Comments on "Planar Artificial Transmission Lines Loading for Miniturization of RFID Printed Quasi-Yagi Antenna"

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In a recent paper by Hajizadeh *et al.* [1], the authors employed the artificial transmission lines (ATLs) proposed in [2] as the radiating elements of a quasi-Yagi antenna for miniaturization. The proposed structure (with discontinuities on one side and a finite ground on the other side of the substrate) is applied to replacing the open-ended transmission line in each arm of the original dipole antenna. The gain of the antenna given in [1] is 1.84 dBi, which is in good agreement with our simulation. However, it raises our attention to the position of antenna radiation. It is widely recognized that the proposed artificial transmission line in [2] is utilized for size reduction in microwave components, such as couplers, baluns, power dividers, and so on [3]–[5]. They do not present some obvious radiation characteristics. Therefore, in the current comments, we have investigated the possible radiation parts of the antenna in [1] and found that the artificial transmission lines do not play any significant role in radiation. However, it is the two finite grounds that are responsible for the radiation.

In order to find out the exact location of the radiation, we removed the two artificial transmission lines on both sides, while the two finite grounds and the reflector remain unchanged. According to our simulation based on the full-wave electromagnetic simulator IE3D, the maximum gain of the structure is 1.07 dBi from 0.6 to 1.2 GHz, as shown in Fig. 1. The radiation pattern and gain of this new structure are quite close to the original one. On the other hand, the two finite grounds on both sides are removed, while the two artificial transmission lines and the reflector are unchanged. As a result, a low antenna gain is observed. It can be seen from Fig. 1 that the maximum gain of this structure is merely -13.6 dBi from 0.6 to 1.2 GHz. It implies that the artificial transmission lines contribute little to the radiation and gain of the antenna. It is the two finite grounds that generate most of the radiation. In short, since the artificial transmission lines contribute little to the radiation and gain of the antenna, it seems to be far-fetched to use artificial transmission lines in an antenna design. If artificial transmission lines are only used for size reduction, simple meandered lines are enough to meet the design goals.

Moreover, the radiation pattern of a quasi-Yagi antenna is usually endfire. However, the quasi-Yagi antenna proposed in [1] is omnidirectional. It can be attributed to the two finite grounds placed on the top and bottom of the substrate, respectively. Also, the reflector contributes little to enhance the gain of the quasi-Yagi antenna. It seems that the characteristics of the proposed antenna deviate from the common known quasi-Yagi antenna.

We would also like to take this chance to point out some minor typographical errors in the above paper. A few parameters with the dimensions seem to be inaccurate. For instance, the parameter w_2 given in [1] is 9.5 (mm), while w_2 shown in [1, Fig. 6] is 15.9 (mm). Meanwhile, the parameter w_8 is marked in the wrong place of the structure. Table I lists the inaccurate parameters and the corrected parameters based on the CAD structure provided by the authors.

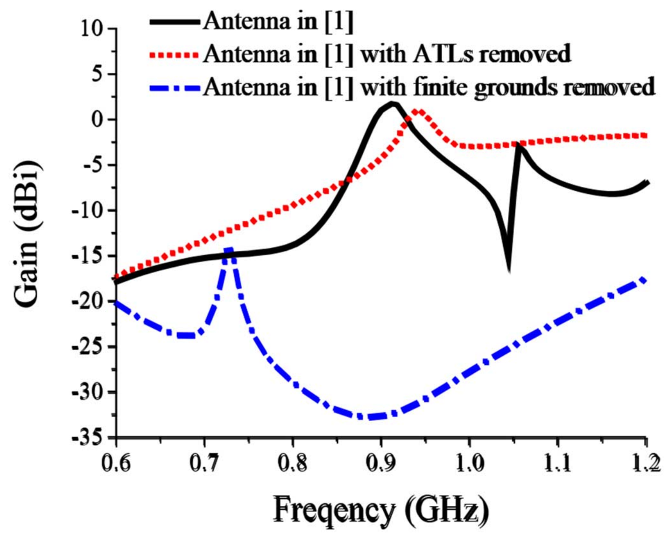

Fig. 1. Comparison among three structures.

TABLE I
ORIGINAL PARAMETERS AND THE CORRECTED PARAMETERS (UNIT: MILLIMETERS)

	w1	*w2*	*w3*	*S1*	*S3*	*S6*	*l3*	*l6*	*l7*
Given in [1]	3.2	9.5	9.7	0.2	0.25	0.25	5.9	8.29	11.5
Correction	3.3	15.9	3.1	0.3	0.6	0.2	5.8	8.76	18

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