Slot-line fed quasi-Yagi antenna

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Slot-line as a transmission was first introduced by S. B. Cohn in late 1970's [1], with a uniplanar structures benefit the remarkable features such as no cutoff frequency, negligible radiation loss, and low dispersion for the quasi-TEM propagation mode, etc. Thus, the slot-line is particularly attractive in wideband antenna feeding. Along with the development of wireless technologies and the trends in advanced communications, a lot of antenna researchers have paid specially attention to quasi-Yagi antenna [2] because this antenna has low profile, broad bandwidth, high directivity, low cost, planar configuration, compatibility with integrated circuits, etc. A quasi-Yagi antenna using slot-line feed is presented in this paper. The proposed antenna is based on classical Yagi-Uda antenna and has advantages such as simple structure, wide bandwidth, very flat gain, and stable radiation patterns.

Figure 1 shows the proposed antenna structure. The antenna is etched on a substrate with a dielectric constant of $\varepsilon_r=10.2$ and a thickness of 0.635 mm. The antenna is comprised of a slot-line feed with characteristic impedance of 50 Ohm, a driver and a director.

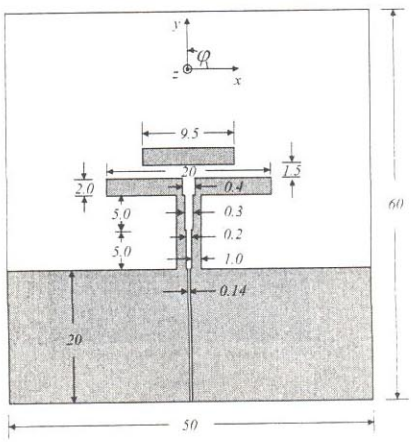

Figure 1. Configuration of proposed antenna (unit in mm).

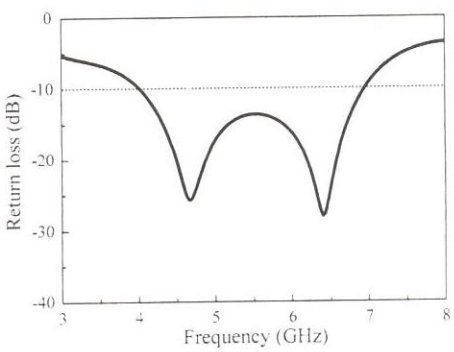

Figure 2. Return loss of the antenna.

The feeder is directly connected to the driver by using a coplanar stripline and its gap size is extended step by step to improve impedance matching. The return loss of the slot-line fed quasi-Yagi antenna is plotted in Figure 2. As can be seen from this plot, the bandwidth covers from 4 GHz to 7 GHz band.

The simulated gain of the quasi-Yagi antenna is shown in Figure 3. As can be seen, the gain is very flat (5.4~5.6 dBi) within the operating bandwidth. Thus, the proposed antenna can be stably transmitted and received a signal in wideband wireless communication systems. The simulated radiation pattern at 5.5 GHz is shown in Figure 4. It can be seen that the radiation pattern characteristic is very good with better than 20.2 dB front-to-back ratio and -27.2 dB cross-polarization. It shows half-power beamwidth (HPBW) of 67° along the x-y plane and 142° along the y-z plane.

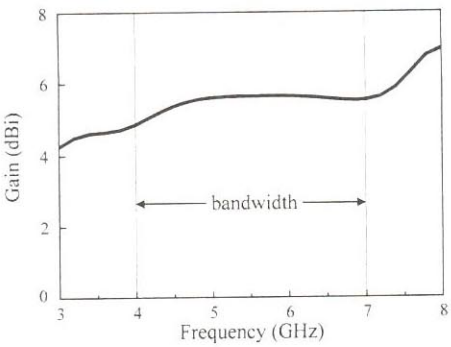

Figure 3. Simulated gain of the antenna.

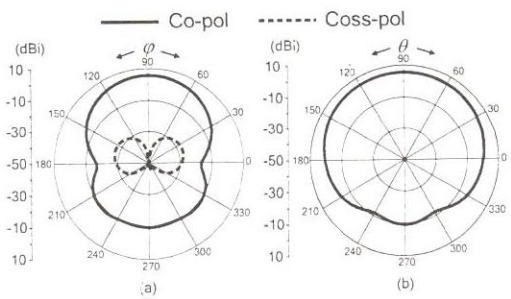

Figure 4. Simulated radiation pattern at 5.5 GHz: (a) x-y plane, (b) y-z plane.

References

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[2] N. Haneda, W. R. Deal, Y. Qian, R. Waterhouse, and T. Itoh, "A broad-band planar quasi-Yagi antenna," *IEEE Trans. Antenna Prop.*, Vol. 50, No. 8, August 2002.