A Wideband, Bow-Tie Yagi Antenna

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Yagi antennas, well known for directive antennas with a simple structure, commonly consists of one driven element connected to the feed line and one or more parasitic elements. Previously, it was reported that the bandwidth of the Yagi antenna could be increased by using bow-tie antenna elements (D. Arceo and C. A. Balanis, IEEE Antennas Wireless Propag. Lett., 10, 442-445, 2011). Recently, a three-element bow-tie antenna was introduced to improve the bandwidth in bow-tie antennas (Y.B. Le and S. Lim, "A wideband, planar bow-tie antenna," IEEE Southeast Con., 2016).

In this paper, a wideband, high-gain Yagi antenna is introduced as shown in Fig. 1. The antenna consists of a driver and two parasitic elements (reflector and director). Three-element bow-tie antennas are employed in the reflector and driver. A three-element bow-tie antenna is made of three different flare angles which provide three different resonances one by one, and hence wide bandwidth is achieved in combination. In the proposed design, the wideband reflector improves directivity toward the director direction while increasing the bandwidth by coupling with the driver. A triangular bow-tie is used as a director which improves directivity toward the director direction and further enhances the bandwidth at the high end of the increased bandwidth from the reflector and driver. The resulting -10-dB impedance bandwidth of the proposed antenna is 75.66% (1.29 - 2.86 GHz) as depicted in Fig. 2. In the design, the distance between reflector and driver is 40 mm (0.17λ, λ is calculated at 1.29 GHz, the lowest frequency of the bandwidth) and that between driver and director is 15 mm (0.06λ). The realized gain in average over the -10-dB impedance bandwidth is 9.21 dBi in the director direction and the peak realized gain is 13.06 dBi.

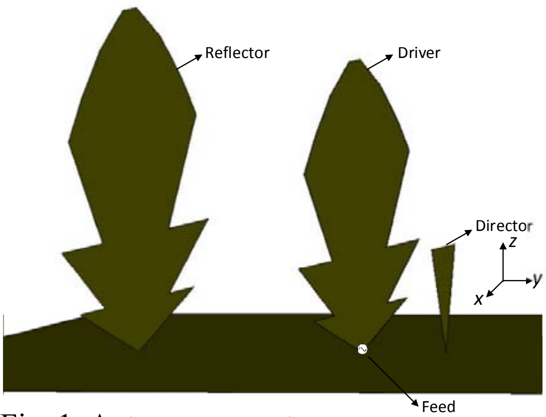

Fig. 1. Antenna geometry

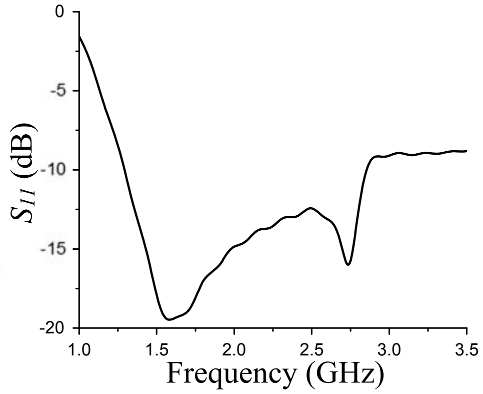

Fig. 2. Simulated S_{11} vs. frequency