



SIGHTTEX Studio – User’s Manual

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1. Introduction

It's not what you look at that matter, it's what you see.

– Henry David Thoreau

Thank you for using SIGHTTEX Studio – a software platform for interactive visualization and computational analysis of visual properties of captured material appearance datasets.

Our software allows transferring material appearance from a real world to a digital world by interactive visualizing the captured material appearance on various objects and under different lighting conditions.

We strive for intuitive and straightforward user interface minimizing demands on user training. This short document should explain all you need to use our application.

Currently supported devices: SIGHTTEX Q

1.1 What is in the box

SIGHTTEX Studio comes in a FREE version with a limited functionality and a commercial PRO version unveiling full features

Differences between FREE and PRO license version:

	FREE	PRO
Scan Module	no	yes
Visualization Module	yes	yes
Video export	no	yes
Analytical modules:		
Color	yes	yes
Reflectance	no	yes
Gloss	no	yes
Sparkle	no	yes
Graininess	no	yes
Normals	no	yes
Photometry	no	yes
In plane	no	yes

1.2 End-user license agreement

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End-User License Agreement (EULA) of SIGHTTEX Studio Pro

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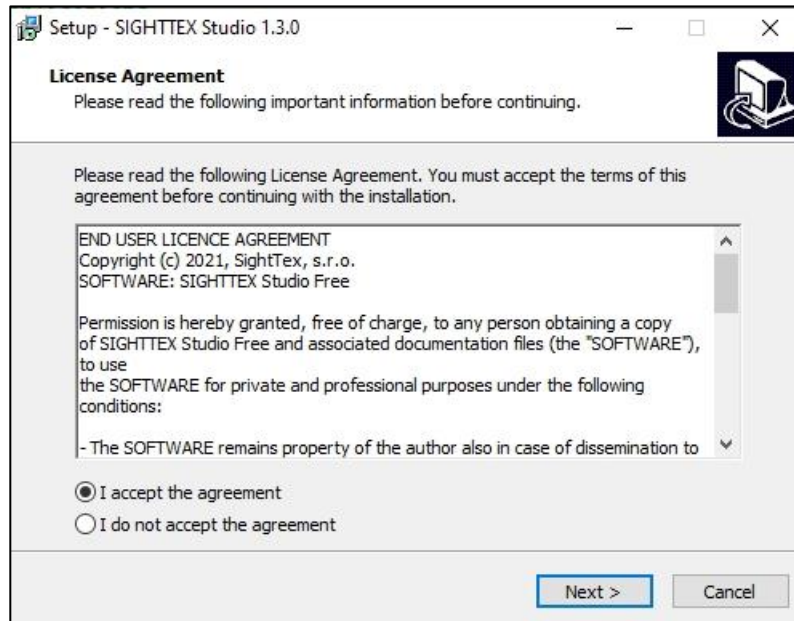
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2. Installation

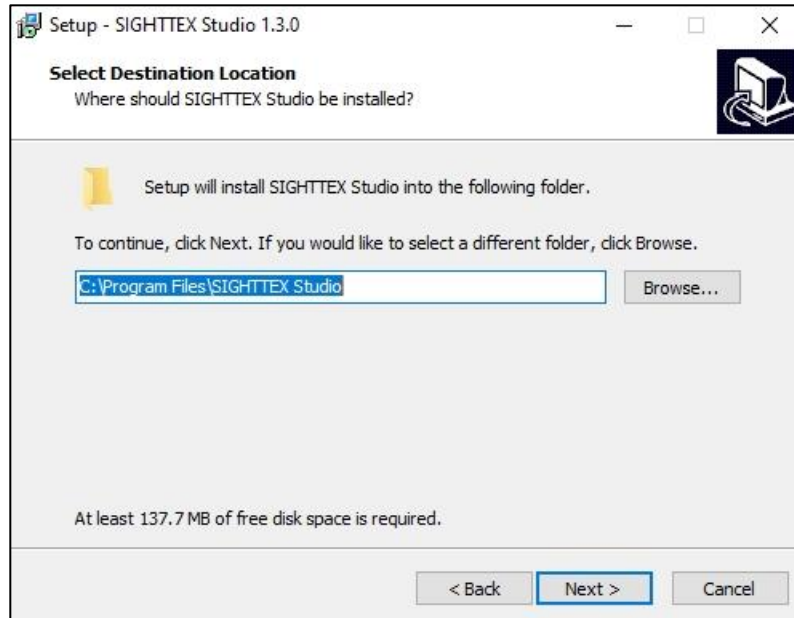
1. Download file setup_sstudio.exe from the address:
<http://www.sighttex.com/>
2. Unpack and run the exe file. First select installation language:



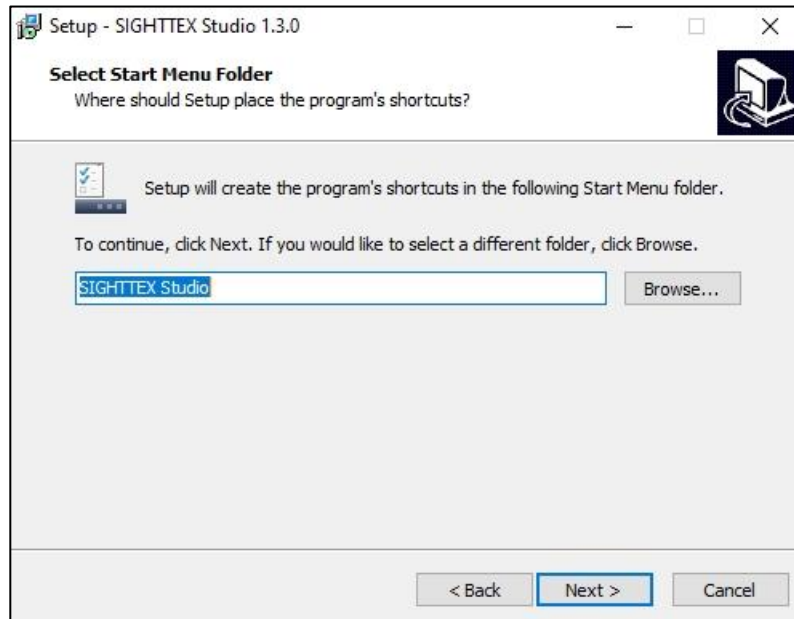
3. Then approve the license conditions for FREE version:



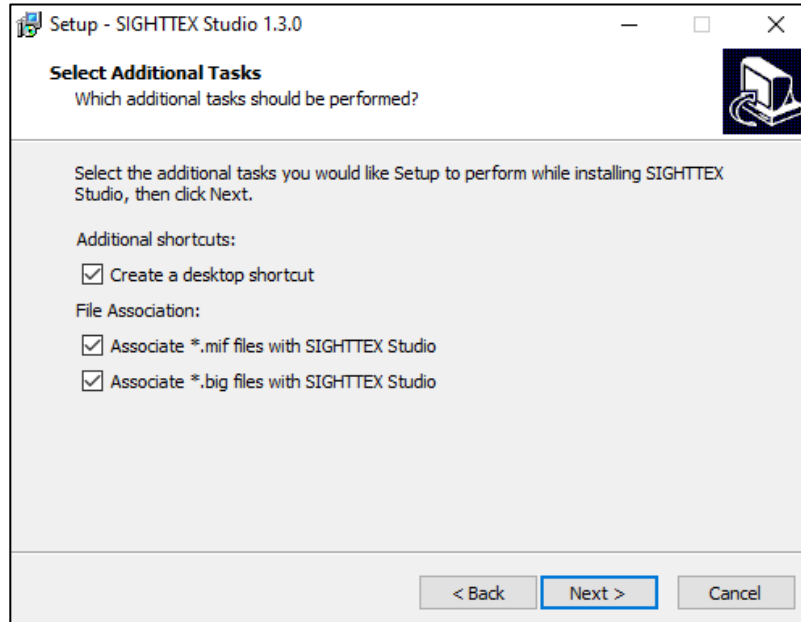
4. Select destination directory (in most cases the default one is OK):



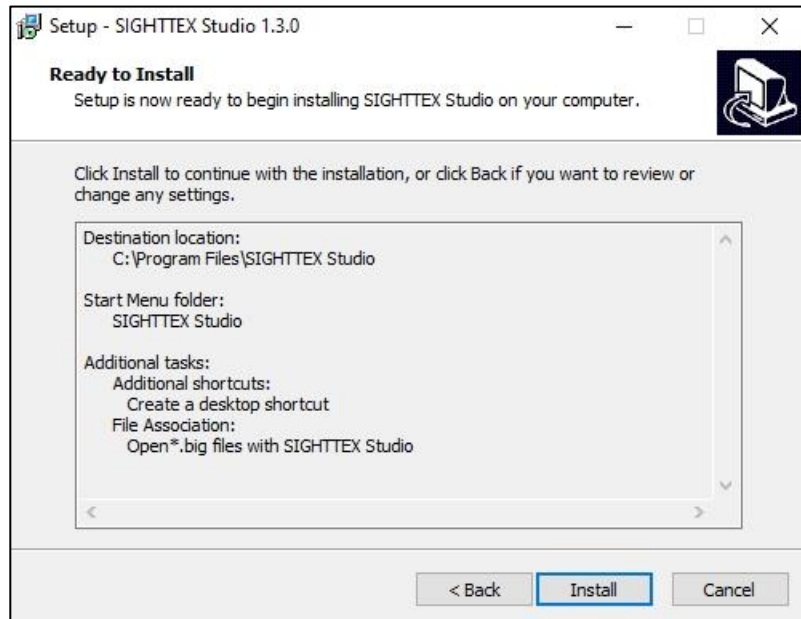
5. Select application title (in most cases the default one is OK):



6. Decide whether you want desktop icon for SIGHTTEX Studio and its automatic association with captured „.mif“ and „.big“ files. Note that it may be needed to setup automatic associations for these extensions manually.

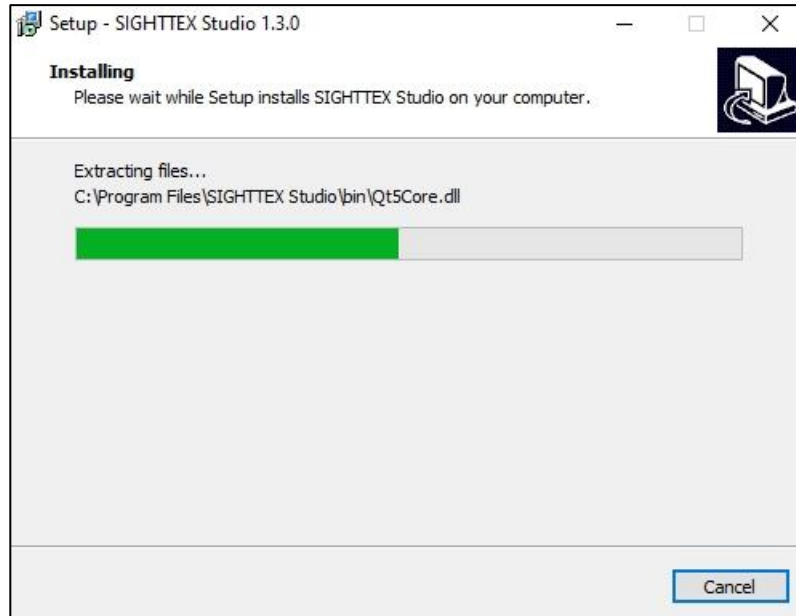


7. Confirm the installation:



Note: The installer may ask you to install Microsoft Visual Studio Redistributable library required for running of our software. This happens only if such an installation is missing on your computer.

8. Wait till the installation finishes (typically less than 1 minute):

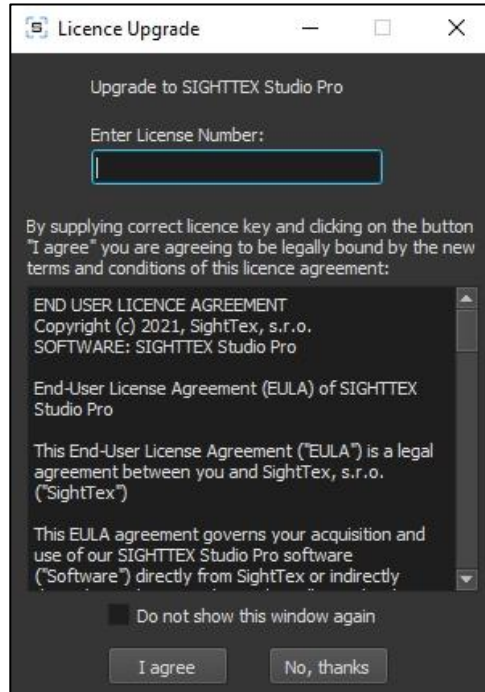


9. After installation you can launch SIGHTTEX Studio FREE:



10. User can use the FREE version or upgrade to PRO version by entering the license key obtained after purchasing the PRO license. By entering a correct license key

and clicking on the button „I agree“, you are agreeing to be legally bound by the new terms and conditions of PRO license agreement. If you do not want to upgrade simply dismiss the window.

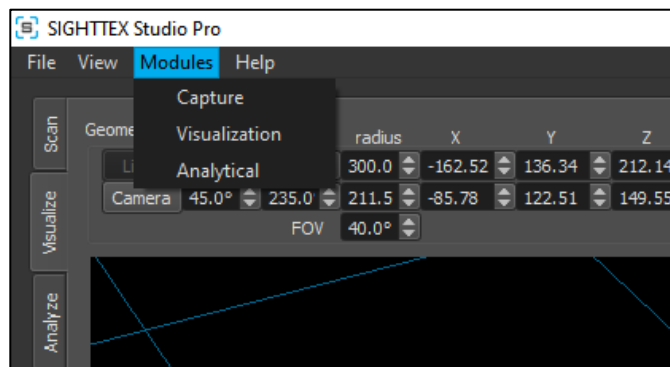


3. Overview

This section briefly outlines main features of SIGHTTEX Studio application.

3.1 Application overview

SIGHTTEX Studio currently features three main application modules. Switching between modules is realized through side tabs on the left or using the item Modules in the main menu:



Scan module – allows material appearance measurements using SIGHTTEX Q device for visualization and analytical purposes.

Visualization module – allows interactive visual assessment of up-to-two materials side-by-side. Main features:

- materials can be placed on several preset geometries or a custom geometry
- user can interactively change position of camera and light
- changing material mapping properties and illuminant color
- two materials can be compared side-by-side synchronously
- point-light and custom environment illumination
- visualization data can be exported to images and video files

Analytical module – contains a set of analytical tools useful for assessment of material properties. Those are:

- **Color analysis** – basic color information
- **Reflectance** – reflectance and captured geometries analysis
- **Gloss analysis** – gloss assessment
- **Sparkle analysis** – texture assessment for directional illumination

- **Graininess analysis** – texture assessment for diffuse illumination
- **Normals distribution analysis** – particle scattering information
- **Photometric analysis** – for capturing surface albedo, normal and height map
- **In plane analysis** – according to recent industrial standards

3.2 Captured representations

The application can currently load and process several captured data representations. These representations are stored in a file with .mif extension (files with extension .big are obsolete). Single .mif file can contain multiple representations.

