

TITLE OF THE PROJECT

Optimized Phased Antenna Array Design for Enhanced performance in Sub-6 GHz 5G Application



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Session: BS Electronics Engineering

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Certification

This is to certify that [Amara jawad], [20abelt0886] and [Faiza Zahir], [20abelt0876] have successfully completed the final project [Optimized Phased Antenna Array Design for Enhanced performance in Sub-6 GHz 5G Application], at the [University of Engineering and Technology Peshawar Abbottabad campus], to fulfill the partial requirement of the degree [BS Electronics Engineering].

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Assistant professor

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Engr.Wajid Mehmood

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Dr. Adam Khan

Chairman**Abstract**

This study investigates the integration and excitation of a 1×4 microstrip linear phased antenna array in the C-frequency frequency (5-6 GHz) using Magneto Static Responsive Structures (MRSs) phase shifters for beam steering applications. The integration technique entails embedding MRS structures between two substrates to accommodate a greater number of MRS cavities, allowing for a wider range of possible phases. The array's performance is tested at main beam steering angles of 0, 10, and 15 degrees. Initially, the corporate feed network is loaded with MRS structures but without antennas to ensure that the desired phases are met. Patch antennas are then connected into the corporate feed network, along with embedded MRSs, to enable full wave modeling. The results from the entire wave simulation of the phased array are then compared to those of the directly excited array. The peak gain was tested for all combinations at scanning angles of 0, 10, and 15 degrees.

The close agreement of radiation patterns between MRS phase shifters excited array and the directly stimulated array demonstrates MRS phase shifters' ability to improve the performance and functionality of integrated phased arrays. This discovery confirms the possibility of utilizing MRS phase shifters in a variety of applications, particularly radar and satellite systems, where the increased gain and directivity characteristics of phased arrays can provide considerable benefits.

Undertaking

I certify that the project [Optimized Phased Antenna Array Design for Enhanced performance in Sub-6 GHz 5G Application] is our own work. The work has not, in whole or in part, been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged/ referred.

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We truly acknowledge the cooperation and help make by [Engr.Wajid Mehmood], **Assistant professor of [UET Abbottabad Campus]**. He has been a constant source of guidance throughout the course of this project. We would also like to thank [Eng. Muhammad Ayaz] from [**Lab Engineer**], [UET Abbottabad Campus] for his help and guidance throughout this project.

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Table of Contents

Certification		
i		
Abstract		
ii		
Undertaking		
iii		
Acknowledgement		
iv		
Table of Contents		
v		
List of Table		
vi		
List of Figures		
vii		
List of Acronyms		
viii		
List of Equations		
ix	Chapter	1
.....		1
1.1 Introduction		1
1.2 Statement of the problem		1
1.3 Goals		1
1.4 Motivation		1
1.5 Assumption and Dependencies		1
1.6 Methods		1
1.7 Report Overview		1
Chapter 2		
2		

2.1	Heading	2
2.1.1	Heading	2
2.1.2	Heading	2
Chapter 3	
3		
3.1	Heading	3
3.1.1	Mathematical Equation	3
3.1.2	Heading	3
Chapter 4	
4		
4.1	Proposed Solution	4
Chapter 5	
5		
5.1	Discussion	5
Chapter 6	
6		
6.1	Summary and Future work	6
Chapter 7	
7		
7.1	Conclusion	7

List of Equations

Equation	1:Expansion	of
sum.....		3

Chapter 1

- 1.1 Introduction**
- 1.2 Statement of the problem**
- 1.3 Goals**
- 1.4 Motivation**
- 1.5 Assumption and Dependencies**
- 1.6 Methods**
- 1.7 Report Overview**

Chapter 2

2.1 Heading

Headings and subheadings provide structure to a document. They signal what each section is about and allow for easy navigation of the document. Use a hierarchical structure for headings and sub-headings.



Figure 1:Computer System

2.1.1 Heading

2.1.2 Heading

Chapter 3

3.1 Heading

3.1.1 Mathematical Equation

$$n = 1 + nx + (n-1)^2 + \dots \quad \frac{\quad}{1!} \quad \frac{\quad}{2!}$$

Equation 1:Expansion of sum

3.1.2 Heading



Figure 2:Computer System

Chapter 4

4.1 Proposed Solution

Your proposed solution should relate the current situation to a desired result and describe the benefits that will accrue when the desired result is achieved. So, begin your proposed solution by briefly describing this desired result.

