Peer reveiw

Chuang, Min H. 2025. “An Optical Model and Experimental Analysis of a Reflective Diffraction Grating.” *Journal of High School Science* 9 (1): 133–57.

you mention that “….By pointing a laser of a specific wavelength onto the CD and analyzing the absolute coordinates of the laser spot captured by the camera, the coordinates corresponding to each wavelength can be identified…..” What was the source of the laser? I thought that only a filament lamp was used for the experiment. Please explain and discuss in the manuscript.
Please explain where the numbers 1770 and 1.83 X 10^8 in eqution 2 originate from? in the manuscript.
I do not understand the ‘pixel’ scale on the y axis in figure 5. if different wavelengths impinge at diffferent positions (angles), should the y axis not be in terms of angle ? Either way, explain what and how the term ‘pixel’ is to be interpreted in terms of position and angle in the manuscript.
You state that “…α, and β are defined as the tilting angle and rotating angle, respectively….” What exactly is the tilting angle and what exactly is the rotating angle? I thought the CD could only be tilted along the XY axis, as shown in figure 4. Why are there then two angles described in the manuscript. Please explain and discuss in the manuscript. From figure 6, should angles alpha and beta not be the same?
you state that “…..Besides, the initial spectrum of the filament lamp also needs to be considered. Therefore, a ratio is added in front of the equation to represent the relative intensities of the filament light bulb at that specific wavelength……” How do you know what the relative intensities of the various wavlengths emanating from the bulb are? Where is this ratio presented in the manuscript? (please include here a reference to appendix a). Should there not be a table or an equation that enables the reader to calculate these relative intensities ? In this connection, please also present the wattage of the filament incandescent lamp as well as its model/make. Does the Alternating current of 50 cycles per second fed to the bulb affect any of your results ?
In figure 9, y axis, what are the units of intensity? How was intensity measured? I only see a camera mounted in the experimental set up. Wat this camera capable of measuing light intensities are different wavelengths? Please explain and describe in detail in the manuscript.
Figure 9a and figure 9b are the same graphs, even though the caption for b mentions close up of angle between 41 and 43 degrees. Please double check.
In equation 24, explain how the numbers 0.046 and 0.116 are derived.
you state that “…..Therefore, projecting vectors AS, and AO onto the x’—y at the center of the CD, with the z-axis perpendicular to the horizontal plane….” However, this does not agree with figure 4, where the z axis is parallel to the horizontal plane. Please explain and describe in the manuscript.
You state that “….To confirm cross-track interference, a laser
with a specific wavelength was directed at the
center of the disc….” this goes back to the point eariler. Where is this laser accommodated in the experimental design ? The experimental set up only show an incandescent bulb. Please explain and describe in the manuscript.
you state “….Overall, the experiments match the trend, with an average deviation of 3.2%…” Please present the percent relative standard deviation as well in the manuscript.
you state “…With the help of a prism, the light is dispersed into monochromatic light, enabling it to compare with the theory in Figure 14(b)……” please make clear if the incident light is dispersed or if the reflected light is dispersed.
does figure 17 show wavelength and tilting angle at different n values or m values? The title says ‘n’ but the figure inserts say ‘m’. Please explain and double check.

