

Press information from Sensor Instruments

February 2021

The color tone is decisive: the color tone measurement of various colored fiber bundles.

15/02/2021. Sensor Instruments GmbH: The color tone of textile fibers should, as far as possible, be measured at the start of the textile dyeing process using inline measurement. The information about the actual color tone (the actual value) can be compared with the color tone target using the PLC. The difference between these two color values provides information as to whether a more or less color should be added to the color bath.



A **SPECTRO-3-28-45°/0°-MSM-ANA-DL** is suitable for measuring the color of the fiber strand which is fitted with a 45° illumination and detects the color under 0°. It is thus possible to avoid the great majority of direct reflection as comes from dye which is still damp during measurement. The distance between the sensor and the color strand is typically 28 mm and the detection range assumes a diameter of c. 10 mm with this clearance.

During testing, work was performed in AC mode, i.e. any ambient light was suppressed to the greatest extent.

In addition, UCAL (User CALibration) was activated to permit almost identical color reproduction in comparison to the laboratory measuring devices. The measured value is outputted using three methods:

1. Digital output:

The color target value is taught in by the sensors (using the Windows® software SPECTRO3 MSM ANA Scope V3.1). Working in three stages, it is possible to use the settable tolerance values to determine whether the actual value of the color tone lies within the tolerances of one of the three taught-in color values. The output is performed as a 0V/+24V binary code signal at the two available digital outputs.

2. Analogue output:

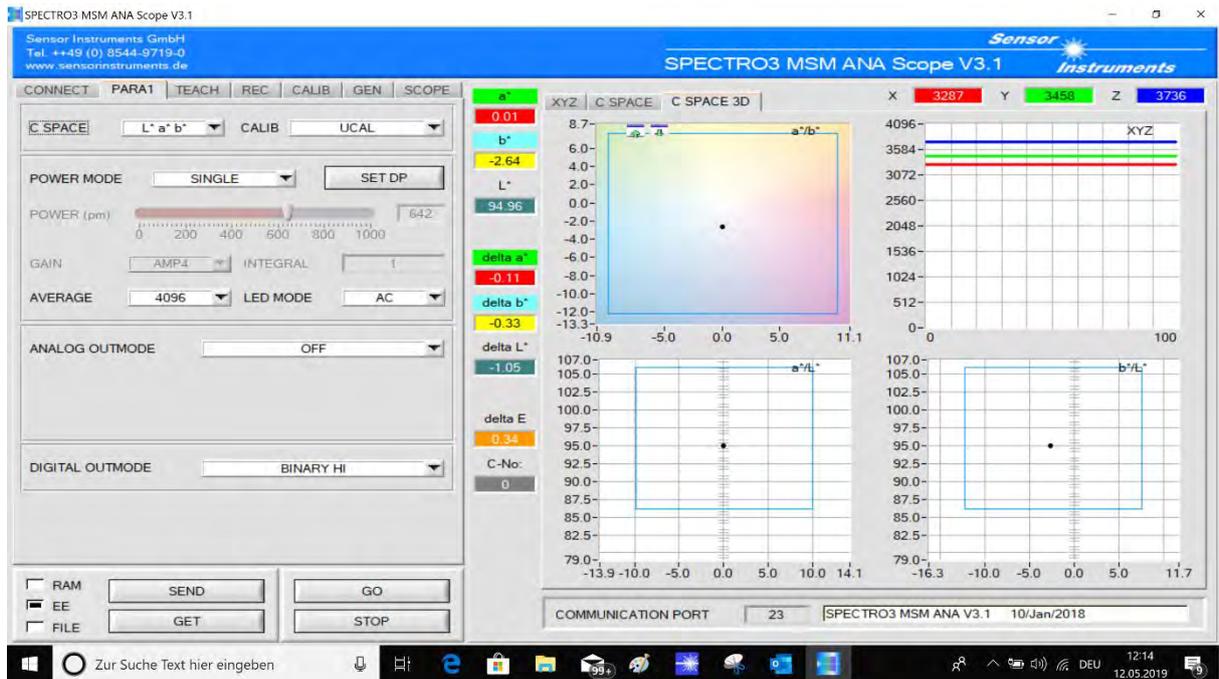
The actual value of the color tone is outputted e.g. in the L*a*b* color range as three analogue signals (0V ... +10V / 4mA ... 20mA).

3. Digital series output:

The data transfer of the color tone values (for example L*a*b*) and the deviations from the taught-in color tone target value (for example $dL^*da^*db^*$) is performed via the RS232 interface or using an external converter via the USB and Ethernet interface (Profinet access will be available from mid-2021; this will be followed by EtherCAT, CC-Link and EtherNet/IP at the end of 2021).



The fiber strand has a diameter of usually 15mm and a c. 28mm clearance to the sensor



Windows® Software SPECTRO3 MSM ANA Scope V3.1

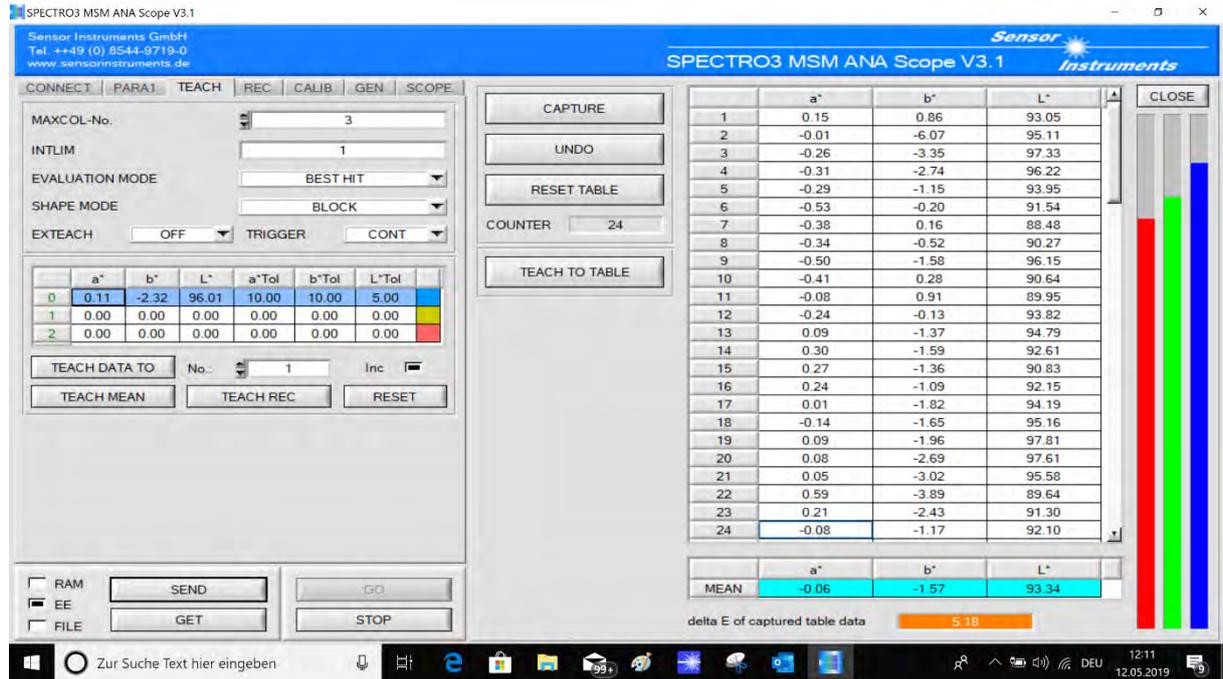
Color tone measurements at ten different colored fiber bundles

The color tone values of the ten different color tones were first measured statically at 25 different locations and an average value was then formed.

