



Abstract of the Thesis



Name: SAMEER HASANBHAI MANSURI

Enrollment No: 219999915009

Faculty: Engineering and Technology

Discipline/Branch: Electronics and Communication Engineering

Title of the Thesis: "Design and Optimization of Reconfigurable Patch Antenna for Wireless Application"

Abstract

The continuous evolution of wireless communication systems, from early cellular networks to fifth-generation (5G) and emerging 6G technologies, has significantly increased the number of standards modern devices must support, including LTE, WLAN, WiMAX, Bluetooth, IoT, and Wi-Fi 6E/7. Meeting these requirements with conventional fixed-frequency antennas demands multiple dedicated radiating elements, increasing hardware complexity, aperture congestion, and mutual coupling. Reconfigurable antennas overcome these limitations by electronically modifying frequency, radiation pattern, or polarization within a single compact structure.

This thesis presents the design, simulation, and experimental validation of compact reconfigurable microstrip antennas employing PIN diode-based switching. Three configurations are proposed: a frequency-reconfigurable antenna achieving multi-band operation through modified current paths; a frequency and pattern reconfigurable antenna using a single diode with reduced switching complexity; and a dual PIN diode circular antenna incorporating a defected ground structure for enhanced frequency agility. The designs primarily target the sub-6 GHz spectrum, extending select bands beyond 6 GHz for LTE, WLAN, 5G, and IoT applications.

Each design is evaluated through reflection coefficient, bandwidth, gain, and surface current analysis. Selected prototypes are fabricated and measured using a Vector Network Analyzer and anechoic chamber, showing good agreement with simulations and favorable comparison with existing reconfigurable antennas reported in the literature.

This PhD thesis would be useful for **the development of compact and reconfigurable antennas capable of supporting multiple wireless communication standards, which can benefit future multiband and multifunctional wireless devices.**

- **List of Publications and Patents:**

- **Research Paper Publications:**

1. S. Mansuri and S. S. Modasiya, "Reliable Single Diode Patch Antenna with Dual Mode Frequency and Pattern Reconfigurability with Compliance Analysis", *Reliability: Theory & Applications*, vol. 20, no. 4 (89), pp. 1006–1016, 2025, doi:10.24412/1932-2321-2025-489-1006-1016. (Scopus Indexed)
2. S. Mansuri, S. Modasiya, and P. Panchal, "A Multi-Mode Frequency Reconfigurable Antenna for 5G and WLAN Applications," *Indian J. Natural Sciences*, vol. 14, no. 82, pp. 69167–69173, Feb. 2024. (Web of Science Indexed)

- **Indian Design Patents (Granted)**

3. S. H. Mansuri and S. S. Modasiya, "Octagonal frequency reconfigurable slotted patch antenna," *Indian Design Patent* 440489-001, Jun. 19, 2025.
4. S. H. Mansuri and S. S. Modasiya, "Slotted triangular frequency reconfigurable patch antenna with stubs," *Indian Design Patent* 440491-001, Dec. 11, 2025.

- **Patent Applications (Published)**

5. S. H. Mansuri, S. S. Modasiya, et al., "Reconfigurable antenna design using Slotted Circular Patch (CMSA) with 2 PIN Diodes," *Indian Patent Application* 202621073063, *The Patent Office Journal*, no. 30/2026, Jul. 24, 2026.