relative light intensity data in figure 20 is plotted as 'Grey value" on the Y axis. What and how is the Grey value obtained and what are its units if any ?
you state " However, the bending of lines is observed when the disc is illuminated with a nearby light source" explain in more detail about the nearby light source.
The section on “Practical applications” needs to be rewritten so that it is clearer. It needs description in more detail so that it can be understood and replicated by the reader. As written, it seems like an afterthought and not clear. Please describe in more detail with much more explanation and the linking of the phenomena you mention with the optimization of the real-world conditions. For example, it is not clear how these phenomena can optimize solar panel design for maximum absorption….? What does analyzing specific wavelength light sources, have to do with enhancing crop productivity?
Your results will be different depending on what songs/data is written on the CD/ DVD ? Please explain and describe in the manuscript. Since all the results will be different, please present what data/songs were recorded on the CD/DVD that you used in your experiment.
change “…Constructive interference occurs if the light path difference is multiplied by the wavelength……” to “….constructive interference occurs if the light path difference is an integral multiple of the wavelength….”
you correctly state that a CD can act as a diffraction grating. However, you should clarify that the tracks on the CD act as the slits in a diffraction grating, and that the spacing between these tracks (or slits) is responsible for the diffraction pattern observed.
The explanation about the distance between slits varying with the observer’s position is incorrect. In reality, the observed diffraction pattern results from the periodic structure of the CD, and the grating equation is used to relate the angle of diffraction to the wavelength and the spacing between tracks.
The assertion that constructive interference can only be seen along the diameter of the CD is incorrect. Constructive and destructive interference patterns can be observed at various angles, and these patterns are generally circular or radial due to the symmetry of the CD’s track arrangement.
The references to previous research should include more specific details about the studies mentioned. For instance, discussing the specifics of the “Fraunhofer diffraction” study or the “skimming light rays” paper can provide more context and accuracy.
The text mentions that the study will discuss equations of lines in arbitrary spatial positions and conduct experiments to verify the model. It will be helpful to the reader to provide more detail about what these equations are and how the experimental verification will be conducted.
Please provide a one column 12 font Times New Roman word file of your revised manuscript. Please see the website for formatting details.

Manuscript ID: 2333432
An optical model and experimental analysis of a reflective diffraction grating
Journal of High School Science
Response to reviewers

Dear Dr. Apte,

Thank you for the opportunity to submit a revised version of the manuscript titled, *“An Optical Model and Experimental Analysis of a Reflective Diffraction Grating,”* for consideration in the *Journal of High School Science.* I greatly appreciate the time and effort you invested in providing insightful and constructive feedback.
In response to the reviewer’s comments and suggestions, I have made substantial revisions to the manuscript, most of which have been incorporated accordingly. Below, I provide a detailed, point-by-

point response to each comment and concern, with my responses highlighted in blue and references to specific revisions included at the end of each response.
Thank you for your consideration of this revised manuscript. I look forward to your feedback and am happy to provide any additional information that may be needed.
Sincerely,
Min-Hsiang Chuang,
Concordia Middle & High School, Taiwan R.O.C.

Reviewer's Comments to the Authors:

- Comment 1: you mention that "….By pointing a laser of a specific wavelength onto the CD and analyzing the absolute coordinates of the laser spot captured by the camera, the coordinates corresponding to each wavelength can be identified….." What was the source of the laser? I thought that only a filament lamp was used for the experiment. Please explain and discuss in the manuscript.
  Author response: Thank you for pointing this out. Two places were clarified in the manuscript to prevent misunderstanding.
  1. A paragraph was added to the manuscript to specify the only situations where laser was used.
     "Besides, only with the laser calibration method and cross-track interference verification, the laser was used to verify the phenomenon in specific wavelengths. Among them, the results of the laser calibration method are used to analyze the wavelength in further experiments." [Pg2, Paragraph 2]
  2. Specific to laser calibration, the sentences were revised as follows:
     "This calibration method uses a laser instead of a filament lamp in order to identify the reflecting position of specific wavelengths. This method was implemented to analyze the wavelengths of light at different positions, which leverages the characteristic that different wavelengths refract to different positions after passing through a prism." [Pg4, Line1-4].

- Comment 2: Please explain where the numbers 1770 and 1.83 X 10^8 in equation 2 originate from? in the manuscript.
  Author response: As suggested by the reviewer, I have explained the origination of the fitting function in the manuscript as follows:
  "The constants 1770 and 1.83×108 show the relation originated from the fitting points in Figure 5." [Pg4, Paragraph2, Line2-3]