Individual representations have variable functionality with regards to individual modules and their tools as follows:

<i>functionality</i>	<i>Captured visualization data representations</i>		
	COATING REGULAR	COATING SPECIAL	UNIVERSAL
Visualization Module	Yes	Yes	Yes
Analytical Module:			
Color	Yes*	Yes*	Yes
Reflectance	Yes	Yes	Yes
Gloss	Yes	Yes*	Yes
Sparkle	No	Yes*	Yes
Graininess	Yes	Yes	Yes
Normals	No	Yes*	Yes
Photometry	No	No	Yes
In-plane	No	No	Yes

*approximate results or limited functionality

<i>functionality</i>	GLOSS	IN-PLANE	OUT-PLANE	SPARKLE	GRAININESS	NORMALS
Visualization Module	No	No	No	No	No	No
Analytical Module:						
Color	Yes	Yes	Yes	Yes	Yes	Yes
Reflectance	Yes	Yes	Yes	Yes	Yes	Yes
Gloss	Yes	Yes*	Yes*	No	No	No
Sparkle	No	Yes*	No	Yes*	No	No
Graininess	No	No	No	No	Yes	No
Normals	No	No	No	No	No	Yes
Photometry	No	No	No	No	Yes	Yes
In-plane	No	Yes	No	Yes*	No	No

*approximate results or limited functionality

4. Scan module

4.1 Product information

This section briefly outlines main features and applications of SIGHTTEX Q measurement device.

SIGHTTEX Q at a glance:

Features

- Capturing of material appearance
- Interactive visualization on arbitrary geometry in desired lighting conditions
- Photorealistic quality and high dynamic range
- Rapid measurement times
- Interactive software for measurement, processing, visualization
- Convenient samples adjustments (flatbed scanner-like)
- Measurement of large objects possible

Applications

- In-house analysis of appearance
- Quality control
- Virtual prototyping
- BRDF / BTF capture
- Automotive industry
- Paints & coatings
- Inks & printing
- Plastics manufacturers
- Wood polishing

Contents of the delivery:

- SIGHTTEX Q device
- Adapter AC 110-230V / DC 24V, 5A
- LAN Network cable RJ45 – length 5m
- USB flash drive with installation software
- Durable transportation box on wheels
- This user manual



4.2 Safety information



Warning – never stare directly into device's aperture when manipulating with a material in a preview mode or during measurement! Intensive light could damage your sight!



Warning To prevent fire or shock hazard, do not expose this product to rain or any type of moisture. Always follow basic safety precautions when using this product to reduce risk of injury from fire or electric shock.



Warning Potential shock hazard.

1. Read and understand all instructions in the Hardware installation section of this manual.
2. Use only a grounded electrical outlet when connecting the device to a power source. If you do not know whether the outlet is grounded, check with a qualified electrician.
3. Observe all warnings and instructions marked on the product.
4. Unplug this product from wall outlets before cleaning.
5. Do not install or use this product near water or when you are wet.
6. Install the product securely on a stable surface.
7. Install the product in a protected location where no one can step on or trip over the power cord and Ethernet cable, and where the power cord will not be damaged.
8. If the product does not operate normally, see the Troubleshooting help in Section 4.8 of this user manual.
9. No operator-serviceable parts inside. Refer servicing to qualified service personnel.
10. Use in a well-ventilated area.
11. Use only with the power adapter supplied by SightTex.



Warning This equipment will be inoperable when main power fails.

Cleaning

Clean the appliance with a moist soft cloth. Do not use any detergents, abrasive products, abrasive cleaning pads, solvents or metal objects as they may irreversibly damage device surfaces!

⚠ Safety warning

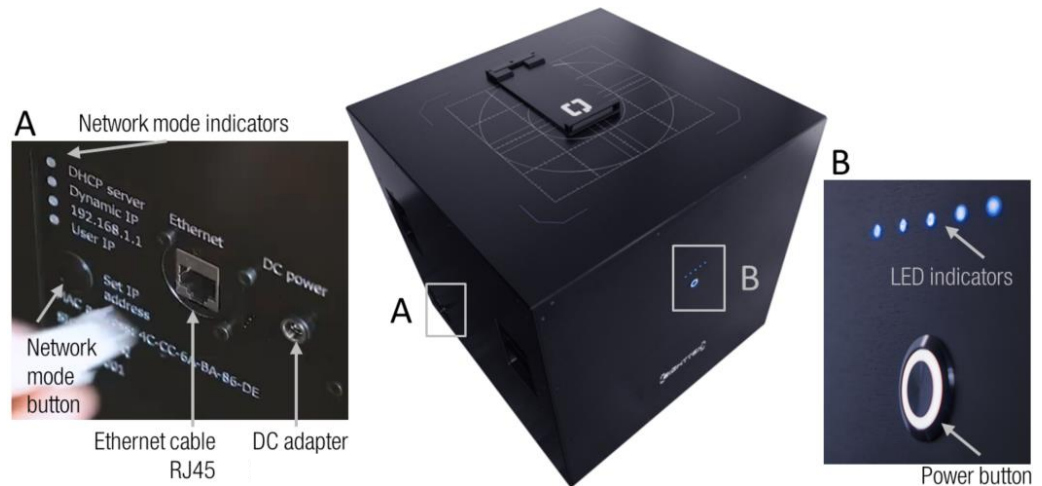
Use the attached handles for any manipulations with the device. Always place the device on a flat even surface. Any other positioning is allowed only with device holder (not part of the delivery).

👉 Tip

You can use a bottom part of the transportation box for convenient manipulation with the device on its wheels. Remember to lock down clamps on the wheels once the device is in its final position.

4.3 Device hardware installation

This section explains setting up the device for the first use.



Connecting the device:

1. Place the device on even surface free of dust or moisture (e.g. table, ground).
2. Connect the device to a Local Area Network (LAN) using the supplied network cable.
3. Plug DC adapter to the inlet on the left side of the device.
4. Plug supplied DC adapter 24V/5A to wall socket (110-240V)

Switching on the device:

1. Press the „power push-button“. The button will pulse white.
2. Once the device is ready to use, the button will shine white and LED indicators will shine blue. Note that device initialization procedure takes around 50 seconds.

Power button LED indicator states:

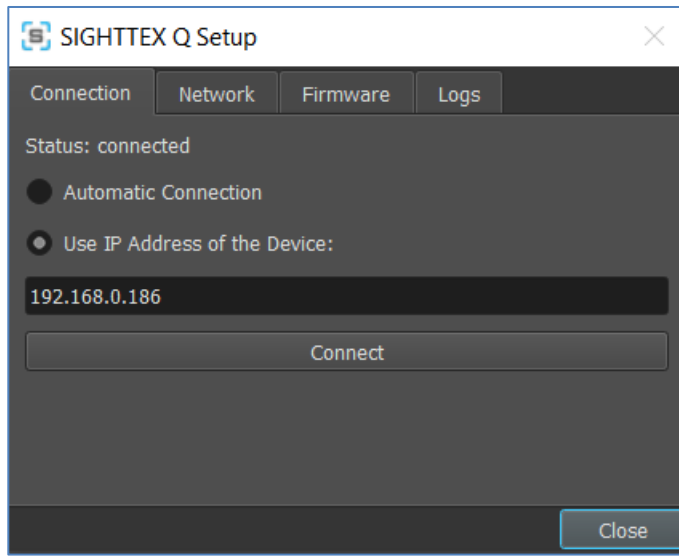
<i>Power Button Color</i>	<i>Device State</i>	<i>Recommended action</i>
Off	Off	Press Power button to turn the device on
White pulsation	Booting / swithing off	Wait until the device is operational / off
White stable	Operational	Use SIGHTTEX Studio application to start scanning new material
Red pulsation	Processing error	Wait until the device reboots itself
Red stable	Unrecoverable error	Call service

LED indicators states:

<i>LED Indicators Color when the device is operational</i>	<i>Device State</i>
Blue stable	Waiting
Blue pulsation	Scanning in progress

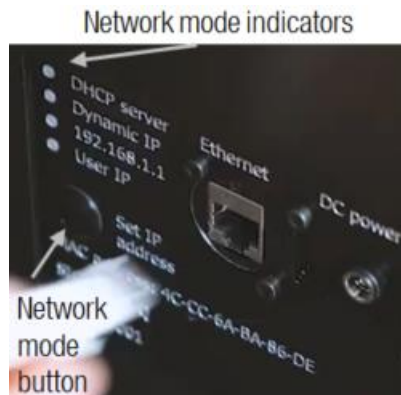
4.4 Device setup

The device is connected to the client PC using Ethernet interface either directly or via local area network (LAN). Therefore, both the device and the client application must be set up prior to the first scanning. After pressing Open Setup button on the first Connection tab appears:



4.4.1 Connect your computer to the device

First of all a desired Network operational mode has to be set. Push and hold Set IP address hardware button on the device interface panel for few seconds to select preferred operational mode.



The following table describes individual connection options:

<i>Operational Mode</i>	<i>Description</i>	<i>IP address and subnet mask of the device</i>
DHCP Server	SIGHTTEX Q acts as a DHCP Server. Whenever a computer with „obtain an IP address automatically“ is connected, the device provides it an IP address in range 192.168.1.100 – 199.	192.168.1.1, 255.255.255.0
Dynamic IP	SIGHTTEX Q expects to receive an IP address from a DHCP Server.	Any, depends on the DHCP Server

192.168.1.1	SIGHTTEX Q has a static IP address.	192.168.1.1, 255.255.255.0
User IP	SIGHTTEX Q has a static IP address provided by user.	Any, provided by user (default 192.168.1.2, 255.255.255.0)

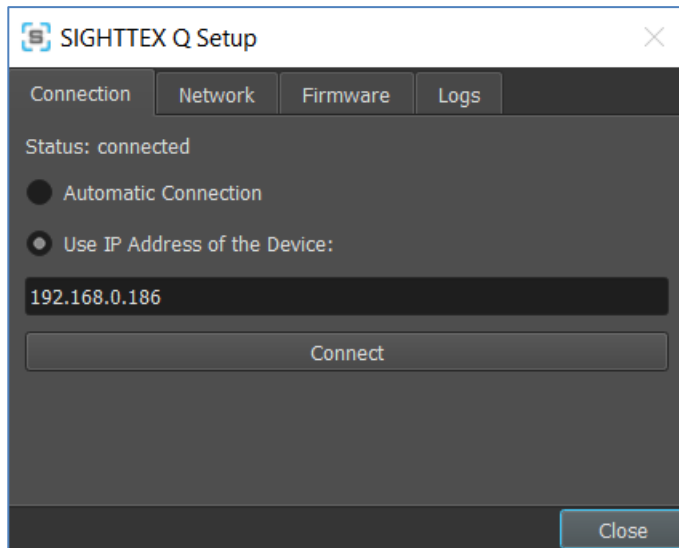
Meanings of network mode indicator button are the following:

<i>Network LED Indicator Color</i>	<i>Network state</i>
Off	Device is off
Orange	Cable not connected / other side not powered
Green	Network operational, SIGHTTEX Studio not communicating
White	Network operational, SIGHTTEX Studio communicating

To connect your computer to the device select whether connection to the device will be realized:

1. Automatically,
2. by providing its IP address.

The entered option is stored and applied by pressing the Connect button. If the connection is established, “Status: connected” text appears. Otherwise, make sure the device is properly set and your computer is properly connected to the device and try again.

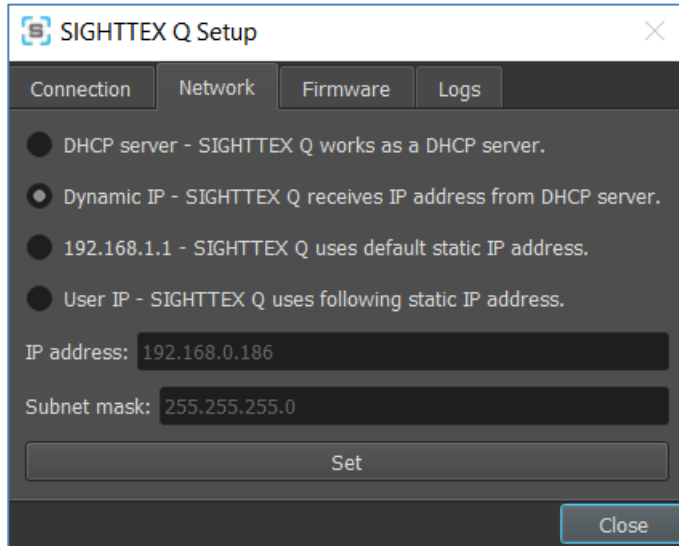


Note: Windows or antivirus software firewall can block automatic connection, therefore, entering IP address manually is preferred. If user does not know the IP address an automatic connection does not work a temporary firewall switch off is an option.

If needed for configuration of a DHCP server, the MAC address of device's network adapter is shown near the network reset button of the device.

4.4.2 Setting device connection to the network

Use this option to change default configuration of the network adapter in the device.



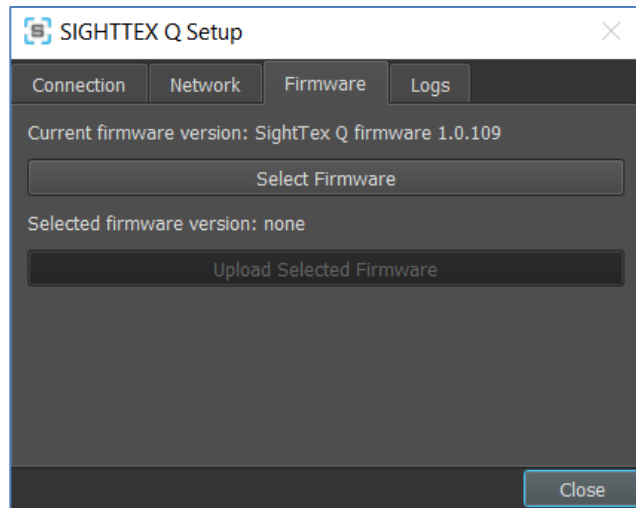
By selecting the Network tab you have four connection options as outlined in the table in Section 4.4.1.

The entered option is stored and applied by pressing button Set. If needed for configuration of a DHCP server, the MAC address of device's network adapter is shown near the network reset button of the device.

4.4.3 Firmware update

The tab Firmware allows updating the device's firmware by pressing button Select Firmware and selecting a firmware file. You can check for new firmware updates at <http://www.sighttex.com/downloads>.

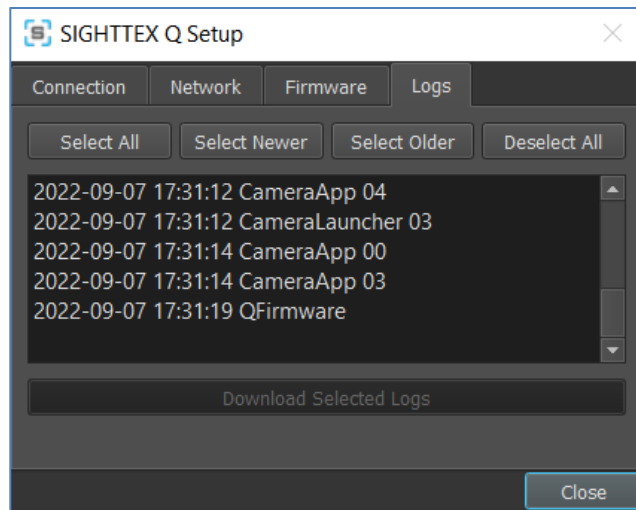
After file selection user is asked to confirm start of firmware update process.



