Fosilum smartLight

Smart lighting systems



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1. Fosilum smartLight

Fosilum LED lights can be controlled by a number of established standards for building automation. We can ensure it with the use of our own universal programmable LED power supply. This approach allows us high flexibility for customer's requirements. With the set of lights with function Fosilum smartLight we want to offer users smart lighting, which can be used in different ways and occasions.

Fosilum smartLight currently consists of the following established standards. In the future the list will be expanded:

- DALI (digital addressable lighting interface)
- 1-10 V analog dimming
- sDim digital analog dimming
- RGBseQuenc

2. DALI

2.1 What is DALI?

DALI stands for **D**igital **A**ddressable **L**ighting **I**nterface (DALI). It is technical standard for lighting control in buildings and houses, which is based on a network bus. All of the devices are connected to the DALI bus, they can be addressed from one place, with random physical addresses. The DALI standard uses optimized commands for communication between the lighting and other devices. It is a perfect standard for standalone lighting systems. Because of its simplicity, it proves successful for controlling large complex systems of smart lighting.

2.3. DALI systems

Communication between the lights and other devices: all input devices like buttons, dimmers and sensors send data to DALI controller which then administers the lights connected to the DALI bus. Some DALI controllers allow the lights connected to the DALI bus, to be controlled by other communication standards (DMX, EIB / KNX, LON ...) or via PC, Smartphone, Tablet PC or other smart devices.

Picture 1: System with DALI controller

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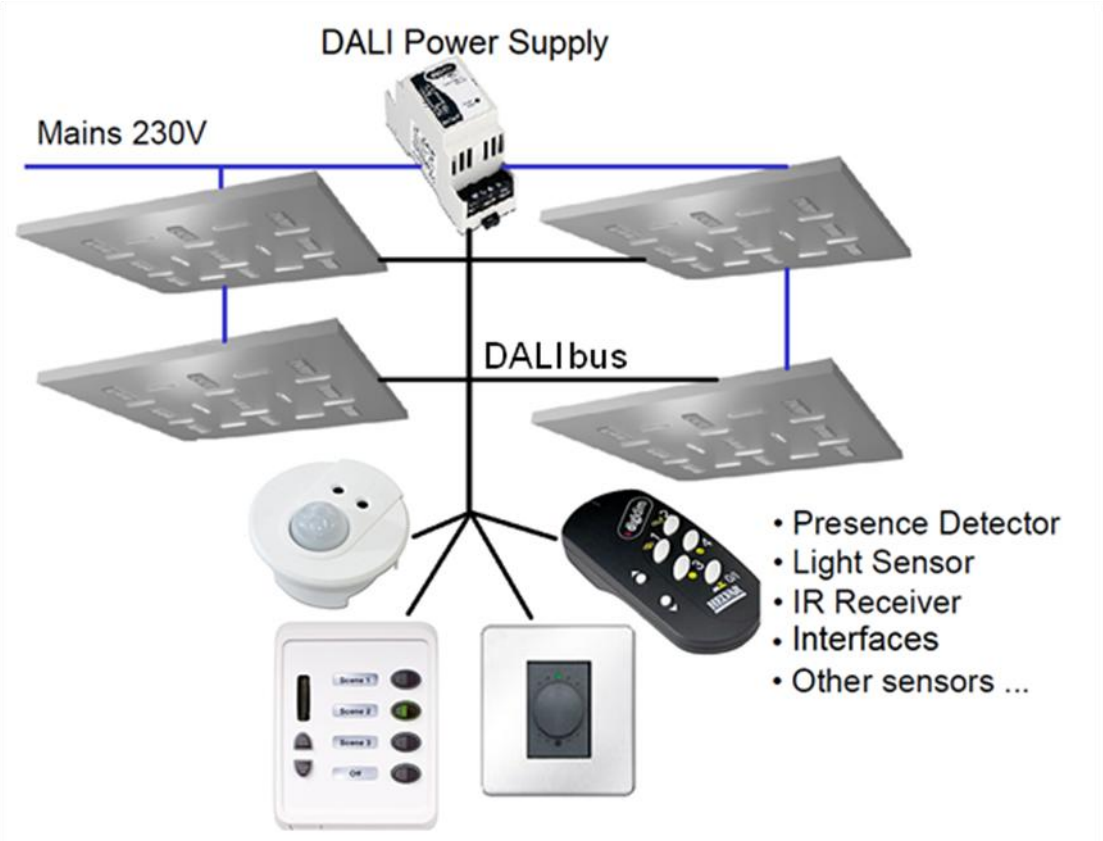
It is possible to create a standalone DALI systems without using a DALI controller. DALI power supply supplies the bus with necessary voltage. In this case each DALI device stores in its internal memory the commands that must be sent to interact to each other on user's request. The diagram below presents a system with four DALI lights. Lights can be controlled on user's request via push buttons, dimmer or remote controls. Lighting can be independently controlled by a multifunctional sensor according to the perceived characteristics of the surrounding area.