- Comment 3: I do not understand the 'pixel' scale on the y-axis in figure 5. if different wavelengths impinge at different positions (angles), should the y axis not be in terms of angle? Either way, explain what and how the term 'pixel' is to be interpreted in terms of position and angle in the manuscript.
  Author response: Thank you for pointing this out. The y-axis is set as "pixel" to directly correspond to the position at the figure to the wavelength, and a detailed explanation for this expression was added in the manuscript.
  "All experimental figures were captured at 4912×3264 pixels with the disc fixed in the same position, allowing the line's position to be correlated to wavelength via equation (2)." [Pg4, Paragraph2, Line1-2]

- Comment 4: You state that "…α, and β are defined as the tilting angle and rotating angle, respectively…." What exactly is the tilting angle and what exactly is the rotating angle? I

thought the CD could only be tilted along the XY axis, as shown in figure 4. Why are there then two angles described in the manuscript. Please explain and discuss in the manuscript. From figure 6, should angles alpha and beta not be the same?
Author response: Thank you for the questions. Two angles are not the same in the research. The angle representing the tilting of the disc is the α angle, which is along the y-axis. The β angle was included in the research to demonstrate the influence of the observing angle. Thus, a clear definition of the angles was added as follows:
"The α angle refers to the tilting of the disc on the y-axis, and the β angle refers to the rotation of the observer, depicted in Figure 6(a). Though not changed in the experiment, the β angle was considered to address the included angle between the observer, CD, and the source. " [Pg5, Paragraph3, Line2-4]

- Comment 5: you state that "…..Besides, the initial spectrum of the filament lamp also needs to be considered. Therefore, a ratio is added in front of the equation to represent the relative intensities of the filament light bulb at that specific wavelength……" How do you know what the relative intensities of the various wavelengths emanating from the bulb are? Where is this ratio presented in the manuscript? (please include here a reference to appendix a). Should there not be a table or an equation that enables the reader to calculate these relative intensities? In this connection, please also present the wattage of the filament incandescent lamp as well as its model/make. Does the Alternating current of 50 cycles per second fed to the bulb affect any of your results ?
  Author response: Thank you for the questions mentioned in the comments, the suggestions were addressed accordingly.
  1. A reference to Appendix A is included as suggested. [Pg8, Paragraph4, Line4-5]
  2. Besides the relative intensities of wavelengths presented in Appendix A, the manuscript also includes the equation for blackbody radiation of 3000K in equation (18). [Pg8, equation18]
  3. The light source, filament lamp, implemented in the research uses 100W, which has been included in the material land method part.
     "The experimental apparatus utilized a 100-wattage filament light bulb as the only light source."[Pg2, Line1-2]
  4. The alternating current (50 Hz) powering the filament lamp causes periodic fluctuations in light intensity. However, these fluctuations are not significant in the experiment. First, the thermal inertia indicates that the filament does not cool down and heat up instantaneously with each AC cycle. Instead, it remains relatively stable with high temperatures. Besides, the camera's exposure time is significantly longer than a single cycle, which effectively averages out any fluctuations in light intensity, capturing a steady intensity distribution.

- Comment 6: In figure 9, y-axis, what are the units of intensity? How was intensity measured? I only see a camera mounted in the experimental set up. Wat this camera capable of measuring light intensities are different wavelengths? Please explain and describe in detail in the manuscript.
  Author response: Thank you for your questions. The relative intensity is analyzed by grey value using ImageJ, as in Figure 20. On the other hand, the absolute intensity is measured by an Ocean Optics optical spectrometer, which is added to the material and method section. While these values are expressed in expressed in arbitrary units (a.u.). Corresponding to the spectrum of the filament lamp in Appendix A. Abovementioned details are included in the Material and method section:
  "The relative intensity is analyzed using grey values using ImageJ. The absolute intensity is measured by an Ocean Optics optical spectrometer, expressed in arbitrary units (a.u.)

corresponding to the spectrum of the filament lamp in Appendix A." [Pg2, Paragraph3, Line5-7]

- Comment 7: Figure 9a and figure 9b are the same graphs, even though the caption for b mentions close up of angle between 41 and 43 degrees. Please double check.
  Author response: Thank you for your nice reminder. The figures were corrected accordingly. [Pg9, Figure9]

