

B.P. PODDAR INSTITUTE OF MANAGEMENT AND TECHNOLOGY



Title of project-

Designing of MIMO Antenna Array

Name of the Supervisor:

Dr. Sushmita Biswas

Academic Year: 2022-2023

SUBMITTED BY

- | | |
|-------------------------|----------------------------|
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Sec- B

Group No. - 11



Department of Electronics & Communication Engineering

TITLE: Designing of MIMO Antenna Array

AIM: To design MIMO Antenna Array

OBJECTIVE:-

- (i) To design Microstrip Antenna
- (ii) To use this Microstrip Antenna in practical scenarios

PO & PSO MAPPING:-

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	3	3	2	2	3	1	3	3	3	2

Note: Correlation levels are as defined:

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High). If there is no correlation, put “-”

JUSTIFICATIONS OF MAPPING:-

PO/PSO MAPPED	LEVEL OF MAPPING	JUSTIFICATION
PO1	1	In this project we have applied knowledge of MIMO Antenna to find solutions to our problem, an engineering specialization to the solution of problems related to MIMO antenna.
PO2	3	Identify, formulate, research literature to analyse MIMO antenna
PO3	3	In our work we have considered societal, and environmental considerations
PO4	3	We have taken the help of previously published research papers to implement a solution.

PO5	3	We are designing our project with the help of ANSYS High Frequency Structural Simulator (HFSS) software.
PO6	3	Our project is helpful for society. Basically it is used in Wireless Communication.
PO7	2	Our project has a big impact on wireless communication
PO8	2	We abided by the ethical principles and professional ethics while working on this project.
PO9	3	We made this project with good team management and good spirits.
PO10	1	We are able to clearly communicate our project through effective reports, design documentation and presentations
PO11	3	This project will help us to work as a team and inculcate professional skills in us.
PO12	3	This is part of lifelong learning and helps us to know more about antennas and how they are used in a variety of applications.
PSO1	3	This project will help us to acquire knowledge in Advance Communication engineering in wireless communication
PSO2	2	This project will help us in higher studies and research work.

SEMESTER WISE PLAN:-

ODD SEMESTER:

JOB	15 th - 31 st July	1 st - 15 th Aug	16 th - 31 st Aug	1 st - 15 th Sep	16 th - 30 th Sep	1 st - 15 th Oct	16 th - 31 th Oct	1 st - 15 th Nov	16 th - 30 th Nov
0 th Review			✓						
Learning HFSS Software	✓	✓							
Extensive Study of Microstrip Antenna				✓					
Designing a Microstrip Antenna					✓	✓			
Designing a Mimo Antenna							✓	✓	
Midterm Evaluation							✓		
Final Evaluation for Odd Semester									✓

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EVEN SEMESTER:

JOB	1 st - 31 th Jan	1 st - 28 th Feb	1 st - 31 st Mar	1 st - 30 th Apr	1 st - 15 th May	16 th - 30 th May
Further optimization and verification of results	✓		✓			
Midterm Evaluation		✓				
Writing the Paper				✓	✓	
Final Evaluation for Even Semester						✓

ABSTRACT:-

The current and future wireless communication systems, WiFi, fourth generation (4G), fifth generation (5G), Beyond5G, and sixth generation (6G), are mixtures of many frequency spectrums. Thus, multi-functional common or shared aperture antenna modules, which operate at multiband frequency spectrums, are very desirable. This project presents a design and analysis of compact Multiple Input Multiple Output (MIMO) microstrip antenna for Wireless Communication. A MIMO antenna is designed with size optimization considering the operating frequency at 2.4GHz. Required mathematical calculation has been done. The antenna is designed using ANSYS High Frequency Structural Simulator (HFSS) software. The proposed antennas were simulated. The antenna would be fabricated and results would be measured after the simulation. The result of this proposed compact MIMO microstrip antenna system shows a wide bandwidth, high data rate, and good amount of physical and virtual size reduction, which are promising proposed compact MIMO microstrip antenna well suitable for next generation wireless application systems.

MIMO technology is expected to be one of the key technologies in the field of 5G wireless communications. MIMO technology is one of the significant transmission terminologies for super charged 5G networks. Transmission tower will be equipped with multiple antennas. It will locate a particular user at a specific location and will transmit to that user using multiple antennas simultaneously. Change in user location can be tracked and user will be handled by the antennas located at the specific direction of user. It enables network operators to offers an uninterrupted service effectively.

**EXPECTED OUTCOME
(PATENT/PUBLICATION/PROTOTYPE/APP/OTHERS):**

Publication

**IMPACT ON SOCIETY (SAFETY
(HEALTH/ELECTRICAL)/SECURITY/ENVIRONMENTAL/BIOMEDICAL
APPLICATION/OTHERS):**

Electrical

TYPE OF PROJECT (HARDWARE/SOFTWARE/MIXED):

Software

**EXPECTED BUDGET (PROPOSED BUDGET/COST EFFECTIVE
SOLUTION):**

If we go for the fabrication process then budget will be required in future.

REFERENCES:-

- [1] C. A. Balanis, *Antenna Theory: Analysis and Design*, 2nd Ed. Wiley India Pvt. Limited, 2007.
- [2] <https://www.antenna-theory.com/antennas/patches/antenna.php>
- [3] <https://www.rfpage.com/mimo-technology-in-wireless-communication/>
- [4] Asif Khan, Suiyan Geng, Xiongwen Zhao, Zahoor Shah, Mishkat Ullah Jan, Mohamed Abdelkarim Abdelbaky. Design of MIMO Antenna with an Enhanced Isolation Technique. *Electronics* **2020**, 9(8), 1217.
- [5] N.O. Parchin, Y.I.A. Al-Yasir, A.H. Ali, I. Elfergani, J.M. Noras, J. Rodriguez, R.A. Abd-Alhameed. Eight-element dualpolarized MIMO slot antenna system for 5G smartphone applications. *IEEE Access* 2019, 7, 15612–15622.
- [6] Mohammad S. Sharawi, Muhammad Ikram, Atif Shamim. A two concentric slot loop based connected array MIMO antenna system for 4G/5G terminals. *IEEE Trans. Antennas Propag.* 2017, 65, 6679–6686.

Program Outcomes (POs):

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO):

1. Students will acquire knowledge in Advance Communication Engineering, Signal and Image Processing, Embedded and VLSI System Design.
2. Students will qualify in various competitive examinations for successful employment, higher studies and research.