Picture 2: Standalone DALI system

When we are dealing with a large number of DALI lighting and devices, we can use the DALI routers connected in one system. DALI routers are connected via an existing LAN or independent LAN. This allows you to administer all lights and devices in the building from one place. Such system allows us to have complete control over the lighting in the whole building. We can also enable certain users who are connected to LAN to administer certain segments of the lighting. With an Internet connection the system can be managed from a distance.

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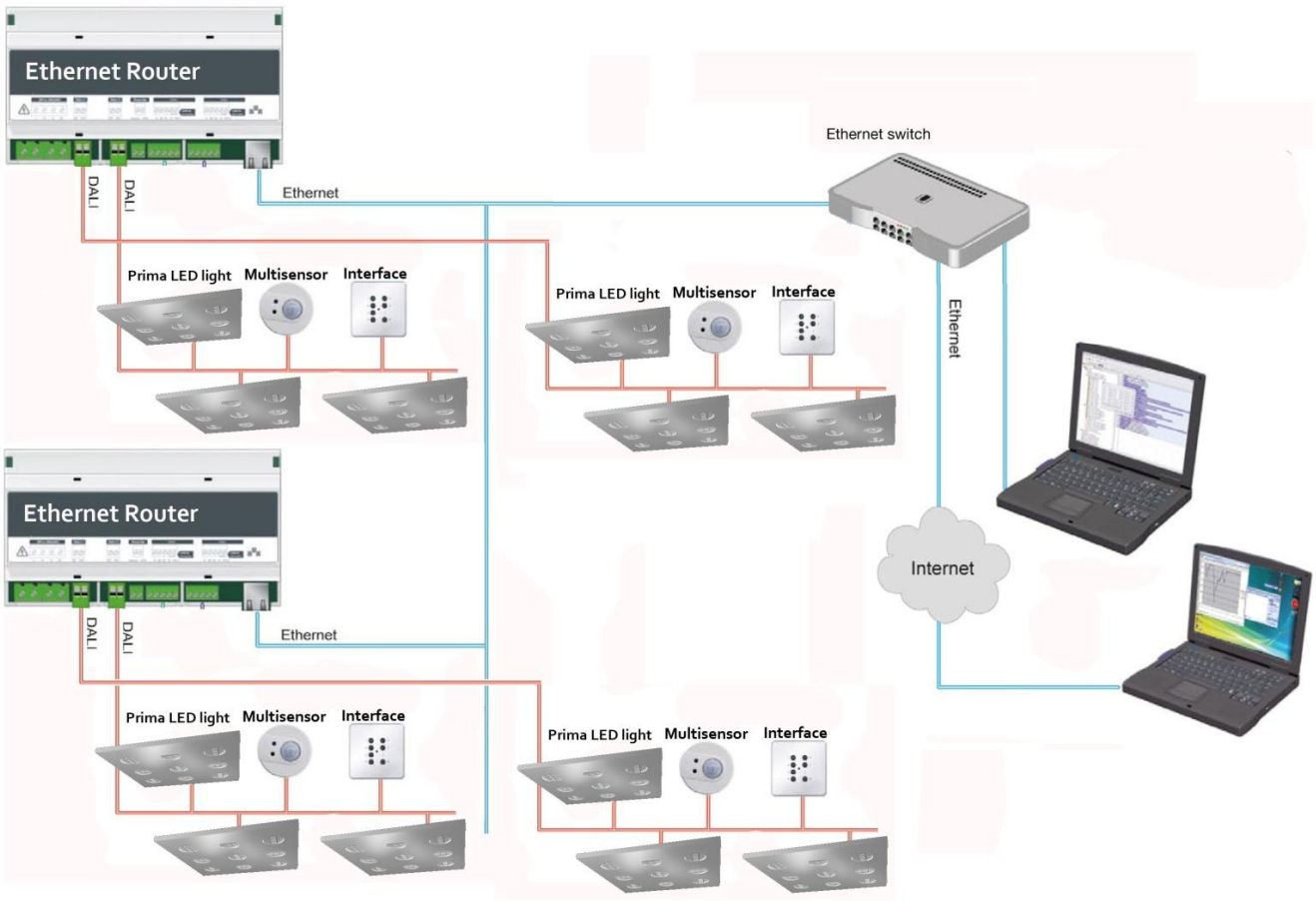

