

SIRTAKI - User Manual



SIRTAKI COMBING MACHINE User Manual 2.00

**BOSSA NOVA
VISION**

SIRTAKI - User Manual

About This Manual

This Manual describes SIRTAKI hardware and software. Use this manual as a reference when working with your SIRTAKI.

About SIRTAKI: SIRTAKI is a turnkey combing machine for repeated grooming test and mechanical abrasion analysis. SIRTAKI allows to comb up to 6 swatches at the same time, with a combing length of 6.5" (16.5 cm), at an adjustable rate, from 0.67 Hz to 2.67 Hz. SIRTAKI is a fully automatic system (Computer controlled, with a dedicated software).

Applications range from hair breakage prevention claims for hair conditioning product or styling device to hair breakage prevention claims from repeated brushing or heat protection claims.

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1. QUICK START

1.1. Unpacking

Please be sure you have all the following items (Figure 1):



Figure 1: SIRTAKI components

1.2. ASSEMBLY

The camera mount has been removed for shipping (Figure 2) and needs to be re-installed.

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Figure 2: Camera mount

It is also possible that the camera mount requires more assembly (Figure 3).

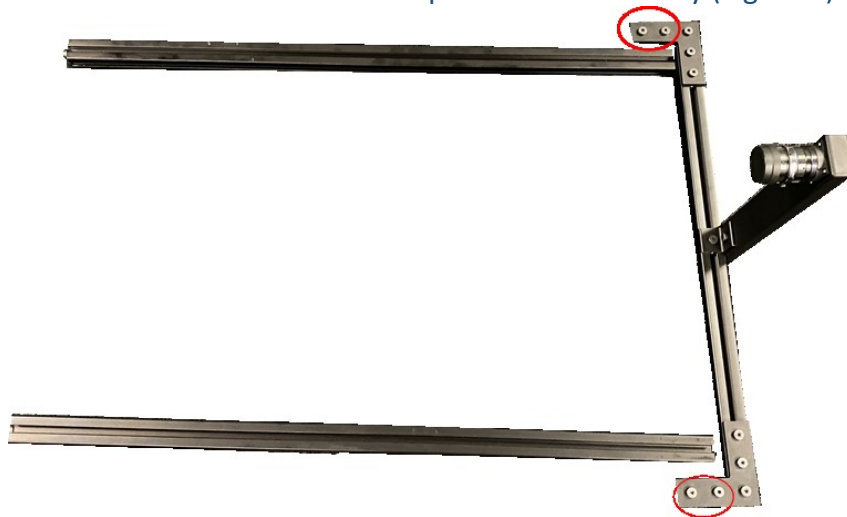


Figure 3: Camera mount disassembled

Just slide back the 2 parts and lock them in place using the x4 ¼-20 screws/nuts combination (Figure 4).



Figure 4: Camera mount assembled

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It needs to be locked back in place. Slide the camera mount in place (Figure 5).



Figure 5: Camera mount in place

Tighten the 4 screws using the hex key on each side of the base (Figure 6).

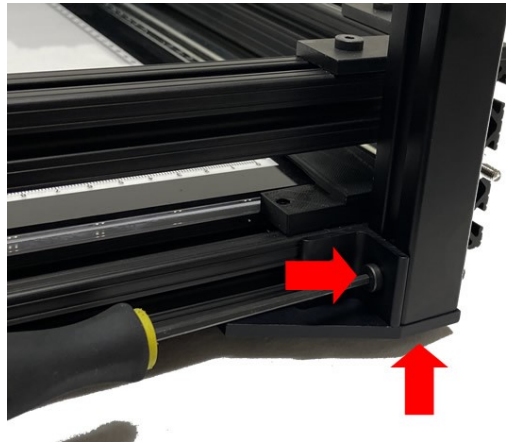


Figure 6: 4 screws (2 screws on each side, on under, one of the side)

Do not forget to remove the black plastic lens cover of the camera before doing measurement (Figure 7)

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Figure 7: Removing black plastic lens cover

2 removable plastic guards to mark the clearance of the tray when it is open are placed. These are very useful for the base when the computer controls the opening and closing of the slide. Manually screw both guards in place (Figure 8).

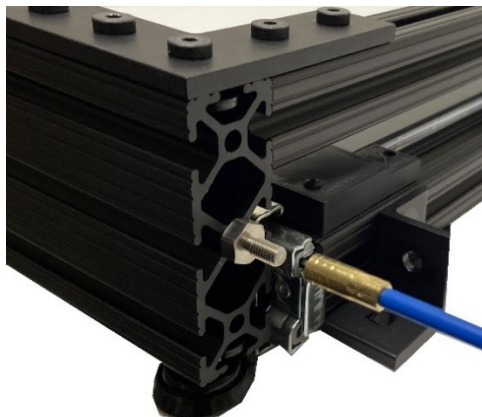


Figure 8: Plastic guard installation

1.3. SIRTAKI HARDWARE

SIRTAKI hardware is composed of (Figure 9):

- 6 Swatch mounts fixed on an adjustable bar (vertically and transverse)
- A rotating mechanism that holds up to 4 combs by channels (6 channels)
- A rotation motor located on the side of the system

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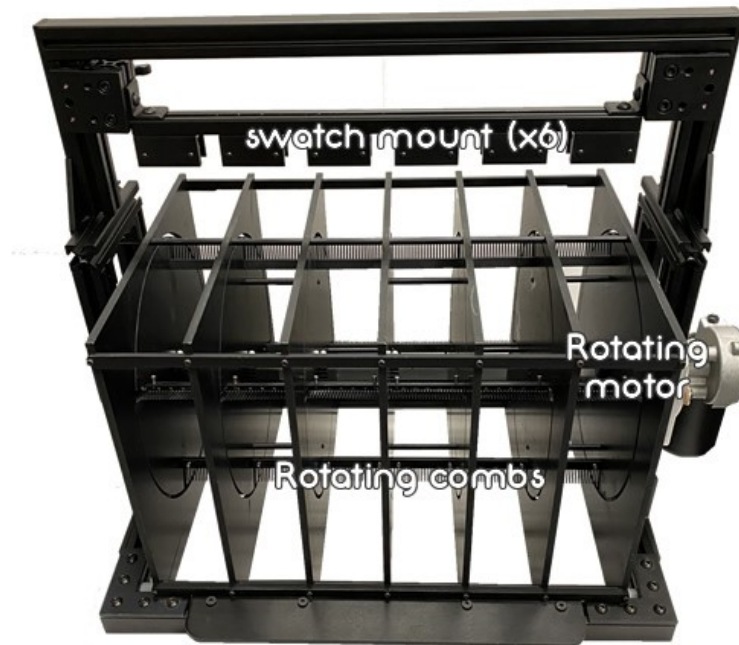


Figure 9: SIRTAKI Hardware

Each channel is 2.5" or 63 mm wide and separated by panels. The combing length is 6.5" or 165 mm (Figure 10).

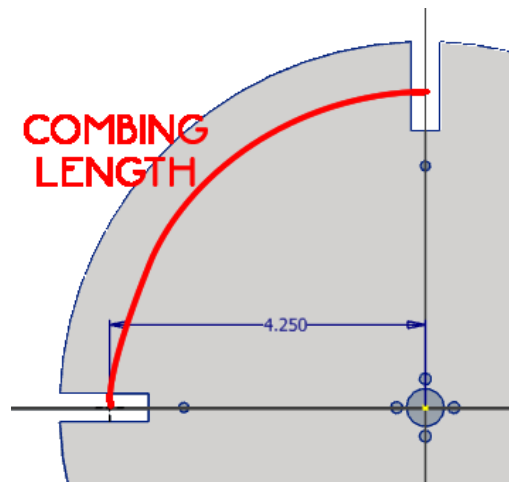


Figure 10: Combing length

If the hair swatch is longer than 6.5", there is a chance that 2 combs are brushing the swatch at the same time. If it is an issue, the user can adjust the vertical position of the switch mount higher.

1.3.1. SWITCH MOUNTS

6 switch mounts allow the user to fix the hair swatch in position using a thumb screw clamp (Figure 11).

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Figure 11: Thumb screw clamp

Flat or round swatch can be easily attached, up to a thickness of 0.6" or 15.4 mm as shown on Figure 12.

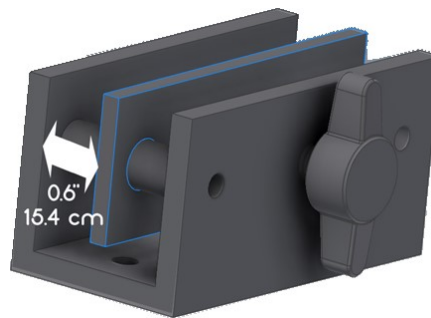


Figure 12: Swatch clamp

BE SURE THAT THE SWATCHES DO NOT HAVE A LARGE TANGLE THAT WILL CAUSE RESISTANCE AND STOP THE MOTOR. WE STRONGLY RECOMMEND TO SLIGHTLY MANUALLY COMB THE SWATCHES BEFORE MOUNTING THEM IN THE SIRTAKI, TO REMOVE ANY LARGE TANGLE.

When the user is combing swatches longer than the combing length (6" or 15 cm), in order to not have 2 combs brushing the swatch at the same time, we recommend to move the swatch higher using the vertical translation mounts located on both side of the bar (Figure 13).

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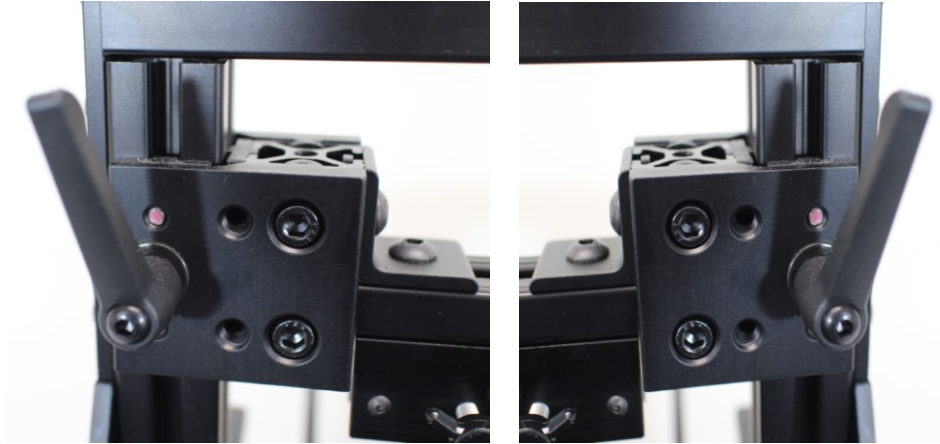


Figure 13: Vertical translation mounts

By unlocking the thumb screw, the bar easily moves higher (or lower) as desired (Figure 14).



Figure 14: Swatches mount up or down

If necessary, for transverse adjustment, the user can unlock or lock the 2 ¼-20 button head screws on each side of the bar (Figure 15) and moves the full swatches mount front or back.

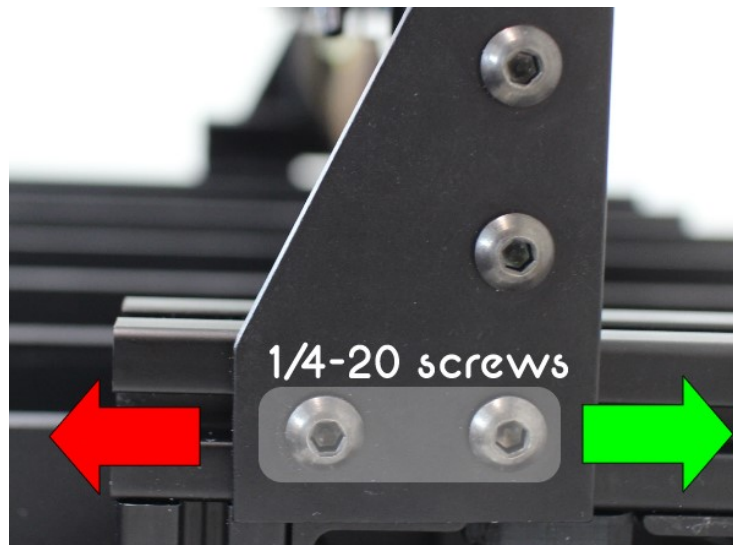


Figure 15: Transverse adjustment

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1.3.2. ROTATING COMBS / MINI BRUSHES

Up to 4 combs (or mini-brushes) are attached for each channel. Each comb is locked in place using x2 4-40 screws (Figure 16).



Figure 16: (a) Comb (b) Mini brush

It is very easy to remove and replace each comb (mini-brush). The comb (mini-brush) width is 2.5" or 63 mm maximum.

1.4. SIRTAKI BASE

The base is shown on Figure 17.



Figure 17: SIRTAKI base

The base has a monochrome camera, to be connected to the computer via a USB 3.0 cable and a motorized slide. A dedicated controller to pilot the opening and closing of the slide and to switch off and on the combing is on the back of the base (Figure 18).

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Figure 18: Base – Controller

2 connectors are present: USB 2.0 to connect to the computer and a power connection to connect to SIRTAKI motor for switching off and on the combing. A DC power cable with a jack connector to connect to the rotation motor is also present. On the top is an On/off switch.

Connect the small power cable from the base controller to the SIRTAKI motor. This will allow the software to start and stop the combing automatically (Figure 19).



Figure 19: SIRTAKI motor connected to BASE controller

Connect the base to the computer using the USB 2.0 cable (Figure 20).

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Figure 20: USB 2.0 connection

Connect the base controller to the DC power / Emergency stop (Figure 21).



Figure 21: Base connected to DC power/ Emergency Stop

You can then connect the DC power / emergency stop to the power outlet. If you switch on the system, you should see the LED panel turning on.

It is easy to install SIRTAKI on top of its base but be careful, SIRTAKI is very heavy and we recommend to do the installation with 2 persons holding it on both side.

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When you dock SIRTAKI on its automatic base (Figure 22), please be sure that the tray compartments are aligned (Figure 23).



Figure 22: SIRTAKI docked on its automatic base

Finally, connect the camera to the computer using the USB 3.0 cable. The opening and closing of the slide is now operated by computer via USB 2.0 connection. Images of the tray are acquired by the camera via USB 3.0 connection. A dedicated SIRTAKI software – detailed in the following – allows to control SIRTAKI automatic operation. Image acquisition, visualization and processing is managed by the software.

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Figure 23: SIRTAKI aligned on the tray compartments

To lock the tray back in place, just use the tray clamp (Figure 24). You can lock the tray clamp in place turning the clamp counter clock-wise.



(a) Unlock



(b) Lock

Figure 24: Tray clamp

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SIRTAKI is now ready for AUTOMATIC OPERATION!

Remark: Be careful about the reflection of external light (ceiling light or desk lamp) on the tray. Because the tray is horizontal, ceiling or desk light can be easily reflected by the plastic tray into the camera lens, creating interferences with the image and data acquisition as shown on Figure 25 where ceiling lights are directly bouncing on the plastic tray.



Figure 25: Ceiling light reflection

This will strongly disturb the image/data processing. We recommend to operate SIRTAKI in an environment with no direct light incident on the system.

2. SIRTAKI SOFTWARE

SIRTAKI software allows to:

- Acquire data
- Process data
- Visualize data
- Manage data

2.1. Startup

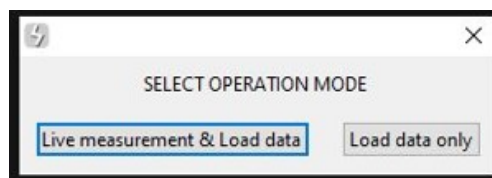


Once the user clicks on the SIRTAKI software icon, a window appears (Figure 26).



Figure 26: SIRTAKI software window

At startup (shown on Figure 27 below), the user can choose the operation mode between **Live measurement & load data** or **Load data only** if no hardware is connected or no measurement is scheduled.



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Figure 27: Start-up pop-up window

- Choosing **Load data only** will lead to the main window. The software does not need hardware to be turned on or connected. The user will only be able to load, process and visualize existing data.
- Choosing **Live measurement & load data** leads to an automated test procedure that insures all hardware components (Camera, LED panel and Slide motor) are working properly to the factory specifications.