Once the firmware update is successful the success confirmation screen appears. Otherwise the firmware is rejected and device's firmware remains unchanged. Make sure that the latest firmware update was correctly downloaded and try again. If the problem prevails, contact our support team at support@sighttex.com.

4.4.4 Logs download

The tab Logs allows downloading of diagnostic log files by selection of files and pressing Download Selected Logs. User can also automatically select files by pressing buttons Select All, Deselect All, Select Newer, and Select Older.

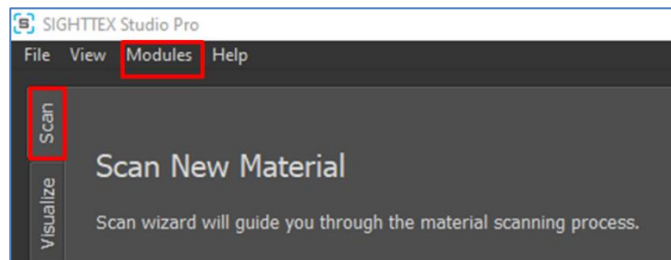


GDPR notice:

- Log- files are stored anonymously and do not contain any data that could reveal user identity or measured samples properties.
- Log-files are plain text files and thus user can check their content before sending them to our support.
- By sending the log-files to our support, user agrees with their analysis and storage exclusively by SightTex, s.r.o. None third party has access to the data.

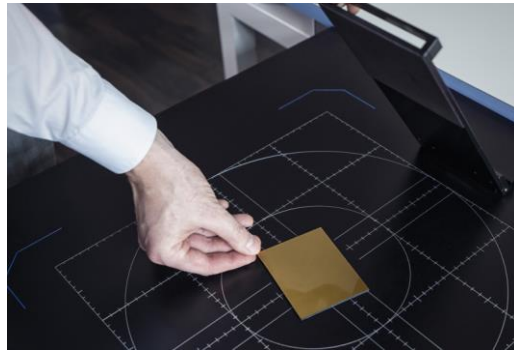
4.5 Material appearance measurement

This section explains steps required for material sample measurement. Material scanning is controlled in a dedicated Scan module accessible from the main menu's item Modules or from left global tab Scan.



4.5.1 Measurement procedure

1. Use the handle to open the lid. Place the measured material sample over the circular sensor opening, facing the measured side down. See the Section 4.5.2 for tips for specific samples measurement.



⚠ Warning

Never place materials over 1 kilogram onto the central part close to the opening without additional support. This could non-reversibly damage the device or degrade its capturing performance. For heavier and larger objects use appropriate padding to distribute their weight over entire top area.

⚠ Safety warning

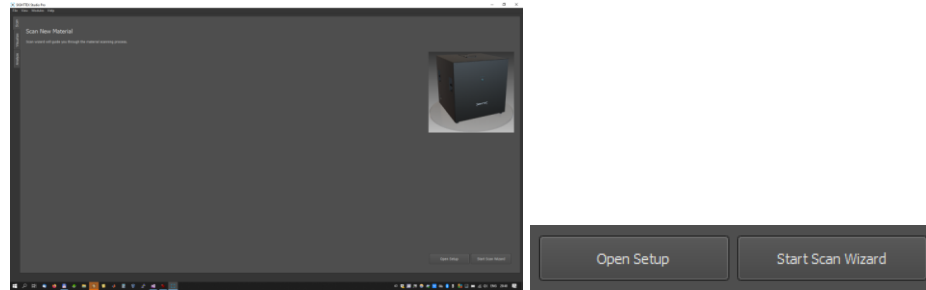
Never stare directly into device aperture when manipulating with the material in a preview mode or during measurement! Intensive light could damage your sight!

👉 Tip

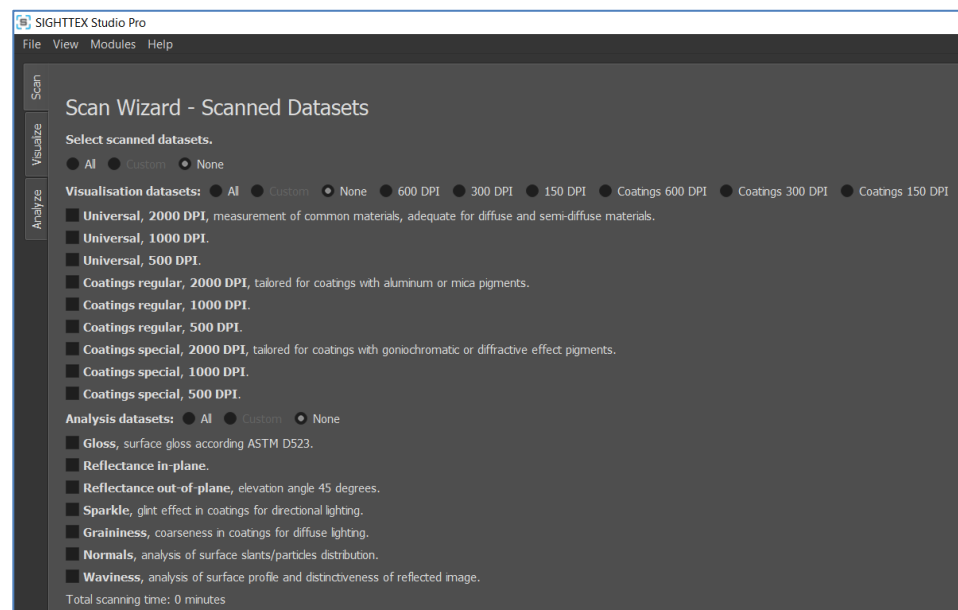
For precise reposition of the sample you can use the ruler engraved in the top cover. Distance of marks in grid is 10 mm.



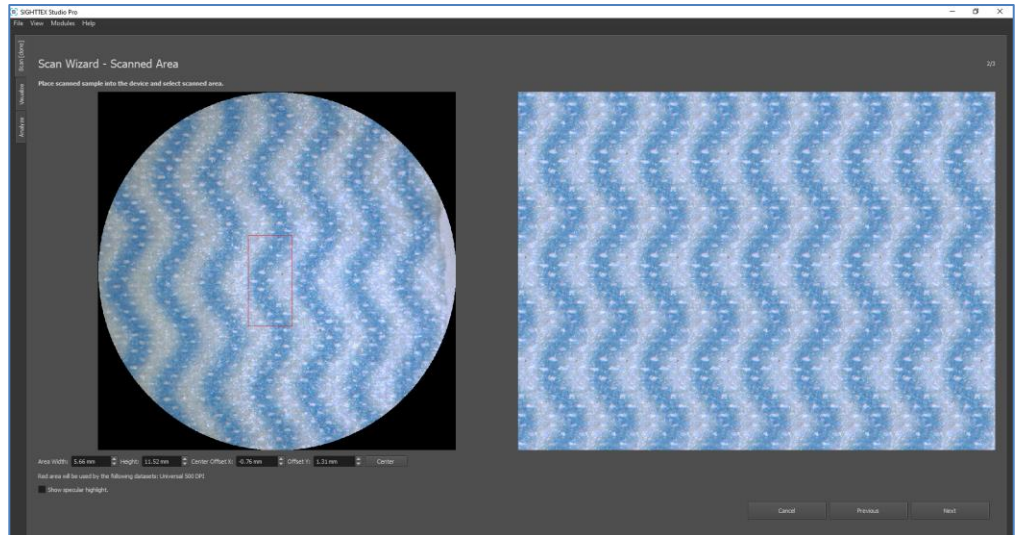
2. If the SIGHTTEX Q device is connected you can continue otherwise press button Open Setup to configure network connection to the device. See details in section 4.4. Once the device is correctly connected to your computer the button Start Scan Wizard becomes enabled and the measurement can be started.



3. Select one or more desired type of data for measurement and press Next. Note that there are two types of datasets: visualization and analytical. Visualization datasets can be captured in three different resolutions 500, 1000, and 2000 DPI. The selection of datasets has crucial impact on measurement time as some configurations capture more image data and produce larger data files. See details in Section 4.5.3



4. Align the sample to the desired position using the live preview on the screen so as the target measurement area is near aperture center.

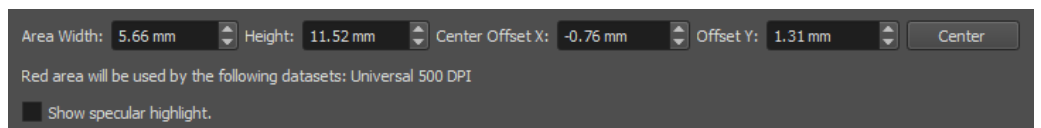


Red frame in left live-view window highlights the measured area. This area is spatially repeated and shown zoomed in the right window. This view highlights seams in material structure, when the measured area is spatially repeated. Select desired rectangular measured area and press Next.

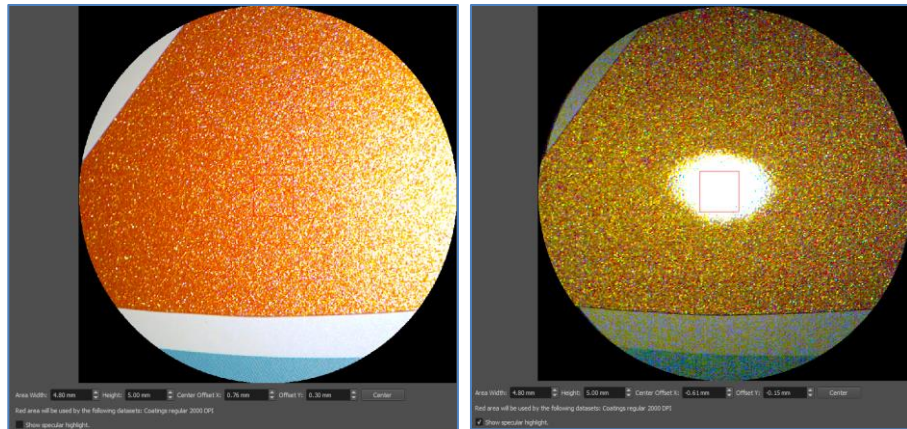
User can modify the size of the measured area:

- a) By dragging edges of the rectangle. The rectangle becomes green when approached by the mouse cursor.
- b) By entering the values of measured area in mm to form fields below. Use the Center button for selected area centering.

A position of the selected rectangle can be changed by mouse dragging.



By selecting tick-box Show specular highlight, user can switch between overhead and specular illumination conditions. This becomes handy for maintaining specular reflection for glossy materials in the center of the aperture. Even slight inaccuracies of sample normal tilt can result in specular highlight shift resulting in disturbing visual seams in captured data visualization.



Tip

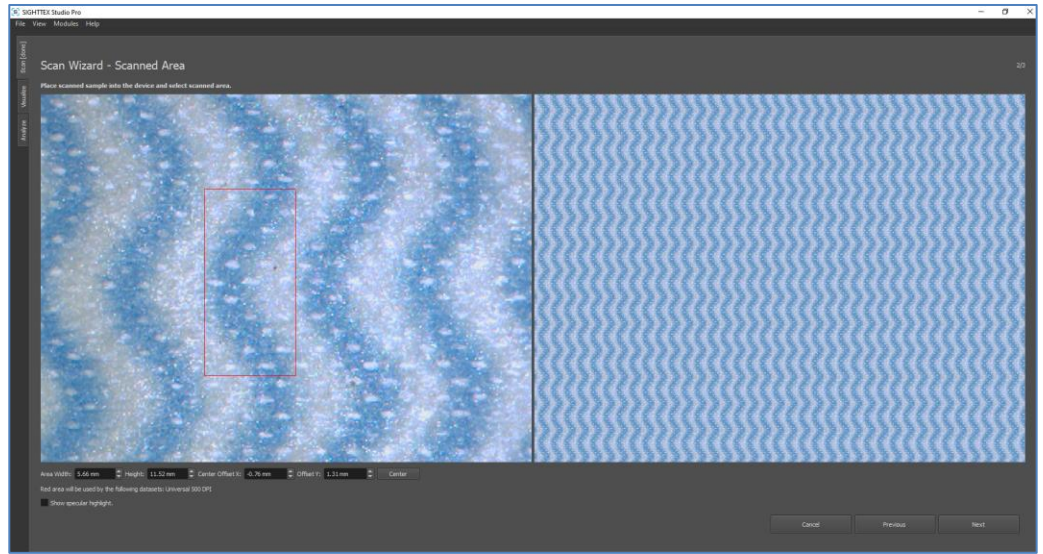
To achieve the best accuracy, use the area near aperture center.



Tip

Move and rotate the sample slowly over aperture to obtain the desired area in the center and its best angular alignment with the borders of the captured frame. This can greatly help to avoid presence of tiling artefacts in renderings.

User can also use mouse wheel in the left window to zoom the live-view. When the mouse wheel is used in the right window, one can observe the measured area spatially replicated across large sheet. This view helps user to select the measured area so as it is spatially repeatable. This is important especially for materials with regular structures.

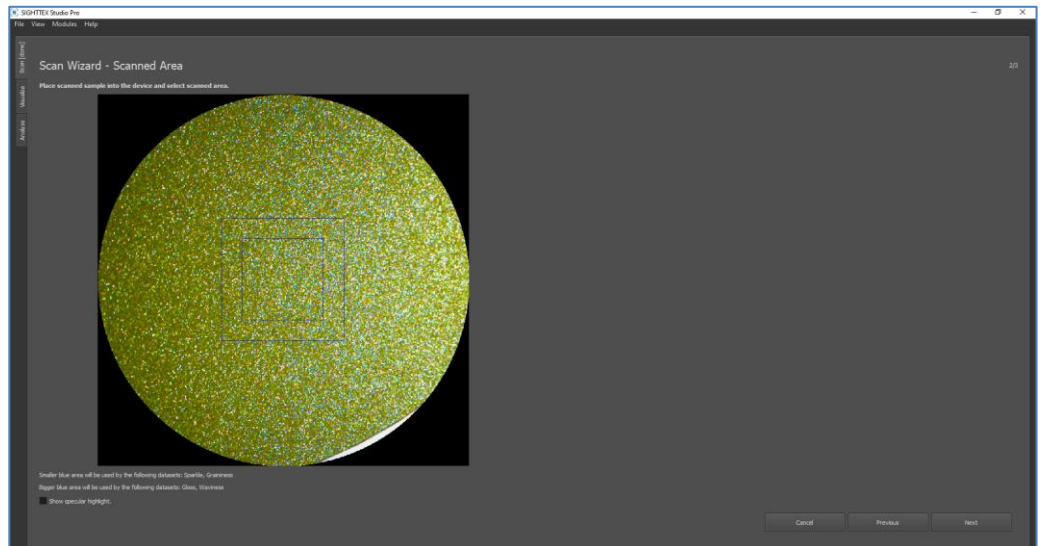


Tip

Double-click on an image to adjust zoom to the window size.