- Comment 8: In equation 24, explain how the numbers 0.046 and 0.116 are derived.
  Author response: As suggested by the reviewer, an explanation of the constants is incorporated into the manuscript as follows:
  "Where 0.046m and 0.116m are respectively the radius of the inner hollow part and the overall size of a disc." [Pg10, Paragraph2, Line1-2]

- Comment 9: you state that "…..Therefore, projecting vectors AS, and AO onto the x'—y at the center of the CD, with the z-axis perpendicular to the horizontal plane…." However, this does not agree with figure 4, where the z-axis is parallel to the horizontal plane. Please explain and describe in the manuscript.
  Author response: Thank you for the reminder. It has been rephrased that the z-axis should be perpendicular to the x-y plane as follows:
  "The coordinate system's origin, A (0,0,0), is set at the center of the CD, with the z-axis perpendicular to the x-y plane." [Pg9, Paragraph, Line3-4]

- Comment 10: You state that "….To confirm cross-track interference, a laser with a specific wavelength was directed at the center of the disc…." this goes back to the point eariler. Where is this laser accommodated in the experimental design ? The experimental set up only show an incandescent bulb. Please explain and describe in the manuscript.
  Author response: Thank you for pointing this out. As suggested in comment 1, a paragraph was added to the manuscript to specify the only situations where laser was used. [Pg2, Paragraph2].

- Comment 11: you state "….Overall, the experiments match the trend, with an average deviation of 3.2%…" Please present the percent relative standard deviation as well in the manuscript.
  Author response: Thank you for your nice reminder. The relative standard deviation was added in the manuscript.
  "Overall, the experiments match the trend, with an average deviation of 3.2% and a percent relative standard deviation of 1.58%." [Pg11, Line7-8]

- Comment 12: you state "…With the help of a prism, the light is dispersed into monochromatic light, enabling it to compare with the theory in Figure 14(b)……" please make clear if the incident light is dispersed or if the reflected light is dispersed.
  Author response: Thank you for the reminder, it's the reflected light being dispersed before being captured by the camera. The manuscript has been revised to clarify the idea as follows:
  "With the help of a prism, the reflected light is dispersed into monochromatic light, enabling it to compare with the theory in Figure 14(b)." [Pg12, Line6-7]

- Comment 13: does figure 17 show wavelength and tilting angle at different n values or m values? The title says 'n' but the figure inserts say 'm'. Please explain and double-check.

Author response: Thank you for the reminder. The figure and the description have been revised accordingly, it should be wavelength changes with tilting angles with different m values. [Pg14, Figure17]

- Comment 14: relative light intensity data in figure 20 is plotted as 'Grey value" on the Y axis. What and how is the Grey value obtained and what are its units if any ?
  Author response: Thank you for pointing this out. The grey value represents the brightness level of a pixel, ranging from 0 to 255 since all figures captured in the experiment are 8-bit images. Thus, it corresponds to the intensity of light captured by the sensor. The description of the grey value is incorporated into the manuscript.
  "Grey values represent the brightness level of a pixel, ranging from 0 to 255, and are obtained using ImageJ." [Pg17, Figure20 description]

- Comment 15: you state " However, the bending of lines is observed when the disc is illuminated with a nearby light source" Explain in more detail about the nearby light source.
  Author response: Thank you for your suggestion, a more specific description of the light source was added, and the sentence was revised as follow:
  "However, the bending of lines is observed when the disc is illuminated within a short distance, as shown in Figure 22, where the light is placed at (-0.02,0.15,0.08), roughly 8.3cm to the center of the disc." [Pg18, Paragraph1, Line2-4]