Picture 3: Large DALI system with DALI routers

2.2 DALI bus wiring

For DALI wiring are required wires 2 x 1,5 mm ², because only with such cables it can achieved the maximum reach of 300 m. Range is limited by the voltage drop on the bus, which must not be greater than 2V. The range can be increased with special repeaters, which adjust weakened voltage on the bus. DALI bus wiring does not require special wiring as twisted-pair cable. DALI system is not classified as SELV (separated or safety extra-low voltage) therefore it may be run next to the main cables or within a multi-core cable that includes main power. Communication on the DALI bus is performed at approximately 16V DC. Voltage on the bus must be kept between 14-20V. Due to the low voltage the electrical isolation on the bus is not needed. Devices are connected to the bus in parallel. The devices can be connected to the bus without concerning the polarity. Total consumption of devices on the bus must not exceed 250mA. Typical power consumption is 2mA, input devices can spend a maximum of 10mA. On the DALI bus the communication is performed at a speed of 1200 bit/s. Devices can be connected according to the star or tree network topology. The DALI routers are used to connect multiple DALI devices.

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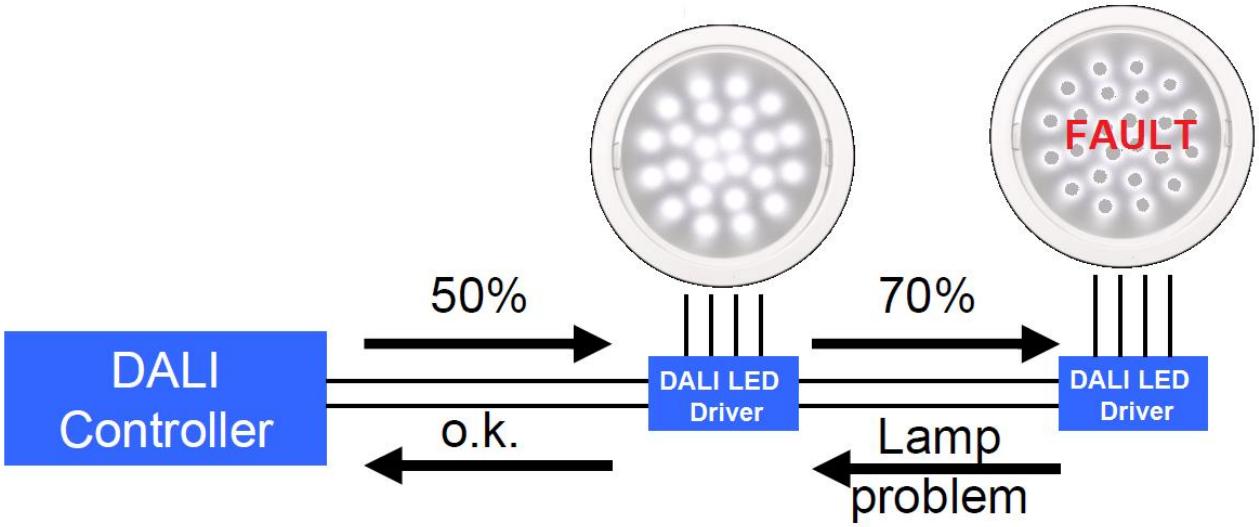
2.3. Address space and DALI commands