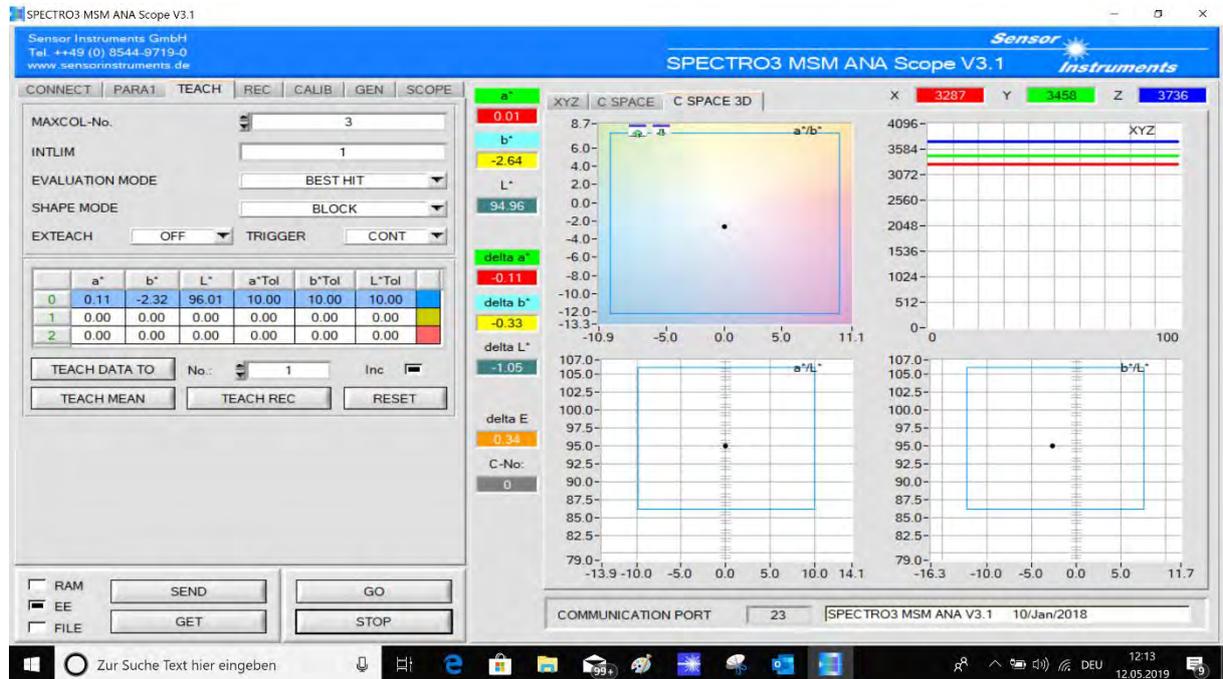


Measurement of the color tone values at 25 various points:

Fiber strand 1:

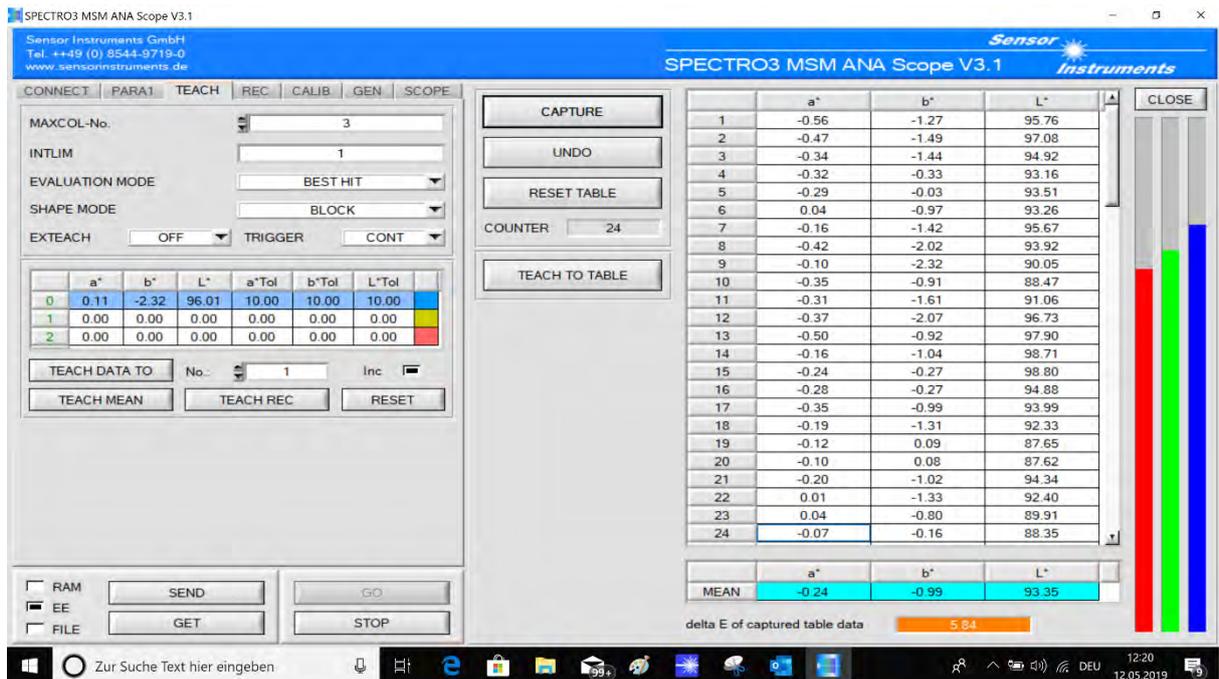


Measurement results from fiber strand 1: $a^*=-0.06$, $b^*=-1.57$, $L^*=93.34$

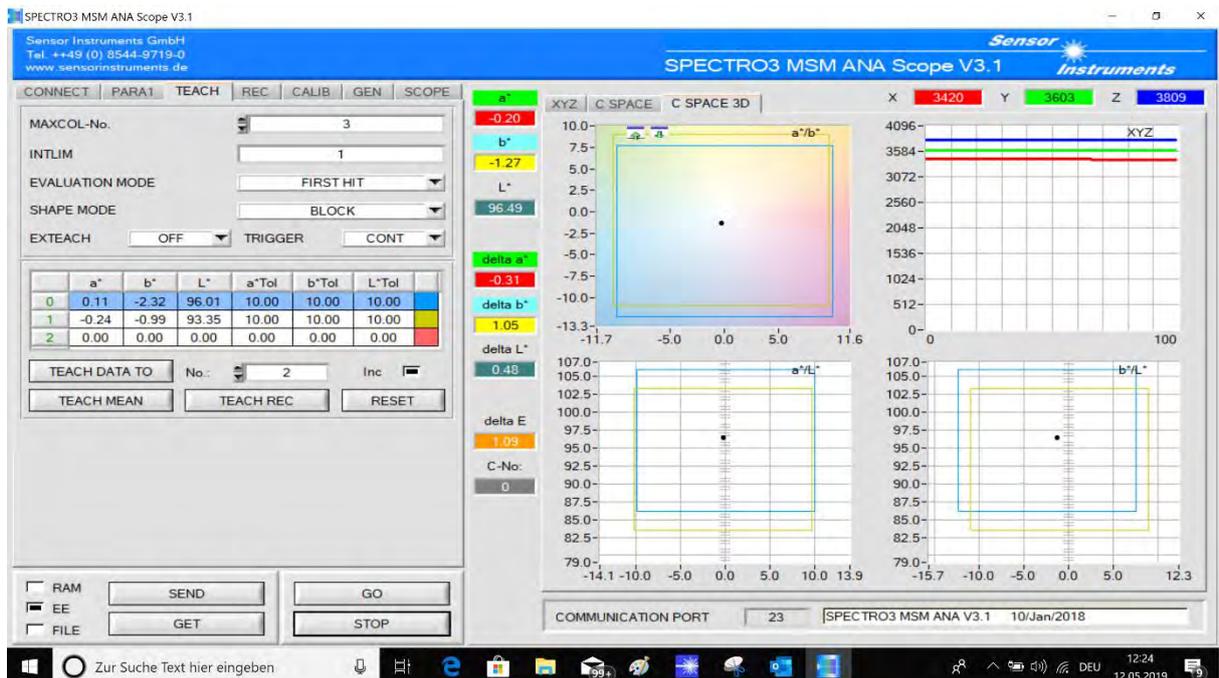


Fiber strand 1 measured at position 25

Fiber strand 2:

