GUIDE

HSG Labs 4P

Premium Cinema Measurement Device

User Manual

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Version: *V01*

Date: *2026/02/16*

Project Owner: *HSG Labs*

Status:

- ☐ *Draft*
- ☐ *Routing for Document Approval*
- ☒ *Approved*
- ☐ *Unapproved*

Table Of Contents

Purpose

Describe the software possibilities offered by the new HSG Labs 4P, with its basic and advanced operations.

Document Revision History

Date	Version	Comment
2026/02/16	1.00	Document release

General Description

The HSG Labs 4P is a portable spectrometer/video-colorimeter that combines performance and ease of use.

Originally created for cinema world, (premium screenings, laboratories, post-production, broadcast) the 4P has a spectral resolution ensuring the highest accuracy: a 3,648 pixel array sensor with a resolution of 0.15nm/pixel and a spectral bandwidth (FHWM) of 1 or 2nm coupled with a 20-megapixel full-frame sensor with extremely low noise.

The laser pointer and live view make it easy to select and identify the area to be measured.

The integrated operating system provides a premium user experience with the intuitive web interface to control measurements and retrieve results.

The embedded Lithium-ion battery confers to the 4P a complete stand-alone operation for a use up to 4 hours continuously.

Manufacturer Details

hsg labs®

151 voie H Impasse des Bruyères
06370 Mouans-Sartoux
France
VAT FR69 948058813

Specifications

GENERAL

Luminance Accuracy *	+/- 1%
Repeatability	≤ 1%
Size	TBC

SPECTRO

Color accuracy *	+/- 0.0015 for CIE 1931 xy
Bandwidth	2nm (1nm with Hi-Res version)
Resolution	0.15nm / pixel
Detector	3 648 pixels
Range	380 - 780nm
Luminance Range	Up to 200k cd/m² with the ND filter
Aperture	1.8°
Shutter	Mechanical
A/D Resolution	16 bit
Integration time	1ms - 65s
Linearity	> 99%

	CAMERA
Throw Ratio	Minimum of 0.8 : 1
Imaging/Pixel Array	5 496 x 3 672 pixels
Total Pixels	20 million
Shutter	Rolling electric
Integration time	32 µs to 2 000 seconds
A/D Converter	12 bits
QE Peak	84%
Read Noise	1.6 e
Full Well	15 ke
Temperature Regulation	+/- 0.1 deg. C

** For a standard illuminate from NIST luminance standard*

Safety, Environmental and Regulatory Information

Safety notice

Read and follow this important safety information. Failure to do so, or use of controls, adjustments, procedures, connections, or signal types other than those specified in this documentation, can result in personal injury or death, and damage to the equipment.

Safety legend

NOTE: A NOTE indicates important information that helps to make better usage of the device.

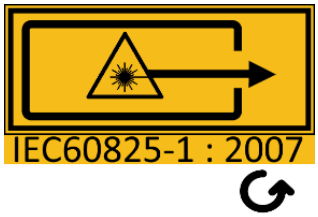
CAUTION: A CAUTION indicates potential damage to hardware or loss of data if instructions are not followed.

WARNING: A WARNING indicates a potential for property damage, personal injury, or death.

Laser pointer

The HSG device uses a laser pointer to target the zone to be measured. The laser emitting point is indicated by the following stickers on the unit.

As such, all precautions relative to laser device use must be respected.



WARNING: Do not stare directly at the laser beam and do not point the laser into someone else eyes.

Specifications:

- Class: Class 3R
- Power: 5mW
- Wavelength: 650nm (red)

General Safety

WARNING: OBSERVE THE FOLLOWING INSTRUCTIONS TO HELP PREVENT POTENTIAL FOR PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH:

- To move the equipment safely, always carry the device by the handle if present or hold it with both hands.
- The power supply provided with the system may produce high voltages and energy hazards. Opening or removing covers that are marked with the triangle symbol with a lightning bolt may expose you to a risk of electric shock.

Components inside these compartments should be serviced only by a trained service technician.

- Use only the provided AC adapter approved for use with this device. Use of another AC adapter may increase the risk of a fire or explosion.
- Do not operate the equipment with any cover(s) removed.
- Do not use damaged equipment, including exposed, frayed, or damaged power cords.
- Do not use the equipment where it can get wet. Protect equipment form liquid intrusion. If the equipment gets wet, turn it off and disconnect power to the equipment and to any attached devices. Contact an experienced electrical technician for further help.
- Do not push any objects into the openings of the equipment. Doing so can cause fire or electric shock.

⚠ **CAUTION:** OBSERVE THE FOLLOWING INSTRUCTIONS TO HELP PREVENT DAMAGE TO HARDWARE OR LOSS OF DATA:

- Do not attempt to service the equipment yourself.
- When disconnecting power supply without battery system: turning off the operating system before unplugging the power supply.
- Operate the equipment only from the type of external power source indicated on the electrical ratings label.
- To avoid possible damage to the system board, wait 30 seconds after turning off the equipment before removing a component from the system board or disconnecting a peripheral device from the equipment.
- Ensure that nothing rests on the equipment's cables.
- Move equipment with care. Avoid sudden stop and uneven surface.
- Keep the unit away from radiators and heat sources.
- Keep the equipment away from extremely hot or cold temperatures to ensure that it is used within the specified operating range.
- Use only approved power cable(s) rated for the equipment. The voltage and current rating of the cable should be greater than the ratings marked on the equipment.
- Observe extension cable and power strip ratings. Ensure that the total ampere rating of all equipment plugged into the extension cable or power strip does not exceed 80 percent of the ampere ratings limit for the extension cable or power strip.
- To help protect the equipment form fluctuations in electrical power, use a surge suppressor, line conditioner, or uninterruptible power supply (UPS).
- Do not spill food or liquids on your equipment.
- Before cleaning the equipment, disconnect it from the electrical outlet. Clean the unit with a soft cloth. Do not use liquids or aerosol cleaners, which may contain flammable substances.
- If the equipment does not operate normally - in particular, if there are any unusual sounds or smells coming from it - unplug it immediately and contact an authorized dealer or service center.
- Use only the 1/4" pitch to hang your equipment.
- Your equipment can be installed right side up or upside down.

AC adapter safety

The 4P is provided with a 12V 5A AC adapter. **This adapter and only this adapter must be used to charge and to use the unit.**

⚠ **CAUTION:** The AC adapter may become hot during normal operation of the equipment. Ensure adequate ventilation and use care when handing the adapter during or immediately after operation. Do not cover the AC adapter with papers or other items that will reduce cooling; also, do not use the AC adapter inside a carrying case.

⚠ **WARNING**: If the AC adapter does not operate normally unplug it immediately from the unit and from the main line. Use of another AC adapter may increase the risk of a fire or explosion.

Ergonomic Instructions

Prolonged use of the device, not installed on tripod, can lead to frequent muscle aches and nerve pain if not done correctly unless a few guidelines are followed.

- The wrists should be in a neutral or straight position when holding the unit or the stylus.

⚠ **CAUTION:** Improper or prolonged stylus use may result in injury

- Take breaks. These breaks can be brief and should include stretches for optimal results.
- Rest your eyes by refocusing on distant objects intermittently when working.

⚠ **CAUTION:** Viewing a display or external monitor screen for extended periods of time may result in eye strain.

Wireless adapter safety

Some HSG Labs products can be equipped with a certificated WIFI card.

⚠ **WARNING**: Explosive Device Proximity - Do not operate a portable transmitter (such as a wireless network device) near unshielded blasting caps or in an explosive environment unless the device has been modified to be qualified for such use.

Regulatory Information:

HSG-Labs is not responsible for any radio or television interference caused by unauthorized modification of the Wireless WLAN devices, or the substitution or attachment of connecting cables and equipment other than that installed by HSG-Labs. The correction of interference caused by such unauthorized modification, substitution or attachment is the responsibility of the user. HSG-Labs and its authorized resellers or distributors are not liable for any damage or violation of government regulations that may arise from the user failing to comply with these guidelines.

Disposal and Recycling Information

HSG-Labs recommends that customers dispose of their used equipment in an environmentally sound manner. Potential methods include reuse of parts or whole products and recycling of products, components, and/or materials.

This marking on the product, accessories or literature indicates that the product and its electronic accessories (e.g. charger, USB-cable) should not be disposed of with other household waste. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate these items from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources. Business users should contact their supplier and check the terms and conditions of the purchase contract. This product and its electronic accessories should not be mixed with other commercial wastes for disposal.

SCIP number: **adbb9342-c097-4a8c-b809-5d637ddb8657**

WEEE registration: please ask your distributor.

Take-back solution

The product can be shipped back to HSG-Labs at any time for the correct disposal, ensure that on the packing there is clearly noted “end-of-life disposal”.

Disposable packing

Carton/cardboard, including packing material:

Total Weight: **750g** 97/129/EC classification: **PAP20**

Plastics included in the box used for packing, wrapping or protection (in grams): Total Weight: **0g**

Any paper included in the box, including manuals, etc. (in grams):

Total Weight: **750g** 97/129/EC classification: **PAP22**

European Waste Codes (EWC)

To help the correct management of the unit and the accessories we list the EWC Codes for each component. An EWC Code is a six-digit code used to identify waste as listed in the European Waste Catalogue. It is formatted as three pairs of numbers, for example 12 34 56. It identifies and classifies waste into categories according to how these wastes have been produced. It adequately describes the waste being transported, handled, or treated.

Item	EWC Code	Description
Cardboard box	15.01.06	mixed packaging
Suitcase	07.02.13	waste plastic
Bag	15.01.06	mixed packaging
Bag Foam	07.02.13	waste plastic
Manual	20.01.01	paper and cardboard
AC adapter	16.02.14	discarded equipment
PS Cable	16.02.14	discarded equipment
4P Hardware	16.02.14	discarded equipment

Battery

The marking on the battery, manual or packaging indicates that the battery in this product should not be disposed of with other household waste.

Substances in batteries can have a potential negative impact on health and environment and you have a role in recycling waste batteries thus contributing to the protection a, preservation, and improvement of the quality of the environment. You should contact your local authority or retailer for details of the collection and recycling schemes available.

Where marked, the chemical symbols Hg, Cd or Pb indicate that the battery contains mercury, cadmium, or lead above the reference levels in EC Directive 2006/66.

Contact the manufacturer for replacement information.

⚠ **WARNING**: Do not disassemble, break, or puncture the battery or attempt to dispose of it in fire. If you intend to dispose of the product, the waste collection center will apply the appropriate measures for recycling and treatment of the product, including the battery.

The unit contains a 2x Li-ion battery composed by 3 cells of 9.62Wh each for a combined total of 57.72Wh.

Composition

Chemical Name	**Concentration range (%)**	**CAS Number**
Lithium Cobalt Oxide	35-38	12190-79-3
Graphite	20-22	7782-42-5
Copper	9-10	7440-50-8
Aluminum	5-6	7429-90-5
Ethylene carbonate	14-16	96-49-1
Polypropylene	5-6	9003-07-0
Carbonate methyl ethyl	4-5	623-53-0
Phosphate (1-), hexafluoro-lithium	5-6	21324-40-3

NOTE: Addition information about the battery can be found at the end of this document. (Battery MSDS)

⚠ **WARNING**: Do not dismantle, open or shred the battery; ingredient contained within, or their ingredients products could be harmful. The battery is not dangerous with normal use.

⚠ **WARNING**: In case of battery fire, toxic fumes, gases, or vapers may evolve on burning. The combustion produces carbon monoxide, carbon dioxide, lithium oxide fumes and so on.

End-of-Life disassembly

The disassembly of the unit should be performed by qualified technician only, with the right tools only and under HSG Labs approval.

Before working on the equipment, make sure the equipment is not damaged or burned. Make sure this operation is done in good condition and in a ventilated area.

- Discharge the battery below 25%. A charged lithium-ion battery can catch fire and/or explode if accidentally punctured.
- Always power off and unplug completely the unit from the AC adapter before working on it.
- Plan the work carefully, try to anticipate potential hazards, and take steps to avoid them. Ensure to work on a hard and stable surface.
- Be careful when disassembling, components are fragile and can be sharp, parts may fall off and injure or cause death.

⚠ **CAUTION:** Disassembly of the unit will void the warranty.

Working inside of the unit

⚠ **WARNING**: Hazardous moving parts. Keep away from the moving fan blades or servo.

- Disconnect the battery and wait 10 minutes before touching the electronic boards.
- To prevent electrostatic discharge (ESD) from damaging the system, be aware of the precautions to consider when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.
- Check the voltage rating before connecting the equipment to an electrical outlet to ensure that the required voltage and frequency match the available power source.

Calibration

Calibration is an important process during which the device biases are evaluated. The biases compensation data are computed and stored as a calibration file. Each 4P is calibrated before shipment. However, spectrometers and cameras physical parameters drift over time. The 4P then needs to be re-calibrated periodically. HSG-Labs recommends calibration once per year.

Power ON the unit

To power ON the unit, connect the provided 12V 5A Power Supply and press the button ON, the unit will then begin the startup process that takes approximatively 60 seconds:

- *Power on the command-control*
- *Startup of the operating system*
- *Power up the internal Spectro*
- *Power up the internal Camera*
- *Functional test performed of each internal system*

If it is the first time that the unit is turned on, please ensure to update it to the last software version. The update process is described in the **APPENDIX** section of this document.

NOTE: If the button ON stay locked, the unit will reboot automatically in case of unplanned power lost.

NOTE: The unit can be also powered up using an internal Lithium-Ion battery provided with the Mobile version.

WARNING: If the unit does not boot, please follow the **TROUBLESHOOTING** *section.*

Power OFF the unit

The unit can be powered OFF by using the Shutdown button in the Settings/System menu.

A clean Halt is recommended with the Shutdown feature but unlocking the Power ON button permits also to turn OFF the unit.

NOTE: Periodic software clean by hard shutdown is not mandatory but is highly recommended.

Network

The unit is delivered with a fixed IP address: **10.10.10.1**

Connection options:

1. *Set the user's computer to a static IP address on the same range (10.10.10.x) as the 4P network connection to control the 4P.*

2. *Modify the 4P IP address with the following procedure:*
   - ⇨ *Plug a HDMI monitor, a mouse and a keyboard to the unit*
   - ⇨ *On the Linux GUI:*
     - ***Settings***
     - ***Network***
     - *On the first line (Ethernet enp1s0), click to the gear icon to configure*
     - *On **IPV4 tab**, select method, for example:*
       - *Manual (method)*
       - *172.20.0.10 (address)*
       - *255.255.255.0 (netmask)*
     - *Then **APPLY***
3. *Configure the 4P to use DHCP.*
   - ⇨ *Using the Default IP, connect to the device or use the HDMI monitor to configure the IP*

NOTE: HDMI should not be used for long term usage.

Connection

To get started, open a web browser and type the IP address configured on the 4P.

Then, select a desired operation from the top tab to begin measurements.

Software Architecture

The main window permits to access to all functionalities and displays important information.

