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MIMO handset antenna for 5G/WLAN applications

Key words: Fifth-generation (5G); Handset antenna; Multiple-input multiple-output (MIMO) antenna; Decouple

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Motivation

1. The traditional single-antenna technology cannot meet the data transmission requirements of 4G and 5G because of its various shortcomings.

2. The multiple-input multiple-output (MIMO) antenna technology, as one of the core technologies of contemporary communication, can meet these requirements.

3. To comply with the development trend of the Internet of Things (IoT) and communication technology, the design and research of MIMO antennas for handheld terminals are very important.

Main idea

1.A dual-module MIMO handset antenna for 5G/WLAN is proposed.

2. The antenna has a wider range of frequency bands and a better independence.

3. The proposed antenna is simulated and measured.

Method

1. The structure is composed of 12 antenna elements. The high-frequency element for WLAN adopts a slot antenna. The low-frequency element for 5G adopts a monopole antenna.

2. To ensure the performance of the antenna, a copper-clad is dug under the 0.5-mm-wide monopole branch.

3. The monopole and slot antennas are staggered to enhance isolation.

Major results

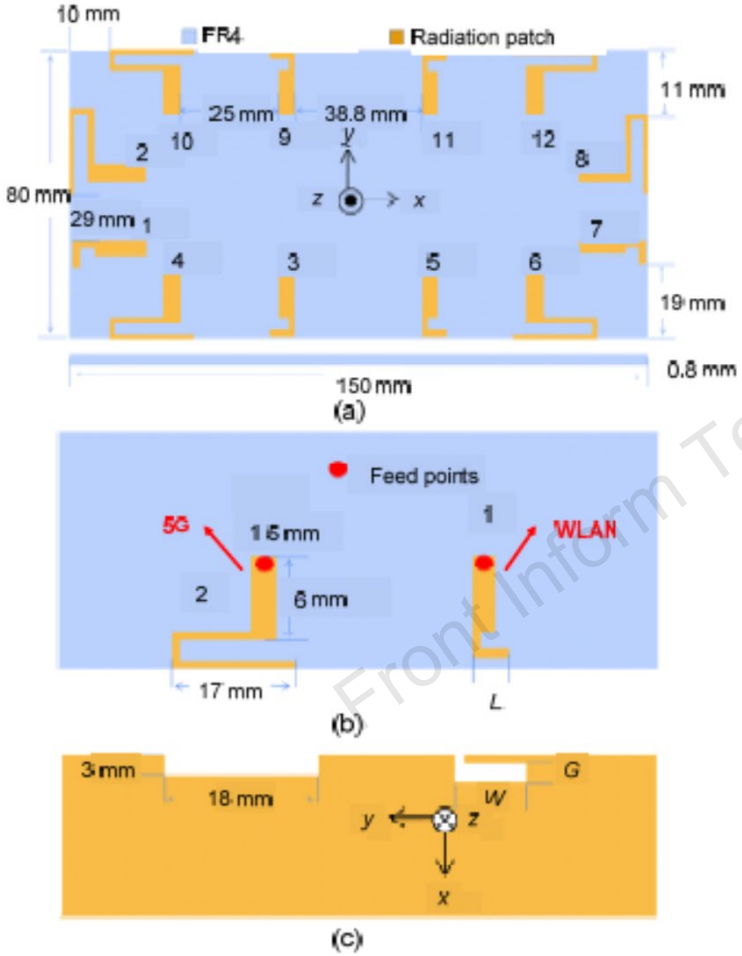

Fig. 1 Structure of the antenna: (a) top view of the antenna; (b) structure of antennas 1 and 2; (c) ground of antennas 1 and 2

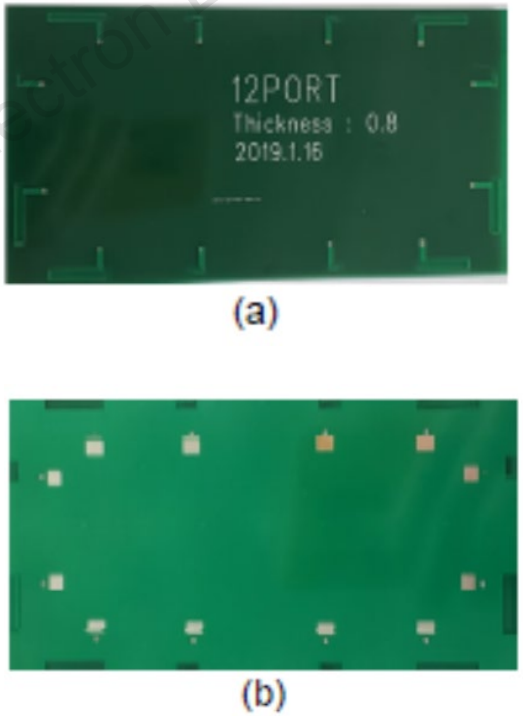

Fig. 10 Dual-module MIMO antenna: (a) top view of the antenna; (b) back view of the antenna

