

1. TASK

If it is bright an RGB diode should light up in blue and when it is dark it should light up in blue/green (cyan) colour.



2. BACKGROUND INFORMATION

To detect the bright / dark transitions, a light-dependent sensor, a phototransistor T1 is needed. In the dark T2 conducts a collector current and the green color of the RGB LED is mixed to the blue color.

3. EXPERIMENT DESCRIPTION

The base resistor R2 of 10kOhm limits the base-emitter current of the transistor T2. Depending on the ambient brightness the voltage divider comprising of R1 and the phototransistor T1 should switch the voltage UBE at the input of the transistor T2 to the highest possible and lowest voltage value. With the resistor R1 the switching threshold is set so that only the blue LED of the RGB LED lights up in a bright room. In a darkened room, the transistor T2 mixes a green color to blue in addition.

Lab A6.1: Turn off the light in the room.

Lab A6.2: Turn on the light in the room.



4. OBSERVATION AND EXPLANATION

Lab A6.1: When the light in the room is switched off only a small base current flows in the phototransistor and the internal resistance in the collector circuit of T1 is high. With the multimeter we can measure a base-emitter voltage of approximately 0.63V. A base current flows in T2 causing its internal resistance to drop. The green and blue LEDs of the RGB LED light up. The two colors produce light in a shade of cyan.



Lab A6.2: When the light in the room is turned on, then a base current flows in the phototransistor and its internal resistance decreases. With the multimeter we can measure a base-emitter voltage of approximately 0.3V. Now there is no base current flowing in T2 causing its internal resistance to increase. That's why only the blue LED lights up.

LEARNING SUCCESS

A phototransistor can be used as a light intensity sensor. Depending on the incidence of light a corresponding collector current results. The control current caused by the incident light of the phototransistor T1 is amplified by the current amplification factor at the output.