2.1.1. Hardware test for LIVE MEASUREMENT & LOAD DATA

A full test requires a clean tray without any broken fibers present in the system in order to capture and save a picture of the background level (LED panel). We recommend to proceed to a full initialization and self-test at least every day.

When the user selects **OK** for a full test, sequential steps are done:

- STEP 1 - SLIDE initialization and test
- STEP 2 - CAMERA initialization and test
- STEP 3 - ILLUMINATION test (measurement of background level and uniformity)
- STEP 4 – DETECTION/IDENTIFICATION OF 6 TRAYS

If the four steps are successful, image acquisition will be possible. If nothing is activated, the user will only be able to load data.

If the tray is open, it will close, and then re-open. Each time the tray opens, a warning message appears under the image (Figure 28).



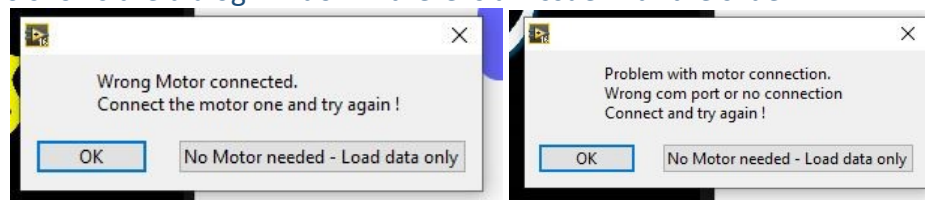
Figure 28: Tray opening message

The software goes to STEP 1 - SLIDE initialization and test is on (Figure 29)



Figure 29: STEP 1 - SLIDE initialization and test

Figure 30 shows the dialog window if there is an issue with the slide.



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Figure 30: Dialog window if there is an issue with the slide

2 problems can occur: No motor is connected (and detected) or the wrong one is connected.

The user can select **OK** while reconnecting the motor (USB 2.0). This option will proceed to STEP 1 - Camera initialization and test again. The user can also select **No motor needed – Load data only**. This option will by-pass next steps and go to SIRTAKI main window. If after few tries, the motor is not correctly initialized, please contact Bossa Nova Vision.

If STEP 1 is successful, STEP 2 – CAMERA initialization and test is on (Figure 31).



Figure 31: STEP 2 - CAMERA initialization and test

Figure 32 shows the dialog window if there is an issue with the camera.

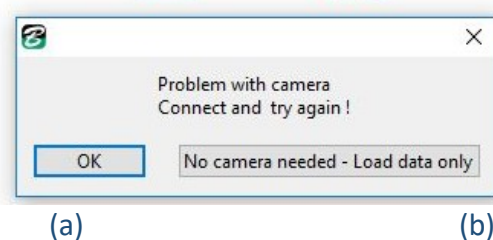


Figure 32: Dialog window if there is an issue with the motor

The user can select **OK** while reconnecting the camera. This option will proceed to STEP 2 - Camera initialization and test again. The user can also select **No camera needed – Load data only**. This option will by-pass next steps and go to SIRTAKI main window. If after few tries, the camera is not correctly initialized, please contact Bossa Nova Vision.

The software proceeds to STEP 3 for a measurement of the LED panel level and the LED panel uniformity. Be sure no swatch is present when this step is running.



Figure 33: STEP 3 - Illumination test (measurement of background level and uniformity)

Figure 34 shows the dialog window if there is an issue with the illumination.

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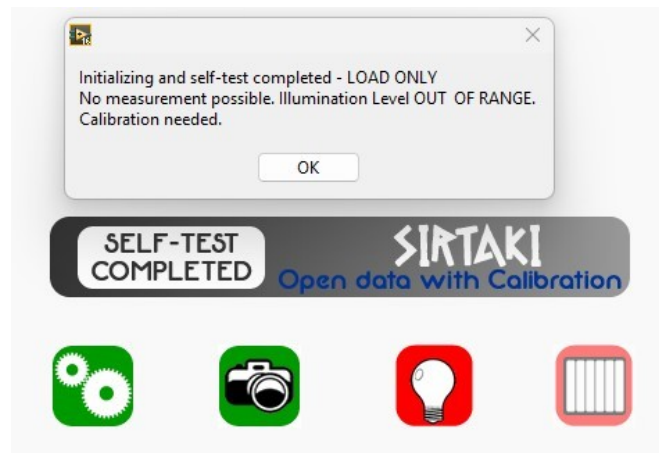


Figure 34: Dialog window if there is an issue with the illumination

Level is too low. The user will be able to check the calibration of SIRTAKI but not be able to acquire new data. If after calibration, the illumination is not correctly initialized, please contact Bossa Nova Vision.

STEP 4 is the detection and identification of the 6 trays (Figure 35).



Figure 35: Detection and identification of the 6 trays

If there is an issue with that step, a pop-up message appears (Figure 36).

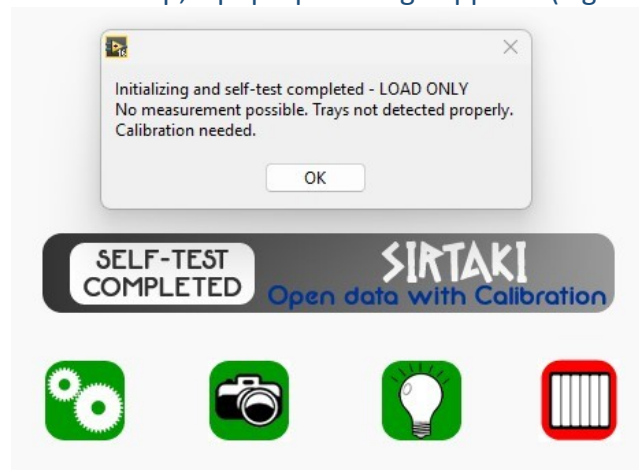


Figure 36: Pop-up message – Problem with trays detection/identification

The user will be able to check the calibration of SIRTAKI but not be able to acquire new data. If after calibration, the trays detection and identification is still failing, please contact Bossa Nova Vision.

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If all the steps are successful, a dialog window appears (Figure 37) indicating to the user that the initialization and self-test are successful. The user can also notice that all indicators are green, all the trays are identified and the image acquisition is authorized.

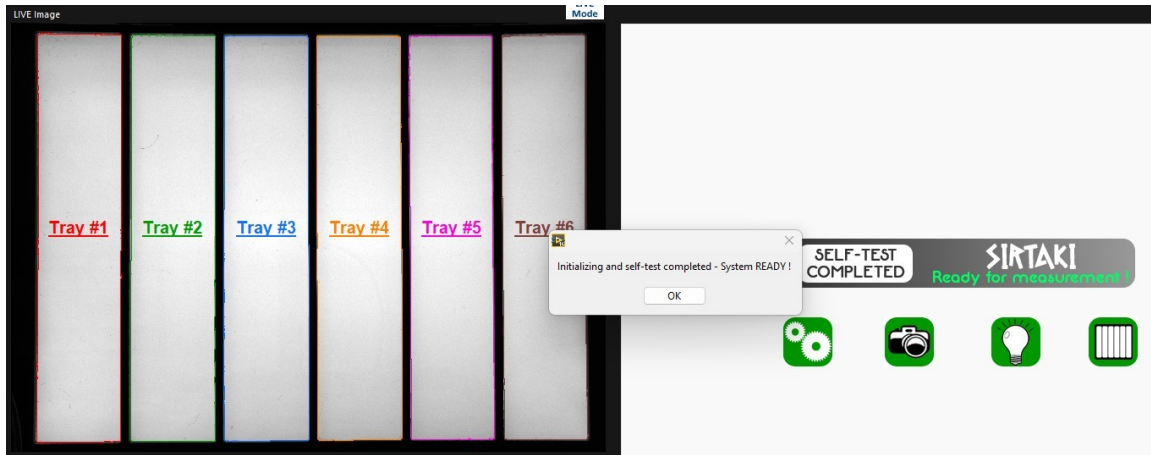


Figure 37: Window – Initialization and self-test successful

In case the camera and/or the motor are not detected and/or operating, the user will only be able to visualize and process old data (Figure 38).

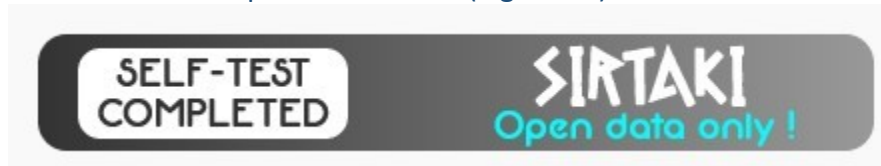


Figure 38: LOAD ONLY – No calibration

The user will not be able to run any calibration.

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2.2. MAIN WINDOW architecture

The main window is presented on Figure 39.

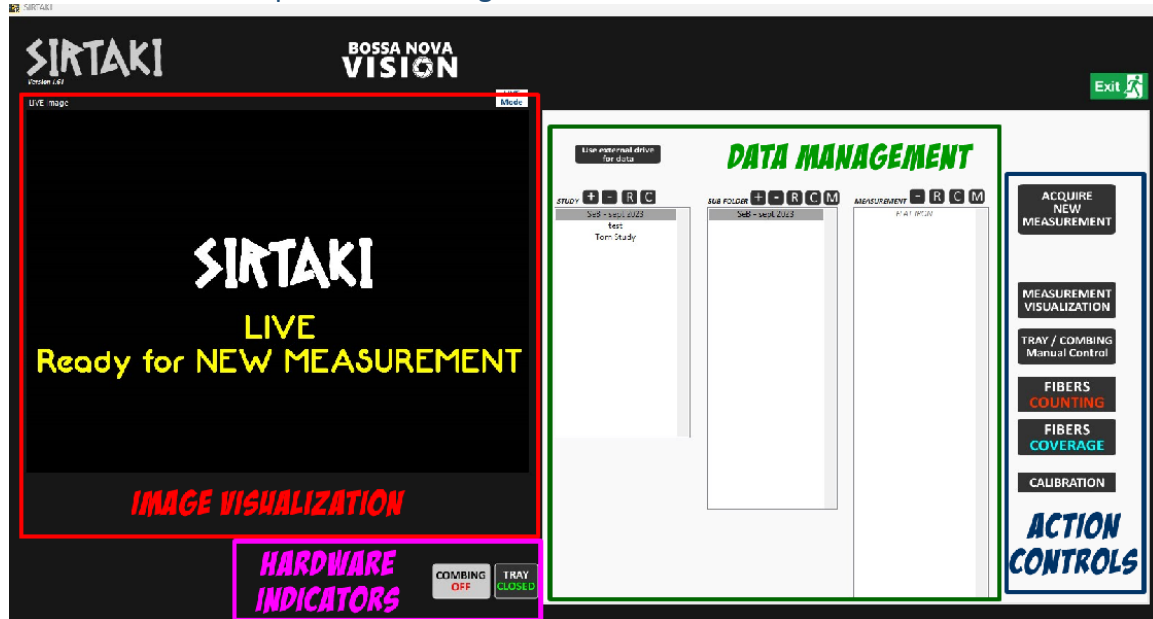


Figure 39: SIRTAKI – Main window architecture

On the left of the window is the **IMAGE VISUALIZATION**. On the right of the **IMAGE VISUALIZATION** is the **DATA MANAGEMENT** window. On the right of the **DATA MANAGEMENT** are the **ACTION CONTROLS**, allowing to acquire new measurements, visualize measurements, process measurements (Fibers counting or coverage), manually control the tray and the combing and calibrate SIRTAKI. Under the image visualization are the **HARDWARE INDICATORS** that show if the combing is off or on, and if the tray is open or close.

On the top right of the window, at the top is the **EXIT SOFTWARE** control  to exit the software.

2.3. IMAGE VISUALIZATION

The left side of the main window consists of the image visualization (Figure 40) showing a live image of the tray **ONLY** when the tray is open.

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Figure 40: Image visualization - Tray

When the tray is closed and if **Live measurement & load data** is selected , the LIVE IMAGE shows (Figure 41) a *SIRTAKI – Live measurement – Ready for new measurement*.



Figure 41: Live measurement & load data - Image

If **Load data only** is selected , the image shows (Figure 42) a *SIRTAKI – no live measurement – Open data only image*.

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Figure 42: Load data only - Image

The indicator/control on the top right of the image shows . The controls allowing the acquisition of new data (image or video) are not visible. If the user clicks on , a pop-up window appears (Figure 43) asking the user to choose the operation mode similar to the start of the software.

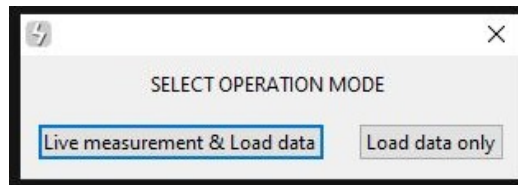


Figure 43: Live or load pop-up window

Choosing **Live measurement & load data** will trigger the hardware check-up procedure previously explained.

2.4. DATA MANAGEMENT

Data Management window allows to manage the data to be saved and processed (Figure 44). The user can create, delete, copy, rename, etc. different folders and measurements.

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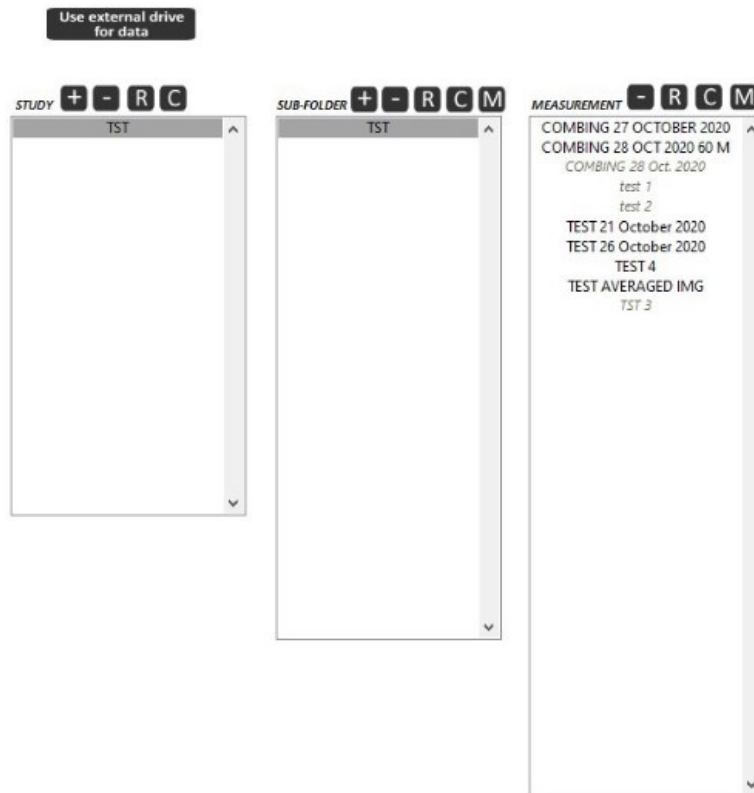


Figure 44: Data Management window

3 lists are present:

- Study
- Sub-folder
- Measurements

These correspond to list of folders where the raw data are saved. If a measurement has not been processed, it appears in *grey italic* in the list (Figure 45).



Figure 45: Measurement List – Processed and not processed

If the measurement has only been processed manually, it will appear in *blue italic*.

If the measurement has only been processed automatically, it will appear in *green italic*.

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Processed measurements (manual and auto) are in normal and black font.

On top of each list are controls: **+ - R C M**

The + and – controls **+ -** allow to CREATE and DELETE folder.

The R control **R** allows to RENAME a folder.

The C control **C** allows to COPY a folder.

The M control **M** allows to MOVE a folder.

2.4.1. CREATE

Clicking on the plus control **+** triggers a pop-up window asking for the name of the new study or the new sub-folder (Figure 46).



Figure 46: New study or new sub-folder name

Clicking on the cancel control **Cancel** will cancel the creation of the new study or sub-folder and close the pop-up window.

2.4.2. DELETE

Clicking on the minus control to delete a study, sub-folder or a measurement will trigger a pop-up window asking the user to confirm (Figure 47).

