Frequently asked Questions of the GPS Digital LED Analyser

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1. Question: What kinds of LEDs and colors can be tested?

The Digital LED Analyser allows to capture the whole spectrum of the visible light of light-emitting diodes (LEDs). All shapes and size, as well as very bright or very dark LEDs, can be tested. Beside the standard LEDs also Bi-Color, Tri-Color, LED Displays and light Bar Displays can be tested.

2. Question: What is RGB?

The RGB color space (**Red**, **Green**, **Blue**) is an additive color model in which the base colors add up to White (color composition). A color is defined through three values: the Red content, the Green content and the Blue content. Depending on the pigment content all possible hue levels (compound colors) can be shown.

3. Question: What is HUE?

Hue is the color shade. The HSV (HSI) color space is the **color space** of the **color model** where the color is defined with the aid of the hue, the saturation and the value or intensity. The **Hue color wheel** often is used to define the color, because it can be displayed in the Hue system by a number.
The **hue** is specified as color angle H on the **chromatic circle** (e.g. 0°= red; 120° = green; 240° = blue).

4. Question: What is CIE color space?

The CIE color space tries to graph a hue like the RGB and HSV color space do.
The CIE color space shows the relationship between a captured weavelength (nm) and xy value, which explains the secondary color. The CIE color space is exactly defined only by the previously experimentally determined relative perceptions of the three cone cells of the human eye (the so-called standard observer) for each visible spectral color. The CIE color space is especially suitable for the determination of white LEDs.

5. Question: How accurate is the GPS Digital LED Analyser?

The applied Digital Color Sensor allows a color depth of 12 bit resolution for each color, that corresponds to 2^{36} : 68.719.476.736 representable colors. The Digital Color Sensor therefore reaches an unmatched repeatability of color and intensity.

CIE color space:	White x = ± 0.0015; y = ± 0.0015
RGB color:	Red (630 nm) ± 3 nm
	Green (540 nm) ± 4 nm
	Blue (630 nm) ± 3 nm

6. Question: How much time does it take to capture LEDs?

The command “Standard Capture” needs about one second. But there is a large number of capture modes available. The light exposure can be freely adjusted between 1ms and 10.000 ms in order to guarantee an optimal capture. Very short exposure times are sufficient for very bright LEDs while dark LEDs need longer capture times.

7. Question: How much time does it take to test 25 or more LEDs?

The command “Capture” allows to take a measure of all LEDs which have to be captured simultaneously. The real time is basically defined by the darkest LED.

8. Question: Can flashing, blinking or PWM modulated LEDs be tested?

Yes, flashing and blinking LEDs can be tested. Please look up the user manual of the LED Analyser command “Capture pwm”.

9. Question: Can 7-Segment Displays be tested?

Yes, if each segment is treated as a single LED and a fiber end is mounted over each segment. So displayed numbers from 0 to 9 can be verified.

10. Question: Can Bi-Color and Tri-Color LEDs be tested?

Yes, each color has to be measured individually.

11. Question: Can Bargraph Displays be tested?

Yes, Bargraph Displays can be tested. But each segment of the Bargraph Display has to be read out by a fibre directly.

12. Question: Can several LEDs be tested simultaneously?

Yes, by using the command “ Capture” all LEDs are actuated simultaneously.
As up to 99 boards are connected through a bus, up to 495 LEDs can be tested nearly simultaneously.

13. Question: What output formats are available from the Analyser?

The Analyser can make the data available through an USB or RS 232.
The results can be output as RGB-, HSI- or CIE-values.

14. Question: How can the Analyser be connected to a PC?

The LED Analyser can be connected by a Serial or USB port.
The cables are provided as accessories by GPS.

15. Question: How close to the LED the fiber should be mounted?

The distance between the LED under test and the fiber should be 1-2 mm.
For bright LEDs the distance might be greater.

16. Question: What is the minimum bend radius for the fiber?

The minimum bend radius is recommended by the manufacturer and shouldn't lie below 10mm. Sharper bends are possible, but the loss of light will increase thereby.

17. Question: How long can the fiber be in length?

The length of the optical fiber can be adjusted to the required length of 0,5 to2 m without great losses. The loss per meter in a 650 nm fiber will be about a 0,18 dB (2%) loss.

18. Question: What are the power requirements?

The Digital Color Analyser with five channels has a current consumption of about 80 mA, 5V.
The Analyser can be operated by an USB as well as by a RS232.
During USB operating the power supply takes place through the USB interface and then up to five boards can be operated (total supply current 400 mA).
During RS232 operating a voltage has to be applied additionally. As every board has an own power supply unit it is possible to apply an unregulated voltage between 7 and 15 V.