

# Photonics Research Laboratory Annual Report 2022



Prepared by:

Percival F. Almoro, PhD  
PRL Program Coordinator

Period Covered: January 1, 2022 – December 31, 2022

Submitted: April 4, 2023

## Contents

1. Executive Summary	..... 2
2. Technical Report	..... 3
3. Appendix	.....11

\*Group picture taken on March 13, 2023, National Institute of Physics, UP Diliman, Quezon City

## 1. Executive Summary

### 1.1 Activities of the research group

#### 1.1.1.

##### Organization

Regular members		4
Student members		
	PhD students	10
	MS student	3
	MSE PhD	2
	MSE students	2
	BS student	12
Apprentices		6
Total		39

#### 1.1.2. Mentoring

##### Number of Graduates

BS Physics		
BS Applied Physics		
MS Physics		
PhD Physics		1
	Total	1

#### 1.2. Research highlights

International peer-reviewed journals	6
Local peer-viewed journals	-
International conference papers	-
International conference presentations	7
Local conference papers / presentations	14
Chapter in books	-
Patents	-
NIP funded projects	3
Non-NIP funded projects	-
Major equipment acquired/ upgraded	-
Research travels abroad	-
Visiting researchers	-
MOA's entered with local and foreign institutions	-

#### 1.3. Extension work highlights

Extension work activities	2
Research interns/ OJT for training held at NIP	1

#### 1.4. Main challenges encountered and proposed solutions

1.5. Awards received	2
----------------------	---

## 2 Technical Report

### 2.1. Highlights of the activities of the research group

- The Photonics Research Laboratory continued to hold weekly group meetings. The three clusters of the laboratory also had separate research meetings.
- The group published 6 ISI papers.
- The group had participated in int'l/ national Physics conferences (7 without full papers and 14 with full papers). The conferences were either online or hybrid.
- The Group helped graduate 1 PhD Physics student (Cherrie May Olaya). Ms. Olaya was the Most Outstanding PhD student (SY 2021-2022) & Edgardo Gomez Awardee.
- For the Group's extension work, Linangan 2022: Learnership in Optics and Photonics was launched. The project-based workshop was conducted in two occasions: online (June, 2022) and on-site (November, 2022).

#### 2.1.1. Organization

##### 2.1.1.1. Group members

###### Regular members (4)

1. Garcia, Wilson
2. Almoró, Percival
3. Hermosa, Nathaniel II
4. Dasallas, Lean (Adjunct Researcher, MSE Program - College of Science)

###### Student Members

PhD Physics students (10)	Year Level	Cluster*	Adviser
1. Abregana, Timothy Joseph	(PhD VIII)	HCM	Dr. Almoró
2. Banguilan, Dina Grace	(PhD IV)	SLA	Dr. Hermosa
3. Binamira, Jonel	(PhD IV)	HCM	Dr. Almoró
4. Bucó, Christian	(PhD III)	HCM	Dr. Almoró
5. Cabanilla, Jayson	(PhD IV)	SLA	Dr. Hermosa
6. De Mesa, Joseph	(PhD VIII)	SLA	Dr. Hermosa
7. Emperado, Rommil	(PhD VII)	LSA	Dr. Garcia
8. Miranda, Jessa Jayne	(PhD V)	LSA	Dr. Garcia
9. Onglao, Mario III	(PhD VII)	HCM	Dr. Almoró
10. Simon, Niña Angelica	(Phd IV)	SLA	Dr. Hermosa
<b>MS Physics (3)</b>			
1. Manuel, Ma. Janelle	(MS II)	SLA	Dr. Hermosa
2. Pablico, Dennis Angelo	(MS IV)	SLA	Dr. Hermosa
3. Tabuzo, Rigil	(MS II)	HCM	Dr. Almoró
<b>MSE PhD students (2)</b>			
1. De Mata, Joy Kristelle	(PhD IV)	LSA	Dr. Dasallas
2. Sagisi, Jenny Lou	(PhD VI)	LSA	Dr. Dasallas
<b>MS MSE (2)</b>			
1. Operana, Jarred Joshua	(MS III)	SLA	Dr. Hermosa
2. Santiago, Leo	(MS II)	LSA	Dr. Dasallas

\* Research Clusters:

HCM (Holography and Coherent Metrology), SLA (Structured Light and Applications), and LSA (Laser Systems and Applications)

BS Applied Physics (7)

1. Abenojar, Joshua	(BS App Phy-IV)	HCM	Dr. Almoró
2. Ambrosio, Benjamin Jose	(BS App Phy-V)	SLA	Dr. Hermosa
3. Buensuceso, Cedio	(BS App Phy-IV)	LSA	Dr. Garcia
4. Grefal, Jesse Rudyll	(BS App Phy-V)	LSA	Dr. Garcia
5. Hermosa, Christian Robic	(BS App Phy-V)	HCM	Dr. Almoró
6. Valdeavilla, Charlyn Mae	(BS App Phy-VI)	LSA	Dr. Garcia

BS Physics (5)

1. Borromeo, John Carlo	(BS Phy-V)	SLA	Dr. Hermosa
2. Cabalar, Vincent	(BS Phy-V)	LSA	Dr. Garcia
3. Cuadra, Marco	(BS Phy-IV)	HCM	Dr. Almoró
4. Loot, Angela Joyce	(BS Phy-IV)	LSA	Dr. Garcia
5. Mullaneda, Jernnex	(BS Phy-IV)	SLA	Dr. Hermosa
6. Sarayan, Juan Gabriel	(BS Phy-V)	SLA	Dr. Hermosa

Apprentices (6)

1. Aclan, Nicole	(BS Phy-III)	HCM	Dr. Almoró
2. Ignacio, Emmanuel John	(BS Phy-III)	SLA	Dr. Hermosa
3. Logarta, Arriane Norfela	(BS Phy-III)	LSA	Dr. Garcia
4. Mendoza, Maria Isabella	(BS Phy-III)	SLA	Dr. Hermosa
5. Quimpo, Evangelos	(BS Phy-III)	LSA	Dr. Garcia
6. Reyes, Arianne	(BS Phy-III)	HCM	Dr. Almoró

Regular Members

4

Student members

35

PhD students	10
MS students	3
MSE PhD	2
MSE students	2
BS students	12

Apprentices

6

Total 35

2.1.2. Mentoring

2.1.2.1. List of graduates

2nd semester 2021-2022

1. Olaya, Cherrie May (PhD)

Surface Plasmon Resonance Enhanced Goos-Hanchen Shift and its Sensing Device Application (Adviser: Dr. Nathaniel Hermosa)

2.1.2.2. Summary

BS Physics  
BS Applied Physics  
MS Physics  
MS MSE  
PhD Physics

Number of graduates

1

Total 1

## 2.2. Research highlights

### 2.2.1. Publication in ISI/SCI and Scopus indexed journals (6)

1. Abregana, T. J. T., & Almoro, P. F. (2022). Phase retrieval by amplitude modulation using digital micromirror device. *Optics and Lasers in Engineering*, 150.  
<https://doi.org/10.1016/j.optlaseng.2021.106851>
2. Aguilar, R. A., Hermosa, N., & Soriano, M. (2022). 3D fourier ghost imaging via semi-calibrated photometric stereo. *Applied Optics*, 61(1), 253-261.  
<https://doi.org/10.1364/AO.447910>
3. Banguilan, D. G. C., Estrada, V. G., & Hermosa, N. P. (2022). On-demand measurement of higher topological charges using hadamard-coded apertures with a DMD. *Optik*, 262.  
<https://doi.org/10.1016/j.ijleo.2022.169260>
4. Manuel, M. J. G., & Hermosa, N. (2022). Split differential transit photometry. *Astrophysics and Space Science*, 367(5).  
<https://doi.org/10.1007/s10509-022-04075-0>
5. Villareal, M. R. E., Binamira, J., & Almoro, P. (2022). Enhanced fixed plane phase retrieval using wavelength-to-distance transformation and unordered propagations. *Optics Communications*, 514.  
<https://doi.org/10.1016/j.optcom.2022.128179>
6. De Los Reyes, A., Prieto, E.A., Dasallas, L., Bardolaza, H., Tumanguil-Quitoras M.A., Cabello, N.I., Somintac, A., Salvador, A., and Estacio, E. Tunneling dynamics and transport in MBE-grown GaAs/AlGaAs asymmetric double quantum wells investigated via photoluminescence and terahertz time-domain spectroscopy. *J Mater Sci: Mater Electron* 33, 16126–16135 (2022).  
<https://doi.org/10.1007/s10854-022-08503-3>