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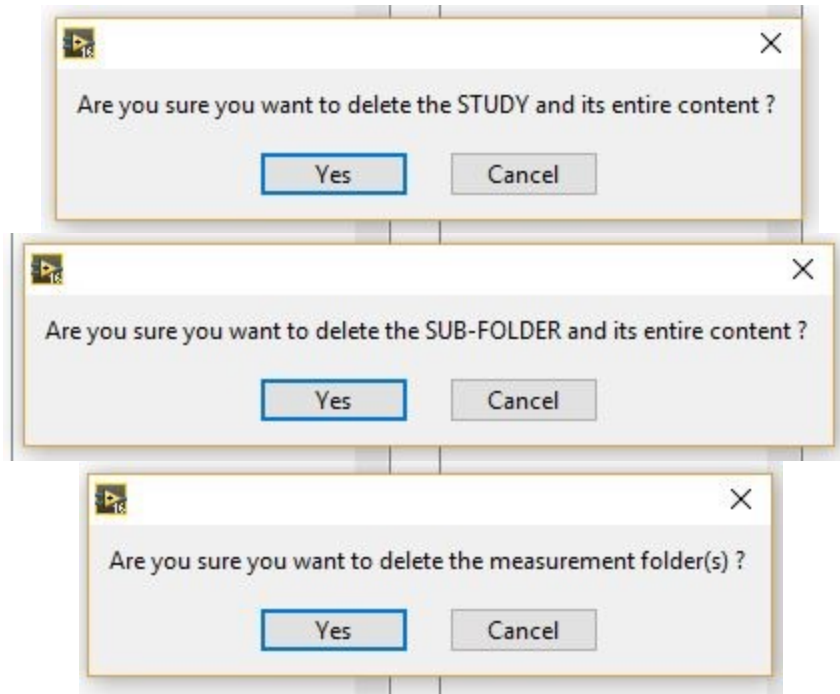


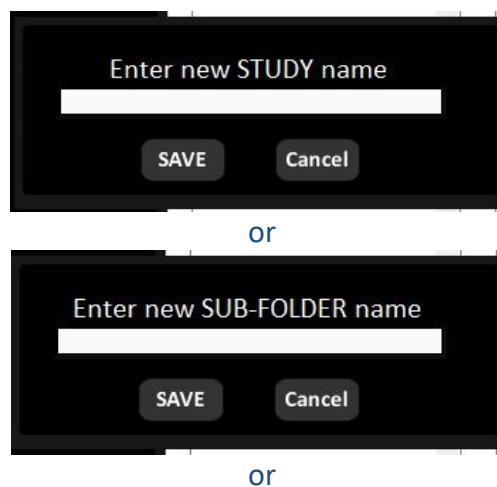
Figure 47: Pop-up window for deleting Study, Sub-folder or measurement

Note that when a folder is deleted, everything it contains is also deleted. For example, if the user deletes a study folder, the sub-folders and measurements folder contained in the study will also be deleted.

2.4.3. RENAME

The user can rename a study, a sub-folder or a measurement. Clicking on the R control

R triggers a pop-up window (Figure 48) to enter the new name.



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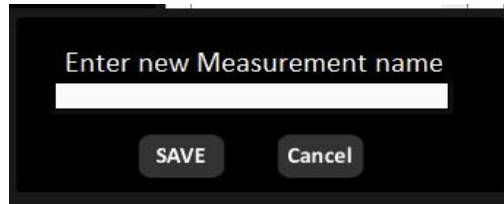


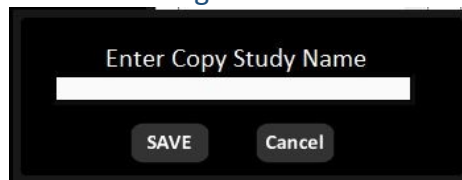
Figure 48: pop-up window for renaming study, sub-folder or measurement



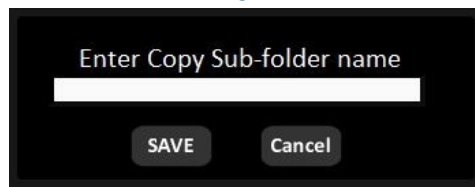
Clicking on the cancel control will cancel the renaming of the study, sub-folder or measurement and close the pop-up window.

2.4.4. COPY

The user can copy a study (and all its contents), a sub-folder (and all its contents) or a measurement. Clicking on the C control  triggers a pop-up window to enter the name of the copy (Figure 49). Note that the original remains the same.



or



Or

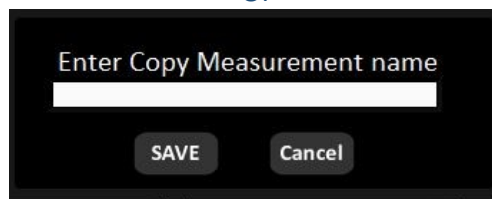


Figure 49: Pop-up window for copying study, sub-folder or measurement



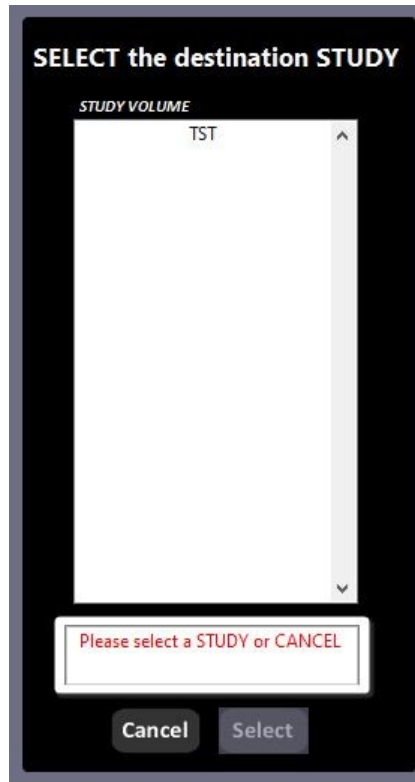
Clicking on the cancel control will cancel the copying of the study, sub-folder or measurement and close the pop-up window.

Note that the copy will be in the same location i.e. a sub-folder cannot be copied to a different study or a measurement cannot be copied to a different sub-folder. The control Move needs to be used for that purpose.

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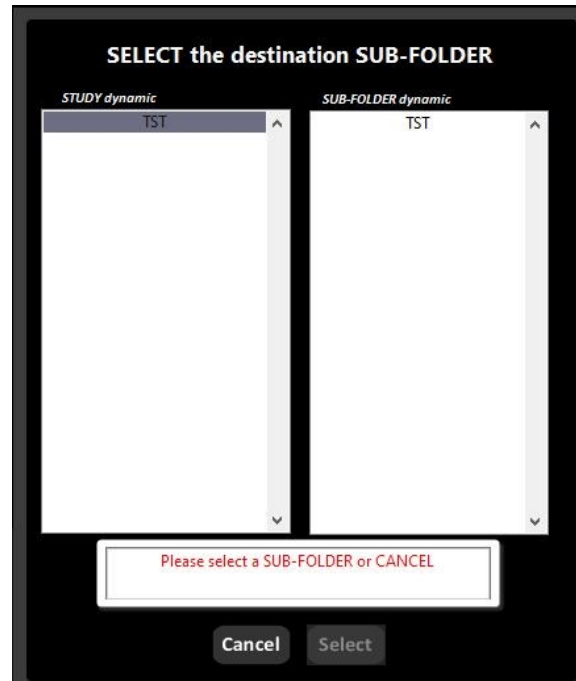
2.4.5. MOVE

The user can move a sub-folder (and all its contents) to a different study or several measurement to a different sub-folder. Clicking on the M control  opens a pop-up window (Figure 50).



Move sub-folder to a different study

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Move Measurement(s) to a different sub-folder

Figure 50: Pop-up window for the destination selection



Clicking on the cancel control will cancel the move of sub-folder or measurement and close the pop-up window.

If the sub-folder already exists in the study or if the measurements already exists in the sub-folder, a message appears (Figure 51).



Figure 51: Sub-folder or measurements already present

2.5. ACTION CONTROLS

Action controls (Figure 52) allow to:

- acquire new data
- process data
- visualize data
- export data



Figure 52: Action controls

2.5.1. ACQUIRE NEW MEASUREMENT



Acquire New Measurement control allows to acquire new tray images while the swatches are combed.

2.5.2. MEASUREMENT VISUALIZATION



The visualization control allows the user to visualize the data of the selected measurement by opening the visualization window.

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2.5.3. TRAY/COMBING Manual Control

TRAY / COMBING
Manual Control

The TRAY/COMBING Manual control allows the user to manually control the opening/closing of the tray and to switch on/off the combing (by opening a tray/combing manual control window). This control can be used:

- To easily remove the plastic tray to clean it or inspect it
- to adjust the speed of the rotation

2.5.4. FIBERS COUNTING PROCESSING

FIBERS
COUNTING

The manual processing control allows the user to manually process the data of the selected measurement by opening the Manual processing window.

2.5.5. FIBERS COVERAGE PROCESSING

FIBERS
COVERAGE

The automatic processing control allows the user to automatically process the data of the selected measurement by opening the automatic processing window.

2.5.6. CALIBRATION

CALIBRATION

The calibration control allows the user to open the calibration window, allowing the adjustment of the cropped image (Xstart and Zstart) and the camera exposure.

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3. ACQUIRE NEW MEASUREMENT

To acquire a new measurement, software must be in live mode  and the hardware test must have been completed successfully for the camera and the illumination. In Load mode , the acquire new measurement control is not visible.

Clicking on **Acquire new measurement** control  will open the measurement page. However, if no study or sub-folder is selected, the new measurement cannot be done and a pop-up window appears (Figure 53).

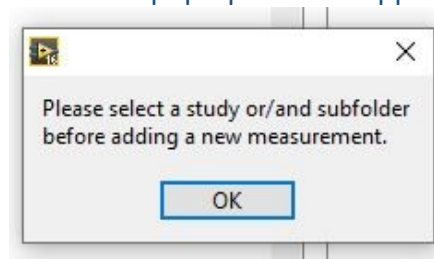


Figure 53: Pop-up window asking for a study/sub-folder selection before adding a new measurement

When the study/sub-folder selection is correct, a new measurement can be done. The measurement page appears once the **Acquire new measurement** control is clicked (Figure 54).

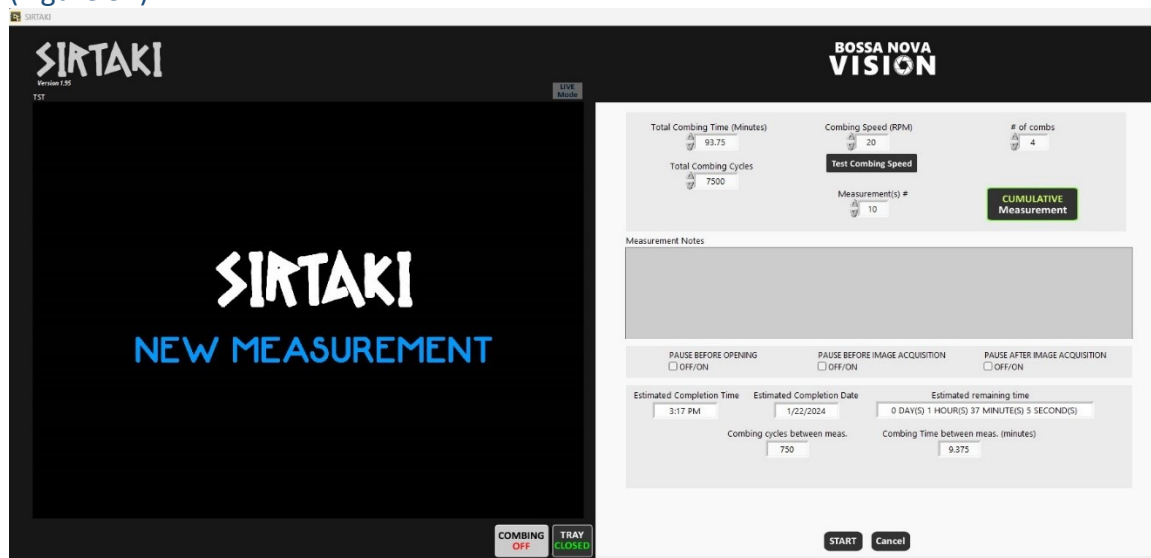


Figure 54: New measurement window

Figure 55 shows the different controls and indicators.

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The screenshot displays the SIRTAKI control interface with the following elements:

- Parameters Section:**
 - Total Combing Time (Minutes): 93.75
 - Combing Speed (RPM): 20
 - # of combs: 4
 - Total Combing Cycles: 7500
 - Measurement(s) #: 10
 - A **Test Combing Speed** button is located between the speed and measurement fields.
 - A **CUMULATIVE Measurement** button is highlighted in green on the right.
- Measurement Notes:** A large gray rectangular area for notes.
- Pause Options:** Three checkboxes labeled "PAUSE BEFORE OPENING", "PAUSE BEFORE IMAGE ACQUISITION", and "PAUSE AFTER IMAGE ACQUISITION", each with an "OFF/ON" toggle.
- Estimated Completion Time:** 3:17 PM
- Estimated Completion Date:** 1/22/2024
- Estimated remaining time:** 0 DAY(S) 1 HOUR(S) 37 MINUTE(S) 5 SECOND(S)
- Combing cycles between meas.:** 750
- Combing Time between meas. (minutes):** 9.375
- Buttons:** "START" and "Cancel" buttons at the bottom.

Figure 55: Controls/Indicators

The user can adjust the different parameters:

- The total combing time, in minutes
- The total combing cycles
- The combing speed i.e. rotation per minutes (between 10 to 40)
- The number of combs used (usually 4) per channel
- The number of measurements i.e. number of tray images to be acquired
- The CUMULATIVE or NON-CUMULATIVE measurement (detailed in the following paragraph)

The combing frequency is $\text{COMBING SPEED (RPM)} \times \text{\# OF COMBS} / 60$. Combing speed varies from 10 to 40 RPM, corresponding to a combing frequency (for 4 combs) varying between 0.67 Hz and 2.67 Hz. 30 RPM with 4 combs delivers a combing frequency of 2 Hz. The total combing cycles is $\text{TOTAL COMBING TIME} \times \text{RPM} \times \text{\# of combs}$. For a combing time of 60 minutes, at 30 rpm for 4 combs, the total combing cycles is 7,200.

The user can now select between **CUMULATIVE** and **NON-CUMULATIVE** measurement:

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- **CUMULATIVE** Measurement: SIRTAKI takes a reference image at the start of the measurement. Each time the tray opens and an image of the tray is taken, there is no need to be present as the broken fibers will accumulate on the tray (unless some pause buttons are activated). CUMULATIVE Measurement does not need to have the user present during the full measurement. The user starts the measurement process and does not need to be around the system while the tray opens and closes.

- **NON-CUMULATIVE** Measurement: SIRTAKI takes a reference image at the start of the measurement. Each time the tray opens, an image of the tray with broken fibers is taken, then a pop-up message appears, asking the user to **clean the tray and remove the broken fibers**, as a new reference image will be taken before closing the tray. This allows to acquire NON-CUMULATIVE images with less broken fibers. NON-CUMULATIVE Measurement needs the presence of the user to clean the tray and remove the broken fibers each time the tray opens.

REMARK: We recommend to use the CUMULATIVE option coupled with the FIBER COVERAGE processing as usually many broken fibers accumulate in the tray. This option leads to a difficult FIBERS COUNTING processing as many fibers will have to be traced manually. On the contrary, the NON-CUMULATIVE option which requires the presence of the user to clean the tray and remove the broken fibers allows an easy FIBERS COUNTING processing as the fibers counting is almost fully automated. Of course, FIBERS COVERAGE processing works well with this option.

The user can add some notes (Measurement Notes) about the measurement.

The user can also select 3 pause options during the measurement:

- Pause BEFORE opening of the tray: SIRTAKI will stop combing. This option is used if the user wants to clean the combs and remove any broken fibers stuck in the combs.
- Pause BEFORE image acquisition: SIRTAKI will stop combing and the tray will open. This option is used if the user wants to re-arrange the broken fibers in case some are too long and between trays.
- Pause AFTER image acquisition: SIRTAKI will stop combing, the tray will open and the image will be taken. This option is used if the user wants to take a break in the measurement or clean the tray and remove the broken fibers as automatically selected for the NON-CUMULATIVE Measurement.