We can connect up to 64 devices to one DALI bus. Addresses are stored in each DALI device as specified random number. Each device has assigned short address with numbers between 0 and 63. The device can assign addresses in different ways. All settings are written into memory of each DALI device and can be rewritten over and over again. DALI devices can be distributed among 16 groups which may overlap. Each device can be set to 16 lighting scenes. In the scenes are stored the set levels of light for each light.

The DALI system is using optimized commands as: On, off, set the level of brightness, dim, brighten, and recall lighting scene and much more. Commands can be addressed to individual luminaries, to group off devices or to all devices on the bus in broadcast mode. Each device has stored down in its own memory different levels of brightness, for example: the brightness on power on or brightness in case of fault. It is possible with a DALI controller to check the status of various lamps, such as setting the luminance errors on the lamp or some other device.



Picture 4: DALI communication

2.5. Groups

In the DALI system individual lights can be placed in groups. Lights that are placed within the same group may be controlled by commands for the entire group. With the use of groups we can simplify the administration of the lighting that has related position in the room. Lights can be grouped as shown in the diagram below. Group 1 consists of three lights at the front of the room. Group 2, 3 and 4 are the lights that follow towards the end of the room. In group 5 are all wall lighting. With use of one button on user interface you can send the command to shut down all the wall lighting or dim the lights at the front off the room to 50%.

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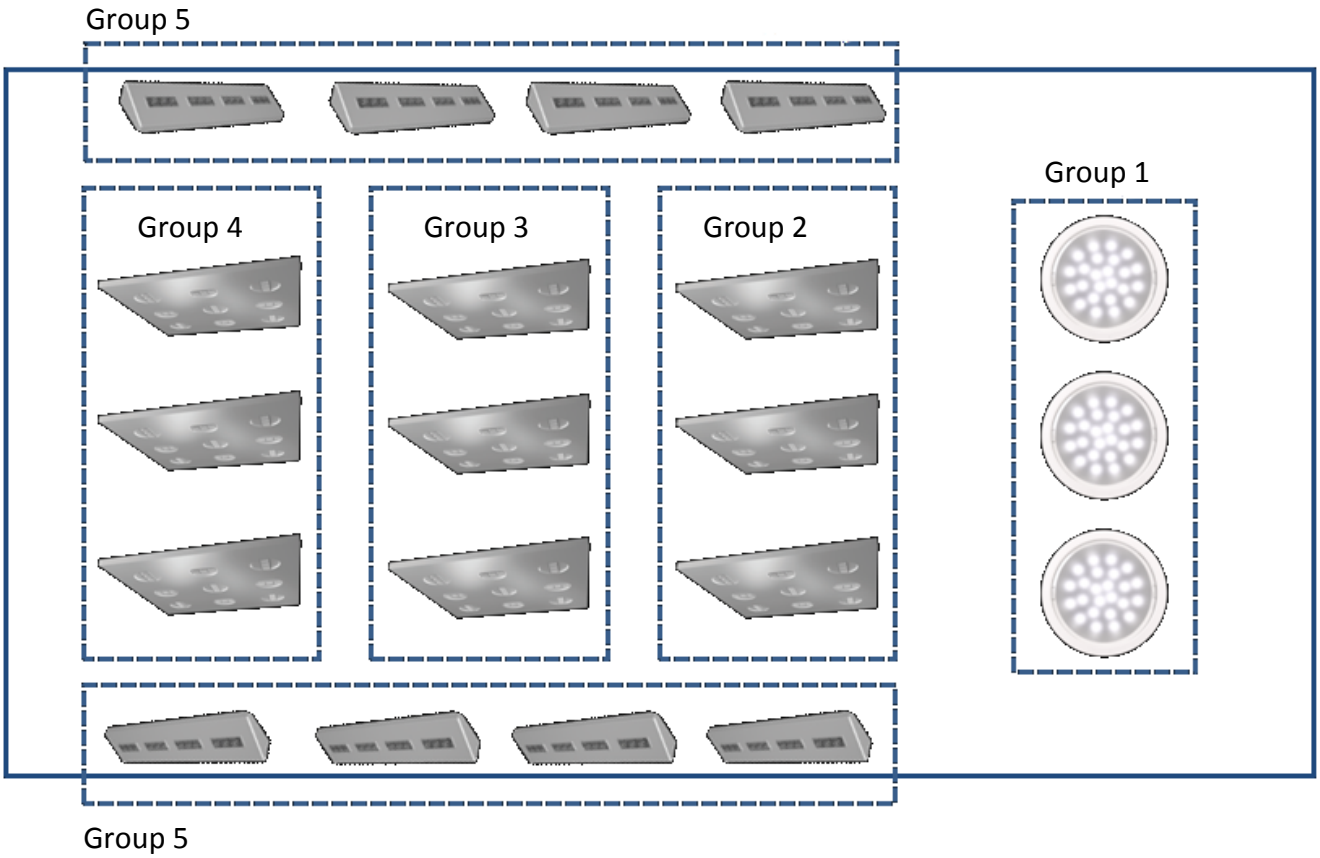