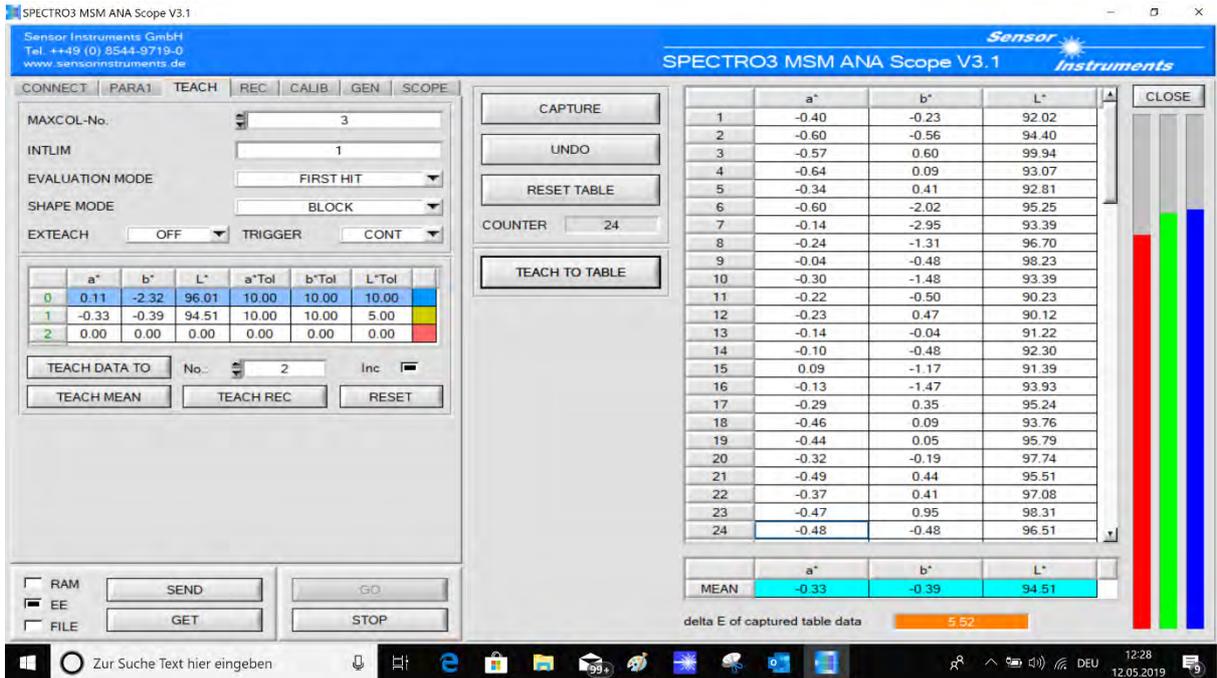


Measurement results from fiber strand 2: $a^*=-0.24$, $b^*=-0.99$, $L^*=93.35$

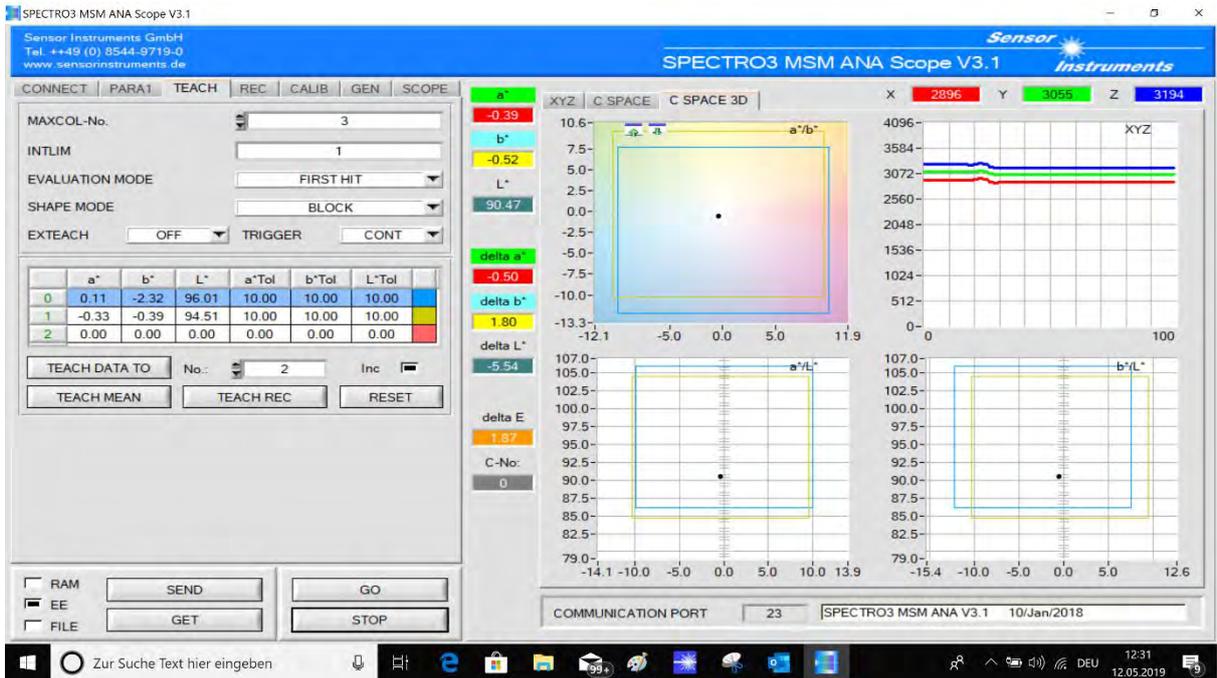


Fiber strand 2 measured at position 25

Fiber strand 3:

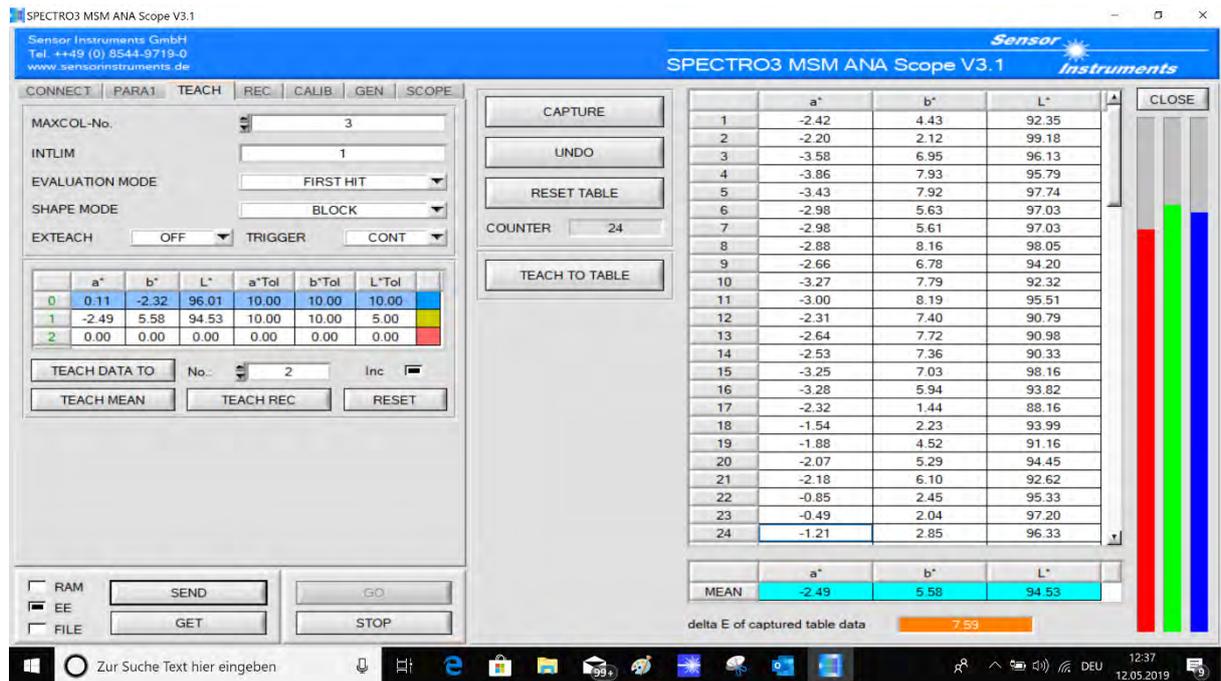


Measurement results from fiber strand 3: $a^*=-0.33$, $b^*=-0.39$, $L^*=94.51$

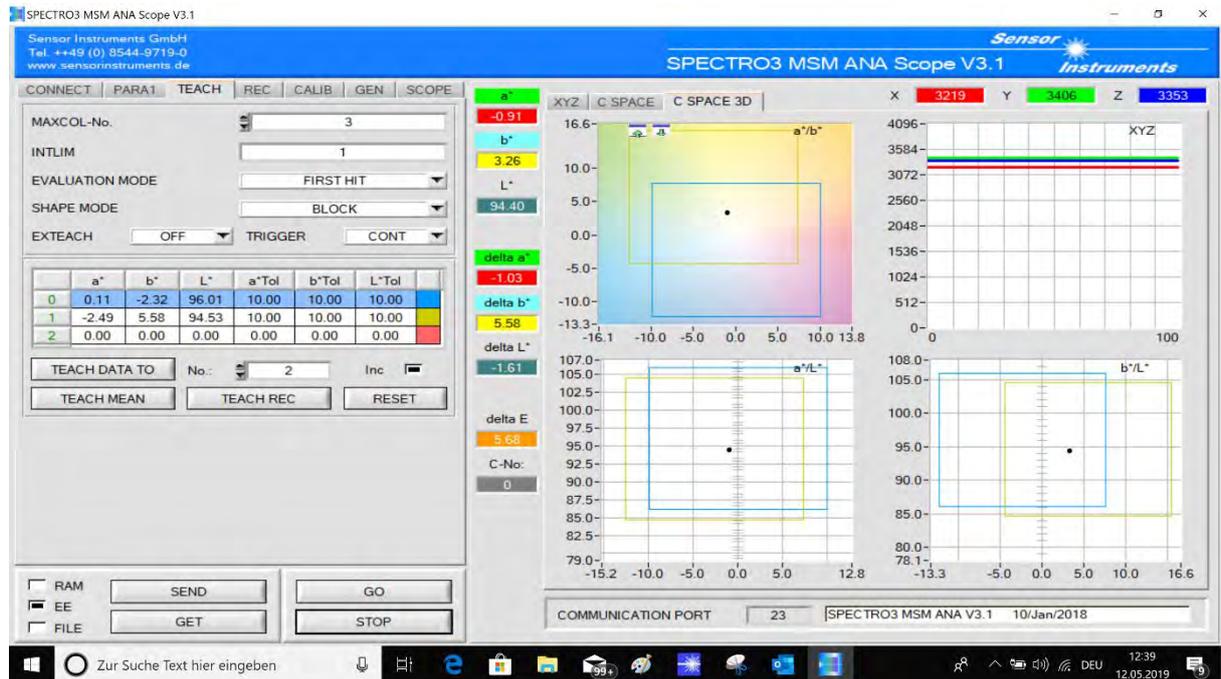


Fiber strand 3 measured at position 25

Fiber strand 4:

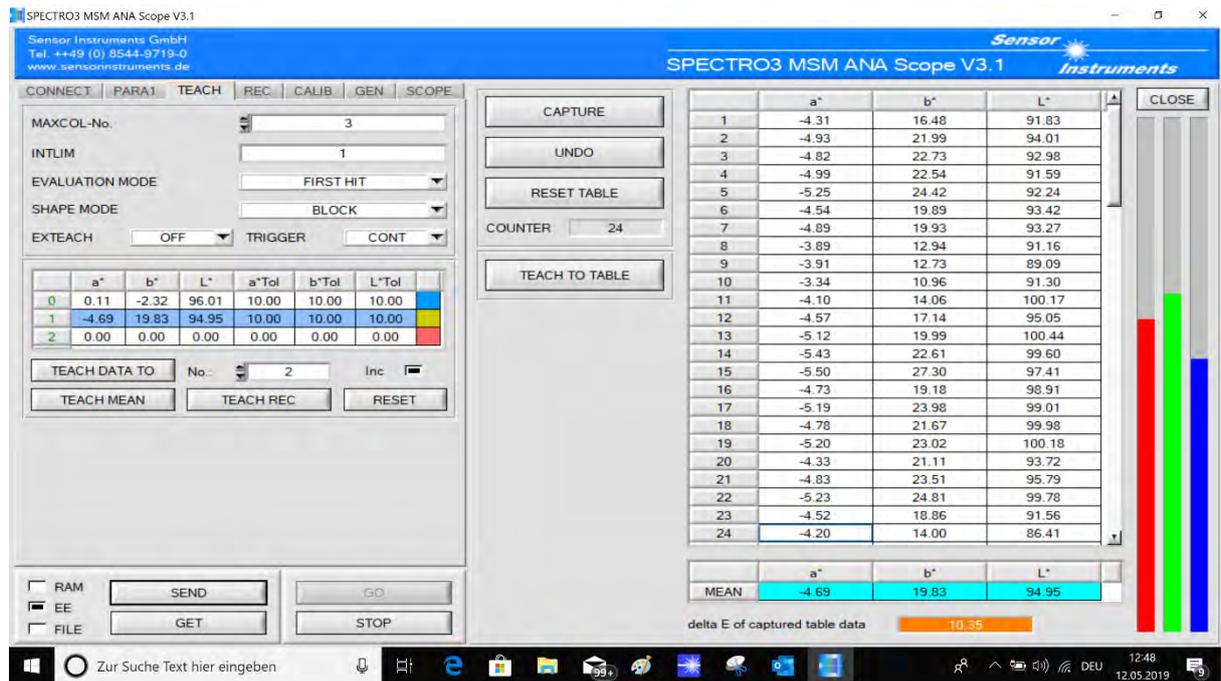


Measurement results from fiber strand 4: $a^*=-2.49$, $b^*=5.58$, $L^*=94.53$

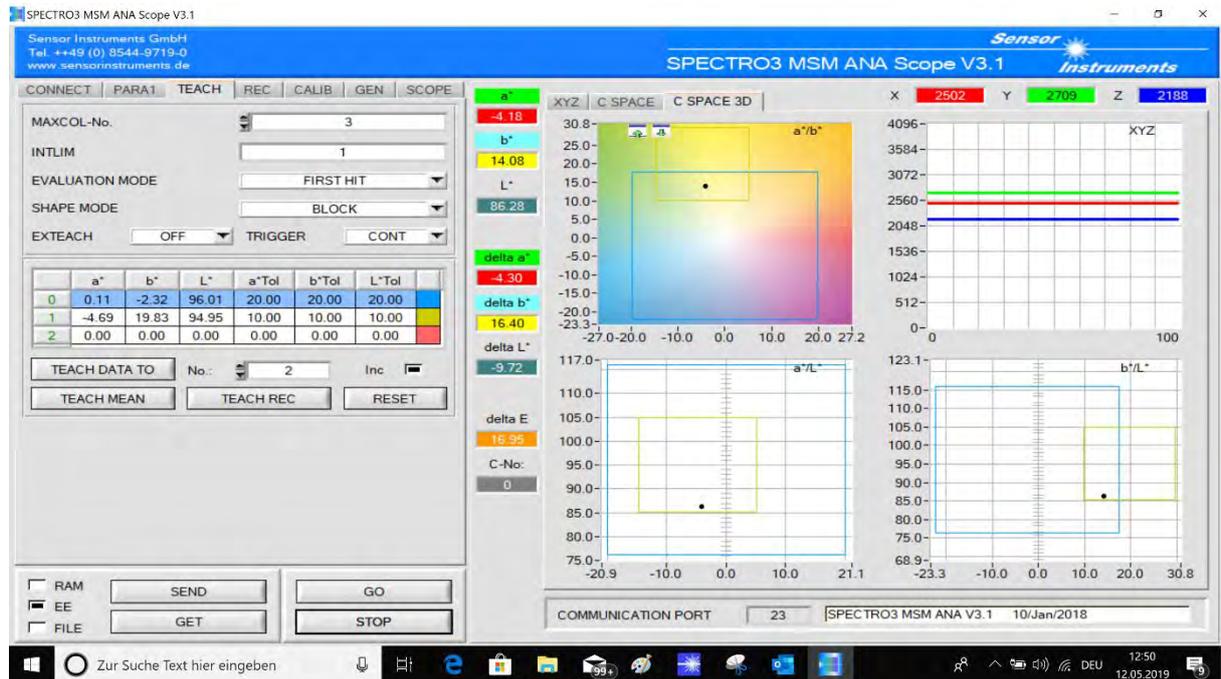


Fiber strand 4 measured at position 25

Fiber strand 5:

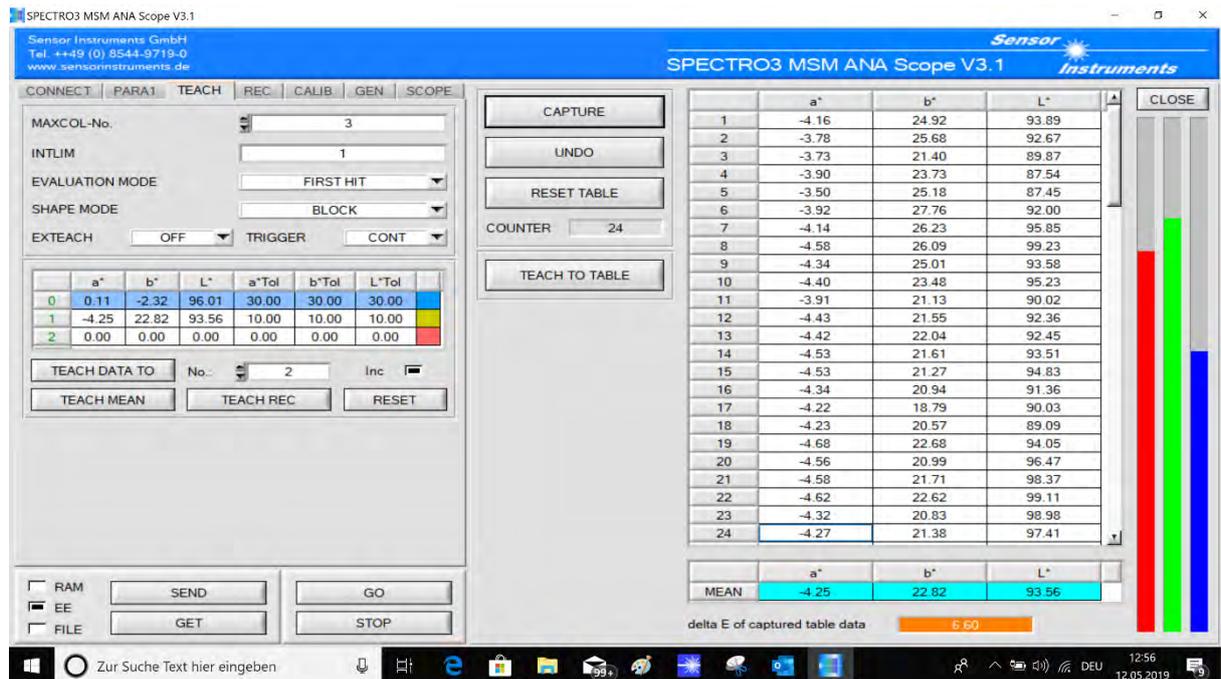


Measurement results from fiber strand 5: $a^* = -4.69$, $b^* = 19.83$, $L^* = 94.95$

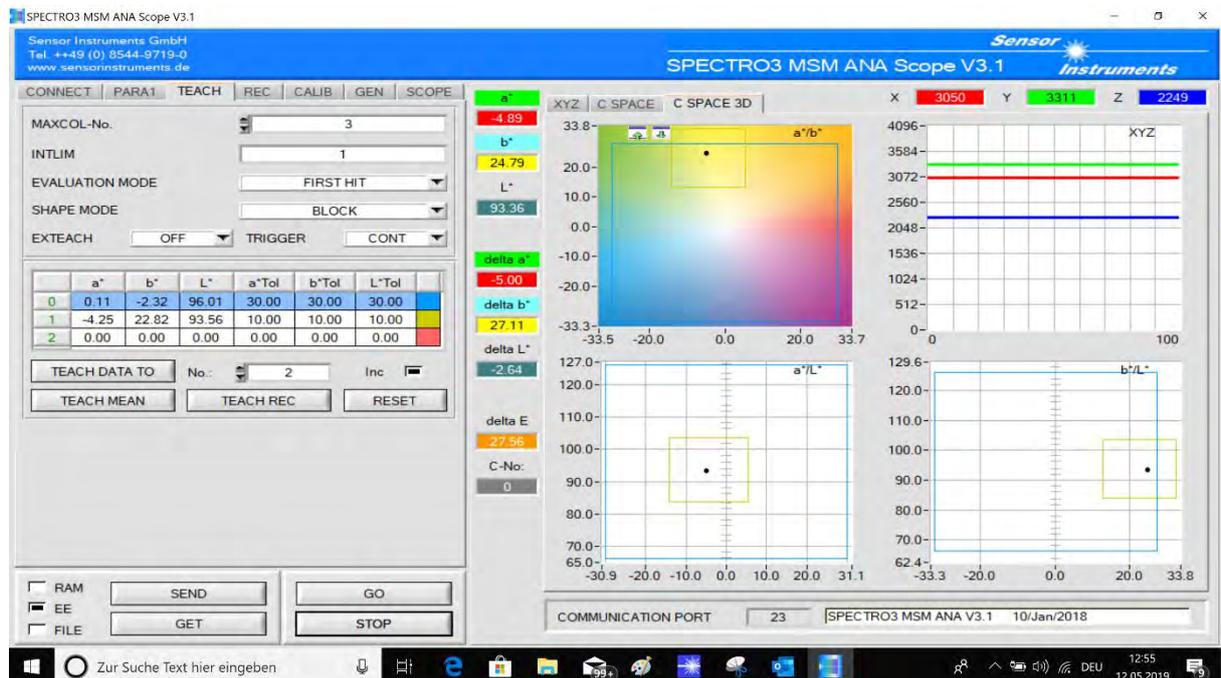


Fiber strand 5 measured at position 25

Fiber strand 6:

