PROJECT PROPOSAL FOR

STUDENT PROJECTS SCHEME

(2023-2024)

PROJECT TITLE

DESIGN AND ANALYSIS OF MINIATURIZED MICROSTRIP PATCH ANTENNA USING SUBSTRATE INTEGRATED WAVEGUIDE

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PROJECT GUIDE

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The Member Secretary,
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DESIGN AND ANALYSIS OF MINIATURIZED MICROSTRIP PATCH ANTENNA USING SUBSTRATE INTEGRATED WAVEGUIDE

I. INTRODUCTION:

A growing expansion of wireless applications operating at centimeter- and millimeter-wave (cm- and mm-wave) frequencies motivates the development of effective and affordably-priced technologies for manufacturing cm- and mm-wave components like antennas, filters, directional couplers, etc. A substrate integrated waveguide (SIW) is a promising candidate for implementing such devices. SIW exhibits advantages similar to conventional metallic rectangular waveguides (high quality factor, high power capacity, and self-consistent electrical shielding). The geometry of an SIW structure . The walls of the SIW are represented by two rows of metallized via holes with center-to-center distance *w*SIW embedded into a dielectric substrate and by the top and the bottom metallization of the dielectric substrate. In recent years, SIW technology has gained considerable attention and the SIW structure was intensively analyzed and studied . The field distribution in an SIW is similar to that in a conventional metallic rectangular waveguide (RWG). However, only TEm0 modes can exist in the SIW structure because of the gaps in the narrow walls.

OBJECTIVES:

- To Determine the required gain for your antenna system. This may be influenced by factors like communication range or link budget..
- Decide on the required bandwidth for your antenna to support the signal bandwidth of interest.
- Determine the required gain for your antenna system. This may be influenced by factors like communication range or link budget.

II. METHODOLOGY:

Define the problem statement or research objectives that your microstrip patch antenna with SIW aims to address. Conduct an extensive review of existing literature on microstrip patch antennas and SIWs.Identify relevant theories, designs, and applications to build a solid foundation for your research.

Clearly define the design specifications, including frequency of operation, bandwidth, gain, and polarization requirements.

Choose an appropriate substrate material for the SIW and microstrip patch antenna, considering factors like dielectric constant, loss tangent, and fabrication constraints.

Design the microstrip patch antenna's geometry, including dimensions, shape, and feed location, based on your design specifications.

Integrate the SIW into the microstrip patch antenna design, ensuring proper alignment and coupling between the SIW and antenna elements.
Use electromagnetic simulation software (e.g., CST Microwave Studio, HFSS) to model and simulate the proposed design. Perform parametric studies to optimize the antenna's performance.

Detail the step-by-step fabrication process, including substrate preparation, metallization, and SIW integration.Mention any specialized equipment or techniques required.

Construct a physical prototype of the microstrip patch antenna with SIW based on the optimized design.Set up measurement equipment (e.g., vector network analyzer) to measure the antenna's performance.Record data on parameters such as return loss, radiation patterns, and gain.

Analyze the measured data and compare it with simulation results to validate the antenna's performance.
Identify any discrepancies and possible reasons.If the measured performance does not meet the design specifications, refine the design through iterative optimizati

III. WORK PLAN:

Time line	Work
Phase 1	Analyzing the Literature survey & Calculate the Antenna dimensions with the help of design equations
Phase 2	Design the Proposed antenna in the CST or HFSS Simulation tool and get the desired antenna parameters
Phase 3	Fabrication of the Proposed antenna and measure the antenna parameters using Network analyzer
Phase 4	Comparison of Simulated result and Real-time measured result
Phase 5	Report Preparation

IV. BUDGET DETAILS:

Sl.No.	List of Apparatus	Price
1.	Proposed Antenna Fabrication	Rs.5000
2.	Gain measurement using Anechoic chamber	Rs.2500
3.	Return Loss and VSWR measurement using Network Analyzer	Rs.1500
	Total	Rs.9000

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