Picture 5: Setup of lighting groups

2.6 The effect of scenes

In the DALI system the scenes are used for simple lighting settings in the room of each individual lamp. Each lamp can be set the level of brightness for each light scene. To illustrate the scene effect, we can use the multipurpose room which is used during the presentation with the projection. Using the arrangement of lights' brightness we want to recall a scene for presentation. When we recall the presentation scene, the lights in group 1 are turned off, lights in groups 2, 3 and 4 are dimmed to 30%. Wall lights are dimmed to 50%, because wall lights do not interfere with the projection. The room is supplied with sufficient light that enables the students to take notes and it also enables a projection of a good quality.

The recall of individual scenes can also be time scheduled. With scene scheduling you can decrees the power consumption on lighting. For example: in the morning and afternoon all the lights are turned on 80% brightness. At noon the lights are dimmed to 60%, because of large amounts of outdoor light. In the night time the lights should be turned on to 100% because of the absence of outdoor light. When there is no activity in the room during the night all the lights can be dimmed only to 10% due to security reasons.

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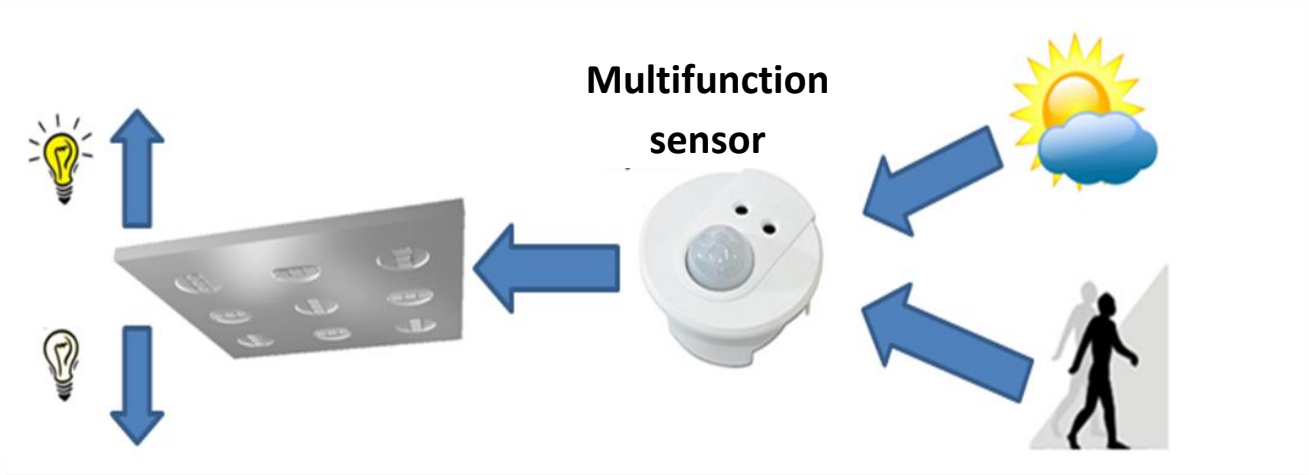
Picture 6: The presentation scene in multipurpose room