### 2.2.2. Publication in local peer reviewed journals (0)

### 2.2.3. International conference presentations with full papers (0)

### 2.2.4. International conference presentations without full papers (7)

1. Banguilan, D. G. "Step Height Measurement via Vortex Beam Diffraction", 15th Pacific Rim Conference on Lasers and Electro-Optics (CLEO Pacific Rim, CLEO- PR 2022). July 31- August 5, 2022.
2. Almoro, P.F. "Phase Retrieval Using Unordered Propagations: Principles and Techniques", 25th Congress of the International Commission for Optics, September 5 – 9, 2022, Dresden, Germany, online. (Invited Talk)
3. Banguilan, D. G. "Optical vortex pair detection using a triangle aperture", The 83rd JSAP Autumn Meeting, September 20-23, 2022.
4. Emperado, R. B., Dasallas, L. L., & Garcia, W. O. "Direct Simulation Monte Carlo modelling of the flip-over effect in laser-produced plasma expansion using SPARTA", 32nd International Symposium on Rarefied Gas Dynamics (Online) (July 4-8, 2022).
5. Santiago, L. M., & Dasallas, L. L. "Modelling the emission behavior of 1D and 2D quantum emitters in a multilayer metallic system", 2022 Int'l Conference on Advanced Functional Materials and Nanotechnology and 24th SPVM Nat'l Physics Conf., Oct 27-29, 2023.

6. Zambale, N. A. "Out-of-Plane Beam Displacements of Radio Waves Due to Ionosphere (Poster Presenter)", Optica Laser Congress and Exhibition 2022 A Hybrid Event, December 11-15, 2022.
7. Zambale, N. A. "Transverse shifts experienced by radio waves due to ionosphere", Theory and Applications of Lidar, An ICTP Virtual Meeting, (16 -19 May 2022)

#### 2.2.5. Local conference papers

##### 2.2.5.1. With full papers (14)

1. BJC Ambrosio, NZ Simon, and NP Hermosa, Characterizing a light dependent resistor (LDR) response to a laser diode using Malus' Law, *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-3D-05 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-3D-05>.
2. DGC Banguilan and N Hermosa, Limits of a digital micromirror device in topological charge measurement, *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-1C-03 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-1C-03>.
3. JF Binamira and PF Almoró, Accelerated unordered propagation phase retrieval using object area of support, *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-2C-03 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-2C-03>.
4. CRL Buco and PF Almoró, Super-resolution multiple plane phase retrieval using multi-angle illumination, *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-PA-07 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-PA-07>.
5. JP Cabanilla and N Hermosa, Mode spectrum of misaligned Hermite Gaussian beam, *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-PA-17 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-PA-17>.
6. MMR Casero, ALL Floro, Salvador, RG Dizon, JLB Sagisi, WO Garcia, and LL Dasallas, Modelling energy transfer in femtosecond pulsed laser ablation using coupled oscillator, *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-PA-12 (2022) URL: <https://proceedings.spp-online.org/article/view/SPP-2022-PA-12>.
7. JKC De Mata, LL Dasallas, and WO Garcia, Laser ablation modeling for Gaussian and tophat beam profiles using a two-temperature model, *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-PA-15 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-PA-15>.
8. JA De Mesa, MJF Empizo, K Shinohara, AP Rillera, VAI Samson, N Sarukura, RV Sarmago, and WO Garcia, Femtosecond pulsed laser deposition of highly oriented cerium (IV) oxide thin films with background oxygen gas, *Proc. of the Samahang Pisika ng Pilipinas* 40, SPP-2022-PA-14 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-PA-14>.
9. RB Emperado, LL Dasallas, and WO Garica, Demonstration of the snow-plow effect in laser-produced plasma expansion in background gas using SPARTA, *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-2C-02 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-2C-02>.