1 **Tabs providing access to product features**

2

 Settings

 Internal server connection (red and popup if not connected)

3 Product name in the HSG Labs product line

4 Software version

5 Selected room

6

 Number of connected IP

 Number of connected browsers

7

 Operating time (from power on)

 Free space memory available

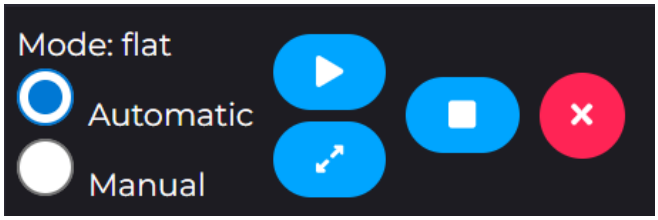
Geometry

The Geometry window is used to select, automatic or manual, the area for the desired measurement. This window is common across the left side of the functions that utilize the camera. This allows the user to preview what the camera will analyze. Selecting the full-page icon, permits an extended, larger view.

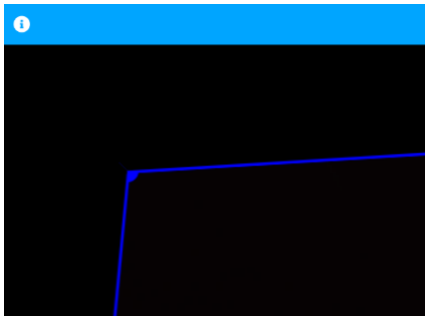
The 4P offers 2 zone definition options: Automatic or Manual.

The measurement / adjustment will then be based on this selected area. The measurement area creates a trapezoid view port with a grid of patches based on the selection criteria. A certain number of patches long by a certain number of patches high, dependent on the working mode.

Automatic



In automatic mode, the user can select the measured area by moving the 4 blue handles in the 4 corners of the screen. For curved screens, the full screen view must be selected.



Masking is thus performed, and detection and measurement parameters (especially exposure and saturation) are only carried out within the zone.

This can be useful if a brightly lit area is in the field of view and other areas need to be ignored.

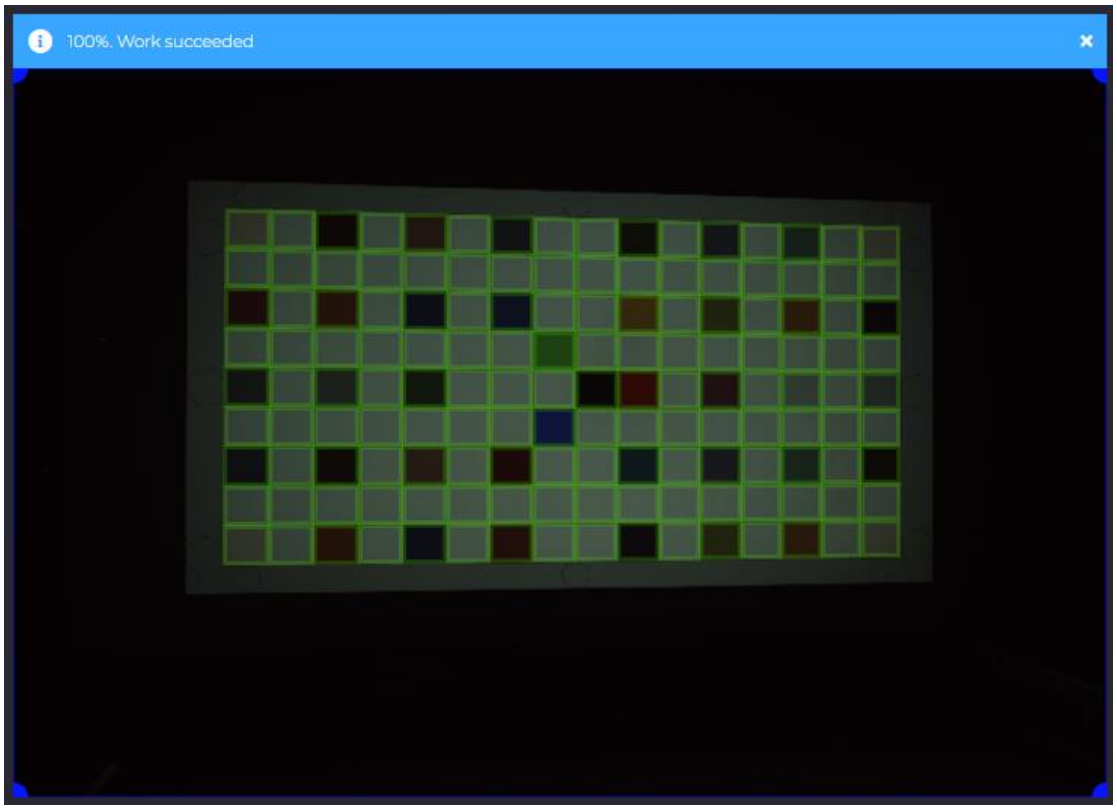
When defined, a click on the CANCEL button resets the current defined masking.

To start the automatic detection, select the PLAY button in the Geometry window.

To stop the procedure, select the STOP button.

The automatic detection is based on the Geometry pattern, with 16 patches wide by 9 patches high (144 patches in all), color independent. The grey area

around the screen is used as scrap area and can be projected off the screen. All colored and white squares must be visible for the automatic mode to function correctly.



On a successful measurement, a message in the status bar displays "**100% Work succeeded**" and the green grid indicates the detected patch positions.

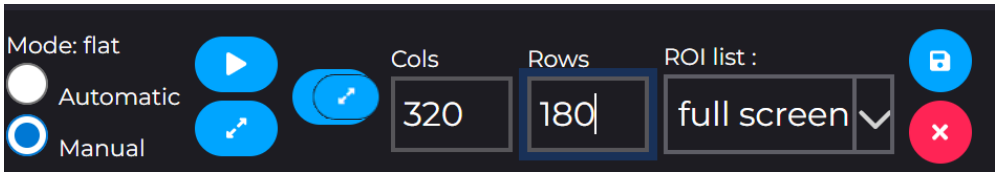
The geometry detection phase is now complete, with a 16 x 9 grid area, and a measurement can be started (2).

Manual

In Manual mode, it is necessary to select the desired measurement resolution by defining the number of desired vertical columns (Cols) and number of horizontal lines (Rows).

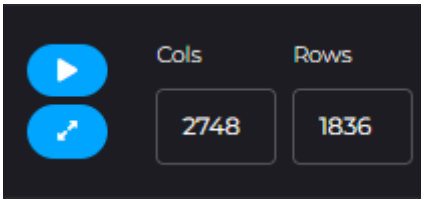
The minimum value is a grid of 1 x 1. In this case, the global average of the target with only one value.

In the screenshot above, the measured area of 320 x 180, i.e. 57,600 patches to analyze.



The maximum value is 2,748 x 1,836, a resolution of 5 million pixels.

Click on the AAROWS to immediately switch to the maximum resolution.

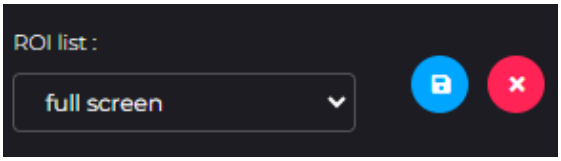


NOTE: For the full resolution, the system averages in groups of 4 pixels for greater precision and analysis stability (hence a camera resolution divided by 4).

As in automatic mode, the blue handles can be moved to define a ROI (Region Of Interest). In this case, the indicated matrix will be applied into this ROI.

If the maximum resolution exceeds the system resolution is configured, after the calculation, the resolution of 2,748 x 1,836 will be applied and displayed in the Cols / Rows area.

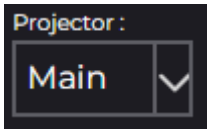
Each defined ROI can be recorded and recalled with the ROI list and the SAVE button.



Press the CANCEL button to remove the ROI application and return to the full screen analysis.

Start the grid construction with the left side PLAY button.

Once the geometry measurement is completed, a message in the status bar reads "**100%. Work succeeded**" and a green grid indicates the detected patch positions.



If defined, in the system settings, an alternate projector can be selected by using the drop-down menu and selecting the

secondary projector. Now the measurement can be taken of the secondary projector.

Display controls

In the top right of the overview window, controls are available:

 To simulate a highlighted view without changing the exposure time of the camera.

 To display or hide the geometry grid.

By default, if the resolution is too high to correctly display separate patches in the grid, the grid is automatically hidden.

 To display a cross in the image center.

 To display or hide the contrast grid.

 To zoom on a dedicated area of the screen and be able to visualize a specific zone.

For each control click to activate or to deactivate.

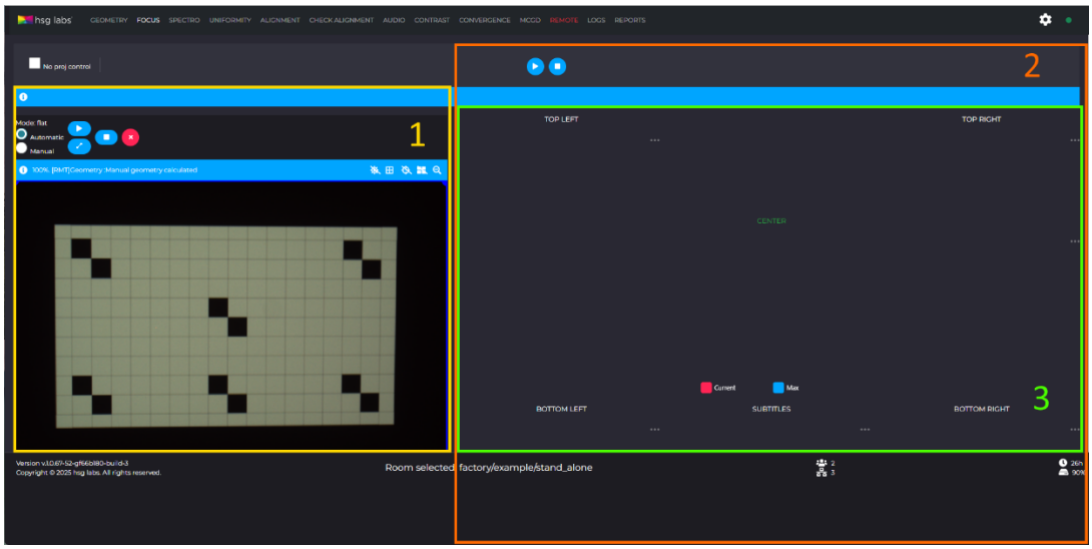
The geometry detection phase is now complete, with user defined Cols x Rows grid, and a measurement can be started (2).

> *NOTE: Ensure the status shows "**100%. Work succeeded**" before switching and engage any measurement (2).*

Focus Function

The Focus adjustment has been engineered to identify the patches on the screen and directly control the projector lens to make the optimized focus settings. This process is divided into two stages:

1. *Region of Interest to be considered for adjustment*
2. *The adjustment process*



The first step of the process is to ensure the Geometry is identified and detected by the device in detection zone (1) on the left side as defined by the GEOMETRY section.

Geometry (1)

The Focus can only be performed after an **Automatic Geometry** detection.

Please refer to the Geometry feature for more detailed information.

Adjustment (2)

After the Geometry is captured and displayed, click on the focus PLAY button on the top window to start the adjustment.

"**100%. Work succeeded**" is

To stop the adjustment in progress by clicking on the STOP button.

After a successful focus, a message in the status bar reads "**100%. Work succeeded**", the results are displayed (3).

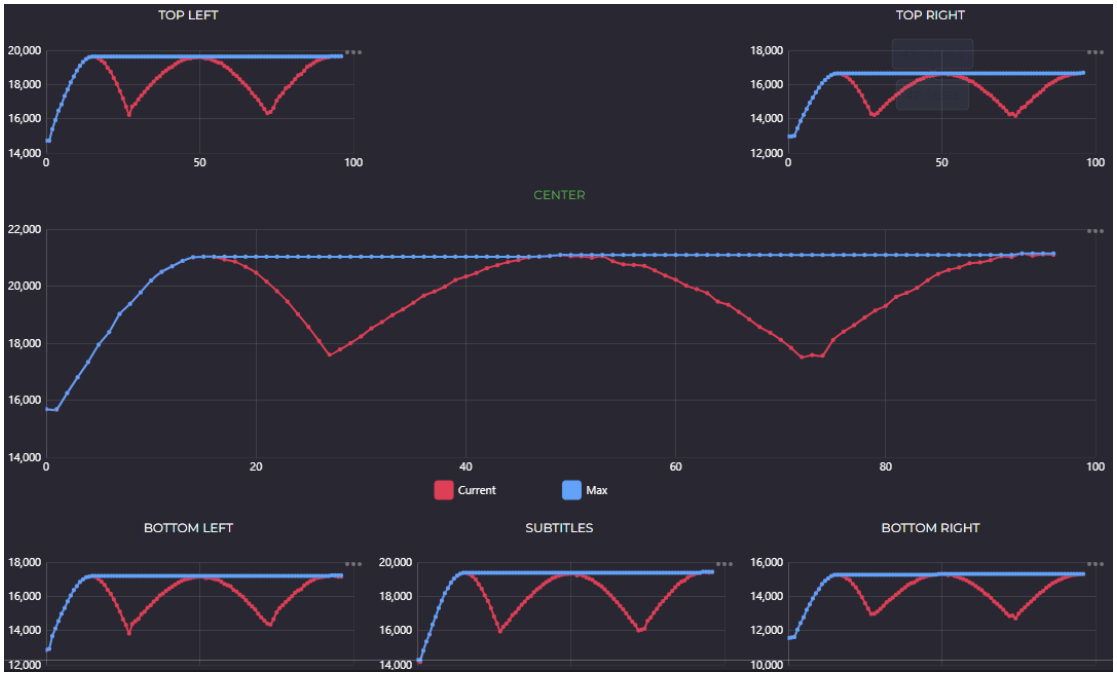
During the process, follow the curves in the results area to check the adjustment in real time. (3).

In this mode, every adjustment is registered in the history and can be analyzed at the end of the measurement.

Result (3)

6 result areas are displayed:

- *Top left focus adjustment*
- *Top right focus adjustment*
- *Center focus adjustment*
- *Bottom left focus adjustment*
- *Bottom right focus adjustment*
- *Subtitles focus adjustment*



The green highlighted location indicates the currently selected area where the success criteria will be validated against.

The focus is performed in 3 phases:

1. *A misalignment that will allow to move through the adjustment range, as it is impossible to predict the optimal focus in advance.*
2. *A quick pass to identify the optimal area of interest.*
3. *A slow pass of this focal point to ensure that we stop at the optimal focus position.*

The Focus features a “smart mode” with benefits to:

- *Detect excessively slow movement of the motion engines during the initial adjustment and automatically adjust the speeds for subsequent adjustments.*
- *A Lens limit detection and automatic adjustment to avoid reaching it on subsequent adjustments.*
- *A detection of inactivity and a user alert.*

Settings

On the dedicated settings, is it possible to adjust:

➢ *Auto exposure mode*

Engage/disengage the auto exposure mode if checker (recommended setting to be able to avoid troublesome light levels).

➢ *Exposure (ms)*

If auto exposure mode disengaged, it is possible to define an exposure value for the acquisition time. Must be engaged by a super-user with the advice of the HSG team.

➢ *Threshold (%)*

Threshold to define the best focus target. Must be modified by a super-user with the advice of the HSG team.

➢ *Focus area*

This setting permits to select the areas to set the best focus among the 6 available. Center will be the optimal focus, but other areas can be used for Schiempflug troubleshooting or optimizing focus on the subtitle areas.

Spectro Operation

The HSG Labs 4P contains a high-quality spectrophotometer that has been calibrated on Illuminate-A.

