(JOUMI):Jurnal Multidisiplin Indonesia
Vol.1, No.4 Desember 2023
e-ISSN: 2986-7541; p-ISSN: 2986-7533, Hal 176-191

LASER POINTER LIGHT AS AN ALTERNATIVE MONOCHROMATIC LIGHT SOURCE IN DIFFRACTION GRATING

Afiyah Salsabila
UIN Syarif Hidayatullah Jakarta
afiyah.salsabila21@mhs.uinjkt.ac.id

Nurul Esa Rahmah
UIN Syarif Hidayatullah Jakarta
nurulesa.rahmah21@mhs.uinjkt.ac.id

Eisha Jansyah Yusuf
UIN Syarif Hidayatullah Jakarta
eisha.jansyah21@mhs.uinjkt.ac.id

Resi Febriyanti
UIN Syarif Hidayatullah Jakarta
resi.febrianti20@mhs.uinjkt.ac.id

Ahmad Suryadi
UIN Syarif Hidayatullah Jakarta
ahmads@uinjkt.ac.id

Fuji Hernawati Kusumah
UIN Syarif Hidayatullah Jakarta
fujikusumah@uinjkt.ac.id

Korespondensi penulis: nurulesa.rahmah21@mhs.uinjkt.ac.id

Abstract*. Previous research only used one type of color, namely red. Then, researchers developed it by using three types of colors. In this research, we want to analyze the wavelengths produced by laser pointers of different colors, identify the distance between the grid and the screen, identify the distance between the central bright spot, and analyze the relationship between the lattice constant and the distance from the center of the light to the next light. The research method used was direct observation in the optics laboratory. The laser pointer was used as a monochromatic light source to produce a diffraction grating. Laser light sources have many colors, but we only use three colors, namely red, green and violet (purple). This experiment uses three different grating constants (d), namely a 100 slit/mm grating, a 300 slit/mm grating and a 600 slit/mm grating as well as the distance between the grating and the screen (l) (which are also different, namely 15 cm, 20 cm and 30 cm respectively). each grating constant. Based on the data that has been obtained, for red, violet and green laser light, for grating constants of 100 slits/mm, 300 slits/mm and 600 slits/mm produce the same*

Received November 30, 2023; Revised Desember 19, 2023; Published Desember 26, 2023
*Nurul Esa Rahmah, *nurulesa.rahmah21@mhs.uinjkt.ac.id*

wavelength and approaching the wavelength indicated on the laser, as well as the wavelength range of visible light.

***Keywords**: Diffraction grating, laser pointer, wavelength*

Abstract. *Penelitian sebelumnya hanya menggunakan satu jenis warna, yaitu merah. Kemudian, peneliti mengembangkannya dengan menggunakan tiga jenis warna. Dalam penelitian ini, kami ingin menganalisis panjang gelombang yang dihasilkan oleh laser pointer berbagai warna, mengidentifikasi jarak antara kisi dan layar, mengidentifikasi jarak antara titik terang pusat, dan menganalisis hubungan antara konstanta kisi dan jarak dari pusat cahaya ke cahaya berikutnya. Metode penelitian yang digunakan adalah observasi langsung di laboratorium optik. Laser pointer digunakan sebagai sumber cahaya monokromatik untuk menghasilkan kisi difraksi. Sumber cahaya laser memiliki banyak warna, tetapi kami hanya menggunakan tiga warna, yaitu merah, hijau, dan ungu (ungu). Percobaan ini menggunakan tiga konstanta kisi (d) yang berbeda, yaitu kisi dengan 100 celah/mm, 300 celah/mm, dan 600 celah/mm serta jarak antara kisi dan layar (l) (yang juga berbeda, yaitu 15 cm, 20 cm, dan 30 cm masing-masing). Setiap konstanta kisi. Berdasarkan data yang telah diperoleh, untuk cahaya laser merah, ungu, dan hijau, untuk konstanta kisi 100 celah/mm, 300 celah/mm, dan 600 celah/mm menghasilkan panjang gelombang yang sama dan mendekati panjang gelombang yang terindikasi pada laser, serta rentang panjang gelombang cahaya tampak.*

