

## Press information from Sensor Instruments

February 2021

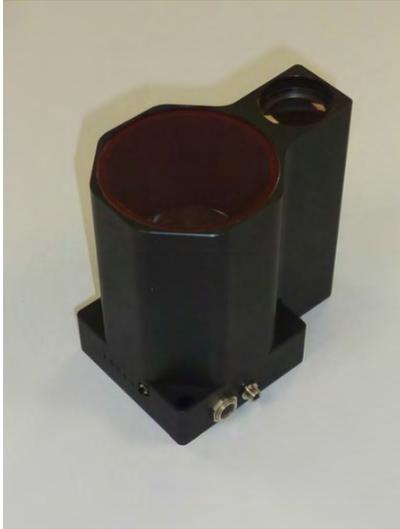
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### Color differentiation of second hand clothes in the recycling process

**01/02/2021. Sensor Instruments GmbH:** Different colored second hand clothes, transported on a conveyor belt, should be differentiated. At this, the orientation of the respective textile is randomly, which means randomly folded, flat or exaggerated positioned. Furthermore, the clothes will be transported serial on the conveyor belt, normally with a certain gap between the respective textiles, thus, the surface of the conveyor belt can be seen from the top side. Additionally, the speed of the conveyor belt is constant and approximately 1m/s. Once the color is detected, a special high-pressure nozzle is blowing the respective clothing item out from the conveyor belt and into a foreseen container.

For the preliminary studies a color measurement sensor type **SPECTRO-3-1000-COF-d50.0-CL-MSM-DIG** is used. At this, the sensor is placed at a distance of around 800mm from the surface of the conveyor belt. Pre-investigations have shown that the clothes achieve a maximum height of approximately 300 mm, while the sensor can cover a much higher range (the measurement range of the sensor is 20mm up to 2000mm). Furthermore, the white light spot size at a distance of 1000mm is roughly 50mm in diameter.





# 1. Sensor system adjustments

## 1.1. Parameterization

The sensor can be parameterized via the Windows® - software here in principle with the following set-up (as an example):

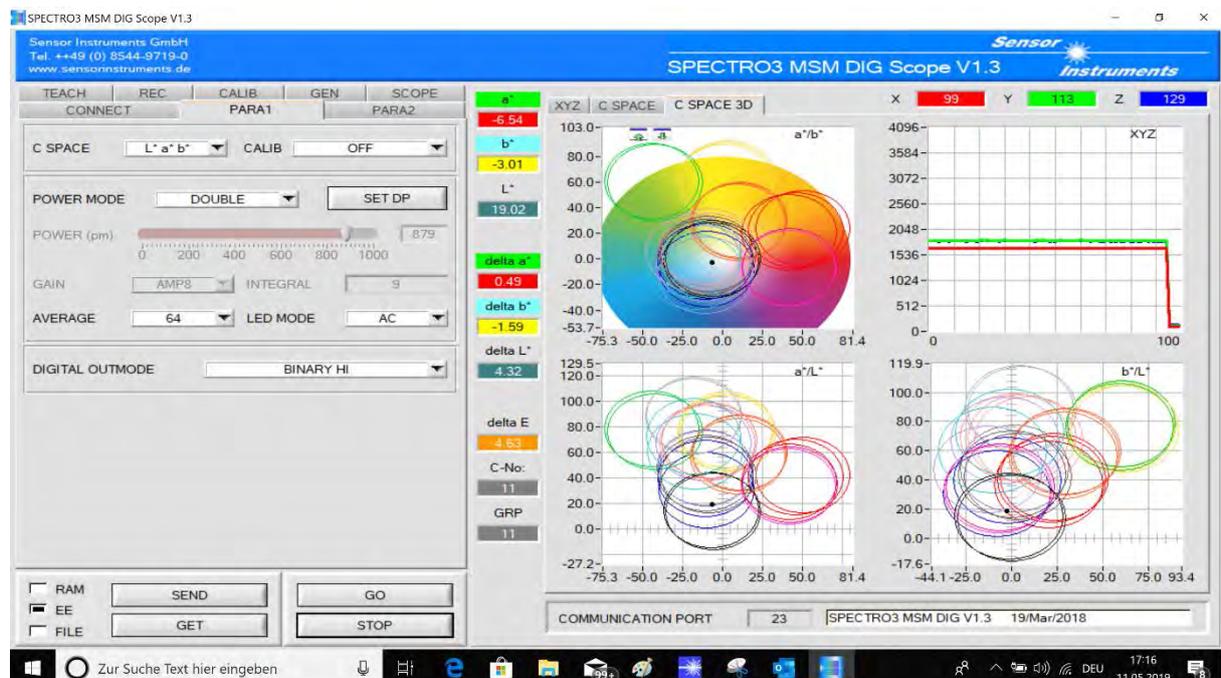
C SPACE:  $L^*a^*b^*$  (color space)

POWER MODE: DOUBLE (in the presence of a dark garment, both the receiver gain and the transmitter power are automatically increased, while in the presence of light garments, both setting sizes are reduced)

GROUP: Here 12 color groups are activated, within a color group different colour tones are combined (for example violet, lilac)

AC: ambient light suppression is activated

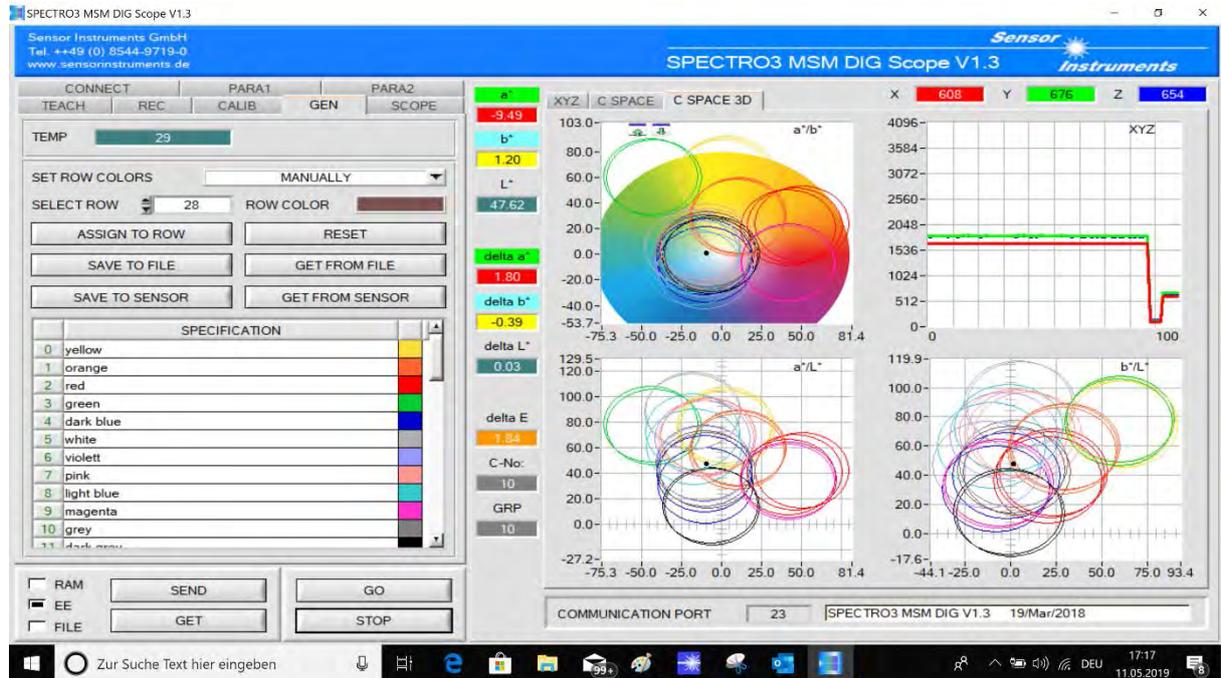
DIGITAL OUTMODE: At the sensor 5 digital outputs are available, thus, in the binary code way, 31 color groups can be stored in maximum and the result of the respective group is available at the 5 digital outputs.



