

Ultra-Wideband (45-50 GHz) mm-Wave Substrate Integrated Waveguide Cavity Slots Antenna for Future Satellite Communications

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Abstract : In this article, a substrate integrated waveguide cavity slot antenna was designed using a computer simulation technology software tool to address the specific design challenges for millimeter-wave communications posed by future satellite communications. Due to the symmetrical structure, a high-order mode is generated in SIW, which yields high gain and high efficiency with a compact feed structure. The antenna has dimensions of 20 mm x 20 mm x 1.34 mm. The proposed antenna bandwidth ranges from 45 GHz to 50 GHz, covering a Q-band application such as satellite communication. Antenna efficiency is above 80% over the operational frequency range. The gain of the antenna is above 9 dB with a peak value of 9.4 dB at 47.5 GHz. The proposed antenna is suitable for various millimeter-wave applications such as sensing, body imaging, indoor scenarios, new generations of wireless networks, and future satellite communications. The simulated results show that the SIW antenna resonates throughout the bands of 45 to 50 GHz, making this new antenna cover all applications within this range. The reflection coefficients are below 10 dB in most ranges from 45 to 50 GHz. The compactness, integrity, reliability, and performance at various operating frequencies make the proposed antenna a good candidate for future satellite communications.

Keywords : ultra-wideband, Q-band, SIW, mm-wave, satellite communications

Conference Title : ICAEME 2022 : International Conference on Advances in Electronics Manufacturing Engineering

Conference Location : London, United Kingdom

Conference Dates : November 18-19, 2022