***Kata Kunci :** Kisi difraksi, laser pointer, panjang gelombang*

BACKGROUND

A diffraction grating is a narrow slit and has the same distance in each slit. Diffraction is the process of bending the direction of light waves by passing through a narrow gap. Meanwhile, a lattice is a large number of parallel gaps that have the same distance. In this research, there are three types of variables used, namely independent variables, control variables (fixed) and dependent variables. The independent variable is the lattice constant distance, the control variable is the lattice constant, while the dependent variable is the wavelength of monochromatic light.

Diffraction grating practicum is a practicum that produces a grating whose main material uses a monochromatic light laser. Diffraction grating practice usually uses a special monochromatic laser found in the laboratory, which must be connected to a power supply as a voltage source so that the laser can turn on. In this research, the laser is replaced with a laser pointer that does not require a power supply to switch it on.

This laser pointer is used as a monochromatic light source to produce a diffraction grating. This laser can be used without an electric voltage to be able to switch it on, just press the button. So at the time of this study, researchers did not need a power supply connection. The laser light source has many colors, including purple, blue, green, yellow, orange and red. However, we only use red, green and violet colors. Based on previous research that we use as a reference, it only uses one type of laser pointer color, namely red. In the laser used, there is no information on the wavelength based on the color, and the type of laser used is different (Kholifudin, 2017, pp. 132-134). Then, the researcher developed it by using three types of colors, namely red, green and violet (purple) where each laser has a wavelength information based on its color. Therefore, we conducted this research to prove and compare whether the wavelength of the resulting grating is the same in each color or different.

An example of an electromagnetic wave is light. The propagation of light waves does not require the use of a medium. Light sources are various objects that can be found around us. Natural and artificial light sources are two types of light sources. Light sources that come from nature always produce light naturally. An example of a natural light source is sunlight, which comes from a massive star at the center of the solar system. Meanwhile, artificial light sources are light sources formed from human hands, for example lasers, flashlights, LEDs and so on (Putra, 2022, p. 1).

According to (Dimyati, 2022, p. 36), a diffraction element known as a diffraction grating uses the concept that the light path length or phase difference between two adjacent gratings determines how light entering the grating is scattered. According to (Aini & Riswandi, 2020, pp. 99 - 100), there are two types of diffraction: single-slit diffraction and double-slit diffraction (also known as grating). (Tanjung & dkk., 2020, p. 71) further subdivide single-slit diffraction into maximum diffraction (bright pattern) and minimum diffraction (dark pattern).

Single slit diffraction (Tanjung & dkk., 2020, p. 71):

- Maximum diffraction formula (bright pattern)

$$d \sin\theta = d\frac{p}{l} = \left(m - \frac{1}{2}\lambda\right) \quad (1)$$

- Minimum diffraction formula (dark pattern)

$$d \sin\theta = d\frac{p}{l} = m\lambda \quad (2)$$

With description:

d = gap width (m)

θ = deviation angle (°)

λ = light wavelength (m)

l = gap to screen distance (m)

p = distance of light or dark line to central light (m)

m = order numbers (m = 1, 2, 3, …)

Meanwhile, multi-slit diffraction (lattice) is also divided into two parts, namely maximum diffraction (light pattern) and minimum diffraction (dark pattern (Tanjung & dkk., 2020, pp. 71-72). Multi-slit (lattice) diffraction:

- Maximum diffraction formula (bright pattern)

$$d \sin\theta = d\frac{p}{l} = m\lambda, m = 0, 1, 2, ... \quad (3)$$

- Minimum diffraction formula (dark pattern)

$$d \sin\theta = d\frac{p}{l} = \left(m - \frac{1}{2}\right)\lambda, m = 1, 2, 3, ... \quad (4)$$

With description:

d = lattice constant = 1N

N = number of gaps per unit length

θ = deviation angle (°)

