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RESEARCH MANAGEMENT CENTRE
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

APPLICATION FOR ATTENDING LOCAL SEMINAR / CONFERENCE / WORKSHOP / VISIT / DATA COLLECTION (USING RESEARCH GRANT)

CHECK LIST

Application form must be submitted to Research Management Centre (RMC) ***at least 1 month*** *from the date of seminar / conference / workshop / visit / data collection*

No.	Item / Document	Please tick (√)	
		Applicant	RMC
1.	Complete Application form with signature of applicant	✓	
2.	Letter of acceptance of working paper	✓	
3.	Abstract / Research article with acknowledgement of the grant	✓	
4.	Brochure of seminar / conference / workshop / visit and other supporting documents	✓	
5.	Updated Financial Statement of research grant	✓	
6.	Verification / Certification from Principal Researcher if applicant is either co-researcher or Research Assistant	–	
7.	Recommendation by Head of Department and Dean of K/C/D/I	✓	

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PART A – PERSONAL DETAIL OF APPLICANT

1. Name: SARAH YASMIN BINTI MOHAMAD
2. Academic Title: DR Kull./Dept.: KOE / ECE
3. Salary Grade: DS51 Staff No. / Matric No.: 7441
4. I/C No / Passport No: 840614-10-5766 Status of appointment: CONFIRMED

PART B – DETAIL OF SEMINAR / CONFERENCE / WORKSHOP/ VISIT / DATA COLLECTION

1. Title : 2019 IEEE ASIA-PACIFIC CONFERENCE ON APPLIED ELECTROMAGNETICS (APACE 2019)
2. Date and Duration : 25-27 NOV 2019
3. Venue : HATTEN HOTEL MELAKA
4. Name of Organizer : IEEE MALAYSIA AP/MTT/EMC JOINT CHAPTER
5. Nature of Participation : Paper Presenter / ~~Discussant / Chairperson / Participant~~
6. Title of paper presentation : A COMPACT AND LIGHTWEIGHT MICROSTRIP ANTENNA ARRAY WITH WILKINSON POWER DIVIDER FOR X-BAND APPLICATION AT 9.5GHz.
7. Detail of Seminar / Conference / Workshop / Visit attended in the last **TWO (2) years**

Title of Seminar / Conference / Workshop / Visit	Venue	Date		Source of Sponsorship
		From	To	

8. Please specify the reason why you should attend the seminar / conference / workshop / visit / data collection

GRANT REQUIREMENT

PART C – FINANCIAL IMPLICATION

Detail of financial incurred:

Description	Amount (RM)	Vote	Remarks
i. Registration Fee	1850	29000	
i. Air tickets		21000	
ii. Hotel / Lodging	700		} 3 DAYS 2 NIGHTS
iii. Food	150		
iv. Others	200		GMS & TOL
Total	2900		

PART D – SOURCE OF FINANCIAL SUPPORT

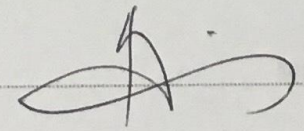
Detail of Research Grant

Project ID : RACER/19-053-0053

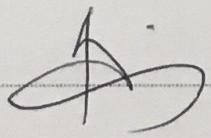
Project Title : STRUCTURAL STUDIES OF GLASS POLYMER COMPOSITE FOR MORE ROBUST FLEXIBLE WEARABLE ANTENNA VIA INJECTION MOULDING PROCESS

PART E – DECLARATION BY APPLICANT

I hereby affirm that all information stated above is correct. The University approval is void if information so provided is false.

Applicant's Signature :  Date: 21/11/2019

VERIFIED BY:

Principal Researcher's Signature :  Date: 21/11/2019

Name : DR. SARAH YASMIN MOHAMAD
Assistant Professor
Department of Electrical and Computer Engineering
Kulliyyah of Engineering
International Islamic University Malaysia

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Revision: 00
Effective Date: 5/9/2019

PART E – RECOMMENDATION

HEAD OF DEPARTMENT

Recommended / ~~Not Recommended~~

Comment:

Signature : Date: 22/10/2019

Name & Official Stamp :

PROF. DR. MOHAMED HADI HABAEBI
Head
Department of Electrical and Computer Engineering
Kulliyyah of Engineering
International Islamic University Malaysia

DEAN OF KULLIYYAH / CENTRE / DIVISION / INSTITUTE

Recommended / Not ~~Recommended~~

Comment:

RACER Grant

Signature : Date: 22/11/2019

Name & Official Stamp :

PROF. DR. AHMAD FARIS ISMAIL
Dean
Kulliyyah of Engineering
International Islamic University Malaysia

PART F – APPROVAL

RESEARCH MANAGEMENT CENTRE, IIUM

APPROVED / NOT APPROVED

Comment:

Signature : Date:

Name & Official Stamp :

