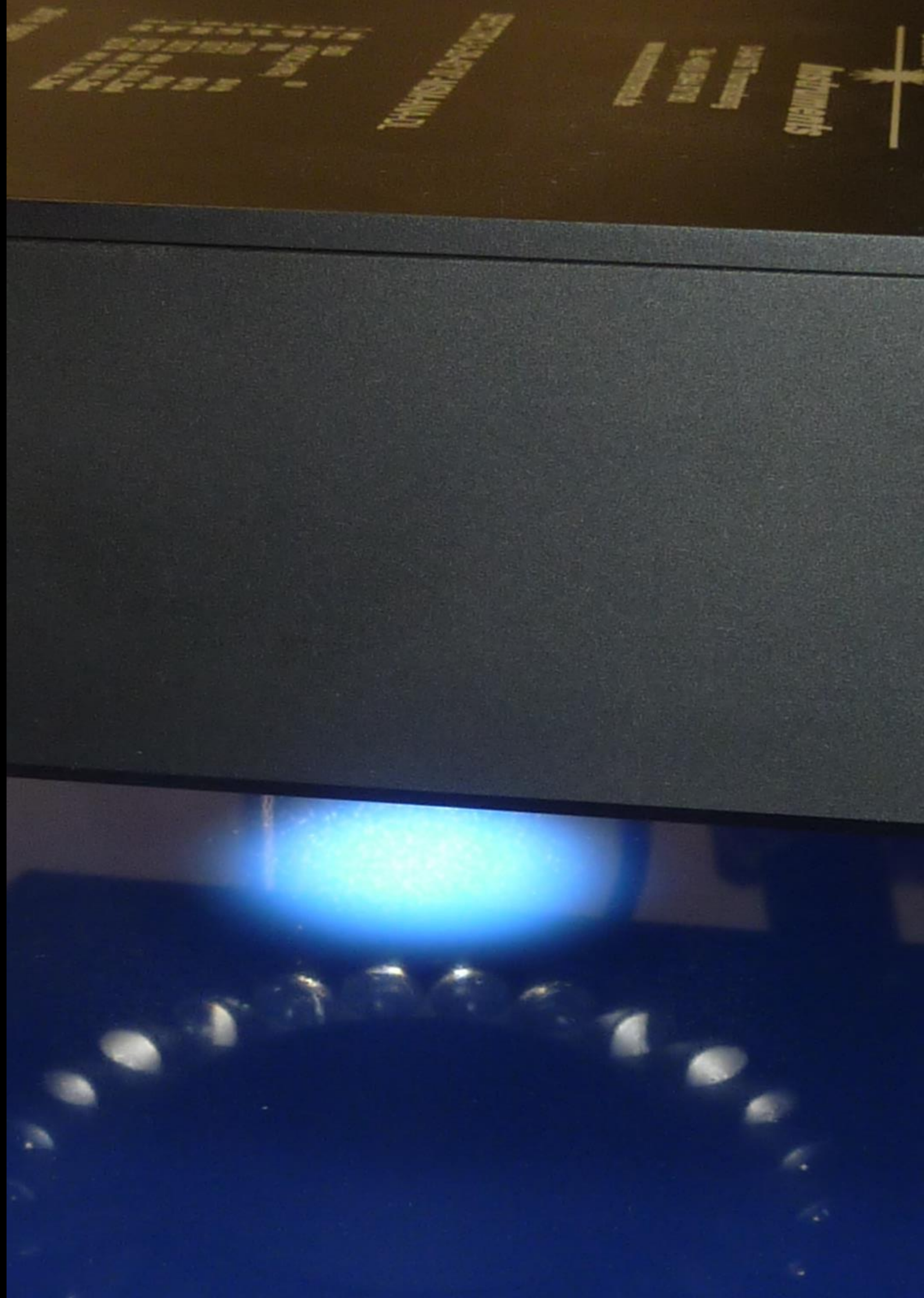
Sensor Instruments

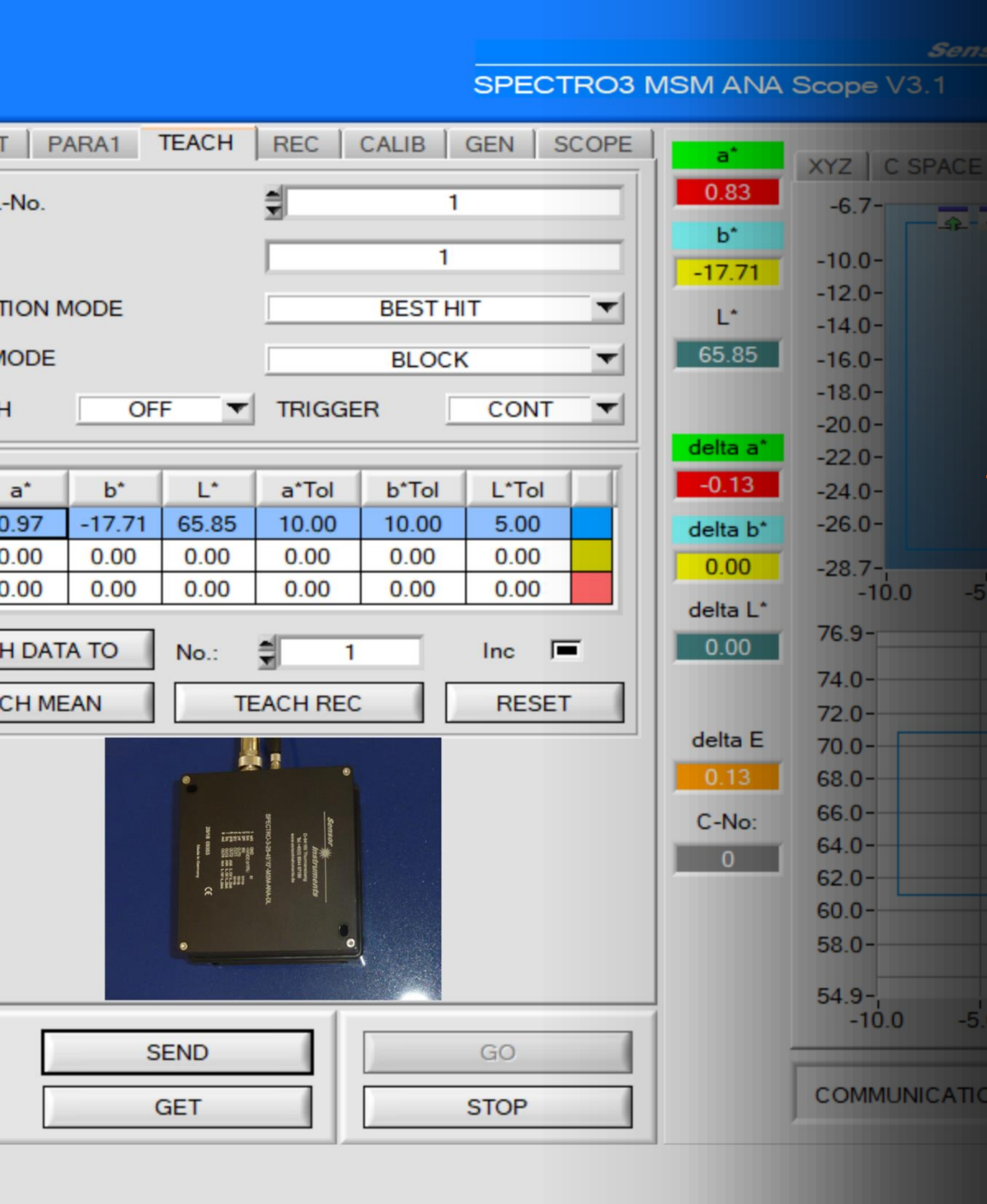
Surface Inspection

Color Measurement I Gloss Measurement I Haze Control I
Fluorescence Measurement I Phosphorescence Measurement

Inline measurement of the color of a surface using the 45°/0° method

To make the actual color more apparent, the direct reflection must be suppressed as much as possible. On the detector side, mainly diffusely reflected transmitter light is incident. Gloss effects are avoided as far as possible on the receiver side. This significantly reduces the difference between glossy and matt surfaces.