λ = light wavelength (m)

l = gap to screen distance (m)

p = distance of light or dark line to central light (m)

m = order numbers (m = 1, 2, 3, …)

Light grilles are made from pieces of metal or glass that have been diamond engraved in a large number of parallel strokes to ensure extreme precision where efficiency matters most (Yusrizal & Rahmati, 2022, p. 286). Many equally spaced parallel slits form a lattice. There may be thousands of lines, or scratches, per centimeter in the box. The lattice constant (d) is the distance between gaps that can be determined from data on the number of lines per centimeter (unit of length). The probability that there are N lines per unit length, a steady cross section d can be arranged (Abidin, Z., & et al, 2019, p. 52):

$$d = \frac{1}{N} \quad (5)$$

Light must have monochromatic properties in order to be quantified, which means it must have a certain wavelength. By passing polychromatic light, or light with many wavelengths, through a monochromator, this is possible. The dispersing element, inlet slit, and exit slit form the monochromator. According to Gandjar & Rahman (2018), the function of the dispersing element is to disperse radiation depending on the wavelength that hits it (Gandjar & Rohman, 2018, p. 52).

In modern spectrophotometers, a diffraction grating is a hole monochromator that allows light from a source to fall onto a dispersing element. The dispersed beam then enters the exit gap of the monochromator. The purpose of this exit gap is to limit the amount of light that can enter the sample and detector. According to (Gandjar & Rohman, 2018, p. 53), the trick is to rotate the dispersing element so that light of various wavelengths can be dispersed and fall sequentially into the exit gap.

The light that is usually seen is called visible light. Visible light is electromagnetic energy with a frequency spectrum that has a wavelength of 38° nm - 78° nm. The light frequency spectrum can be seen in the image below.

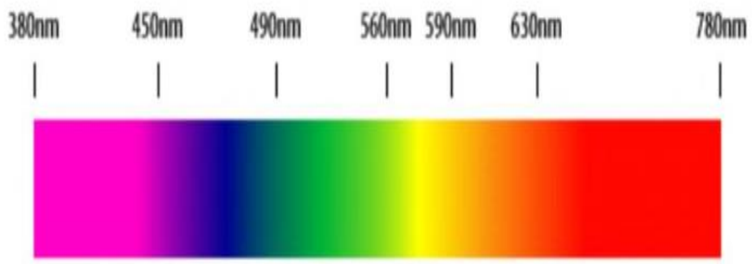


Figure 1. Frequency spectrum of visible light

The region of the electromagnetic spectrum that passes through the Earth's atmosphere experiences almost no or very little reduction in intensity (although blue light is emitted more than red light, this is one of the reasons why the sky is blue). Although the visible light spectrum is a continuous spectrum so there is no clear boundary between one color and another (Faridah, 2018, p. 5).

Table 1. Wavelength (λ) in the visible light spectrum

No.	Color	λ
1.	Purple	380 nm – 450 nm
2.	Blue	450 nm – 495 nm

3.	Green	495 nm – 570 nm
4.	Yellow	570 nm – 590 nm
5.	Orange	590 nm – 620 nm
6.	Red	620 nm – 750 nm

Based on this, this research was conducted to analyze the difference in the wavelength of monochromatic light in each laser pointer of different colors when directed at the grating, identify the distance of the grating to the screen, identify the distance of the central bright spot and analyze the relationship between the grating constant and the distance of the interference pattern of the central bright spot to the next bright spot.

RESEARCH METHODS

This research is one of the research based on Physics lessons in the laboratory on Diffraction Grating material. This research with the title "Laser Pointer Beam as an Alternative Source of Monochromatic Light in Diffraction Gratings" was carried out directly at the Optical Laboratory, Syarif Hidayatullah State Islamic University, Jakarta. This research was carried out by collecting data twice, this is because in the first data collection the results were still far from being in accordance with the actual theory. Apart from that, it was also because we had difficulty in making a laser pointer whose shape was different from the laser in the lab so that it could stay still and move straight. So we carried out data collection a second time to get appropriate results. The first data collection was carried out on Monday, 05 December 2022 at 07.30 – 09.10 WIB. Meanwhile, the second data collection was carried out on Tuesday, December 13 2022 at 09.30 – 11.00 WIB.