SARAH YASMIN BINTI MOHAMAD . <smohamad@iium.edu.my>

[APACE 2019] Notification of Acceptance of paper #1570589464 ('A Compact 9.5 GHz Microstrip Antenna Array with Wilkinson Power Divider')

1 message

contact@apmttemc.org <contact=apmttemc.org@edas.info> Sat, Oct 19, 2019 at 3:24 PM
Reply-To: contact@apmttemc.org
To: Najmin Mohamed <najmin.md@live.iium.edu.my>, Sarah Yasmin Mohamad <smohamad@iium.edu.my>, Norun Abdul Malek <norun@iium.edu.my>, Farah Nadia Mohd Isa <farahn@iium.edu.my>

Dear Ms. Najmin Mohamed,

We are pleased to inform you that the submitted paper #1570589464 ('A Compact 9.5 GHz Microstrip Antenna Array with Wilkinson Power Divider') has been ACCEPTED for presentation at the 2019 IEEE Asia-Pacific Conference on Applied Electromagnetics (APACE) (APACE 2019). You are hereby invited to participate and give an oral presentation of the paper at APACE 2019 that will be held from 25 to 27 November, 2019, in Malacca, Malaysia. This notification email serves as our formal acceptance of your paper as well as an invitation to present your work at 2019 IEEE Asia-Pacific Conference on Applied Electromagnetics (APACE).

The decision was the result of peer-review process by the APACE 2019 Technical Program Committee that comprises more than 500 reviewers from all over the world. You are required to read comments from reviewers and make necessary corrections where appropriate as suggested for the Final Manuscript submission. Your paper may still be rejected if this is not respected. Reviewers' comments are included at the end of this notification email or can be found at https://www.edas.info/showPaper.php?m=1570589464.

At least one of the authors is required to PRE-REGISTER, pay the REGISTRATION FEE and complete the online IEEE Copyright form in EDAS, before uploading the FINAL MANUSCRIPT. The deadline for the Final Manuscript submission is NOVEMBER 15, 2019. Information about the registration procedures and fees, and instructions for final manuscript preparation and submission is available at the APACE 2019 website (http://apace2019.apmttemc.org).

We would like to take this opportunity to thank you for choosing APACE 2019 to present your research results and look forward to see you in Malacca, Malaysia.

Regards,

Fauziahanim Che Seman
Chair

==========
REVIEWS
==========

======= Track Chair Review 1 =======

> *** Track Chair Recommendation: Track Chair Recommendation
Borderline Accept (3)

> *** Track Chair Comments: Track Chair Comments

To lengthen the introduction section. Critically highlight the importance of the design and new contribution compare to exisiting literature.

Please improve the presentation, advisable to plot the measured and simulated results in one graph and please explain their discrepancies

======= Review 2 =======

> *** Originality, Novelty & Contribution: Originality, Novelty and Contribution to Knowledge
Accept (8)

> *** Significance of Topic: Significance of topic and relevance to the conference scope
Weak Accept (6)

> *** Presentation: Clarity and Organisation of Content
Weak Accept (6)

> *** Detailed comments & Suggestions: Please provide detailed comments (major issues addressed in the paper, its degree of novelty, creativity and technical depth) and suggestions that will be helpful to the TPC for assessing the paper, as well as feedback to the authors to improve the final paper if accepted.

accepted for this conference

======= Review 3 =======

> *** Originality, Novelty & Contribution: Originality, Novelty and Contribution to Knowledge
Accept (8)

> *** Significance of Topic: Significance of topic and relevance to the conference

scope
Strong Accept (10)

> *** Presentation: Clarity and Organisation of Content
Accept (8)

> *** Detailed comments & Suggestions: Please provide detailed comments (major issues addressed in the paper, its degree of novelty, creativity and technical depth) and suggestions that will be helpful to the TPC for assessing the paper, as well as feedback to the authors to improve the final paper if accepted.

Please follow the authors guideline manuscript template given in the APACE2019 website for reference, figure, table in text form.

======= Review 4 =======

> *** Originality, Novelty & Contribution: Originality, Novelty and Contribution to Knowledge
Neutral (5)

> *** Significance of Topic: Significance of topic and relevance to the conference scope
Weak Accept (6)

> *** Presentation: Clarity and Organisation of Content
Weak Reject (4)

> *** Detailed comments & Suggestions: Please provide detailed comments (major issues addressed in the paper, its degree of novelty, creativity and technical depth) and suggestions that will be helpful to the TPC for assessing the paper, as well as feedback to the authors to improve the final paper if accepted.

