ELENA LIGHT SPECTRA

Sources of light: a candle flame, incandescent light bulb, soft white fluorescent bulb, LED, TFT LCD computer monitor, laser pointer and sun.

First, I saw spectra using just an OSA Kit 500 lines/mm grating alone, second I used a “toilet paper tube spectrometer” (fig. 1) to block out the stray light from other sources in the room. Also, in the room was complete dark.

Fig. 1

Third, I used an improve spectroscope (digital camera + diffraction grating) and a cardboard box 40 cm x 40 cm in size to block out the light source except for a 1 mm x 5 cm slit. Putting a slit in front of the light source helps a lot.

Let’s see the photo’s of a candle flame spectrum, as seen looking through the 500 lines/mm grating (fig. 2):

Fig. 2

The brightest flame image is the undiffracted light (zero order) from the flame itself. I saw two orders of diffraction, the second very faint. I made another picture to show it because the field of view of my digital camera could only capture the central and first orders (fig. 3). The diffraction orders overlap.

Fig. 3

Next two photos show the same candle, this time with cardboard box blocking the flame except for a narrow slit. The individual colors in each order show much clearly (fig. 4 and fig. 5).

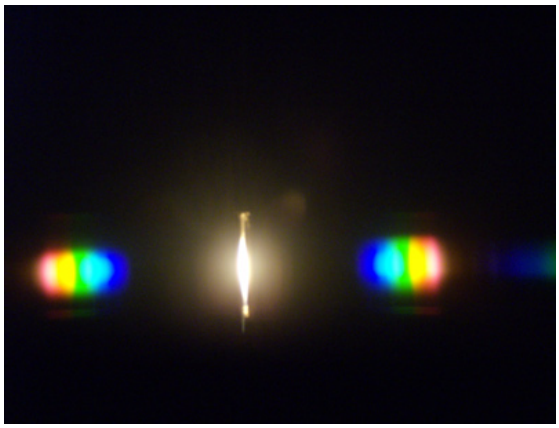

Fig. 4

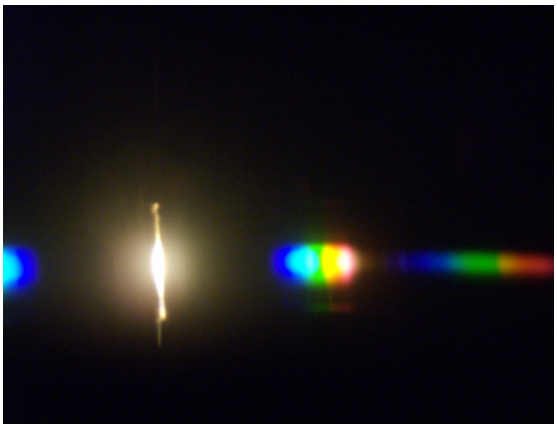

Fig. 5

I repeated the experiment with an incandescent clear bulb (Fig 6, 7), with a soft white fluorescent bulb (Fig 8, 9) and with my TFT LCD computer monitor (Fig. 10). For candle and bulbs, I obtained a rainbow continuous spectrum. For LCD monitor, I got next colors from the zero order to outside: violet-blue, sky-blue, green, faint red and bright-red.

Remark that, the spectral lines are colored images of the slit, which is an irregular slit.

(I spent a lot of time to make the slit and the toilet paper tube spectrometer's round hole!)

For LED I saw one order of diffraction each side of the central undiffracted light, but the overlapping was almost complete because I saw only irisations (Fig. 11).

For laser pointer was only one color: red. I shined the laser on a piece of white paper and I looked at the light reflected from the paper. Still, I couldn't make a good picture. I don't know why. (Maybe, if Donna wants to tell me some tricks…)

I saw the spectrum of sunlight ("Roy-G-Biv") in the same way.