2.7. Multifunction sensor

Maximum power savings on lighting can be achieved using multifunctional sensors. It can regulate the desired illumination in the room according to the level of outside light. You can set the desired illumination in the room and the sensor will adjust the lighting to such level to suit the desired illumination. Multifunction sensor detects the presence in the room, so in case the users are not in the room, lights will dim or completely turn off. When users will return to the room, the lights will be set to the previous level of illumination. With this type of regulation we can reduce the power consumption of lighting from 35% to 50%, depending on the setup of the system.



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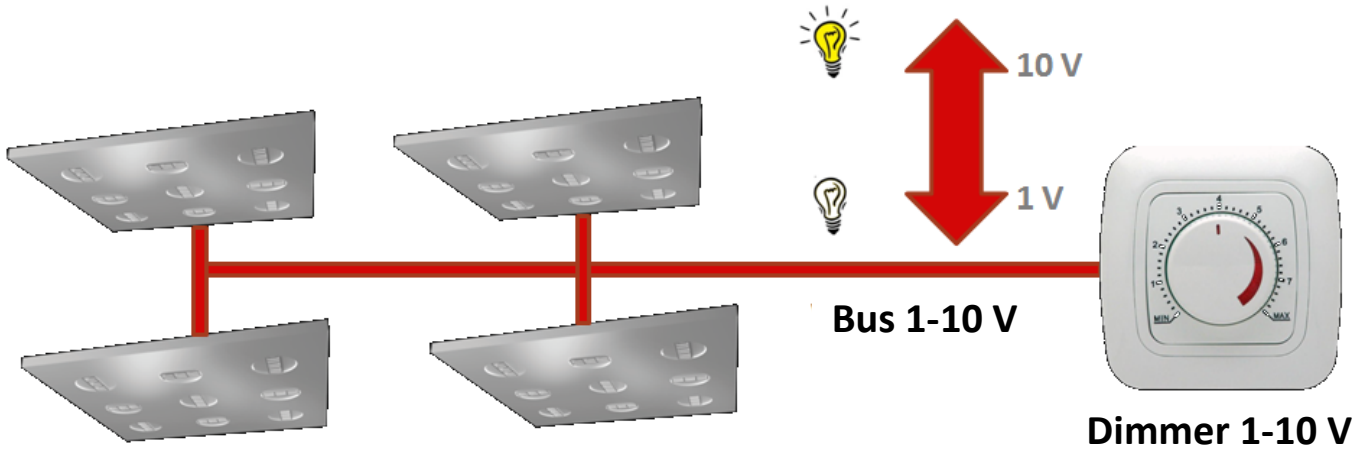
3. Analogue dimming system 1-10V

The analog dimming system 1-10V is one of the first analog systems for management of the lighting systems. It is distinguished by simplicity and affordability. All the lights that are connected to the same bus set its brightness according to the voltage level on the bus. Voltage on the bus can be adjusted between 1-10V with special dimmers, which have the voltage source adjusted between the 1-10V. If the voltage on the bus is 5V, the lights will be dimmed to 50% of luminance. Such a system is not suitable for large lighting systems. At large distances, due to different voltage drops on the bus, the lights can be adjusted to different brightness levels.



Picture 7: Analogue dimming system 1-10V

4. sDim digital dimming system

This is a simple digital dimming system use for single lamps. Desired adjusted level of light will be stored in its own memory. Individual lamp can be dimmed with a simple switch, which must be individually connected to the lamp. The system is not suitable for connecting multiple lights on the same switch. It is a simple and cheap solution with certain restrictions.