10. JJC Miranda and WO Garcia, Observation of colliding plasmas through Direct Simulation Monte Carlo method , *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-3B-06 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-3B-06>.
11. MJS Onglao and PF Almoró, Numerical investigation on the speckle formation produced by Fourier domain phase modulation, *Proc. of the Samahang Pisika ng Pilipinas* 40, SPP-2022-PA-10 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-PA-10>.
12. DAL Pablico, NAF Zambale-Simon, and NP Hermosa, Quasi-non-diffracting static light sheets generated by multiple slit interference mask, *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-1C-05 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-1C-05>.
13. JGC Sarayan and NP Hermosa, Optimum grating parameter for diffractive label-free biosensing, *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-PA-11 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-PA-11>.
14. RG Tabuzo, JE Caya, J Leaño, and PF Almoró, Enhanced textile characterization using fluorescence imaging and UV photography, *Proceedings of the Samahang Pisika ng Pilipinas* 40, SPP-2022-1E-02 (2022). URL: <https://proceedings.spp-online.org/article/view/SPP-2022-1E-02>.

2.2.6. Chapters in books (0)

2.2.7. Patents (0)

2.2.8. NIP funded projects (3)

Almoró, Percival F.

Enhanced Phase Retrieval Using phase modulation at the fourier plane.

Period: 01 January 2022 - 31 December 2022

Funding Source: NIP / UP Diliman

Amount: P 105,600.00

Garcia, Wilson O.

Computational Modeling of Pulsed Laser Ablation and Deposition Under Different Target Deposition Geometries.

Period: 01 January 2022 - 31 December 2022

Funding Source: NIP / UP Diliman

Amount: P 105,600.00

Hermosa, Nathaniel II P.

Optimum Grating Parameter for Diffractive Label Free Biosensing

Period: 01 January 2022 - 31 December 2022

Funding Source: NIP / UP Diliman

Amount: P 105,600.00

2.2.9. Non-UP funded project (1)

OVCRD

Project No.: 222205 ORG

Project Title: Laser ablation of high Tc oxides and ceramics: simulations, experiments, and applications

Project Leader: DR. WILSON O. GARCIA  
 Period: 1 September 2022 - 31 August 2023

- 2.2.10. Major equipment acquired (0)
- 2.2.11. Research travels abroad (0)
- 2.2.12. Visiting researchers (0)
- 2.2.13. MOA's entered with local or foreign institutions (0)

### 2.3 Extension Work Activities

#### 2.3.1. As Reviewer/ Editor (15)

Abregana, Timothy Joseph	Reviewer, 40th Samahang Pisika ng Pilipinas
Almoro, Percival	Topical Editor, Optics and Image Processing, 40 <sup>th</sup> Samahang Pisika ng Pilipinas
	Topical Editor, Applied Optics (January, 2022)
Banguilan, Dina Grace	Reviewer, 40th Samahang Pisika ng Pilipinas
Binamira, Jonel	Reviewer, 40th Samahang Pisika ng Pilipinas
Buco, Christian Ray	Reviewer, 40th Samahang Pisika ng Pilipinas
Cabanilla, Jayson	Reviewer, 40th Samahang Pisika ng Pilipinas
Dasallas, Lean	Secretary General, Samahang Pisika ng Pilipinas
De Mata, Joy Kristelle	Reviewer, 40th Samahang Pisika ng Pilipinas
De Mesa, Joseph	Reviewer, 40th Samahang Pisika ng Pilipinas
Emperado, Rommil	Reviewer, 40th Samahang Pisika ng Pilipinas
Miranda, Jessa Jayne	Reviewer, 40th Samahang Pisika ng Pilipinas
Onglao, Mario Juvenal III	Reviewer, 40th Samahang Pisika ng Pilipinas
Sagisi, Jenny Lou	Reviewer, 40th Samahang Pisika ng Pilipinas
Zambale, Niña Angelica	Councilor, Samahang Pisika ng Pilipinas
	Invigilator, International Physics Olympiad 2022

#### 2.3.2. Research interns/OJT's (1)

Joseph Robin T. Aguinaldo, Bachelor in Science Education with Specialization in Physics  
 Philippine Normal University  
 Supervisor: Dr. Nathaniel Hermosa



2.3.3. Workshops (2)  
 Linangan sa Optics at Photonics 2022:  
 An extension program of the NIP Photonics Research Laboratory  
 (See Appendix 3.3)

Two (2) Workshops:

- 1) June 4 – 25, 2022 (Online), Number of Participants: 13
- 2) November 26, 2022 (Mapúa University), Number of Participants: 22

Participants (June 4 – 25, 2022)