Major results (Cont'd)

1. Simulation results of the antenna

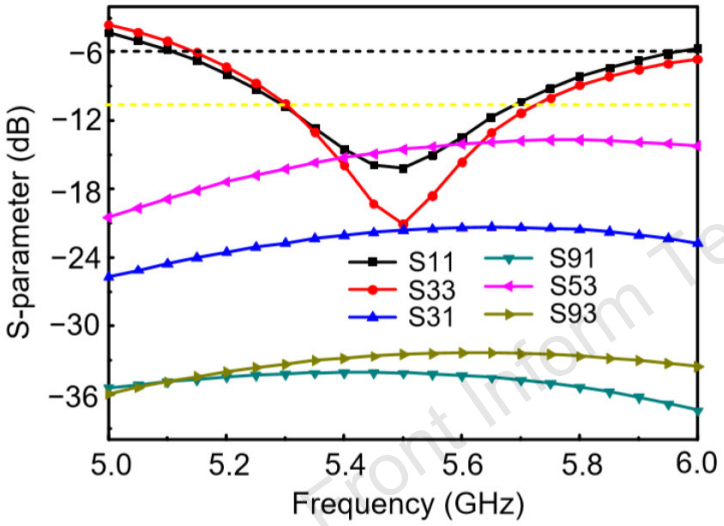

Fig. 5 S-parameters on antennas 1 and 3

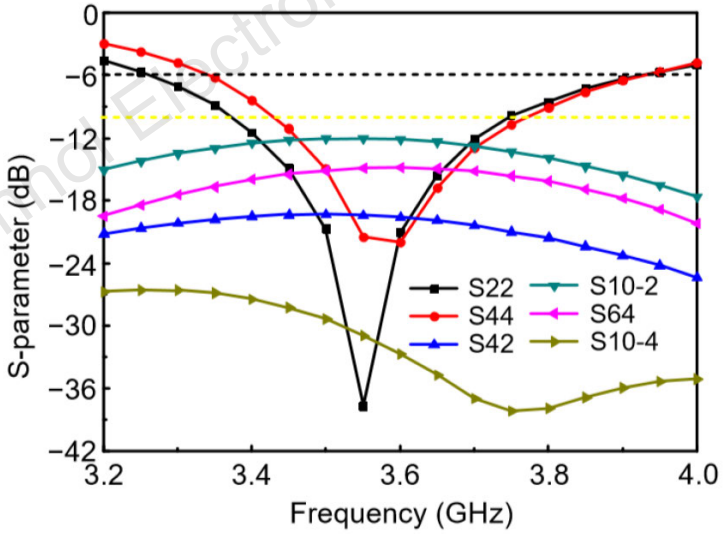

Fig. 6 S-parameters on antennas 2 and 4

Major results (Cont'd)

2. Experimental results and discussion

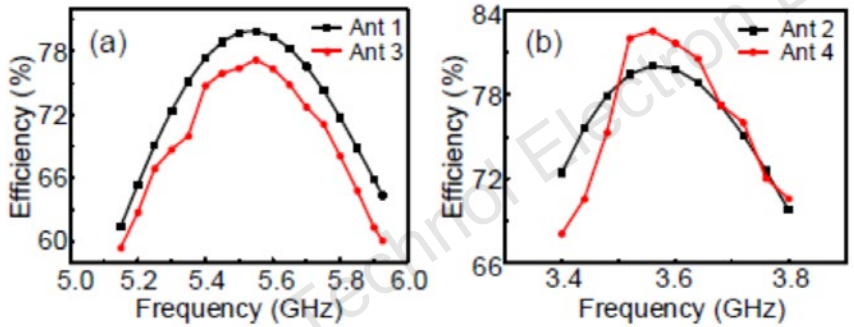

Fig. 8 Radiation efficiency of each antenna: (a) antennas 1 and 3; (b) antennas 2 and 4

