

EARTH

TO SPACE



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# PROGRAMS AND ACTIVITIES

## IKIM.fm Radio Program Broadcast (Man & Nature)

Man & Nature is a radio program broadcast in IKIM.fm radio station. UKM-YSD Chair for Climate Change sponsored 12 time slots starting from 8 November 2020 to 24 January 2021 on every Sunday night (6 pm). Nine experts from UKM were invited to share their knowledge and research results to the public in layman's terms. These shows talked about humans, nature, climate change, and how Islam deals with environmental problems

Below is a list of the episodes, speakers, and topics for January 2021:

**Episode 9 (3 January 2021):** Green Biotechnology and Climate Change by YBhg. Assoc. Prof. Dr. Che Radziah Che Mohd Zain

**Episode 10 & 11 (10 & 17 January 2021):** "Climate Change: Starts from YOU!" - Part 1 & 2 by YBhg. Prof. Dr. Lilia Halim

**Episode 12 (24 January 2021):** The Importance and Impact of Astronomy in Our Daily Lives Man and Nature by YBrs. Prof. Madya Dr. Nur Adlyka Ainul Annuar



## MoA Signing Ceremony between UKM and Angkatan Koperasi Kebangsaan Malaysia Berhad (ANGKASA)

**Date** : 16 March 2021  
**Venue** : Auditorium ANGKASA, Angkatan Koperasi Kebangsaan Malaysia Berhad (ANGKASA)  
**Organizer** : Institute of Climate Change (IPI) and Angkatan Koperasi Kebangsaan Malaysia Berhad (ANGKASA)

On 16 March 2021, Angkatan Koperasi Kebangsaan Malaysia Berhad (ANGKASA) and Universiti Kebangsaan Malaysia (UKM) signed a memorandum of agreement (MoA) through Institute of Climate Change (IPI). This strategic partnership aims to assure environmental sustainability by implementing the COOPCARE KOPERASI PRIHATIN SEJUTA POKOK programme, which targets to plant a million trees. This programme is a large-scale environmental conservation measure to mitigate the impact of climate change that is extensively driven by the cooperative movement to give ongoing awareness in accordance with the Sustainable Development Goals (SDGs) 2030. The programme will involve researchers from IPI who will monitor the development of tree growth using Aerial Satellite technology and applications, as well as monitor and assess the carbon content and health of trees.



## Bengkel Hala Tuju Penyelidikan Institut Perubahan Iklim (IPI)

**Date** : 24 Mac 2021  
**Venue** : Puri Pujangga Hotel, UKM  
**Organizer** : Institute of Climate Change (IPI)

A workshop was held to gather all the research academicians and staffs and to discuss the missions and objectives of the IPI this year, focusing on the research strategies to meet the Malaysia Research Assessment (MyRA).



# IPI SEMINAR SERIES 1/2021: Biomass-burning Spring Campaigns of Seven South East Asian Studies (7-SEAS): Concept, Results and Future Plan

**Date** : 30 March 2021  
**Venue** : Zoom Online Platform  
**Organizer** : Institute of Climate Change (IPI)

IPI invited Prof. Dr. Lin Neng-Hui from the National Central University of Taiwan to give a talk entitled "Biomass-burning Spring Campaigns of Seven South East Asian Studies (7-SEAS): Concept, Results and Future Plan". About 42 participants from UKM and various organizations joined the seminar. The seminar was streamed live in the official IPI Facebook.

The poster is for the IPI Seminar Series 1/2021. It features a purple banner with the title "Biomass-burning Spring Campaigns of Seven South East Asian Studies (7-SEAS): Concept, Results and Future Plan". Below the banner is a photo of Professor Dr. Lin Neng-Hui. To the right of the photo, there is a box containing the date "30 March 2021 (Tuesday)", the time "10.00 am", and the Zoom App link "https://bit.ly/3eWUxbs". A QR code is also present with the text "Register Here" below it. At the bottom left, there is a purple box with the name "Professor Dr. Lin Neng-Huei" and his affiliation: "Department of Atmospheric Science, National Central University (NCU), Taiwan". At the bottom right, there are logos for the website "www.ukm.my/ipi" and the Facebook page "ipiukm".