- Comment 16: The section on "Practical applications" needs to be rewritten so that it is clearer. It needs description in more detail so that it can be understood and replicated by the reader. As written, it seems like an afterthought and not clear. Please describe in more detail with much more explanation and the linking of the phenomena you mention with the optimization of the real-world conditions. For example, it is not clear how these phenomena can optimize solar panel design for maximum absorption….? What does analyzing specific wavelength light sources, have to do with enhancing crop productivity?
  Author response: Thank you for pointing this out. I have revised the "Practical Applications" section to provide a more detailed explanation of how the device functions and how the phenomena observed in the experiment can be applied to real-world conditions. Specifically, we have clarified how the diffraction pattern produced by the CD can be used to analyze the angle and spectral composition of incident light. Besides, a figure is added for clarification and readability for the reader. [Pg19]
- Comment 17: Your results will be different depending on what songs/data is written on the CD/ DVD ? Please explain and describe in the manuscript. Since all the results will be different, please present what data/songs were recorded on the CD/DVD that you used in your experiment.
  Author response: Thank you for pointing this out. Since results will be different with different data and tracks carved, the files recorded in the experiment were detailed in the manuscript.
  "In the experiments, the CD burner was used to record single-tone audio files with varying durations and sizes: 150 MB, 300 MB, and 500 MB. These files were generated using Audacity, while the tones are 1kHz which allows for comparison of diffraction patterns." [Pg16, Paragraph1, Line3-5]

- Comment 18: change "…Constructive interference occurs if the light path difference is multiplied by the wavelength……" to "….constructive interference occurs if the light path difference is an integral multiple of the wavelength…."
  Author response: Revised accordingly. [Pg1, Paragraph1, Line6-7]

- Comment 19: you correctly state that a CD can act as a diffraction grating. However, you should clarify that the tracks on the CD act as the slits in a diffraction grating, and that the spacing between these tracks (or slits) is responsible for the diffraction pattern observed.
  Author response: Thank you for your suggestion, I have clarified the idea in the introduction as follows:
  "The closely spaced tracks on the disc act as the slits in a diffraction grating, with the pitch determining the observed diffraction pattern." [Pg1, Paragraph1, Line3-4]

- Comment 20: The explanation about the distance between slits varying with the observer's position is incorrect. In reality, the observed diffraction pattern results from the periodic structure of the CD, and the grating equation is used to relate the angle of diffraction to the wavelength and the spacing between tracks.
  Author response: Thank you for highlighting this issue. I have revised the passage to accurately describe the diffraction pattern's origin, emphasizing the periodic structure of the CD and the role of the grating equation.
  "As the back of the CD diffracts light with a periodic structure, depicted in Figure 1(b), it causes interference of light scattered from different tracks." [Pg1, Paragraph1, Line4-5]
  "The grating equation establishes the relationship between the angle of diffraction, the wavelength of the light, and the pitch, which determine the diffraction pattern observed." [Pg1, Paragraph1, Line7-9]

- Comment 21: The assertion that constructive interference can only be seen along the diameter of the CD is incorrect. Constructive and destructive interference patterns can be observed at various angles, and these patterns are generally circular or radial due to the symmetry of the CD's track arrangement.
  Author response: The reviewer's comment is valid, and I have revised the assertion accordingly. The explanation now includes the concept of the circular arrangement of the tracks, and I have removed the previous limitation regarding the diameter of the disc. The updated text reads:
  "Constructive and destructive interference patterns can be observed at various angles due to the circular arrangement of the tracks." [Pg1, Line7-8]
- Comment 22: The references to previous research should include more specific details about the studies mentioned. For instance, discussing the specifics of the "Fraunhofer diffraction" study or the "skimming light rays" paper can provide more context and accuracy.
  Author response: Thank you for your valuable suggestion. I have expanded the references to previous research to provide more specific details and context. The revision now includes a more thorough discussion and summation of previous research. The discussion of the specifics of the references is as follows:
  1. "José F. D. proposed a quantitative method in his study, "A simple experiment to distinguish between replicated and duplicated compact discs using Fraunhofer diffraction" (1). His work demonstrates that the subtle differences in the microstructures of these CDs lead to distinct diffraction patterns when laser light strikes the surface at nearly normal incidence. Furthermore, the study explores the influence of different layers of the disc using the Fraunhofer diffraction model (8). The Fraunhofer diffraction model uses Fourier transforms to calculate the resulting pattern at a large distance from the diffracting object." [Pg1, Paragraph3]
  2. "The paper by R. De Luca et al., "A compact disc under skimming light rays"(2) investigates the diffraction effects on CDs when illuminated by skimming light rays. The study explains the formation of colored lines, such as a green line observed when tilted with

small angles. However, the existing discussions have been limited to small tilt angles and assumed that the lines were aligned with the centerline of the CD, the observation point, and the source." [Pg1, Paragraph4]