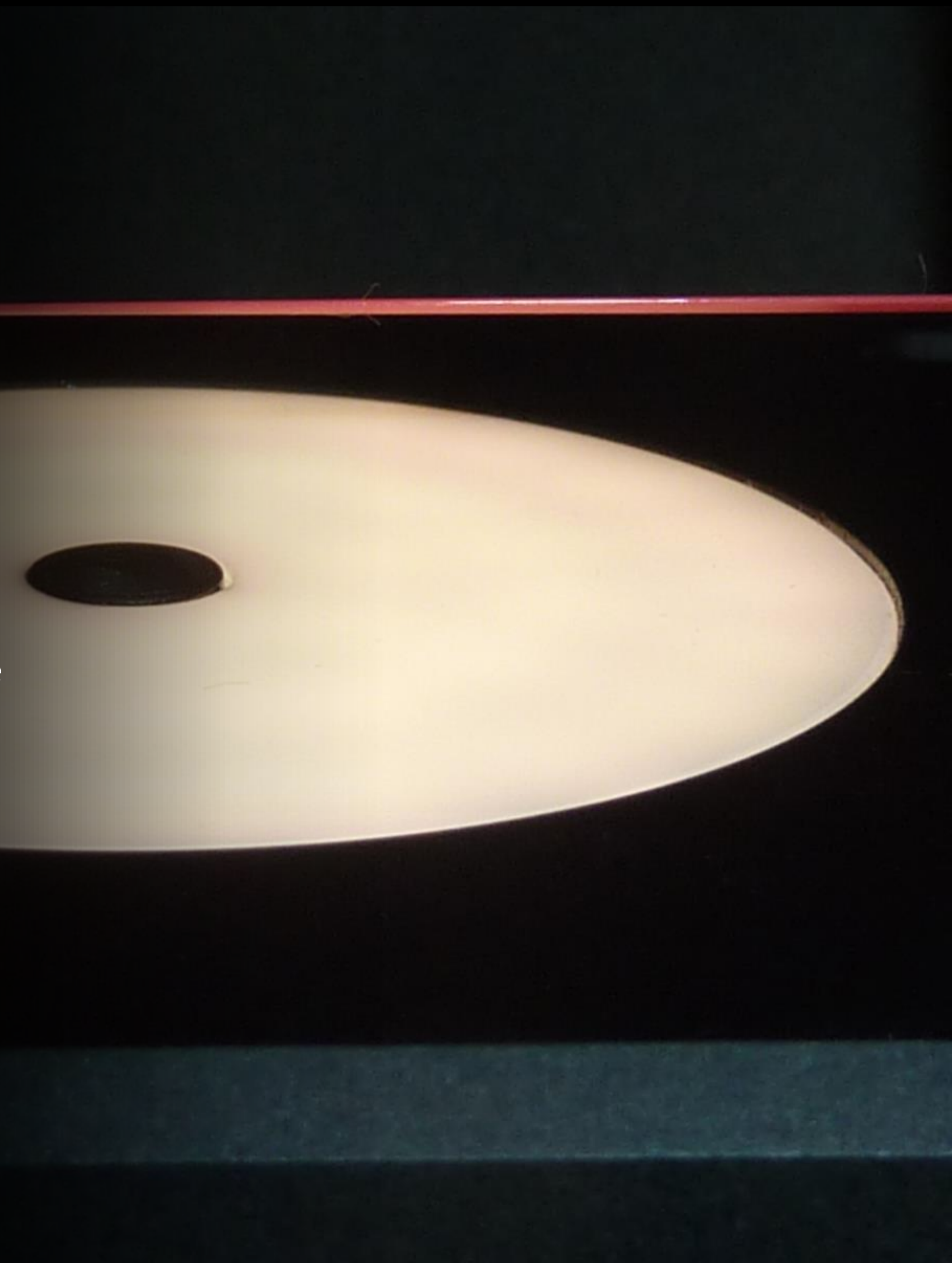
45°/0° color measurement method

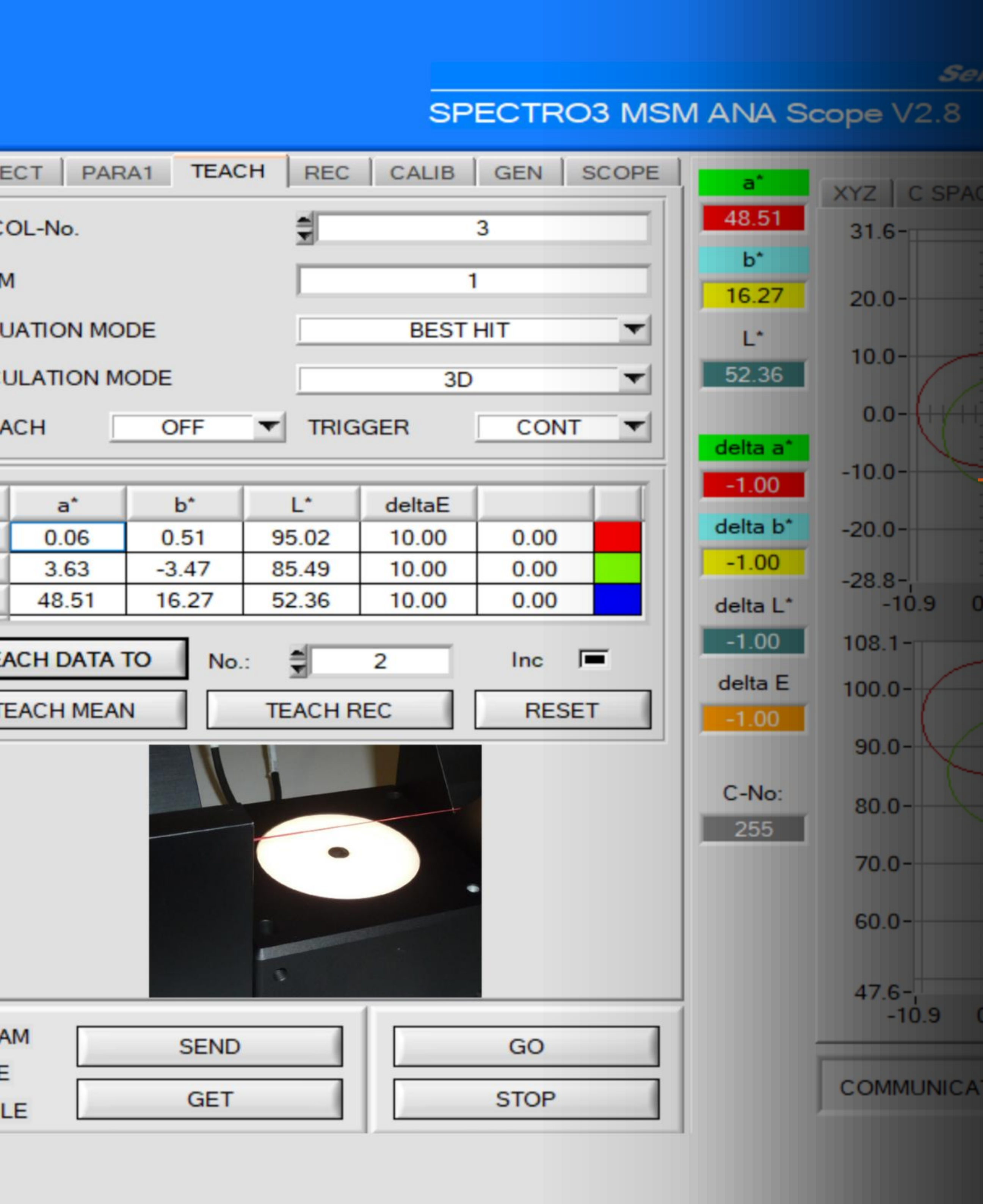
This color measurement method is mainly used for flat surfaces (flat within the measuring spot). Moreover, homogeneous surfaces should be measured. For the measurement of structured surfaces, this measuring principle is less suitable.