## ARCGIS Desktop Training

**Date** : 1 April 2021  
**Venue** : Lab ICT 1, Earth Observation Centre, Institute of Climate Change (IPI)  
**Organizer** : Earth Observation Centre (EOC), IPI

This GIS training course was organized by the Earth Observation Centre of IPI. 10 participants from the department of public health of UKM attended the training. The mentor of this training was the Assoc Prof. Sr. Dr. Khairul Nizam Abdul Maulud and the practical training was guided by Sr Ahmad Tarmizi Mohd Azmi. The objective of this training is to expose a basic theory on Geographical Information System, application of ArcGIS consisting of ArcMap, Arc catalog and Arc toolbox. The participants also were exposed to the basic spatial analysis method on the public health and disease control application. In the end of the training, participants can understand the fundamental GIS theory and the importance of the GIS in the health studies.



## Workshop on Introduction to Ionosphere and GNSS Scintillation

**Date** : 12 April 2021  
**Venue** : IPI Seminar Room, Level 7, Research Complex UKM  
**Organizer** : Space Science Centre (ANGKASA), IPI

IPI hosted a workshop to introduce the fundamentals of the ionosphere and GNSS scintillation for UKM students. Some participants from Universiti Sains Malaysia and Universiti Teknikal Malaysia were also joined through the virtual platform. During the workshop, the participants also learned the Swarm satellite data and how to process GNSS data using GPS Bernese software.

