ABSTRACT

This research discusses the design and implementation of a dual-band microstrip antenna at 1.8 GHz and 2.1 GHz frequencies intended for RF Energy Harvesting Systems. The antenna is derived from cellular service provider signals. The 1.8 GHz and 2.1 GHz frequencies are the primary frequencies used by cellular operators in Indonesia, such as Telkomsel, Indosat, and XL Axianta, for 4G LTE services. The selection of these cellular frequencies is also based on the high signal availability in urban and residential environments, thus potentially generating higher RF power for harvesting and conversion into electrical energy.

The antenna is designed using a coaxial feed method and modified with an S-shaped slot on the patch to create additional resonance, allowing it to operate at the working frequency (dual-band). Simulations were performed using CST Studio Siute 2019 software and obtained Return Loss values at both frequencies -16.5314 and -16.1589 with VSWR values of 1.350 and 1.322 with bandwidths of 2% and 1.523% and linear polarization.

The simulation optimization results were then fabricated and tested using a Vector Network Analyzer (VNA) to evaluate the physical performance of the antenna. Return Loss measurements obtained at both frequencies -17.9084 and -11.8406 with VSWR values of 1.2915 and 1.6875 with bandwidth percentages of 3.036% and 0.952%. Differences between the simulated and measured antennas were analyzed based on factors such as fabrication imperfections, variations in the substrate, and the influence of the supply system. Therefore, this antenna can be used as a receiving antenna in an RF Energy Harvesting system to harvest energy from widespread cellular communication signals in the surrounding environment.

Keywords: Microstrip Antenna, Dual-band Frequency, RF Energy Harvesting, S-shaped Slot, S-Parameters, Bandwidth, Return Loss.