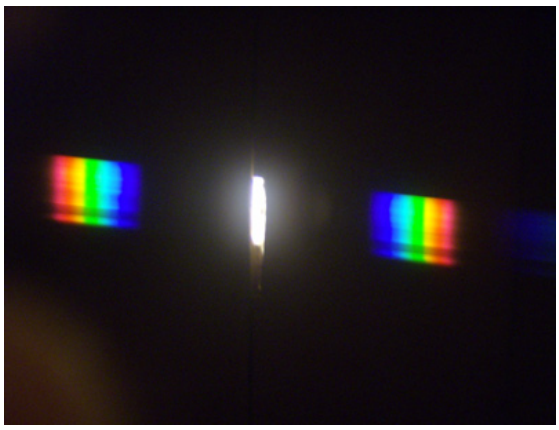

Fig. 6

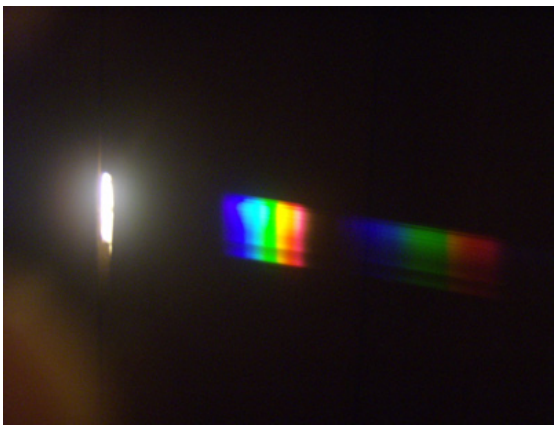

Fig. 7
incandescent clear bulb

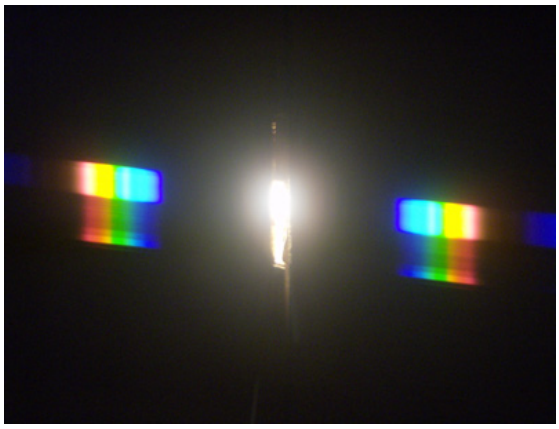

Fig. 8

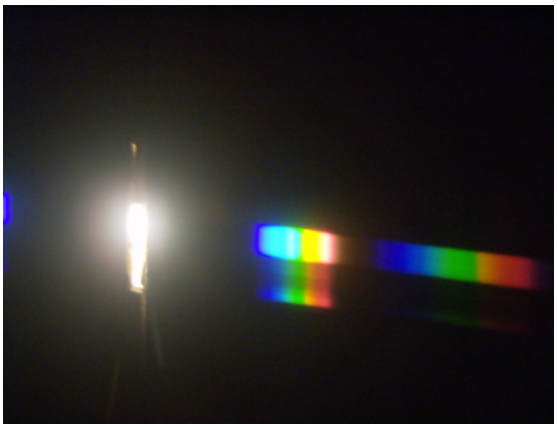

Fig. 9
soft white fluorescent bulb

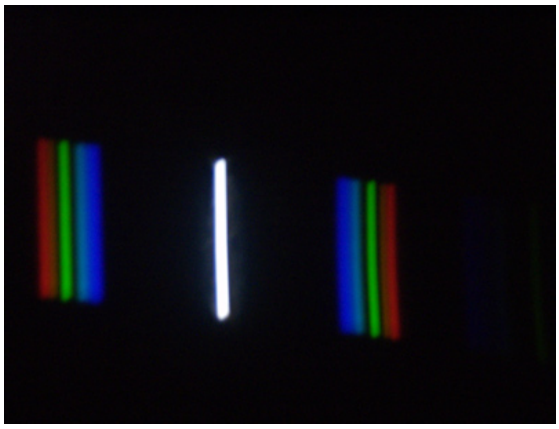

Fig. 10
TFT LCD computer monitor

Fig. 11
LED spectrum

To summarize, this is my data table:

Type of light source	Colors I saw in the spectrum
incandescent light bulb	1. Using a slit (fig. 6,7) and looking through a 500 line/mm grating, I saw 2 continuous spectra on either side of the central image: a bright spot in the center and a full rainbow with very bright violet, blue, green, faint yellow, faint orange and very bright red. Second order was faint. 2. Using a "toilet paper tube spectrometer" and a grating, I saw two continuous spectra on either side of the central image and same colors, but fainted.
soft white fluorescent light bulb	3. Using a slit (fig. 8,9) and looking through a 500 line/mm grating, I saw 2 continuous spectra on either side of the central image: a bright spot in the center and a full rainbow with very bright violet, faint blue, bright green and yellow, very faint orange and very bright red. In the second order, I saw orange and no yellow. 4. Using a "toilet paper tube spectrometer" and a grating, I saw two continuous spectra on either side of the central image and same colors, but fainted.
candle flame	5. Looking through a 500 line/mm grating without spectrometer, I saw 2 continuous spectra on either side of the central image: a bright image in the center and a full rainbow with very bright violet, faint blue, bright green, yellow, very faint orange and very bright red. (fig. 2) Second order was faint (fig. 3). 6. Using a "toilet paper tube spectrometer" I saw two continuous spectra on either side of the central image and same colors, but fainted. 7. Using a slit in front of the flame (fig. 4 and 5), the spectrum is brighter.
computer green LED	8. Looking through a 500 line/mm grating without spectrometer, I saw 2 continuous spectra on either side of the central image (the third very dimmed): a bright spot in the center and a full but narrow rainbow(like irizations) with the following colors: faint blue, faint green, very bright yellow-green, faint yellow and orange and bright red.(fig 11) 9. By using a "toilet paper tube spectrometer" I saw two spectra on either side of the central image and same colors, but fainted.
sun light	10. Looking to the sun image focalized on a piece of white paper through a 500 line/mm grating without spectrometer, I saw 2 continuous spectra on either side of the central image: a bright spot in the center and a full rainbow "Roy-G-Biv". 11. By using a "toilet paper tube spectrometer" I saw two continuous spectra on either side of the central image and same colors, but fainted.

LCD computer monitor	12. Using a slit (fig. 10) and looking through a 500 line/mm grating, I saw 2 continuous spectra on either side of the central image: a bright slit image in the center and violet-blue, sky-blue, green, faint red and bright-red.
laser	13. Only one order of diffraction in red.