Measurement

Use the integrated laser or camera for targeting the desired measurement area.

When the settings are complete and the target is in place, click on the PLAY button to start measurement.

Stop the measurement in progress by clicking on the STOP button.

At the end of the measurement, the results are displayed and the Spectro returns to an idle state.

In this mode, every measurement taken is registered in the history and can be accessed later.

When in auto-adjust mode, low light and saturation are controlled and the integration time is adjusted as needed, apart if the spectrometer is used out of its specifications. In manual adjust mode, if the target to measure is too dark or too bright, the measure is not performed, and an error message is displayed indicating what the problem is.

In both modes, a running measure can be cancelled. It is important to note that cancelling an operation is not instantaneous and may take time depending on the measurement status. If the spectrometer is in the process of measuring the

integration time, the process must finish prior to the cancelled measurement taking affect, the averaging parameter does not interfere. Cancelling a measure with a low integration-time is very fast but cancelling a measure with high integration-time can be a longer time. The maximum integration-time applicable is 65s, the waiting time cannot be greater than 65s (and with an integration-time set to 65s). Please be cautious of this process when cancelling a measurement.

Live View (Continuously mode)

In Live View mode, the Spectro will take measures continuously. The interface is updated at a regular interval, with new data from the continuous acquisition. Notice that using a low integration-time, not all the measures are displayed to prevent interface, overwhelming, and lagging. The interface cannot be refreshed at a rate of one measure per millisecond, which is the minimum integration-time applicable. Even though it were possible, the human eye cannot follow this refresh rate.

In this mode, no measures are registered in the history.

Low light and saturation are controlled only at the first stage to check the environment luminosity. Once the run-time starts recording measurements, no control is performed to avoid stopping the runtime acquisition in the event of an environment change. This way, the spectrometer target can be easily changed while acquiring measures in runtime.

> *NOTE: As no environment control is performed during the run-time acquisition, the measure results can be biased and as much as the measure conditions vary.*

Live View acquisition is stopped either by pressing the STOP button (which is the same as the measure button but becomes a stop in this mode once the acquisition is started) or by changing the acquisition mode back to One Shot.

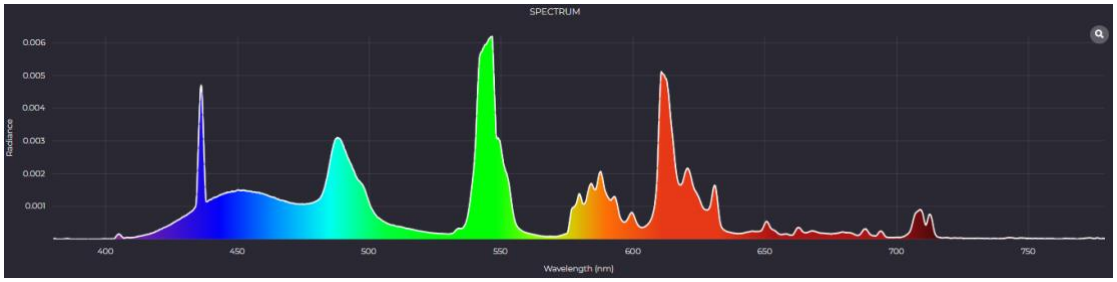
Results

The measurement results panel provides a quick overview of the colorimetric data calculated from the measured spectrum and the CIE 1931 standard.

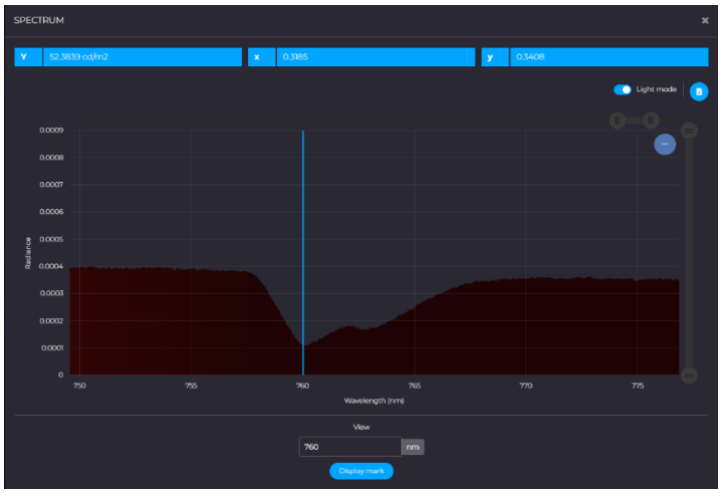
These values are obtained using a full radiometric calibration carried out, for each unit individually, in our laboratory.

The main data, i.e. Y luminance and xy colorimetric coordinates, are highlighted to facilitate data collection at a glance.

Spectrum

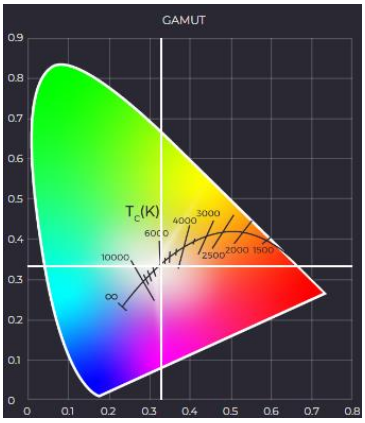


This curve displays the real measured spectrum in the visible range (380 to 780 nm).



Zoom functions are available by clicking on the magnifying glass button to the right of the curve. These can be used to target specific areas, or to define a line at a specific wavelength value.

Gamut



The Gamut tab shows the visualization of the measure chromaticity coordinates. It both eases the verification that it really corresponds to what was measured and the perception of the measured color.

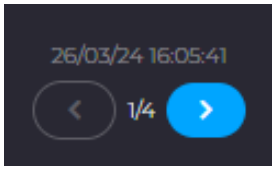
If it's a White measurement, a curve also represents the color temperature of the measured value.

CRI (Color Rendering Index)

The CRI is a measurement of how natural colors render under an artificial white light source when compared with sunlight. The index is measured from 0-100, with a perfect 100 indicating that colors of objects under the light source appear the same as they would under natural sunlight.

Report

To obtain a complete results report file in the form of a table of values, for the current measurement or the one selected in the measurement history, simply click on the top right-hand corner SAVE button.



Use the selection buttons at bottom right to return to a past measurement. The measurement can be viewed or carried forward as if it were the current measurement.

A file containing all the values and the complete spectrum curve will be automatically downloaded to the local PC download directory.

File format: CSV

Separator: « , »

Sequence:

- *First row: name of measured values (X, Y, Z, x, y, u, v, u', v' ,cct, Peak, Exposure, Average)*
- *Second row: values*
- *Third row: empty*
- *Fourth row: name of spectrum curve values (wavelength, radiance)*
- *From the fifth row to 3652nd : values (and chained with carriage return for each couple)*

Settings

On the dedicated settings, is it possible to adjust:

➢ *Exposure*

Exposure parameter is the duration while photoelectric information gathered from the light sensor are accumulated (integrated).

There are two ways of using the Spectro measurement:

Auto adjust unchecked: an exposure time set by the user (in ms or s).

Auto adjust checked: an automatic process that determines the best exposure to use according to the measured signal. This method takes longer but gives better results if the target and exposure time are not known in advance. **This is the recommended mode of use.**

➢ *ND Filter*

The Spectro inside the 4P is provided with an internal, calibrated Neutral Density Filter (ND Filter) that can be used to decrease the light that will goes to the spectrometer that permit to reach very high Luminance values and/or increase the measurement time.

- ***Auto:*** *according to the exposure time, the ND filter is automatically engaged or not if necessary (depends on frequency and number of iterations)*
- ***ON:*** *filter still in place*
- ***OFF:*** *no filter (**default**)*

NOTE: When the ND Filter is enabled, the Spectro changes the optical path mechanically and the software uses the ND Filter specific radiometric calibration.

Use case

Non exhaustive list of possible usage of the ND Filter:

- *Hight Luminance light source to measure that saturate the spectrometer*
- *Unstable light that needs a longer integration time to have stable result*
- *Home Cinema Projectors that use a 1 Chip and a color wheel that need an increased integration time due to the hi-speed of the Spectro (as some non-cinema Phosphor projectors)*

➢ *Average*

The averaging parameter is the number of measures taken and averaged to give one final resulting measure. An averaging of one is no average, the taken measure is the result. With an averaging parameter of N, N measures are taken, summed and divided by N resulting in one averaged measure.

Averaging acquisitions allows reducing the noise of the measure and thus reducing the results uncertainty.

Averaging parameter range: [1..100]

Recommended Average value: 3.

➢ *Spectrum smoothing*

Precision in distinguishing between closely spaced spectral peaks is crucial in UV-Vis spectroscopy. This precision of spectral resolution is often quantified using the Full Width at Half Maximum (FWHM) to distinguish between wavelengths defining a spectral bandwidth.

FWHM corresponds to the width of a spectral peak at half of its maximum amplitude. Visually, it represents the distance between two points on a spectral curve where the intensity is half of the peak value. While the concept is simple, this is a vital quantity as the FWHM is used to define resolution. If two peaks have overlapping FWHMs, they are unresolvable, i.e. they will look like one peak. This metric provides an indication of the precision of a spectral measuring instrument and its separating power.

As an example, a narrower FWHM indicates a sharper peak, and this is essential for distinguishing between closely spaced compounds in a mixture. Conversely, a broader FWHM might suggest overlapping peaks or a less resolved spectrum.

We have introduced a filtering to virtually modify the bandwidth.

This is a filtering performed with the width on both sides of the central pixel.

The principle is to increase the smoothing with unstable sources (Xenon, UHP) and reduce with narrow sources (Laser, LED, OLED, LCD).

This parameter represents a group on each side of a central pixel so to "reduce" the spectral resolution (finally, not the bandwidth but the result is almost the same).

For example: 16 = central pixel + 16 points left side + 16 points right side.

So, a group of 33 points of 0,15nm => a simulated resolution of 5nm.

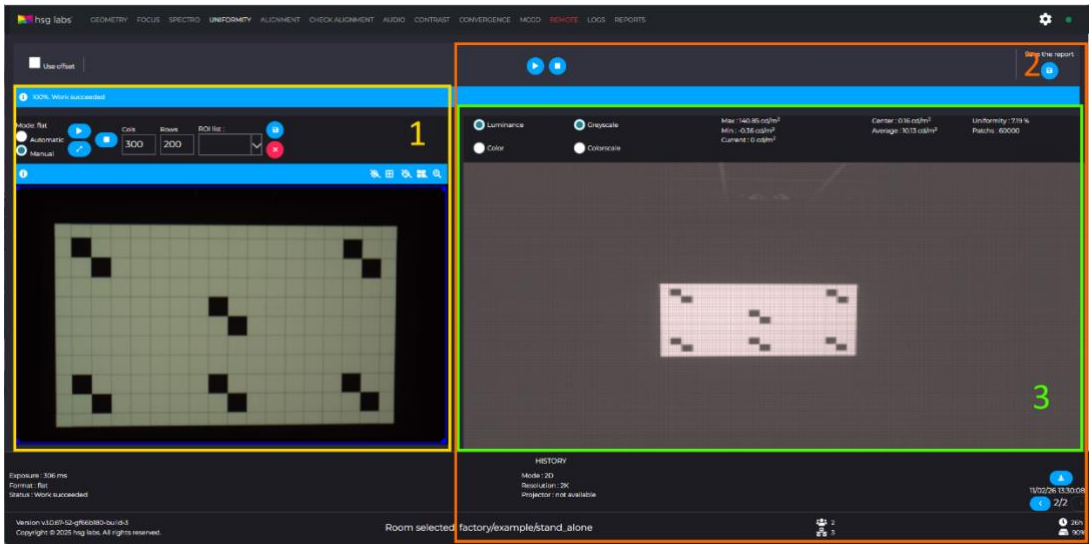
No filtering for lower bandwidth available (2nm).

Recommended smoothing value: 0 (2nm bandwidth).

Uniformity

The uniformity measurement measures the light and color uniformity of the target ROI. The acquisition procedure is divided into two stages:

1. *Region of Interest to be considered for measurement*
2. *The measured result*



The first step of the process is to ensure the Geometry is identified and detected by the device in detection zone (1) on the left side as defined by the GEOMETRY section.

Geometry (1)

Please refer to the Geometry feature for more detailed information.

Measurement (2)

After the Geometry is captured and "**100%. Work succeeded**" is displayed, click on the focus PLAY button on the top window to start the adjustment.

To stop the adjustment in progress by clicking on the STOP button.

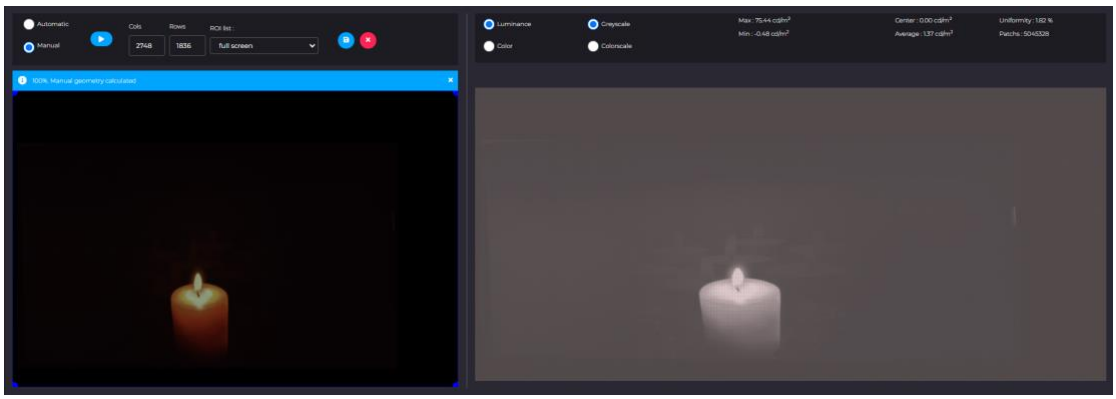
After a successful uniformity measurement, a message in the status bar reads "**100%. Work succeeded**", the results are displayed (3).

In this mode, every measurement taken is registered in the history and can be accessed later.