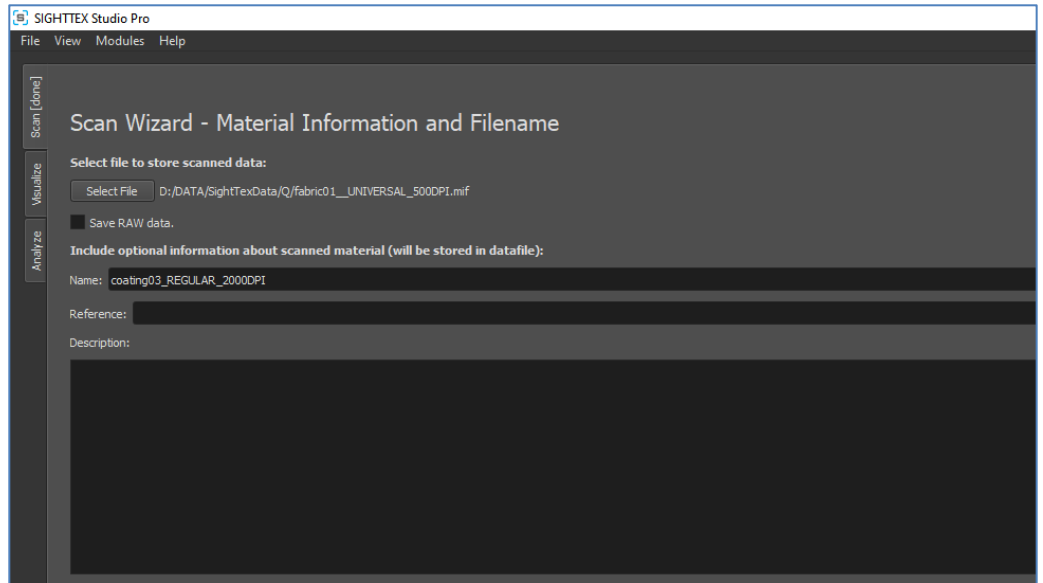
Note that when only analytical datasets are selected, the live view:

- shows rectangles of the areas captured by individual analytical datasets, but their size and positions cannot be changed,
- does not show spatial repetitions of the captured area on the right side of the window.



5. Once the captured datasets are selected and the sample is finally placed, material name and optional additional information can be entered. By pressing the button Select file, you open a dialog where you have to specify location and name of the file

with captured data. Additionally, you can enter sample name, reference, and description. If material name is not entered it will be filled automatically by file name.

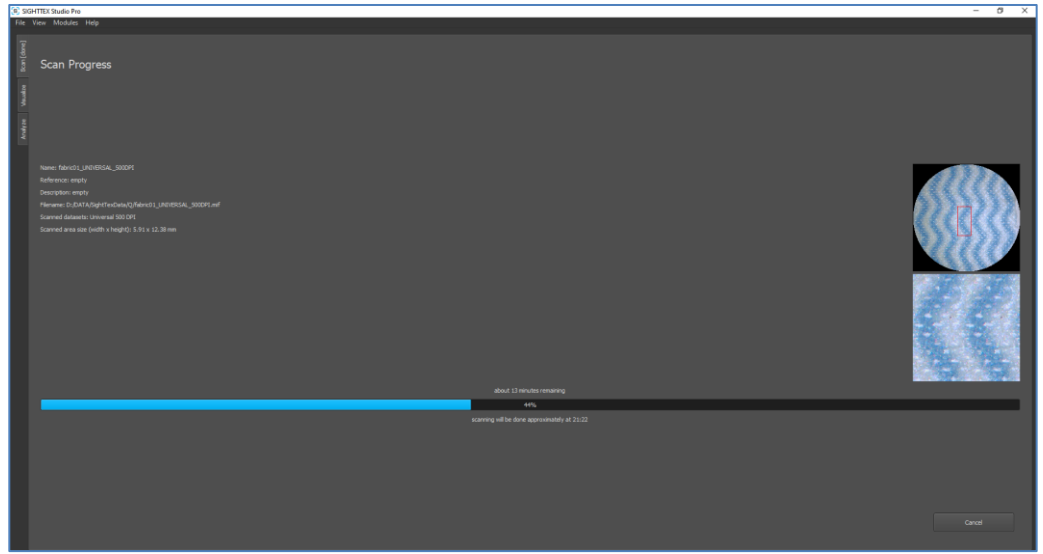


Material scanning is initiated by pressing the button Start scanning. The front LED indicator will start blinking. **Do not open the lid nor move the sample till the LED indicator does not stop blinking.**

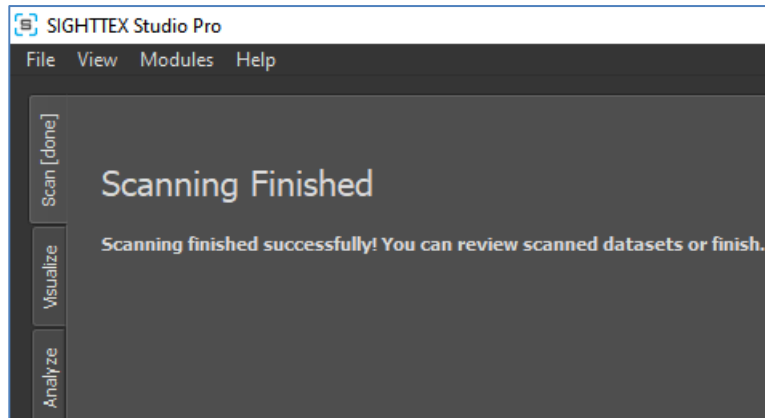


Note, that all selected datasets will be stored in one file (extension .mif), which can be for some datasets very large. To avoid this you can capture individual datasets sequentially.

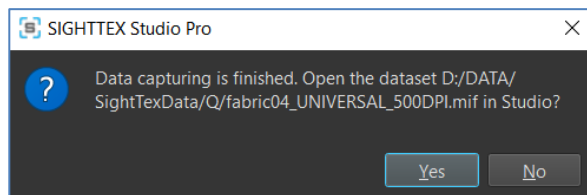
6. The following screen will summarize information on measured material and datasets. It also displays progress of the scanning process and estimated scanning time. Note that the estimate is only informative and may depend on material properties.

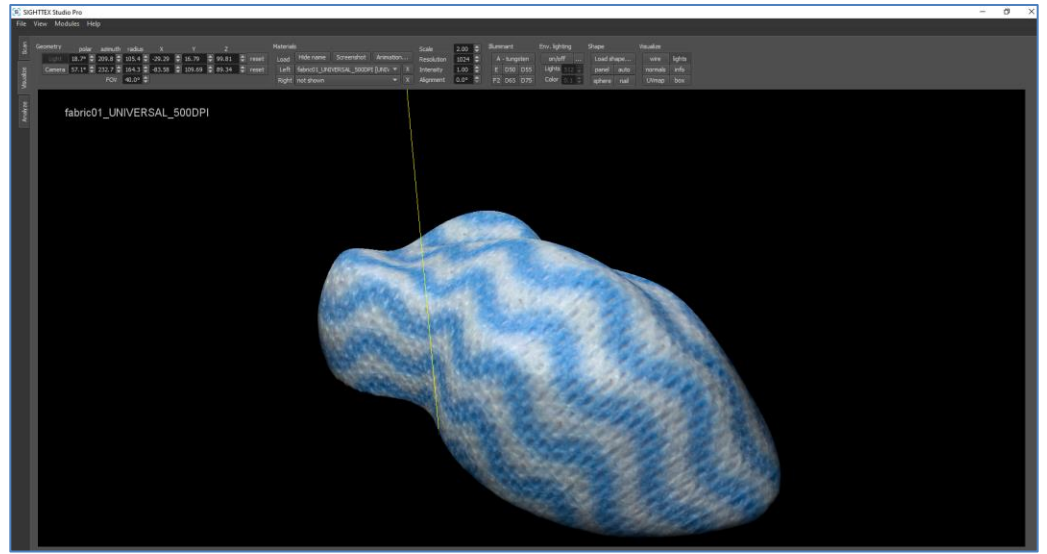


Once the scanning is finished the final screen will appear. In case of any error you will be redirected to start of the scanning wizard with an option to continue in the previously interrupted scanning.



7. After the scanning is finished you will be shown a dialog allowing you to open the captured file in SIGHTTEXT Studio. If you confirm this dialog the material will be loaded and Studio will be switched to the tab Analyze or Visualize (if the data file contains visualization representation).



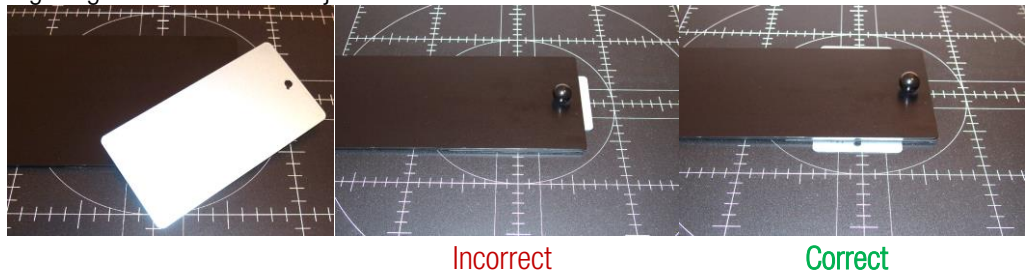


4.5.2 Sample adjustment

This section describes correct approaches to measured sample adjustment.

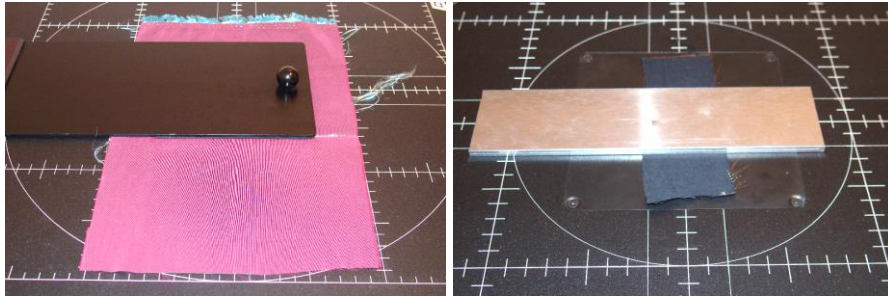
Metal/plastic panel measurement

The sample has to be weighted down evenly by the cover. Therefore, always position the panel so as its longer side is parallel with the closing cover hinge. For large panels use e.g. large book or similar object instead.

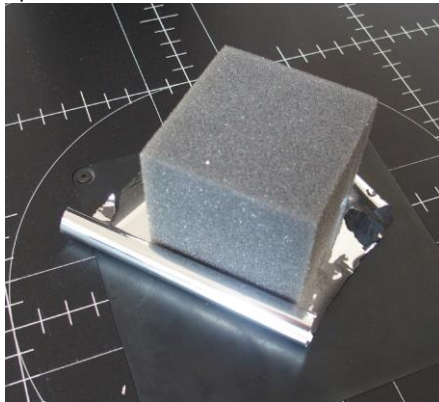


Fabric, paper, foil material measurement

For smooth and large material samples one has to (1) cover the samples as they might be partially translucent, (2) secure the sample against bending in the measurement aperture. To achieve this, close the top cover and stretch the fabric gently outwards. For small samples you can let the cover open and use some flat and appropriately heavy object.



An example of using a sponge object for a fragile foil sample adjustment over the aperture.



To capture large object, unmount the lid by releasing the only attachment screw and then gently lift the holder up.

4.5.3 Measurement Configurations

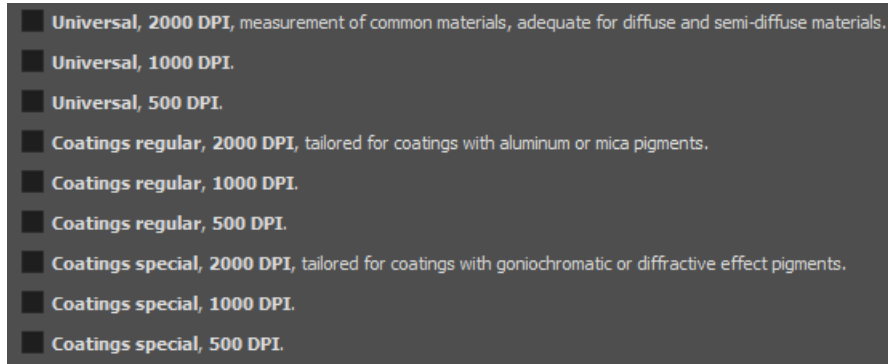
Currently the following measurement configurations are supported:

Visualization data – allow interactive visualization of material appearance and limited analysis

Universal – measurement of common materials. It is adequate for diffuse materials like fabric, leather. Measurement time: 25-40 minutes (depends on DPI).

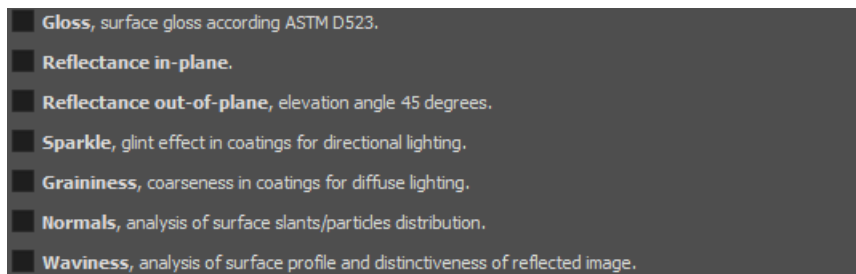
Coatings regular – tailored for effect coatings with aluminum or mica effect pigments. Measurement time: 2-8 minutes (depends on DPI). This mode is not appropriate for gonio chromatic or diffractive coatings but can capture anisotropic effects.

Coatings special – tailored for special effect coatings, e.g., with goniochromatic or diffractive effect pigments with anisotropic features. Measurement time: 5-16 minutes (depends on DPI).



Note that all configurations can be captured in different spatial resolutions 500, 1000, and 2000 DPI. Note that increasing the resolution twice results in 4x larger data file.

Analytical data – allows detailed material analysis, however, cannot be used for visualization.



Gloss – captures gloss at 20°, 60°, and 85°, contrast gloss, DOI, haze index, haze and directionality. Measurement time: below 1 minute. For details see Section 6.3.

Reflectance in-plane – captures in-plane data for standard ASTM geometries implemented by commercial spectrophotometers. Additionally, for view 45° captures illumination polar angles at 3° interval. Measurement time: 15 minutes. For details see Sections 6.2 and 6.9.

Reflectance out-of-plane – captures out-of-plane data for view 45° illumination azimuthal angles at 3° interval. Measurement time: 18 minutes. For details see Sections 6.2.

Sparkle – captures in-plane data for standard ASTM geometries for sparkle analysis. Measurement time: 1 minute. For details see Section 6.4.

Graininess – captures data for approximation of diffuse illumination for graininess and photometry analysis. Measurement time: 4 minutes. For details see Sections 6.5 and 6.8.

