ليزر عملي

الكورس الاول /التجربة الثالثه

المرحلة الثالثة

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Spectroscopy

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Purpose

Finding the wavelength of the laser beam

Devices used

Source (neon)

diffraction grating

Spectroscopy

Theory

The diffraction grating is used to study and analyze the neon spectrum to see that it consists of several lines (several wavelengths) only one of them has the largest profit in the laser device, where these lengths can be measured and the wavelength used in the work of the laser device is found by measuring the angle of each line and at the specified level.

The spectroscope consists of three main parts: the socket, which is a non-nucleated lens, whose function is to form a parallel beam of light, a window from the lens and the endoscope, and it is a regular astronomical telescope whose function is to receive the spectrum and see it through the eyepiece and the base scale, with which we can read angles using a vernier

We notice from the following figure the most important transitions between the energy levels of the neon atom, the first

table gives the type of transition and the wavelength of the red color associated with it, and the second table gives the five most important transitions in laser work because of the presence of a good profit value, and we notice that the largest profit occurs in the 632.8 nm wavelength, which is the wavelength For helium-neon lasers

611.8 *nm*	**10**
629.8 *nm*	**20**
632.8 *nm*	**100**
635.2 *nm*	**6**
640.1 *nm*	**34**

Transition	Wavelength(*nm*)
3s2→2p1	730.5
3s2→2p2	640.1
3s2→2p3	635.2
3s2→2p4	632.8
3s2→2p5	629.8
3s2→2p6	611.8
3s2→2p7	604.6
3s2→2p8	593.9

Accounts and discussion

1. Set up the spectrometer and turn on the red neon lamp so that the slit of the spectrometer appears clearly lit and matches the wire

2. The notch is fixed in the place designated for it and the telescope rotates until the first line of the spectrum is seen from the left and the angle is read, then the telescope rotates to the right through the direct main line until the first line of the spectrum from the right and the angle is read, then the second line from the left and right and so on.
3. The diffraction angle is calculated θ_n
4. Calculates the wavelength

$$\lambda = \frac{\sin \theta_n}{N}$$