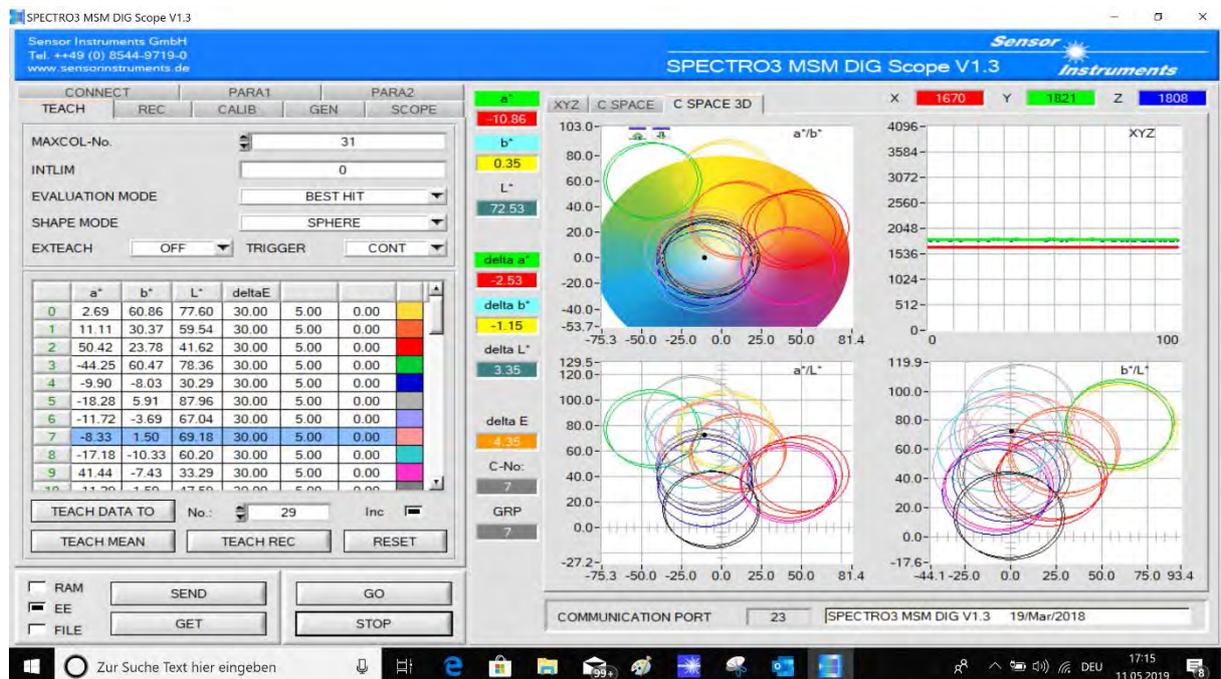
Software-Parametereinstellungen über den Reiter PARA1

## 1.2. Teach process

After the number of color groups is chosen, the number of colors inside a group should be defined. In the following step typical representants of the respective color group should be chosen and taught into the teach table, step by step.



Number of color groups: 12 (0 ... 11)



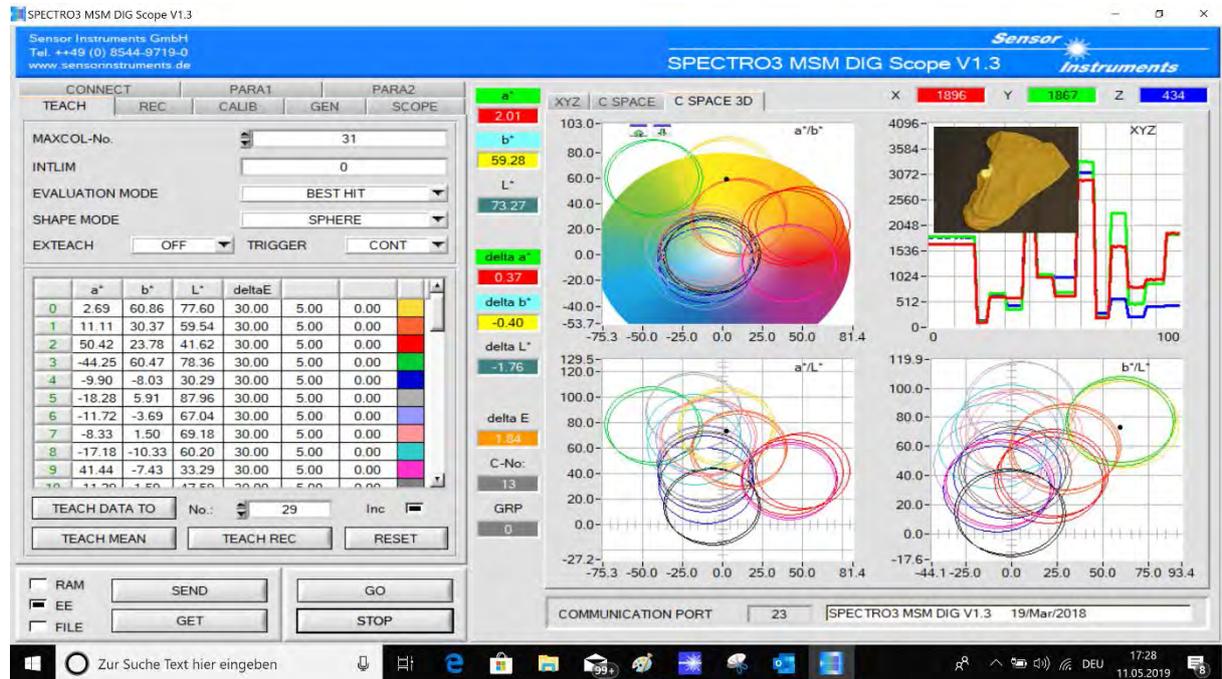
Typical representatives of the respective color group

After the 12 color groups have been defined, up to 64 color tones can be taught into the so-called teach table. The color group is assigned to the color tone in the PARA2 table, the color group belonging to the color tone is output in binary code at the 5 digital ports.