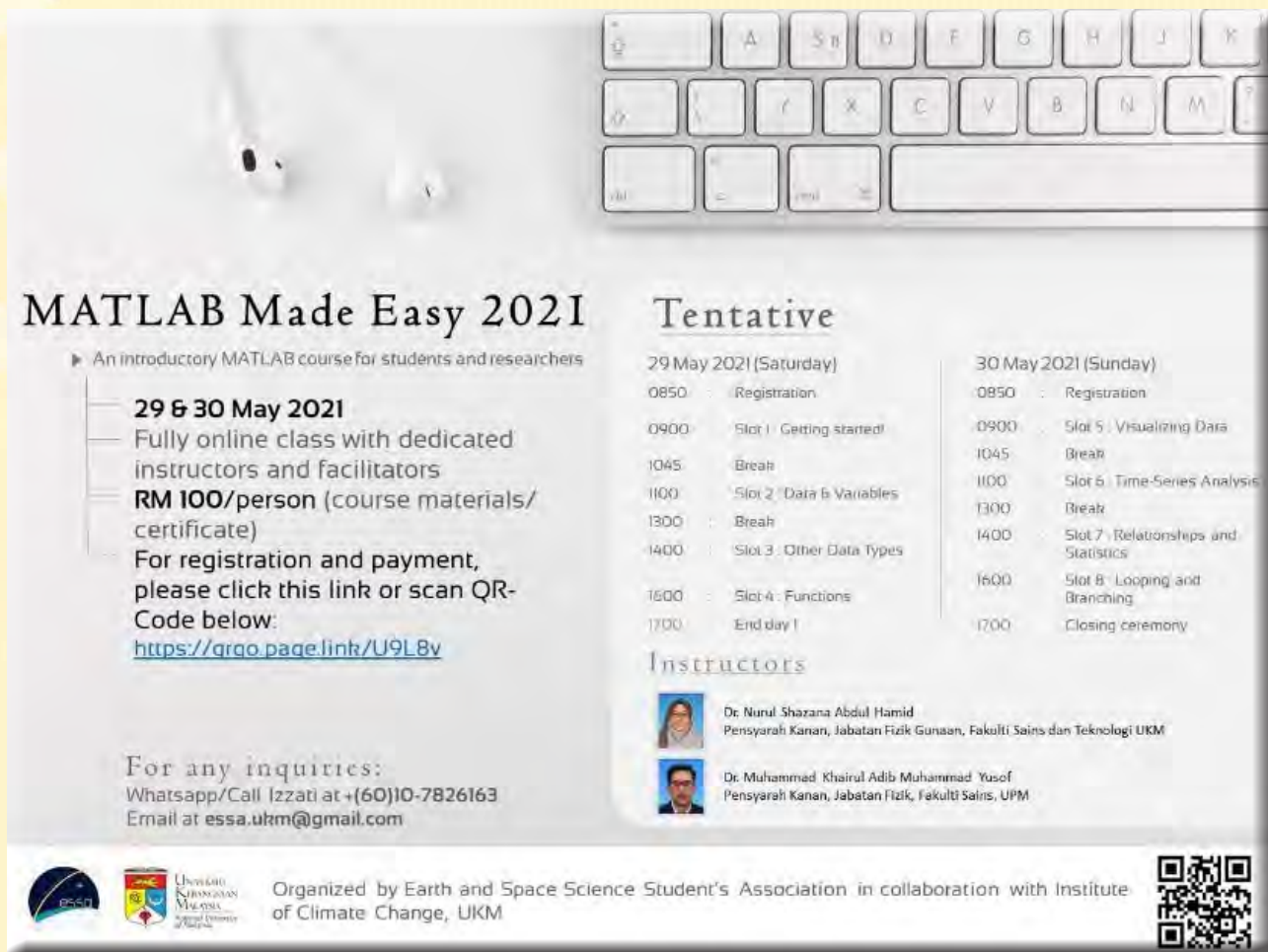




## Matlab Made Easy Workshop

**Date** : 29 – 30 May 2021  
**Venue** : Zoom Online Platform  
**Organizer** : Earth and Space Science Student's Association (ESSA) and Institute of Climate Change (IPI)

With the success of the previous Matlab workshop held in 2019, we hosted again the Matlab Made Easy workshop this year. This workshop attracted 24 participants who are using the Matlab software for their research works.



### MATLAB Made Easy 2021

► An introductory MATLAB course for students and researchers



- 29 & 30 May 2021
- Fully online class with dedicated instructors and facilitators
- RM 100/person (course materials/certificate)
- For registration and payment, please click this link or scan QR-Code below:  
<https://qrqo.page.link/U9L8y>

For any inquiries:  
Whatsapp/Call Izzati at +(60)10-7826163  
Email at [essa.ukm@gmail.com](mailto:essa.ukm@gmail.com)


### Tentative

29 May 2021 (Saturday)	30 May 2021 (Sunday)
0850 : Registration	0850 : Registration
0900 : Slot 1 : Getting started	0900 : Slot 5 : Visualizing Data
1045 : Break	1045 : Break
1100 : Slot 2 : Data & Variables	1100 : Slot 6 : Time-Series Analysis
1300 : Break	1300 : Break
1400 : Slot 3 : Other Data Types	1400 : Slot 7 : Relationships and Statistics
1500 : Slot 4 : Functions	1600 : Slot 8 : Looping and Branching
1700 : End day 1	1700 : Closing ceremony

### Instructors

-  Dr. Nurul Shazana Abdul Hamid  
Pensyarah Kanan, Jabatan Fizik Gunaan, Fakulti Sains dan Teknologi UKM
-  Dr. Muhammad Khairul Adib Muhammad Yusof  
Pensyarah Kanan, Jabatan Fizik, Fakulti Sains, UPM

Organized by Earth and Space Science Student's Association in collaboration with Institute of Climate Change, UKM



## IPI SEMINAR SERIES 2/2021: MAGDAS System in Malaysia and Its Data Application in Space Science Research

**Date** : 15 July 2021  
**Venue** : Webex Online Platform  
**Organizer** : Institute of Climate Change (IPI) and IEEE Young Professionals Malaysia (IEEE YP)

With the IEEE Young Professionals Malaysia (IEEE YP), IPI hosted a seminar entitled "MAGDAS System in Malaysia and Its Data Application in Space Science Research". This seminar was one of the initiatives to introduce the Magnetic Data Acquisition System (MAGDAS) in Malaysia. The MAGDAS system is a joint research project by the Malaysian Space Agency (MYSA), Universiti Kebangsaan Malaysia (UKM), Universiti Teknologi MARA (UiTM), Universiti Sultan Zainal Abidin (UniSZA) and Universiti Pendidikan Sultan Idris (UPSI). The seminar was streamed live in the official IPI Facebook.

IPI SEMINAR SERIES 2/2021

**MAGDAS System in Malaysia and its Data Application in Space Science Research**

**Mrs. Zahira Binti Mohd Radzi**  
Host of MAGDAS stations in Malaysia & Director of Exploration and Space Science Division, Malaysian Space Agency (MYSA)

**Dr. Nurul Shazana Abdul Hamid**  
MAGDAS Coordinator in Malaysia & Senior Lecturer, Department of Applied Physics, Faculty of Science and Technology, UKM

**15 July 2021**

**10.00 am**

**Webex App**  
<https://bit.ly/3y593Et>

**Organised by:**  
Institute of Climate Change, UKM

**Co-organised by:**  
IEEE young professionals MALAYSIA

[www.ukm.my/ipi](http://www.ukm.my/ipi) | [f ipiukm](https://www.facebook.com/ipiukm)