Result (3)

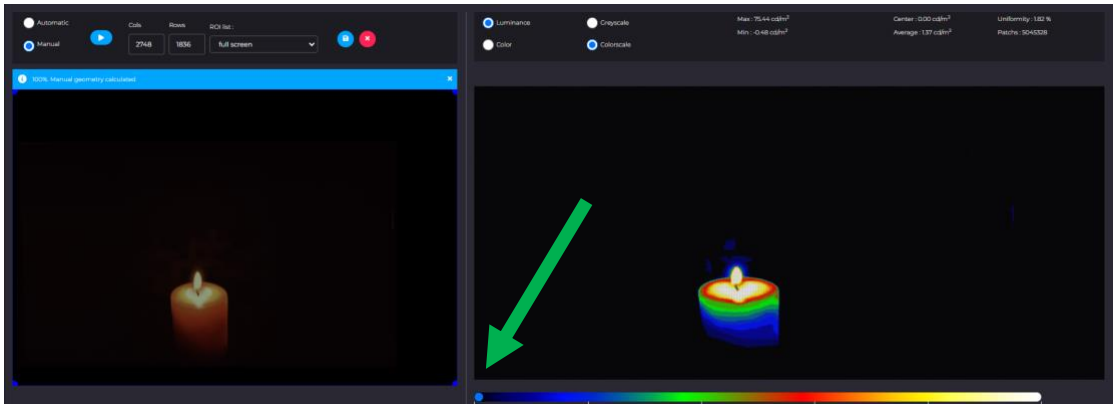
3 results display modes are available:

1. *Luminance (Y) – Greyscale*

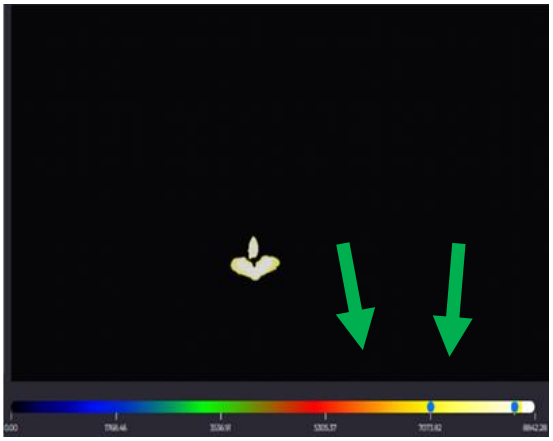


The Luminance level (Y) of each patch is represented by a grey level on the screen.

2. *Luminance (Y) – Colorscale*

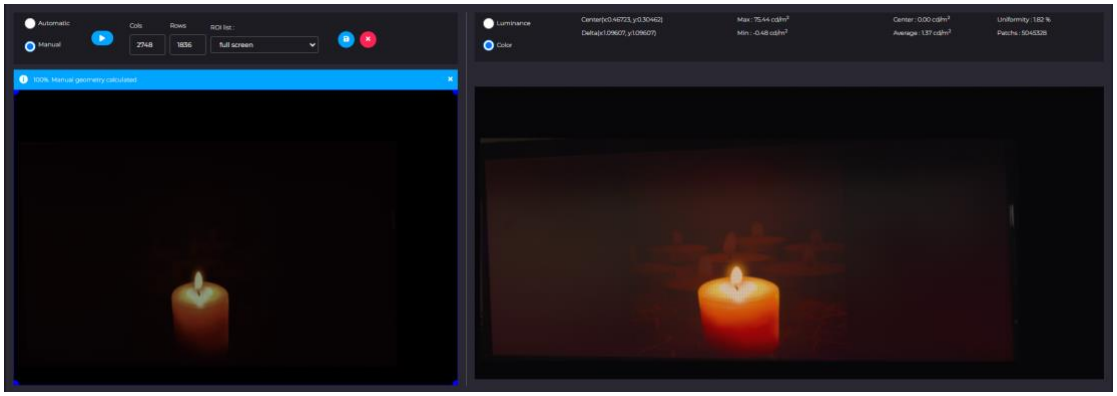


The luminance level of each patch is represented by a color on the display. Blue is the least luminous and white the most luminous, scaled across the measured area. Moving the cursor will highlight brighter areas and making the darker areas outside the selected luminance levels "disappear" from the image. A specific luminance band can be selected to reduce the maximum luminance values visible on screen



Values are Luminance values in cd/m² measured in the image.

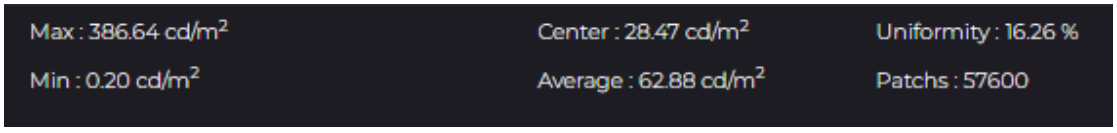
3. *Color (xy)*



The Color (xy) of each patch is represented by a corresponding RGB color on the screen.

This recreates an image that gives the illusion of a "simple" photo but is in fact a calibrated representation of the target, with Luminance correlation for a perfect rendering perception.

Image information is displayed on the result banner above the display.

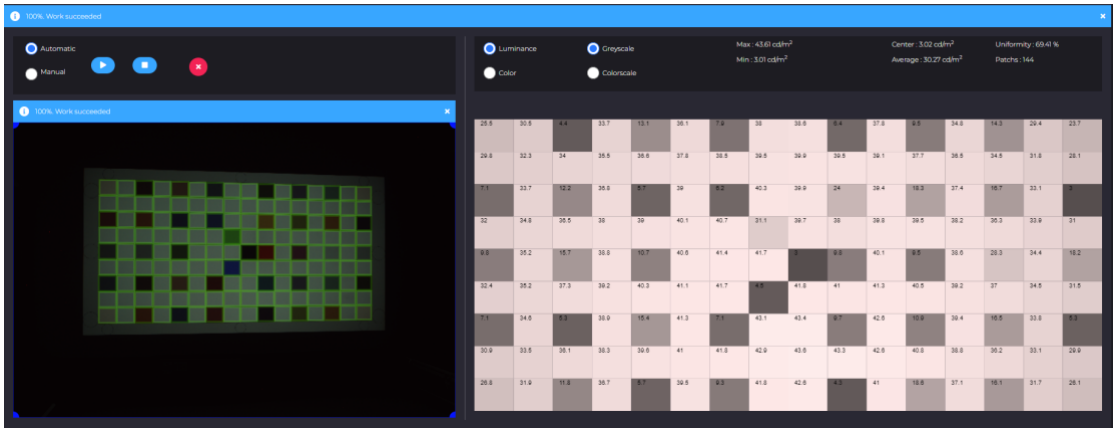


- ***Max**: maximum Luminance (Y) in the area*
- ***Min**: minimum Luminance (Y) in the area*
- ***Center**: Luminance (Y) at the center*

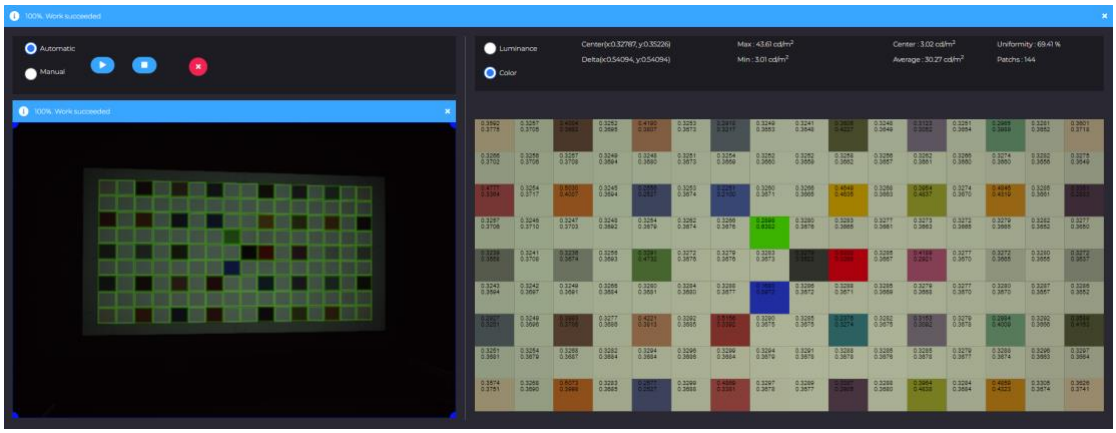
- ***Average**: average Luminance (Y) of the area*
- ***Uniformity**: uniformity percentage of the area*
- ***Patches**: total number of analyzed patches*

Examples

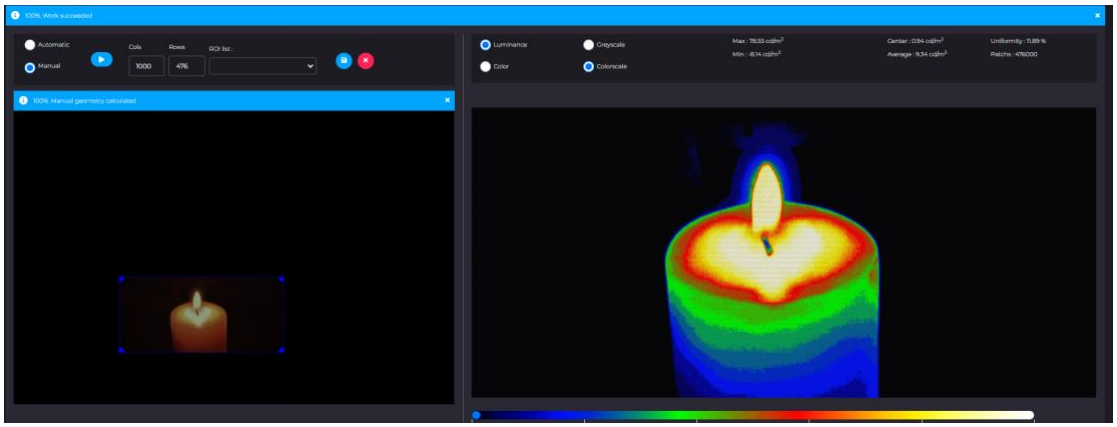
Automatic – 16 x 9 - no masking – Luminance



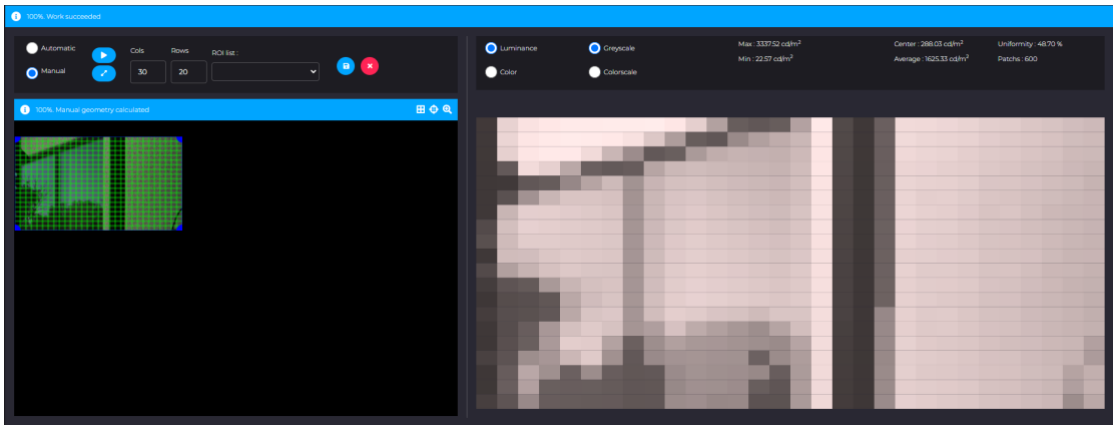
Automatic – 16 x 9 – no masking – Color



Manual – ROI – 1000 x 476 - Luminance - Colorscale



Manual – ROI – 30x20 - Luminance – Greyscale

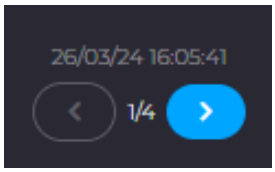


NOTE: The choice was made on the prototype to fill the result window and not leave any empty areas. This can lead to distortion of the display. To avoid this, for the time being, it is recommended to make a rectangular ROI at the ratio of the result window (i.e. 2/1) if you wish to maintain geometric perception. In the final version, users will be able to choose between :

- *fill the result area (as at current)*
- *maintain the ratio of the measurement area*
- *obtain a ROI zone that follows the ratio of the measurement result zone*

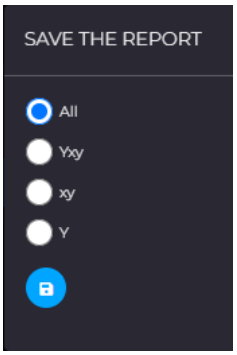
Report

To obtain a complete results file in the form of a table of values, for the current measurement or the one selected in the measurement history, simply click on the top right-hand corner SAVE button.



Use the selection buttons at bottom right to return to a past measurement. The measurement can be viewed or carried forward as if it were the current measurement.

A select box is displayed to permit the user to choose which level of detailed information is desired.



The selected file will be automatically downloaded to the local PC download directory after clicking on the SAVE button.

File format: CSV

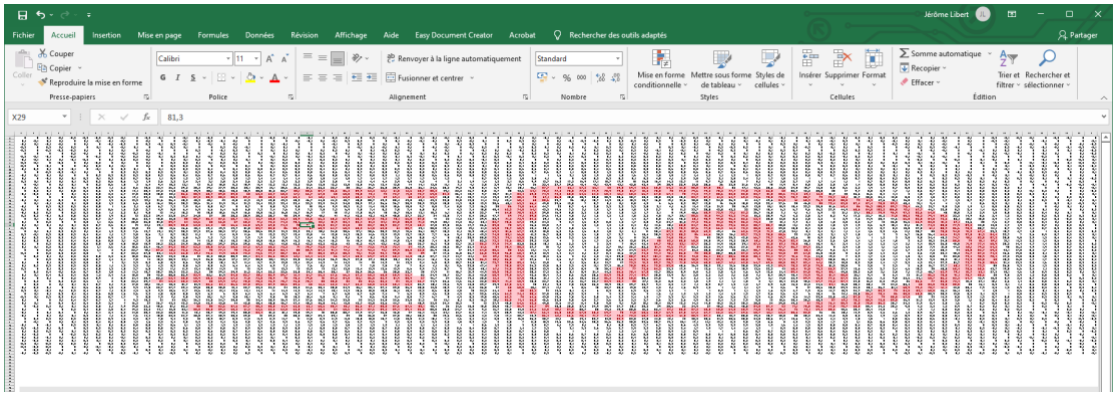
Separator: « , »

Sequence: according to choice.

- *Y : only Luminance value (Y), sorted according to the grid Cols x Rows*
- *xy : only color values (xy), separated by a space " " and sorted according to the grid Cols x Rows*
- *Yxy : Luminance value (Y) and color values (xy), separated by a space " " and sorted according to the grid Cols x Rows*
- *All : all values, preceded by descriptions, for example "x:0.3114", separated by a space " " and sorted according to the grid Cols x Rows, with this sequence:*
    - *x y Y*
    - *w (the patch width)*
    - *h (the patch height)*
    - *center-x (the horizontal position of the patch center)*

- *center-y (vertical position of patch center)*

These reports, with simple rules, can already give useful displays in a spreadsheet:



Settings

On the dedicated settings, is it possible to adjust:

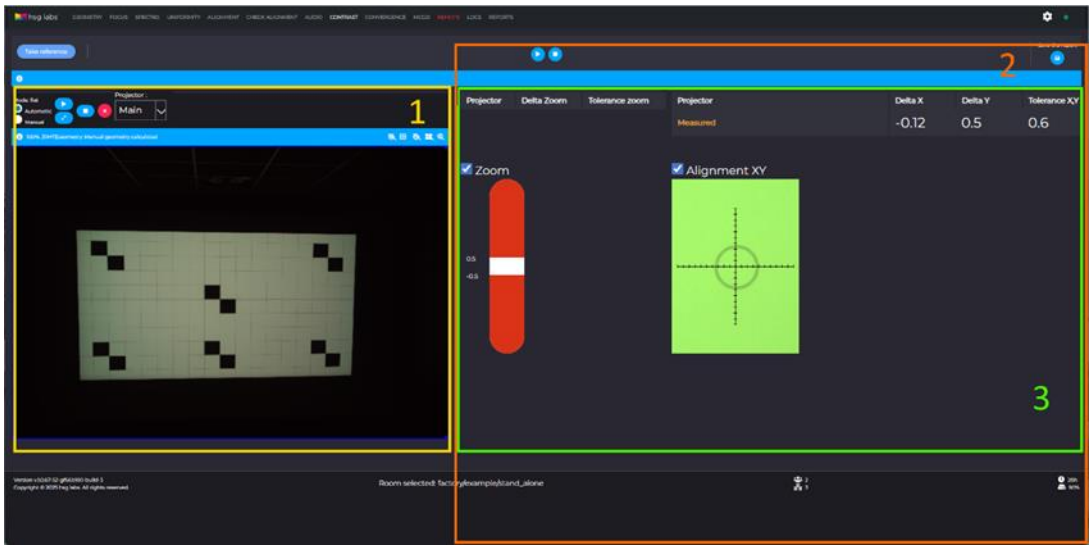
- ***Calibration file***

Permits to choose the calibration file used for the camera measurement and be more relevant according to the measured source (Laser, Xenon…).