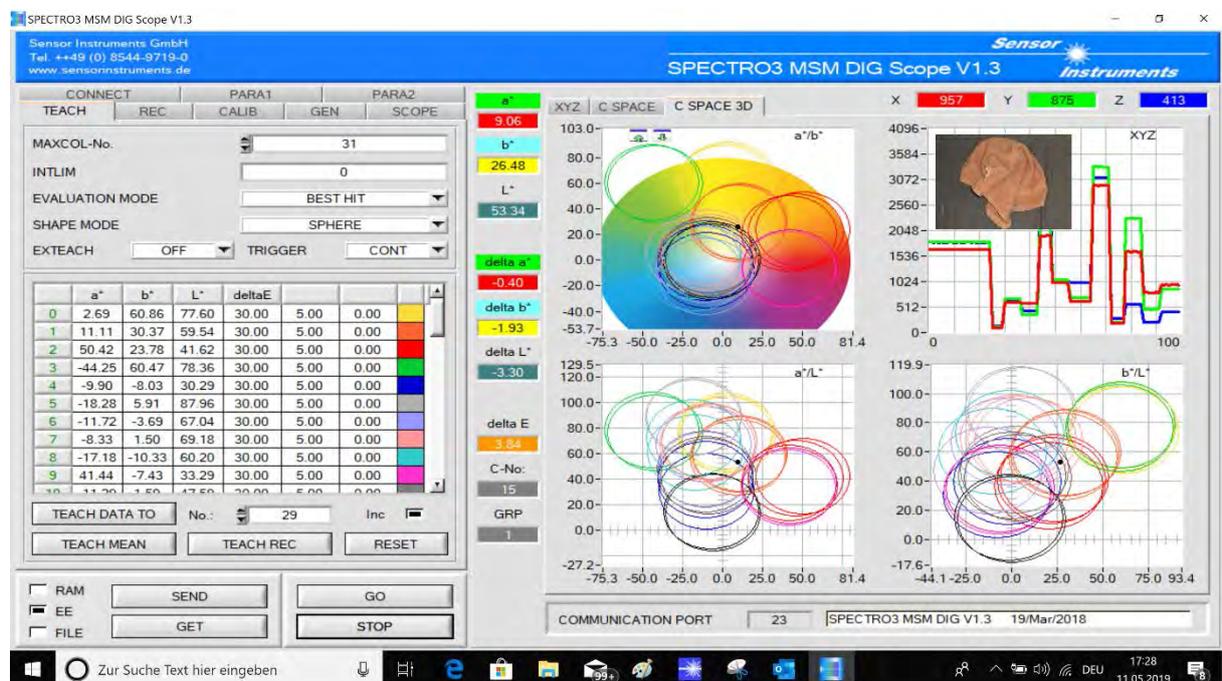
## 2. Test results

### 2.1. Static tests

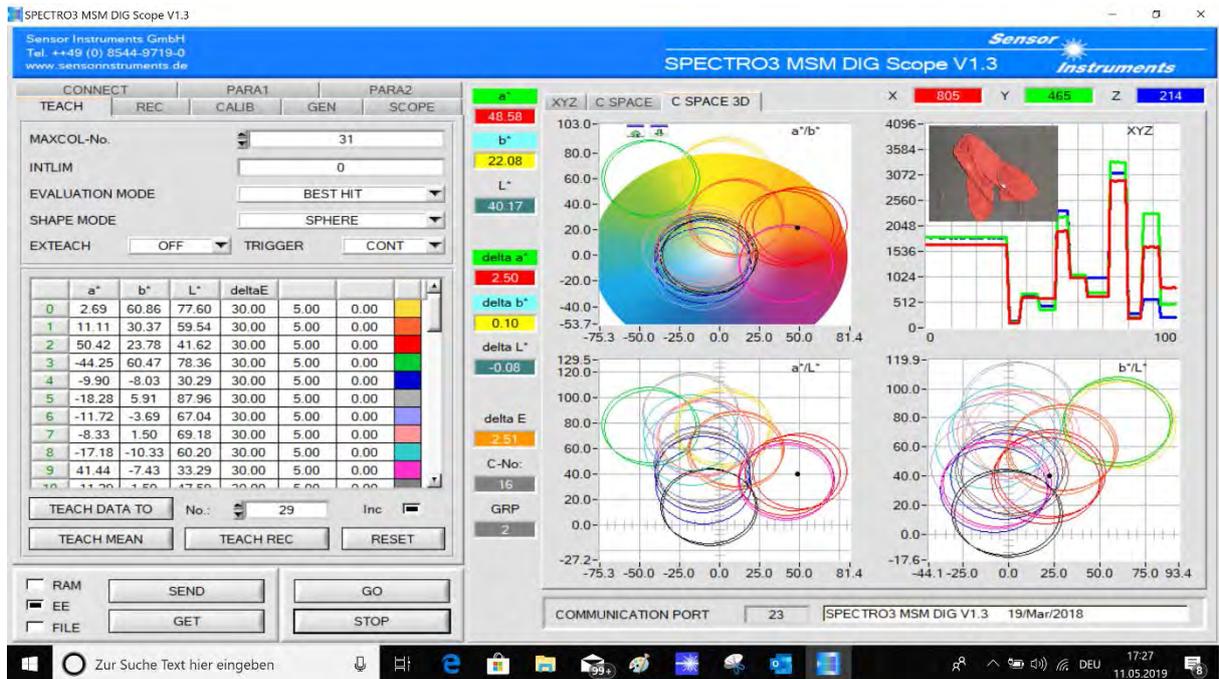
In the next step, the individual garments are positioned one after the other under the sensor:



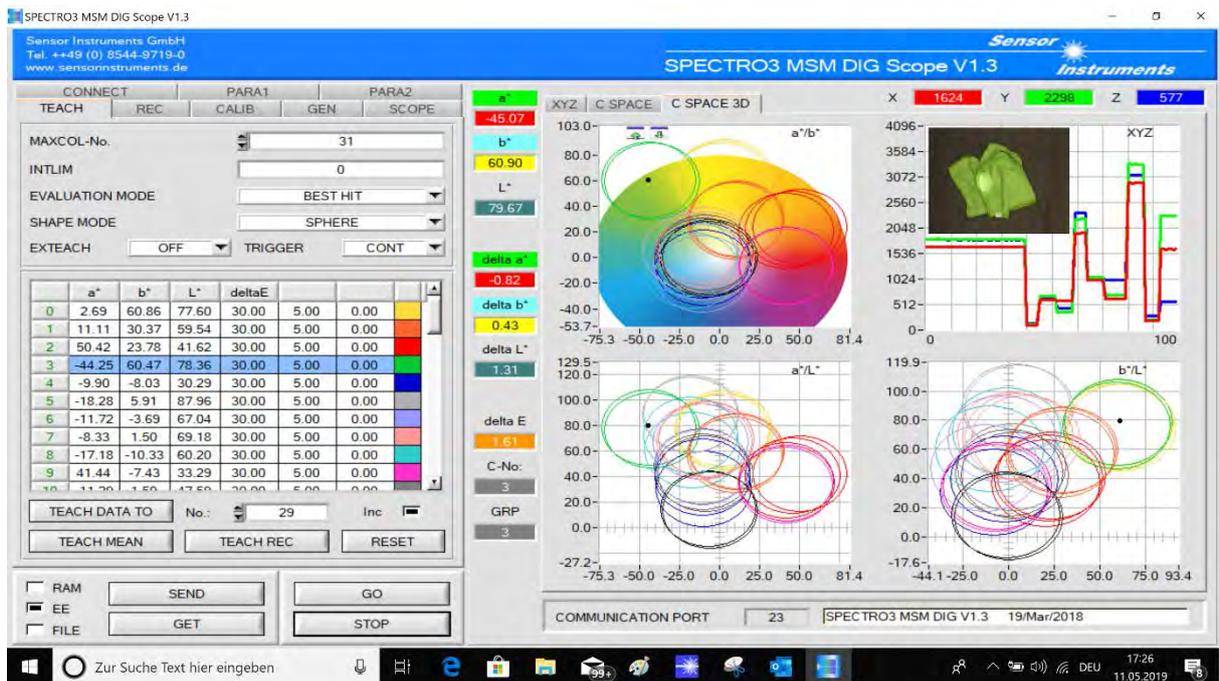
GROUP 0: YELLOW



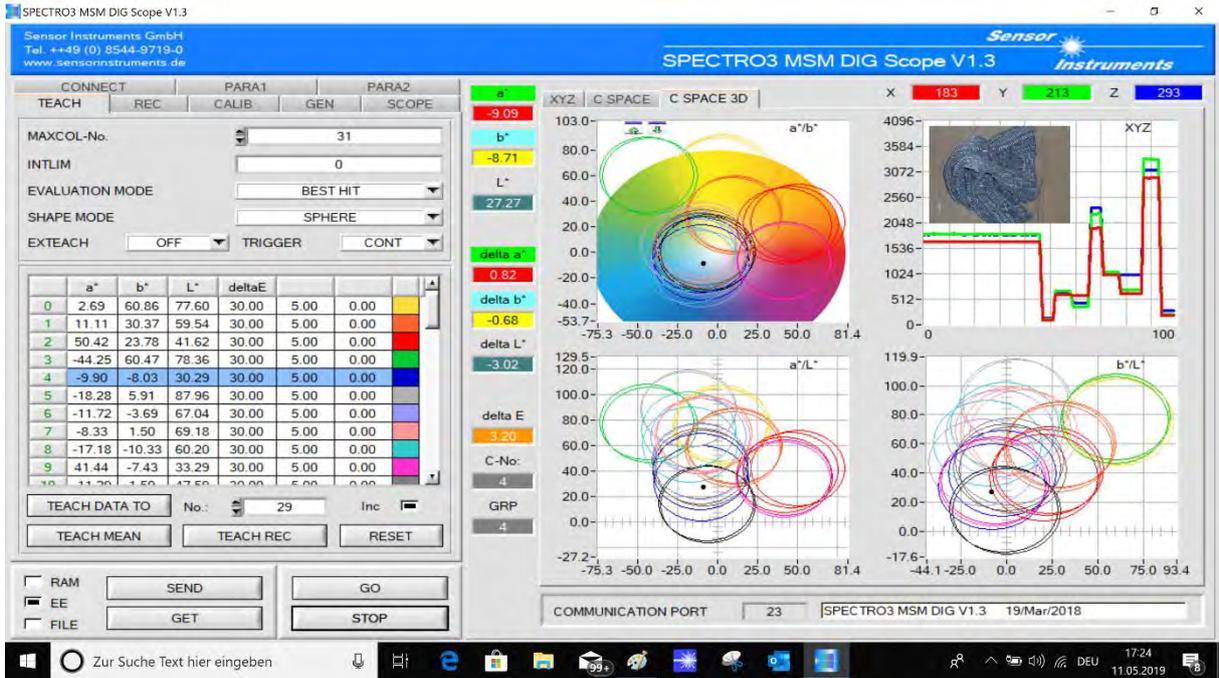
GROUP 1: ORANGE



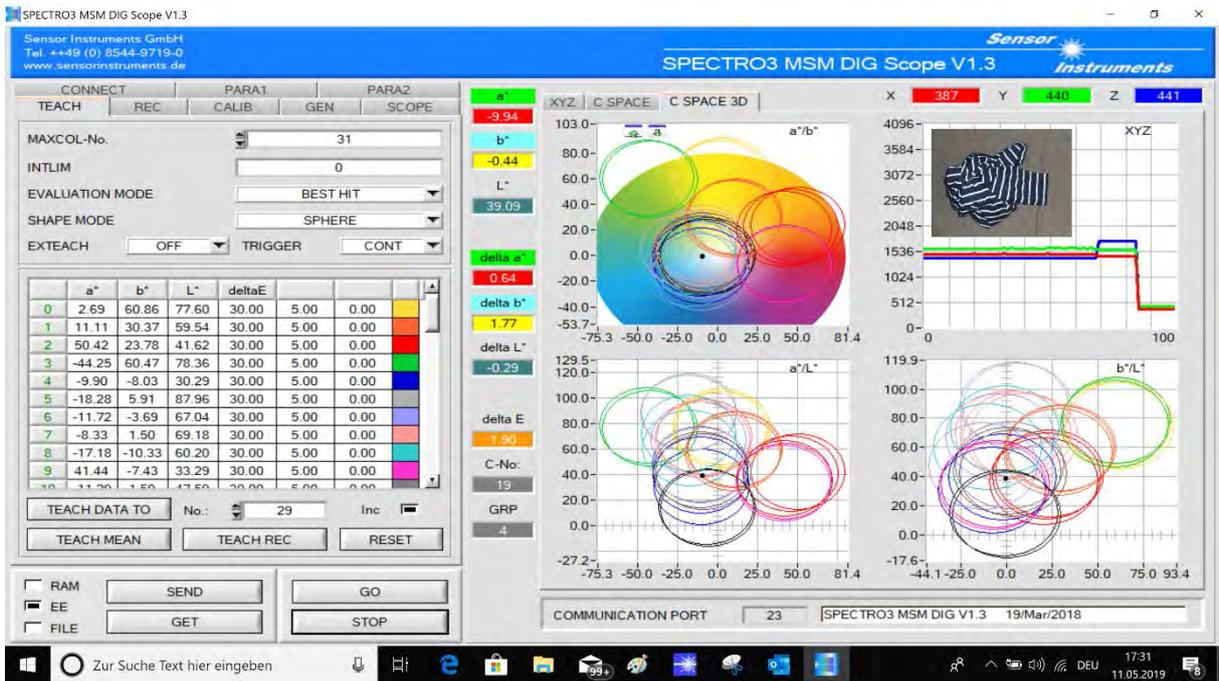
GROUP 2: RED



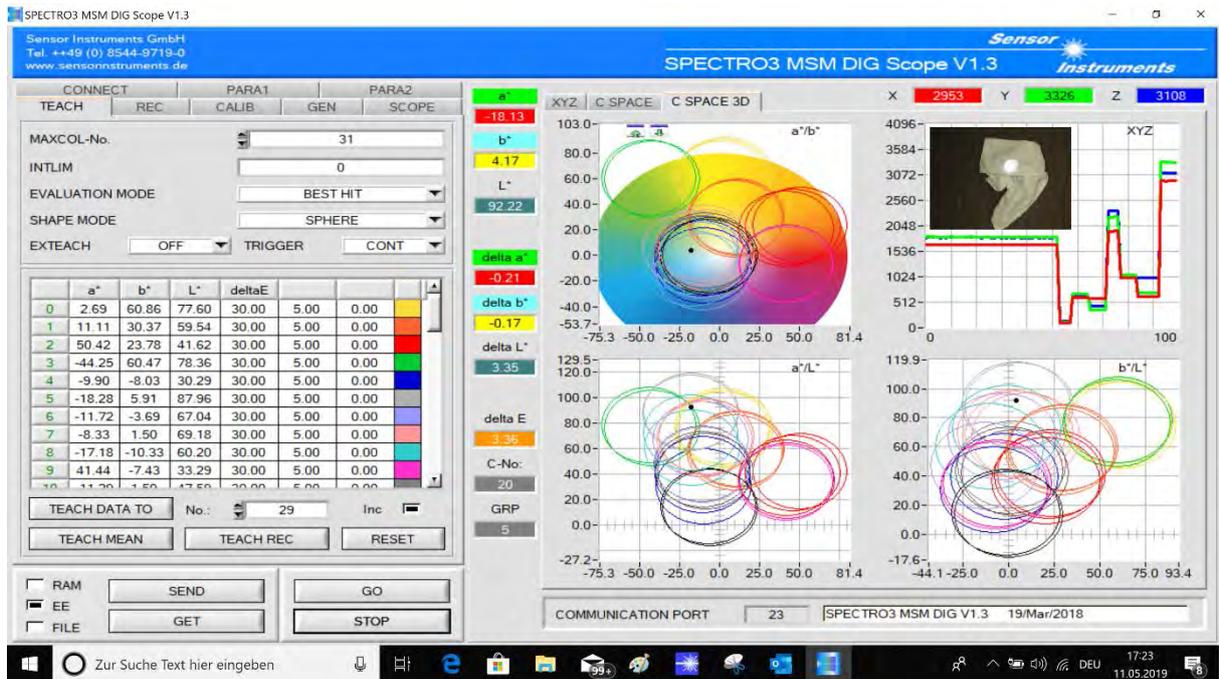
GROUP 3: GREEN



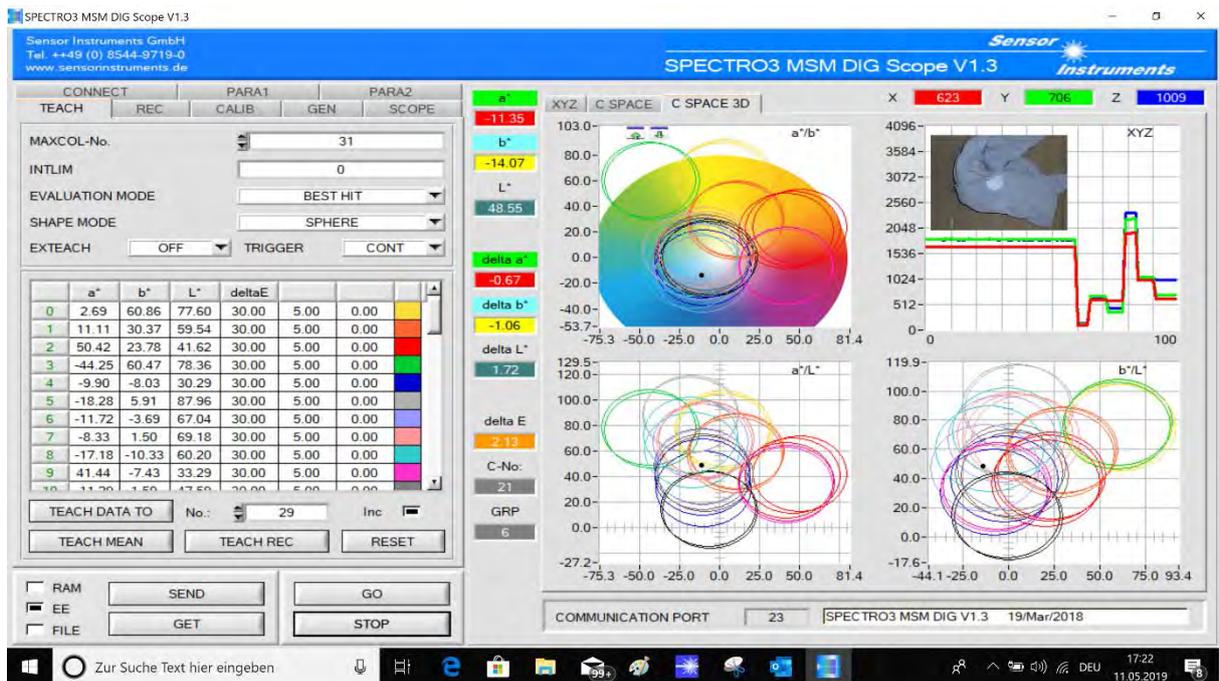
GROUP 4: DARK BLUE



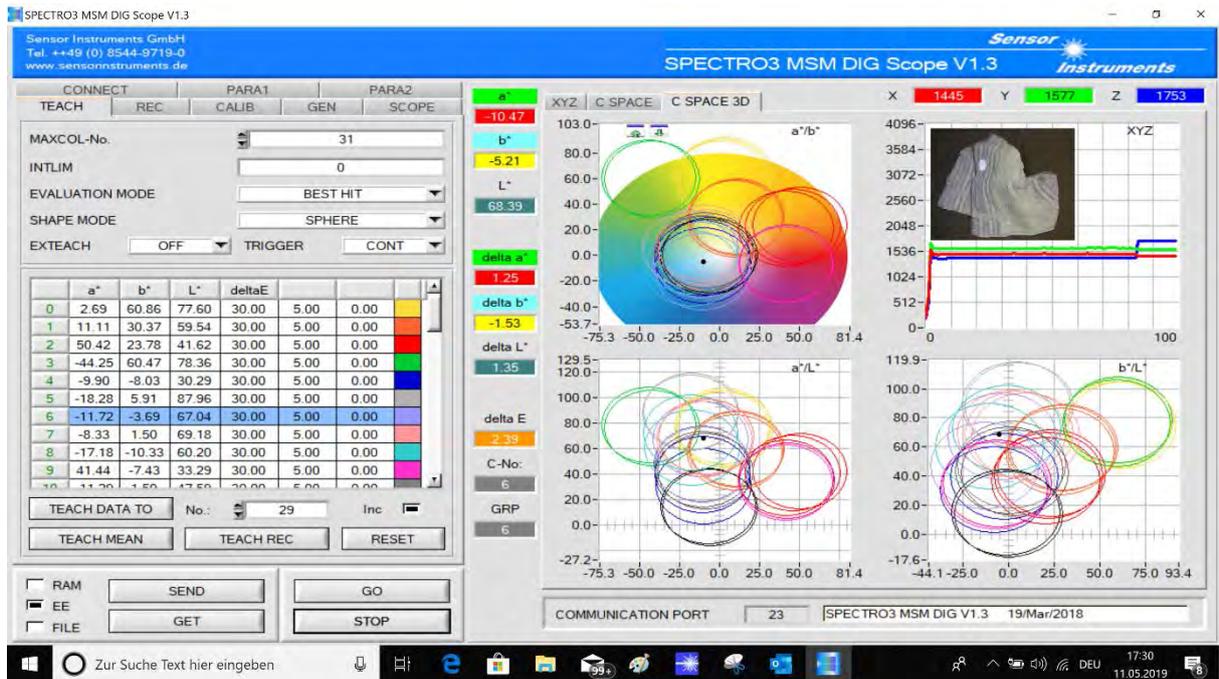
GROUP 4: DARK BLUE