Activity	Optimistic (a)	Most Likely (m)	Pessimistic (b)	Expected (Te)
A	21	23	25	23
B	0.5	1	1.5	1
B	0.5	1	1.5	1

Table 1:PERT Activity Time estimate table

Chapter 5

5.1 Discussion

When you are ready to write your discussion, you have already introduced the purpose of your study and provided an in-depth description of the methodology. The discussion informs readers about the larger implications of your study based on the results.

A successful discussion section puts your findings in context. It should include:

1. The results of your research,
2. A discussion of related research, and
3. A comparison between your results and initial hypothesis.

Chapter 6

6.1 Summary and Future work

A summary of a thesis/project is like an abstract of a research paper. Basically, the purpose of the summary is to give the reader an overview of the main points of your thesis/project. Generally, the summary is about 200-350 words. The summary should include the following points:

1. What is the thesis about?
2. What is the purpose of the project/thesis?
3. What were the methods used to research the information?
4. What are the results, conclusions, and recommendations that the thesis presents?

The future work section is a place for you to explain to your readers where you think the results can lead you. What do you think are the next steps to take? What other questions do your results raise? Do you think certain paths seem to be more promising than others?

Chapter 7

7.1 Conclusion

Conclusions are the last section people read in your paper, and therefore it is what they leave remembering. You need to make sure they walk away thinking about your

paper/project just the way you want them to. Your conclusions need to do three main things:

1. Recap what you did. In about one paragraph recap what your research question was and how you tackled it.
2. Highlight the big accomplishments. Spend another paragraph explaining the highlights of your results. These are the main results you want the reader to remember after they put down the paper, so ignore any small details.
3. Conclude. Finally, finish off with a sentence or two that wraps up your paper. I find this can often be the hardest part to write. You want the paper to feel finished after they read these. One way to do this, is to try and tie your research to the “real world.” Can you somehow relate how your research is important outside of academia? Or, if your results leave you with a big question, finish with that. Put it out there for the reader to think about to.

References

References are to be placed in square brackets and interlaced in the text. For example, "A comprehensive detail of how to prevent accidents and losses caused by technology can be found in the literature [1]. A project report / thesis cannot be accepted without proper references. The references shall be quoted in the following format:

The articles from journals, books, and magazines are written as:

- [1] Abe, M., S. Nakamura, K. Shikano, and H. Kuwabara. Voice conversion through vector quantization. *Journal of the Acoustical Society of Japan*, April 1990, E-11 pp 71-76.

-
- [2] Hermansky, H. Perceptual linear predictive (PLP) analysis for speech. Journal of the Acoustical Society of America, January 1990, pp 1738-1752.

The books are written as:

- [1] Nancy G. Leveson, Safeware System Safety and Computers, A guide to preventing accidents and losses caused by technology, Addison-Wesley Publishing Company, Inc. America, 1995.
- [2] Richard R. Brooks, S. S. Iyengar, Multi-Sensor Fusion Fundamentals and Applications with Software, The Prentice-Hall Inc. London, 1998.

The Internet links shall be complete URLs to the final article.

- [1] <http://www.pu.edu.pk/ucit/projects/seminars.html>

General Guidelines for Writing Project's Thesis

For convenient upload on PEC's e-Library

Page Setup

Page Size:	A4
Top margin:	1.00 inch or 2.54 cm
Bottom margin:	1.00 inch or 2.54 cm
Left margin:	1.00 inch or 2.54 cm
Right margin:	1.00 inch or 2.54 cm

Fonts and Styles:

Use a standard font such as Times New Roman, Arial, or Calibri

Font size should be 12 points for the main text. Use consistent font sizes and styles (bold, italics) for headings, subheadings, and content.

Footer:

Each page shall have a footnote "Page number, right align".

Header:

Each page shall have a header "Project/Thesis Title".

Chapter Startup:

Each chapter shall be numbered as Chapter 1, Chapter 2, etc.

Paragraph Formatting:

Single-spaced, Line entered paragraph, left align or justified.

List of

Line Spacing:

1.5 spacing is required for the text. Only footnotes, long quotations, bibliography entries (double space between entries), table captions, and similar special material may be single spaced.

Maintain consistent spacing between paragraphs

Images, Figures, Hyperlink:

Ensure that images, figures, and hyperlink are of high quality and are properly labeled.

Tables and Equations:

Format tables with clear column and row headings.

Provide captions for each Table.

Label equations and provide clear explanations.

Citations and References:

Follow a standardized citation style (e.g., APA, MLA, PEC etc.) for references.

Include a separate references section at the end of the document.

File Naming Convention:

Submitted files be named with a clear and concise title that reflects the content of the paper or thesis.

