A04-151E-Y01

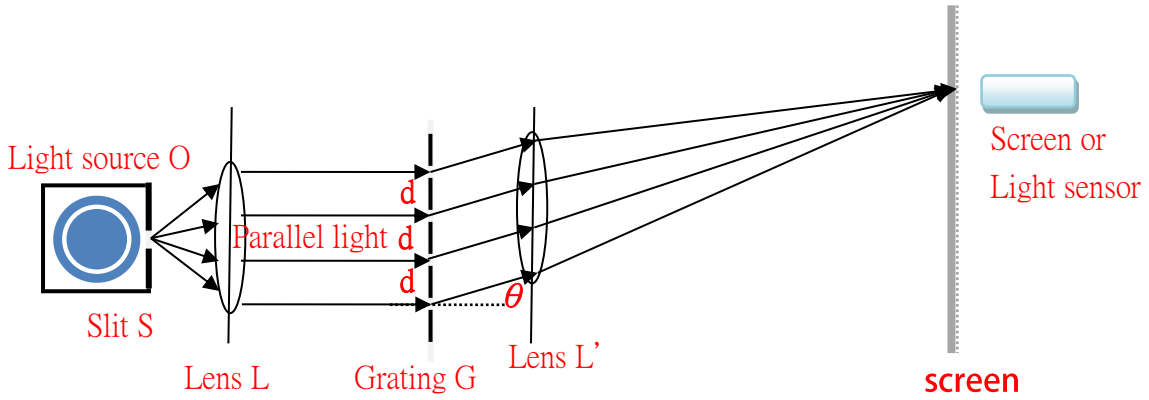
Grating Spectrometer

I. Experiment purpose

1. We use spectrometer to do diffraction grating for analyzing spectrum.
2. We know the theory of multiple slit diffraction of grating.
3. We use grating to the first rank diffraction with normal incidence and measure the first rank diffraction spectrum with mercury lamp.

II. Experiment theory

Image 2-1 is an optical path of diffraction grating. The light starts from O and goes through slit S. The slit is located on focal spot of lens L and projects parallel light. Then, the light enters diffraction grating (the distance of the grating is d) and diffuse diffraction. We use lens L' to gather the light on a screen and observe the diffraction of the strip. When doing this experiment, we can use Light Sensor for recoding and observing.



According to phasor addition, we can infer to the condition of the main bright rays(or main maximum) when diffraction is:

$$d\sin\theta = m\lambda \qquad (1)$$

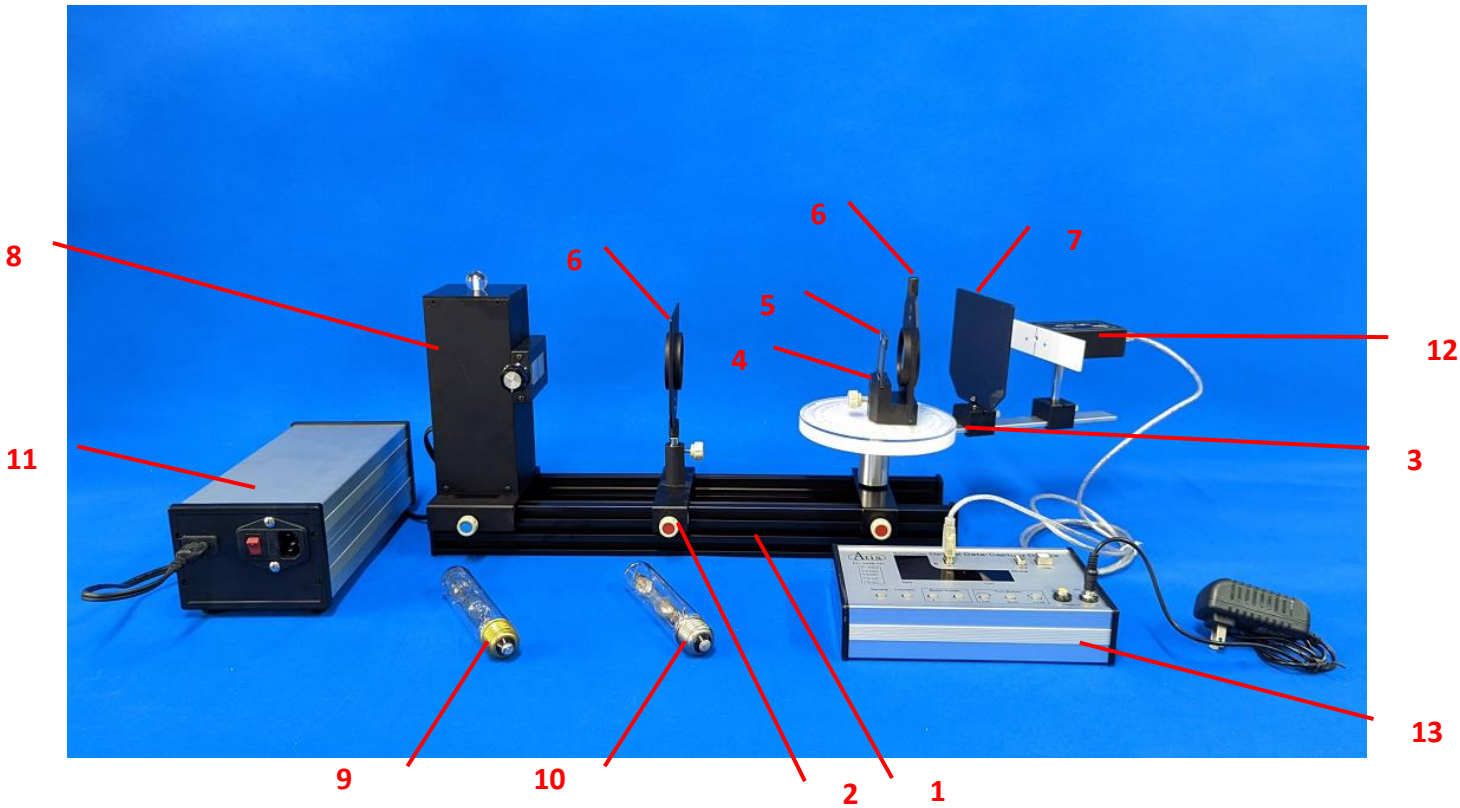
We call the upper formular is Grating Relation. d is the distance between the two slits. If the grating specification is 500 lines/mm, then $d = \frac{1}{500}cm$, θ is angle of diffraction.

From formula (1) we know when m=0, and then $\theta = 0^0$ that we call zero rank maximum. Thereby, it is not relative to λ. All of covered shades in this angle without dispersing that we can see white bright rays as light in incandescent lamp. When m=1, we call the first rank maximum. θ and

λ has no relative, so different shade with different wavelength will have different diffraction angle that we will see different bright rays of color. When m=2 that we call the second rank maximum, and m=3 that we call the third rank maximum and so no. According to (1) formula we know that when m is larger and then the angle θ will increase gradually from zero rank bright angle. We can see gradually the mix color in diffraction spectrum from rank by rank. According by formula (1) by the value of m and θ that we can calculate the wavelength of each single color in the spectrum.

III. Experiment accessory(For reference only， subject to the actual sample.)

No.	Name	Qty.	No.	Name	Qty.
1.	Optical slide base	1	**2.**	fixable connector slide equipment	1
3.	fixable angle disc with plug (with two slide equipment)	1	**4.**	kit for fixing grating piece with indicator.	1
5.	grating piece	1	**6.**	convex lens with holder (F100、F75mm)	2
7.	anti-glare black screen with holder	1	**8.**	adjustable slit lamp base	1
9.	mercury lamp	1	**10.**	sodium lamp	1
11.	Sodium mercury lamp power supply (with cable)	1	**12.**	illuminance sensor (with white screen, pillar×2)	optional
13.	illuminance capture device (with sensor cable, direct current power supply)	optional			



Attention

(1) Grating piece is delicate. Do not touch grating piece by hand. Grating piece cannot be cleaned with any materials.

(2) The slit width from light source cannot be wide too much. Otherwise, the spectrum will not be sharp enough and overlap easily that will observe hardly.

(3) When changing lamp, we turn off the power for about 5 minutes to avoid scald.

(4) When observing spectrum, we make the indicators point at one side.

Atis Scientific Instruments Co.,Ltd
Address：1F., No.18, Nanming St., South Dist.,
Tainan City 702, Taiwan (R.O.C.)
E-mail:atis@atissi.com.tw
Tel: (886) -6-2925201
Fax: (886)-6- 2611476
Mobile:+886-9-8006-1128
Website: www.atis.com.tw