Alignment

The device has the capability to measure the physical position of the onscreen projection and move the lens to a desired position using several different alignment methods. The alignment feature is divided into two stages:

1. *Region of Interest to be considered for adjustment*
2. *The alignment process*



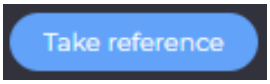
The first step of the process is to ensure the Geometry is identified and detected by the device in detection zone (1) on the left side as defined by the GEOMETRY section.

Geometry (1)

The Alignment can only be performed after an Automatic geometry detection has succeeded.

Please refer to the Geometry feature for more detailed information.

If the selected mode is “Reference” (refer to the Settings menu), a reference must be taken before starting by clicking on the dedicated button (top left):



NOTE: Reference mode is a saved onscreen position for the projected image.

The unit will automatically set or ask for the dedicated test patterns to record the Reference.

Adjustment (2)

After the Geometry is captured and "**100%. Work succeeded**" is displayed, choose the desired alignment mode and proceed by selecting the scope:

- *Zoom*
- *Alignment XY*

One or both can be selected and engaged.

Then, click on the main PLAY button on the top to start the adjustment.

It is possible to stop the adjustment in progress by clicking on the STOP button.

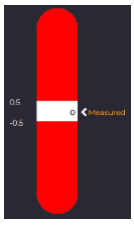
During the process, it is possible to check the adjustment in real time by following the values in the results area (3).

After a successful uniformity measurement, a message in the status bar reads "**100%. Work succeeded**", the results are displayed (3).

In this mode, every measurement taken is registered in the history and can be accessed later.

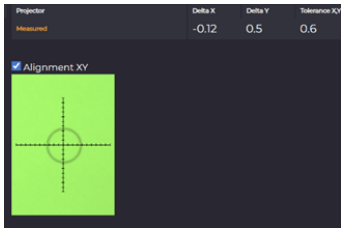
Result (3)

- *Zoom*



Visual indicator of the zoom measured position according to the defined tolerance.

- *Alignment XY*



Visual indicator of the XY measured positions and the defined tolerance.

Settings

On the dedicated settings, is it possible to adjust:

➢ *Mode*

Permits to select the alignment mode:

- *Second to main* *The second projector is aligned with the position of the prime projector (**not yet available**).*
- *Reference* *Both projectors are aligned with a recorded reference position.*

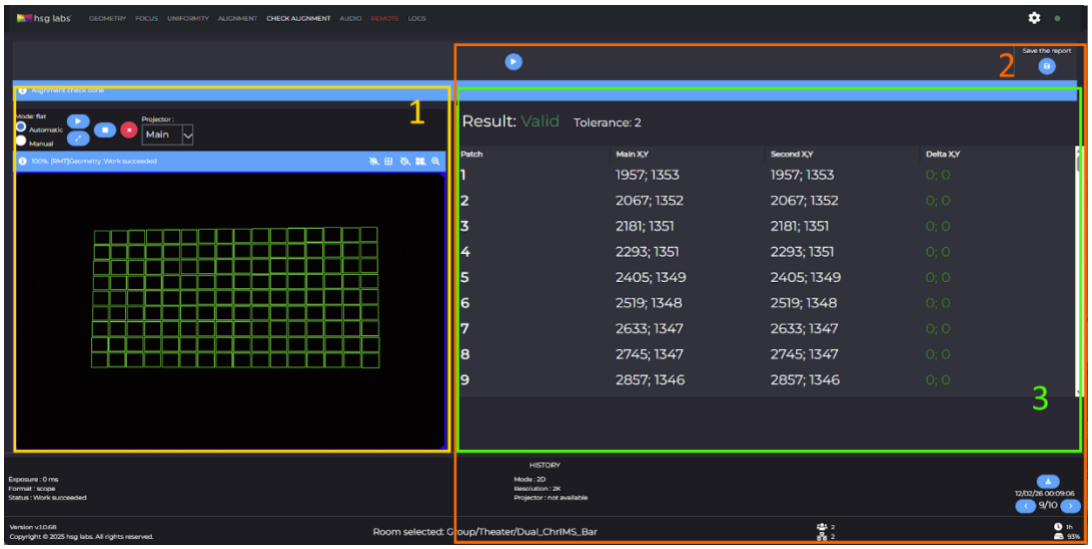
➢ *Tolerances*

Tolerance to define the alignment conformity target in terms of pixel accuracy.

Check Alignment

The Check Alignment feature can check the alignment of two projectors and provide a measurement of the difference between the patches at a pixel level. The process is divided into two stages:

1. *Region of Interest to be considered for adjustment*
2. *The check alignment process*



The first step of the process is to ensure the Geometry is identified and detected by the device in detection zone (1) on the left side as defined by the GEOMETRY section.

Geometry (1)

The Check Alignment can only be performed after an Automatic geometry detection for the Prime projector and for the Secondary projector.

Please refer to the Geometry feature for more detailed information.

Measurement (2)

After the Geometry is captured and "**100%. Work succeeded**" is displayed for both projectors, click on the main PLAY button on the top to start the comparison.

It is possible to stop the measurement in progress by clicking on the STOP button.

After a successful Check Alignment measurement, a message in the status bar reads "**100%. Work succeeded**", the results are displayed (**3**).

In this mode, every measurement taken is registered in the history and can be accessed later.

Result (3)

The result displays the 144 patches with the measured gap for each patch representing the difference in alignment of each square, in pixels.

According to the defined tolerance, the status is **Valid** or **Not valid**.

If only one patch is out of tolerance, the status is **Not valid**.

Settings

On the dedicated settings, is it possible to adjust:

- ***Tolerances*** *(on the Alignment settings)*

Tolerance to define the check alignment conformity target in terms of pixel.

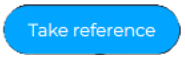
Audio

The Audio features on this device allow the product to validate audio systems, including 6 and 8 channel standard system and advanced Atmos systems with up to 64 channels. All audio validations are comparing a current level for each speaker and a recorded, calibrated and validated reference.

Reference (1)

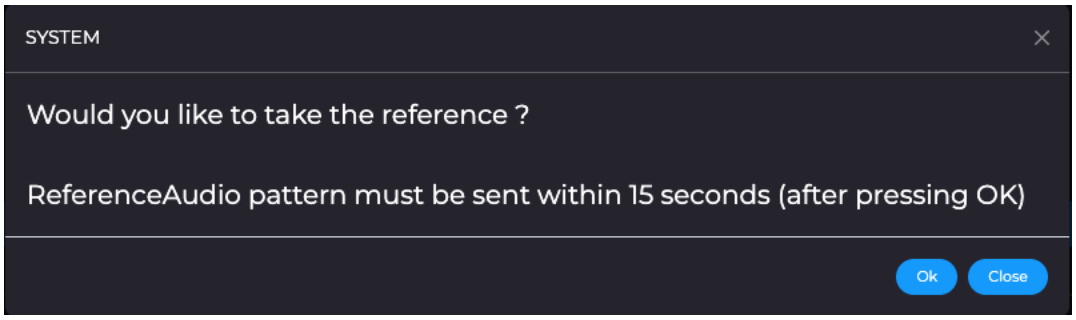
To start the process, the first action required is to select a Reference. If no valid Reference exist, then a new reference must be recorded.

> *NOTE: The audio system should be professionally calibrated prior to recording a reference. If any environmental or room factors are changed, a new reference should be recorded. It is recommended to record a new reference anytime the system is change.*

If no valid Reference is present, click on the button to  record a new reference. Follow the onscreen steps to save and record a reference.

When the audio reference creation is started, the system must hear the audio within 15 seconds or the process will fail. For 6 or 8 channel content, the user must manually start the ReferenceAudio CPL on the player. For Atmos

systems, once configured, the device to talk directly to the CP950/850 and start the recording process.



Once the OK button is selected, the Reference name must be entered, select OK to continue. The user has 15 seconds to start the audio pattern.

The CANCEL button allows the user to stop the Reference process.

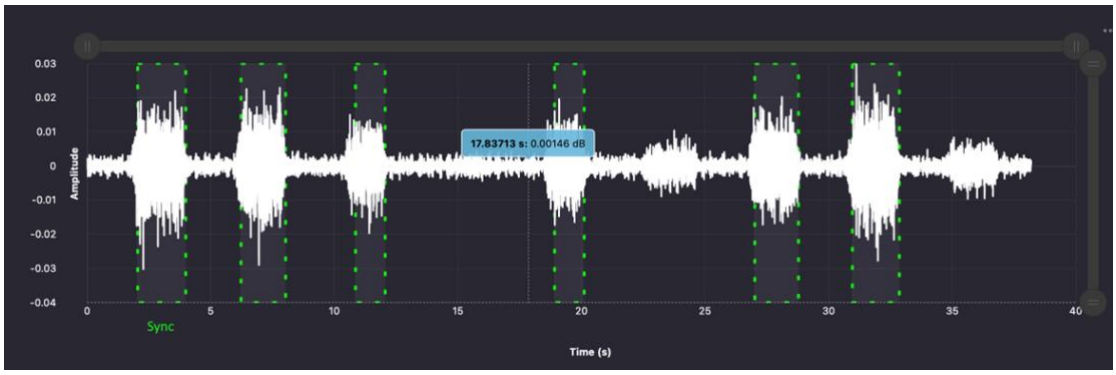
Measurement (2)

When the Reference is complete or/and selected on the list, click on the main PLAY button on the top to start the audio recording.

It is possible to stop the audio progress by clicking on the STOP button.

After a successful audio recording, a message in the status bar reads "**100%. Work succeeded**", the results are displayed.

During the process, it is possible to check the measurement process in real time by following the output signal display. Speaker recording identification are highlighted by the green boxes.



The first sound is the synchronization signal to engage the detection process. During the recording, only this first signal is identified and labelled in the curve. The processing to identify each speaker is performed at the end of the recording

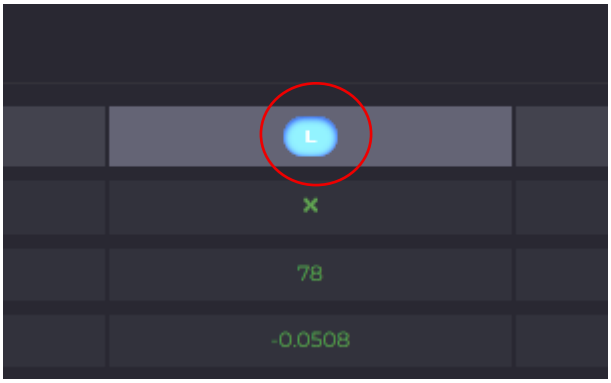
and the identified labelling of every speaker will be completed at the end of the process.

In this mode, every adjustment is registered in the history and can be accessed later.

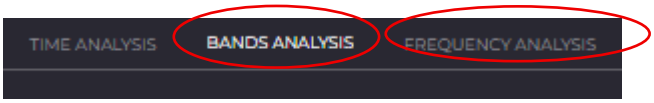
Result

The result is a tab representing each detected speaker channel, the pass/fail metric, dbC level and level shift from the reference.

For each channel, clicking on the channel name/number will provide more details in the measured signal.



It is possible to access both the Band Analysis and Frequency Analysis resulting curves by selecting the feature.



Band analysis

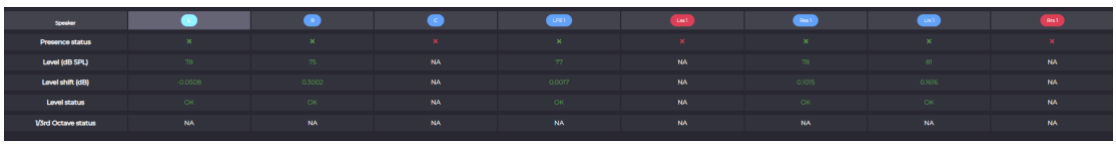
The band analysis provides a smoothed spectrum from 40- 20k hertz for each channel. The status OK/NOK status is displayed for the band analysis. The reference bands and tolerance limits can be displayed across to the frequencies for more detailed analysis.

Frequency analysis

The frequency analysis provides the raw frequency data from 20 to 20k hertz. This data includes the Display Spectrum, the Reference Spectrum and band detail.

The bottom table, each channel includes the channel status, x for presence and x for no presence. The level measured in dbC is displayed along with the level shift when compared to the reference. The level status will display OK when within the tolerance, NOK when outside the specified tolerance and NA when no presence detected.

1/3 Octave status is not present.



Status:

- ***the final status is fail if at least one channel is NOK***

- **OK** ***if everything is in the tolerance***

Settings

On the dedicated settings, is it possible to adjust:

- ***Tolerance up (dB)***

The tolerance to define the maximum conformity level (in dB).

- ***Tolerance down (dB)***

The tolerance to define the minimum conformity level (in dB).

- ***Emission duration (ms)***

The signal emission duration time (in ms).

- ***Silence duration (ms)***

The silence duration time between 2 signals (in ms).

- ***Synchro timeout (ms)***

The timeout duration before cancelling the test if no synchronization signal detection (no sound).

- ***Detection level (dB)***

The threshold level to detect a speaker (in dB).

- ***Loss level (dB)***

The threshold level to not detect a speaker and consider unrelated “noise” (in dB).

- ***Mode***

Permits to select the analyzing process:

- *1/3rd Octave (33 bands)*

  Specific method to create a breakdown that allows for better analysis of audio problems (**recommended mode**).