# PUBLICATIONS

## HIGH IMPACT JOURNALS

BIL	PAPER TITTLE JOURNAL / PROCEEDING NAME	AUTHORS
1	A multi-split based square split ring resonator for multiband satellite applications with high effective medium ratio Results In Physics (Q1)	Air Mohammad Siddiky* Mohammad Rashed Iqbal Faruque Sabirin Abdullah
2	Electromagnetic radiation reduction using novel metamaterial for cellular applications Radiation Physics and Chemistry (Q1)	Ahmed Mahfuz Tamim* Mohammad Rashed Iqbal Faruque
3	Polarization-independent symmetrical digital metasurface absorber Results In Physics (Q1)	Ahmed Mahfuz Tamim* Md Mehedi Hasan Mohammad Rashed Iqbal Faruque
4	Reduction of 5G cellular network radiation in wireless mobile phone using an asymmetric square shaped passive metamaterial design Scientific Reports (Q1)	Tayaallen Ramachandran* Mohammad Rashed Iqbal Faruque Air Mohammad Siddiky
5	Symmetric square shaped metamaterial structure with quintuple resonance frequencies for S, C, X and Ku band applications Scientific Reports (Q1)	Tayaallen Ramachandran* Mohammad Rashed Iqbal Faruque
6	Anthropogenic emissions of atomic chlorine precursors in the Yangtze River Delta region, China Science of the Total Environment (Q1)	Maggie Chel Gee Ooi
7	Application of life cycle assessment for desalination: Progress, challenges, and future directions Environmental Pollution (Q1)	Marlia Mohd Hanafiah
8	Calculation of secondary radiation absorbed doses due to the proton therapy on breast cancer using MCNPX code Radiation Physics and Chemistry (Q1)	Mehdi Hassanpour Mohammad Rashed Iqbal Faruque
9	Cyclone vulnerability assessment of the western coast of Bangladesh Geomatics, Natural Hazards and Risk (Q1)	Biswajeet Pradhan
10	Earthquake risk assessment in NE India using deep learning and geospatial analysis Geoscience Frontiers (Q1)	Biswajeet Pradhan
11	Elevated concentrations of metal (loids) in seaweed and the concomitant exposure to humans Foods (Q1)	Mohammad Rashed Iqbal Faruque
12	Enhancement of mechanical and corrosion resistance properties of electrodeposited Ni-P-TiC composite coatings Scientific Reports (Q1)	Mohammad Rashed Iqbal Faruque
13	Evaluation of e-waste management systems in Malaysia using life cycle assessment and material flow analysis Journal of Cleaner Production (Q1)	Marlia M. Hanafiah

BIL	PAPER TITLE JOURNAL / PROCEEDING NAME	AUTHORS
14	Forecasting landslides using SIGMA model: a case study from Idukki, India Geomatics, Natural Hazards and Risk (Q1)	Biswajeet Pradhan Khairul Nizam Abdul Maulud
15	Improving road semantic segmentation using generative adversarial network IEEE Access (Q1)	Biswajeet Pradhan Khairul Nizam Abdul Maulud
16	Incorporation of basic alpha hydroxy acid residues into primitive polyester microdroplets for RNA segregation Biomacromolecules (Q1)	Kuhan Chandru
17	Integrating multilayer perceptron neural nets with hybrid ensemble classifiers for deforestation probability assessment in Eastern India Geomatics, Natural Hazards and Risk (Q1)	Biswajeet Pradhan Khairul Nizam Abdul Maulud
18	Intelligent controllers and optimization algorithms for building energy management towards achieving sustainable development: challenges and prospects IEEE Access (Q1)	Rawshan Ara Begum
19	Investigation on (Zn) doping and anionic surfactant (SDS) effect on SnO <sub>2</sub> nanostructures for enhanced photocatalytic RhB dye degradation Environmental Research (Q1)	Marlia M. Hanafiah
20	Observation of site diversity gain dependency on separation distance using an attenuation-dependent logarithmic model in a tropical region IEEE Access (Q1)	Mandeep Jit Singh
21	Oil spill trajectory modelling and environmental vulnerability mapping using GNOME model and GIS Environmental Pollution (Q1)	Biswajeet Pradhan
22	On-the-move measurement analysis for Ka-band high throughput satellite and LiFi communication networks in tropical region IEEE Access (Q1)	Mandeep Jit Singh
23	Particulate matter (PM <sub>2.5</sub> ) as a potential SARS-CoV-2 carrier Scientific Reports (Q1)	Kuhan Chandru
24	Polarization-independent multiband double-negative metamaterial through ferrite-based flexible substrate with tunable microwave dielectric properties Results in Physics (Q1)	Mandeep Singh Jit Singh
25	Recent progress on synthetic strategies and applications of transition metal phosphides in energy storage and conversion Ceramics International (Q1)	Marlia M. Hanafiah
26	Robustness analysis of machine learning classifiers in predicting spatial gully erosion susceptibility with altered training samples Geomatics, Natural Hazards and Risk (Q1)	Biswajeet Pradhan Khairul Nizam Abdul Maulud
27	Solar photovoltaic energy optimization methods, challenges and issues: A comprehensive review Journal of Cleaner Production (Q1)	Rawshan Ara Begum
28	Spatial assessment of drought vulnerability using fuzzy-analytical hierarchical process: a case study at the Indian state of Odisha Geomatics, Natural Hazards and Risk (Q1)	Biswajeet Pradhan Khairul Nizam Abdul Maulud