Normals – captures data for normals distribution analysis. Measurement time: 20 minutes. For details see Section 6.6

4.6 Technical information

System requirements

- Supported operating systems: Microsoft Windows 7, Windows 10, Windows 11 (32 or 64bit)
- RAM: minimum 8GB
- Recommended processor: minimum Intel Core i5 or similar

Technical specifications

- Maximum effective optical resolution: 1500 DPI
- Measurement area: diameter 45 mm
- Measurement and data processing time: variable, 1 – 40 minutes
- Dimensions (W x D x H) / Weight: 72 cm x 72 cm x 77 cm / 65 kg
- Interfaces:
 - data – Gigabit Ethernet (cable included)
 - power – 24V (adapter AC 110-230V/DC 24V, 5A included)
- Shipping dimensions (W x D x H) / Weight: 76 cm x 76 cm x 95 cm / 99 kg

Power specifications

- Idle state power consumption: 35 W
- Operating state power consumption: 70 W
- Peak power consumption: 90 W
- Off state power consumption: < 1 W
- Input voltage: AC 110 to 240 VAC, 1.1A, 50-60 Hz, grounded / DC 120W, 24V/5A

Environmental specifications

- Recommended operating temperature range: 15° to 32° C
- Allowable operating temperature range: 0° to 40° C
- Humidity: 15% to 80% relative, non-condensing
- Non-operating (Storage) temperature range: -20° to 65° C
- Do not place the device on a place exposed to a direct sunlight!

4.7 Troubleshooting

SIGHTTEX Studio show “Connection Error”

When connection error appears, restart SIGHTTEX Studio. If this does not help, switch off the device by short press of power button. If the device does not switch off, press and hold power button for 5 seconds. Wait 20 seconds after the device powers off and then switch it on again by short press of power button. Start SIGHTTEX Studio and check connection status.

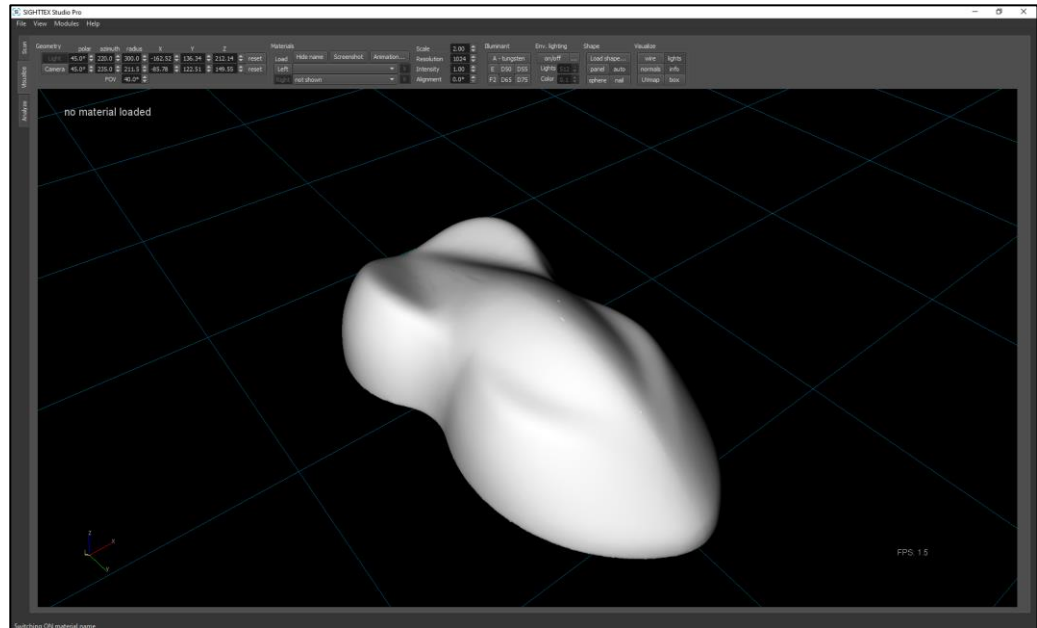
Connection to the device does not work / Device is not identified over the network.

1. Make sure that you follow the steps described in Section 4.5.
2. Make sure that there are not any firewalls between your PC and the device. If there are any, we recommend adding an exception to packet rules and open ports 14549 (outbound communication) and 14550 (inbound communication) over UDP protocol and ports 14539 and 14549 for bidirectional communication over TCP protocol.

For any other technical problems contact customer support at support@sighttex.com.

5. Visualization module

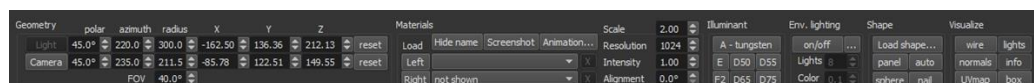
After the first launching the SIGHTTEX Studio the visualization module is switched on and the following screen appears. It displays default object for default point-light illumination, without any material loaded.



User can use among others the following functionality:

- interactively change point-light direction and distance from the object center,
- interactively change view-point and distance from the object center,
- load material on the object and compare two objects side-by-side for any position of point-light and view,
- visualize and compare materials on custom objects,
- assess material appearance under custom environment illumination and point-light with an option of several different illuminants,
- export screenshots and animation sequences,
- create and use custom settings profiles for better productivity.

All these features are controlled from the main toolbar and described in a detail in the following sections.



Status-bar at the bottom of the application screen provides user with feedback for any actions taken. Once the application is correctly terminated it restores the last active module once it is started again.

5.1 Light & camera geometry controls

Light and camera controls are located on the left side of the toolbar.

5.1.1 Light control

User is operating in a light control mode when Light button is disabled:



In the light control mode can user can control point-light location in several ways:

- pressing left-mouse-button and move – moves light horizontally over the object at fixed height
- pressing right-mouse-button and move up/down – moves light vertically, i.e., adjusts its height
- pressing middle-mouse-button and move or using mouse wheel – change distance of the light towards center of the object. This can be handy if one need to check material behavior at variable illumination angles, i.e., close to the object.

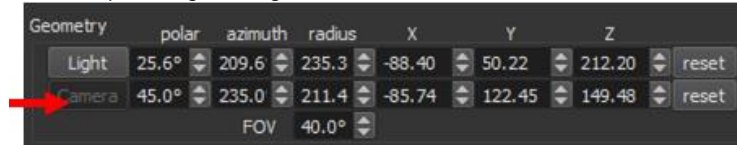
Initial light position can be restored to defaults by pressing reset button or by application menu Control->Reset light:



- User can switch between light and camera control mode also by simultaneous pressing of left and right mouse buttons

5.1.2 Camera control

User is operating in a light control mode when Camera button is disabled:



In the camera control mode can user can control viewpoint location in several ways:

- pressing left-mouse-button and move – moves camera around the fixed object and light. Horizontal movement changes position in azimuthal angle and vertical movement in polar angle, respectively
- pressing right-mouse-button and move up/down or using mouse wheel – zooms the view
- pressing middle-mouse-button and move – shifts the object out of camera center of view

Initial camera view can be restored to defaults by pressing reset button:



- User can switch between light and camera control mode also by simultaneous pressing of left and right mouse buttons

Additionally, position of light and camera can be controlled by entering exact values in spherical coordinates (polar and azimuthal angle in degrees, distance from object center) or in Cartesian coordinates (x,y,z coordinates owing to object center):

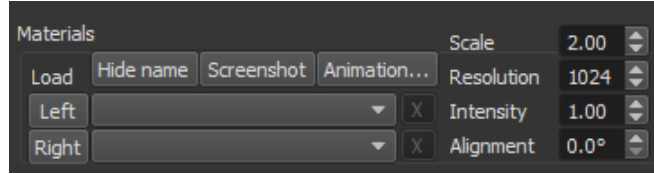


For camera one can also control its field-of-view defined by angle FOV in degrees.

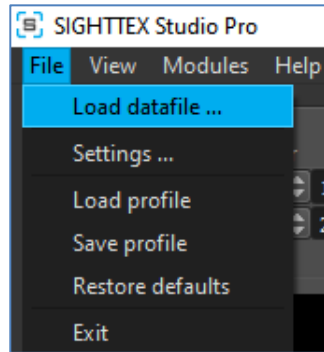
Note: To speed up the rendering the application by default reduces resolution of texture on object when manipulating the light or camera. This feature can be switched off in the settings.

5.2 Material controls

Material related controls are grouped in the middle section of main toolbar:



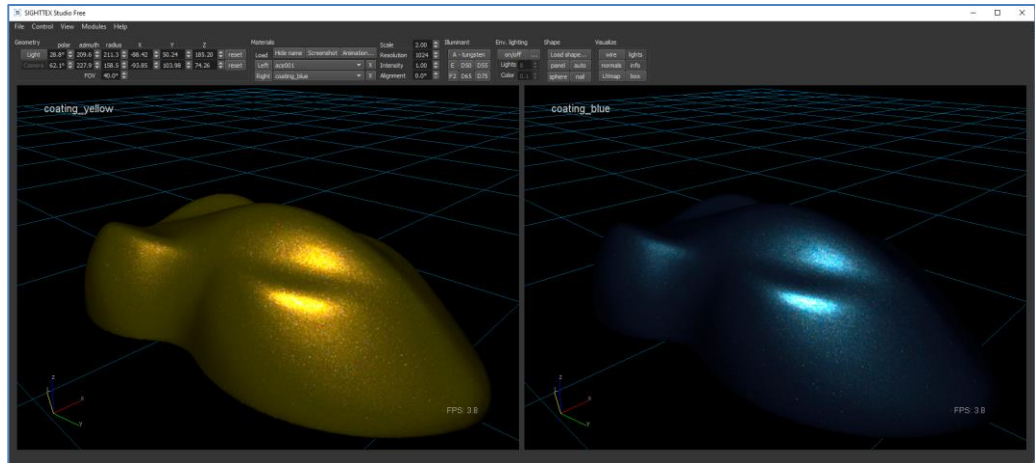
The application allows simultaneous visualization of up to two materials. For this purpose the controls feature buttons Left and Right are denoting loading a new material to the left or right window, respectively. Alternatively, one can use application menu File->Load datafile...



This opens dialog window for loading data files with an extension .mif or .big (the .big file format is obsolete, misses some features, and will not be developed in future). By default it opens folder *C:\Users\username\Documents\SIGHTTEX\SIGHTTEX_Studio\Materials*, however, user can define any other default directory in application menu File->Settings: Path to material files. Once any path is selected the application will use this path as starting for future material loading dialog. Note that for large material files the loading can take up to tens of seconds.

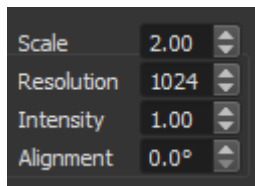
Once the material is loaded, its name appears in the drop-down menu on the left side of buttons Left and Right. One can use the dropdown menu to select which material appears on the left- and right-side when more than two materials are loaded to application. Material can be removed from application by pressing [X] button located on the right side of the drop down menu, displaying its name.

Once two different materials are shown in left and right windows any user action is applied to both materials (windows) simultaneously. This allows user to compare materials at the same conditions.



User can switch back to single window mode simply by selecting the same material in both dropdown menus, i.e., without need of deleting all but one materials.

Additional material-related parameters can be specified:



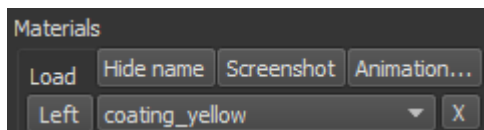
Scale – size and frequency of material pattern replication over the object surface (default value 2)

Resolution – resolution of texture on the object (always in power of 2). Valid values are 64, 128, 256, 512, 1024 (default), 2048, 4096.

Intensity – brightness of the material. Value 1 corresponds to actually measured and calibrated intensity (Illuminant D65)

Texture Alignment – user can also change orientation of texture over the object surface by changing alignment angle between 0° (default) and 360°.

The remaining buttons in the material controls:



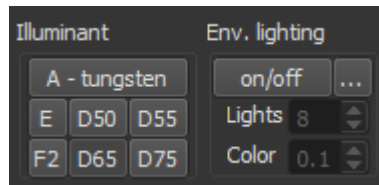
Hide name – hides material name/s from display in the top-left corner rendered window

Screen – takes a screenshot of current window/s and save it as PNG file/s to the directory: *C:\Users\username\Documents\SIGHTTEX\SIGHTTEX_Studio\Export*

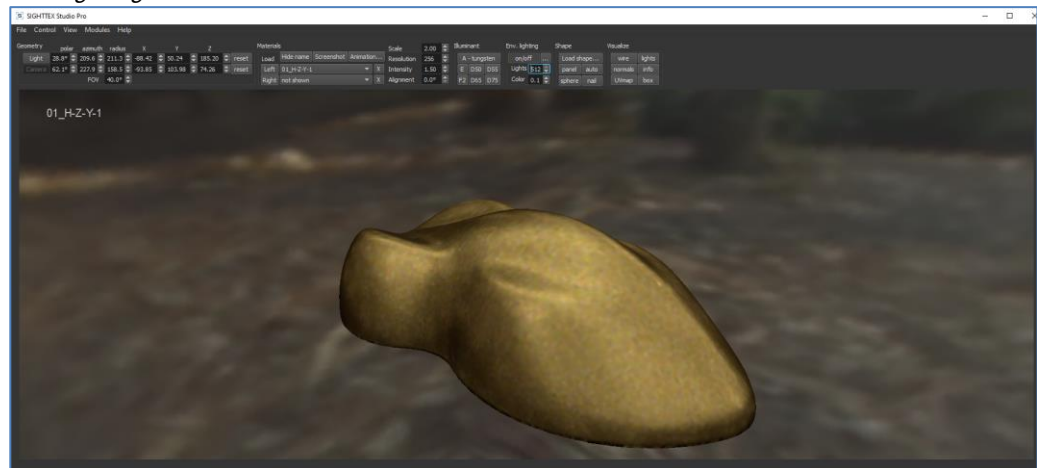
Animation... – opens export animation sequence dialog described in Section: Export animation.

5.3 Illumination controls

Section of *Illuminant* controls allows user to switch between seven predefined standard illuminants (A, D50, D55, D65, D75, E, F2) simulating different illuminant temperatures. The default illuminant is D65.



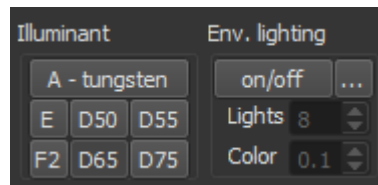
Instead of the point illumination user can also simulate environment illumination using a precomputed set of point lights for a give environment map. One can toggle between environment and point light illumination using button EnvMap in a *Env. lighting* section.



With environment illumination switch on, moving the mouse in:

- light control mode – moves environment (and lights respectively) around the object
- camera control mode – moves object in the environment

The custom environment map can be loaded in a form of PNG, HDR, or EXR panorama image using button ... in a section *Env. lighting*.



When in environment lighting mode, user can also specify:

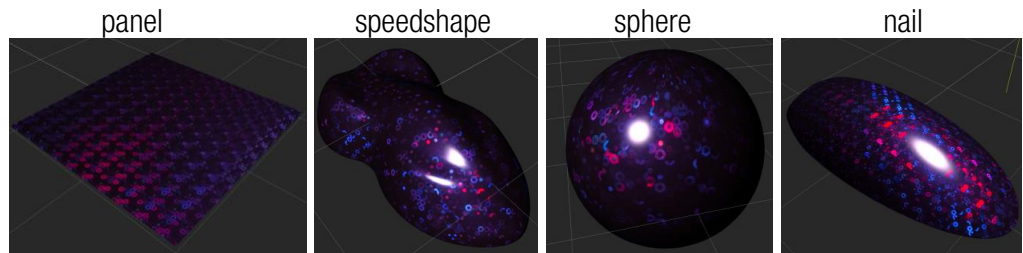
- Number of lights always as a power of 2. Note that the more lights are applied the better is the visual quality but the longer are the rendering times. Valid

range is between 2 and 512.