Note that if the NON-CUMULATIVE measurement is selected, the pause AFTER image acquisition is automatically selected.

The user can also test the combing speed by clicking on the test combing speed control

Test Combing Speed

. This will start the combing (Figure 56).

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The screenshot displays the SIRTAKI software interface with the following elements:

- Top Section:**
 - Total Combing Time (Minutes):** 93.75
 - Combing Speed (RPM):** 20
 - # of combs:** 4
 - Total Combing Cycles:** 7500
 - Measurement(s) #:** 10
 - STOP COMBING to START NEW MEAS.** (Yellow button)
 - CUMULATIVE Measurement** (Green button)
- Measurement Notes:** A large gray text area for notes.
- Pause Controls:**
 - PAUSE BEFORE OPENING:** ☐ OFF/ON
 - PAUSE BEFORE IMAGE ACQUISITION:** ☐ OFF/ON
 - PAUSE AFTER IMAGE ACQUISITION:** ☐ OFF/ON
- Estimated Completion Time:** 3:18 PM
- Estimated Completion Date:** 1/22/2024
- Estimated remaining time:** 0 DAY(S) 1 HOUR(S) 37 MINUTE(S) 5 SECOND(S)
- Combing cycles between meas.:** 750
- Combing Time between meas. (minutes):** 9.375

Figure 56: Test combing speed on

You can notice that while the combing is on, the user cannot start or cancel the measurement. The combing needs to stop before doing so, by clicking on Stop combing to start new meas. control.

Different indicators give the estimated completion time, data and remaining measurement time. 2 indicators gives the combing cycles between measurement (and the combing time between measurements).

To cancel the acquisition and go back to the data management page, the user clicks on

Cancel . Once the parameters are adjusted, to start the acquisition, the user clicks

on the start control . A pop-up message appears. The pop-up window asks for the number of measurements, their name and their position in the image (Figure 57).

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Figure 57: Pop-up window – Measurement name

Once the measurement name is entered, the user click on save (or cancel to cancel the measurement) and the measurement window appears (Figure 58).

The Measurement window displays the following information:

- Measurement Parameters:**
 - Total Combing Time (Minutes): 93.75
 - Combing Speed (RPM): 20
 - # of combs: 4
 - Total Combing Cycles: 7500
 - Measurement(s) #: 10
 - CUMULATIVE Measurement** (highlighted in green)
- Measurement Notes:** A large text area for notes.
- Pause Controls:**
 - PAUSE BEFORE OPENING: ☐ OFF/ON
 - PAUSE BEFORE IMAGE ACQUISITION: ☐ OFF/ON
 - PAUSE AFTER IMAGE ACQUISITION: ☐ OFF/ON
- Estimated Completion Time:** 3:18 PM
- Estimated Completion Date:** 1/22/2024
- Estimated remaining time:** 0 DAY(S) 1 HOUR(S) 37 MINUTE(S) 5 SECOND(S)
- % COMPLETION:** A progress bar showing the current status of the measurement.
- Next Measurement:** A field for scheduling the next measurement.
- ABORT MEASUREMENT:** A prominent yellow button to stop the measurement.

Figure 58: Measurement window

Different indicators (Figure 59) give the estimated completion time, data and remaining measurement time.

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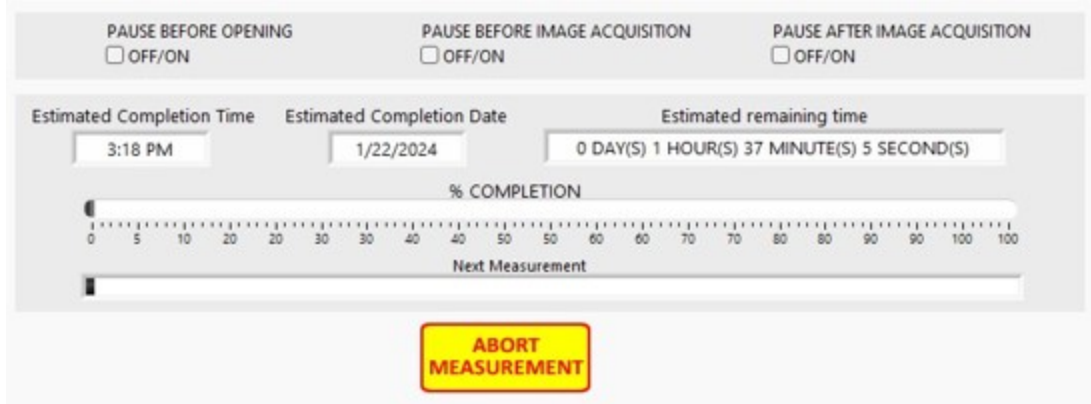


Figure 59: Indicators

A progression bar gives the % of completion of the measurement. Another progression bar gives the time when the next measurement will be done. An ABORT MEASUREMENT

control  allows to abort the measurement and go back to the data management window. If the user clicks on ABORT, a pop-up window asks the user to fully delete or save the data up to the ABORT point (Figure 60).

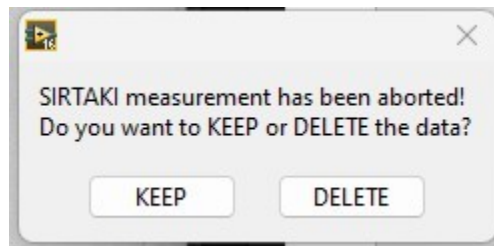


Figure 60: Abort – Pop-up message

The 3 PAUSE MEASUREMENT controls allow to pause the combing process. When PAUSE BEFORE OPENING is selected, a pop-up message appears before the tray opens, asking to CLEAN the combs or to resume the operation (Figure 61)

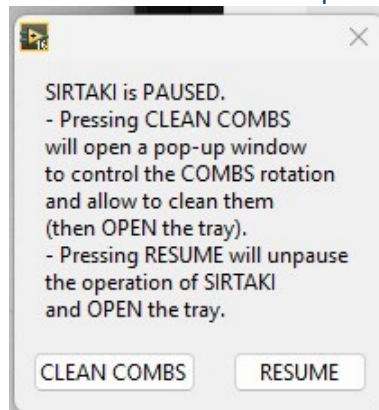


Figure 61: Pop-up message – PAUSE BEFORE OPENING

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If the user clicks on CLEAN COMBS, a new window opens (Figure 62) allowing the user to rotate the combs by $\frac{1}{4}$, $\frac{1}{8}$ or $\frac{1}{16}$ rotation.



Figure 62: Clean combs – Combs rotation

Clicking on Back to business will resume the operation and open the tray.

If the user selects PAUSE BEFORE IMAGE ACQUISITION, once the tray is open, a pop-up message appears (Figure 63).

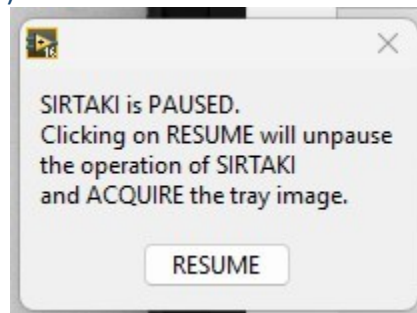


Figure 63: Pop-up message - PAUSE BEFORE IMAGE ACQUISITION

The user can re-arrange the broken fibers on the tray and click on RESUME when done.

When MOM-CUMULATIVE Measurement is selected, once the tray is open and the image is acquired, a pop-up message appears, asking the user to clean-up the tray and remove the broken fibers (Figure 64).

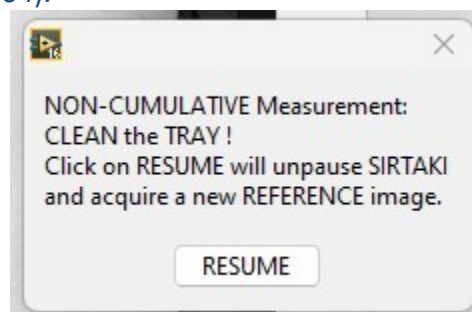


Figure 64: Pop-up message – Clean the tray

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Once done with the cleaning, the user clicks on RESUME and a new reference tray image is acquired.

**PLEASE NOTE THAT FOR EACH TRAY IMAGE
ACQUIRED, THE TRAY WILL OPEN AND CLOSE.
BE SURE THERE IS NOTHING IN THE WAY!**

4. MEASUREMENT VISUALIZATION

The data visualization window allows to visualize the results of a single selected measurement. When the user selects a measurement in the data measurement window

and clicks on the measurement visualization control

**MEASUREMENT
VISUALIZATION**

, the visualization window opens (Figure 65).

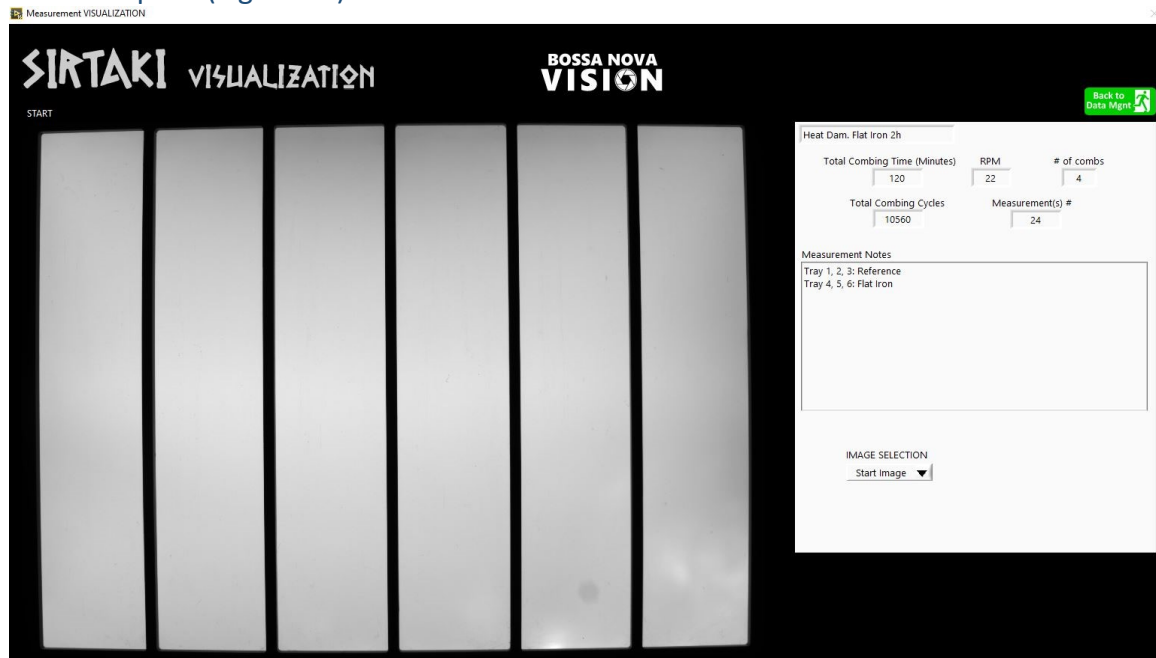


Figure 65: Measurement visualization window

On the left of the window is the image. On the right are the indicators and image selection control (Figure 66).

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COMBING 28 OCT 2020 60 M

Total Combing Time (Minutes)	RPM	# of combs
60	30	4
Total Combing Cycles	Measurement(s) #	
7200	60	

Measurement Notes

50 images average
60 measurements

IMAGE SELECTION

Start Image ▼

Figure 66: Indicators and image selection control

The indicators give the information about the measurement – Total combing time, RPM, etc. -. The image selection allows to visualize the image of the full tray before the combing (Start image), during the combing (Full image) and for each different compartments of the tray – noted tray 1 to tray 6 – (Figure 67).

IMAGE SELECTION

- ✓ Start Image
- FULL IMAGE
- Tray 1
- Tray 2
- Tray 3
- Tray 4
- Tray 5
- Tray 6

Figure 67: Image selection control

When the full image or any tray image is selected, the image # is visible allowing to select which image is visualized.

Image #

10

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The user can also zoom in and out (using the zoom tool on the left top corner of the image, and the shift key to zoom out) in the selected image (Figure 68)

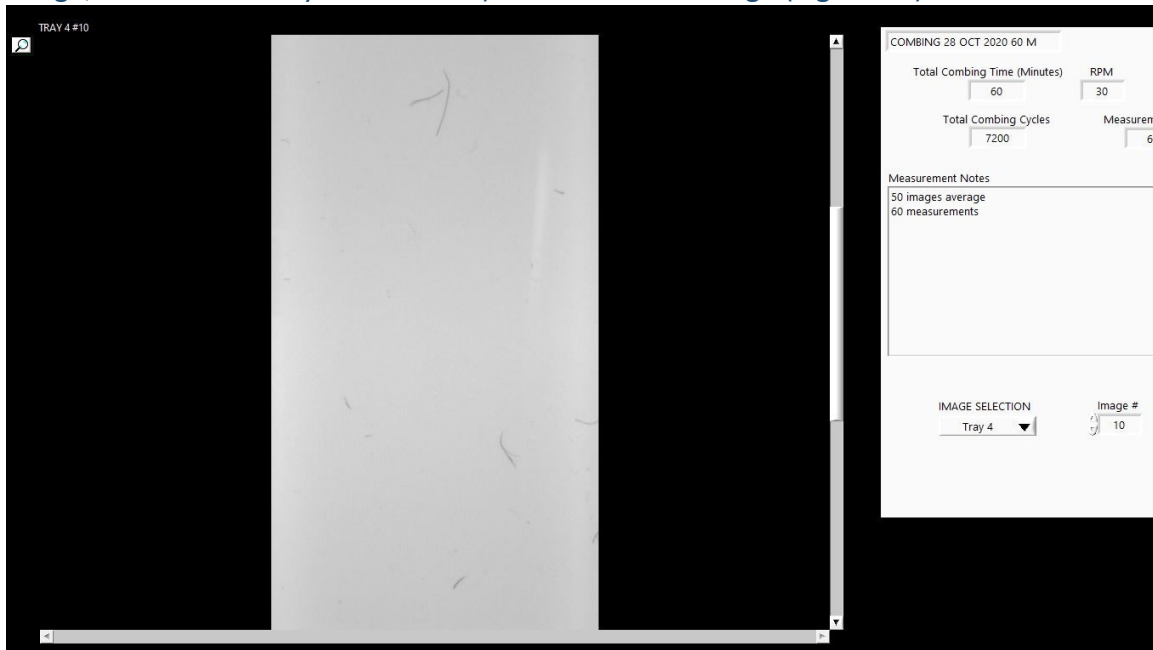


Figure 68: Zoom

5. TRAY/COMBING MANUAL CONTROLS

**TRAY / COMBING
Manual Control**

When the user clicks on TRAY/COMBING Manual control , the TRAY/MANUAL manual control window opens (Figure 69).