The authors present a microstrip antenna array with Wilkinson Power Divider. Generally, the paper is not written and organized well. Some revisions of this paper are shown below:

1. This reviewer recommends the authors to revise the paper and clearly indicate what is novel about this work for both antenna array and power divider and what makes it different from other similar work in the literature.
2. In the introduction, author must add several references, its wonder that there is no single reference in your introduction
3. This reviewer recommends to replot your measured and simulated result in one figure.
4. In Fig 5, the width of transmission line is 2.3 mm which is NOT suitable with 50 ohm impedance matching
5. Some other reference are highly needed, such as in Section III (To achieve an excellent isolation) please add reference.
6. There are some typo mistakes which need to be corrected such as
7. References are not aligned. please check IEEE format

======= Review 5 =======

> *** Originality, Novelty & Contribution: Originality, Novelty and Contribution to Knowledge
Strong Reject (0)

> *** Significance of Topic: Significance of topic and relevance to the conference scope
Neutral (5)

> *** Presentation: Clarity and Organisation of Content
Reject (2)

> *** Detailed comments & Suggestions: Please provide detailed comments (major issues addressed in the paper, its degree of novelty, creativity and technical depth) and suggestions that will be helpful to the TPC for assessing the paper, as well as feedback to the authors to improve the final paper if accepted.

The authors state that the paper focuses on the design of an antenna array and wilkinson power divider. However, very little information on the design methodology is discussed.

The measurement results do not match well with simulation.

There is apparently no significant improvement in gain and radiation pattern.

To evaluate the performance, the antenna array should be measured in combination with the feeding network instead of measuring a single element on the array itself.

The demonstration of the results makes the reader hard to follow. For comparison between measurement and simulation results, the curves should be plotted on the same graph and on the same scale.

The authors did not explain why the ground plane on the Wilkinson divider is missing. Is that an intention or else a design mistake?

======= Review 6 =======

> *** Originality, Novelty & Contribution: Originality, Novelty and Contribution to Knowledge
Weak Reject (4)

> *** Significance of Topic: Significance of topic and relevance to the conference scope
Weak Accept (6)

> *** Presentation: Clarity and Organisation of Content
Weak Reject (4)

> *** Detailed comments & Suggestions: Please provide detailed comments (major issues addressed in the paper, its degree of novelty, creativity and technical depth) and suggestions that will be helpful to the TPC for assessing the paper, as well as feedback to the authors to improve the final paper if accepted.

1. The proposed work seems not providing sufficient novel contribution. the work presented in this paper seems too simple, no sufficient discussion for the experimental results, and no comparison with state of the other work.
2. Some pictures in this paper are very illegible, it is strongly suggested to process those pictures by professional drawing software.
3. The introduction seems so short that it cannot clearly state the background and motivation.
4. The format of the manuscript is messy and not the standard IEEE paper format.

======= Review 7 =======

> *** Originality, Novelty & Contribution: Originality, Novelty and Contribution to Knowledge
Accept (8)

> *** Significance of Topic: Significance of topic and relevance to the conference scope
Accept (8)

> *** Presentation: Clarity and Organisation of Content
Accept (8)

> *** Detailed comments & Suggestions: Please provide detailed comments (major issues addressed in the paper, its degree of novelty, creativity and technical depth) and suggestions that will be helpful to the TPC for assessing the paper, as well as feedback to the authors to improve the final paper if accepted.

The paper presents a design of a two-element microstrip antenna array with a compatible 1:2 Wilkinson Power Divider operating at 9.5 GHz for X-band communication. The paper shows a good performance in term of gain and bandwidth. Besides that the simulated result has verified by measurement and the comparison between them reveal fair agreement.

A Compact and Lightweight Microstrip Antenna Array with Wilkinson Power Divider for X-band Application at 9.5 GHz

Najmin Mohamed, Sarah Yasmin Mohamad [#1], Norun Farihah Abdul Malek[#], and Farah Nadia Mohd Isa[#]

[#]*Microwave, Communication and Information System Engineering (MCISE) Research Group,*
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***Abstract* — In this paper, a two-element microstrip antenna array with a compatible 1:2 Wilkinson Power Divider operating at 9.5 GHz for X-band application is presented. The design, simulation and optimization of this work are performed using Computer Simulation Technology (CST) Microwave Studio. The proposed design is shown to exhibit good simulation performances with return loss of -38.21 dB, bandwidth of 493 MHz, and gain of 7.08 dB. Coupled with the antenna array, a 1:2 Wilkinson Power Divider is then designed, simulated and optimized. The simulation result of the power divider exhibits three modes of resonance at 8.0-8.5 GHz, 9.09-10.28 GHz and 11.2-11.5 GHz. The operating frequency at 9.5 GHz resulted an equal power division with insertion loss less than 3.68 dB and less mutual coupling as the isolation factor is at 16.23 dB. The antenna array and Wilkinson Power Divider configuration produced an overall dimension of 83.14 mm × 67.34 mm, which realized a portable solution for the parabolic reflector antenna.**

Index Terms — Microstrip Antenna, Array Antenna, Wilkinson Power Divider, X-Band, Compact, Lightweight