	Surname	First name	Affiliation (Department/ School/ Institution)
1	Tabao	Justin Emmanuel	Philippine Science High School - Eastern Visayas Campus
2	Alforja	Edmayelle	University of Santo Tomas
3	Manliguez	Cinmayii	Dep't of Math., Physics, and Comp. Science, UP Mindanao
4	Gador	Ferdinand II	University of the Philippines Mindanao
5	Bhibhithpalarak	Joseph Nol F.	Mapua University, Department of Physics
6	Pedro	Albert Josh	Department of Physics, Mapua University
7	Agub	Edette Micah	Department of Physics, Mapua University
8	Canata	Johndell	Mindanao State University Marawi City Physics Department
9	Prodigalidad	Alenn Jhulia	Ateneo De Manila University
10	Gumayan	Efren	Natural Science Department/Iloilo Science and Tech. Univ.
11	Bautista	Brent Buv	University of Northern Philippines
12	Soberano	Elvis, Jr.	University of Northern Philippines
13	Carlos	Aileen	UP Manila College of Dentistry

Participants (November 26, 2022)

	Surname	First name	Affiliation (Department/ School/ Institution)
1	Macalalad	Ernest	Department of Physics/ Mapua University
2	Gammag	Rayda	Department of Physics/ Mapua University
3	Payag	Christian Joseph	Department of Physics/ Mapua University
4	Bercasio	Czarowitz Joss	Department of Physics/ Mapua University
5	Legaspi	Rafael Yrjosmiel	Department of Physics/ Mapua University
6	Adan	John Vincent	Department of Physics/ Mapua University
7	Dometita	Randy	Department of Physics/ Mapua University
8	Mercadol	Robald	Department of Physics/ Mapua University
9	Lagasca	David	Department of Physics/ Mapua University
10	Estrellado	Vien	Department of Physics/ Mapua University
11	Cupiado	Kayle Vincent	Department of Physics/ Mapua University

12	Melu	Antonio Miguel	Department of Physics/ Mapua University
13	Domingo	Zane Nikia	Department of Physics/ Mapua University
14	Alporha	Renzo	Department of Physics/ Mapua University
15	Camarse	Jeofrey Kaneida	Department of Physics/ Mapua University
16	Marin	Richard	Department of Physics/ Mapua University
17	Guzman	Jonelle Mae	Department of Physics/ Mapua University
18	Ancheta	Ma. Carmela Pauline	Department of Physics/ Mapua University
19	Roldan	Nizee	Department of Physics/ Mapua University
20	Orongan	Manuel Allan	Department of Physics/ Mapua University
21	Livingston	Czarine	Department of Physics/ Mapua University
22	Menor	Aljohn Dario	Department of Physics/ Mapua University

#### 2.4. Main challenges encountered and proposed and solutions

On the conduct of research, due to problems related to the pandemic, some students struggle to participate in research meetings. It is suggested that adjustments in the research activities and targets be made iteratively.

#### 2.5. Awards or accreditations received/positions of responsibility held and other accomplishments (2)

1. Cherrie May Olaya, Most Outstanding PhD student (SY 2021-2022) & Edgardo Gomez Awardee.
2. Nina Angelica Zambale, Student Paper Award Finalist under the Applications of Lasers for Sensing and Free Space Communications cluster  
ICO-Optica SPIE Outstanding Contributed Talk Award

### 3. Appendix: Photos, ISI/SCI Publications, Extension Work, and other documentations

#### 3.1. Photos



PRL dinner, October 19, 2022, Legazpi




PRL by a local jeepney, October 20, 2022, Legazpi




3.3. Extension Work

Linangan sa Optics at Photonics 2022

An extension program of the NIP Photonics Research Laboratory

<p>Name of event</p>	<p>2022 Project-Based Remote Learnership in Optics and Photonics</p> 
<p>Dates/ Period of Event</p>	<p>Two (2) Workshops:</p> <ol style="list-style-type: none"> <li>3) June 4 – 25, 2022 (Online), Number of Participants: 13</li> <li>4) November 26, 2022 (Mapúa University), Number of Participants: 22</li> </ol> <p><u>For the Online Workshop:</u></p> <p><u>Application Period:</u>      May 13 to May 25: Online Application      May 26 to June 3: Evaluation and notification</p> <p><u>Learnership Activities:</u>      June 4: Online orientation, lectures, and simulations      June 5 to 10: Shipping of kits      June 11: Discussion on Balangaw Spectrometer DIY Kit and design of experimental investigations      June 12 to 24: Home exp'ts, analysis, and consultation      June 25: Presentation of output</p>