The tools and materials used in this research were laser pointers with 3 different types of colors, grating slide holders, diffraction gratings, white or styrofoam screens, rulers, precision rails, precision rail feet, grating slide holder stands and black duct tape. The laser pointer source used consists of 3 kinds of colors, namely red, green and violet (purple). There are three different types of grating sizes used, namely N = 100 gaps/mm, N = 300 gaps/mm and N = 600 gaps/mm, with N being the number of gaps per unit length. This research was carried out by preparing all the tools and materials used, making a research series consisting of a laser pointer and a slit using a precision rail, measuring the distance between the bright patterns recorded on a white screen, and recording all the results obtained. The laser pointer which is placed on the precision rail is covered with black tape to prevent the laser pointer from falling or shifting.

At a lattice constant of 100 gaps/mm, 300 gaps/mm and 600 gaps/mm, the lattice constant (d) will be obtained using the formula $d = \frac{1}{N}$. The distance from the grid to the screen (l) is obtained by calculating the size of the scale on the precision rail. For each lattice constant, it is made different in its repetition. The grid constants are 100 gaps/mm, 300 gaps/mm and 600 gaps/mm using the distance between the grid and the screen (l) is 15 cm, 20 cm and 30 cm. The distance to the central bright point (p) is obtained by measuring the distance between light-dark interference patterns. The wavelength of light is obtained by the formula:

$$\lambda = \frac{dp}{ml} \quad (6)$$

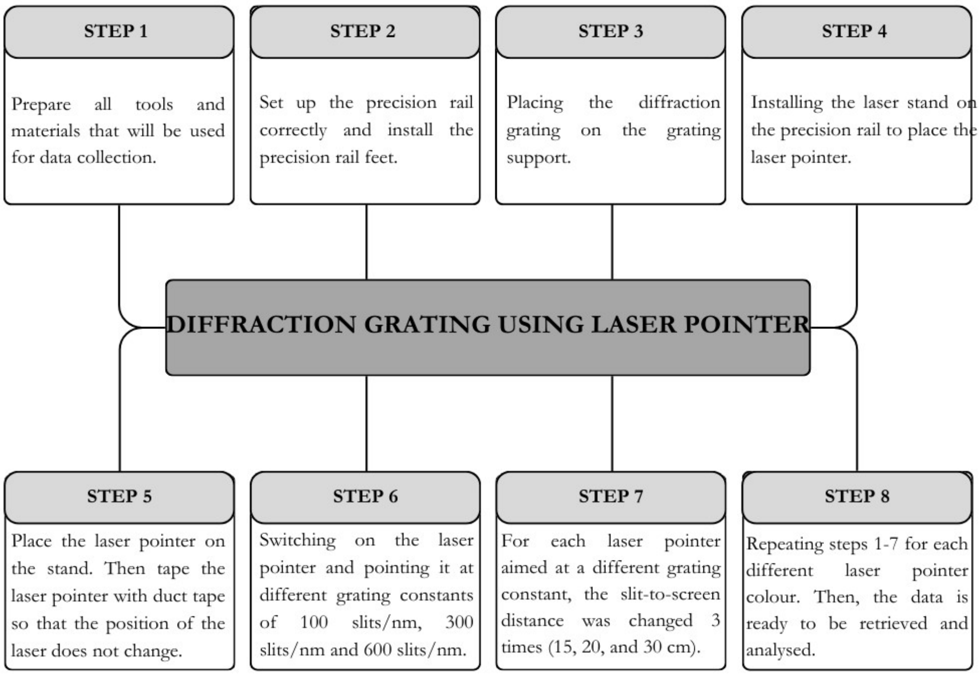


Figure 2. Flowchart of the diffraction grating data capture process.

