

Chapter 10

A Study of Different 5G Reconfigurable Antennas for Communication: Futuristic Glimpse for 6G

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ABSTRACT

This chapter specifies a concise review of recent research and development in the context of reconfigurable antenna. An attempt has been made to elaborate the distinct types of the 5G reconfigurable antenna with vital technique of the reconfigurability since from its evolution. Several significant prospects of 5G antennas are described to enhance antenna characteristics. Some basic concepts, theories, advantages, disadvantages, applications, and requirements of the Adaptive and MIMO antenna are discussed along with historical accomplishments. These systems can be the promising candidates for next generation network. This paper also provides a futuristic glimpse of UM-MIMO for 6G purpose.

INTRODUCTION

An antenna is a word that sounds extremely small out and out, but internally it is the backbone of the modern wireless communication system. It has several advantages over the enhancement of the quality

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of the signal to the trans-receiver terminal. It is an energy conversion device that interfaces between the transmission line and the free space. The modern communication system has the advantage over the conventional one in suppressing the unwanted signal and enhancing the main lobe. When we look back toward the antiquity of the antenna, the electromagnetic theory of J.C. Maxwell webbed out the new path in the field of communication through Maxwell's Equation. His authoritative concept regarding similar traveling Speeds of the electromagnetic and the light wave is the key for communication and related applications. G. Marconi uses this concept to successfully transmit the waves over a significant distance, even more than 2k km. He uses the antenna with more than 60 vertical wires with horizontal support between two wooden poles of 60m and the receiver antenna design on the other side. It is the aurora period of the antenna where manual concepts are more (Balanis 1982). Although the Second World War had a disgraceful effect on the world's socio-economic development, for the antenna and related fields, there is the penetration of new and advanced technology, which opened the door to using an antenna in space communication, radar, and remote sensing. From here, the gradual shifting of the antennal from the secondary to the primary domain happens. It also attracts several engineers to work in this domain. The overall efficiency of the antenna improves the broadband pattern, and the antenna impedance characteristic is enhanced to 40:1 from that of 2:1 (Balanis 2008). Advancement in the field of the antenna makes this field much more interesting than earlier, which not only boosts the engineer's confidence level but also prohibits the hit and trial method of designing and fabrication. The evolution of new types of antenna's, especially microstrip antenna's in the 1970s, reduces the cost, weight, and size to a great extent with excellent interfacing with the surface also, although the aspect of disadvantage is also not ignored, which includes reduced efficiency, minute bandwidth, and crushed power handling capabilities (Suman and Mishra, 2022). It is an antenna with a substrate arranged on the ground plane with the well-calculated length, width, and shape of the patch. An appropriate feeding technique helps in the smooth and efficient working of the Micro-Strip Patch type antenna. It is reported that the antenna designed previously is dedicated to a single application. For multiple applications, multiple antenna's are supposed to fabricate, making the entire system more expensive, bulky, and too complex. From here, the concept of reconfigurability emerged where a single antenna adjusts itself concerning the requirement and the need condition. Without the critical concept of reconfigurability, the antenna's performance is limited. Reconfigurable antennas' capacity to tune resonances, change polarisation, and modify radiation patterns makes their development critical in modem telecommunication system's.

Motivation and Purpose of the Work

There have been numerous challenges have been documented in wireless mobile communication from the first generation to the fourth generation, particularly in terms of bandwidth and data speed. After the adoption of '3G,' the need for a new generation of mobile communication is becoming apparent. With Coma LTE and WIMAX AKTU technology, 4G was developed, with data streaming speeds ranging from 10 to 20 Mbps (Chandan et al., 2021). It is, in fact, a data system whose primary goal is to meet rising subscriber demand. During these times, applications such as Netflix and other multiplayer services are also launched. Users now want more and more data to fulfill their wishes, and they expect it to be available on their mobile devices. They also hope to manage all web apps from their mobile device. In 4G, there is no answer for Internet of Things (IoT) technology, and it is insufficient to meet current expectations and scientific progress in the upcoming day. These concerns were tightly managed in the fifth generation. So, the 5G will be the central aspect of the Next Generation Network (NGN) (Sinha

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