

Left-handed metamaterial (lhm) structure stacked on a two-element microstrip antennas array

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Abstrak

Antenna can be one of the largest components in a wireless device; therefore antenna miniaturization can reduce the overall size of wireless devices. One method used to reduce the element size of an antenna is by using metamaterial structures. This paper discusses a Left-Handed Metamaterial (LHM) structure stacked on a two-element microstrip antennas array for miniaturization and gain enhancement at a frequency of 2.35 GHz. To observe the impact of the LHM structure on the antenna, first this paper discuss the design of a conventional rectangular shape microstrip antenna without a LHM structure, then a design of the LHM structure which shows both negative permittivity and negative permeability. This LHM structure is then implemented on a conventional single element microstrip antenna and on a two-element microstrip antennas array. Results and discussion of implementation of the LHM structure on the conventional microstrip antenna is provided in this paper.

The results show that good agreement between simulated and measured results has been achieved. The simulation results show that the antenna works at a frequency of 2.29-2.42 GHz with a bandwidth of 128 MHz (5.4%) and a gain of 8.2 dBi, while the measurements show that the antenna works at a frequency of 2.26-2.41 GHz with a bandwidth of 146 MHz (6.21%) and a gain of 8.97 dBi. In addition, by comparing the substrate dimension for the two element array antennas, with and without the LHM structure, shows a 39% reduction is achieved.