I. INTRODUCTION

Parabolic reflector antennas have been one of the main choices for most of telecommunication usage for the past decades [1]. This is due to its ability to modify the radiation pattern of the radiating element by increasing the gain and directivity of the antenna [2]. However, evolvement in the military usage in the X-band range (8-12 GHz) requires an antenna that is compact, lightweight and portable, where it can be transported in backpacks or conformed on moving stations such as jib, automobile, aircraft or ship [3]. It was also mentioned by [3] that these antennas are very heavy and bulky, which is impossible to be mounted on a moving vehicle. The typical dimensions of the parabolic reflector antennas that were used for X-band application can reach up a dimension of 0.85–1.2m, and a weight up to 70 kg (Fig. 1) [4]. Also, this exclude the positioned case that can reach a weight of up to 40 kg, which is required to be used together with the parabolic reflector antenna (Fig. 1) [4].

In order to solve this problem, we propose that a microstrip patch antenna is used as an alternative to the parabolic reflector antenna due to its lightweight structure, smaller dimensions and easy to conform to any surfaces [1]-[2]. In this paper, a microstrip patch antenna is first simulated as a single element antenna, followed by a two-element array antenna. It follows that an array antenna needs to operate along with a compatible and reliable power divider. There have been numerous studies and on-going researches which explore the performance of microstrip antennas [5]-[7] array antennas together with power dividers [8]-[9] and those specifically used for X-band application [10]-[13]. In [14], a ten-element microstrip patch array antenna is shown to operate in the X-band frequency region at 9.5 GHz with a gain and directivity of 16.5 dB and 17.7 dB, respectively. The antenna configuration has a compact size of 285 mm × 59.275 mm. However, only simulation part is shown and without the design and simulation of a power divider.

Fig. 1. An example of an X-band parabolic reflector antenna with its positioned case [4].

In this work, we designed, simulated and optimized a microstrip array antenna and its compatible Wilkinson Power Divider (WPD). The antenna configuration can be operated in the X-band communication range specifically at 9.5 GHz, which targeted to military and government usage. The proposed antenna is shown to exhibit good radiation performances with a much compact size and lightweight structure compared to the typical huge parabolic reflector antenna.

II. Design of the Antenna and Wilkinson Power Divider

A. Single Element Antenna

This work concentrated on the design of a microstrip patch antenna to be used in the X-band region of 9.5 GHz. The microstrip patch antenna is initially designed and simulated as a single element by using a specialized microwave tool, the Computer Simulation Technology (CST) Microwave Studio. The Rogers' RT/duroid 5880 is used as the substrate with a dielectric constant of ε_r = 2.2, loss tangent of δ = 0.0009 and thickness of t = 1.574 mm. The optimum dimensions that met the desired performance of this research are displayed in Table 1 and the design in front view and isometric view are illustrated in Fig. 1 and Fig. 2, respectively.

TABLE 1
DIMENSIONS OF THE SINGLE ELEMENT ANTENNA

Parameters	Values (mm)
Rectangular patch width	11.03
Rectangular patch length	9.32
Transformer width	1.20
Transformer length	5.61
Feeding width	5.04
Feeding length	4.99
Dielectric and ground plane width	20.00
Dielectric and ground plane length	24.27
Dielectric thickness	1.575

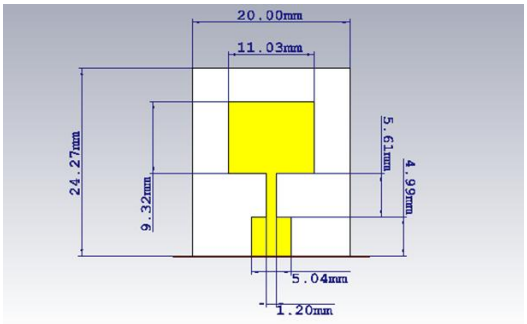


Fig. 2. Front view of the single element antenna.

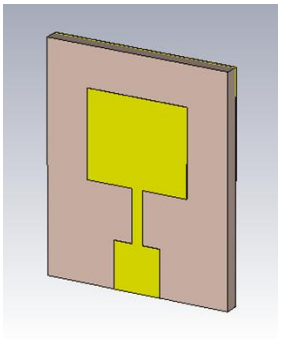


Fig. 3. Isometric view of the single element antenna.

B. Two –Element Antenna Array

In order to increase the gain and directivity, the single element antenna is further modified to be an array with two elements. In designing an array, arrangement and spacing between the antennas are crucial in determining the radiation performances. As this study also focus on designing the WPD, a linear array arrangement with parallel series feed is chosen. There are various of research findings [1,8,15] reported that proposed and discussed contradict results for different length of spacings. These certainly shows that the findings do not apply to all cases as different studies referred to various design configuration of antenna. Therefore, after several optimizations on the spacing, 2λ is chosen in this work as it shows a relatively good performance that could satisfy the objectives of this particular work. Fig. 3 shows front view of the two-element antenna array configuration with a full dimension of 83.14 mm × 24.27 mm. Fig. 4 shows the prototype of the two-element antenna array using a chemical etching fabrication process.