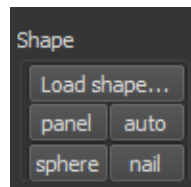
- Color contribution from light representing the scene. Valid range is between 0.0 and 1.0. The default value is 0.1.

5.4 3D geometry loading controls

SIGHTTEX Studio includes several default geometries directly accessible by pressing button in the toolbar.



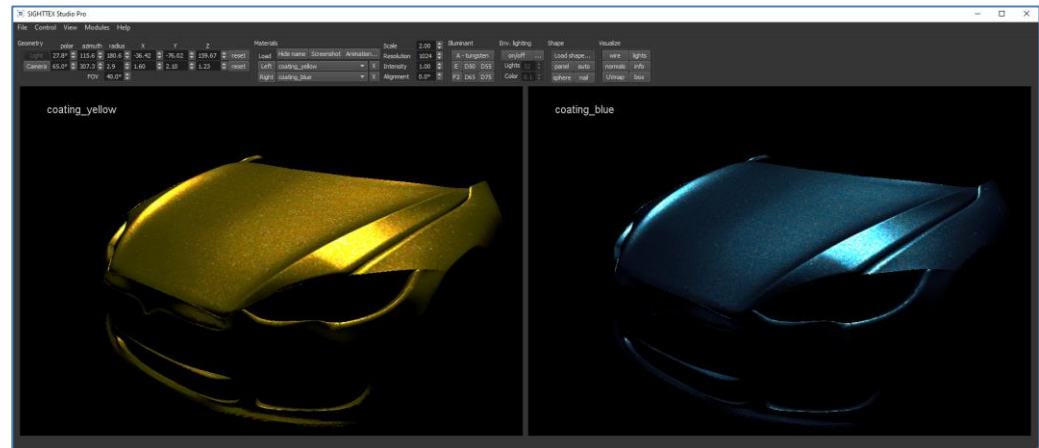
One can also use Load shape... button in a section *Shape* to load any proprietary geometry file.



Various geometry formats are supported: 3D, 3DS, 3MF, AC, AC3D, ACC, AMJ, ASE, ASK, B3D, BLEND, BVH, CMS, COB, DAE/Collada, DXF, ENFF, FBX, gITF, HMB, IFC-STEP, IRR/IRRMESH, LWO, LWS, LXO, MD2, MD3, MD5, MDC, MDL, MESH / MESH.XML, MOT, MS3D, NDO, NFF, OBJ, OFF, OGEX, PLY, PMX, PRJ, Q3O, Q3S, RAW, SCN, SIB,

SMD, STP, STL, TER, UC, VTA, X, X3D, XGL, ZGL

Note that shape should have defined texture UV coordinates, otherwise geometry loading will fail. The entire geometry scene in the file will be covered by the same material regardless the number of separate meshes.

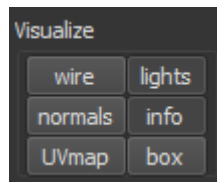


Important: The geometry file must follow the specifications shown below (otherwise it will not be loaded and shown correctly):

- **triangulated geometry only** (no general polygons or NURBS)
- **present UV/texture mapping coordinates for each scene triangle**

5.5 Visualization options

Viewing options are located on the right-side of the toolbar. User can use them to toggle several visual features in the scene. Namely:



wire – shows wireframe of the model

lights – displays light in the scene (or environment lights)

normals – toggles displaying per-vertex normal

info – toggles displaying coordinate system and rendering speed in frames per second

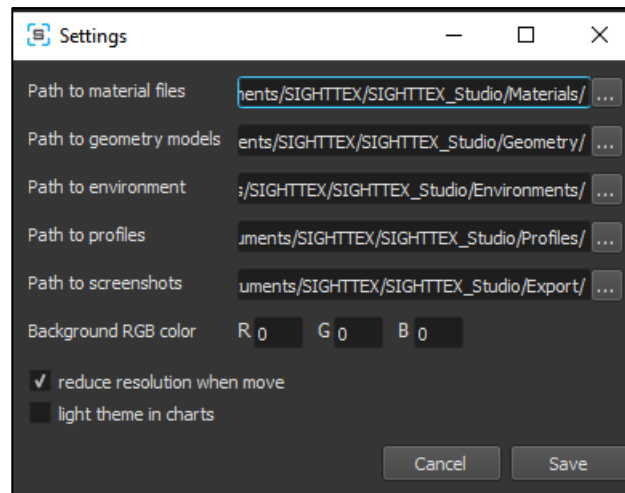
UVmap – display checkered pattern to visualize UV/texture mapping

box – toggles displaying bounding box of the object

The same can be done also in application menu View when one can also switch-off entire toolbar (e.g., to save some screen space).

5.6 Settings

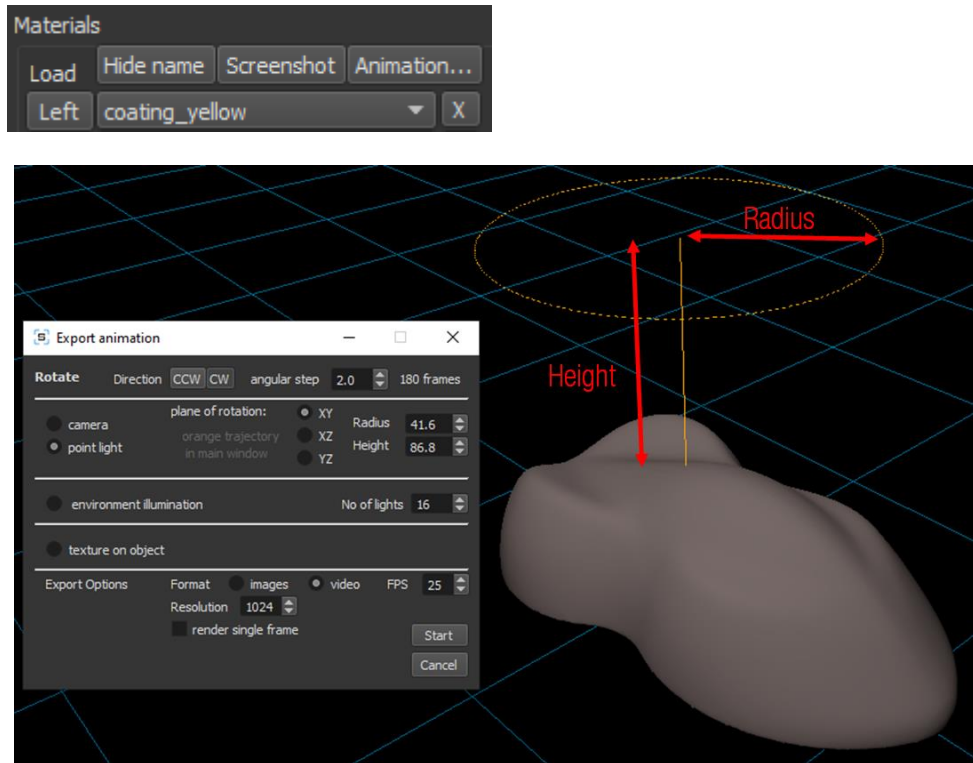
User can set preferred data directories in application menu File->Settings.



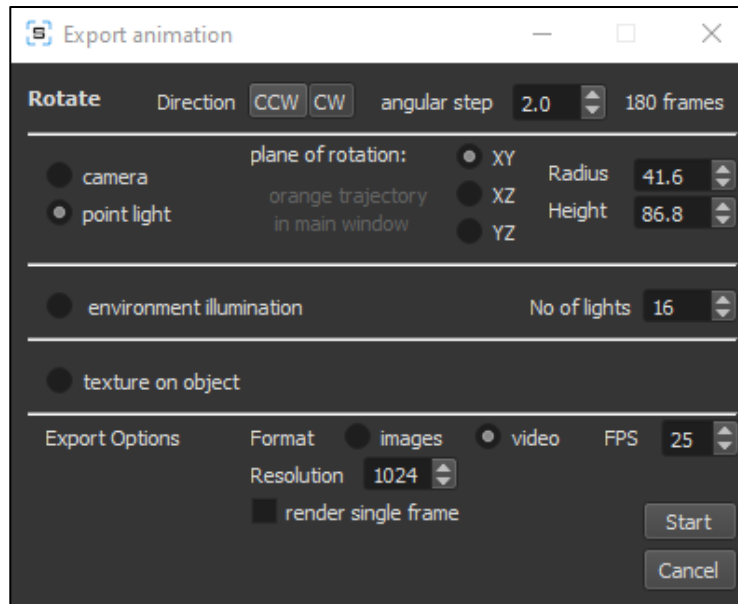
- Here one can type (or select using open dialog by pressing `...` button) the paths to material files, geometry models, environment files, user profiles, screenshots.
- User can also specify RGB color of background, where (0,0,0) is black and (255,255,255) is white.
- Tickbox “Reduce resolution when move” – PRO version allows to switch off resolution reduction when manipulating the light or camera.
- Tickbox “light theme in charts” – allows switching light theme in all charts in analytical toolboxes.

5.7 Export animation

The application allows creating basic animation of the visualized object. User has to press button `Animation...` to obtain a dialog. Once the dialog is open the material on the object is substituted by a simple shading with a line and circle above it. The circle represents a path of light or camera during the animation.



The Export animation menu allows setting defining animation parameters:



The most important is the animation type, i.e., definition which entity is moving:

camera – camera rotates around the object on a predefined circular trajectory (defined by *Radius* and *Height* parameters), while pointing towards object center

point light – light rotates around the object on a predefined circular trajectory (defined by *Radius* and *Height* parameters)

environment illumination – environment illumination is rotating azimuthally around the object

texture on object – texture mapping on the object rotates with a predefined angular step

Other parameters:

Direction – a direction of light/camera rotation over the object (CCW-counter-clockwise, CW-clockwise); default value: CW

Angular step – a predefined angular step between two consecutive frames, smaller values produce more frames, i.e., smoother movies, but rendering time prolongs respectively; default value: 2

Plane of rotation – defines orientation of the light/camera path rotation circle owing to the world coordinates (XY-horizontal, XZ, YZ-vertical); default value: XY

Radius – defines a radius of the circular rotation path

Height – defines a distance of the circular rotation path from a center of the object

No of lights – for environment illumination only, defines a number of lights representing the environment (more lights create more accurate appearance, but prolongs rendering time); default value: 16

Format – selects if data are saved as individual images (PNG) or video (AVI); default value: video

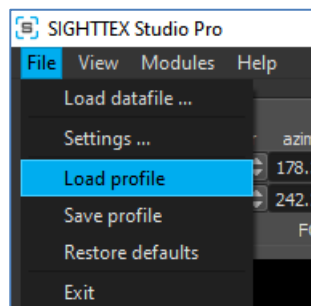
FPS – frame speed of the video in frames-per-second; default value: 25

Resolution – texture resolution on the object; default value: 1024

Render single frame – when selected it allows rendering single image only; this becomes useful e.g., for time-demanding rendering of the object in high texture resolution texture under environment illumination represented by many lights

5.8 User profiles

User can store current state of visualization module (including all settings, view and lighting geometry and material selections) to a profile file with extension PRF. This profile file can be then used to restore the stored visualization configuration. The default folder for profile files is *C:\Users\username\Documents\SIGHTTEX\SIGHTTEX_Studio\Profiles*, however, user can define any other directory in application menu File->Settings: Path to profiles.



User can use the following functionality:

- save current settings using application menu File->Save Profile
- return to the saved application settings using application menu File->Load Profile
- restore default profile using application menu File->Restore defaults

Note that the default profile is stored in the default folder as file *default.prf*. This profile is used for setting up the application after first launching.

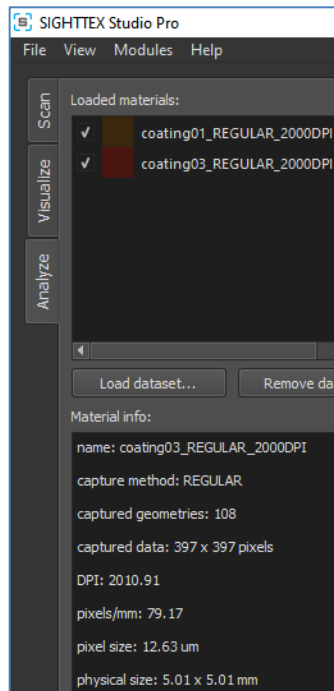
For the best customization, the profile files are text files that can be edited manually if needed.

Note: The application remembers the last settings after a correct exit and restores these settings automatically on the next start-up.

6. Analytical module

Analytical module introduces several computational tools for quantification of selected visual features of materials being compared. Currently the following tools are available:

- **Color analysis** – basic color information
- **Reflectance** – reflectance and captured geometries analysis
- **Gloss analysis** – gloss assessment according to ASTM D523
- **Sparkle analysis** – texture assessment for directional illumination
- **Graininess analysis** – texture assessment for diffuse illumination
- **Normals distribution analysis** – particle scattering information



The analytical window is accessed from menu item Modules or from left global tab Analyze. The window is split to two parts, while the right one shown module specific information, the left one show material-related information and controls shared by all analytical modules.

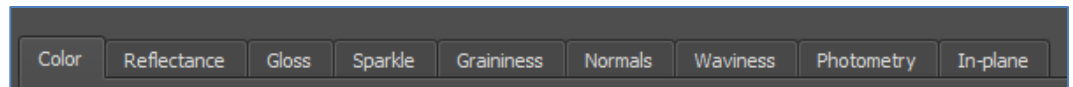
Its upper part shows a list of loaded materials, where user can select/unselect only desired ones. It features two buttons:

Load material... – this button opens material-file loading dialog

Remove dataset – when the material is selected user can use button to remove it from the application.

Bottom part of the left side displays material information as material name, captured method, number of captured geometries, DPI, image resolution, pixel size captured area, and user specified information.

The right larger part of the window displays information of individual analytical tools. Those can be switched by selecting corresponding tab. Note that individual tabs are enabled only if there are captured data methods among the loaded material datasets that allow corresponding analysis.



The following section describes functionality of individual tools more in detail. Some of the tools process all eligible datasets in a list (Color, Gloss, Sparkle, Graininess, In-plane) while the others process only one of the materials selected by clicking on the list of the loaded materials on the left (Reflectance, Normals, Photometry).