RESULTS AND DISCUSSION

Diffraction grating experiment with a red laser pointer (wavelength: 650 nm)

In the first experiment, a red laser pointer with a wavelength of 650 nm was used. Red light has a wavelength range of 620 - 750 nm. At a grating constant of 100 mm/slit, if the distance from the grating to the screen is 0.15 m, 0.20 m and 0.30 m, the resulting wavelength value (λ) is 667 nm - 750 nm. At a lattice constant of 300 nm/slit, if the distance of the lattice to the screen is 0.15 m, 0.20 m and 0.30 m, the resulting wavelength value (λ) is 600 - 630 nm. While at a grating constant of 600 nm/slit, if the distance of the grating to the screen is 0.15 m, 0.20 m and 0.30 m, the resulting wavelength value (λ) is 667 - 693 nm. Based on the data obtained, grating constants of 100 slits/mm, 300 slits/mm and 600 slits/mm produce wavelengths that match or approach the visible light spectrum.

Table 2. Red laser pointer diffraction grating practical data

No.	**Lattice Constant (gap/mm)**	d **(meters)**	l **(meters)**	**p (meters)**	**λ (meters)**
1.	100 (gap/mm)	$1 \times 10^{-5}\ m$	0,15 m ± 0,0005	0,01 m ± 0,0005	$6{,}67 \times 10^{-7}\ m = 667\ nm$
		$1 \times 10^{-5}\ m$	0,20 m ± 0,0005	0,015 m ± 0,0005	$7{,}5 \times 10^{-7}\ m = 750\ nm$
		$1 \times 10^{-5}\ m$	0,30 m ± 0,0005	0,02 m ± 0,0005	$6{,}67 \times 10^{-7}\ m = 667\ nm$
2.	300 (gap/mm)	$3{,}3 \times 10^{-6}\ m$	0,15 m ± 0,0005	0,03 m ± 0,0005	$6 \times 10^{-7}\ m = 600\ nm$
		$3{,}3 \times 10^{-6}\ m$	0,20 m ± 0,0005	0,042 m ± 0,0005	$6{,}3 \times 10^{-7}\ m = 630\ nm$
		$3{,}3 \times 10^{-6}\ m$	0,30 m ±0,0005	0,06 m ± 0,0005	$6 \times 10^{-7}\ m = 600\ nm$
3.	600 (gap/mm)	$1{,}6 \times 10^{-6}\ m$	0,15 m ± 0,0005	0,065 m ± 0,0005	$6{,}93 \times 10^{-7}\ m = 693\ nm$

	$1,6 \times 10^{-6}\, m$	0,20 m ± 0,0005	0,085 m ± 0,0005	$6,8 \times 10^{-7}\, m = 680\, nm$
	$1,6 \times 10^{-6}\, m$	0,30 m ± 0,0005	0,0125 m ± 0,0005	$66,7 \times 10^{-7}\, m = 667\, nm$

Table 3. Figure of red laser pointer light interference pattern

No.	Lattice Constant (gap/mm)	Picture
1.	100 gaps/mm	
2.	300 gaps/mm	
3.	600 gaps/mm	

Diffraction grating experiment with a violet laser pointer (wavelength: 405 nm)

In the second experiment, a violet laser pointer was used with a wavelength of 405 nm. Violet light has a wavelength range of 380 - 450 nm. At a grating constant of 100 mm/slit, if the distance from the grating to the screen is 0.15 m, 0.20 m and 0.30 m, the resulting wavelength value (λ) is 500 - 650 nm. At a grating constant of 300 nm/slit, if the distance of the grating to the screen is 0.15 m, 0.20 m and 0.30 m, the resulting wavelength value (λ) is 375 - 400 nm. Whereas at a constant grating of 600 nm/slit, if the distance of the grating to the screen is 0.15 m, 0.20 m and 0.30 m, the resulting wavelength value (λ) is 400 - 426 nm. Based on the data obtained, grating constants of 100 slits/mm, 300 slits/mm and 600 slits/mm produce wavelengths that are close to the visible light spectrum.