SPECTRO-3-28-45°/0°-MSM-ANA-DL

Inline measurement of the color of a surface using the Diffuse/0° method

This measuring method is particularly suitable for structured surfaces, as surface differences are largely compensated for by diffuse light. Yet this measuring method is also extremely suitable for wire-shaped objects (e.g. metal wires, plastic wires and textile threads).





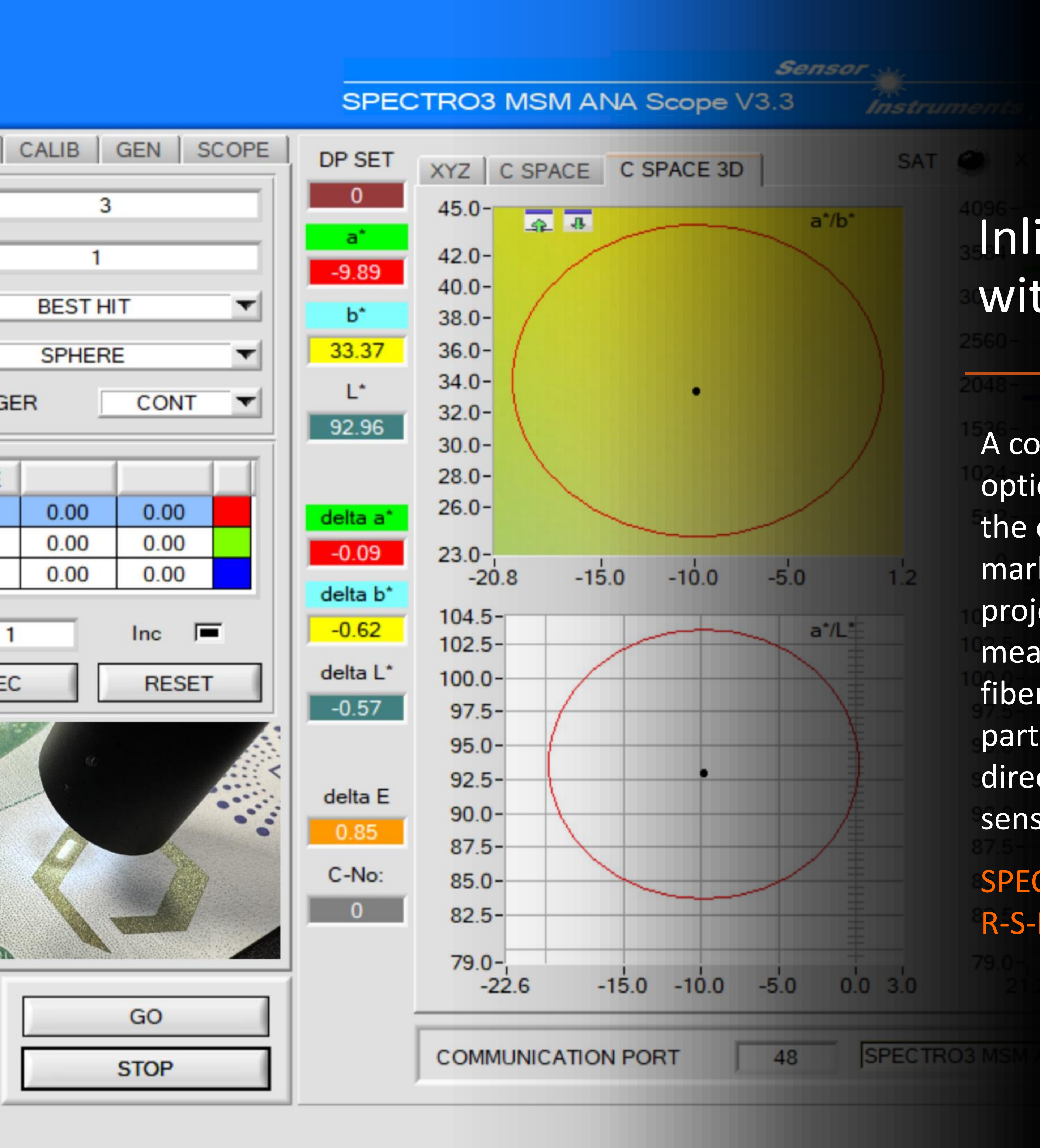
Diffuse/0° measurement method

Since the measurement is done inline here, an integrating sphere cannot be used as a diffuse light source. Instead, a combination of volumetric diffusers and a Sunlight-LED cluster is used. This ensures that the entire half-space is illuminated almost homogeneously.

SPECTRO-3-20-DIF-MSM-ANA-DL

Spot inline color measurement

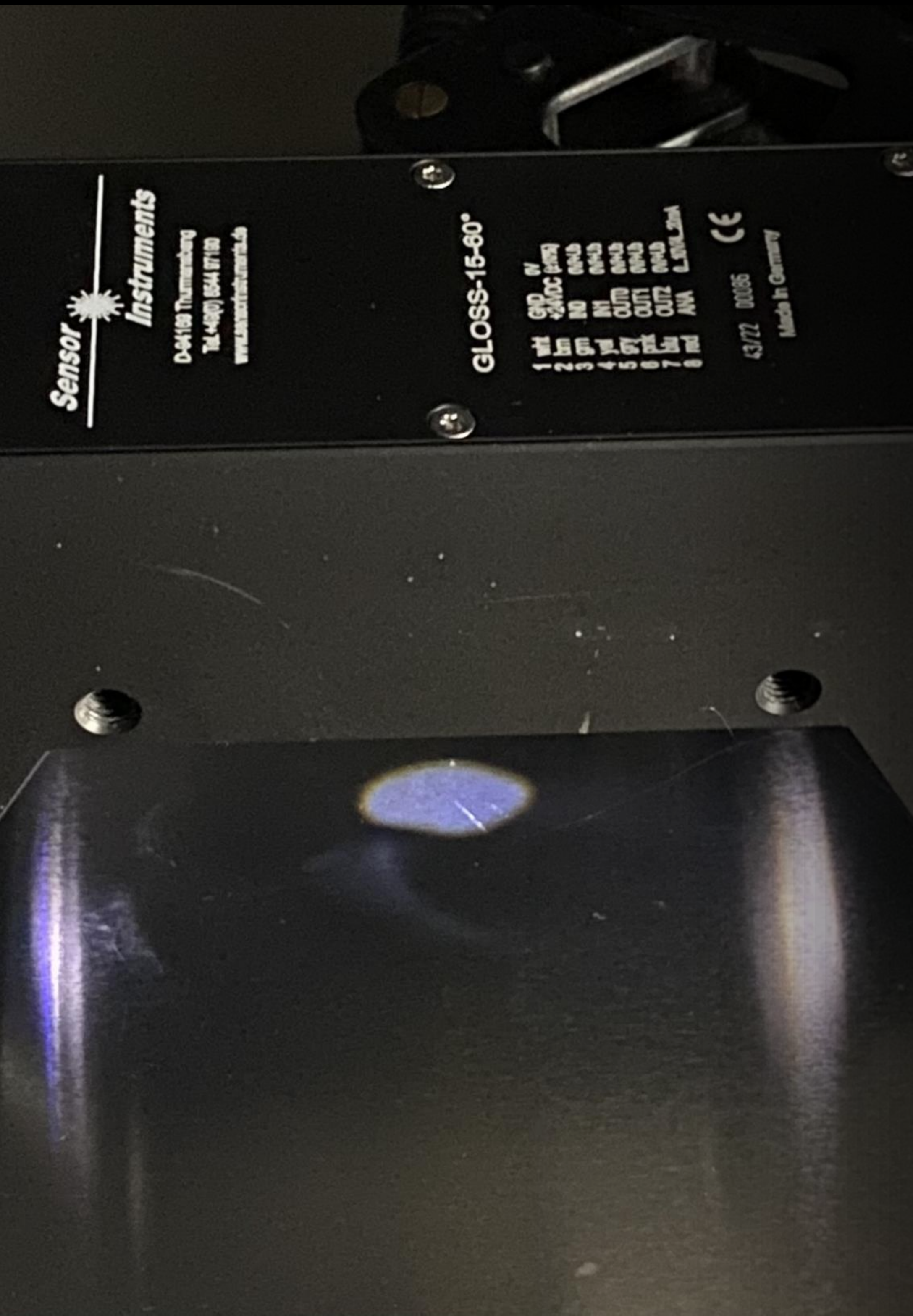
Fiber optic frontends are suitable for inline color measurement of small surface sections. Depending on the application, either a combination of transmitter and receiver fiber optics in a V-shaped arrangement or a reflected light fiber optics in which the transmitter and receiver branches are equally present can be selected. Corresponding cross-section converters enable both circular and rectangular light spots.