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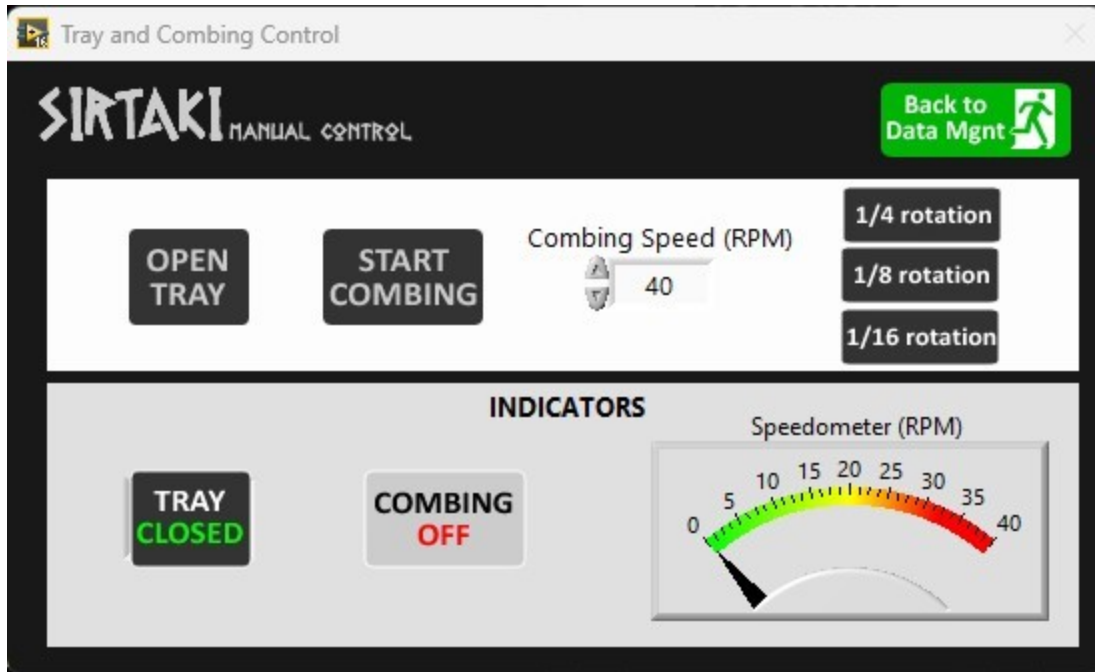


Figure 69: TRAY/MANUAL manual control

The controls are self-explanatory and allow to open/close the tray and start/stop the combing while adjusting the RPM (from 10 to 40). The 3 controls on the right allow to rotate the combing wheel by a quarter, an eighth or a sixteenth revolution. The user can quit the window and go back to the main window only if the tray is closed and/or the combing is off.

The manual controls of the tray and combing are used to adjust and test the combing speed, check and clean the tray, etc.

6. FIBERS COUNTING PROCESSING

This processing method is semi-automatized and depending on the number and size of the broken fibers, the user will have to finalize the fibers counting manually using the software. This technique is very powerful as the broken fibers will be detected and identify, leading to the measurement of their respective length and position for complex statistical analysis of the breakage rate.



If the user clicks on fibers counting processing control without having selected a measurement, the pop-up message appears (Figure 70).

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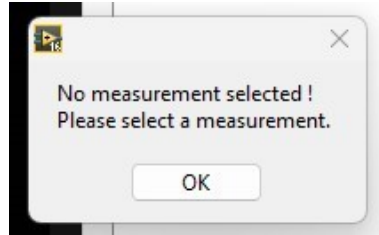


Figure 70: pop-up message – No measurement selected

When the user clicks on fibers counting processing control **FIBERS COUNTING** while a measurement is selected, a pop-up message appears, if the data are not processed yet (Figure 71).

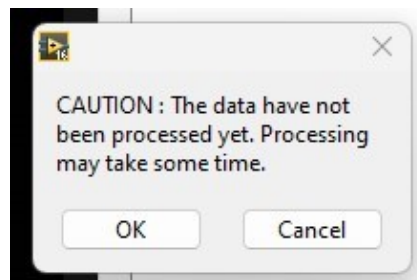


Figure 71: Pop-up message – Data not processed

If the data were already processed, another pop-up message appears (Figure 72)

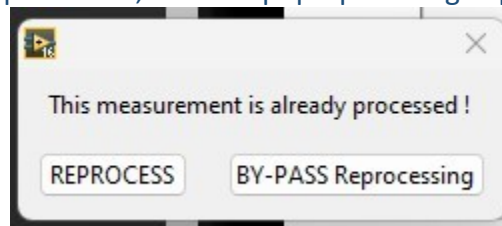


Figure 72: Pop-up message – Data already processed

Clicking on OK (or REPROCESS) will start the processing. The following window appears (Figure 73). Clicking on By-BASS Reprocessing will by-pass the processing and go directly to the fibers counting results window.

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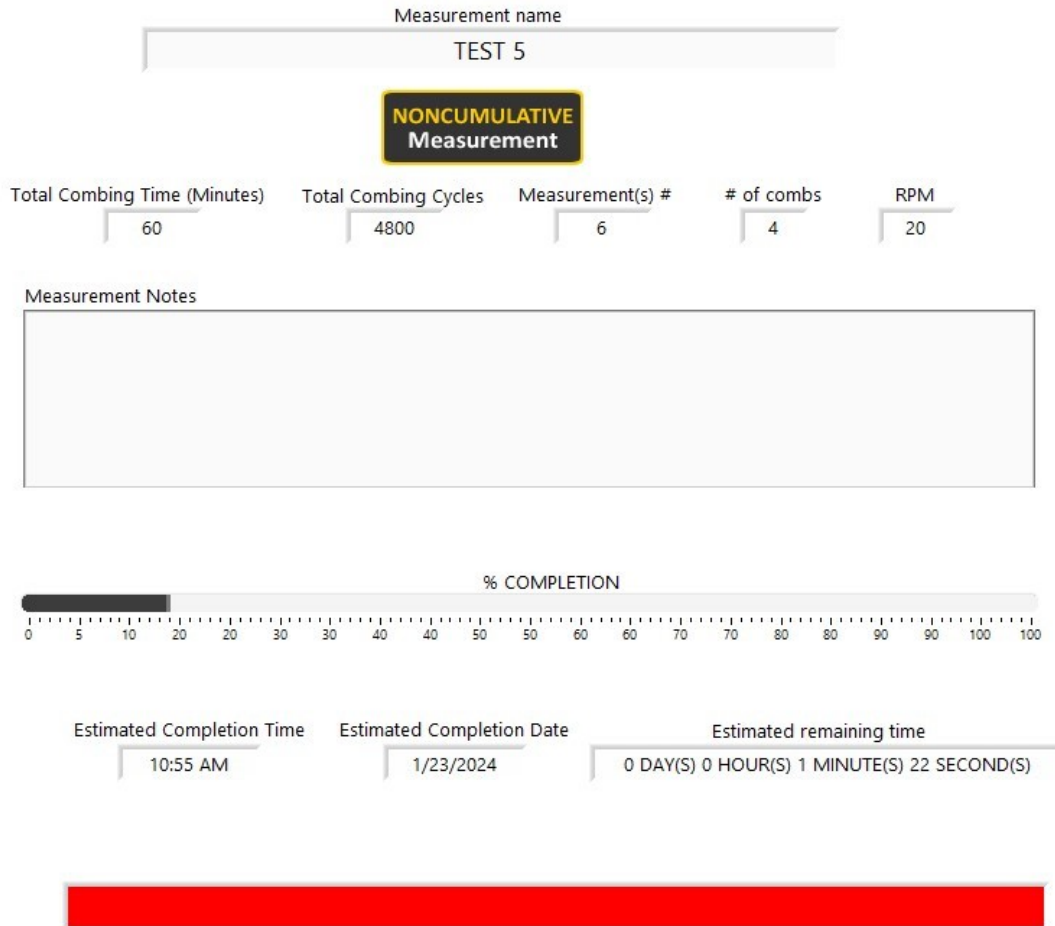


Figure 73: Fibers counting in progress

The fibers counting window shows the information about the current measurement processed. Below the information is the completion progress bar and the estimated completion time. A blinking message indicates that the software is in automatic detection and identification of broken fibers mode. Once the processing is completed, a new window appears, showing the status of the fibers counting (Figure 74).

6.1. Fibers counting status

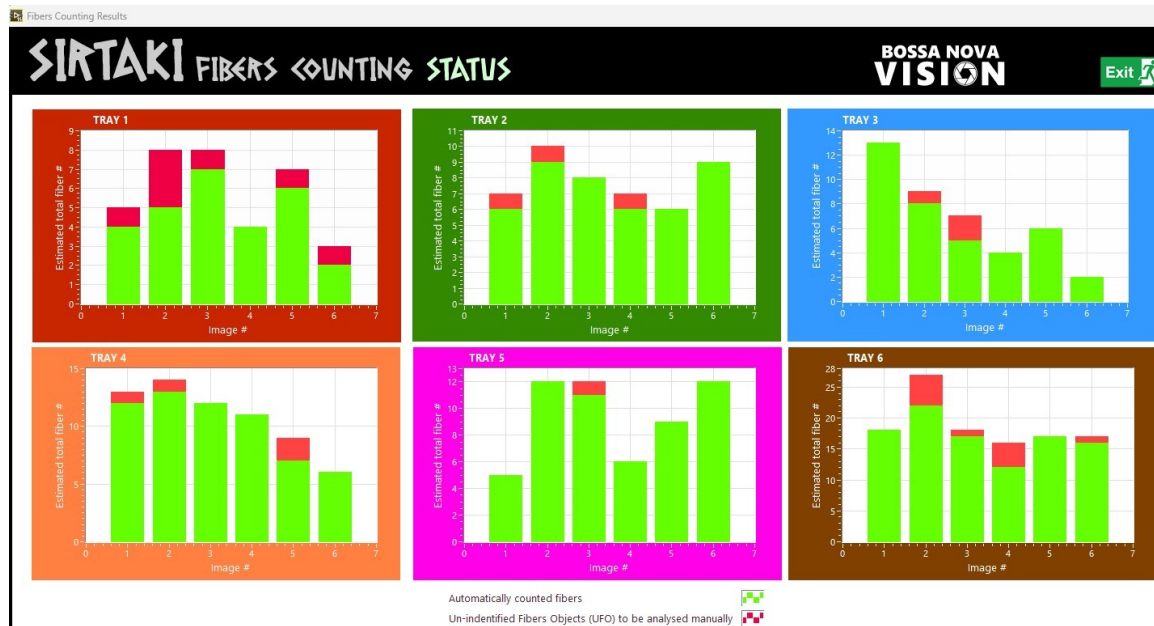


Figure 74: Fibers counting status

The fibers counting status window shows 6 graphs, corresponding to the 6 trays. Each graph shows the number of fibers versus the images acquired. In the example above, only 3 images have been acquired (Figure 75).

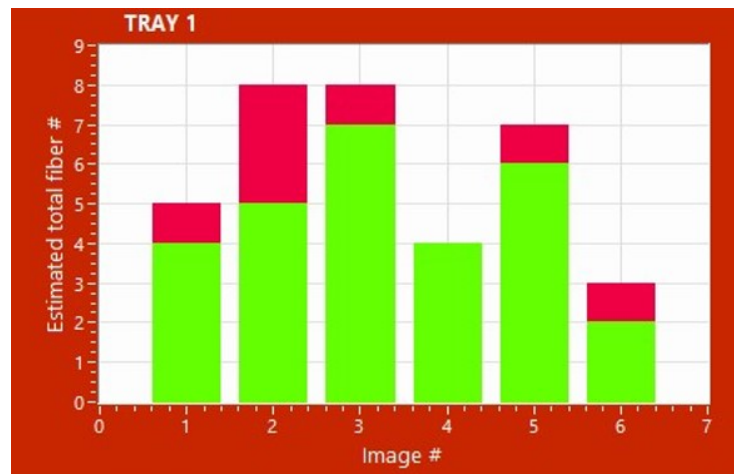


Figure 75: Fibers # versus image # graph

Each graph shows in GREEN, the number of fibers detected and identified, in RED, the number of fibers detected but un-identified. The Un-identified Fiber Objects or UFOs will need to be traced manually by the user.



When the user clicks on , the Fibers counting main window appears (Figure 76).

6.2. Fibers counting main window

The fibers counting main window is shown below.

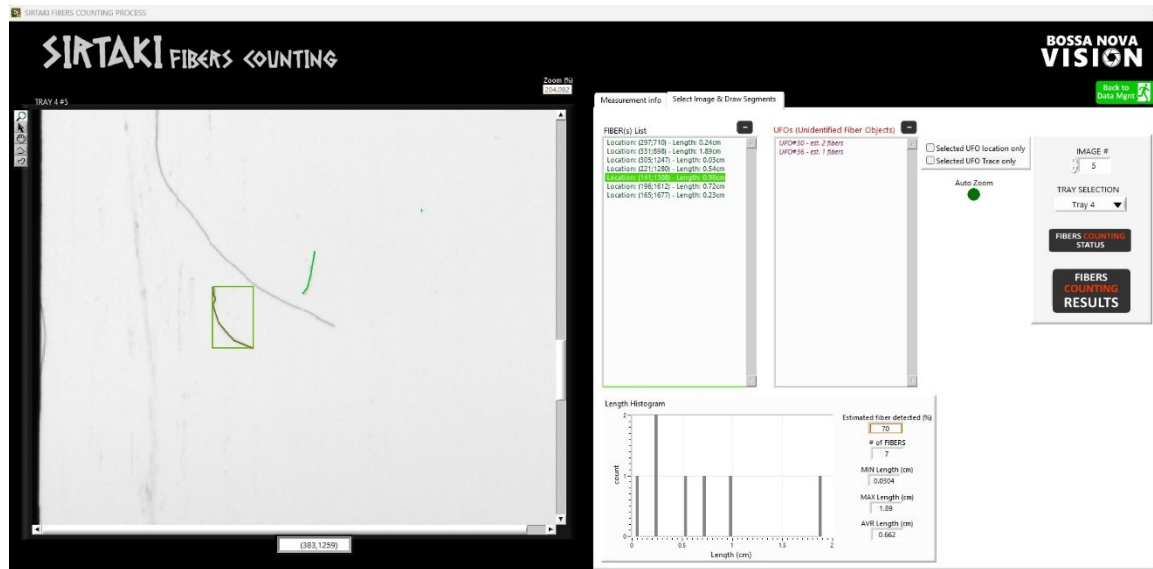


Figure 76: Fibers counting main window

On the left of the window is the image of the tray, with the zoom info on the top right, the tool box on the top left and the cursor position indicator at the bottom (Figure 77).

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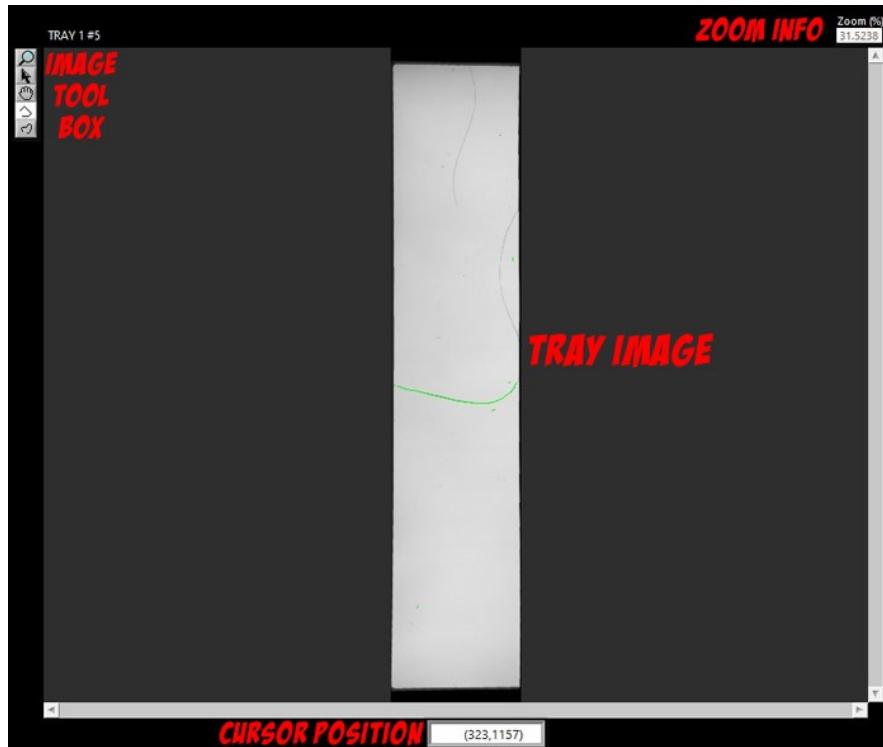


Figure 77: Image with tool box and indicators

The cursor position indicates the position of the cursor. It is very useful as the fibers are defined by their location and their length. The user can right clicks on the image and select the zoom to fit option to reduce the zoom value and to show the tray image in full (Figure 78).

