

Design and Analysis of a Compact Low-Cost U-Band Waveguide OMT

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This paper presents the design and fabrication of an Ortho Mode Transducer (OMT) operating in the U-band, incorporating matching stubs to enhance performance. The fabricated OMT has been validated through back-to-back measurements. Furthermore, this OMT enables the production of a low-cost OMT at only 21% of the cost of foreign products, thereby assessing its potential contributions to next-generation communication systems.

Fig. 1(a) shows the overall shape and cross-section of the proposed U-band OMT. The proposed OMT consists of a square waveguide common port and two standard isolated rectangular waveguide ports. The common port is a square with dimensions of 5×5 mm, incorporating both V-pole and H-pole. Port 2 is designed to conform to the WR-19 standard by adding a tapered waveguide to the square structure, outputting only V-polarization. Port 3 outputs only H-polarization and includes a matching stub to resolve impedance mismatch, ensuring ideal isolation performance while minimizing insertion loss and increasing bandwidth. Ultimately, the compact U-band waveguide OMT is designed to be 13×14.3 mm in size, with an extended length of the WR-19 standard waveguide port section to enhance manufacturability.

Fig. 1(b) shows the return loss, transmission loss, and isolation of the proposed OMT for the V-pole and H-pole. In the U-band frequency range, the return loss of the OMT is less than 12.5 dB for the V-pole and less than 10 dB for the H-pole, while the transmission losses are S_{21} = less than 0.85 dB and S_{31} = less than 0.5 dB. The isolation is approximately 72 dB at 40 GHz and 45 dB at 60 GHz, as derived from the simulation results. Here, the ohmic losses are considered by setting the metal material as copper.

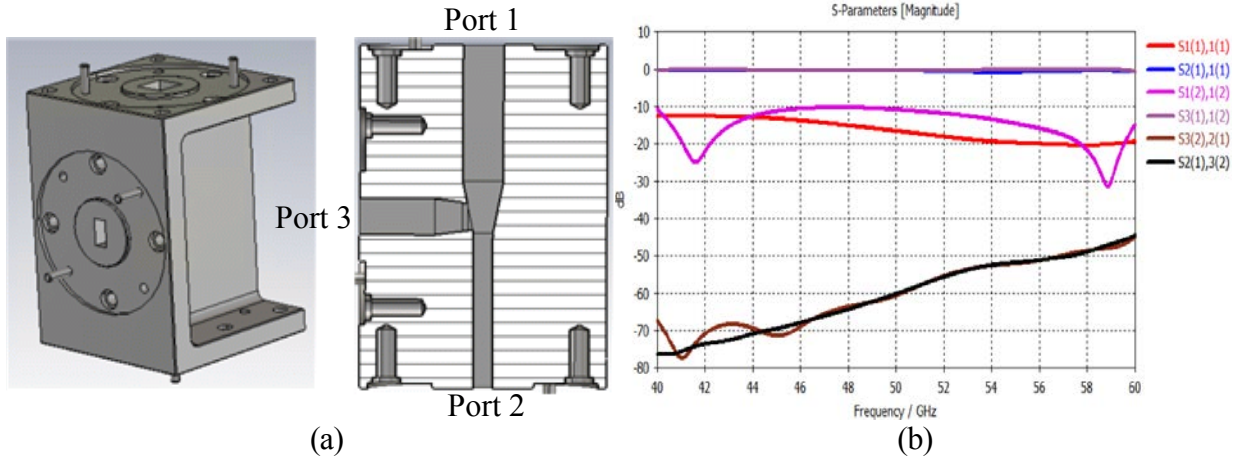


Fig. 1. Simulated using CST Studio Suite (a) Overall shape and cross-section of the OMT, (b) loss results.

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