

Measuring wavelength of light in mercury spectrum

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Measurements & Calculations

The grating and vernier tables were adjusted such that the zero points of $V1$ and $V2$ were 45° and 135° respectively.

The positions of the first order spectral lines of mercury were recorded to be the following.

Color	Right				Left				Mean (θ)
	V1		V2		V1		V2		
	MSR	CSR	MSR	CSR	MSR	CSR	MSR	CSR	
Violet	59	2	149	0	30.5	28	120.5	26	14.03
Indigo	60	4	150	2	29.5	28	119.5	26	15.05
Blue	62	4	152	2	27.5	29	117.5	28	17.08
Green	64	12	154	10	25.5	18	115.5	17	19.20
Yellow	65	14	155	12	24.5	04	114.5	03	20.33

Table 1: Angular positions of certain spectral lines of the mercury lamp.

Results

The wavelength of the green line at 541.9 nm was used to estimate the line density N (or equivalently, the grating constant d). The grating equation

$$d \sin \theta = m \lambda$$

for first order ($m = 1$) provides a grating constant of

$$d = 1.66 \times 10^{-6} m$$

which is consistent with $N = 600 \text{ lines mm}^{-1}$

Adopting that value of N we found the following wavelength estimates

Color	Wavelength (\AA)
Violet	4041.4
Indigo	4327.7
Blue	4883.3
Green	5479.9
Yellow	5790.2

Table 2: Wavelength estimates of the mercury spectral lines from first-order diffraction.

We notice how the green line measured to be 547.99 nm is off the true value of 546.1 nm by only 0.34%