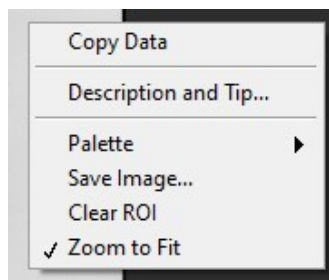


Figure 78: Zoom to fit

The tool box presented on Figure 79 allows to zoom on the image, select segment, move in the image, draw segments or draw free-hand.



Figure 79: Image tool box

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On the right on the window is the tab control that allow to navigate between two windows (Figure 80).

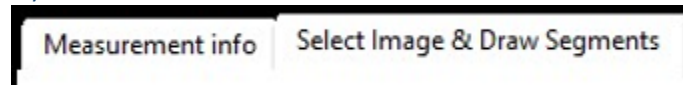


Figure 80: Tabs control

The first tab is the measurement info (Figure 81).

6.2.1. Measurement info

 A screenshot of the 'Measurement info' window. At the top, there are two tabs: 'Measurement info' (active) and 'Select Image & Draw Segments'. Below the tabs, the window displays the following information:

- Measurement name:** TEST 5
- Measurement type:** NONCUMULATIVE Measurement (highlighted in a yellow box)
- Parameters:**

Total Combing Time (Minutes)	Total Combing Cycles	Measurement(s) #	# of combs	RPM
60	4800	6	4	20
- Measurement Notes:** A large, empty text area for entering notes.

Figure 81: Measurement info

The measurement info window shows the different parameters of the measurement (Combing time, Combing cycles, etc.) and the measurements notes. The Select Image/Tray and Draw segments tab is shown on Figure 82.

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6.2.2. Select Image and Draw segments

The Select Image/Tray and Draw segments tab is shown below.



Figure 82: Select Image/Tray - Draw segments

That window is showing many controls and indicators. On the top right are the controls (Figure 83).

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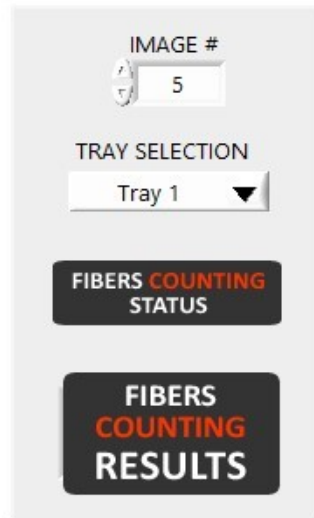
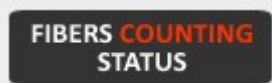


Figure 83: Fibers counting - Controls



The processing status control that opens the Fibers counting status window (as shown in Figure 74) showing the number of broken fibers per tray that need to be manually traced. It is updated each time and allows to simply visualize the tracing to be done before completion. The image # and Tray selection control allow the



visualization of the different images of the tray acquired. The last control opens a new window that shows the results of the fibers counting, to be detailed in the following.

Each time the user select an image, the two lists are updated:

- The list on the left is the **FIBERS** list that gives the location and the length of each fibers automatically processed.
- The list on the right is the **Unidentified Fiber Objects (UFOs)** that shows the different object and their estimated number of fibers they contain. This list is the one that the user will have to work with by tracing each segment/fiber contained in each object and when done, delete the object that has been traced using the delete  control.
- The graph under the list is the histogram of the fibers length, updated each time an image # or tray # is updated.

If the user clicks on any of the FIBER(s) list to select a name, the corresponding segment region of interested appears in green (Figure 84).

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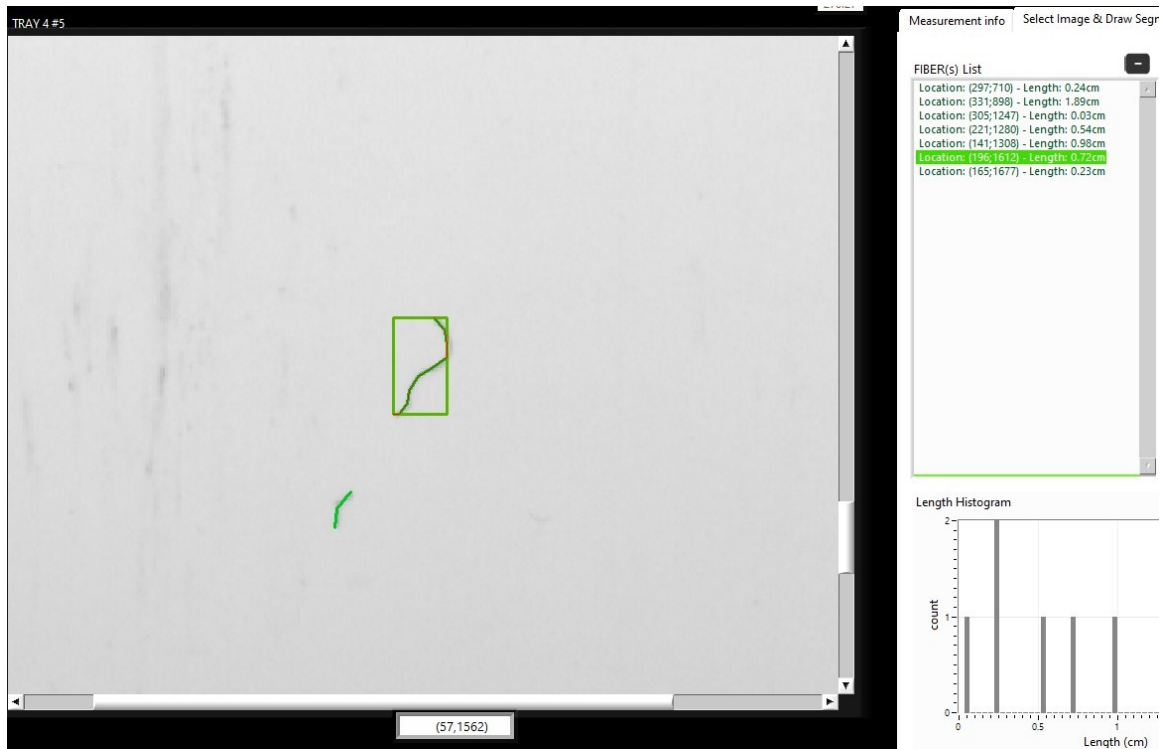


Figure 84: Fiber(s) list selected

You can see the position of the cursor that corresponds to the position of the selected fiber. Using the tool box, the user can zoom on the image using the zoom tool, change the segment using the arrow tool, move in the image using the hand tool, or trace a new segment or trace free-hand. We do not recommend using the 2 last tools for the Fiber(s) list as these tools are used for the UFOs. Because the fibers in that list were automatically detected, there is no need to modify them.

The UFOs list is the one that will required the most work as the user needs to trace each of the UFO (Figure 85).

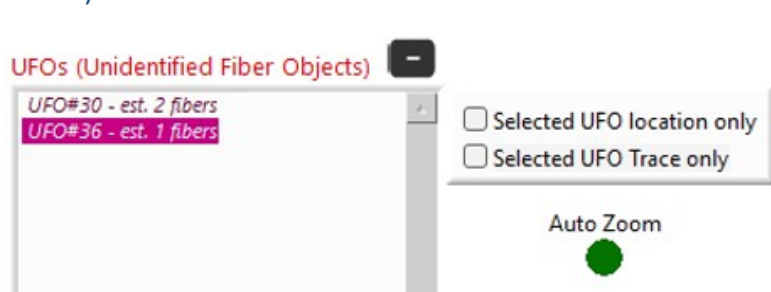


Figure 85: UFOs list

On the right top of the list are 2 overlay controls (Figure 86).

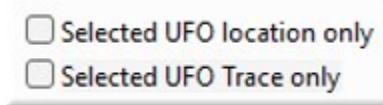


Figure 86: overlay controls

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The list shows an estimation of the fibers composing the UFO. If the user selects one UFO, it appears in red on the image (Figure 87).

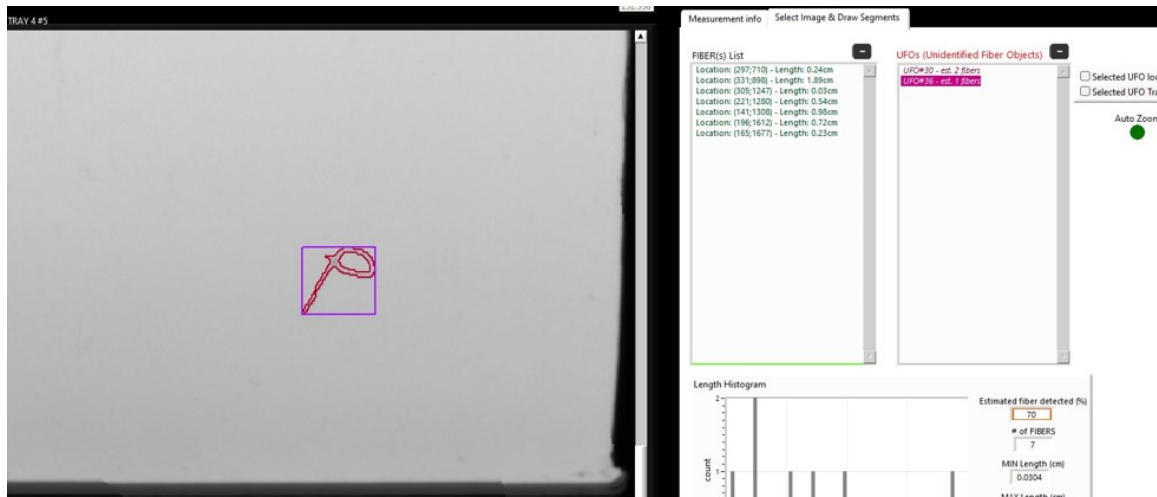


Figure 87: All objects overlay (in red)

If AUTO ZOOM is selected, each time a fiber or an UFO is selected, the zoom will automatically locate and adjust its value to show the selection in the image (Figure 88).

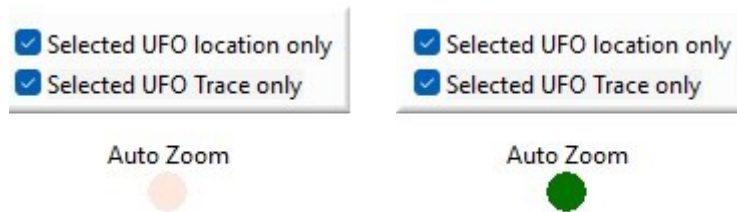


Figure 88: AUTO ZOOM (OFF and ON)

Once the user has selected an UFO, he can manually trace it using the segment or free hand tool. The selected UFO is shown on Figure 89.

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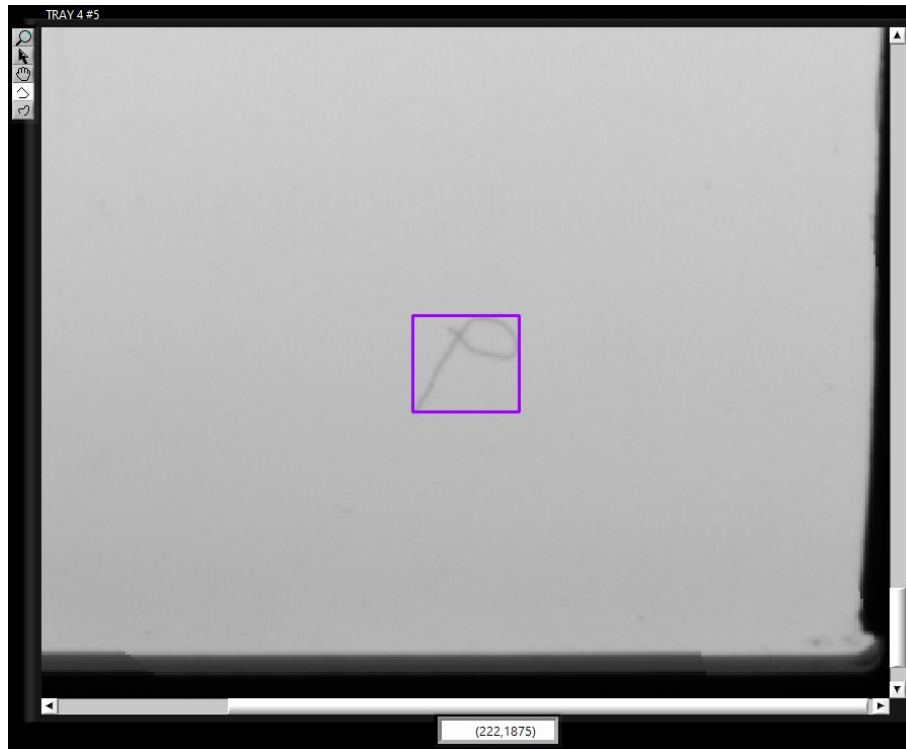


Figure 89: Manual tracing

Using the segment tracing tool, the user traces the segment of the UFO (Figure 90).

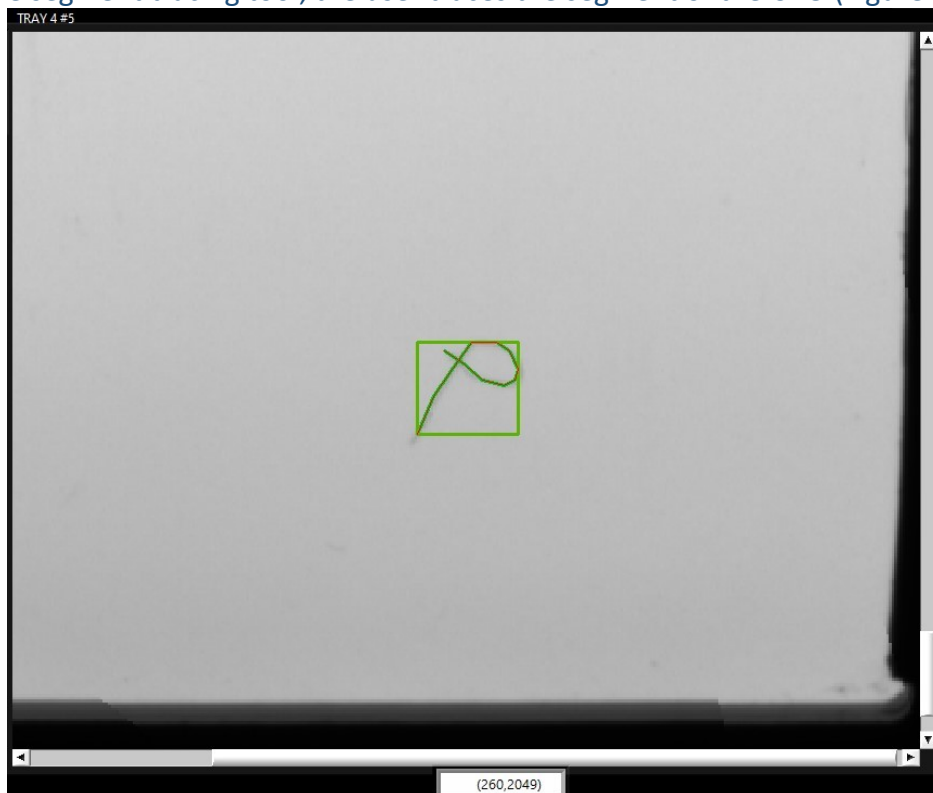


Figure 90: Segment tracing

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The Fibers list is updated each time a segment is traced. Note that sometimes an UFO can just be a small dust particle and needs to be ignored. Once all the segments have been traced or ignored in an UFO, the user needs to manually delete the corresponding UFO using the  control. If the user traces all the segments of the ufo but forgets to delete the ufo, it will still appear in the list and on the fibers counting status. The tracing has to be done for each images of each tray. To monitor the status of the tracing, the user can click on the processing status control as shown below where all the ufos are now identified and traced - No more red -, as shown on Figure 91.



Figure 91: fibers counting status – Tracing done!

6.3. Fibers Counting Results

Once every UFO has been manually processed, the user can check the results of the test



by clicking on the  controls and the Fibers counting results window appears (Figure 92).