Inline color measurement with optical fibers

A color sensor system with a fiber optics interface is used to measure the color of pearlescent effect color marks, for example. The light is projected onto the color marks by means of a reflectied light optical fiber with attachment optics and a part of the diffuse reflected light is directed backwards to the color-sensitive detector element.

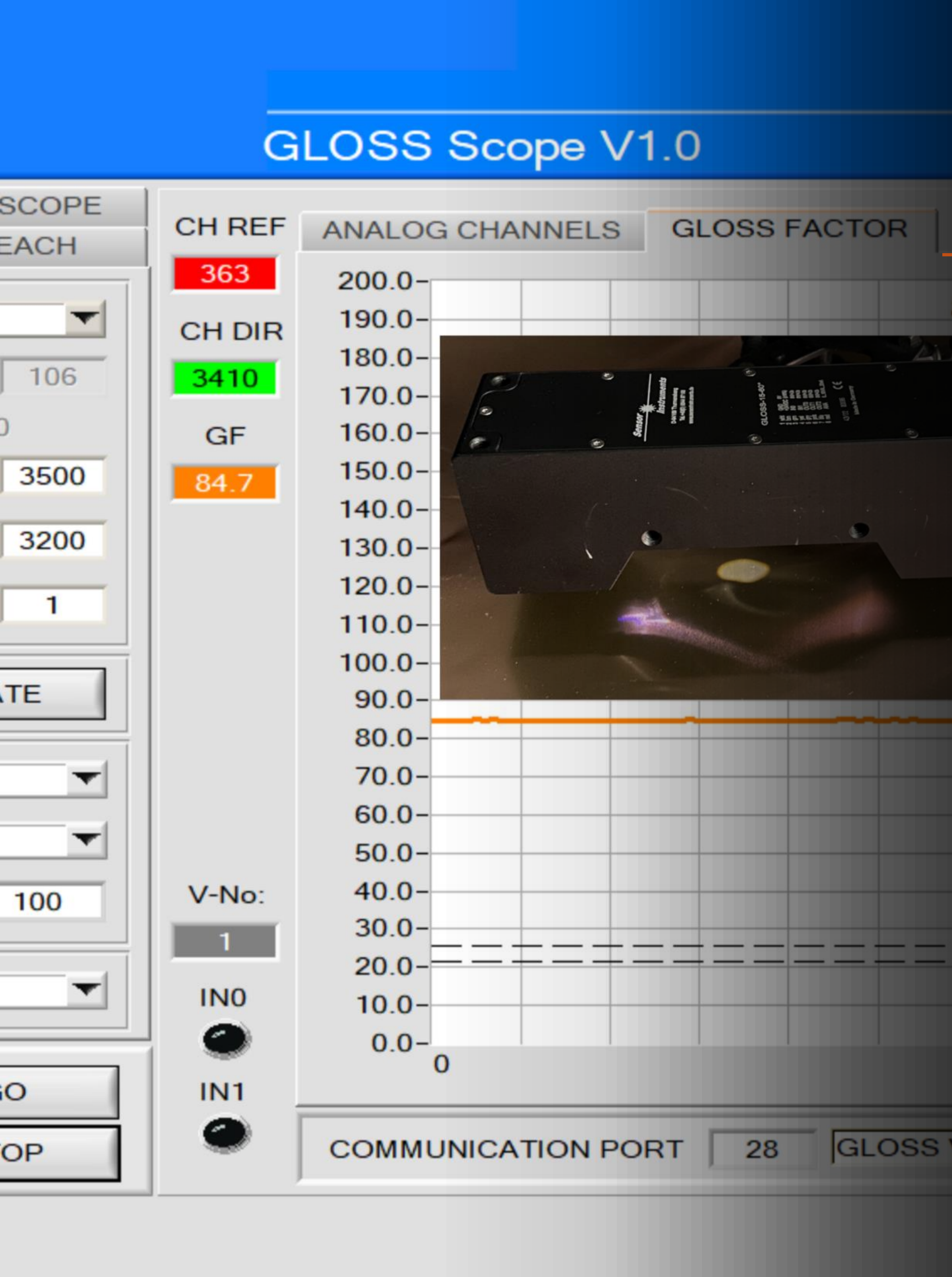
SPECTRO-3-FIO-MSM-ANA-DL + R-S-R2.1-(6x1)-1200-67° + KL-8-R2.1



Inline gloss measurement

When assessing the quality of a surface, gloss is used in addition to color. Gloss is the direct reflection on the object surface. It is important to ensure that the surface within the light spot is flat and homogeneous. Depending on the degree of gloss, measurements are taken at different angles to the normal:

- 20° (high-gloss surface)
- 60° (glossy to matt surface)
- 85° (matt surface with low gloss)
- 45° (matt to glossy paper surface, TAPPI standard)
- 75° (matt paper surface, TAPPI standard)



Inline gloss measurement

For inline gloss measurement, it is necessary to ensure that the measuring distance, i.e. the distance between the gloss measurement system and the surface to be measured, is constant and corresponds to the specified measuring distance.

In addition to the stated measuring angles, different apertures are available for each measuring angle. This allows light spot sizes from 1mm in diameter to be realized, which means that correspondingly small objects can be measured.

GLOSS-20-20°
GLOSS-20-45°
GLOSS-20-75°
GLOSS-15-60°
GLOSS-5-85°

Inline haze control

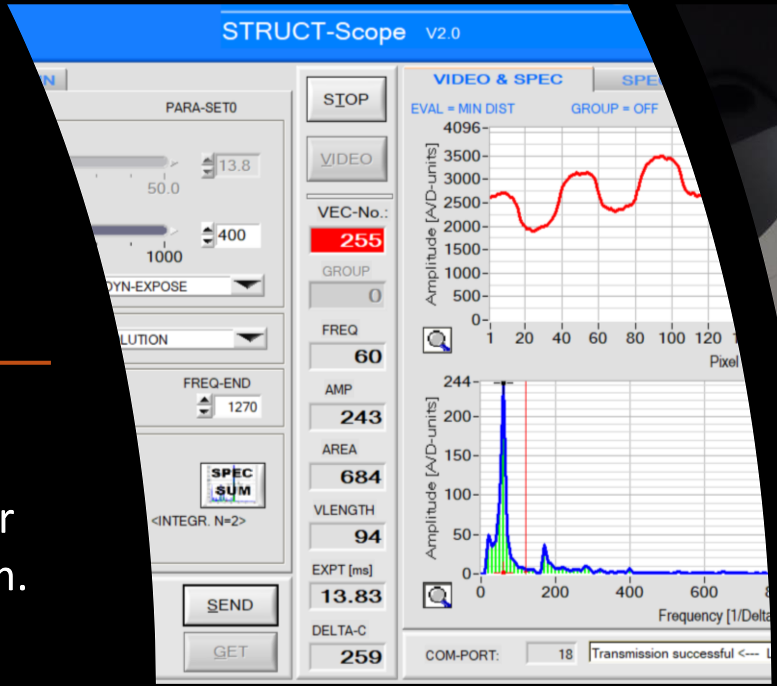
In difference to gloss measurement, where direct reflection is decisive, haze control is concerned with the diffusely scattered portion of directed light on the surface to be measured.