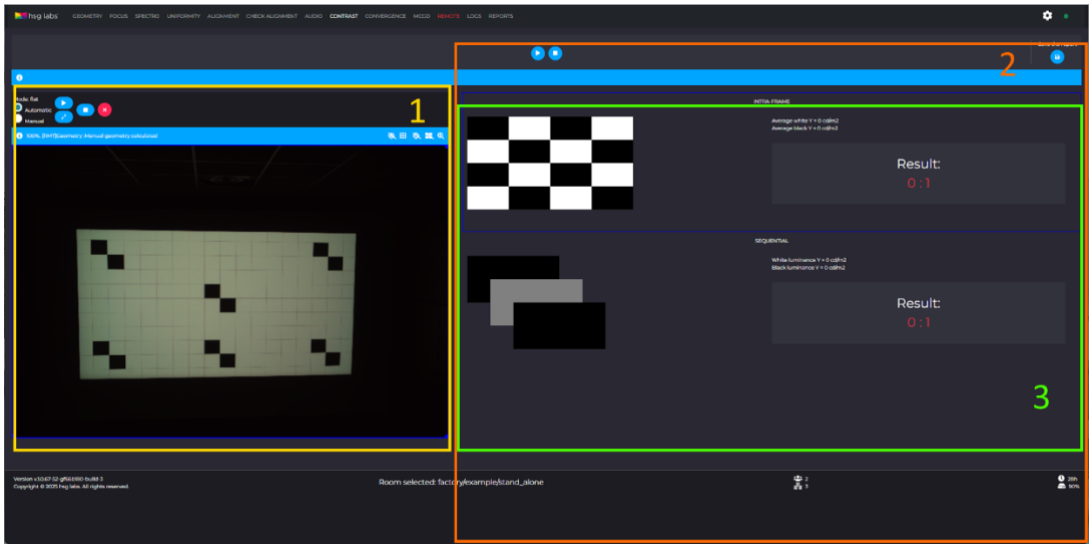
- *Global level*

  Standard method with averaging audio level.

Contrast

The Contrast measurement uses the device tools to measure the contrast of the image and displays the result in a single process. Two contrast features are present, Intraframe and Interframe contrast measurements. This process is divided into two stages:

1. *Region of Interest to be considered for adjustment*
2. *The contrast measurement process*



The first step of the process is to ensure the Geometry is identified and detected by the device in detection zone (1) on the left side as defined by the GEOMETRY section.

Geometry (1)

The Contrast Measurement can only be performed after an Automatic geometry detection for the Prime projector and for the Secondary projector.

Please refer to the Geometry feature for more detailed information.

Measurement (2)

After the Geometry is captured and "**100%. Work succeeded**" is displayed for both projectors, click on the main PLAY button on the top to start the comparison.

It is possible to stop the measurement in progress by clicking on the STOP  button.

After a successful contrast measurement, a message in the status bar reads "**100%. Work succeeded**", the results are displayed (3).

In this mode, every measurement taken is registered in the history and can be accessed later.

Result (3)

2 result data sets are displayed according to the measurement selected:

- *Intra-frame contrast (black and white ratio in the same image)*
- *Sequential contrast (black and white ratio in different images)*

Settings

On the dedicated settings, is it possible to adjust:

➢ ***Intra-frame tolerance***

The threshold of conformity for the Intra-frame measurement.

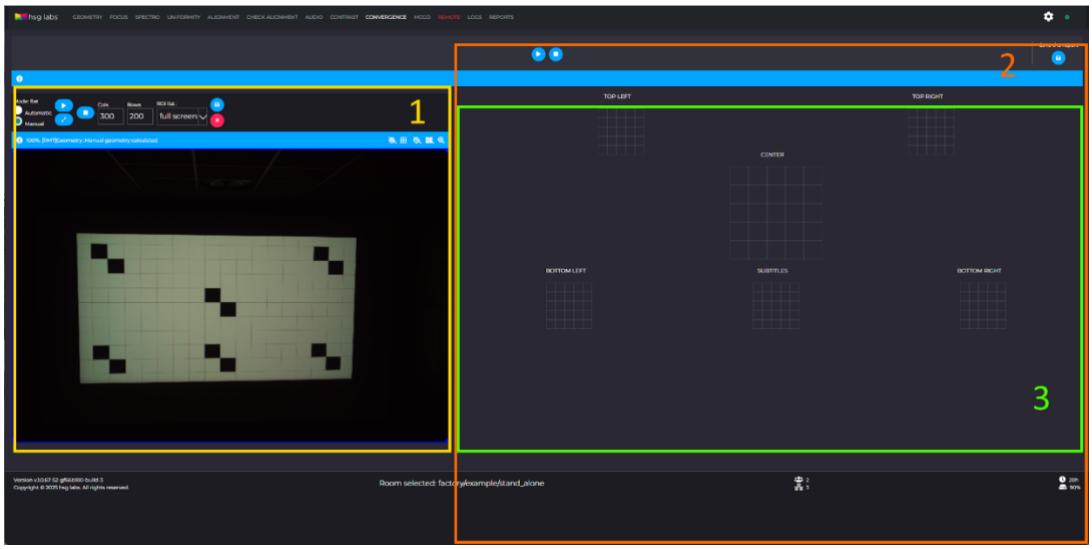
➢ ***Sequential tolerance***

The threshold of conformity for the Sequential measurement.

Convergence

The Convergence adjustment can identify the position of the pixel alignment of a projector with a TI chip and display the results for correction. This adjustment is divided into two stages:

1. *Region of Interest to be considered for adjustment*
2. *The check alignment process*



The first step of the process is to ensure the Geometry is identified and detected by the device in detection zone (1) on the left side as defined by the GEOMETRY section.

Geometry (1)

The Convergence can only be performed after an Automatic geometry detection for the Prime projector and for the Secondary projector.

Please refer to the Geometry feature for more detailed information.

Measurement (2)

After the Geometry is captured and "**100%. Work succeeded**" is displayed for both projectors, click on the main PLAY button on the top to start the comparison.

It is possible to stop the measurement in progress by clicking on the STOP button.

After a successful Convergence measurement, a message in the status bar reads "**100%. Work succeeded**", the results are displayed (**3**).

In this mode, every measurement taken is registered in the history and can be accessed later.

Result (3)

6 result areas are displayed:

- *Top left convergence*
- *Top right convergence*
- *Center convergence*
- *Bottom left convergence*
- *Bottom right convergence*
- *Subtitles convergence*

Settings

On the dedicated settings, is it possible to adjust:

- ***Tolerance***

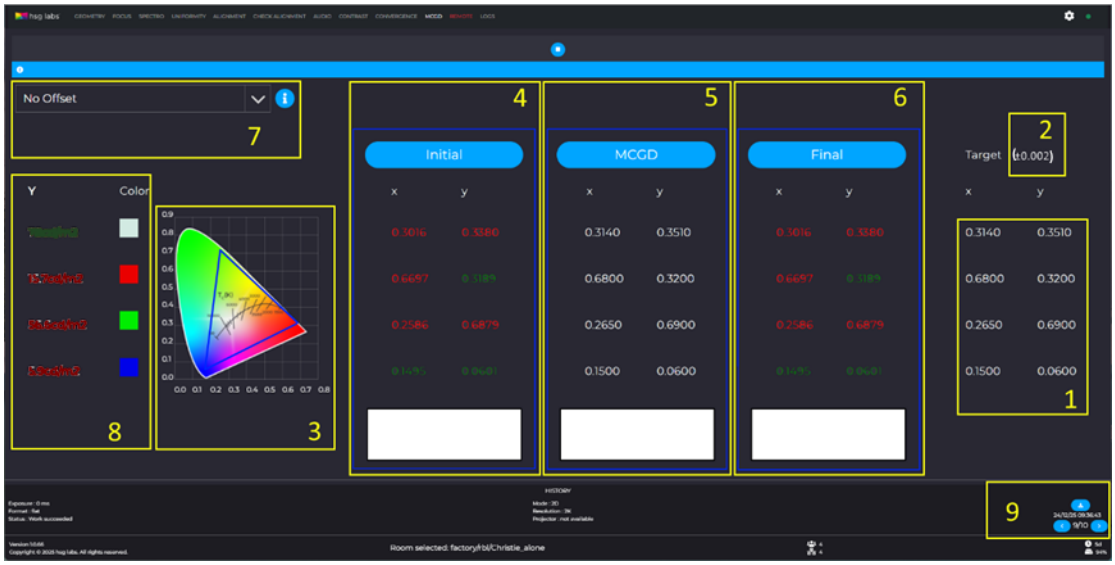
Tolerance to define the convergence conformity target in terms of pixel.

- ***Reference***

The color (R, G or B) identified as the “base color reference” and in the center in the display (gaps are indicated according to this reference position). Please refer to the projector manufacture for the base chip color for each model projector.

MCGD

The MCGD adjustment is a process for measuring, adjusting and verifying the calibrated colors of a cinema projector using an automatic algorithm and known test patterns. The device controls the full process from MCGD creation to verification in a single click with exportable results. The adjustment process is divided into nine stages.



The principle is to display a first initial measure to define the current state, engage the automatic adjustment and measure at the end the resulted values.

The target (1)

Displays the expected color space (example: DCI).

The tolerance (2)

Displays the selected tolerance, applied to the color measurement to determine the conformity of the measured values.

The Gamut (3)

Resulted gamut according to the selected color space (triangle in blue).

Initial (4)

A first measure on WRGB to define the current state.

The displayed values are with the conformity defined by the selected color space and tolerance.

MCGD (5)

Permits to engage the automatic settings of the projector.

The displayed values are the MCGD matrix settings.

Final (6)

A final measure on WRGB to define the final state after the set-up.

The displayed values are with the conformity defined by the selected color space and tolerance.

The Offset (7)

Resulting in some cases, is necessary to apply an offset to the result of the measure. The ability to configure and apply an automatic offset calculation decrease the probability of human errors.

NOTE: In the professional projection sector along with the usage of different light sources (Xenon Lamps, RB Laser, RGB Laser, High-pressure mercury Lamps, LED, …) and technologies (3 Chip DLP's, Single DLP Chip, LCD, …) sometimes is required to shift the measured value so that once the projector is configured with those values different target color are displayed. The key reason to perform those shifted calibrations is to reduce the different white point perception between the different technologies.

With a selected offset, values are automatically displayed, only in this tab, with the calculated offset for each color.

The Luminance (8)

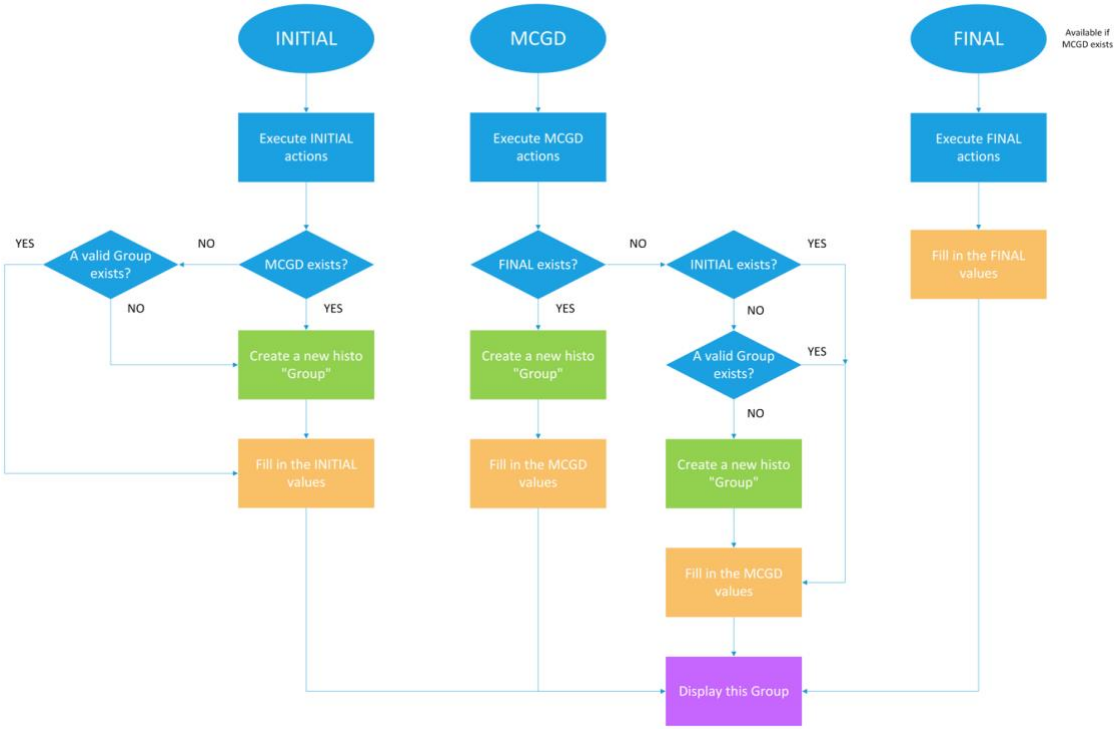
Luminance measurement for each color WRGB.

The displayed values are the last measurement, so usually, at the end, the final one (Initial one if only this first step performed at the beginning).

The History (9)

Different from the other processes on this device due the process management, the history is constructed by groups (Initial / MCGD / Final).

In order to avoid being restrictive with an imposed scheme, **Initial => MCGD => Final**, and to allow for the immediate application of the adjustment in some cases, a process has been defined to create the history. This makes it possible to make immediate adjustments without an Initial check, for example.



Settings

On the dedicated settings, is it possible to adjust:

- ***Color Space***

The targeted color space.

- ***MCGD tolerance Y***

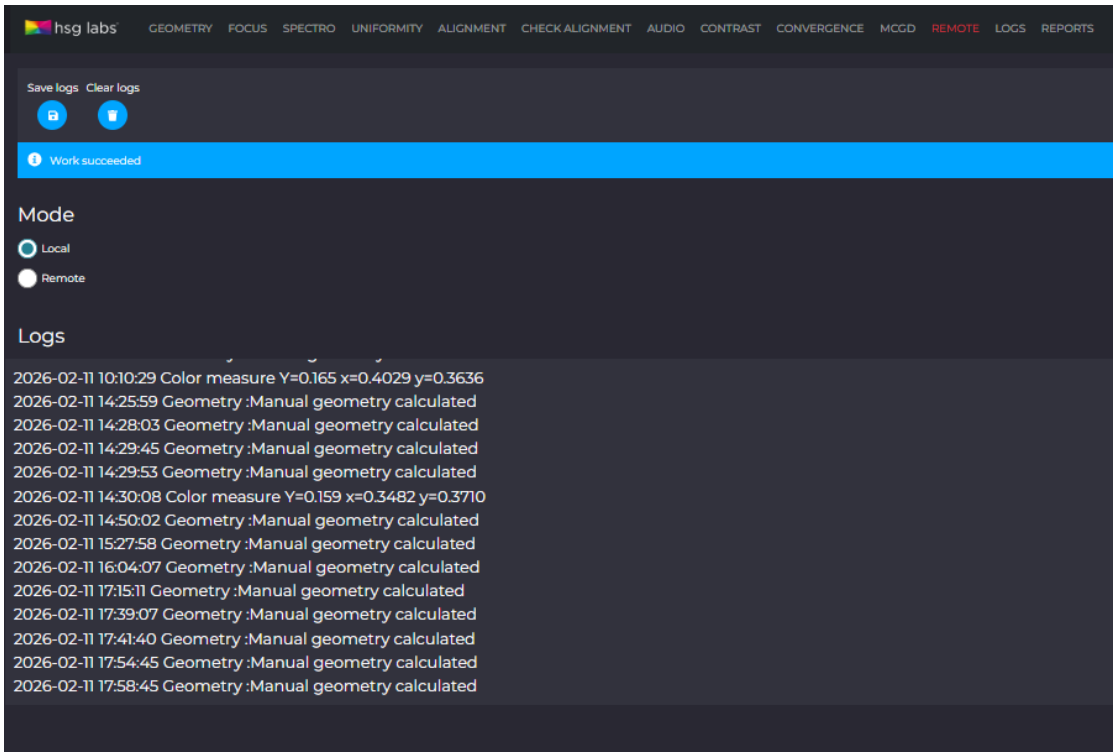
The threshold of conformity for Y (Luminance).