- Comment 23: The text mentions that the study will discuss equations of lines in arbitrary spatial positions and conduct experiments to verify the model. It will be helpful to the reader to provide more detail about what these equations are and how the experimental verification will be conducted.
  Author response: Thank you for your valuable suggestion. I have clarified the reference to the equations concerning arbitrary spatial positions and provided more detail regarding the experimental verification of the model. The updated text now includes specific references to Experiment 5, where spatial positions of the light source, the CD, and the lines are discussed. The revised text reads:
  "Therefore, this study has included a discussion of lines in arbitrary spatial positions in general cases, leading to the discovery of curved lines, as shown in equations (24~27), Experiment 5." [Pg1, Paragraph 4, Line5-7]

- Comment 24: Please provide a one-column 12-font Times New Roman word file of your revised manuscript. Please see the website for formatting details.
  Author response: Thank you for the reminder. I have prepared the revised manuscript as requested and according to the formatting guidelines provided on the website.

Thank you for addressing my comments. However, please address comments 4, 6, 9 and 16 in the attached document.

An optical model and experimental analysis of a reflective diffraction grating
Journal of High School Science
Response to reviewers

Dear Dr. Apte,

Thank you for your prompt feedback on my revised manuscript, *"An Optical Model and Experimental Analysis of a Reflective Diffraction Grating."* I appreciate the opportunity to further improve my work based on your insightful comments.

I have carefully addressed comments 4, 6, 9, and 16 in the revised document, ensuring that the necessary modifications and clarifications are incorporated. Specifically, Figure 4 and Figure 6 were revised to demonstrate the arrangement of the experimental apparatus. Please find the updated manuscript attached for your review.

I appreciate your time and consideration and look forward to your feedback. Please let me know if any further revisions are required.

Sincerely,
Min-Hsiang Chuang
Concordia Middle & High School, Taiwan R.O.C.

Reviewer's Comments to the Authors:

- Comment 4: You state that "…α, and β are defined as the tilting angle and rotating angle, respectively…." What exactly is the tilting angle and what exactly is the rotating angle? I thought the CD could only be tilted along the XY axis, as shown in figure 4. Why are there then two angles described in the manuscript. Please explain and discuss in the manuscript. From figure 6, should angles alpha and beta not be the same?
  New Comment: This is confusing. In figure 6b the alpha angle is drawn wrt x axis . It should be wrt y axis. Also beta angle shown in 6a is confusing. he should draw a perpendicular line to the disc in fig 6b and then show beta angle (which is the observer angle) wrt that
  Author response: Thank you for your valuable suggestion. There are errors in both the definition and Figure 6, confusing the definition of these two angles. The definition has been revised as follows:
  "The α angle represents the tilting angle, defined as the angle between the surface of the disc and the x-y plane, shown in Figure 6(a) and Figure 6(b). The β angle refers to the rotation of the observer, depicted in Figure 6(a)."[Pg3, Paragraph3, Line2-4]

  Besides, the axis label in Figure 6(a) is wrong; it should be the x-axis instead of the y-axis. Thus, Figure 6 has been carefully revised, with both angles demonstrated clearly and axis labels added along the figures to clarify. Since Figure 6(b) is the side view of the optical disc, Figure 6(a) clearly illustrates the beta angle.

