

2.45 GHz patch antenna based on thermoplastic polymer substrates

ABSTRACT

In this paper, the development of patch antenna based on recycle and natural material as substrate is presented. The patch antenna has been designed, simulated, fabricated and tested successfully. Two types of antenna material were chosen as the antenna substrates. They were Polymethyl methacrylate (PMMA), a compounded synthetic resin produced from the polymerization of methyl methacrylate and Polylactic acid (PLA) which is extracted from fully renewable resources such as corn, sugar beet or rice. The PMMA and PLA both have dielectric constant of 2.546 and 2.6 respectively. The PMMA and PLA substrates were prepared using hot press machine at the same thickness of 1.6 mm. The patch antenna based on PMMA and PLA substrate were designed at operating frequency of 2.45GHz. It was observed that, both substrates PMMA and PLA have simulated return loss of 16.36 dB and 19.65 dB respectively. Then, the measured return loss were observed at 18.98 dB and 16.15 dB for PMMA and PLA respectively. The radiation pattern was observed to have similar trend for both substrates. In order to verify the performance of the newly develop substrate as patch antenna, FR4 was selected, designed and tested as patch antenna at the same operating frequency. In comparison to FR4, both materials PMMA and PLA, can be an option substrate material for RF and microwave application.

Keyword: Poly-lactic acid; Polymethyl methacrylate; FR4; Patch antenna; Substrate