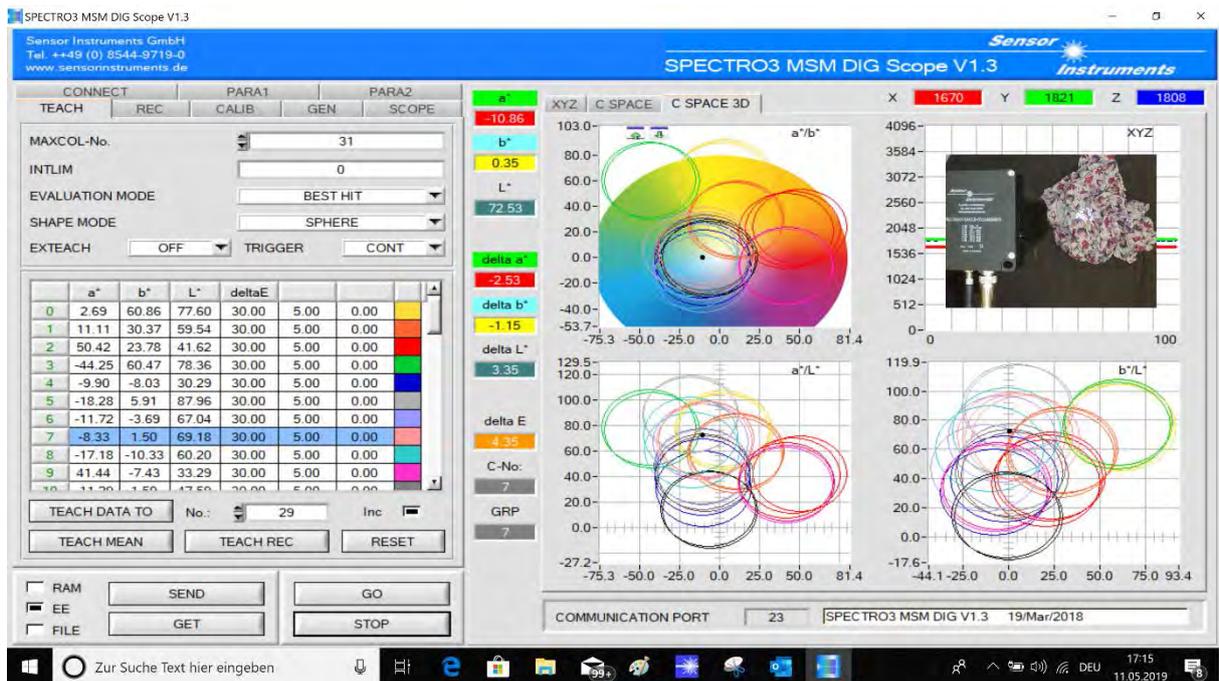
GROUP 5: WHITE



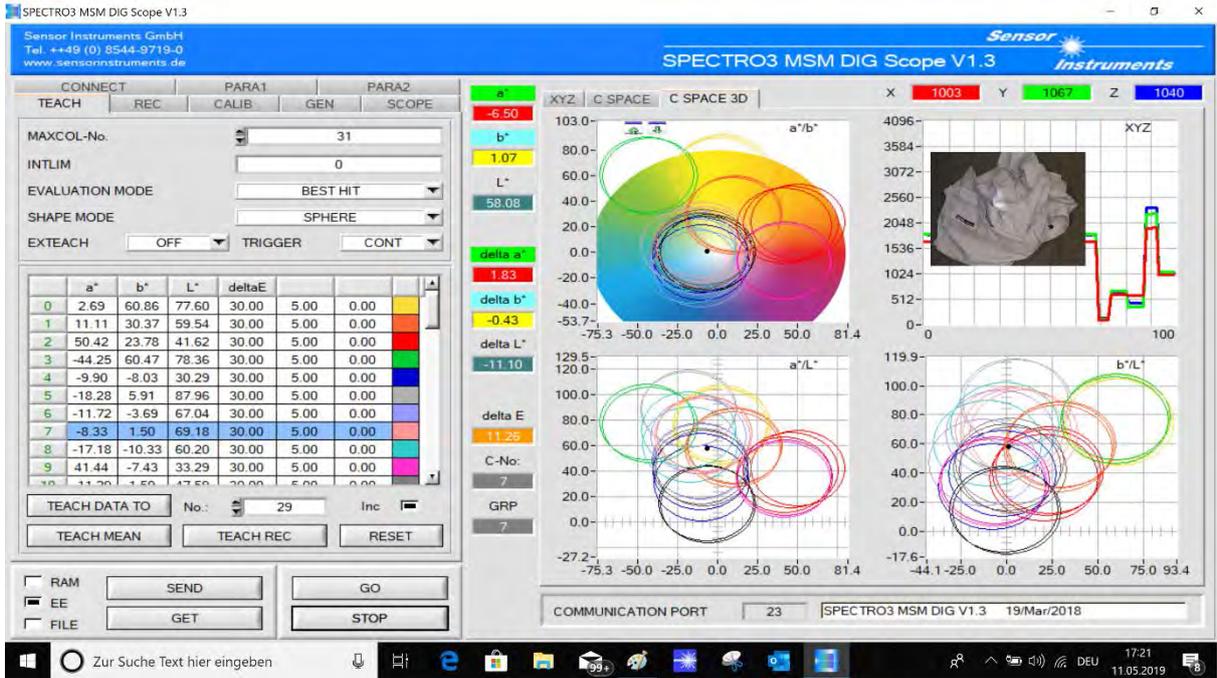
GROUP 6: VIOLETT



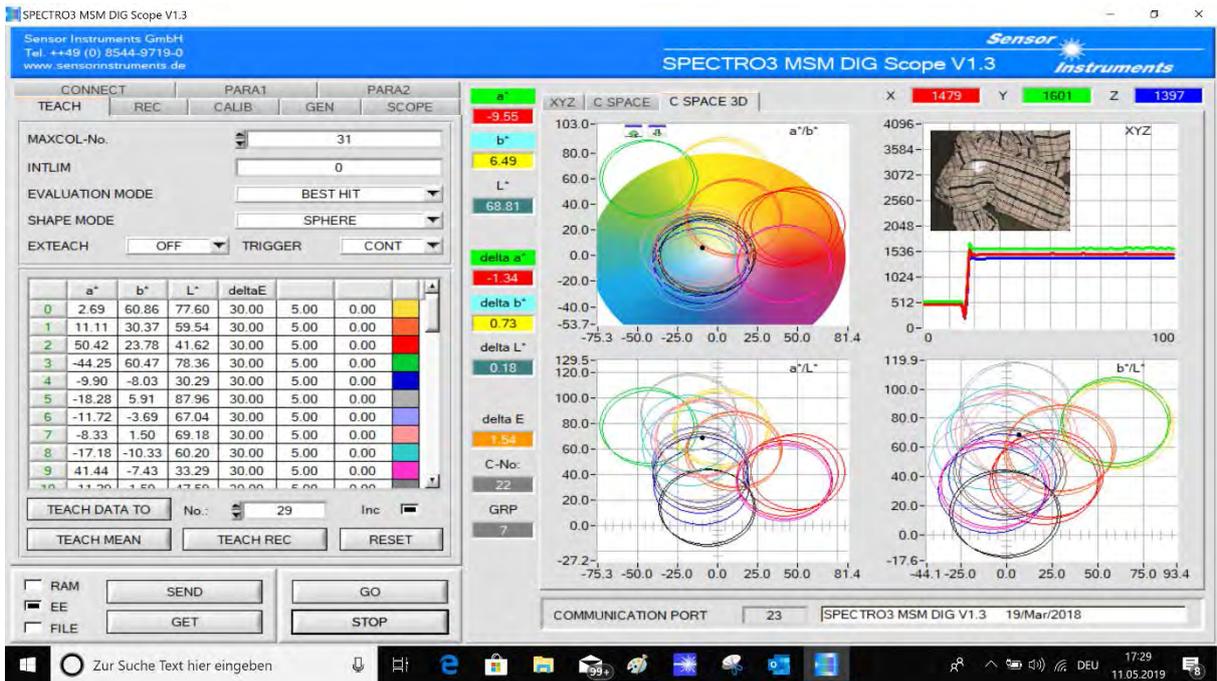
GROUP 6: VIOLETT



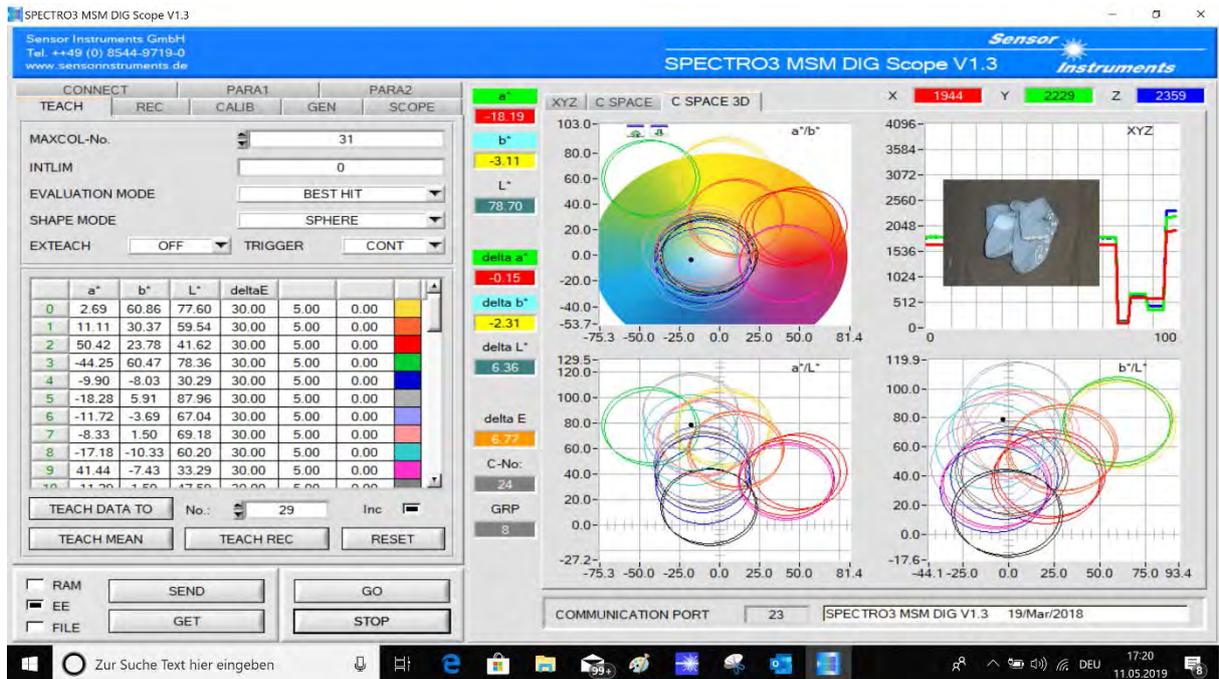
GROUP 7: PINK



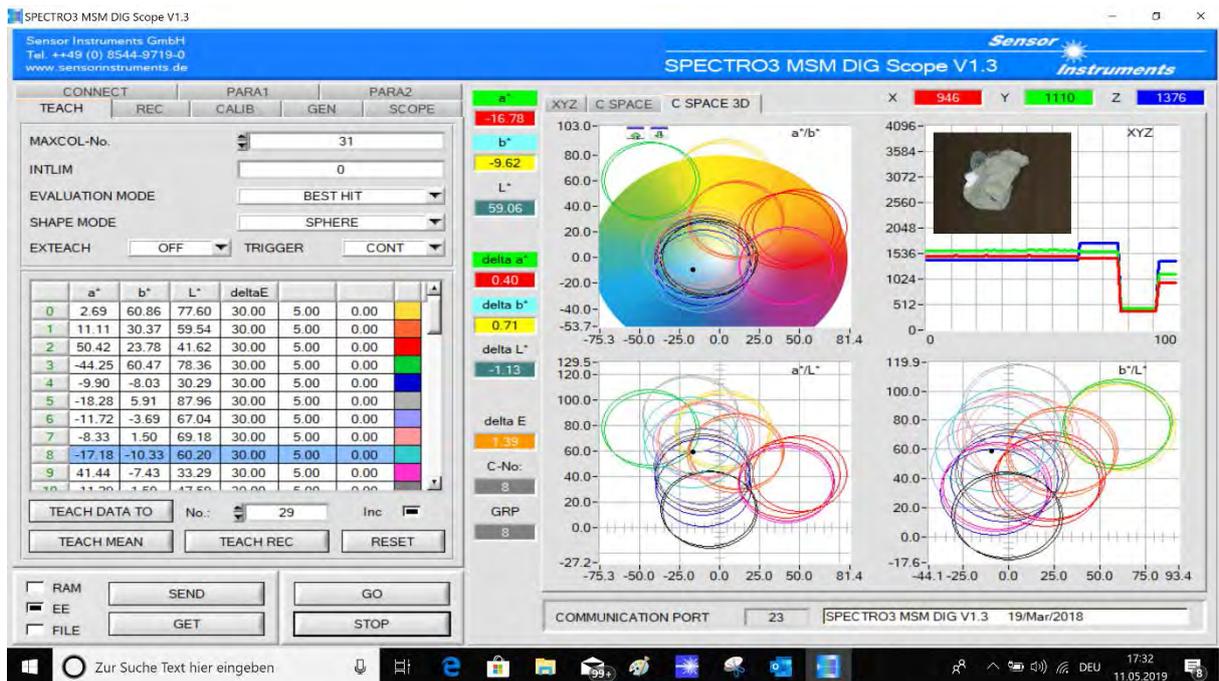
GROUP 7: PINK



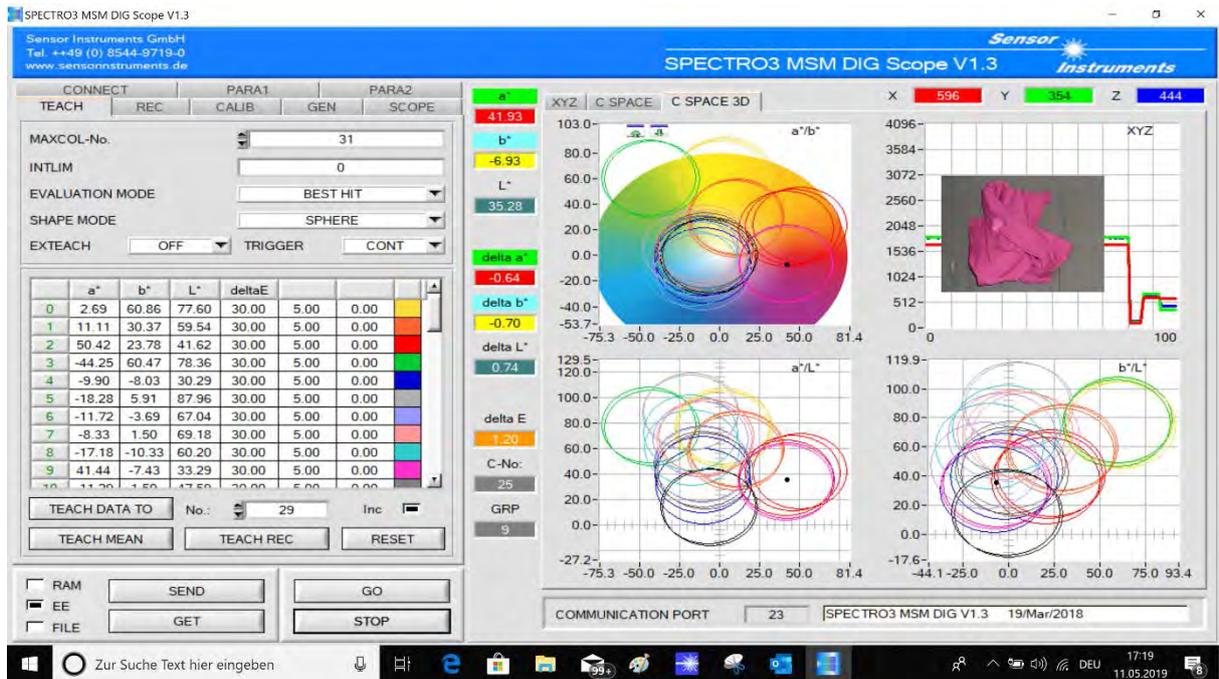
GROUP 7: PINK