6.1 Color analysis

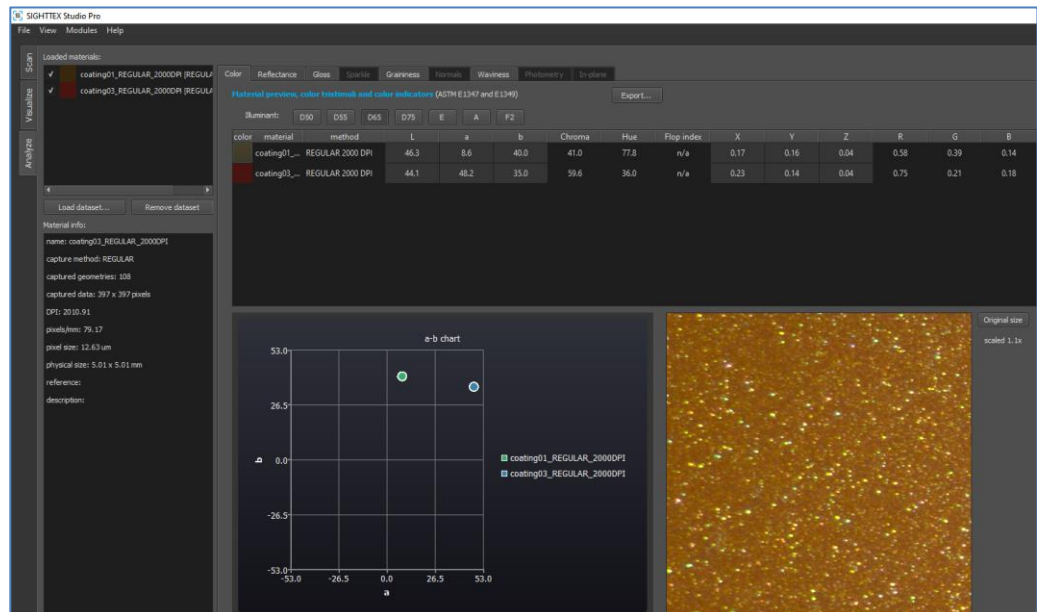
The default analytics tool of analytical module is color analysis. It displays basic material color information obtained for the standard geometry given by polar angles illum 45°/ view 0° or similar (if the captured representation does not feature the standard geometry).

The *Color* tab consists of two basic sources of information:

- Color table: showing material color in CIE Lab, CIE XYZ, sRGB, Chroma and Hue values and for selected representations it computes also Flop index.
- ab-chart: shows positioning of material's chromaticity in CIE ab space based on the chromatic information obtained from the standard geometry. If the same material is captured using different methods it appears in the chart as a single point.

User can change the illuminant using buttons above the table to simulate different lighting temperatures. Available predefined illuminants are A, D50, D55, D65, D75, E, and F2. Note: The selection of illuminant in this tab affects color information in all analytical tools in the remaining tabs.

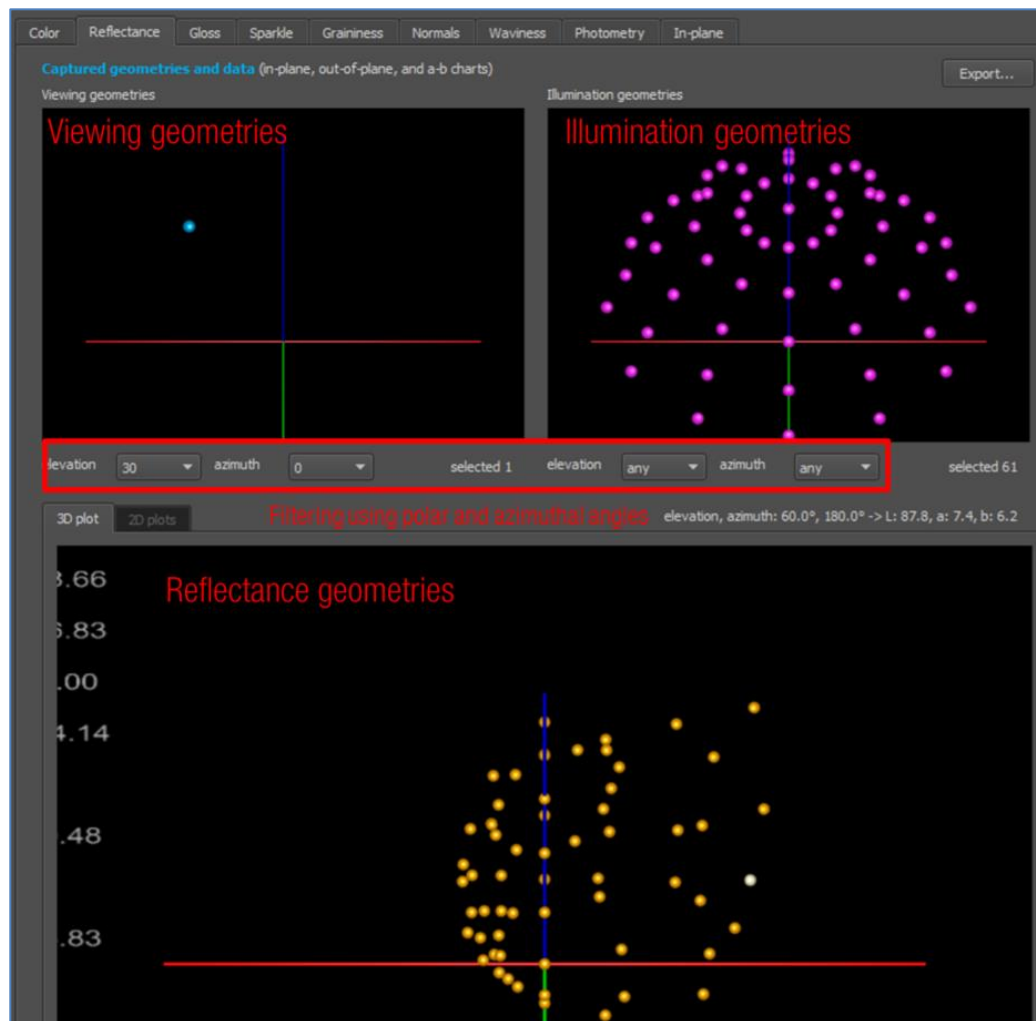
Note: A specific material can be removed from a comparison (without need of its removal from application) simply by un-ticking the tick-box near its name in material list in the left window. All values from the table can be exported using the Export button.



6.2 Reflectance and geometries analysis

The tab Reflectance allows exploring captured geometries and the bidirectional reflectance values by means of 3D and 2D charts. Select the dataset by clicking on its name in the list of the loaded datasets on the left.

The upper two charts depict the captured viewing and illumination geometries on the hemisphere. User can filter visualized geometries by specific elevation (polar) and azimuthal angles using drop-down menus showing available captured angles. Note that for viewing geometries the default setting is the standard geometry 45°/0°.

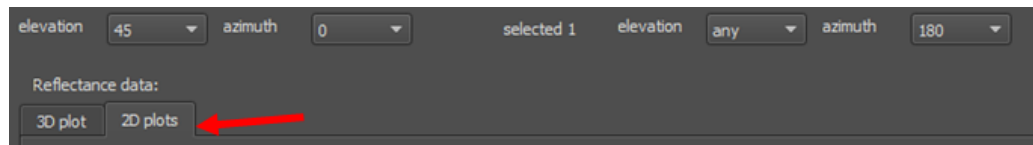


Once only a single geometry is selected either for viewing or for illumination direction, the bottom 3D graph appears. This 3D graph depicts reflectance values for individual selected geometries. If one of the geometries graph does not filter apply any filter (both values features „any“) the reflectance graph depict entire captured reflectance lobe. User can:

- rotate all three graphs synchronously using right mouse button (RMB) + mouse move
- zoom the content of reflectance graph using a mouse wheel; a pivot point of the zoom is a mouse location in the graph

Different materials can be compared easily for the selected graph orientation by material selection in the left material panel.

Once the 3D geometry consists of only geometries lying all in horizontal or vertical plane, one can switch from the reflectance graph from 3D to 2D visualization.



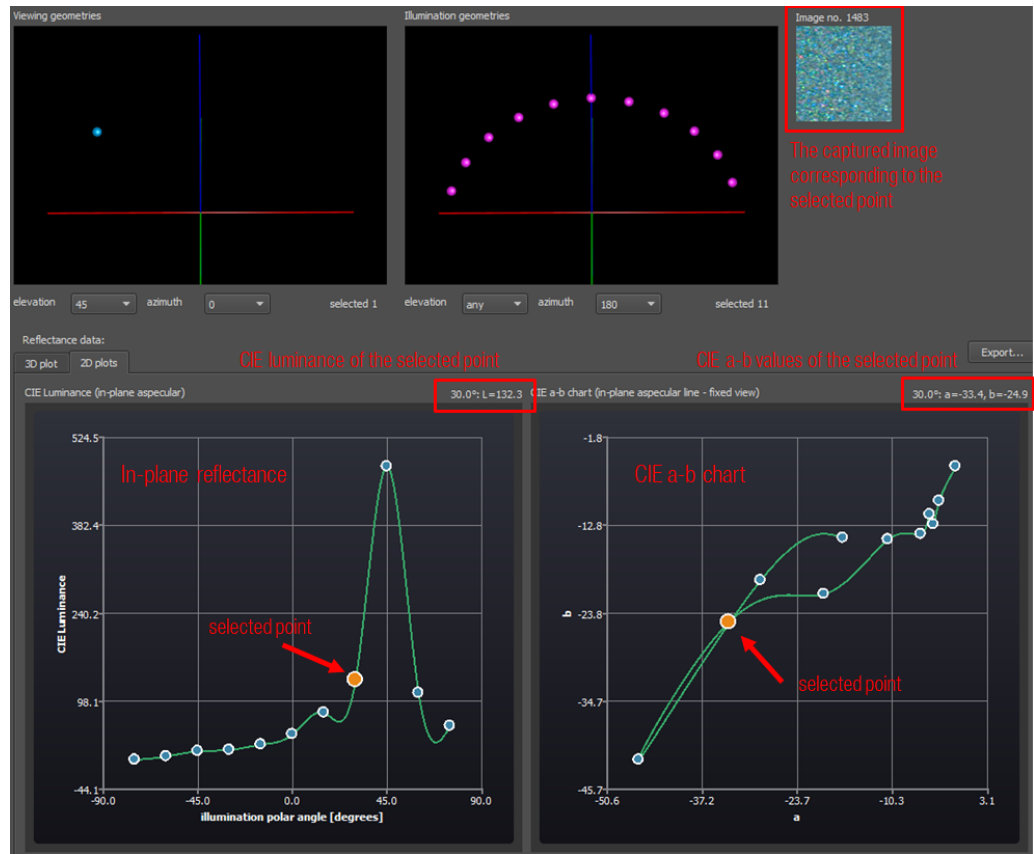
Displaying in-plane geometry

When viewing angles are azimuthal 180° degrees apart from illumination angles, e.g., 45° and 0° and illumination angles „any“ and 180° are selected, the 2D reflectance graph displays:

- on the left: **reflectance** for in-plane geometry, polar angle rang -90°, 90°
- on the right: **CIE a-b graph** for the corresponding geometries

By moving mouse cursor over individual points in the graph, one can highlight the point in both graphs. The corresponding CIE luminance and a-b values are shown above the graphs. Additionally, on the right side of the illumination geometries is shown captured image corresponding to the selected point as it is shown in screenshot below. Note that the CIE luminance and a-b values are obtained by spatial imaging of the image in CIE Lab color-space.

Note: Any angle from a selected drop-down menu can be quickly changed by mouse wheel, when mouse is positioned over the menu. This way user can quickly compare graphs, e.g. for individual illumination elevation angles.



Similarly, one can show horizontal azimuthally-dependent in-plane data in range 0-360°, e.g., by selecting angles 45° and 0° and illumination angles 45° and „any“.

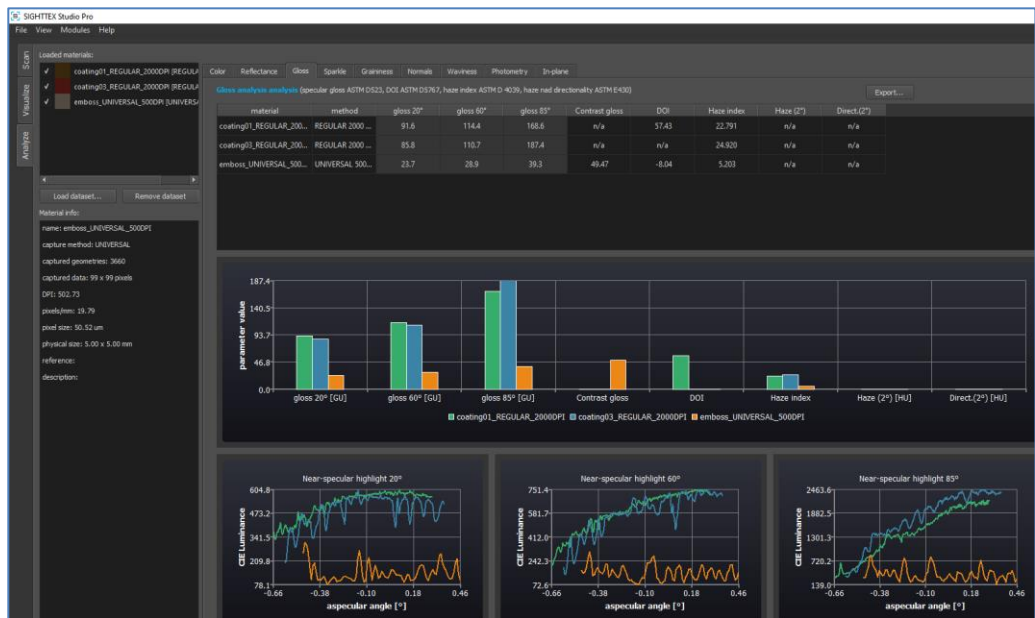
All CIE Lab values for the selected material can be exported using Export button.

6.3 Gloss analysis

Gloss is one of the principal material properties. Application currently implements gloss measurement according to standard ASTM D523. All applicable datasets in the list of datasets are processed.

For each of the loaded materials the table shows gloss values for geometries 20°, 60°, and 85°, contrast gloss, DOI, haze index, haze and directionality (when applicable).

The bar graph below compares results visually. Graphs below compare near specular intensity and highlight profiles for geometries 20°, 60°, and 85°.



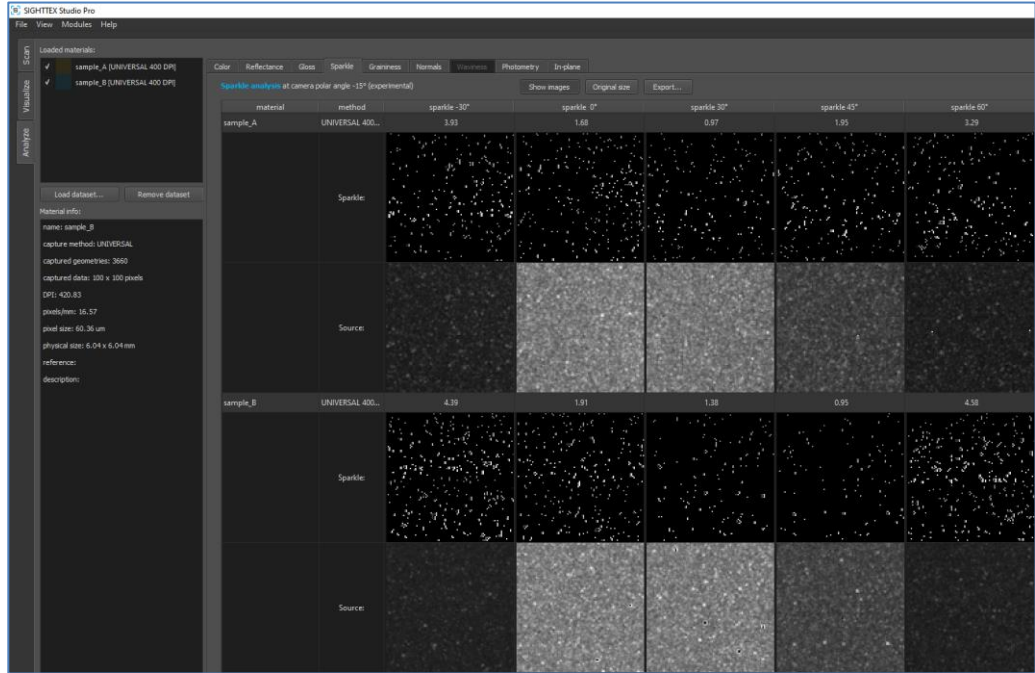
Note that a specific material can be removed from a comparison (without need of its removal from application) simply by un-ticking the tick-box near its name in material list in the left window. Gloss values for the selected materials can be exported using Export button.