Table 4. Practical data for violet (purple) laser pointer diffraction gratings

No.	**Lattice Constant (gap/mm)**	d **(meters)**	l **(meters)**	**p (meters)**	**λ (meters)**
1.	100 (gap/mm)	$1 \times 10^{-5}\, m$	0,15 m ± 0,0005	0,008 m ± 0,0005	$5{,}33 \times 10^{-7}\, m = 533\, nm$
		$1 \times 10^{-5}\, m$	0,20 m ± 0,0005	0,013 m ± 0,0005	$6{,}5 \times 10^{-7}\, m = 650\, nm$
		$1 \times 10^{-5}\, m$	0,30 m ± 0,0005	0,015 m ± 0,0005	$5 \times 10^{-7}\, m = 500\, nm$
2.	300 (gap/mm)	$3{,}3 \times 10^{-6}\, m$	0,15 m ± 0,0005	0,02 m ± 0,0005	$4 \times 10^{-7}\, m = 400\, nm$
		$3{,}3 \times 10^{-6}\, m$	0,20 m ± 0,0005	0,025 m ± 0,0005	$3{,}75 \times 10^{-7}\, m = 375\, nm$
		$3{,}3 \times 10^{-6}\, m$	0,30 m ± 0,0005	0,038 m ± 0,0005	$3{,}8 \times 10^{-7}\, m = 380\, nm$
3.	600 (gap/mm)	$1{,}6 \times 10^{-6}\, m$	0,15 m ± 0,0005	0,04 m ± 0,0005	$4{,}26 \times 10^{-7}\, m = 426\, nm$
		$1{,}6 \times 10^{-6}\, m$	0,20 m ± 0,0005	0,052 m ± 0,0005	$4{,}16 \times 10^{-7}\, m = 416\, nm$
		$1{,}6 \times 10^{-6}\, m$	0,30 m ± 0,0005	0,075 m ± 0,0005	$4 \times 10^{-7}\, m = 400\, nm$

Table 5. Figure of violet (purple) laser pointer light interference pattern

No.	Lattice Constant (gap/mm)	Picture
1.	100 gaps/mm	
2.	300 gaps/mm	
3.	600 gaps/mm	

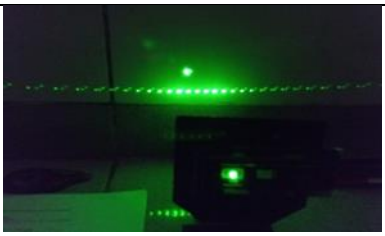
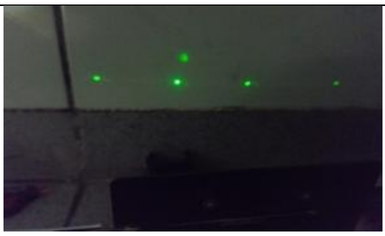
Diffraction grating experiment with a green laser pointer (wavelength: 532 nm)

In the third experiment, a green laser pointer was used with a wavelength of 532 nm. Green light has a wavelength range of 495 - 570 nm. At a grating constant of 100 mm/slit, if the distance from the grating to the screen is 0.15 m, 0.20 m and 0.30 m, the resulting wavelength value (λ) is 600 - 750 nm. At a grating constant of 300 nm/slit, if the distance of the grating to the screen is 0.15 m, 0.20 m and 0.30 m, the resulting wavelength value (λ) is 480 - 560 nm. While at a grating constant of 600 nm/slit, if the distance of the grating to the screen is 0.15 m, 0.20 m and 0.30 m, the resulting wavelength value (λ) is 507 - 533 nm. Based on the data obtained, grating constants of 100 slits/mm, 300 slits/mm and 600 slits/mm produce wavelengths that are close to the visible light spectrum.

