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# DESIGN AND ANALYSIS OF A MICROSTRIP PATCH ANTENNA AT 7.5 GHZ FOR X-BAND VSAT APPLICATION

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## Abstract

In this paper, a microstrip patch antenna is designed to be used for X-band VSAT application at 7.5 GHz. The antenna is proposed to replace the massive and commonly used parabolic reflector antennas (46.0 inch × 29.3 inch × 13.5 inch (116.84 cm × 74.42 cm × 34.29 cm) with weight of 66.2 kg)

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in terms of portability due to its compact and lightweight features, with overall dimensions of 19.00 mm × 30.55 mm. The 7.5 GHz frequency is chosen based on the X-band frequency used in Malaysia, as reported by STRIDE. The microstrip patch antenna is first designed and simulated using CST Microwave Studio (CST MWS) and exhibits a good return loss ( $S_{11}$ ) of -42.09 dB, a bandwidth of 399 MHz, directivity of 7.63 dB and gain of 7.18 dB. The antenna is then fabricated using RT/duroid® High Frequency 5880 substrate with a dielectric constant of  $\epsilon_r = 2.2$ , loss tangent of  $\delta = 0.0009$  and thickness of  $t = 1.574$  mm. Next, the return loss and radiation pattern measurements are carried out to confirm the simulated results. The measurement of the antenna prototype provides a return loss  $S_{11}$  of -30.53 dB, bandwidth of 455 MHz, directivity of 5.51 dB and gain of 3.88 dB © 2022. IIUM Engineering Journal. All Rights Reserved.

#### Author keywords

Microstrip patch antenna ; Vsat application ; X-band communication

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