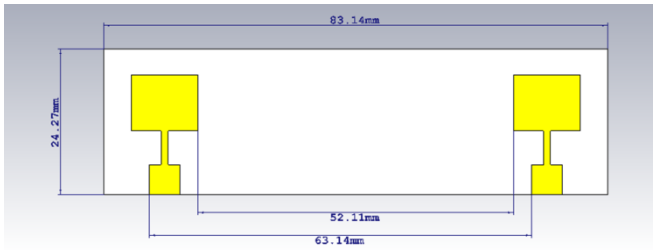


Fig. 4. Front view of the two-element antenna array.

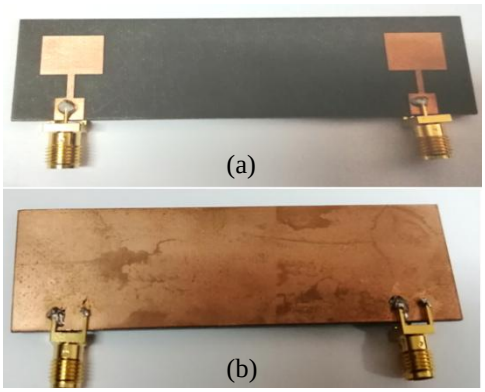
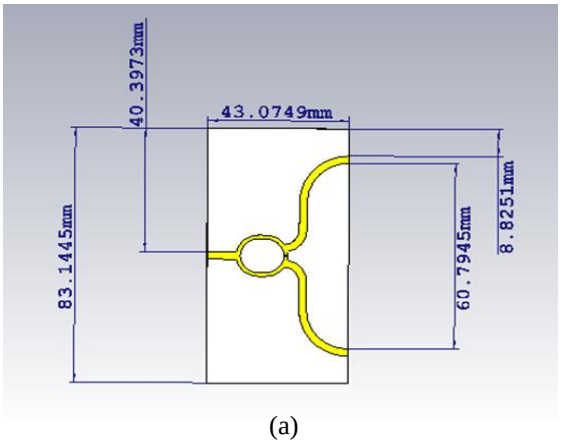


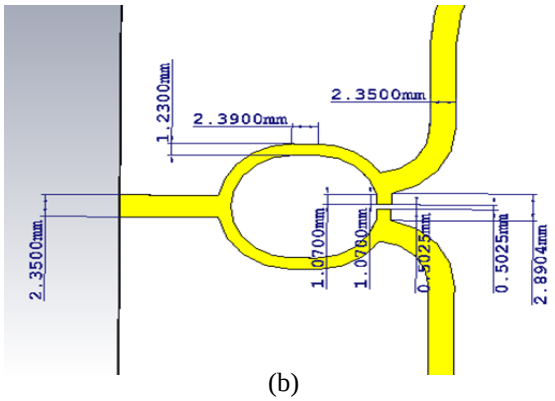
Fig. 5. The fabricated two-element antenna array (a) front, and (b) back.

C. Wilkinson Power Divider (WPD)

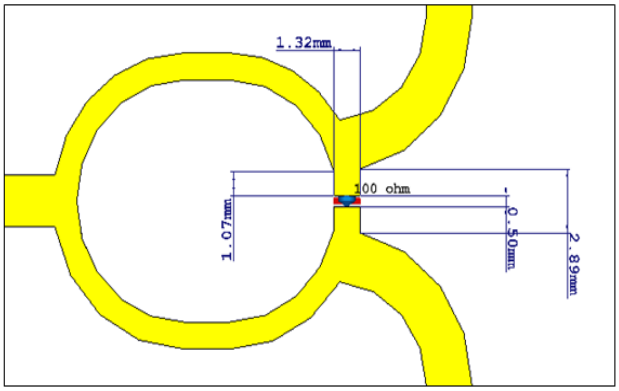
In order for a WPD to operate at the desired frequency, the length of the quarter wave transformer arm, $\sqrt{2}Z_0$ should be at $\lambda/4$. The dielectric substrate used for the WPD is the same as the antenna; Rogers' RT/duroid 5880 with a dielectric constant of ε_r = 2.2, loss tangent of δ = 0.0009 and thickness of t = 1.574 mm. To achieve an excellent isolation factor in power divider, a 100 Ω resistor (Fig. 5(c)) is used with a case size of 0805 due to its high availability in the market. The gap dimension should be designed based on the standard size of land pattern for a 0805 case size of surface mount resistor. Therefore, this study refers to the land pattern dimension of Vishay PCAN0805 [16]. Finally, the complete design of the WPD is constructed (Fig. 6).