BIL	PAPER TITTLE JOURNAL / PROCEEDING NAME	AUTHORS
29	Spatial landslide susceptibility assessment using machine learning techniques assisted by additional data created with generative adversarial networks Geoscience Frontiers (Q1)	Biswajeet Pradhan
30	Tailoring bismuth borate glasses by incorporating PbO/GeO2 for protection against nuclear radiation Scientific Reports (Q1)	Mohammad Rashed Iqbal Faruque
31	The removal of anionic and cationic dyes from an aqueous solution using biomass-based activated carbon Scientific Reports (Q1)	Marlia M. Hanafiah
32	Enhancement of magnetic field intensity with a left-handed metamaterial tunnel resonator for obstacle sensing Chinese Journal of Physics (Q2)	Eistiak Ahamed* Mohammad Rashed Iqbal Faruque Ahmed Mahfuz Tamim
33	Two-dimensional reconstruction of a time-dependent mirror structure from double-polytropic MHD simulation Earth and Space Science (Q2)	Teh Wai Leong*
34	An LCA-based environmental performance of rice production for developing a sustainable agri-food system in Malaysia Environmental Management (Q2)	Marlia M. Hanafiah
35	Barrier islands resilience to extreme events: do earthquake and tsunami play a role? Water (Q2)	Biswajeet Pradhan
36	Battery storage systems integrated renewable energy sources: A bibliometric analysis towards future directions Journal of Energy Storage (Q2)	Rawshan Ara Begum
37	Broadband single-layer reflectarray antenna loaded with meander-delay-lines for X-band applications Alexandria Engineering Journal (Q2)	Samir Salem Al-Bawri
38	Chemical analysis of thermoluminescent colorless topaz crystal using laser-induced breakdown spectroscopy Minerals (Q2)	Mohammad Rashed Iqbal Faruque
39	Coastal erosion vulnerability assessment along the eastern coast of Bangladesh using geospatial techniques Ocean and Coastal Management (Q2)	Biswajeet Pradhan
40	Community awareness towards coastal hazard and adaptation strategies in Pahang coast of Malaysia Natural Hazards (Q2)	Rawshan Ara Begum
41	Comparison of the effects of two laser photobiomodulation techniques on bio-physical properties of Zea mays L. seeds PeerJ (Q2)	Marlia M. Hanafiah
42	Current trends in the application of nanomaterials for the removal of pollutants from industrial wastewater treatment-a review Molecules (Q2)	Marlia M. Hanafiah
43	Editorial for the special issue: multispectral and hyperspectral remote sensing data for mineral exploration and environmental monitoring of mined areas Remote Sensing (Q2)	Biswajeet Pradhan