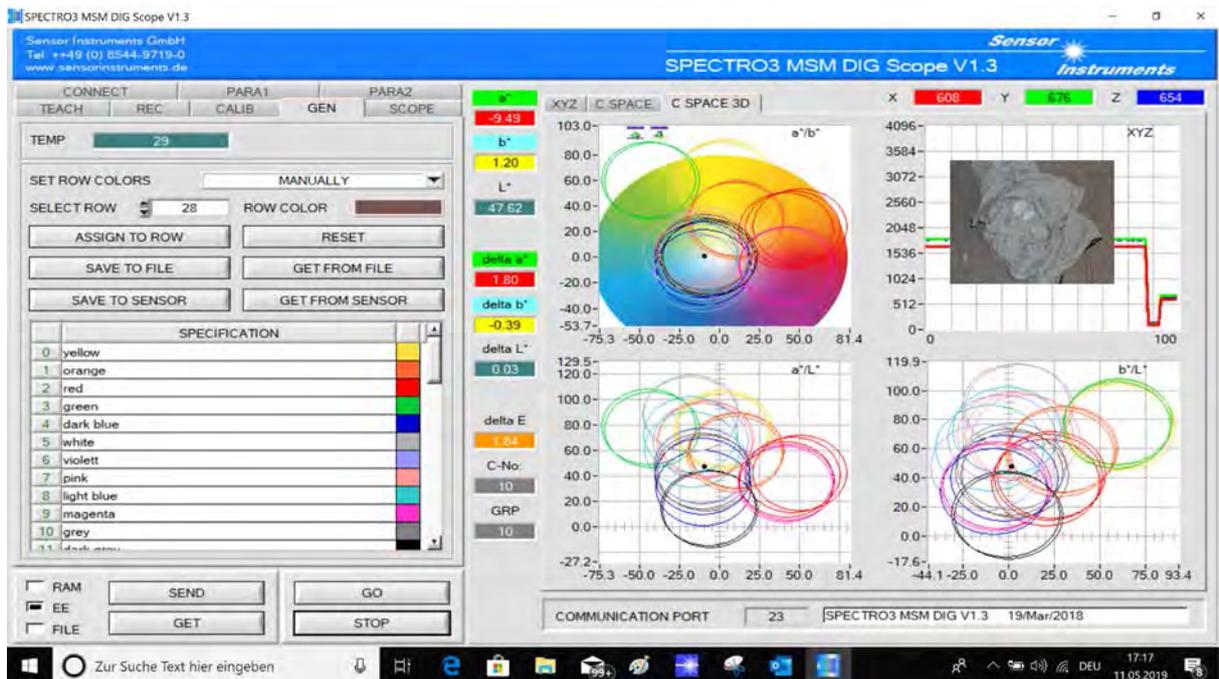
GROUP 8: LIGHT BLUE



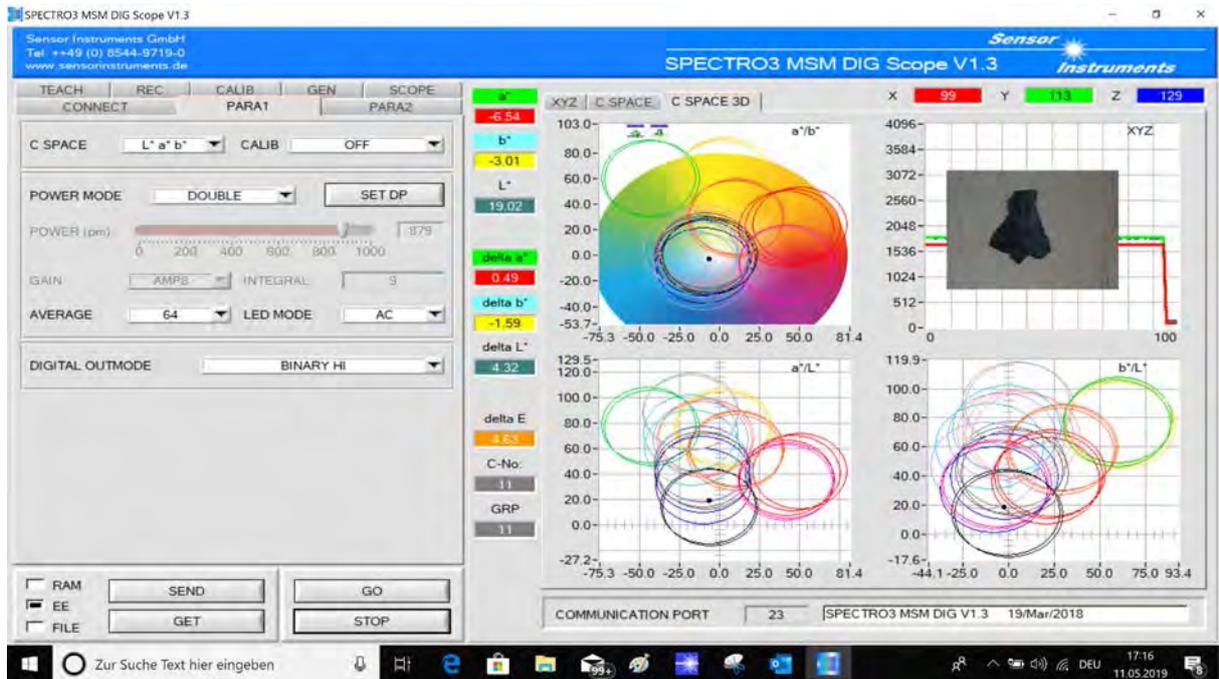
GROUP 8: LIGHT BLUE



GROUP 9: MAGENTA



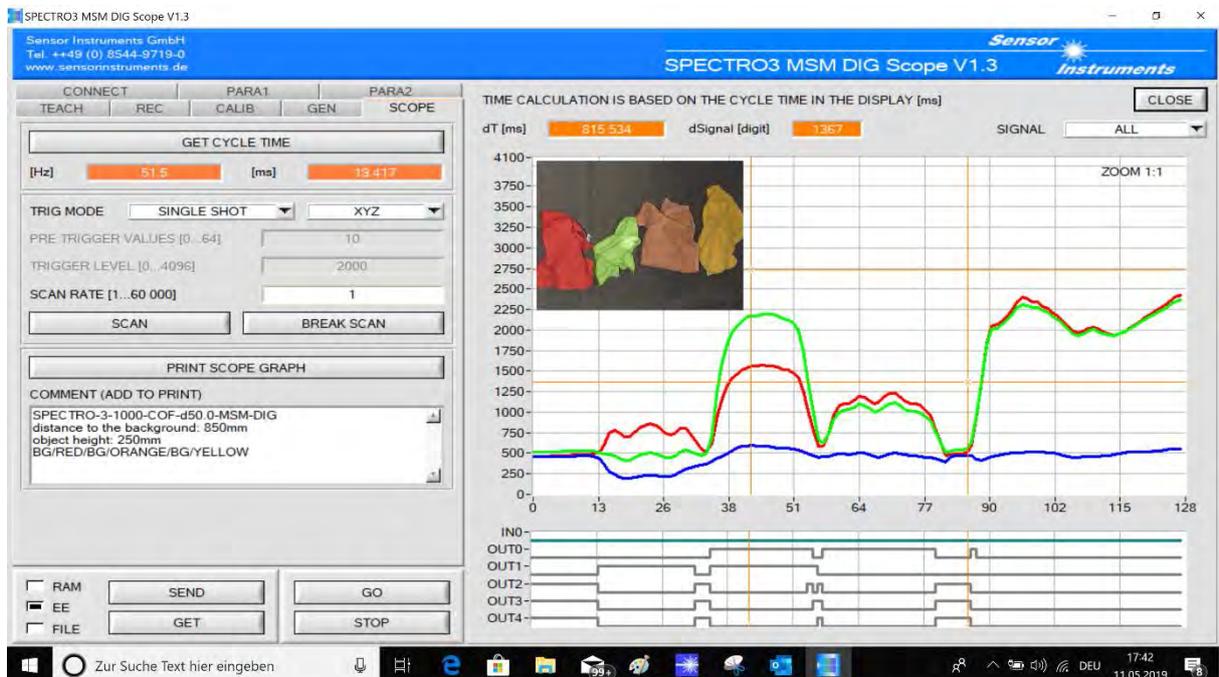
GROUP 10: GREY



GROUP 11: DARK GREY

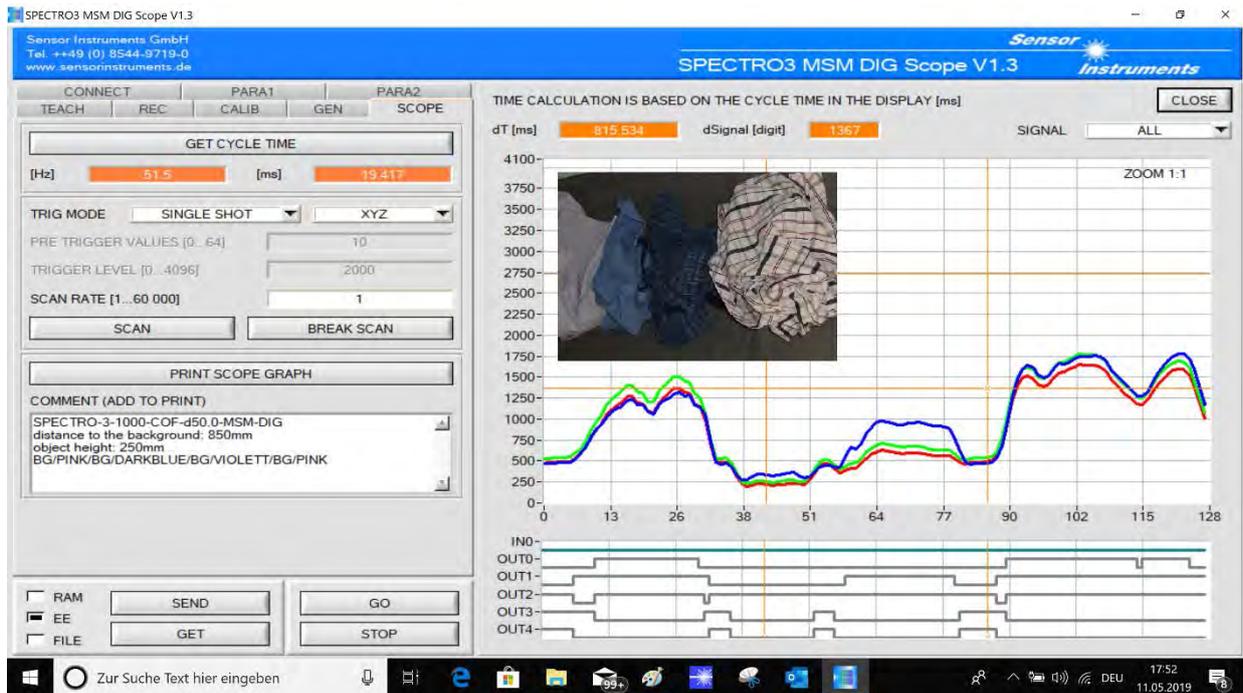
## 2.2. Dynamic tests

The clothes are transported under the sensor at a defined speed (0.5m/s ... 1m/s), which can be seen in the following screenshot:



Sequence of the clothing items:

BACKGROUND / RED / BACKGROUND / GREEN / BACKGROUND / ORANGE / BACKGROUND / YELLOW



Sequence of the clothing items:  
 BACKGROUND / PINK / BACKGROUND / DARK BLUE / BACKGROUND / VIOLETT / BACKGROUND / PINK

### 3. Summary

The color sensor **SPECTRO-3-1000-COF-d50.0-CL-MSM-DIG** enables perfect sorting of garments according to colour, in particular due to the large measuring range (20mm ... 2000mm), a light spot size of 50mm in diameter, as well as the high scan frequency (without averaging, this is in the kHz range) and the special software algorithm (BEST HIT, DOUBLE, GROUP).

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