(a)



(b)



(c)

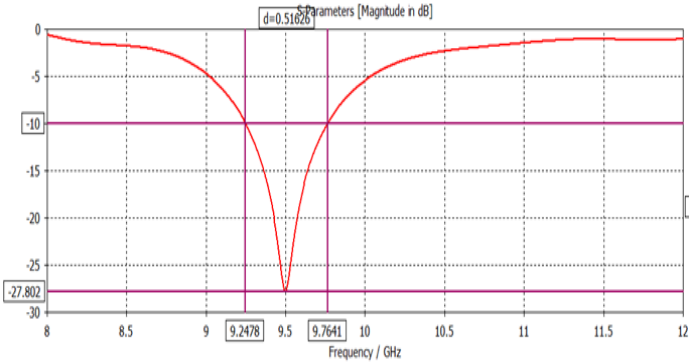
Fig. 6. The WPD (a) full view showing outer dimensions, (b) close up view showing WPD dimensions, and (c) close up view showing the 100 Ω resistor.

III. Performance Results

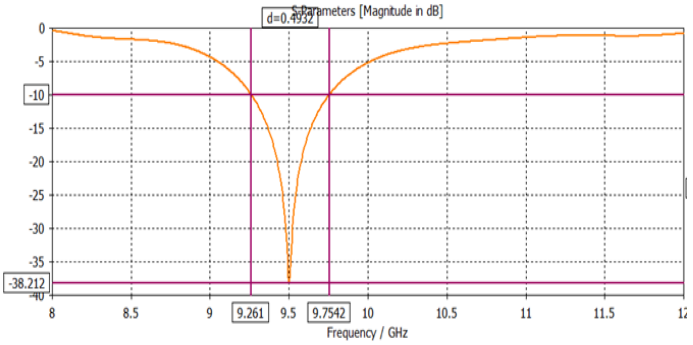
The simulated results of the rectangular microstrip patch antenna (both single and two-element), and WPD are presented. These results are then compared with the measurement result of the two-element antenna array and WPD.

A. Single element antenna and two-element antenna array

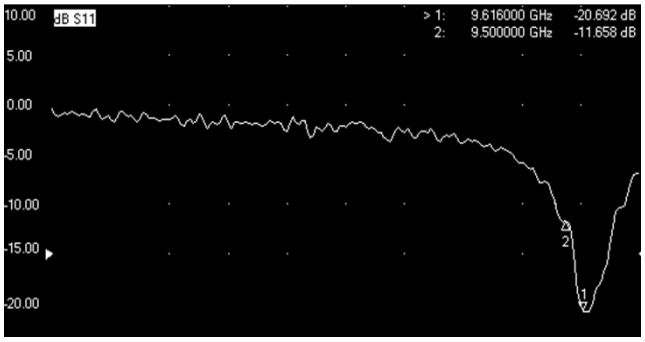
The simulated return loss of the single element (Fig. 7(a)) and two-element array (Fig. 7(b)) resonate at 9.5 GHz, with S_{11} = -27.80 dB and S_{11} = -38.21 dB, respectively. There is an increment of 10.41 dB (37.44%) when the array is constructed. The measured return loss of the fabricated two-element array (Fig. 7(c)) is 11.66 dB at 9.5 GHz. It can also be observed that the bandwidth of the two-element array (493 MHz) appeared to be smaller than the single element (516 MHz). This decrement of 23 MHz of bandwidth might be due to mutual coupling between the adjacent patch [14].



(a)



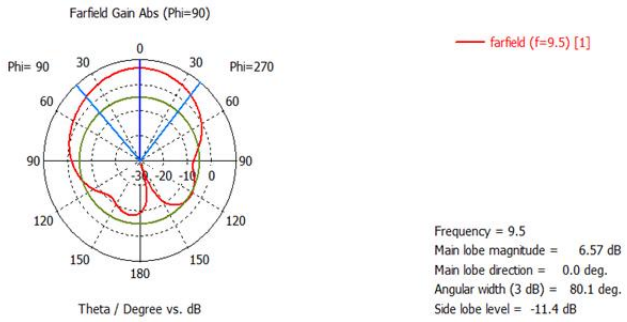
(b)



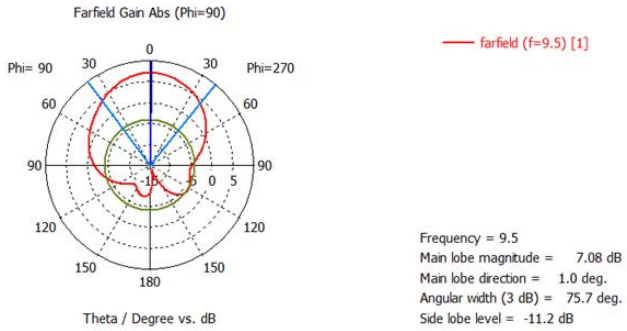
(c)

Fig. 7. The return loss of the (a) simulated single element antenna, (b) simulated two-element antenna array, and (c) measured two-element antenna array.