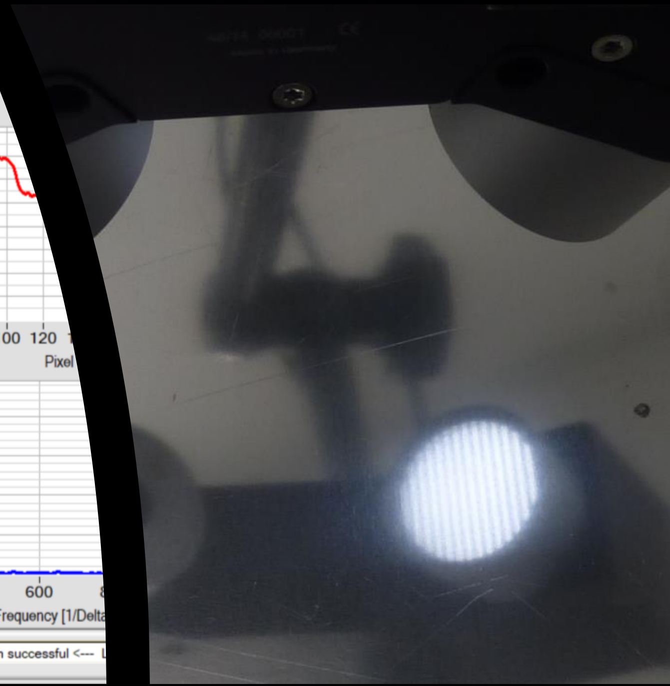
If, for example, a line grid is projected onto the surface to be measured, a so-called haze effect appears due to the diffuse reflection, which shows the image on the surface slightly blurry.

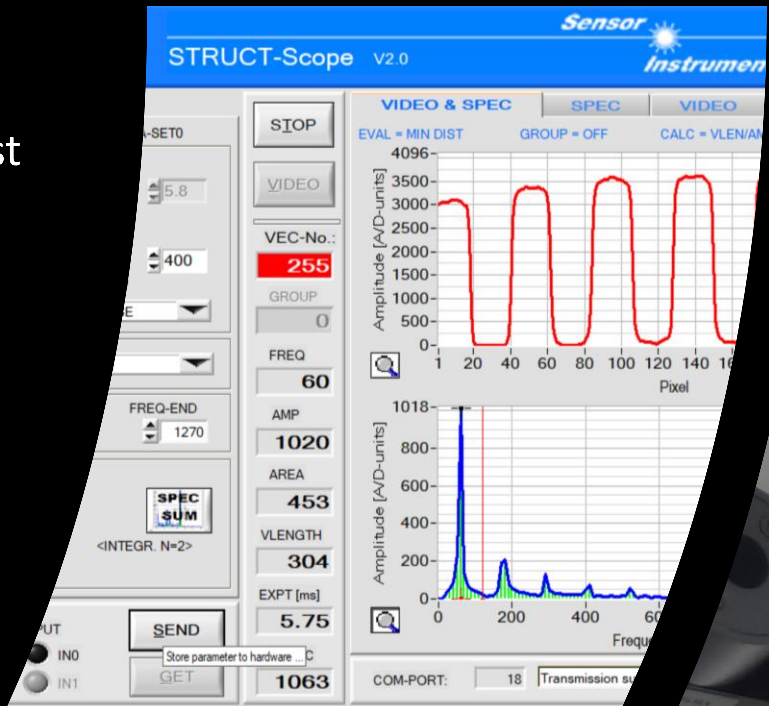
Inline haze control

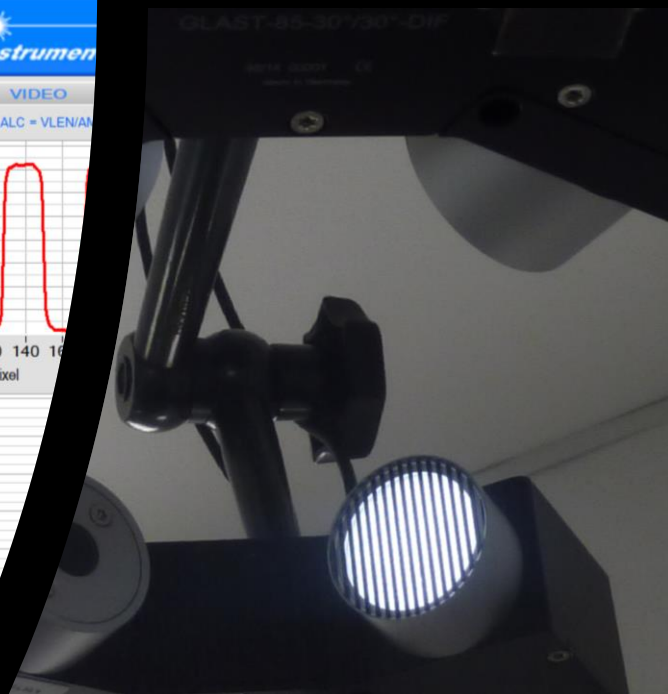
The haze effect is measured using imaging optics including a line sensor integrated into the measuring system. If a haze-free surface is present, the image on the line appears with high contrast, i.e. light-dark transitions in the line grid show a high amplitude on the video signal. However, if the surface is slightly diffuse, the contrast is reduced and the amplitude on the video signal decreases accordingly.