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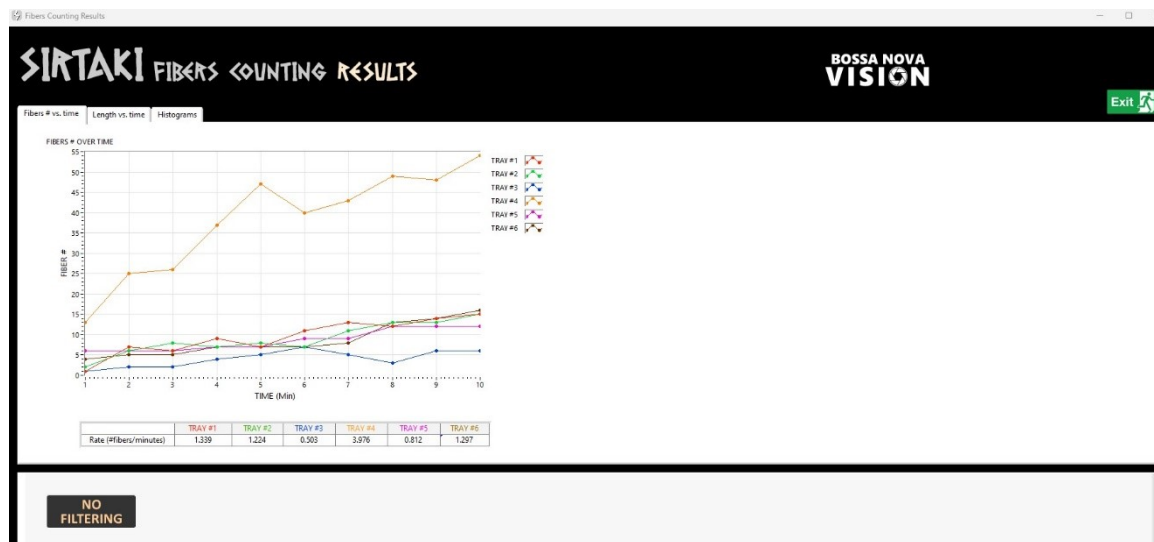


Figure 92: Fibers counting results window

3 tabs allow to visualize different graphs (Figure 93).

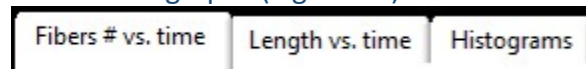


Figure 93: Fibers counting tabs

The user can visualize the number of fibers versus time (Figure 94).

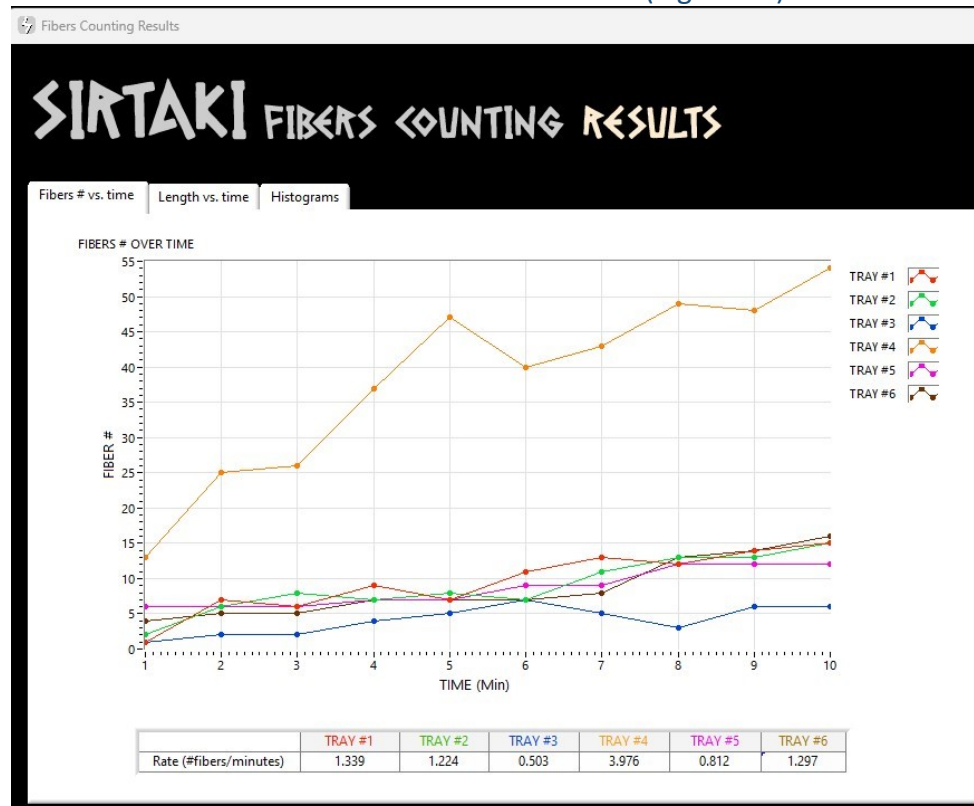


Figure 94: Number of fibers versus time

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The graph shows the variation of the number of broken fibers in each tray versus time. An estimation of the linear rate (# fibers per minute) is showed in the table below the graph. Figure 95 shows the lengths of the fibers for each tray versus time (average, min and max).



Figure 95: Length versus time

The last tab shows the histogram of the length for an image and a tray (Figure 96).

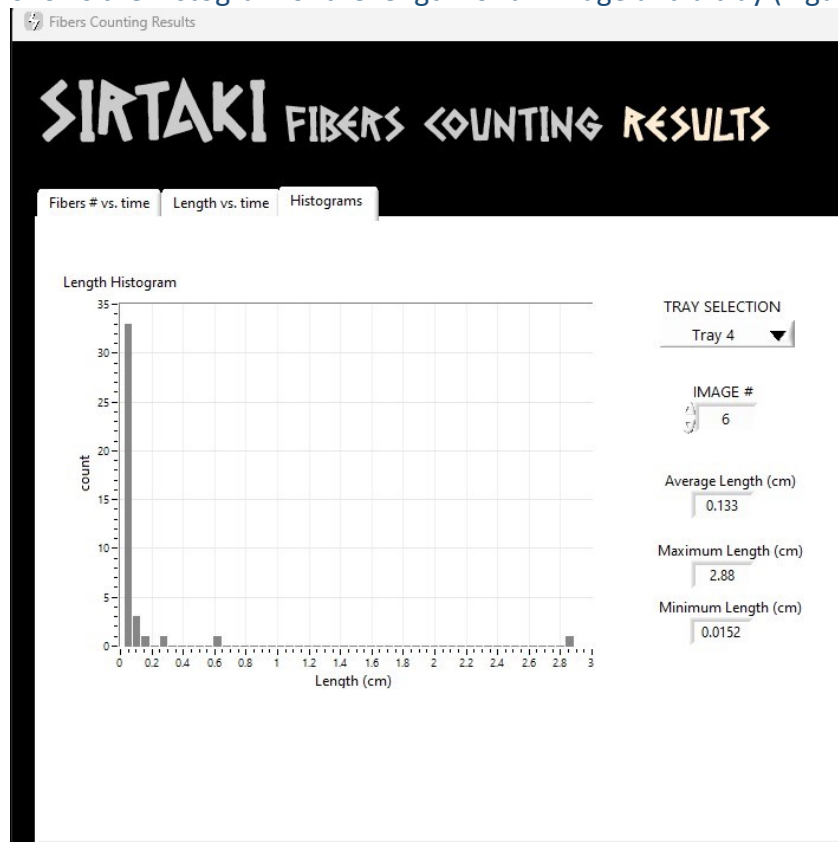


Figure 96: Histogram of the length

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These graph can easily be exported in Excel or as text file by right clicking on them (Figure 97).

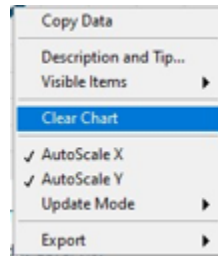


Figure 97: Easy export

All the results and graph can be updated as the user can filter out the maximum and the minimum of the length using the filter control (Figure 98).

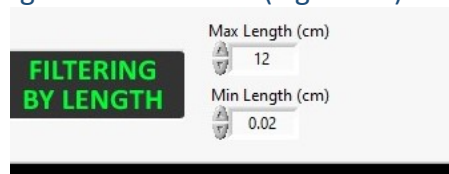


Figure 98: Filtering by length

The user can filter out the influence of small fibers or dust particles.

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7. FIBERS COVERAGE PROCESSING

This option is a fast processing as it does not identify the broken fibers individually but just measure the surface (in pixels) covered by the broken fibers. This method allows the user to rapidly evaluate the tendencies of fiber breakage.

**FIBERS
COVERAGE**

When the user clicks on automatic processing control , the automatic processing window opens (Figure 99).



Figure 99: Automatic processing window

Information about the measurement is displayed on the right of the window. The user clicks on start to start the automatic processing (Figure 100) or cancel.

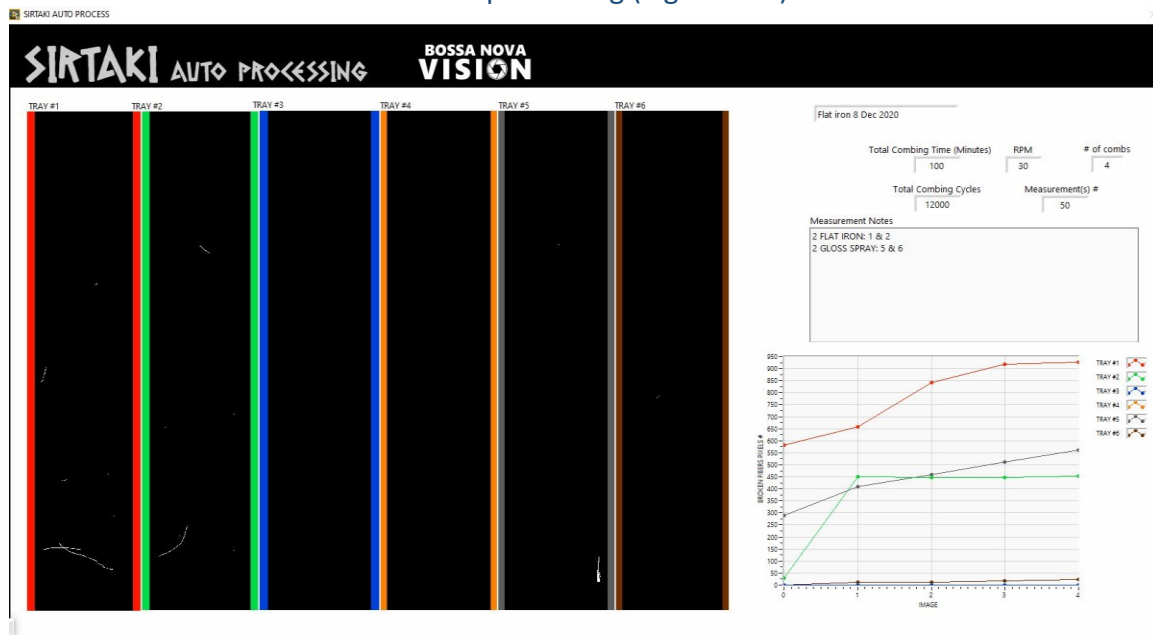


Figure 100: Automatic processing on

A graph appears with the transmission image of each tray – 1 to 6 – (Figure 101).

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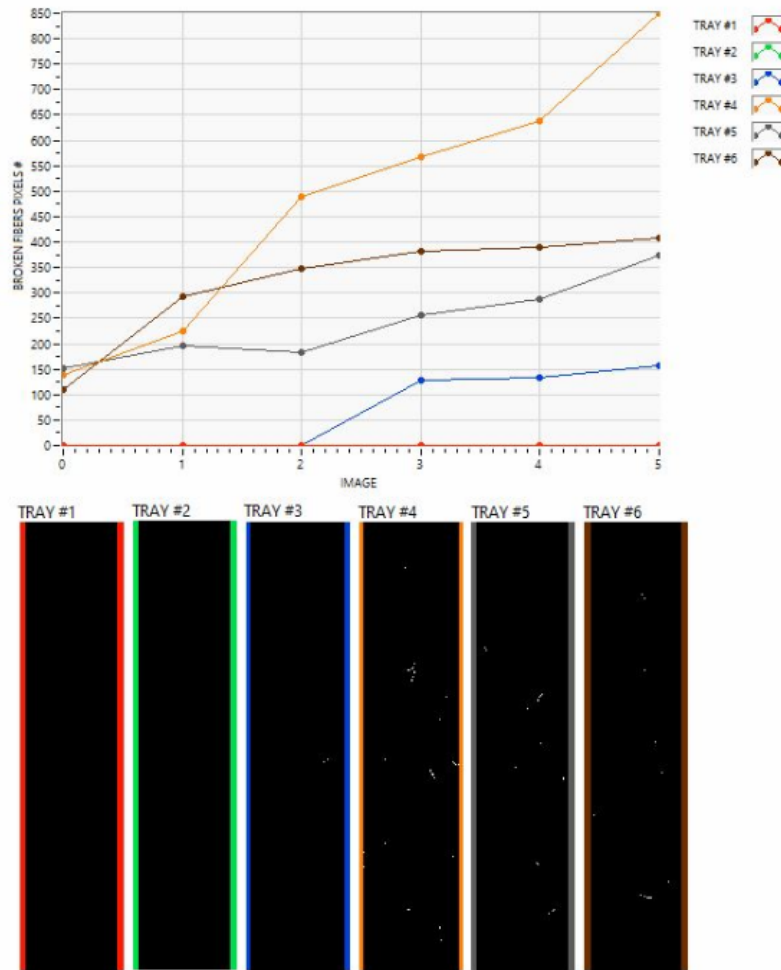


Figure 101: Graph and image

The graph shows the number of pixels corresponding to the broken fibers versus the image #. The image shows the transmission imager of each tray – broken fibers appears in white on a black background -. Once the automatic processing is done, the results are automatically saved in a text file named `pixels_vs_img.txt` that contains the variations of the pixels number for each tray versus the image (Figure 102: `pixels_vs_img.txt`).

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pixels_vs_img - Notepad

File	Edit	Format	View	Help
583	28	0	0	290
659	450	0	0	409
842	446	0	0	458
919	447	0	0	513
927	454	0	0	562
1105	470	0	0	585
1366	476	0	0	600
1364	488	0	0	619
1436	514	0	38	634
1477	589	0	35	657
1564	647	0	32	661
1542	683	0	33	674
1587	718	0	34	687
1650	775	0	31	697
2205	1066	0	37	707
2223	1259	0	28	704
2232	1259	0	23	747
2207	1275	0	18	751
2211	1537	0	23	768
2219	1562	0	32	768
2317	1560	0	23	836
2297	1553	0	30	836
2296	2070	0	37	846
2327	2102	0	33	852
2348	2093	0	34	851
2349	2104	0	17	870
2324	2093	0	24	867
2315	2078	0	24	867
2301	2111	0	23	871
2332	2289	0	18	882
2323	2338	40	11	894
2329	2371	40	6	908
2330	2697	42	6	924

Figure 102: pixels_vs_img.txt

By right clicking on the graph, the user can also export the data to clipboard, excel or as an image (Figure 103: EXPORT data).

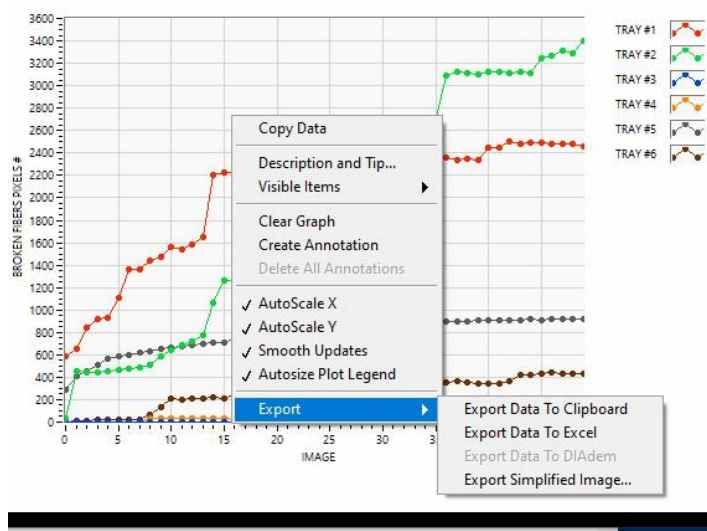
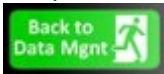


Figure 103: EXPORT data

The user can exit the automatic processing window to the main window (Figure 104) using

the top right corner button .