Fig. 8 shows the radiation pattern of the single element antenna and two-element antenna array. It can be seen from the figure that both single and two-element array resulted a directive radiation pattern. The two-element array produced a slightly higher gain of 7.08 dB compared to the single element with 6.57 dB. This is an increment of 0.51 dB (7.76%) in the respective plane.



(a)



(b)

Fig. 8. The radiation pattern of the (a) single element antenna, and (b) two-element antenna array.

Table 2 summarized the overall simulated results of the single element antenna and two-element antenna array, together with the measured results of the fabricated two-element array. The table showed that the fabricated two-element array exhibits a decrease of 26.55 dB. This is due to the divergence of 0.1 GHz resonance frequency (9.6 GHz, instead of 9.5 GHz).

TABLE 2
PERFORMANCE RESULTS OF THE SINGLE ELEMENT ANTENNA AND TWO-ELEMENT ANTENNA ARRAY IN TERMS OF RETURN LOSS, BANDWIDTH, GAIN, ANGULAR WIDTH, AND SIDE-LOBE LEVEL AT 9.5 GHZ

Parameters	**Simulated single element antenna**	**Simulated two-element antenna array**	**Measured two-element antenna array**
Return loss (dB)	-27.80	-38.21	-11.66
Bandwidth (MHz)	516	493	410
Gain (dB)	6.57	7.08	N/A
Angular width (º)	80.1	75.7	N/A
Side-lobe level (dB)	-11.4	-11.2	N/A

B. Wilkinson Power Divider

The simulated return loss curve of the WPD in Fig. 9 shows three resonant modes centered around 8.28 GHz, 9.58 GHz and 11.31 GHz. At 9.58 GHz, the bandwidth observed is 1.19 GHz ranging from 9.09–10.28 GHz (for S_{11} <-15 dB). The targeted operating frequency of 9.5 GHz shows that the return loss is S_{11} = -23.1 dB. Thus, it can be said that the WPD is compatible and reliable with the two-element antenna array.

For insertion loss analysis, both parameters of S_{21} and S_{31} ideally should be equal to -3 dB [8]-[9]. From Fig. 10, it is shown that the S_{21} = -3.54 and S_{31} = -3.68. This value has little difference of around 0.54–0.68 dB from the ideal split power of the two-element WPD.

For isolation factor analysis, it is expected that a higher isolation factor is obtained in order to achieve a lower mutual coupling [8]-[9]. The simulated S_{23} and S_{32} (Fig. 11) of the WPD is shown to be -16.23 dB at 9.5 GHz.

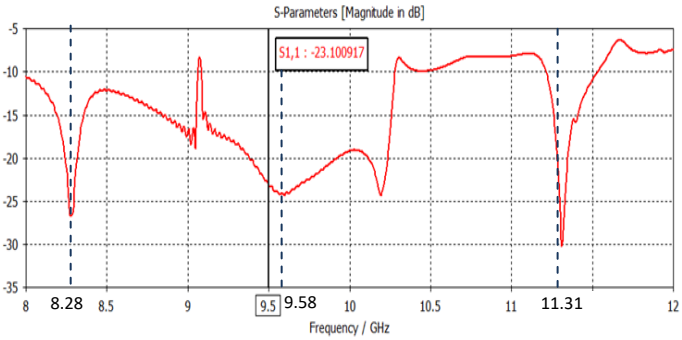


Fig. 9. The return loss (S_{11}) of the WPD.

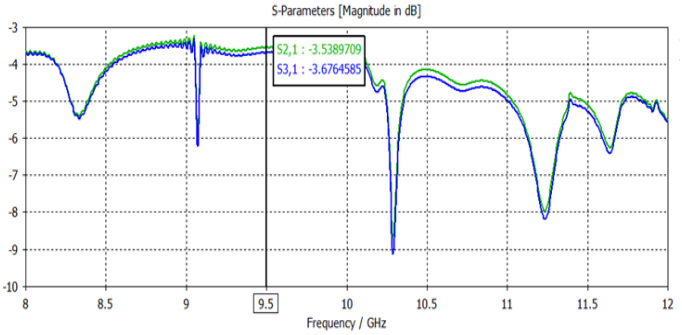


Fig. 10. The insertion loss (S_{21} and S_{31}) of the WPD.

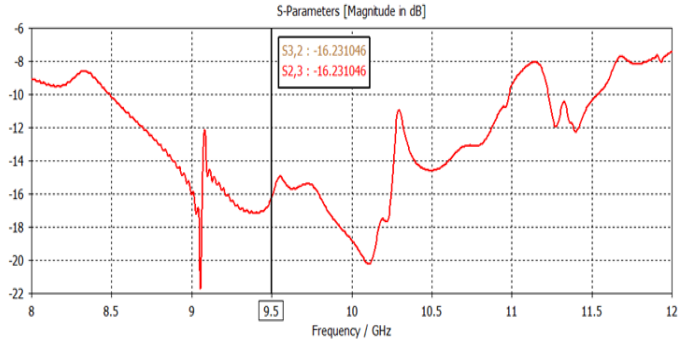


Fig. 11. The isolation factor (S_{23} and S_{32}) of the WPD.