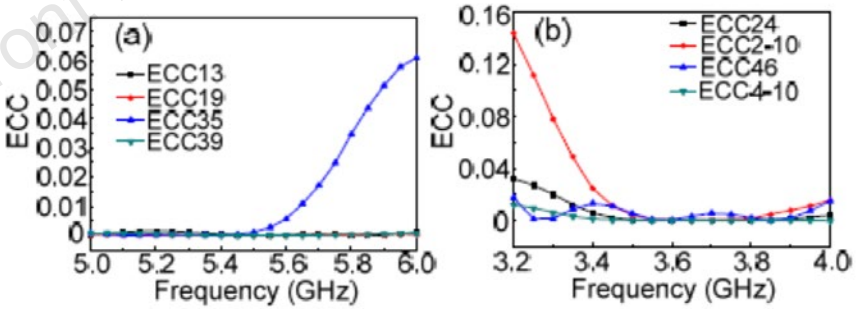

Fig. 9 Envelope correlation coefficient of antennas: (a) antennas 1 and 3; (b) antennas 2 and 4

ECC: envelop correlation coefficient

Major results (Cont'd)

3. Comparison of the simulation and measurement results

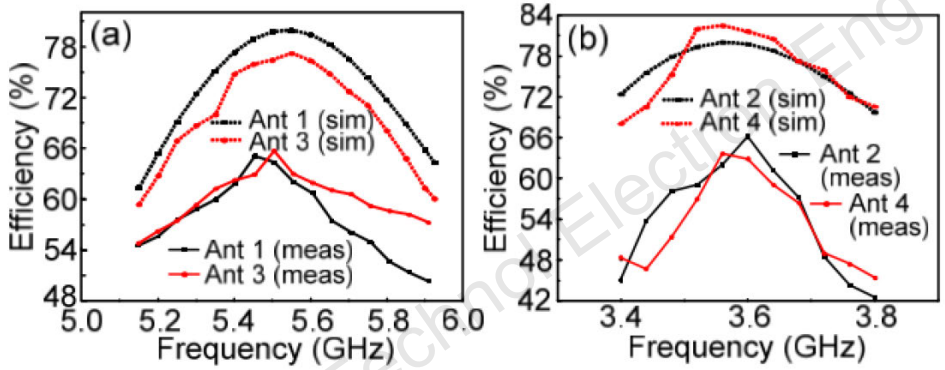

Fig. 12 Simulated and measured radiation efficiency: (a) antennas 1 and 3; (b) antennas 2 and 4

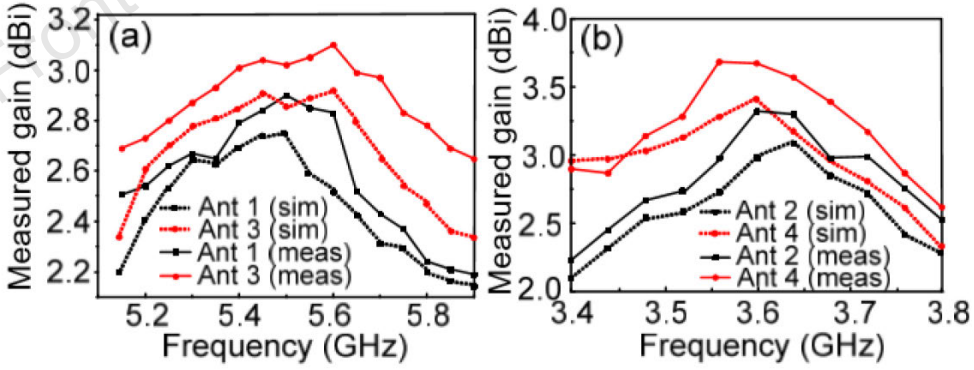

Fig. 13 Simulated and measured gain: (a) antennas 1 and 3; (b) antennas 2 and 4

Conclusions

1. A dual-module MIMO antenna has been proposed for 5G (3.4–3.8 GHz) and WLAN (5.150–5.925 GHz) portable terminals.

2. The bandwidth is about 1 GHz. The measured efficiency of the low-frequency antenna is above 40%, and that of the high-frequency antenna is above 50%.

3. The gain of antennas 1 and 3 varies between 2.2 and 3.1 dBi, and that of antennas 2 and 4 varies from 2.25 to 3.75 dBi.