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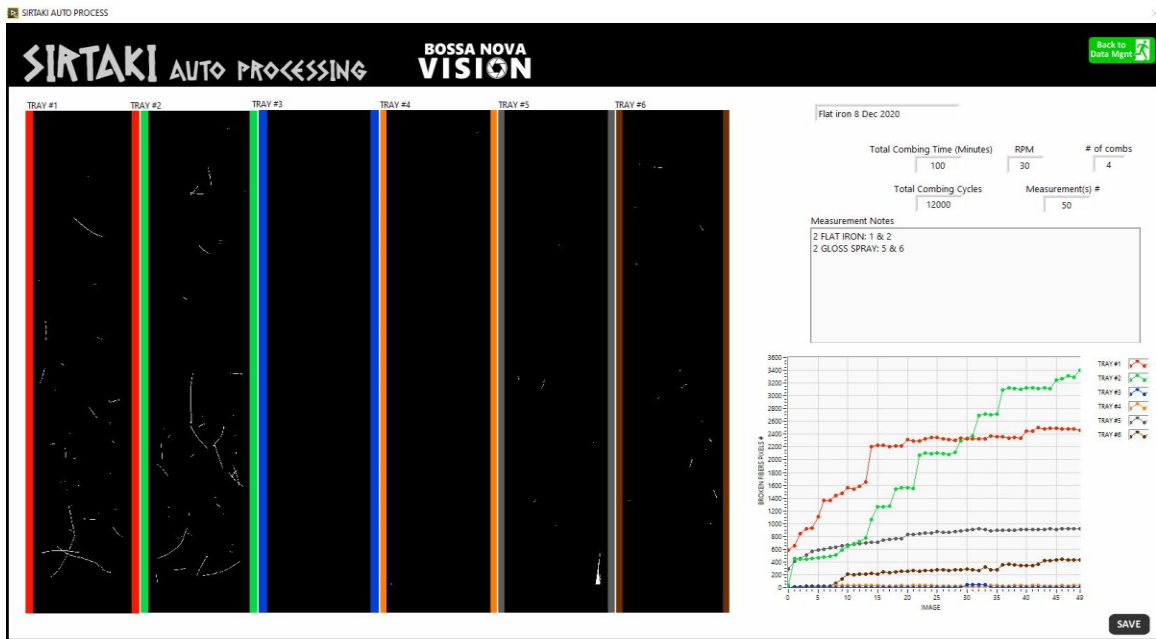


Figure 104: Automatic processing done

8. Calibration

By clicking on Calibration button, the user will be able to adjust Xstart and Zstart to crop the SIRTAKI image form the full image and adjust the exposure time of the camera. On the start of the calibration, the tray will open (Figure 105).

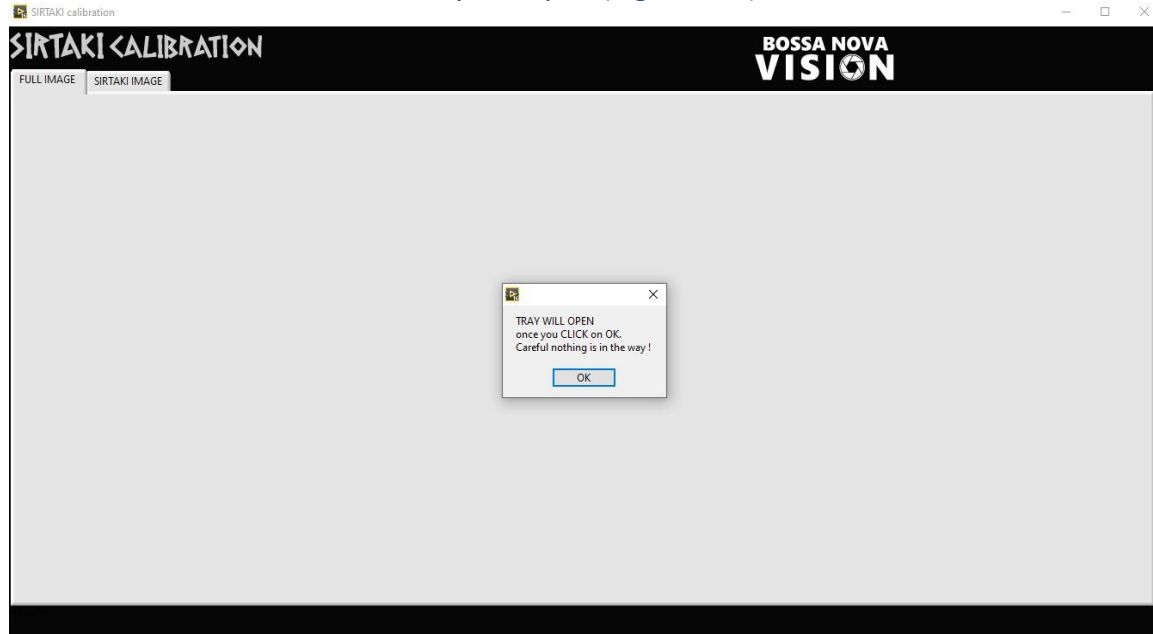


Figure 105: Calibration – Main window

Once the tray is open, the message appears (Figure 106)

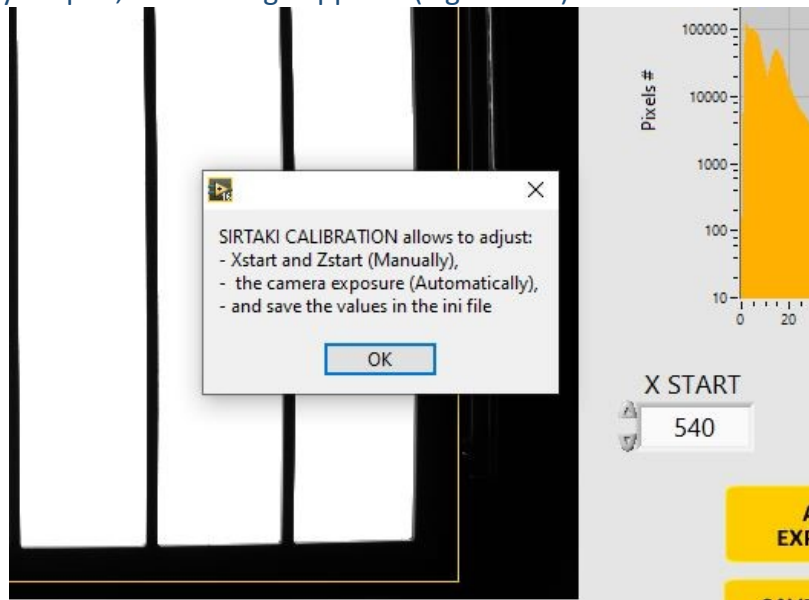


Figure 106: Calibration message

Click on ok. The main window appears (Figure 107).

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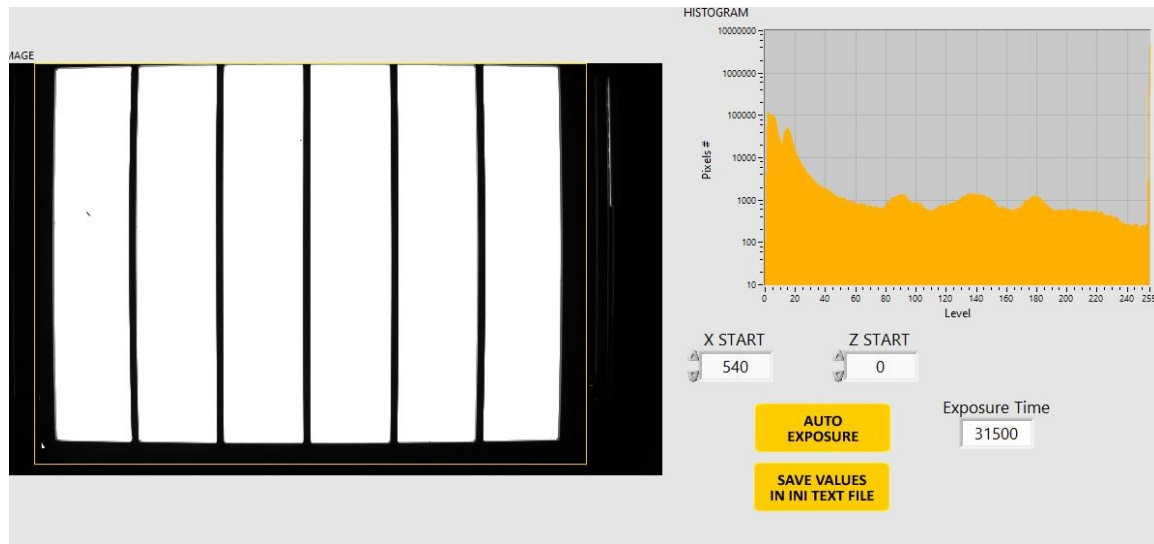


Figure 107: Calibration main window

On the left is the full image delivered by the camera. It is not cropped. Adjusting Xstart and Zstart allows the user to crop the image. The orange rectangle shows the position of the cropped image in the full image. If the user clicks on the SIRTAKI image tab at the top of the window, he can visualize the cropped image used in SIRTAKI (Figure 108).

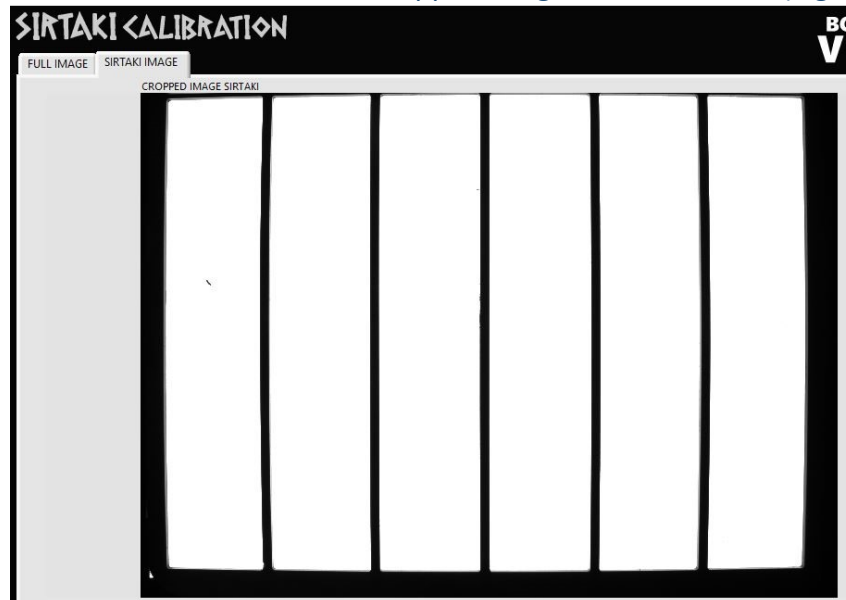


Figure 108: SIRTAKI Image (cropped from full image)

The goal is to get a clear image of the 6 trays, as shown above.

Once it is done, the user can click on AUTO EXPOSURE to automatically adjust the exposure of the camera. Once done, do not forget to click on SAVE VALUES in



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SAVE VALUES
IN INI TEXT FILE

the INI text file . Once calibrated, you should get a clear image of the tray like below (Figure 109).



Figure 109: Calibration done

9. Data format

The data are stored in a measurement folder (Figure 110).

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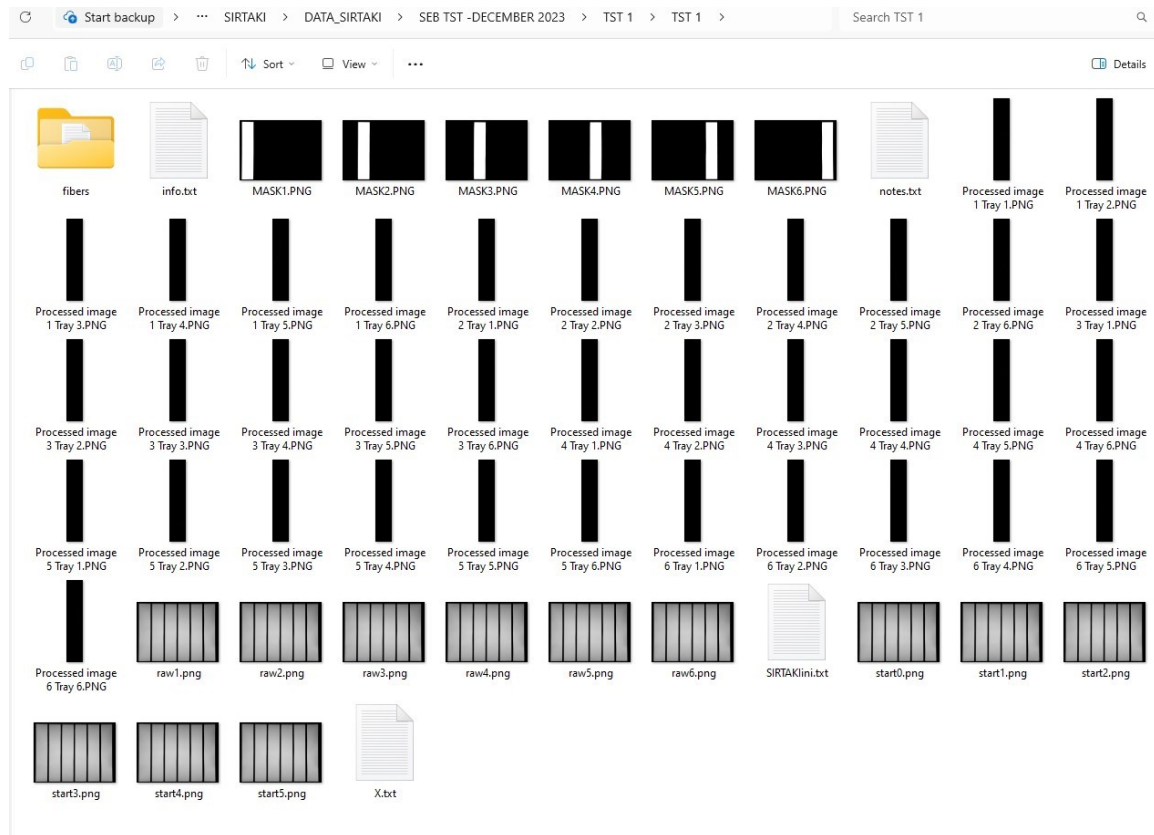


Figure 110: Measurement Folder

It contains:

- Info.txt, a text file where all the measurement parameters are stored (RPM, etc.)
- Notes.txt, a text file where the notes are stored.
- All rawx.png images
- 6 MASK png images
- A pixels-vs-img.txt where the automatic processing results are stored (if fiber coverage processing has been done).
- Processed images x tray y.png (x the image number, y the tray number) (if fibers counting has been done)
- A fibers folder containing the text files corresponding to the fibers counting processing)

10. Technical Specifications

COMBING LENGTH	6.5" (16.5 cm)
SWATCH LENGTH	Up to 10" (25.4 cm)
SWATCH TRAY	Removable (Easy to clean) – 6 compartments
Rotation speed	Adjustable from 10 to 40 rpm
COMBING FREQUENCY	Adjustable from 0.67 Hz to 2.67 Hz (with 4 combs)
COMBS	2.5" width maximum
DIMENSIONS	Width 27" (67.5 cm) Height 22" (55cm) Length 22" (55cm) Length (slide open) 36" (92 cm)
WEIGHT	46 Lbs. (21 kg) - Top 38 Lbs. (17 kg) - Automatic base
Software	SIRTAKI 2.00
Operating system	Windows 10/11
Camera computer connection	USB 3.00
SIRTAKI computer connection	USB 2.00
DATA Output	8 bits monochrome image in png Text files
Calibration	Factory calibrated
Power requirement	110/220 VAC 50/60 Hz