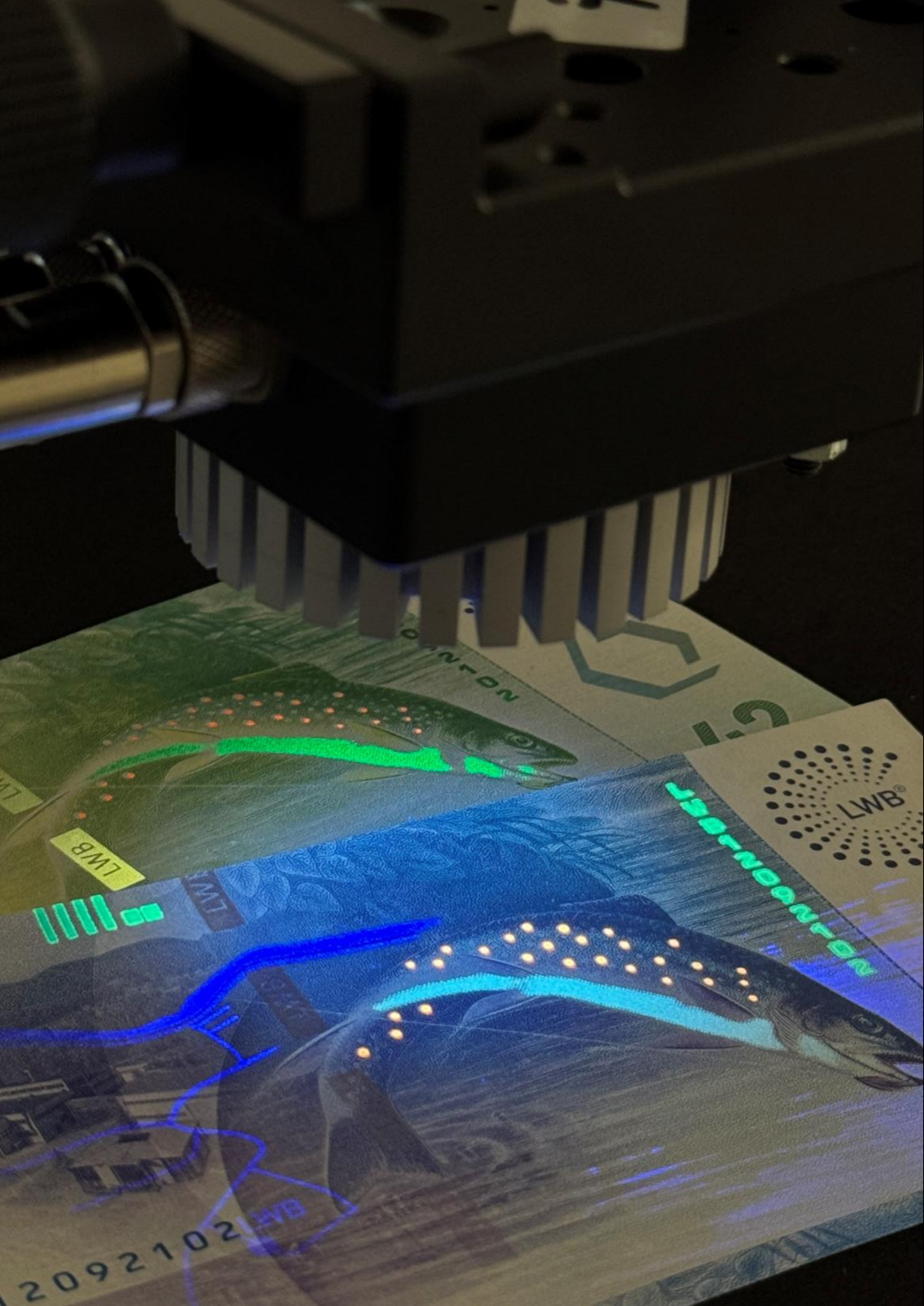
GLAST-85-30°/30°-DIF-0.5/0.5
GLAST-85-30°/30°-DIF-1.0/1.0
GLAST-85-30°/30°-DIF-2.0/2.0











Inline fluorescence measurement

Fluorescent surfaces are characterized by the fact that they respond to the exposure to light (primary light) of a certain wavelength by emitting secondary light. Once the primary emission has ceased, the secondary emission also ends abruptly. Thus, there is no afterglow.

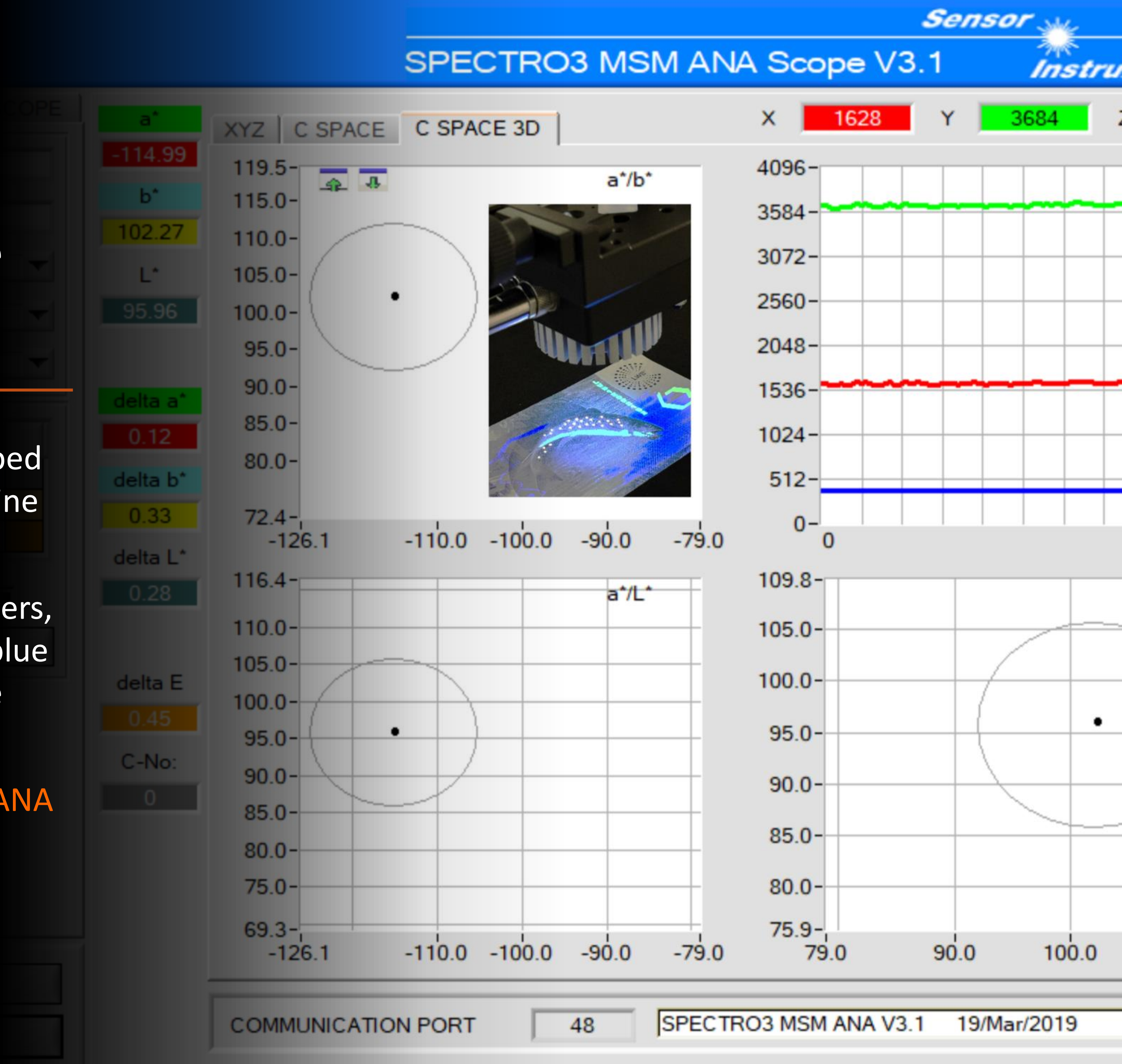
Typical excitation wavelengths are in the so-called UVA range (typically 365nm), but certain phosphors can also be excited in the blue or red wavelength range. Secondary emission thereby occurs in the longer-wave visible range or in the near infrared range.

Inline fluorescence measurement

A color sensor system equipped with UVA LEDs is used for inline fluorescence measurement.

By using optical long-pass filters, secondary light as from the blue wavelength range can hit the color detector.