<p>Description of event-what</p>	<p><u>Part I (synchronous): Lectures and Simulations</u>          Introduction to optics with focus on refraction, reflection, interference, diffraction, and scattering          Basics of spectroscopy and light matter interaction          Simulations: Spreadsheet-Based Spectral Modeling and Synthesis</p> <p><u>Part II (synchronous): Workshop on DIY Kit</u>          Construction, calibration, and testing of the Balangaw Spectrometer Kit          Measurements using Theremino open source software</p> <p><u>Part III: Investigations and Reporting</u>          Individualized experimental investigations (asynchronous)          Collaboration and individual consultation (synchronous)          Video report and presentation (synchronous)</p> <p><u>References:</u></p> <ol style="list-style-type: none"> <li>1. David J. Flannigan, "Spreadsheet-Based Program for Simulating Atomic Emission Spectra," J. Chem. Educ. 2014, 1736–1738. <a href="https://doi.org/10.1021/ed500479u">https://doi.org/10.1021/ed500479u</a></li> <li>2. Theremino Spectrometer. (n.d.). Retrieved from <a href="https://www.theremino.com/en/downloads/automation">https://www.theremino.com/en/downloads/automation</a></li> </ol>
<p>Event Coordinator/Contact person</p>	<p>PRL Coordinator          photonics@nip.upd.edu.ph</p>
<p>Target Participants</p>	<p>Students, teachers, or enthusiasts from <u>partner schools or institutions</u>: 2 to 3 slots (each)          Other interested parties from <u>non-partner</u> institutions: 18 to 20 slots (total)</p> <p><u>Must possess</u>: Laptop with webcam, Windows OS</p> <p><u>Be ready with the following</u>:          Documentary proof(s) of official affiliation          Statement of interest in optics and photonics (75-100 words)</p>
<p>Event Outcomes</p>	<p>At the end of the workshop, the participant can explain the basic concepts in optical spectroscopy and can demonstrate some practical skills in spectral measurements and analysis.</p>

<p>Learnership Kit</p>	 <p>Cardboard cut-outs, gratings, spacer, blade, clips, cuvette, lamp receptacle</p>
<p>Objectives - why Be clear about what you hope to achieve with this event</p>	<ol style="list-style-type: none"> <li>I. Discuss some basic principles and techniques in optics (eg, wave propagation and diffraction) and photonics (eg, spectroscopy and light matter interaction)</li> <li>II. Synthesize and analyze various light spectra using spreadsheet-based simulation</li> <li>III. Construct, calibrate, and apply the Balangaw DIY Spectroscopy Kit</li> </ol>
<p>Technical notes</p>	<ol style="list-style-type: none"> <li>1. Label: “Balangaw” to replace “Bahaghari”</li> <li>2. Stray light due to the use of white cardboard is addressed by attaching to the inner side a black matted sticker</li> <li>3. Each participant will be provided with a square clear cuvette for the absorption experiments</li> <li>4. Lecture topics are identified and will be related to familiar optical effects, to the planned simulations, and the experiments: Optics- Refraction, reflection, interference, diffraction Photonics: Emission/ types of spectra, line broadening, absorption, applications of spectroscopy</li> </ol>
<p>Risk assessment - what Identify possible risks and develop strategies to minimize risks</p>	<ol style="list-style-type: none"> <li>1. Experimental procedures and safety: Use of instructional videos</li> <li>2. Receiving the workshop kits: Via courier service</li> <li>3. Sourcing of sample materials: Identify possible items available in the household</li> </ol>

<p>Evaluation criteria established</p>	<p>A. Number of participants and demographics          B. Assessment test results and qualitative evaluation          C. Documentary reports/ videos</p>
<p>Budget and Logistics</p>	<p>Printing of kits and shipping</p>
<p>Trainers</p>	<p>(Online)          Nathaniel Hermosa II          Lean Dasallas          Mario Onglao          Percival Almore</p> <p>(On-site)          Percival Almore</p>