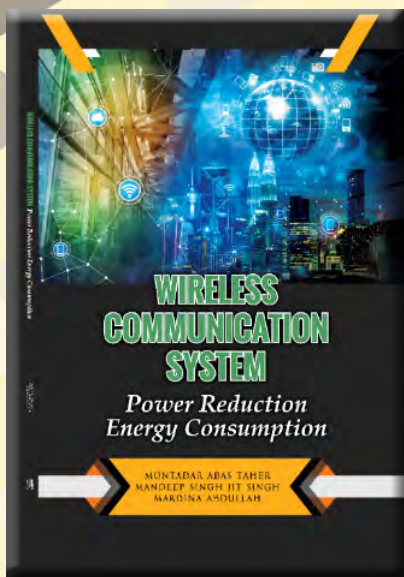
BIL	PAPER TITTLE JOURNAL / PROCEEDING NAME	AUTHORS
44	Electrically tunable left-handed textile metamaterial for microwave applications Materials (Q2)	Samir Salem Al-Bawri
45	Enhancement of the shielding capability of soda lime glasses with Sb <sub>2</sub> O <sub>3</sub> dopant: a potential material for radiation safety in nuclear installations Applied Sciences (Q2)	Mohammad Rashed Iqbal Faruque
46	Environmental performance of small-scale seawater reverse osmosis plant for rural area water supply Membranes (Q2)	Marlia M. Hanafiah
47	Facile Synthesis of High Quality Nano Size 10B Enriched Fibers of Hexagonal Boron Nitride Crystals (Q2)	Mohammad Rashed Iqbal Faruque
48	Influence of zonal wind velocity variation on equatorial plasma bubble occurrences over Southeast Asia Journal of Geophysical Research: Space Physics (Q2)	Nurul Shazana Abdul Hamid Mardina Abdullah Suhaila M Buhari
49	Parabolic Split Ring Resonator (PSRR) based MNZ metamaterial with angular rotation for WiFi/WiMax/Wireless/ISM band applications Chinese Journal of Physics (Q2)	Air Mohammad Siddiky Mohammad Rashed Iqbal Faruque Sabirin Abdullah
50	Photoelectrochemical applications of electrochemical deposition of Ni <sup>2+</sup> -doped FeS <sub>2</sub> thin films Journal of Materials Science: Materials in Electronics (Q2)	Marlia M. Hanafiah
51	bioflocs produced by two drying methods Journal of Marine Science and Engineering (Q2)	Marlia M. Hanafiah
52	Radionuclides Transfer from Soil to Tea leaves and Estimation of Committed Effective dose to the Bangladesh Populace Life (Q2)	Mohammad Rashed Iqbal Faruque
53	Reconfigurable THz metamaterial filter based on binary response for information processing system Frontiers In Physics (Q2)	Eistiak Ahamed Ahmed Mahfuz Tamim Mohammad Rashed Iqbal Faruque Rasheduzzaman Sifat
54	Structural, optical and antibacterial efficacy of pure and zinc-doped copper oxide against pathogenic bacteria Nanomaterials (Q2)	Mohammad Rashed Iqbal Faruque
55	Synergistic effects of Cu-doped ZnO nanoantibiotic against Gram-positive bacterial strains PLOS One (Q2)	Mohammad Rashed Iqbal Faruque
56	The presence of radioactive heavy minerals in prospecting trenches and concomitant occupational exposure PLOS ONE (Q2)	Mohammad Rashed Iqbal Faruque
57	Unmodified titanium dioxide nanoparticles as a potential contrast agent in photon emission computed tomography Crystals (Q2)	Mohammad Rashed Iqbal Faruque

Note: Only authors affiliated to IPI are shown.

\*First author

# PUBLICATIONS

## BOOKS



### *Wireless Communication System: Power Reduction Energy Consumption*

Authors: Montadar Abas Taher, Mandeep Singh Jit Singh, Mardina Abdullah

Publisher: Penerbit UKM

ISBN: 978-9672512073

## CHAPTER IN BOOK

### *Chapter Title: Kimia Hijau: Ke Arah Kelestarian Industri Kimia*

Book Title: Bahan Kimia dalam Kehidupan Harian: Adakah Kita Selamat?

Authors: Azhar Bin Abdul Halim, Lee Khai Ern, Marlia Binti Mohd Hanafiah, Mazlin Mokhtar

Publisher: Dewan Bahasa dan Pustaka

ISBN: 9789834926489

Chapter (Page): Bab 10 (276 – 278)



### *Ethnobotanical Properties and Traditional Uses of Medicinal Plant Abutilon theophrasti Medik*

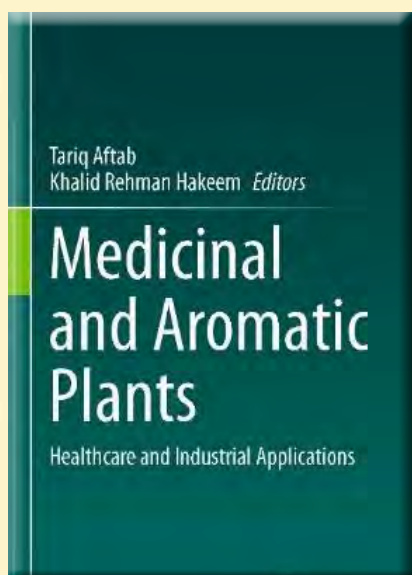
Book Title: Medicinal and Aromatic Plants: Healthcare and Industrial Applications