Note: Not all captured material representations allow assessing gloss for all geometries.

6.4 Sparkle analysis

Especially for coating materials SIGHTTEX Studio features coated texture glint analysis for directional illumination; often denoted as sparkle. All applicable datasets in the list of datasets are processed.

Application characterizes in-plane sparkle for camera at -15° , and lights at -30° , 0° , 30° , 45° , and 60° .



The main table shows results for each illumination direction the sparkle value, sparkle image with location of sparkle spots and source image used for analysis. The images can be hidden by pressing Show images button.

By pressing Original size button the images are displayed in original resolution without rescaling to the window. Note that images can be very large for higher resolution and larger captured areas.

Note that a specific material can be removed from a comparison (without need of its removal from application) simply by un-ticking the tick-box near its name in material list in the left window. Sparkle values for all materials can be exported using Export button.

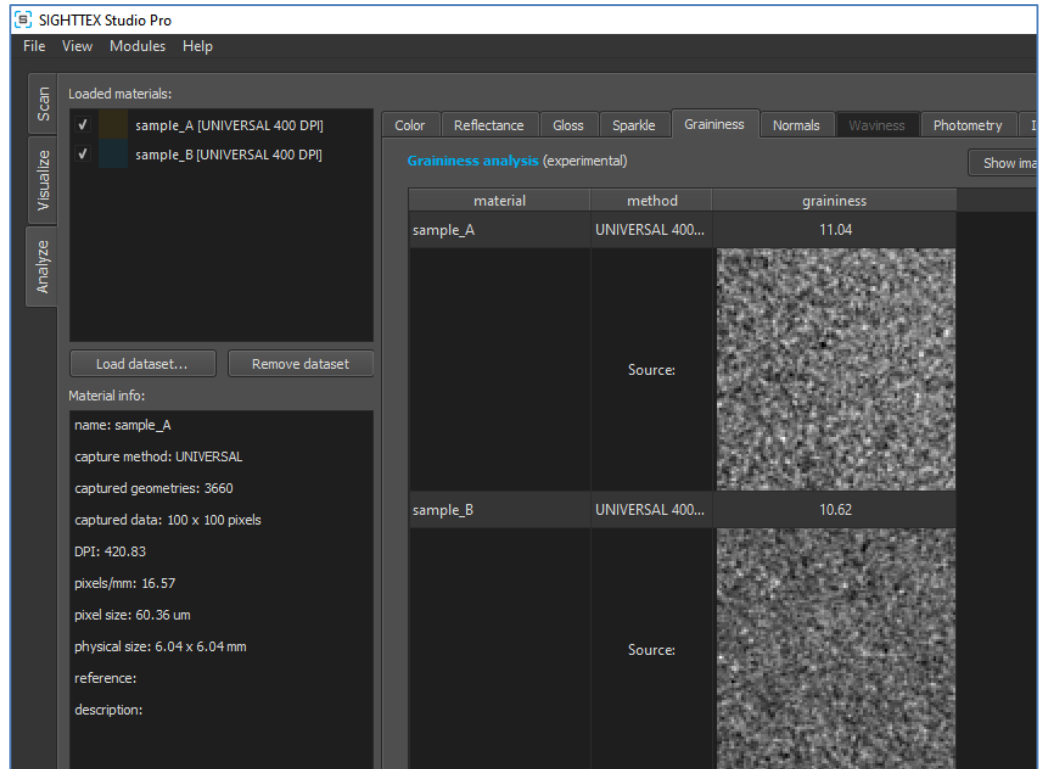
Note: A specific material can be removed from a comparison (without need of its removal from application) simply by un-ticking the tick-box near its name in material list in the left window.

Note: Not all captured material representations allow assessing sparkle for all illumination geometries.

6.5 Graininess analysis

In contrast to sparkle, another texture feature of effect coatings – graininess is obtained for a diffuse illumination. Its image is obtained for viewing angle at 15°. All applicable datasets in the list of datasets are processed.

The table of results show for each compared material graininess value and the source image.



The images can be hidden by pressing [Show images](#) button.

By pressing [Original size](#) button the images are displayed in original resolution without rescaling to the window. Note that images can be very large for higher resolution and larger captured areas.

Note that a specific material can be removed from a comparison (without need of its removal from application) simply by un-ticking the tick-box near its name in material list in the left window. Graininess values for all materials can be exported using [Export](#) button.

Note: A specific material can be removed from a comparison (without need of its removal from application) simply by un-ticking the tick-box near its name in material list in the left window.

6.6 Normals' distribution

Light scattering from material to different directions over a hemisphere can be quantified by normal distribution function (NDF). Individual data capture methods provide different amount information required for NDF computation. Select the dataset by clicking on its name in the list of the loaded datasets on the left. The number of geometries (images) contributing to NDF analysis for a given material is shown in the first line of Normals tab.

The tab breaks down to three graphs:

- **Normal distribution function** (left) – a 3D graph showing density of individual scattering directions. One can rotate the graphs using right mouse button (RMB) + mouse move. The content can be zoomed using a mouse wheel, where a pivot point of the zoom is a mouse location in the graph. The scaling of the graph can be set using a drop-down menu *Maximal value* and scaled back to the window using a button Fit to window.
- **Histogram of normals' inclinations** (top-right) – depicts histogram of deviation normals from captured surface plane. The Y-axis depicts count of directions while X-axis is in degrees. The scaling of the graph can be set using a drop-down menu *Maximal value* (a mouse wheel can be used) and scaled back to the window using a button Fit to window.

The top-right corner of the graph features *Scatter level* of the material relating material directional scattering owing to a reference shiny glass material. A minimal value is 0 for material reflecting only along the surface normal.

- **Histogram of normals' azimuths** (bottom-right) – depicts histogram of distribution of normals to azimuthal directions from 0° to 360°. The Y-axis depicts count of directions while X-axis is in degrees. The scaling of the graph can be set using a drop-down menu *Maximal value* (a mouse wheel can be used) and scaled back to the window using a button Fit to window.

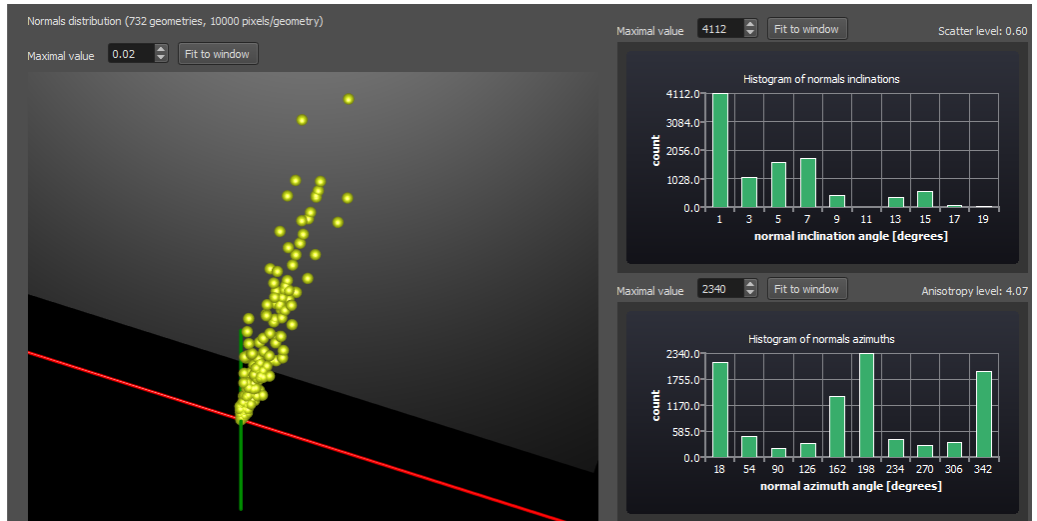
The top-right corner of the graph features *Anisotropy level* of the material relating material azimuthal scattering owing to its *Scatter level*. A minimal value is 0 for isotropic material reflecting to all azimuthal direction equally.

Two examples follow:

Gloss coating material – the reflection normals are well aligned with surface normal; elevation histogram shows maximum for one degree from surface normal; azimuthal distribution is more or less uniform so the material is almost isotropic (the same behavior to all azimuths)



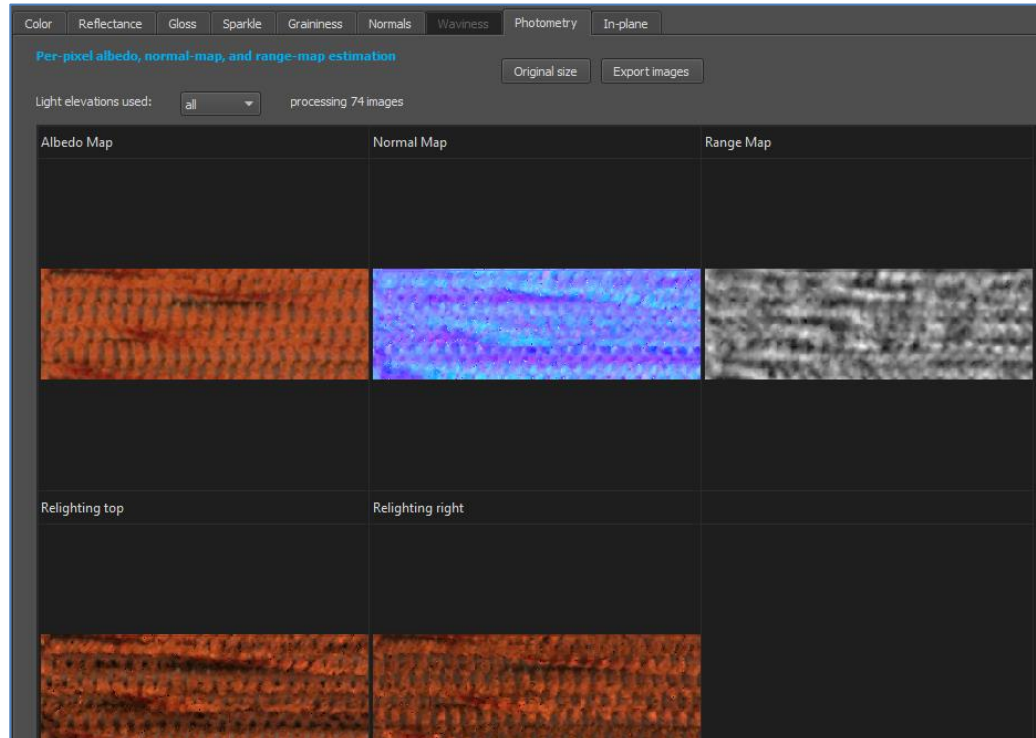
Polyester fabric – the reflection normals are scattered around surface normal; elevation histogram shows relevant contribution from angles up to 15 °; azimuthal distribution shows significant differences and peaks 180° apart denoting strong anisotropic reflection in this direction.



6.8 Photometry analysis

Photometry tool provides basic photometric representation of the captured material using albedo-map, normal-map, and range-map estimated by a photometric stereo. Select the dataset by clicking on its name in the list of the loaded datasets on the left.

Obtained result are then verified by basic Lambertian relighting for light positioned on the top and on the right of the material sample.



User can use a drop-down menu Light elevations used: to select elevations used for photometric computations. After the selection, on the right side is number of images used for the computations.

By pressing Original size button the images are displayed in original resolution without rescaling to the window. Note that images can be very large for higher resolution and larger captured areas. The resulting maps can be exported as PNG files using the button Export images.

6.9 In-plane analysis

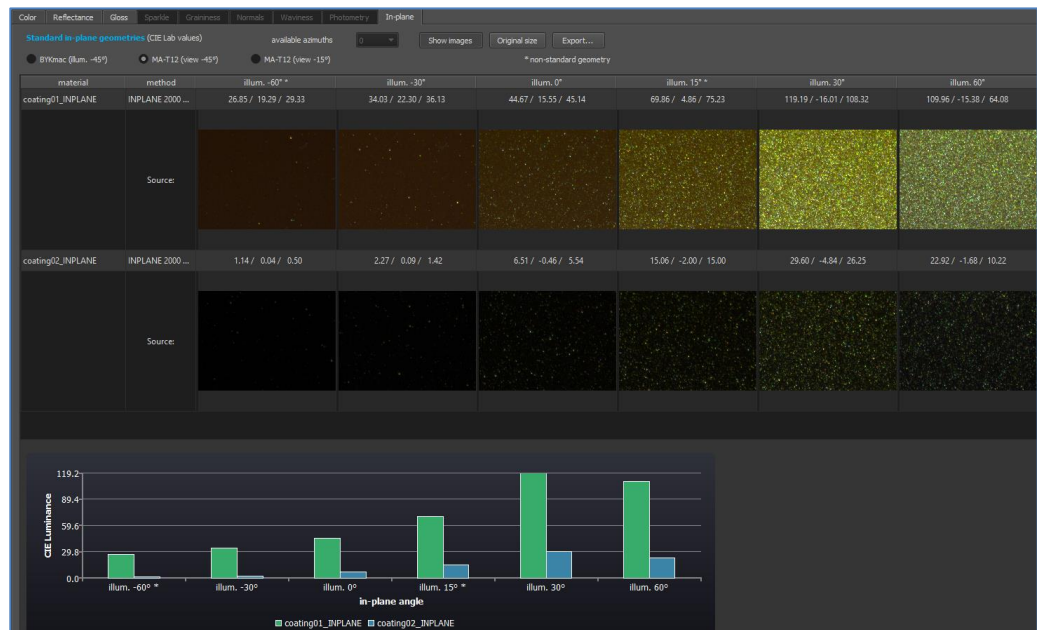
SIGHTTEX Q allows direct material visual comparison in ASTM geometries and geometries captured by current industrial devices. All applicable datasets in the list of datasets are processed.

One of three options can be selected by a tick-box:

- 6 ASTM geometries (E 2539 – 08) for polar illumination angle 45 ° and variable observation angles -60°, -30°, 0°, 15°, 30°, 60°.
- 6 geometries for polar observation angle 45 ° and variable illuminations angles -60°, -30°, 0°, 15°, 30°, 60°.
- 6 geometries for polar observation angle 15 ° and variable illuminations angles -60°, -30°, 0°, 30°, 45°, 60°.

For each eligible material average CIE Lab values are computed and corresponding material texture is shown. Below is shown a bar graph comparing CIE Luminance values of different materials visually.

For method UNIVERSAL user can switch between individual in-plane measurements taken for different azimuthal positions of light and camera using drop-down menu [available azimuths](#).



The images can be hidden by pressing [Show images](#) button.

By pressing Original size button the images are displayed in original resolution without rescaling to the window. Note that images can be very large for higher resolution and larger captured areas.

Note that a specific material can be removed from a comparison (without need of its removal from application) simply by un-ticking the tick-box near its name in material list in the left window. In-plane values for all materials can be exported using Export button.