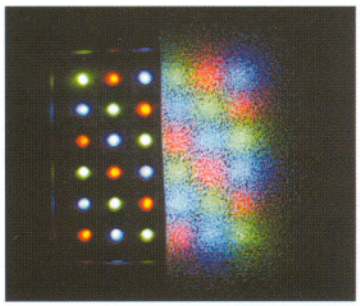
Colormixing and spectra

Spectral PLUS

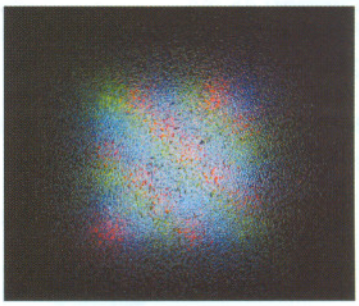
Spectral Plus Demonstration Set is designed for easy visualization of the basic light and color behavior. Using red, green and blue LEDs, filters of different colors and gratings it is possible to demonstrate additive and subtractive color mixing, light diffusion, absorbtion and diffraction. Using spectroscope students can analyze light emitted by different light sources, understand the difference between continuous and bright line spectrum and realize the ways in which white light can be produced. By using this set light, optics and some parts of atom physics can be explained in a more attractive way.

The set consists of:

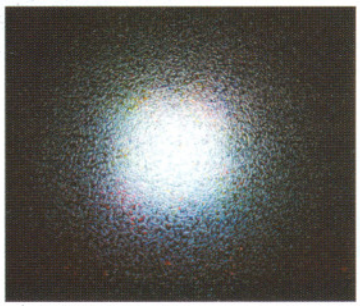
- ✓Display containing red, green and blue LEDs
- ✓Incandescent bulb
- ✓Fluorescent tube
- ✓White LED containing phosphor
- ✓RGB LED
- ✓Set of color filters
- ✓Holographic grid
- ✓Spectroscope
- ✓Slit

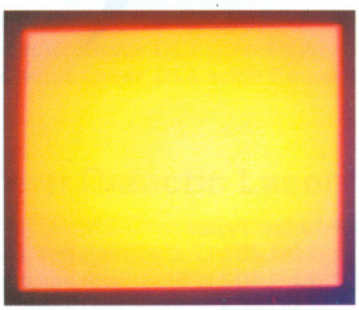


Light scattering on the diffusion filter - the light dots are scattered on the rough surface of the filter. By changing the distance of the filter they completely disappear. And what happens to the color?

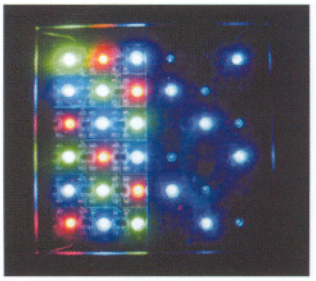


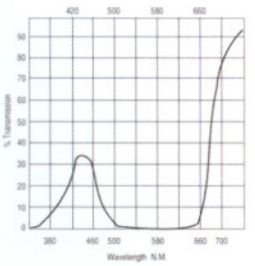
At the certain distance of the diffusion filter the red, green and blue colors mix together and produce the white light (**additive color mixing**). By changing the proportions of the three components we can mix many different hues.



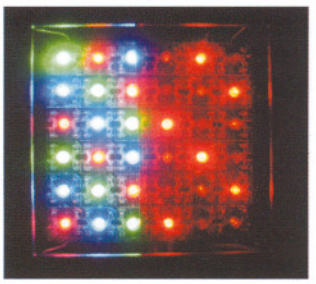


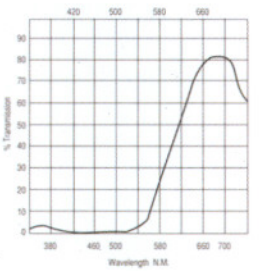
If you put the cyan, magenta and yellow filter on the white light, the black light is produced. Red, green and blue light is mixed again by the pairs of filters. This is **subtractive color mixing**. If you change the proportions of red, green and blue light, the picture on the left starts to change - try it yourself!



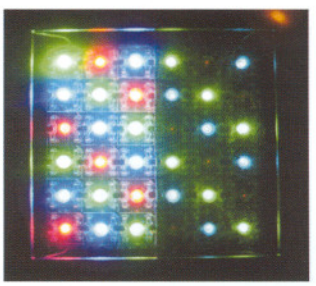


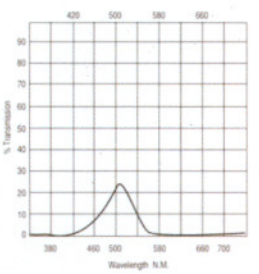
The blue filter transmits the light with the wavelengths corresponding to the blue light and absorbs most of the other wavelengths of the visible spectrum.



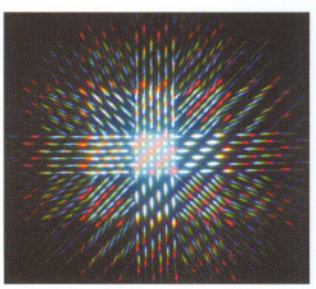


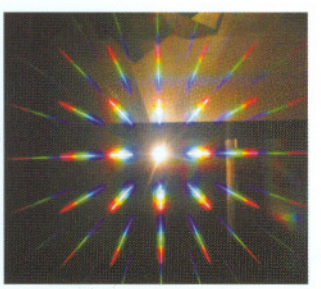
Longer wavelengths (λ> 600nm) refer to the red light. If the red, green and blue light hit the filter which absorbs the short wavelengths, only red light passes through.

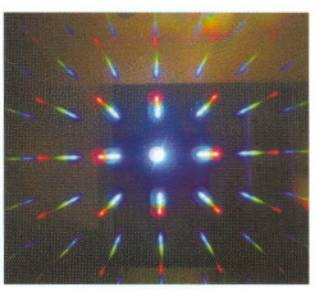


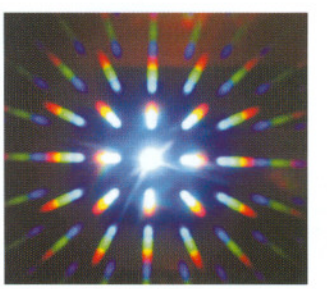


The absorption of light on the green filter and the transmission diagram for the green filter. In the picture above you can see that the blue filter transmits a small amount of the green light and this green filter transmits also some blue light. Why?

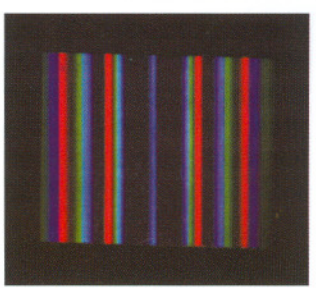


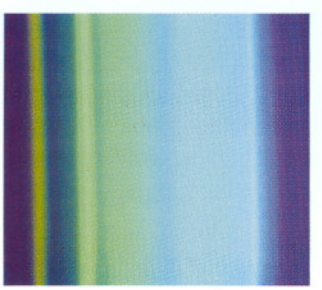






The diffraction image of the RGB display, incandescent bulb, RGB LED and white LED created by a cross diffraction grid. The difference between the spectral characters is visible - the incandescent bulb and white LED emit continuous spectrum, three colors are visible in the RGB display and RGB LED spectrum. Observing spectra through the grid can be attractive because of the interesting shapes.





Bright line spectra of the RGB display observed through the holographic grating (left) and bright line spectra of the fluorescent lamp viewed through diffraction grating spectroscope (right). The orange, green and blue lines in the fluorescent lamp spectrum reveal the mercury vapor content of the lamp.