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Abstract
In the modern radio communication system, antennas are the devices that convert the energy to electromagnetic power and radiate. As the rapid increasing of the wireless radio communication products, miniaturization and the high-efficiency of the antenna are the two main requirements of the antennas. In this thesis, Aluminum Oxide (Al2O3) is used as the substrates of the antennas, and which exhibits the microwave dielectric characteristics of dielectric constant r = 9.8, quality value Q×f = 300000 GHz. Comparing to the microwave devices which used the FR4 substrates in the past, the dielectric constant and quality factor of Al2O3 are better than FR4 substrates. Therefore, the antennas are miniaturized and reveal lower dielectric loss.
The simulation toll HFSS is used to simulate the microstrip line T-shaped antennas, and high dielectric constant Al2O3 (r=9.8) were used as the substrates. In addition, the resonant frequencies of the antennas could be controlled by adjusting the metal of covering, and the bandwidth of the antennas could be controlled by adjusting the length of ground, and the stub is used to adjust the characteristics of the antennas. Finally, the characteristics of fabricated antenna were measured by an impedance analyzer in a chamber.
For the single-band (4.2 GHz) antennas, the optimum characteristics of the proposed antennas in this thesis are: return loss ~ 36.77 dB, bandwidth 760MHz / 18.1%, gain 2.785 dBi, and size 19mm× 25mm, which are suitable the applications of IEE802.16e. And for the single-band (5.77 GHz) antennas, the optimum characteristics of the proposed antennas in this thesis are: return loss ~ 40.92 dB , bandwidth 560MHz / 9.71%, gain 2.813 dBi, and size 14.18mm×20mm, which are suitable the applications of IEE802.11a. For the dual-band (4.22/5.94 GHz) antennas, the optimum characteristics of the proposed antennas in this thesis are: return loss ~ 35.69 dB at 4.22 GHz and ~ 40.46 dB at 5.94 GHz, bandwidth 440 MHz/10.43 % at 4.22 GHz and 360 MHz/6.06% at 5.94 GHz, gain 1.20 dBi at 4.22 GHz and 3.04 dBi at 5.94 GHz, and size 22.58mm×20mm, which are suitable the applications of IEE802.16e and IEE802.11a. Finally, all of the characteristics of the proposed antennas are also investigated detail in this thesis.
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