Authors: Musheerul Hassan, Sheikh Marifatul Haq, Akhtar Rasool, Sana Fatima, Aniqah Ashraf, Muhammad Zulfajri, and Marlia M. Hanafah

Publisher: Springer / Kluwer

ISBN: 9783030589752

Chapter (Page): Chapter 11 (271 – 285)



# CONGRATULATIONS

## INTERNATIONAL RESEARCH GRANT



### **DR. TEH WAI LEONG**

**Research Title:** Understanding the Role of Magnetic Island in Plasma Acceleration and Energy Dissipation during Magnetic Reconnection

**Granted by:** Institute for Space-Earth Environmental Research (ISEE), Nagoya University, Japan

**Value:** RM13,000.00

## INDUSTRY GRANT



### **LT. KOL. BERSEKUTU (PA) PROF. MADYA SR. DR. KHAIRUL NIZAM ABDUL MAULUD**

**Research Title:** Integrated shoreline Management Plan (ISMP) Negeri Kedah

**Granted by:** ZNK Consult Sdn. Bhd.

**Value:** RM30,000.00

## INNOVATION GRANT



### **ASSOC. PROF. DR. MOHAMMAD RASHED IQBAL FARUQUE**

**Research Title:** Lab scale model to  $\alpha$ -prototyping of Metamaterial-based Invisibility Cloak

**Rakan Industri :** K PINTAR SYSTEM & SOLUTIONS

**Value:** RM171,200.00



## PROFESSIONAL APPOINTMENT



### TS. DR. WAN SHAFRINA WAN MOHD JAAFAR

**Appointed as:** Expert Panel Working Group 4: "Integrated Land Resource Management" National Technical Research Committee on Geoinformation/Geomatic, Ministry of Water, Land and Natural Resources.

**Appointed Body:** Ministry of Energy and Natural Resources

**Date of Appointment:** 15 June 2021

## DUTA INOVASI UKM



### ASSOC. PROF. DR. MOHAMMAD RASHED IQBAL FARUQUE

**Appointed as:** Duta Inovasi UKM

**Appointed Body:** Universiti Kebangsaan Malaysia

**Date of Appointment:** 1 April 2021 – 31 March 2023

## ANUGERAH PERKHIDMATAN CEMERLANG (APC) 2021

(Assessment Year of 2020)



**DR. NORSUZLIN MOHD SAHAR**  
Research Fellow / Head of Quality



**NURUL AIN NORDIN**  
Assistant Administrative Officer



**Ahmed Mahfuz Tamim, Mohammad Rashed Iqbal Faruque, Mayeen Uddin Khandaker, Mohammad Tariqul Islam, David Andrew Bradley**

**Title:** Electromagnetic radiation reduction using novel metamaterial for cellular applications

**Journal:** Radiation Physics and Chemistry (Q1)

**Ahmed Mahfuz Tamim, Md Mehedi Hasan, Mohammad Rashed Iqbal Faruque, Mohammad Tariqul Islam, Jamel Nebhen**

**Title:** Polarization-Independent Symmetrical Digital Metasurface Absorber

**Journal:** Results In Physics (Q1)



## Electromagnetic radiation reduction using novel metamaterial for cellular applications

Ahmed Mahfuz Tamim<sup>a</sup>, Mohammad Rashed Iqbal Faruque<sup>a,\*</sup>, Mayeen Uddin Khandaker<sup>b</sup>, Mohammad Tariqul Islam<sup>c</sup>, David Andrew Bradley<sup>b</sup>

<sup>a</sup> Space Science Centre (ANGKASA), Universiti Kebangsaan Malaysia, Malaysia

<sup>b</sup> Centre for Biomedical Physics, Sunway University, Malaysia

<sup>c</sup> Dept of Electrical, Electronic and Systems Engineering, Universiti Kebangsaan Malaysia, Malaysia

### ARTICLE INFO

**Keywords:**  
ELC resonator-based metamaterial

### ABSTRACT:

Excessive exposure to radiation has an adverse impact on human health, as an increase in body temperature may damage human organs or tissues, including the brain, eyes, and skin. Hence, this study assessed the effect of