SPECTRO-3-30-UV/BL-MSM-ANA



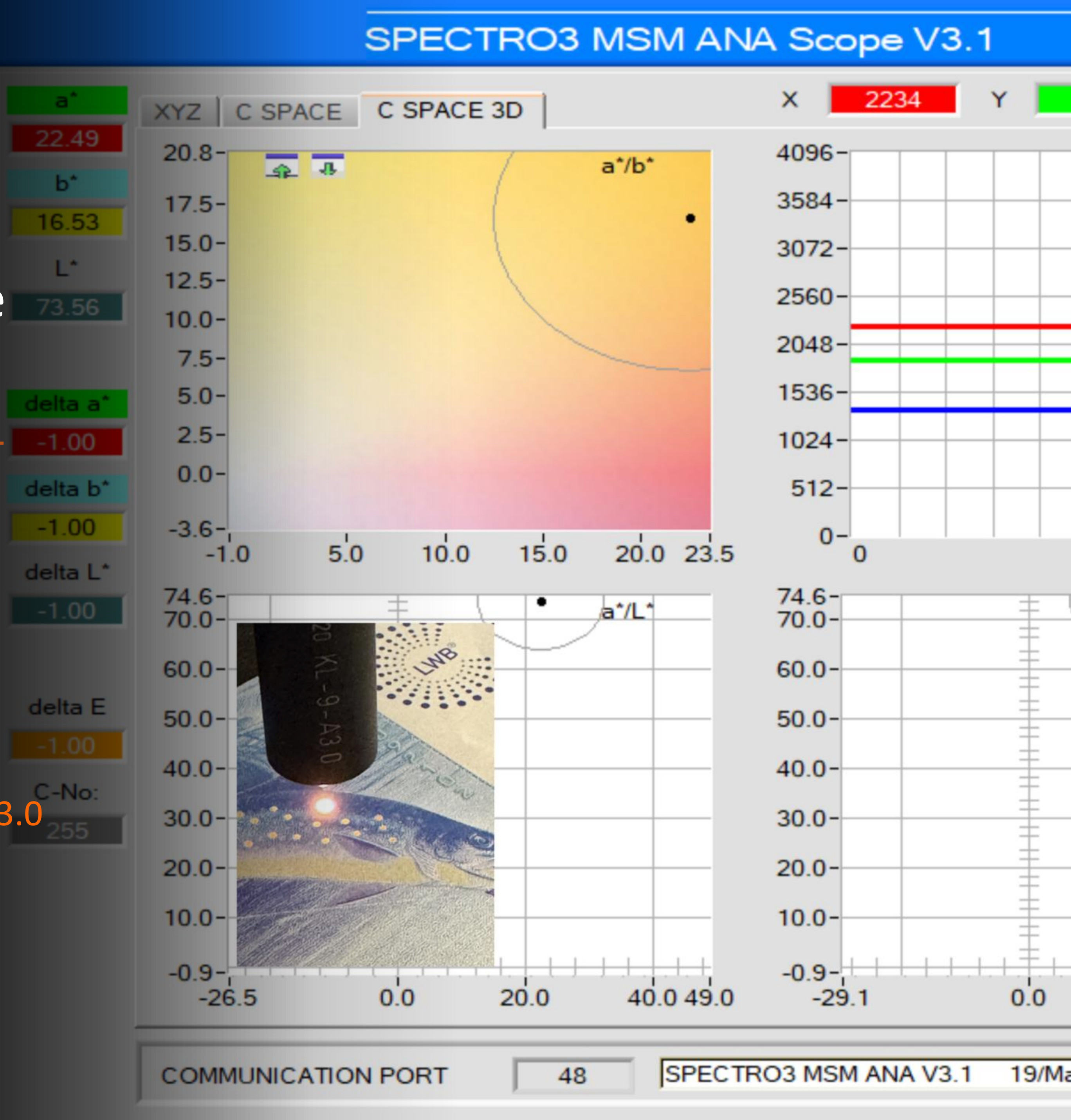
Spot inline fluorescence measurement

For measuring very small fluorescent surfaces, sensors with attachment optics that are connected to the measuring system via an optical fiber are most suitable. This allows light spot sizes from approx. 1mm in diameter or cross-sections of 2mm x 0.3mm to be realized.

Spot inline fluorescence measurement

The visible wavelength range is evaluated here as well. The color of the secondary emission can also be determined using a three-range detector (L*a*b*).

SPECTRO-3-FIO-UV/BL-MSM-ANA + R-S-A3.0-(3.0)-1200-22°-UV + KL-9-A3.0



Inline phosphorescence measurement

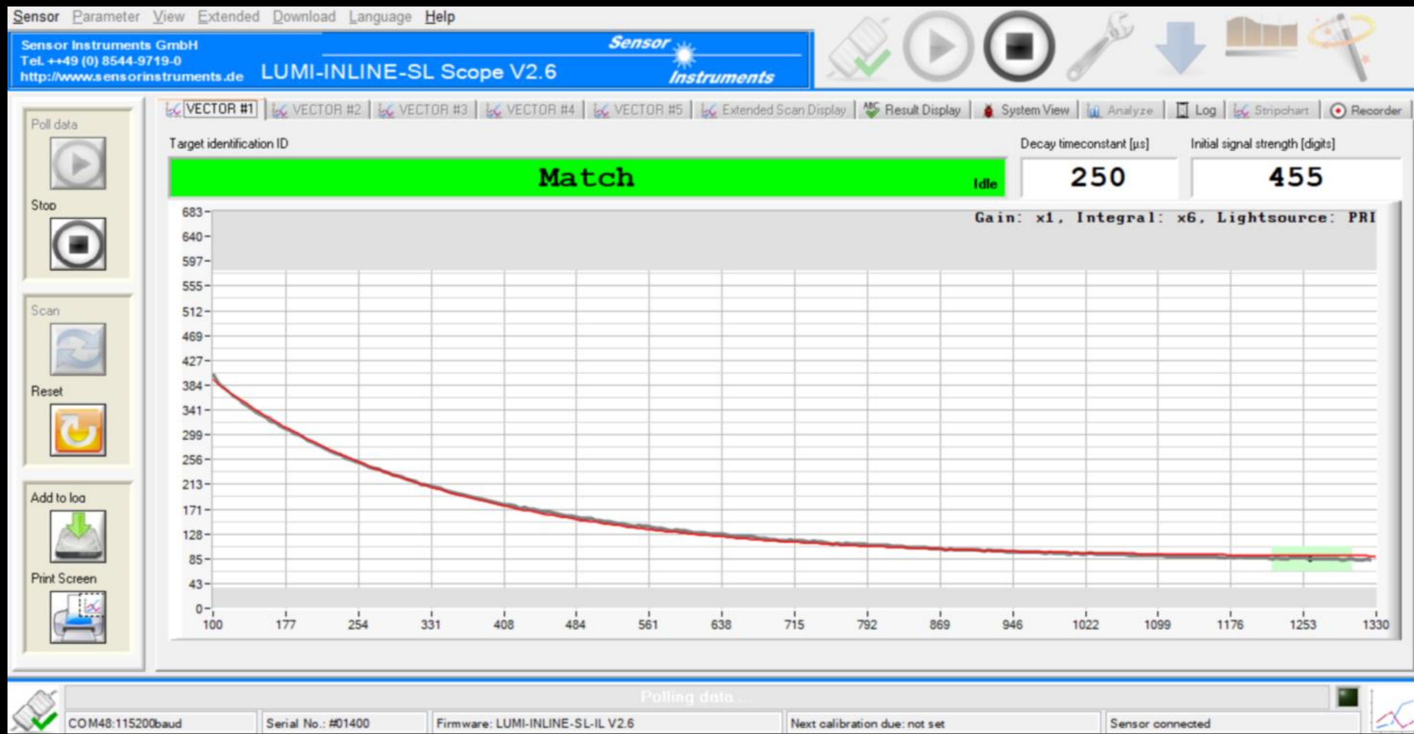
In contrast to fluorescent surfaces, an afterglow can be detected on phosphorescent surfaces, the intensity of which decays exponentially with a marker-specific time constant (TAU) after the end of the primary emission.