Table 3 shows the overall performance of the WPD in terms of resonant frequency (GHz), return loss (dB), insertion loss (dB) and isolation factor (dB) at 9.5 GHz. It can be summarized that the designed WPD is compatible with the two-element antenna array.

TABLE 3
OVERALL PERFORMANCE OF THE WPD IN TERMS OF RESONANT FREQUENCY, RETURN LOSS, INSERTION LOSS AND ISOLATION FACTOR AT 9.5 GHZ.

Parameters	Target	Result
Resonant frequency (GHz)	9.5	8.0–8.5 9.09–10.28 11.2–11.5
Return loss (dB)	< -10	-23.1
Insertion loss (dB)	-3	-3.54 to -3.68
Isolation factor (dB)	< -10	-16.23

IV. CONCLUSION

In this paper, a two-element microstrip antenna array for X-band communication at 9.5GHz is designed and simulated. The simulation performance of the two-element array have shown a good return loss of -38.21 dB, a bandwidth of 493 MHz, a gain of 7.08 dB, an angular width of 75.7º and side-lobe level of -11.2 dB. The measured return loss of the antenna array achieved a fair agreement with the simulated result. The overall dimension of the antenna array is 83.14 mm × 24.27 mm.

A Wilkinson Power Divider (WPD) that is compatible with the antenna array has also been designed and simulated. The WPD exhibit a reliable performance with a return loss of -23.1 dB, an almost equal split of power to the output port with an insertion loss value of 3.54–3.68 dB and a positively less mutual coupling at isolation factor of -16.23 dB. The overall dimension of the WPD is 83.14 mm × 43.07 mm.

Thus, the two-element antenna array and the WPD configuration gave an overall dimension of 83.14 mm × 67.34 mm. Therefore, the proposed antenna configuration can be an alternative solution for the typical X-band antenna in terms of mobile utilization, as it deliver a more compact size and lightweight structure than the parabolic reflector antenna.

ACKNOWLEDGEMENT

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Shanghai Jiao Tong University

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Chiba Institute of Technology

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FINANCIAL SUMMARY DETAILS

Project ID	RACER19-053-0053
Title	Structural Studies of Glass-Polymer Composite for More Robust Flexible Wearable Antenna via Injection Moulding Process
Kulliyyah	Kulliyyah of Engineering
Duration	24

Researchers	
DR. Sarah Yasmin Binti Mohamad (7441)	Principal
PROF. DR. Md. Rafiqul Islam (3802)	Co-Researcher
PROF. DR. Ahmad Fadzil Bin Ismail (5068)	Co-Researcher
DR. Siti Noorjannah Bt. Ibrahim (3823)	Co-Researcher
DR. Siti Hajar Binti Yusoff (7329)	Co-Researcher

Fund Summary

Vote Code	Description	Initial Allocation (RM)	Current Allocation (RM)	Disburse (RM)	Committed (RM)	Balance (RM)
V11000	Research Assistant (RA)	0.00	28,800.00	0.00	0.00	28,800.00
V21000	Travelling Expenses And Subsistence	0.00	4,500.00	0.00	0.00	4,500.00
V23000	Communication and Utilities	0.00	0.00	0.00	0.00	0.00
V24000	Rental	0.00	0.00	0.00	0.00	0.00
V27000	Research Materials & Supplies	0.00	4,000.00	0.00	0.00	4,000.00
V28000	Maintenance services	0.00	0.00	0.00	0.00	0.00
V29000	Professional Services & Other Services including Printing & Hospitality, Honorarium for subjects	0.00	2,600.00	0.00	0.00	2,600.00
V35000	Equipment	0.00	0.00	0.00	0.00	0.00
V50000	Goods and Services Tax (GST)	0.00	0.00	0.00	0.00	0.00
Total		**0.00**	**39,900.00**	**0.00**	**0.00**	**39,900.00**

Fund Received Detail

Receive Date	Description	Receipt No	Total	Vote Code
No records				

Fund Disbursed Detail

Disburse Date	Description	Supplier Name	Documentre	Total (RM)	Vote Code
20-11-2019	RESEARCH ADVANCEMENT RACER19-053-0053 REQUEST VOTE V27000 RM2500 V29000 RM2500	SARAH YASMIN BINTI MOHAMAD		5,000.00	A73107
Total Fund Disbursed				**5,000.00**	

Reconciliation Advancement Detail

Receive Date	Description	Receipt No	Total (RM)
No records			