- ***MCGD tolerance xy***

The threshold of conformity for xy (Color).

Remote

The device can run in both local and remote modes depending on the desired operation and functionality. This tab allows to switch on Local or Remote mode.



In Local mode, all manual operations and user settings are available.

In Remote mode, all manual operations and user settings are locked and only API commands are permitted.

In every mode, a log viewer is available to monitor ongoing operations.

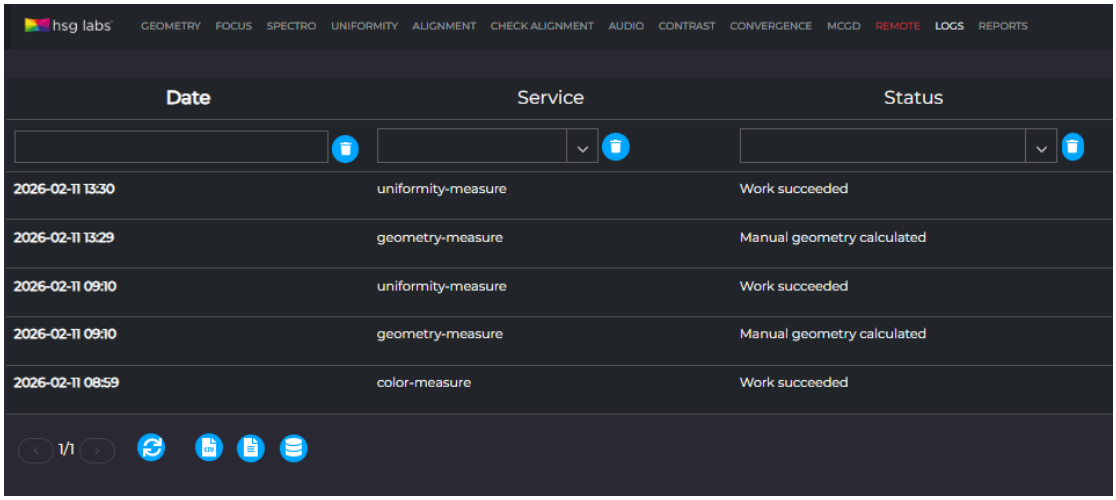
The color of the tab indicates the device remote status:

- **REMOTE** => Local mode
- **REMOTE** => Remote mode

*NOTE: Only text API commands (used in particular in SPLs) are affected by Local/Remote mode. Native API commands are always effective in any mode. Refer to the native API document for a list of commands (**hsg4X_WEB-API**).*

Logs

This tab allows to sort and display the logs from every service.



The available filters are:

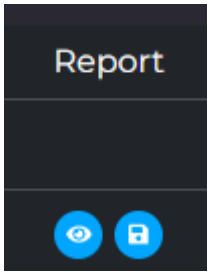
- *Date*
- *Service*
- *Status*

For example, to access all successful processes in Uniformity for yesterday, select:

- *Date: yesterday (the current time must be correct)*
- *Service: uniformity-measure*
- *Status: work succeeded*

NOTE: Please note that only the processes engaged in the unit are displayed in the service list.

For each displayed report, device can:



- *Display in json style*
- *Download the report (json format)*

Controls in bottom left of the window allow to:

Update the current list

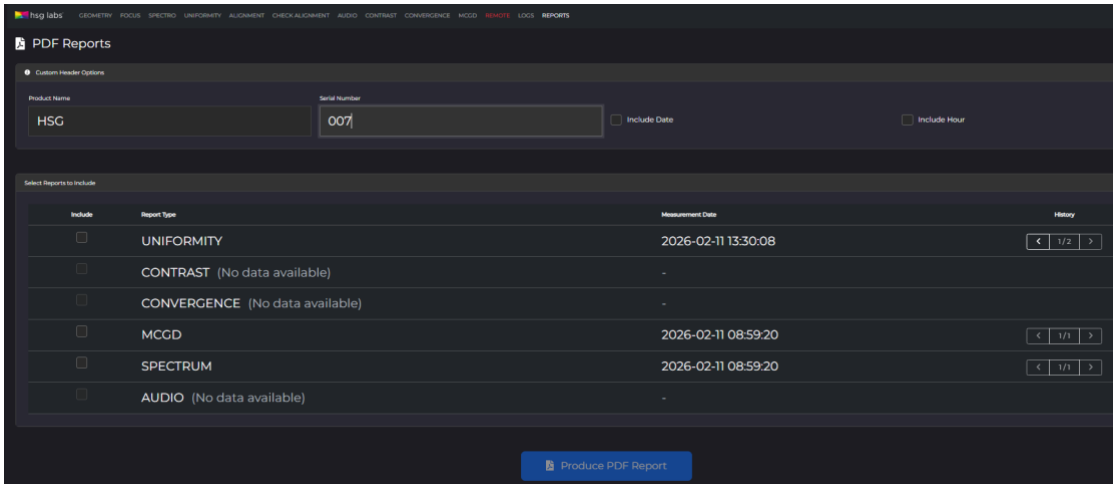
Download all reports in csv format

Download all reports in json format

Download all the database (can be long according to the size of the DB and the network connection speed with the unit)

Reports

This tab allows the operator to create a customer report in PDF format to display the desired tests that have been performed and what information is pertinent to the customer needs.



- *Enter a product name (optional).*
- *Modify the serial number (by default the SN of the unit).*
- *Choose to include Date or/and Hour.*

Select the type of report required by checking the selected process and which test from the process history (by default the last one is selected).

At the end, click to  obtain the PDF.

Settings

GENERAL

Default mode

⇨ *Select the default mode configuration in case of restart*

- *Local*
- *Remote*

Orientation

⇨ *Select the orientation of the product to modify the camera image if necessary*

- *Right side up*
- *Upside down*

Resolution

⇨ *Select the projected pattern resolution*

- *2K*
- *4K*

Default mode

⇨ *Select the default pattern format*

- *Flat*
- *Scope*

Mode

⇨ *Select the default playback stereoscopic pattern mode*

- *2D*
- *3D*

Mask

⇨ *Indicates the current active mode of the Mask*

- *Full screen* or not *(info only, can't be modified)*

OFFSET Configuration

These settings adjust the luminance of the instruments according to the installation position (for example, in an auditorium with a significant angle) and a reference position (usually the center seat). Significant deviations may be observed, particularly on high gain screens.

Spectrometer luminance correction

⇨ *Configure the Spectro Y offset for remote mounting*

- *Calibration Seat Luminance (measured value from the reference position)*
- *Installed Unit Location Luminance (measured value from the installation position)*

Camera luminance correction

⇨ *Configure the Camera Y offset for remote mounting*

- *Calibration Seat Luminance (measured value from the reference position)*
- *Installed Unit Location Luminance (measured value from the installation position)*

Projector messages

⇨ *These fields allow specific messages to be displayed during operations and appear as pop-ups on the interface of the projectors.*

UNIT

⇨ *Select the default unit for Luminance*

- *cd/m² (recommended value as the international standard)*
- *fL*

HISTORY SIZE

⇨ *Select the default loaded history size (important to reduce if a bad network connection is present)*

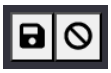
- *1 / 10 (recommended value) / 50 / 100 / All*

NETWORK

⇨ *Configure the network interface of the unit by clicking on the edit button* 

- *DHCP* *Automatic obtain IP address*
- *Fixed IP* *Manual configuration of IP address*

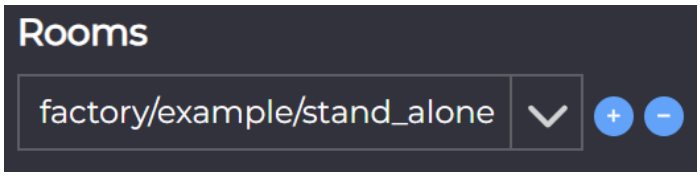
NOTE: A DHCP server on the local network is required to obtain a correct IP configuration for the DHCP mode.

After the SAVE or  configuration, select save or cancel by using the dedicated CANCEL buttons.

ROOMS

⇨ *Update the room configuration of the unit*

The ROOM control permits user to select working room, create new rooms or delete existing rooms.



- *Select* v *Select existing room on the list*
- *Create* + *Create new room*
- *Delete* - *Delete existing room*

NOTE: The room "stand_alone" is available to allow user to test and measure without any controlled equipment (server, projector or sound processor). This is the best method for manual point and shoot operation.

The room creation allows a user to configure a room with a single or dual projection system, a media player and a sound processor (with or without ATMOS control).

Several options need user input:

Use internal test pattern : If checked, the patterns used will be generated by the internal projector patterns (there is no need for a player). The HSG patterns need to be loaded into the projector interface, please check the projector configuration documentation.

X shift inversion: If checked, the X shift of the projector movement is inverted (if the system is mounted upside down)

Y shift inversion: If checked, the Y shift of the projector movement is inverted (if a mirroring system is used)

SNMP

⇨ *Define the SNMP server address for monitoring*

- *IP* *SNMP server IP*
- *Port* *SNMP server port*

UPDATE

⇨ *Update the unit to the latest software version*

- *Internet* *from HSG Labs servers*
- *USB or File* */opt/hsg/user/tmp/*

ABOUT

⇨ *Obtain information from the unit*

NOTE: For each setting, after configuring the desired values, click the 'Apply' button to save the configuration. Be sure not to skip this step to avoid any problems or unwanted settings.

Apply

Customer Support

HSG provides users with support services for questions, calibration requests or problems related to the use of the equipment:

support@hsg-labs.com

hsg labs®

January 01, 2024

CE COMPLIANCE NOTICE for 4P / 4A

Version 1 and higher

Marking by the symbol CE indicates compliance of the device to the EMC (Electromagnetic Compatibility) directive and to the Low Voltage directive of the European Community. Such marking is indicative that this device meets or exceeds the following technical standard:

- *EN 55022 "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment."*
- *EN 62368-1 "Audio/video, information and communication technology equipment - Part 1: Safety requirements."*

A "Declaration of Conformity" in accordance with the above standard and our CB certification FR3-000260 has been made.

Listed below are the Part numbers covered by this compliance notice:

Part #'s: 4P / 4A
Part #'s: Fixed Kit
Part #'s: Mobile Kit

HSG LABS
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SIREN 948058813
TVA FR69948058813

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SIREN 948058813
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hsg labs®

January 01, 2024

Letter of Compliance RoHS for 4P / 4A

Version 1 and higher

This letter is to confirm compliance with Directive 2002/95/EC and the amendment (EU) 2015/863 in addition to RoHS 2011/65/EU of the European Council on the Restriction of Hazardous Substances in electrical and electronic equipment.

We hereby certify that the materials found in this component meet the acceptable levels as stated by the RoHS directive confirming compliance.

Listed below are the Part numbers covered by this compliance notice:

Part #'s: 4P / 4A
Part #'s: Fixed Kit
Part #'s: Mobile Kit

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SIREN 948058813
VAT FR69948058813

Laser Poiter Accession Number (FDA 0820048-029)

This message is to acknowledge receipt of your **Product Report**, which was filed pursuant to the regulations for the administration and enforcement of the Radiation Control for Health and Safety Act of 1968 (Title 21, Code of Federal Regulations, Subchapter J) as they pertain to the submission information description below. If your submission is a report, it has been filed according to reporting requirements in Title 21, Code of Federal Regulations (CFR), Part 1002. Your submission has been assigned an informal subject title below after "Purpose:" . Your submission has been assigned an ACCESSION NUMBER which can be used by you and FDA to identify your submission.

WARNING:

THE ACCESSION NUMBER ASSIGNED TO YOUR SUBMISSION DOES NOT IMPLY, CONVEY OR CONSTITUTE FDA APPROVAL OF ANY REPORT, APPLICATION FOR VARIANCE OR EXEMPTION, NOTIFICATION, OR ANY OTHER SUBMISSION OR ITS CONTENTS. THE ACCESSION NUMBER IS ONLY AN ACKNOWLEDGMENT THAT FDA HAS RECEIVED YOUR SUBMISSION. IT MAY BE REVOKED BY FDA. ITS DISCLOSURE IS YOUR RESPONSIBILITY. IT IDENTIFIES YOUR SUBMISSION FOR PRODUCTS OR PRODUCT FAMILIES IDENTIFIED IN THIS MESSAGE.

Be advised that failure to comply with FDA regulations may result in notification of affected persons and corrective actions at no cost to the purchaser, pursuant to 21 CFR Part 1003 -- Discovery of Defect or Failure to Comply and 21 CFR Part 1004 -- Repurchase, Repairs, or Replacement of Electronic Products.

- - - - - - - - - - DOCUMENT RECEIVED, FILED, & ACKNOWLEDGED - - - - - - - - -

This automated notification from the CeSub Submission Process contains general information about the aforementioned submission:

Accession Number: **0820048-029**
Date Loaded: **10/21/2013**
Document Date: **10/7/2013**
Establishment Name: **QUARTON INC.**
Purpose: **This submission is a(n) Product Report supplement. These Surveying, Leveling, Alignment Laser Products include designated VLM-650-01 LPA.**

Submitter: **Gordon Lien**
Email: **gordon_lien@mail.quarton.com.tw**
Reporting Official: **Gordon Lien**
Email: **gordon_lien@mail.quarton.com.tw**

- -

Please note that your firm is required to submit an Annual Report to CDRH every year by September 1.

If you meet all other applicable FDA requirements, you may market the product(s) reported. Please be aware that additional electronic product radiation control or medical device regulations may apply to your product, such as:

21 CFR 1002.11, requiring report supplements under certain circumstances following the same reporting forms as used for product reports on your products

21 CFR 1002.13, requiring annual reports to be submitted each year by September 1 using the appropriate reporting form for annual reports

21 CFR 1010 - 1050, requiring certification to FDA radiation safety performance standards

21 CFR 807, requiring manufacturer registration and device listing, and

21 CFR 807, 812 and 814, requiring medical device clearance or approval

CB Certification

	Ref. Certif. No.
IEC IECEE	FR3-000260

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

CB TEST CERTIFICATE

Product	Videocolorimeter
Name and address of the applicant	HSG LABS 151 voie H, Impasse des bruyères Mouans-Sartoux, 06370 France
Name and address of the manufacturer	HSG LABS 151 voie H, Impasse des bruyères Mouans-Sartoux, 06370 France
Name and address of the factory *Note: When more than one factory, please report on page 2*	HSG LABS 151 voie H, Impasse des bruyères Mouans-Sartoux, 06370 France ☐ Additional information on page 2
Ratings and principal characteristics	ULTIMATE v3.5 system : PSU : 100-240V, 50/60Hz, 1.3A ; 19Vdc, 4.74A, 90W ULTIMATE V3.5 :19Vdc, 3.4A. OPTIMIZER v3 system: PSU : 100-240V, 50/60Hz, 0.3A ; 5.0Vdc, 2.0A OPTIMIZER v3 :5Vdc, 2A.
Trademark / Brand (if any)	HSG LABS
Customer's Testing Facility (CTF) Stage used	
Model / Type Ref.	ULTIMATE v3.5 OPTIMIZER v3
Additional information (if necessary may also be reported on page 2)	☐ Additional information on page 2
A sample of the product was tested and found to be in conformity with	IEC 61010-1:2010/AMD1:2016 National differences: EU Group Differences, AT, BE, BG, CA, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, RO, SE, SI, SK, US
As shown in the Test Report Ref. No. which forms part of this Certificate	1E41388-01

This CB Test Certificate is issued by the National Certification Body

APAVE Certification
Immeuble Canopy , 6 rue du General Audran
COURBEVOIE, 92400
France

apave Certification

Date: 2025-04-15

Signature: Xavier Schmitt

page 1 of 1

hsg labs®

January 01, 2024

Letter of Authority of the 4P / 4A lithium-ion battery for air transport

Version 1 and higher

This letter is to confirm that common lithium batteries in the 4P / 4A device are contained in equipment (UN3481).