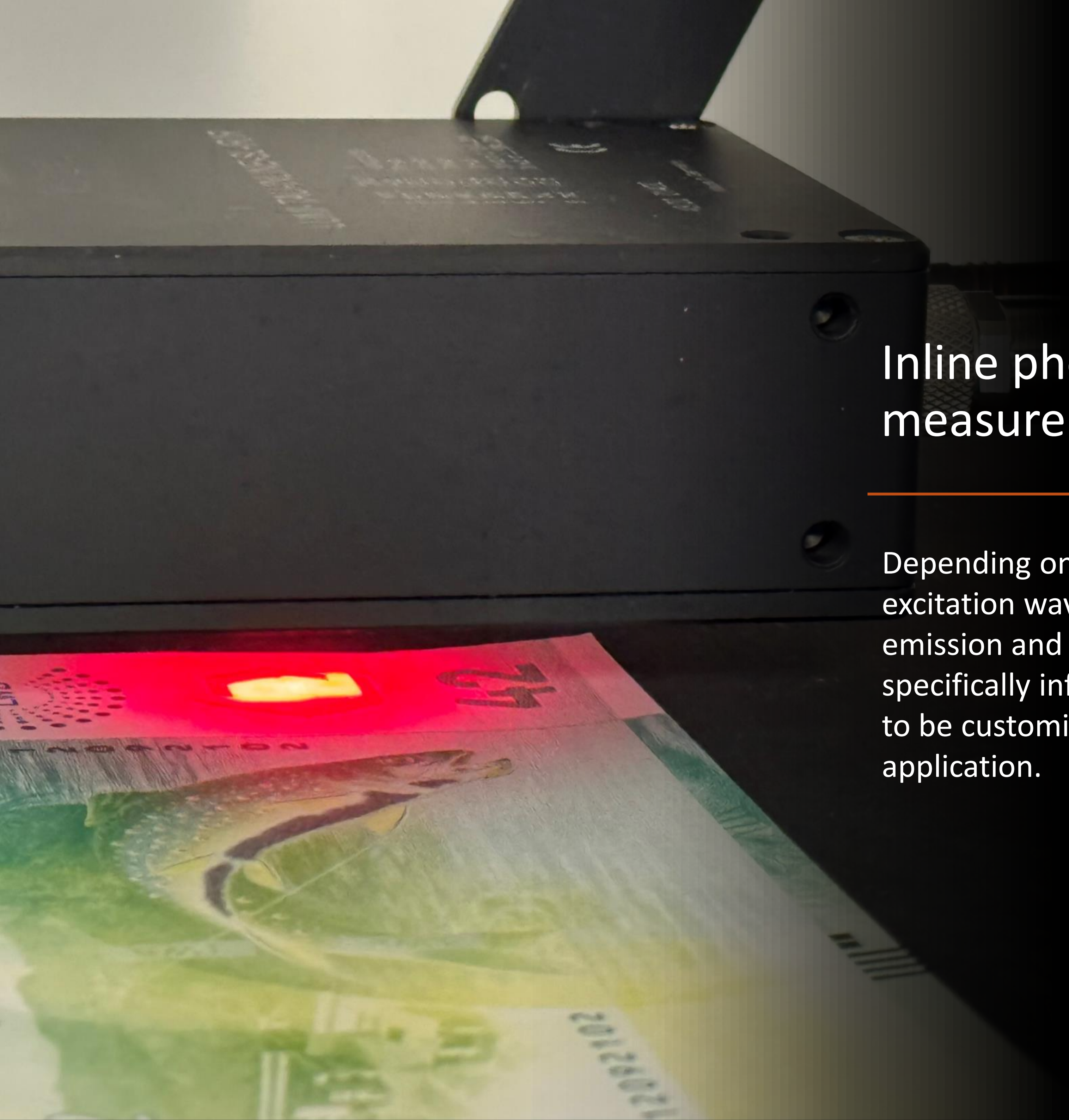
Depending on the marker used, suitable excitation wavelengths extend from the UVA range (e.g. 365nm) through the visible wavelength range (e.g. blue or red) to the near infrared range.
The primary emissions are either in the visible wavelength range or in the near infrared range.

Inline phosphorescence measurement

The marker-specific, exponential decay curve can be described using two parameters: The initial intensity INT (here: 455) and the time constant TAU (here: 250µs).

LUMI-TAU-INLINE-SL-IR/IR



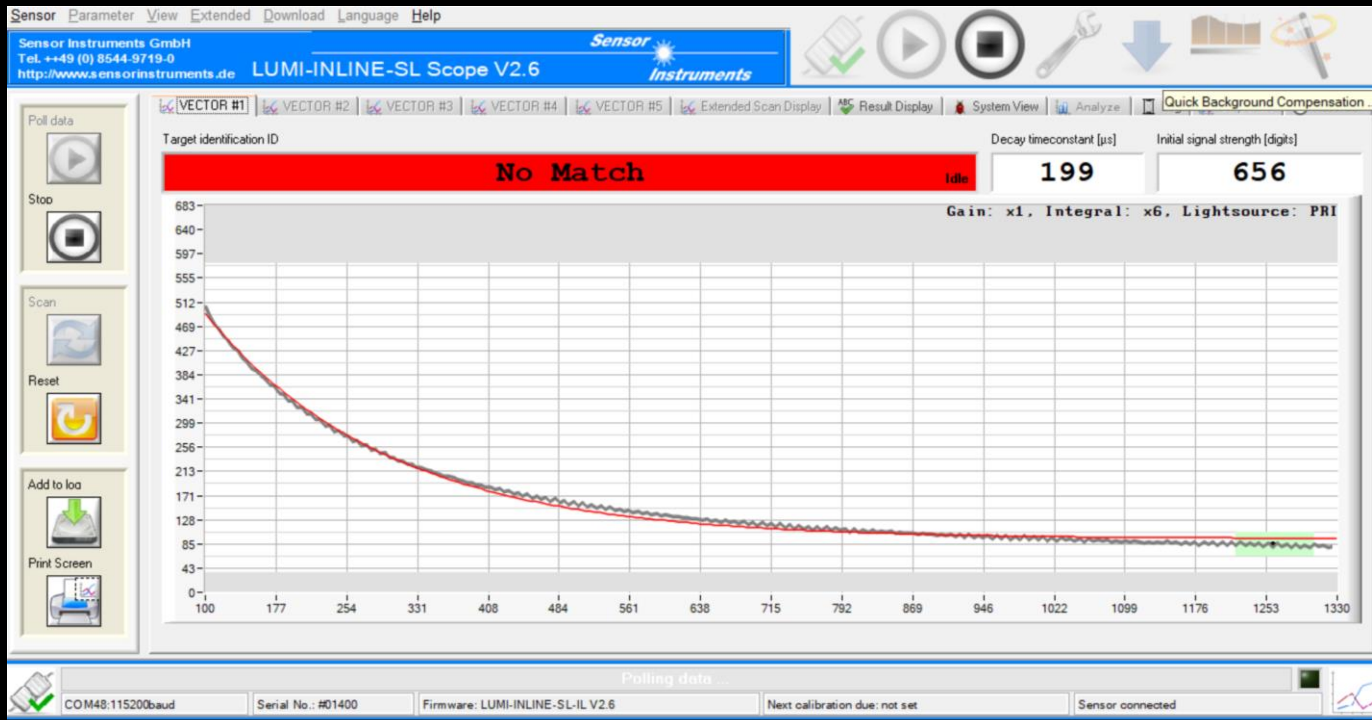


Inline phosphorescence measurement

Depending on the marker dosage, the excitation wavelength, the secondary emission and the time constant TAU can be specifically influenced. This allows markers to be customized for the respective application.

Inline phosphorescence measurement

As can be seen in this application, the time constant TAU shifts towards lower values (here: 199µs) with an INT value of 656.



LUMI-TAU-INLINE-SL-IR/IR

Clarity about the Surface

Detect Color, Gloss, Haze, Fluorescence and Phosphorescence

Maintain control over the surface properties

Our specialists are happy to tell you more about it

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Sensor Instruments

Let's make sensors more individual