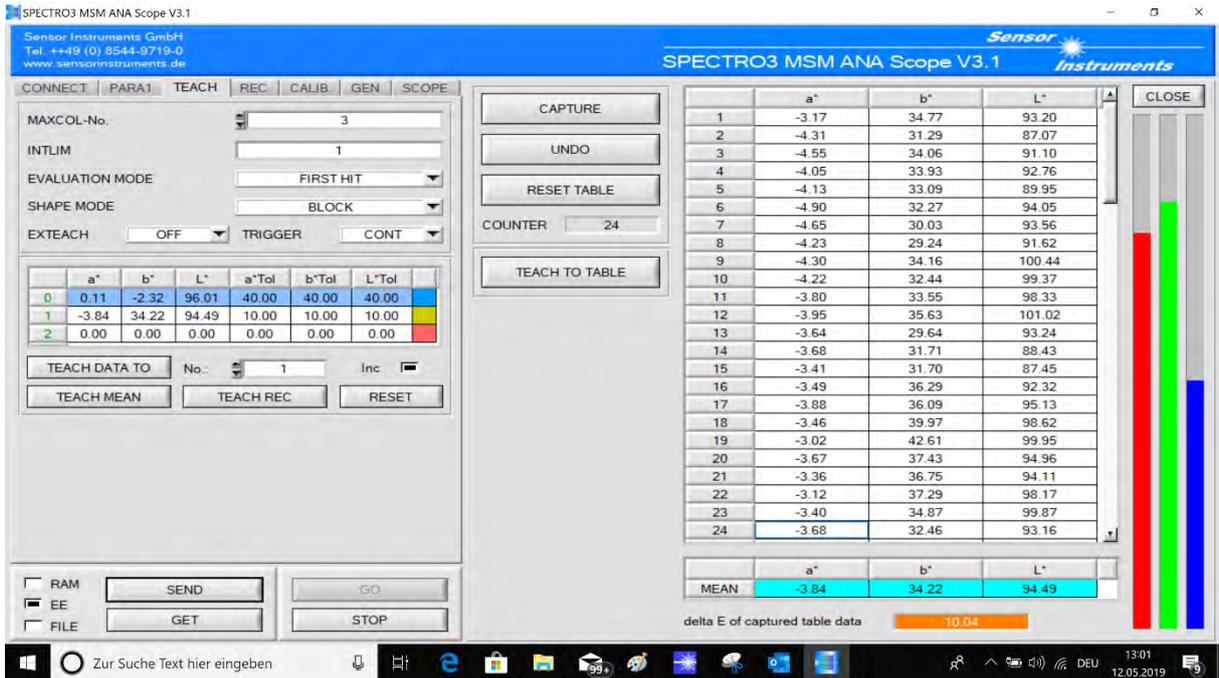


Measurement results from fiber strand 6: $a^*=-4.25$, $b^*=22.82$, $L^*=93.56$

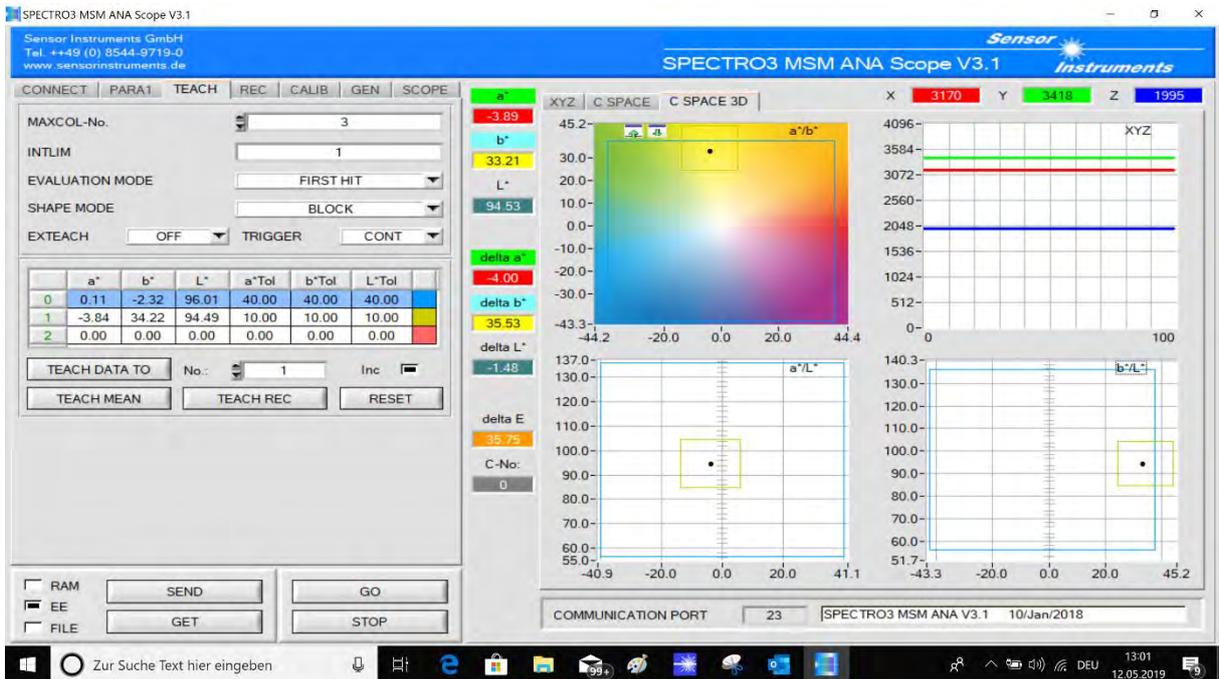


Fiber strand 6 measured at position 25

Fiber strand 7:

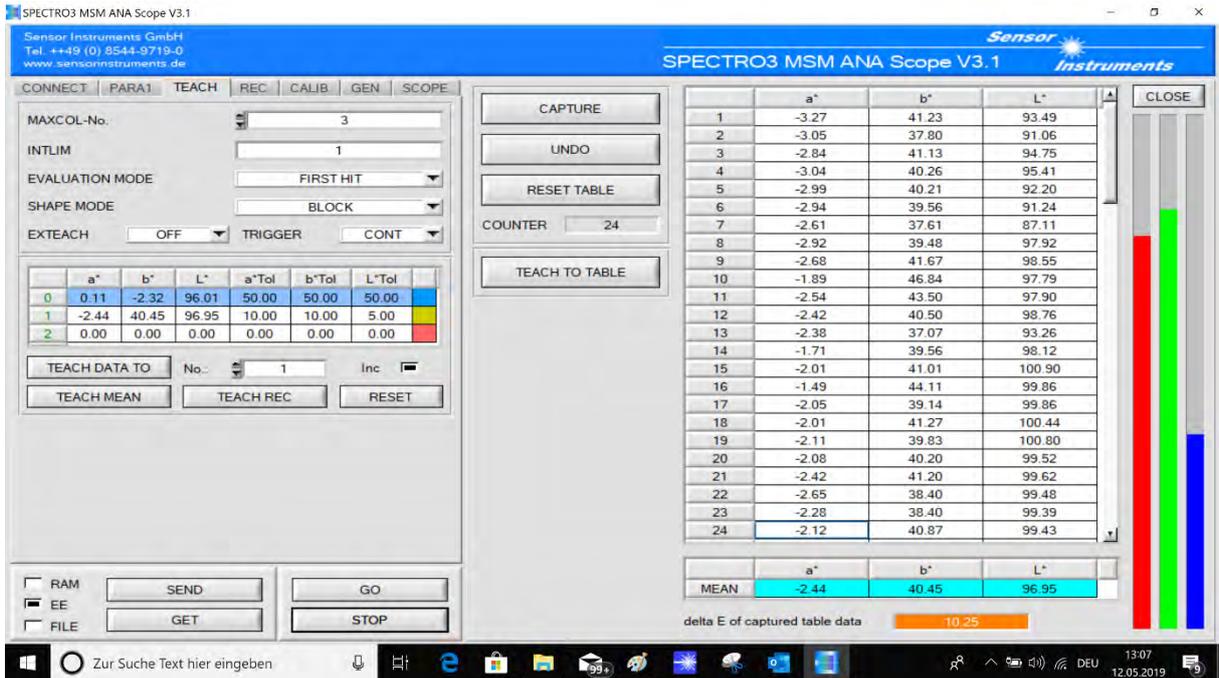


Measurement results from fiber strand 7: $a^*=-3.84$, $b^*=34.22$, $L^*=94.49$

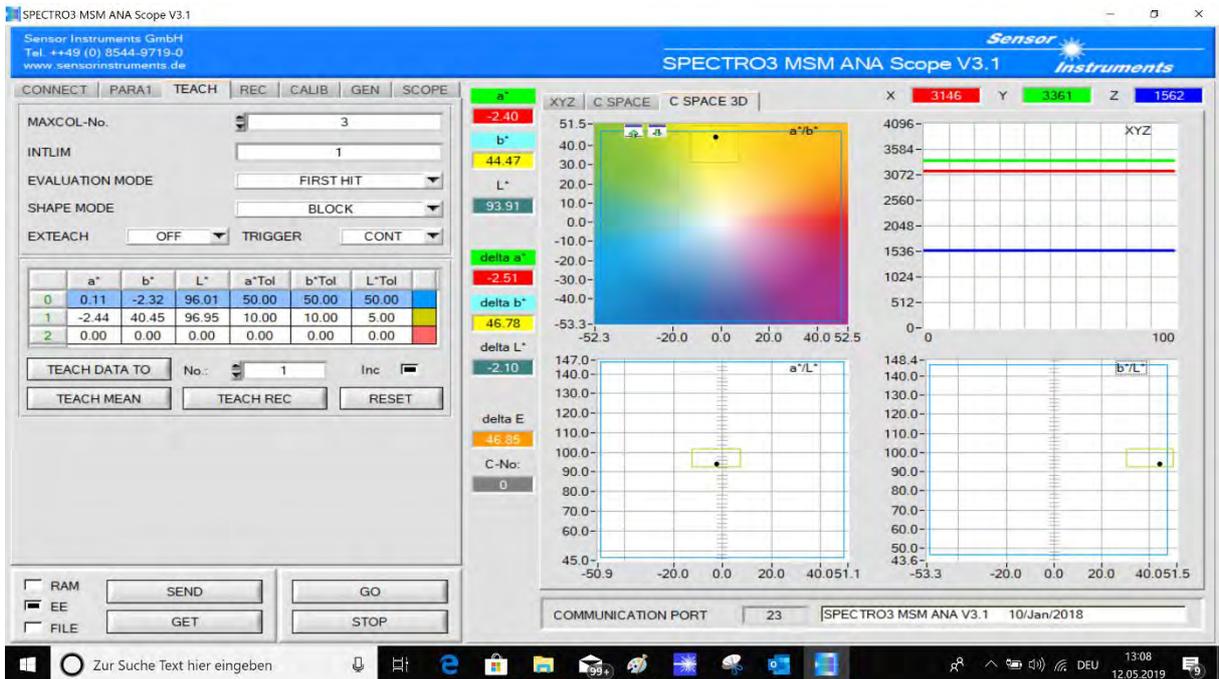


Fiber strand 7 measured at position 25

Fiber strand 8:

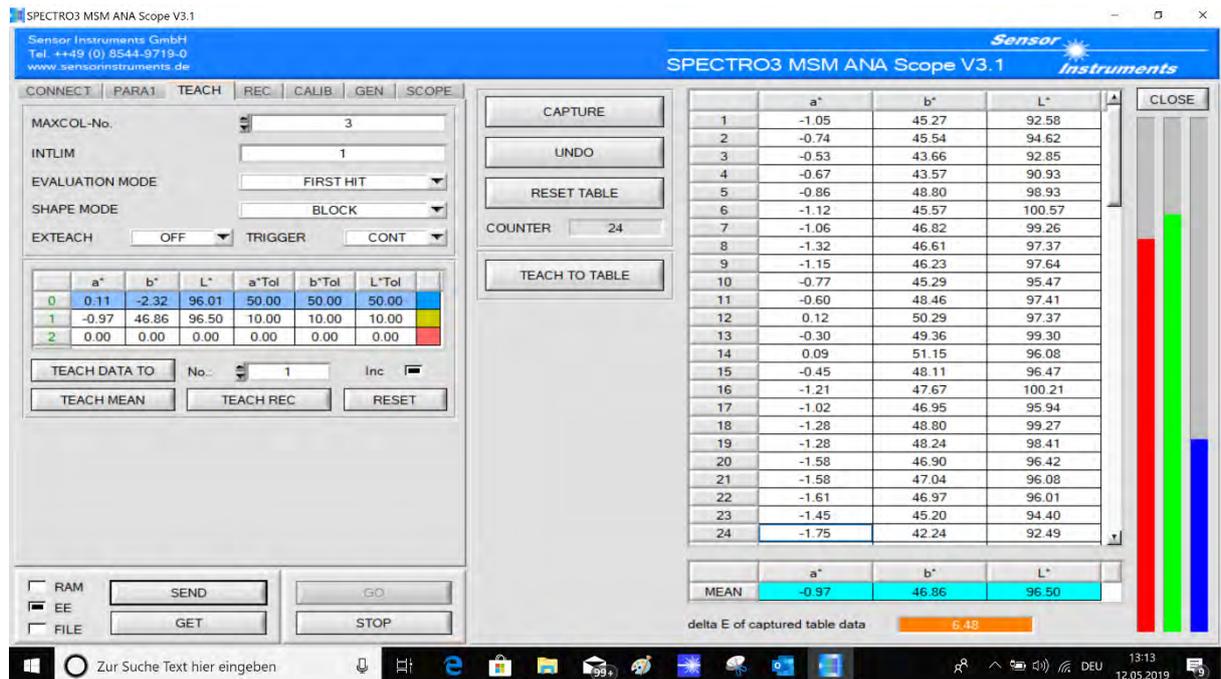


Measurement results from fiber strand 8: $a^*=-2.44$, $b^*=40.45$, $L^*=96.95$

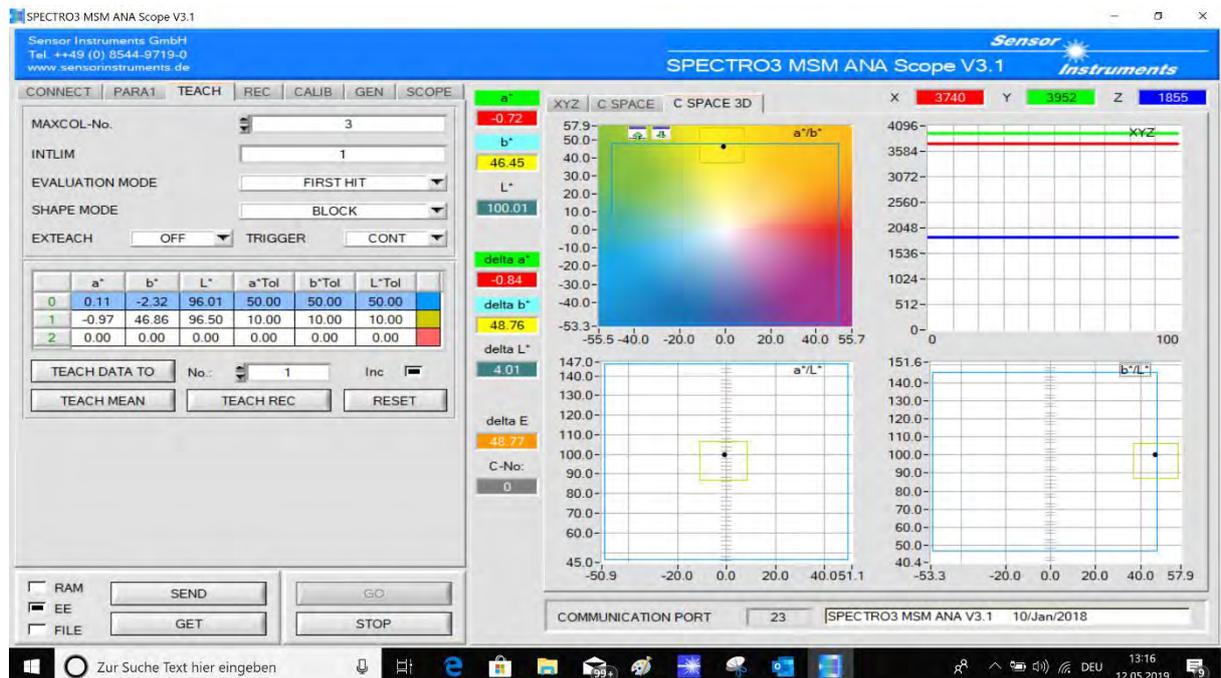


Fiber strand 8 measured at position 25

Fiber strand 9:

