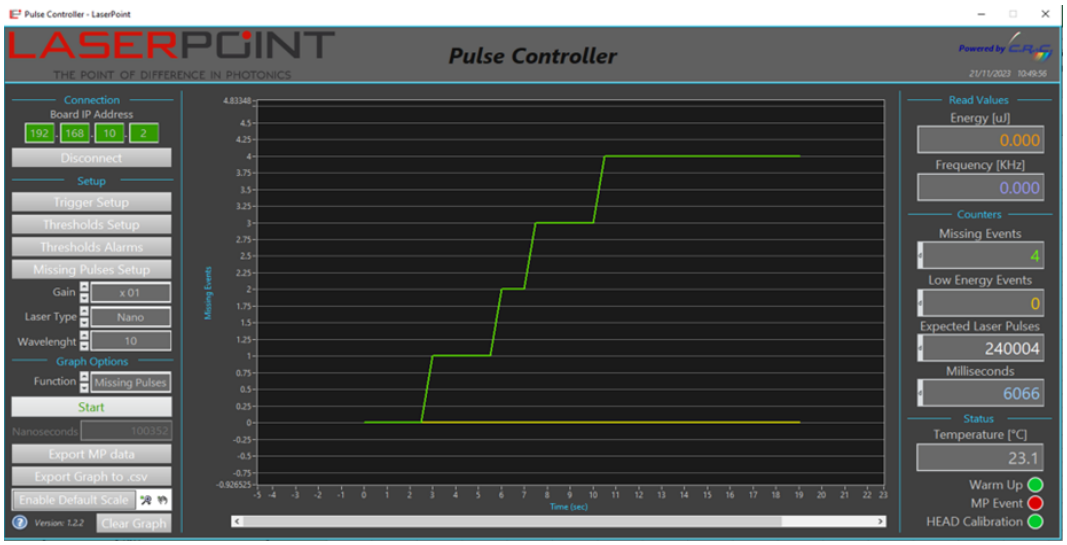


Figure 43: Export MP data (Figure 8): Missing Pulse CSV file and relative Home Page screenshot

Functio	Oscilloscop
Time [ns]	Amplitude [mV]
0.000	847.932
2.000	848.239
4.000	848.494
6.000	847.907
8.000	848.673
10.000	848.800
12.000	848.749
14.000	848.366
16.000	848.341
18.000	847.958
20.000	847.856
22.000	848.213
24.000	847.958

Function	Metrological
Time [sec]	Energy [uJ]
0.000	0.000
0.500	0.000
1.000	0.000
1.500	0.000
2.000	1.852
2.500	1.855
3.000	1.688
3.500	1.835
4.000	1.770
4.500	1.905
5.000	0.000
5.500	0.000

Figure 44: Export Graph to .csv (Figure 8): Oscilloscope CSV export file (left) and Real Time CSV export file (right)

18- HOW TO RESET MISSING PULSES LOG FILE AND COUNTERS

Warning!
The Missing Pulses (MP) events log file fills up over acquisition in Append mode, when full the earliest data are progressively discarded.
In order to reset the MP log file please toggle between Mode of Operation, e.g. Missing Pulses to Oscilloscope and back to Missing Pulses. To clear counters refer to Figure 11.

19- HS SENSORS CALIBRATION

The HS sensors are supplied as a standard with calibration of Gain x1 ("no gain" in the drop-down menu), of the customer selection of wavelength at order time (available wavelength calibration list at www.laserpoint.eu).
HS sensor can be calibrated, upon request, as well for Gain x10 (**ENHANCED version, P/N Extension -ENH**), thus allowing a more accurate measurement at the low energy side of the usable range.

Warning!
Use Gain x10 in the energy range specified in the calibration certificate (in the example from 0.25 to 4 microJ), and switch to Gain x1 in the energy range specified in the calibration certificate (in the example from 4 microJ to 40 microJ).

In the following Figure 45 is shown a sample of the calibration certificate, reporting HS (high sensitive model, in this case) calibration at Gain x10 and Gain x1, and three wavelengths (1064 nm, 532 and 355 nm, respectively).