Table 6. Green laser pointer diffraction grating practical data

No.	**Lattice Constant (gap/mm)**	d **(meters)**	l **(meters)**	**p (meters)**	**λ (meters)**
1.	100 (gap/mm)	$1 \times 10^{-5}\ m$	0,15 m ± 0,0005	0,01 m ± 0,0005	$6{,}67 \times 10^{-7}\ m = 667\ nm$
		$1 \times 10^{-5}\ m$	0,20 m ± 0,0005	0,015 m ± 0,0005	$7{,}5 \times 10^{-7}\ m = 750\ nm$
		$1 \times 10^{-5}\ m$	0,30 m ± 0,0005	0,018 m ± 0,0005	$6 \times 10^{-7}\ m = 600\ nm$
2.	300 (gap/mm)	$3{,}3 \times 10^{-6}\ m$	0,15 m ± 0,0005	0,028 m ± 0,0005	$5{,}6 \times 10^{-7}\ m = 560\ nm$
		$3{,}3 \times 10^{-6}\ m$	0,20 m ± 0,0005	0,035 m ± 0,0005	$5{,}25 \times 10^{-7}\ m = 525\ nm$
		$3{,}3 \times 10^{-6}\ m$	0,30 m ± 0,0005	0,048 m ± 0,0005	$4{,}8 \times 10^{-7}\ m = 480\ nm$
3.	600 (gap/mm)	$1{,}6 \times 10^{-6}\ m$	0,15 m ± 0,0005	0,05 m ± 0,0005	$5{,}33 \times 10^{-7}\ m = 533\ nm$
		$1{,}6 \times 10^{-6}\ m$	0,20 m ± 0,0005	0,065 m ± 0,0005	$5{,}2 \times 10^{-7}\ m = 520\ nm$
		$1{,}6 \times 10^{-6}\ m$	0,30 m ± 0,0005	0,095 m ± 0,0005	$5{,}07 \times 10^{-7}\ m = 507\ nm$

Table 7. Figure of green laser pointer interference pattern

No.	Lattice Constant (gap/mm)	Picture
1.	100 gaps/mm	
2.	300 gaps/mm	
3.	600 gaps/mm	

The monochromatic light source of the laser pointer beam which is red, violet and green is obtained from the results of the maximum interference pattern visible on a white screen in the form of monochromatic light in red, violet and green as in the images in **Table 3**, **Table 5** and **Table 7**. The interference pattern formed On the screen you can clearly see the difference in the distance between the central bright spot (p) and the lattice constant which is also different, namely 100 slits/mm, 300 slits/mm and 600 slits/mm. The greater the lattice constant, the greater the distance from the central bright spot (p). The images shown in **Table 3**, **Table 5** and **Table 7** illustrate that the diffraction angles (θ) red, violet and green laser light are getting bigger. If the laser pointer beam is shifted away from or close to the grating gap, the interference pattern produced on the white screen is constant, because the position of the laser pointer beam relative to the grating gap has no effect on the distance of the central bright spot (p). What influences the distance of the central bright spot (p) is the distance from the grid to the screen (l). The farther the distance from the grid to the screen (l), the greater the interference pattern or distance from the central bright spot (P).

Based on the data obtained in **Table 2**, **Table 4** and **Table 6**, if the distance between the grid and the screen (l) is further, the distance from the central bright spot (P) will be greater and the wavelength (λ) will be the same or almost close. According to the grating constants in **Table 2**, **Table 4** and **Table 6**, the greater the distance from the central bright spot on the screen (p), the greater the diffraction angle (θ) and the wavelength (λ) of the laser pointer beam produced is the same or almost close. This shows that research on diffraction gratings using laser pointer rays of different colors can determine the wavelength of visible light, for example red, violet and green laser pointer rays.

The relationship between the lattice constant, the center bright spot distance and the lattice to screen distance affect each other. The greater the grating constant and the grating-to-screen distance, the greater the center bright spot distance. For example, as can be seen in the table, if the grating constant is 100 slits/mm and the grating-to-screen distance is 0.15 m, 0.20 m and 0.30 m, the central bright spot distance will increase in magnitude.