- Comment 6: In figure 9, y-axis, what are the units of intensity? How was intensity measured? I only see a camera mounted in the experimental set up. Wat this camera capable of measuring light intensities are different wavelengths? Please explain and describe in detail in the manuscript.
  New Comment: This is fine . The ocean optics (OES optical emission spectroscopy) is used to measure light intensity in arb units.
  Author response: Thank you for your comment. I appreciate the clarification and confirm that the Ocean Optics system was used for measuring light intensity in arbitrary units. The original text reads:
  "The relative intensity is analyzed using grey values using ImageJ. The absolute intensity is measured by an Ocean Optics optical spectrometer, expressed in arbitrary units (a.u.) corresponding to the spectrum of the filament lamp in Appendix A." [Pg2, Paragraph3, Line5-7]

- Comment 9: you state that "…..Therefore, projecting vectors AS, and AO onto the x'—y at the center of the CD, with the z-axis perpendicular to the horizontal plane…." However, this does not agree with figure 4, where the z-axis is parallel to the horizontal plane. Please explain and describe in the manuscript.
  New Comment: he should redo figure 4 to be consistent with this
  Author response: Thank you for your suggestion. To demonstrate the coordination system, Figure 4 has been revised with the x-y plane painted in blue, the origin A added, and the axis labels depicted in the figure. The coordination system aligns with the definition as follows:
  "The coordinate system's origin, A (0,0,0), is set at the center of the CD, with the z-axis perpendicular to the x-y plane." [Pg9, Paragraph, Line3-4]

- Comment 16: The section on "Practical applications" needs to be rewritten so that it is clearer. It needs description in more detail so that it can be understood and replicated by the reader. As

written, it seems like an afterthought and not clear. Please describe in more detail with much more explanation and the linking of the phenomena you mention with the optimization of the real-world conditions. For example, it is not clear how these phenomena can optimize solar panel design for maximum absorption….? What does analyzing specific wavelength light sources, have to do with enhancing crop productivity?
New Comment: he authors practical applications sectrion regarding solar panels is wrong. Solar panels are adjusted to ensure that they are sun facing throughout the day. The sunlight itself consists of all visibe wavelengths which are absorbed by the solar panel. The CD experiment has nothing to do with improving efficiency etc. This is plain wrong.
Author response: Thank you for the comment. The reviewer is correct; the CD experiment has no direct relation to the improving efficiency of solar panels. Similar concepts have been omitted in both practical application sections, and the abstract, which mentioned the application. The practical application now explains thoroughly how the device detects the incident angle by analyzing the position of the lines and mapping the wavelengths, which provides another method for optical analysis.

The revised manuscript of the section reads:
"The optical characteristics of a CD, specifically the diffraction pattern produced by the spacing of tracks, offer a unique way to analyze light sources. To demonstrate this, I developed a device capable of measuring the angles of incident light. When illuminated at different angles, the tracks on the CD produce diffracted lines that are visible to a smartphone camera. The positions of these lines are highly sensitive to the angle at which the light strikes the disc.

In the experimental setup, the upper half of the CD is observed vertically using a smartphone camera equipped with a prism. The image is then transferred to a computer, where OpenCV is employed to analyze the lines. After mapping the position of these lines and wavelength, Appendix B and equation (28) are applied to correspond to the angle of incident light.

This capability provides a practical method for analyzing incident light direction. Such measurements may have broader applications in fields requiring precise characterization of light angles and wavelengths, providing a straightforward approach for optical analysis."

Thank you for addressing my comments. Before we can accept this manuscript, it will require extensive revision with regard to English grammar, composition, tense and sentence structure. Please write the entire manuscript in third person, past perfect tense. Please make sure the Figures depict what the text says. Please have the reference in sequential order in the manuscript and revise the references section as described in the attached document. It will also help if you CLEARLY state what you are trying to achieve, and why experiments1 through experiment X are necessary and what they do individually and in cohesion. Why are they in that particular order?
Please address all these comments as described in the attached document and return when you have thoroughly and meticulously addressed all the comments.

Dear Dr. Apte,

Thank you for your prompt feedback on my revised manuscript, *"An Optical Model and Experimental Analysis of a Reflective Diffraction Grating."* I appreciate the opportunity to further improve my work based on your insightful and constructive comments.