CERTIFICATE OF CALIBRATION N°

Meter P/N: BM-A-5W-14-TX-E-PC
Serial Number: ENH-
Detector Head: BM-A-5W-14-TX-PC Electronic Unit: HSM-1000-PC
Serial Number: Serial Number:

Date of calibration:
Laboratory environment: Temperature: 23°C Humidity: 40%

Energy Measures
Gain x10 (specific for energy < 4 uJ)

	Wavelength	*Standard*	*Device under test*	*Measured Error*	*Tolerance*	*Comment*
*	1064	0.950 µJ	0.94 µJ	- 1.26%	± 5%	Within Tolerance
*	1064	4.15 µJ	4.18 µJ	+ 0.72%	± 5%	Within Tolerance
**	532	3.45 µJ	3.44 µJ	- 0.29%	± 5%	Within Tolerance
***	355	3.212 µJ	3.232 µJ	+ 0.62%	± 5%	Within Tolerance

Gain = x10 Baseline = detected using "AUTO" function Trigger Start = Baseline + 40 mV Trigger Stop = Baseline + 5 mV

Energy Measures
Gain x1 (specific for energy RANGE 4 - 40uJ)

	Wavelength	*Standard*	*Device under test*	*Measured Error*	*Tolerance*	*Comment*
*	1064	11.85 µJ	11.79 µJ	- 0.51%	± 5%	Within Tolerance
**	1064	51.32 µJ	51.92 µJ	+ 1.17%	± 5%	Within Tolerance
***	532	16.15 µJ	16.26 µJ	+ 0.68%	± 5%	Within Tolerance
****	355	25.97 µJ	26.19 µJ	+ 0.85%	± 5%	Within Tolerance

Gain = x1 Baseline = detected using "AUTO" function Trigger Start = Baseline + 12 mV Trigger Stop = Baseline + 1.2 mV

* 1068 nm Fiber Laser, 125 kHz rep rate
** 1070 nm Fiber Laser, 50 kHz rep rate
*** 532 nm Fiber Laser, 100 kHz rep rate
**** 355 nm Laser, 30 kHz rep rate

Laserpoint s.r.l. hereby certifies that this instrument has been calibrated using standards whose accuracy is traceable to the National Institute of Standards and Technology (NIST) and to the PTB (Physikalisch-Technische Bundesanstalt) and other standards in accordance with EN 61040.

CALIBRATION STANDARDS TRACEABILITY DATA:

Manufacturer	Model	Serial N°	Certification	Cal. Due Date
FLUKE	8808A	4799023	LAT 042 04828	11/09/2024
LASERPOINT	A-40-D25	142030	NIST: 686153, O-39260-22	07/09/2024
LASERPOINT	A-02-D12	131965	PTB-4.54/4111746/22	30/08/2024

Figure 45: HS calibration certificate sample

20- COMPLIANCE TO ROHS DIRECTIVE (2011/65/EU & 2015/863/EU)

LaserPoint, warrants, that all products as supplied by LaserPoint do not contain the Hazardous Substances as described in Annex II by Directive 2015/863/EU of the European Parliament and of the council on the restrictions of the use of the certain hazardous substances in electrical and electronic equipment (RoHS) relating to restrictions on the marketing and use of certain dangerous substances and preparations; or, if present, are below the maximum concentration values tolerated by weight in the homogeneous material as indicated in Annex II of Directive 2015/863/EU referring to Article 4(1)
LaserPoint **Blink HS** Energy meter is a product compliant to RoHS European Directive.

21- WASTE OF ELECTRICAL & ELECTRONIC EQUIPMENT

Information on Disposal of Electrical & Electronic Equipment (EUROPEAN UNION WEEE DIRECTIVE -WEEE 2012/19/EU)

This product bears the selective sorting symbol for waste electrical and electronic equipment (WEEE). This means that this product must be handled to the local collecting points or given back to retailer when you buy a new product, in a ratio of one to one pursuant to European Directive 2012/19/EU in order to be recycled or dismantled to minimize its impact on the environment.

Very small WEEE (no external dimension more than 25 cm) can be delivered to retailers free of charge to end-users and with no obligation to buy EEE of an equivalent type. For further information, please contact your local or regional authorities. Electronic products not included in the selective sorting process are potentially dangerous for the environment and human health due to the presence of hazardous substances. The unlawful disposal of the product carries a fine according to the legislation currently in force.

**********End of Document**********