Picture 8: sDim digital dimming system

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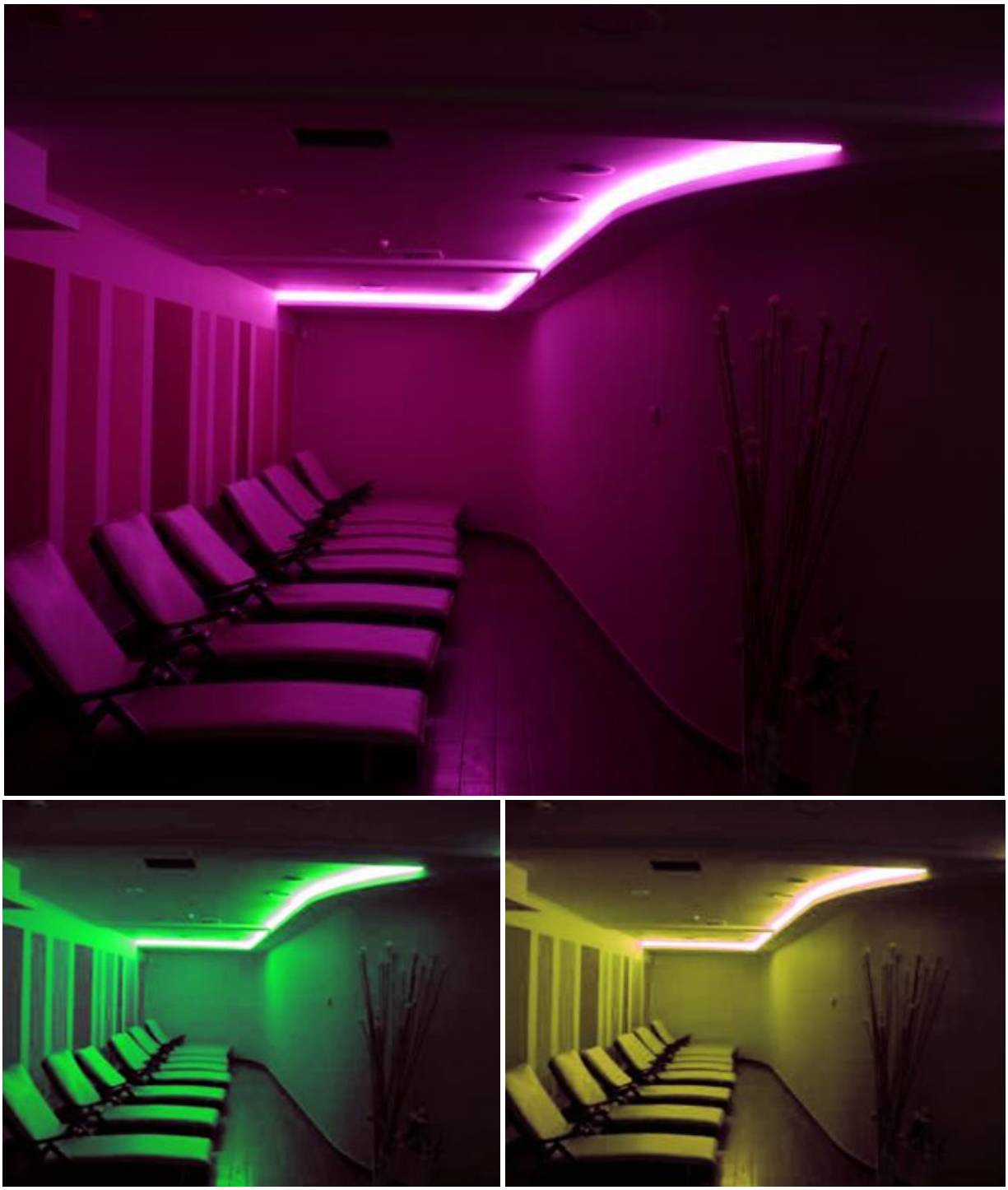
5 . RGBseQuenc

RGB LED sequencers will create a rainbow ambient in your room. .On sequencers it is possible to choose color shedding mode or to choose several different color tones of light. By using RGB LED lighting we can create any color tone we wish. Bellow you can see three different color tones of the same room.



Picture 9: Three different color tones in one room

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