High-performance radiation design of a planar bow-tie antenna combined with a dielectric lens and cascaded matching layers at terahertz frequencies

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Abstrak

The demand for high-speed data transmission has increased significantly in the last decades. Terahertz (THz) frequency, which lies between 100 GHz to 10 THz, has been considered as the solution to the demand. However, the low gain and low efficiency of a THz antenna remain to be issues that hinder reasonable performance for various applications. This paper proposes the design of a high-gain and high-efficiency planar bow-tie antenna for applications in the THz frequency. A planar bow-tie on a high-resistivity silicon substrate is considered to obtain the broadband characteristics. To increase the gain and efficiency, a dielectric silicon lens and a matching layer based on the quarter-wavelength are applied in the design. From simulations using Computer Simulation Technology (CST) Microwave Studio, gain and radiation efficiency of up to 32.69 dB and 90.4% are obtained, respectively. This proposed design has shown high radiation performance suitable for high-speed transmission systems.