In the previous study, we only used a red laser pointer and the grating distance to the screen was 0.20 - 0.60 m with a multiple of 10. In this study, we used three colors of laser pointer, the grating distance to the screen was 0.15 m, 0.20 m, and 0.30 m, and the grating constant was kept fixed (100 slits/mm, 300 slits/mm and 600 slits/mm). Therefore, the results we obtained are more varied and visible differences in each color compared to previous studies.

CONCLUSIONS

The red light spectrum has a wavelength range of 620 - 750 nm, while the laser pointer used has a wavelength value of 650 nm. The violet light spectrum has a wavelength range of 380 - 450 nm, while the laser pointer used has a wavelength value of 405 nm. The green light spectrum has a wavelength range of 495 - 570 nm, while the laser pointer used has a wavelength value of 532 nm. Based on the data obtained, the grating constants of 100 slits/mm, 300 slits/mm and 600 slits/mm produce wavelengths that match or approach the visible light spectrum.

The number of gratings greatly affects the distance of the central bright line to a particular bright, where the more the grating, the greater the distance. This means that the number of gratings greatly affects the distance of the central bright line to a particular light. Conversely, the smaller the width of the slit or grating, the greater the distance from the central bright line to a particular bright line. The relationship between the grating constant and the distance of the interference pattern of the bright center to the next bright is directly proportional, the greater the grating constant, the more lines separated by the grating. This will cause the interference pattern to be larger.

Based on the results of the study, there is a mutually influencing relationship between the lattice constant, the distance of the central bright spot and the distance of the lattice to the screen. The greater the distance of the central bright spot, the greater the grating constant and the distance of the grating to the screen. Referring to previous research that only used a single color laser pointer, namely red. So we used three different colored laser pointers, red, violet and green. The results we obtained may have many discrepancies and inaccuracies. Therefore, we suggest that future researchers research more deeply so as to produce certain updates related to diffraction gratings.

ACKNOWLEDGEMENT OF THANKS

We would like to thank the lecturer of the Optics and Wave Practicum course, Mr. Ahmad Suryadi, M.Pd., the lecturer of the English course, Mrs. Fuji Hernawati Kusumah, M.Si., and the supervising laboratory assistant, Ms. Resi Febriyanti, who has directed and guided us well so that we can complete this mini research on time.

LIST OF REFERENCES

Abidin, Z., & et al. (2019). *10 Karya Pembelajaran Sains.* Yogyakarta: Deepublish, hlm. 52.

Aini, Y., & Riswandi. (2020). *Taklukan Fisika Dasar 2.* Yogyakarta: DIVA PRESS, hlm. 99-100.

Ariani, T., & Saparini. (2015). Penentuan Pola-pola Interferensi Menggunakan Kisi Difraksi dengan Medium Udara, Air, dan Asam Cuka. *Jurnal Perspektif Pendidikan*, 81-85.

Dimyati, M. (2022). *Memahami Penginderaan Jauh Mandiri.* Depok: Universitas Indonesia Publishing, hlm. 36.

Faridah, N. (2018). *Mengenal Lebih Dekat dengan Cahaya dan Warna.* Yogyakarta: Penerbit LeutikaPrio, hlm. 5.

Gandjar, I. G., & Rohman, A. (2018). *Spektroskopi Molekuler Untuk Analisis Farmasi.* Yogyakarta: UGM Press, hlm. 52-53.

Kholifudin, M. Y. (2017). Sinar Laser Mainan Sebagai Alternatif Sumber Cahaya Monokromatik Praktikum Kisi Difraksi Cahaya. *Jurnal Penelitian Pembelajaran Fisika*, 132 - 134.

Putra, R. M. (2022). *Cahaya dan Penerapan Sifat-sifat Cahaya.* Surabaya: CV Media Edukasi Creative, hlm. 1.

Tanjung, Y. I., & dkk. (2020). *Kajian Pengetahuan Konseptual (Teori & Soal).* Bandung: Media Sains Indonesia, hlm. 71-72.

Yusrizal, & Rahmati. (2022). *Fisikawan & Ilmu Fisika.* Aceh: Syiah Kuala University Press, hlm. 286.