I have carefully revised the manuscript to address all concerns. Grammar, tense, and sentence structure have been corrected for clarity and accuracy. Figures have been updated, references renumbered, and all necessary model and manufacturer details included. I have also clarified the purpose and sequence of the experiments.

I appreciate your time and consideration and look forward to your feedback. Please let me know if any further revisions are required.

Sincerely,
Min-Hsiang Chuang
Concordia Middle & High School, Taiwan R.O.C.

Reviewer's Comments to the Authors:

- Comment 1: Figure 1(a) does not show this. Please change the figure. Figure 1(b) does not show this. Please change the figure. separate figure 1a and 1b into separate figures.
  Author Response: Thank you for the suggestions. Figure 1(b) had been removed to eliminate misunderstanding about the actual periodic structure and tracks on the back of the compact disc since it was not a clear illustration. Besides, the description of Figure 1(a) has been revised, so that it correctly describes the phenomenon, which is the line observed on the disc. When illuminated, the phenomenon observed was a single line on the disc demonstrated in the figure; therefore, the manuscript has been revised as
  "When an optical disc is used as a diffraction grating and illuminated by a light source, a distinctive diffraction line appears along its diameter, as shown in Figure 1." [Pg1, Paragraph1, Line2-3]

- Comment 2: references should be numbered in sequential order in the manuscript.
  Author Response: Thank you for the reminder, the references have been numbered in sequential order according to the manuscript.

- Comment 3: The manuscript should be written in past perfect tense, please check entire manuscript. There are too many instances of incorrect tense, grammar and sentence structure throughout the manuscript. Please note that we cannot accept a manuscript that is deficient in English composition and we are limited to copyright review for 2 times maximum due to resource constraints
  Author Response: Thank you for the feedback. The manuscript has been reviewed to correct grammatical errors, improve sentence clarity. All necessary revisions have been made to conform to proper tense usage.

- Comment 4: need make, model, manufacturer, pixel resolution
  Author Response: Thank you for the suggestion. All the models, manufacturer and pixel resolution were included in the manuscript for the camera, spectrometer, and software used in the experiment.

- Comment 5: ~~enabling the carving of the tracks for further discussion regarding the recording of the dise~~.what does this mean? Please check English and sentence structure.
  Author Response: The implementation of the CD burner has been included in the manuscript with a clear explanation as follows:
  "Additionally, a CD burner was used to record files onto the disc, for further discussion regarding the effects of recording on the disc." [Pg2, Paragraph 4, Line 4-5]

- Comment 6: Then, using the Cauchy equation (1), fitting function (2) is obtained, which was fitted to the second order with R2 = 0.998. where is this graph/data?
  Author Response: Thank you for the suggestion. An explanation and a reference to the figure have been added to the manuscript. Figure 5 includes the data that were used to fit to obtain equation 2.

- Comment 7: It will be useful to decribe what is the use and meaning of Experiment1…. ExperimentX and why they are performed in that order. What is each experiment trying to prove? Why was the manuscript divided into these experiments?
  Author Response: Thank you for the valuable suggestion. A paragraph has been added before the experimental discussion for clarification of the purpose of each experiment and the meaning of the order.
  "The experimental analysis is structured to systematically analyze diffraction effects on optical discs. Experiment 1 establishes how tilting affects wavelength and intensity, forming the basis for later studies. Experiment 2 examines wavelength distribution across the disc, while Experiment 3 explores different track spacing using CDs, DVDs, and BDs. Then, Experiment 4 investigates how data recording alters diffraction efficiency, and Experiment 5 explains line bending under close-range illumination. This sequence ensures logical progression, validating the theoretical model." [Pg12, Paragraph1]

- Comment 8: remove all ampersands from all references
  Author Response: All ampersands have been removed from the references, according to the comment.
- Comment 9: These are not live links. This link refers to the aggregator. I need the link to the original article. Please check all references, all of them appear to link to aggregators, not the original article.
  Author Response: Thank you for the reminder. All links included in the reference have been revised as direct links to the original articles.

Accepted.