## Polarization-independent symmetrical digital metasurface absorber

Ahmed Mahfuz Tamim<sup>a,\*</sup>, Md Mehedi Hasan<sup>a,b</sup>, Mohammad Rashed Iqbal Faruque<sup>a,\*</sup>, Mohammad Tariqul Islam<sup>c</sup>, Jamel Nebhen<sup>d</sup>

<sup>a</sup> Space Science Centre (ANGKASA), Universiti Kebangsaan Malaysia, Bangi 43600, Selangor, Malaysia

<sup>b</sup> Research School of Electrical, Energy and Materials Engineering, College of Engineering and Computer Science, The Australian National University, Canberra ACT 2601, Australia

<sup>c</sup> Department of Electrical, Electronic and Systems Engineering, Universiti Kebangsaan Malaysia, Bangi 43600, Selangor, Malaysia

<sup>d</sup> College of Computer Engineering and Sciences, Prince Sultan bin Abdulaziz University, P.O. Box 151, Alkharj 11942, Saudi Arabia

### ARTICLE INFO

**Keywords:**

### ABSTRACT

A metasurface absorber developed using binary-coded unit cells and with the combination of coded unit cells



**Air Mohammad Siddiky, Mohammad Rashed Iqbal Faruque, Mohammad Tariqul Islam, Sabirin Abdullah**

**Title:** A multi-split based square split ring resonator for multiband satellite applications with high effective medium ratio

**Journal:** Results In Physics (Q1)

Results in Physics 22 (2021) 103865

Contents lists available at ScienceDirect

**Results in Physics**

journal homepage: [www.elsevier.com/locate/rinp](http://www.elsevier.com/locate/rinp)

**A multi-split based square split ring resonator for multiband satellite applications with high effective medium ratio**

Air Mohammad Siddiky<sup>a</sup>, Mohammad Rashed Iqbal Faruque<sup>(\*)</sup>, Mohammad Tariqul Islam<sup>b</sup>, Sabirin Abdullah<sup>a</sup>

<sup>a</sup> Space Science Centre (ANGKASA), Institute of Climate Change (IPIC), Universiti Kebangsaan Malaysia, Malaysia  
<sup>b</sup> Dept. of Electrical, Electronic & Systems Engineering, Universiti Kebangsaan Malaysia, Malaysia

ARTICLE INFO      ABSTRACT

**Keywords:**  
Double negative metamaterial

Metamaterial is an innovation that makes today's world look forward to another research area extension. In this proposed article, a double negative multi-split based square split ring resonator is discussed, where the Rogers-



**Tayaallen Ramachandran, Mohammad Rashed Iqbal Faruque, Air Mohammad Siddiky, Mohammad Tariqul Islam**

**Title:** Reduction of 5G cellular network radiation in wireless mobile phone using an asymmetric square shaped passive metamaterial design

**Journal:** Scientific Reports (Q1)

**Tayaallen Ramachandran, Mohammad Rashed Iqbal Faruque, Mohammad Tariqul Islam**

**Title:** Symmetric square shaped metamaterial structure with quintuple resonance frequencies for S, C, X and Ku band applications

**Journal:** Scientific Reports (Q1)

www.nature.com/scientificreports

**scientific reports**

**OPEN** Reduction of 5G cellular network radiation in wireless mobile phone using an asymmetric square shaped passive metamaterial design

Tayaallen Ramachandran<sup>1</sup>, Mohammad Rashed Iqbal Faruque<sup>(\*)</sup>, Air Mohammad Siddiky<sup>2</sup> & Mohammad Tariqul Islam<sup>2</sup>

This study aims to demonstrate the feasibility of metamaterial application in absorption reduction of 5G electromagnetic (EM) energy in the human head tissue. In a general sense, the radio frequency

www.nature.com/scientificreports

**scientific reports**

**OPEN** Symmetric square shaped metamaterial structure with quintuple resonance frequencies for S, C, X and Ku band applications

Tayaallen Ramachandran<sup>1</sup>, Mohammad Rashed Iqbal Faruque<sup>(\*)</sup> & Mohammad Tariqul Islam<sup>2</sup>

This study explores the effect of symmetrical square shaped metamaterial design for microwave



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Faks: 03-8921 6098  
E-mel: [pghikp@ukm.edu.my](mailto:pghikp@ukm.edu.my)



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