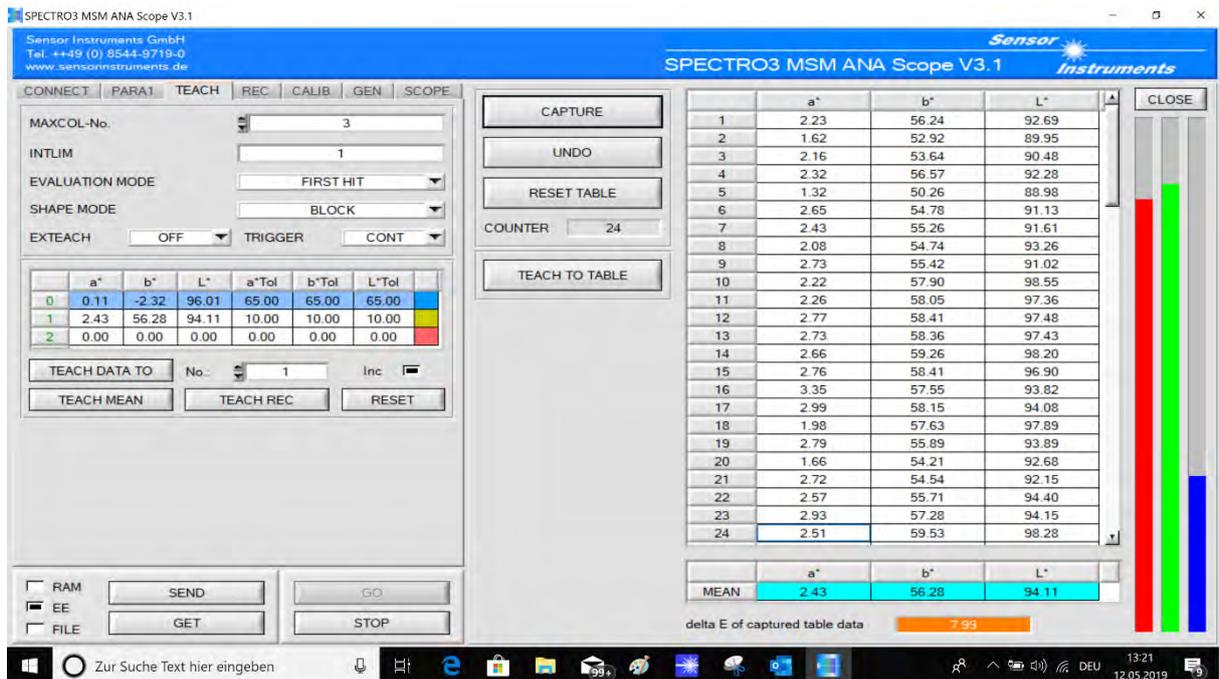


Measurement results from fiber strand 9: $a^*=-0.97$, $b^*=46.86$, $L^*=96.50$

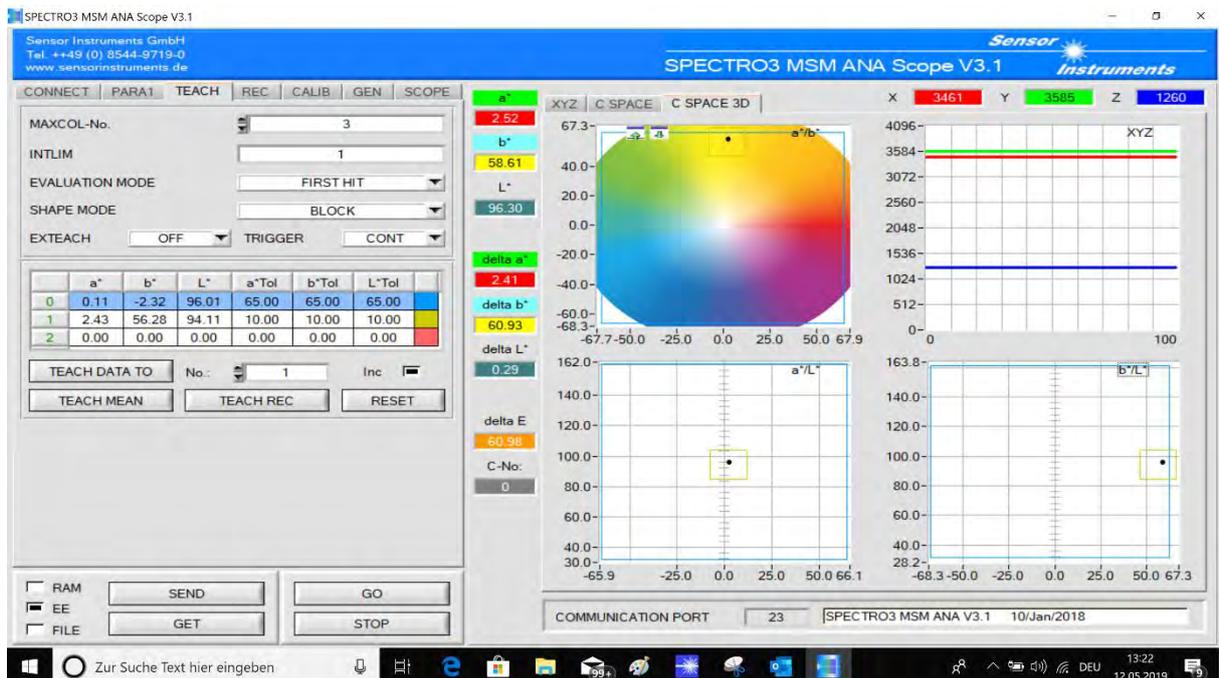


Fiber strand 9 measured at position 25

Fiber strand 10:



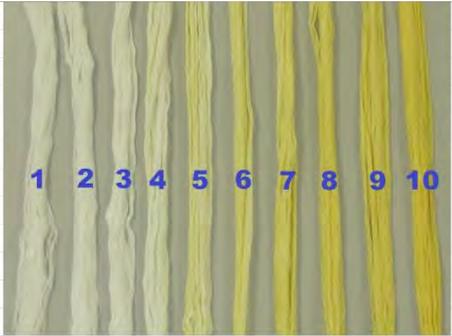
Measurement results from fiber strand 10: $a^*=2.43$, $b^*=56.28$, $L^*=94.11$



Fiber strand 10 measured at position 25

Summary of the measurement results

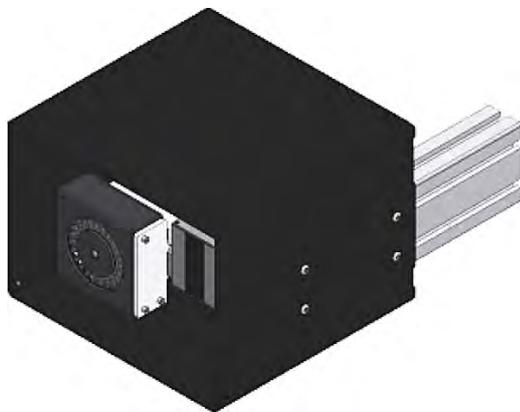
FIBER BUNDLE TYPE	color	a*	b*	L*
1	white	-0,06	-1,57	93,34
2	white	-0,24	-0,99	93,35
3	white	-0,33	-0,39	94,51
4	white / yellow	-2,49	5,58	94,53
5	white / yellow	-4,69	19,83	94,95
6	yellow/white	-4,25	22,82	93,56
7	yellow/white	-3,84	34,22	94,49
8	yellow	-2,44	40,45	96,95
9	yellow	-0,97	46,86	96,5
10	yellow	2,43	56,28	94,11



The measurement results primarily display a color shift in b^* , which points to a significant color tone displacement into yellow. The L^* value is probably not reduced significantly because the diameter of the yellow fiber bundle is greater than the diameter of the white fiber bundle.

Recommended sensor types

Both sensors, the **SPECTRO-3-28-45°/0°-MSM-ANA-DL** and the **SPECTRO-3-28-45°/0°-MSM-DIG-DL** are suitable for this measurement task. Optionally, you can use a system with automatic INLINE white comparison: **SPECTRO-3-28-45°/0°-ICAL**



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