MSDS of the initial battery before integration is attached with this letter.

Coordinates in case of problem:

+33 (0)7 69 54 09 26

shipping@hsg-labs.com

Listed below are the Part numbers covered by this compliance notice:

Part #'s: 4P / 4A

HSG LABS
Impasse des Bruyères
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SIREN 948058813
TVA FR69948058813

HSG Labs
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06370 Mouans-Sartoux - FRANCE
+33 (0) 769 540 926
SIREN 948058813
VAT FR69948058813

MSDS Report

Prepared For : 申请商：	SHENZHEN PKCELL BATTERY CO., LTD. 深圳市比苛电池有限公司 2nd Floor, 4th Building, Meitai Technology Park, No.1231, Guanguang Road, Osmanthus Community, Guanlan Town, Longhua New Area, Shenzhen 深圳市龙华新区观澜街道桂花社区观光路 1231 号美泰科技园肆号厂房贰楼
Product Name: 产品名称：	Li-ion Battery 锂离子电池
Model 型号:	ICR18650 6600mAh 3.7V
Nominal Voltage: 标称电压	3.7V
Typical Capacity: 典型容量:	6600mAh, 24.42Wh
Weight 重量:	139.0g
Dimension 尺寸 :	69.0mm X 55.5mm X 19.0mm (L×W×T)
Prepared By : 编制单位：	Shenzhen NCT Testing Technology Co., Ltd. 深圳诺测检测技术有限公司 1 / F, No. B Building, Mianshang Younger Pioneer Park, Hangcheng Road, Gushu Xixiang Street, Baoan District, Shenzhen, Guangdong, China 中国广东省深圳市宝安区西乡街道固戍航城大道绵商青年创业园 B 栋第 1 层
Report No. 报告编号:	NCT20047404XM1-1

Written by 编写: _____ Approved by 批准: _____

Inspected by 审核: _____ Date 日期: 2021. 01. 02

中国认可
检验
INSPECTION
CNAS IB0078

危险物品
DANGEROUS GOODS

航空运输条件鉴别报告书

Identification and Classification Report for Air Transport of Goods

年度有效
年12月31日

此报告本年度有效
有效期至2021年12月31日

报告编号：
Issued No.: PEKGZ2020121443546X960001

签发日期：
Issued Date: 2021.01.01

委托单位：深圳市比苛电池有限公司

Applicant: SHENZHEN PKCELL BATTERY CO., LTD.

物品名称：锂离子电池 ICR18650 6600mAh 3.7V 24.42Wh

Name of Goods: Li-ion Battery ICR18650 6600mAh 3.7V 24.42Wh

北京迪捷姆空运技术开发有限公司

Beijing DGM Air Transport Technology Development Co.,Ltd.

报 告 书 使 用 约 定

Terms of the Using of the Report

1. 本公司依据本年度国际航协《危险品规则》以及委托人（托运人或其代理人）提供的物品及其运输信息，确定货物的航空运输条件并出具此报告书。
   The report is issued by DGM China according to IATA ***Dangerous Goods Regulations*** published in the current year and the information of the goods and the information of its shipping provided by the applicant (shipper or his agent).

2. 依据鉴别的需要，本公司要求委托人提供真实、完整的货物样品及资料。
   According to the demand of identification and classification, DGM China requires the applicant to provide true and exact sample and data of the cargo.

3. 委托人保证申报的物品和/或提供的样品与交运的货物是同一种物质。
   The applicant guarantees that the declared goods and/or the sample who provides should be identical with the contents of cargo that is to be transported.

4. 本公司仅对样品的鉴别结果负责。
   DGM China is only responsible for the identification and classification of the sample provided by the applicant.

5. 本报告书经主检员、审核人和批准人签字并加盖本公司印章后生效。
   This report will be effective only after it is signed by the inspector, checker and approver, and stamped by DGM China.

6. 未经本公司书面批准，不得复制本报告书。
   The duplicating of this report is prohibited without the written approval of DGM China.

7. 私自转让、复制、盗用、冒用、涂改、或以任何媒体形式篡改的报告书无效。
   The report is invalid when anything of the following happens - illegal transfer, reproduce, embezzlement, imposture, modification or tampering in any media form.

8. 为适应国际航协《危险品规则》的年度变化，报告书仅在本年度内有效。
   This report is only valid within the year in which the IATA ***Dangerous Goods Regulations*** is effective.

地址：北京首都国际机场货运北路天竺综合保税区BGS货运楼249室　　邮编：101300

电话：010-69479673　　传真：010-69479621

网址：www.dgmchina.com.cn　　E-mail: test@dgmchina.com.cn

北京迪捷姆空运技术开发有限公司 **

项目编号 Item No.		PEKCZ202012144354	生效日期 Effective Date	2021.01.01
鉴别目的 Identification Purpose		是否属于航空运输危险物品 Dangerous Goods or not restricted	鉴别日期 Identification Date	2020.12.15
鉴别依据 Identification Criteria		IATA DGR 62nd, 2021		
物品名称 Name of Goods	中文 Chinese	锂离子电池 ICR18650 6600mAh 3.7V 24.42Wh		
	英文 English	Li-ion Battery ICR18650 6600mAh 3.7V 24.42Wh		
生产厂家 Manufacturer		深圳市比苛电池有限公司 SHENZHEN PKCELL BATTERY CO., LTD.		
件数 Pieces			注：本栏内容为托运人或其代理人在使用本报告书时候填写的运输信息，不属于鉴定内容。运输信息与报告书的关联性以及实际运输货物与报告书的一致性由托运人或其代理人保证，如发生任何不一致由托运人或其代理人承担全部责任。（请认真填写本栏内容，并盖章） 负责人： 联系方式：	
运单号 Air waybill No.				
目的港 Destination				
物品信息 Nature of the goods		该样品为蓝色近长方体电池。 型号：ICR18650 6600mAh 3.7V 尺寸：(69.0×55.5×19.0)mm 每包装件中电池/电芯数量：64 每包装件中电池/电芯净重：8.9kg 该电池已经做好防短路措施并装入坚固的外包装内。 该锂电池不属于召回电池，不属于废弃和回收电池，并按照DGR3.9.2.6(e)规定的质量体系进行制造 根据委托方所提供的声明：本报告所述锂离子电池（或电芯）交付运输时，其荷电状态不超过设计额定容量的30%。 (注：单块电池重量为139g。该电池的UN38.3检测报告由深圳诺测检测技术有限公司出具，报告编号：NCT180521076B1-1。该电池的1.2米跌落测试报告由深圳诺测检测技术有限公司出具，报告编号：NCT180521076B1-2。) 该电池的UN38.3试验概要由深圳诺测检测技术有限公司出具，详见附页。 This sample is blue almost cuboid battery. Model: ICR18650 6600mAh 3.7V Size: (69.0×55.5×19.0)mm Number of batteries / cells per package: 64 Net quantity of batteries/cells per package: 8.9kg Batteries have been protected so as to prevent short circuits and packed in strong rigid outer packagings. The lithium batteries don' t belong to batteries returned to the manufacturer for safety reasons, are not waste lithium batteries and not lithium batteries being shipped for recycling or disposal, are manufactured under a quality management program as described in 3.9.2.6(e). Lithium ion cells and batteries must be offered for transport at a state of charge(SoC) not exceeding 30% of their rated desigh capacity.		

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项目编号 Item No.		PEKGZ202012144354
物品名称 Name of Goods	中文 Chinese	锂离子电池 ICR18650 6600mAh 3.7V 24.42Wh
	英文 English	Li-ion Battery ICR18650 6600mAh 3.7V 24.42Wh
鉴别结论 Conclusions		该货物为锂离子/聚合物电池，单独包装。额定瓦特小时为24.42Wh。已通过 UN38.3 测试，已通过包装件1.2米跌落试验，每个包装件上均有锂电池标记。 参考有关资料，根据DGR有关规定，该物质分类识别为第9类（或项）危险品，UN3480。 This goods is lithium ion/polymer battery, packed individually. Watt-hour rating is 24.42Wh. Each battery is of a type proved to meet the Requirements of each test in the UN MANUAL OF TESTS AND CRITERIA, Part III, sub-section 38.3, Each package is capable of withstanding a 1.2m drop test in any orientation without damage to the cells contained therein, without shifting of the contents so as to allow cell to cell contact and without release of contents, Each package is marked with lithium battery mark. According to IATA DGR this substance is classified as dangerous goods Class (or division) 9, UN3480.

建议运输条件 Suggestion for Transport Condition	UN/ID 编号 UN/ID No.	运输专用名称 Proper Shipping Name	类或项 Class or Div. (次要危险性) (Subsidiary Risk)	包装等级 Packing Group
	UN3480	Lithium ion batteries	9	/

包装说明 Packing Inst.	客货机 Passenger and Cargo	Forbidden
	仅限货机 Cargo Aircraft only	965, IB
注意事项 Remarks	本货物仅限货机运输。 The goods can be transported on cargo aircraft only.	

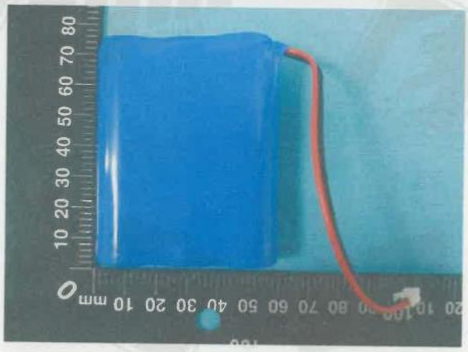
主检员 Prepared by: 罗薄　审核人 Checked by: 梁小佳　批准人 Approved by:

报告单位（盖章） Stamp

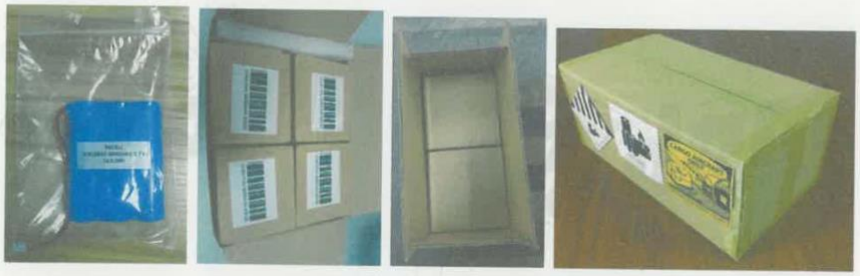
制单：　梁小佳

第 4 页 共 4 页

电池 Battery:



包装件 Package:



UN38.3 测试概要
UN38.3 Test Summary

按照《试验和标准手册》第 38.3 小节对锂电池或锂电池组进行试验的情况概要
Lithium cell or battery test summary in accordance with sub-section 38.3 of Manual of Tests and Criteria

Product Name 产品名称	Li-ion Battery 锂离子电池	**Sample Model** 样品型号	ICR18650 6600mAh 3.7V
Basic parameter 基本参数	3.7V, 6600mAh	**Product Type** 产品类型	Lithium ion battery 锂离子电池组
Rated Energy 额定能量	24.42Wh	**Lithium Content** 锂含量	--
Sample Mass 样品重量	139.0g	**Sample Physical description** 样品物理形态	Blue, Cylindrical 蓝色，圆柱形
Client 委托方	SHENZHEN PKCELL BATTERY CO., LTD 深圳市比苛电池有限公司		
Client Address 委托方地址	2nd Floor, 4th Building, Meitai Technology Park, No.1231, Guanguang Road, Osmanthus Community, Guanlan Town, Longhua New Area, Shenzhen 深圳市龙华新区观澜街道桂花社区观光路 1231 号美泰科技园肆号厂房贰楼		
Manufacturer 制造商	SHENZHEN PKCELL BATTERY CO., LTD. 深圳市比苛电池有限公司		
Manufacturer Address 制造商地址	2nd Floor, 4th Building, Meitai Technology Park, No.1231, Guanguang Road, Osmanthus Community, Guanlan Town, Longhua New Area, Shenzhen 深圳市龙华新区观澜街道桂花社区观光路 1231 号美泰科技园肆号厂房贰楼		
Factory 工厂	SHENZHEN PKCELL BATTERY CO., LTD. 深圳市比苛电池有限公司		
Factory Address 工厂地址	2nd Floor, 4th Building, Meitai Technology Park, No.1231, Guanguang Road, Osmanthus Community, Guanlan Town, Longhua New Area, Shenzhen 深圳市龙华新区观澜街道桂花社区观光路 1231 号美泰科技园肆号厂房贰楼		
Manufacturer's contact information 制造商联系信息	**Phone number** 电话号码	+86-13727580105	
	Email address 电子邮箱地址	3004814533@qq.com	
	Website 网址	http://www.pkcell.com	

NCT Technology

Lithium Battery UN38.3 Test Summary

UN38.3 Test Report No. UN38.3 测试报告编号	NCT180521076B1-1	Test Date 测试时间	2018.12.29- 2019.01.14
Test No. 测试编号	**Test item 测试项目**		**Conclusion 结论**
T1	Altitude simulation 高度模拟		Pass 合格
T2	Thermal test 温度试验		Pass 合格
T3	Vibration 振动		Pass 合格
T4	Shock 冲击		Pass 合格
T5	External short circuit 外部短路		Pass 合格
T6	Impact/Crush 撞击/挤压		Pass 合格
T7	Overcharge 过度充电		Pass 合格
T8	Forced discharge 强制放电		Pass 合格
Test Reference 测试依据	UNITED NATIONS "Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria" (ST/SG/AC.10/11/Rev.6 Section 38.3) 联合国《关于危险货物运输的建议书 实验和标准手册》第六修订版第 38.3 节。		
Assembled Battery Description 集成电池组说明	Not applicable for 38.3.3(f), 38.3.3(g). 不适用 38.3.3(f), 38.3.3(g)测试要求。		
Test Laboratory 测试实验室	Shenzhen NCT Testing Technology Co., Ltd. 深圳诺测检测技术有限公司		
Test Lab's Address 测试实验室地址	1 / F, No. B Building, Mianshang Younger Pioneer Park, Hangcheng Road, Gushu Xixiang Street, Baoan District, Shenzhen, Guangdong, China 中国广东省深圳市宝安区西乡街道固戍航城大道绵商青年创业园 B 栋第 1 层		
Test Lab's Phone 测试实验室电话	+86-755-27790922		
Test Lab's Email 测试实验室邮箱	sales@nct-testing.com		
Test Lab's Website 测试实验室网址	http://www.szncttesting.com		
Tested by 主检人	Vide Fan.	**Test Engineer 测试工程师**	Shenzhen NCT Testing Technology 深圳诺测检测技术有限公司
Inspected by 审核人	Holy Wang	**Technical Manager 技术经理**	Date of Issue: 2020. 12. 02
Approved by 批准人	Boris Lin	**Technical Director 技术总监**	

END OF DOCUMENT