

# Wideband Antenna Structure for LTE Mobile Device

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**Abstract** – This paper proposed a new antenna design for wideband LTE mobile device. The design is put 2 antenna strips next to each other to be 2-strip antenna. The antenna signal feed-in terminal will become 2 terminals. By individual test on these 2 strips antenna, the returned losses are small and both of them can support for 2 bands. Combining 2 strips to be a new design, antenna filed will change. The test result shows the returned loss of the 2-strip antenna is more suitable for LTE mobile device and it can support for 3 bands.

**Index Terms** — 2-Strip antenna, returned loss, LTE.

## I. INTRODUCTION

Wireless communication prosperously and rapidly grows up these years. New communication technology, Long Term Evolution (LTE), has launched to the world and LTE 700/2300/2500 has covered wider band areas which are from 700 to 960MHz and from 1710 to 2690MHz. Comparing to wireless local area network, the antenna design of LTE mobile device will be complicate and difficult to support wider bandwidth.

In current antenna designs using on mobile device, most of these antennas only can cover 2 bands, such as GSM, CDMA, UMTS, and so on [1]. Because the overall antenna area in mobile device is limited and restricted, these antenna designs will be difficult to cover LTE supporting band. To overcome these limitations and restrictions, this paper proposes a new antenna design which will cover not only current wireless systems, but also LTE system. The design idea is to put 2 antenna strips together. The performances of these 2 antenna strips are good. Because the antenna magnetic field will be changed if 2 antennas are put closed, the returned loss will be changed. This is the original design concept. The evaluation result shows its bandwidth has become wider which has covered LTE supporting bands. Considering with the antenna design for the future LTE mobile device, this kind of 2-strip design may be more suitable.

## II. PROPOSED ANTENNA DESIGN

The design of strip type antenna has widely adopted on mobile device. Most of the strip type antenna will use 1-strip design. Because the antenna area of mobile device is limited, especially in smart phone, the performance of 1-strip type antenna will be restrictive and most of the 1-strip type antenna will support for 2 bands only. Considering with mobile device which need to support for LTE system, 1-strip antenna design will be insufficient. To solve such kind of

design issue, this paper proposed a 2-strip antenna design, and Fig. 1 shows the proposed antenna design [2].

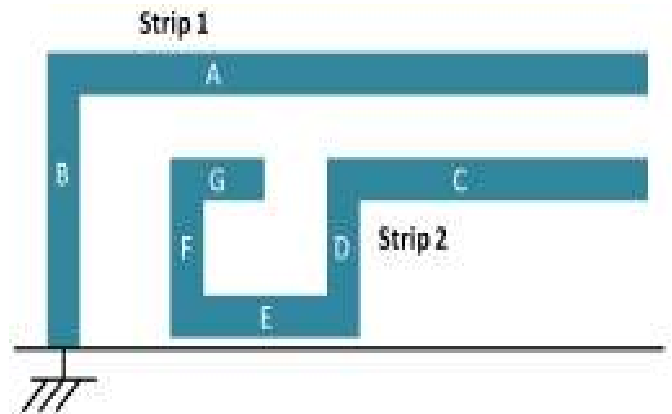


Fig. 1. 2-strip type antenna design

In Fig. 1, Strip 1 is the first strip antenna and Strip 2 is the second strip antenna. Individually checking with Strip 1, it is composed by part A and B. Part A is antenna emission body and part B is emission ground connection which is connecting to ground. For the detail design of Strip 2, it is composed by part C, D, E, F, and G. Part C and G are the emission bodies which are parallel to part A of Strip 1. Part D and F of Strip 2 are the emission ground connections which are parallel to part B of Strip 1. Part D and F are connecting to part E, and part E is impedance connection. The design of Strip 2 is special, and even it can be defined it as 1 strip with 2 antennas (part C and G). Overall reviewing this antenna design, part A, C, and G are the antenna signal feed-in terminals. Part B, D, and F are the antenna ground connections.

Impedence is also one of the important parameters in antenna design. The impedance of Strip 1 is easy to calculate and measure, and it is around 50ohm combining with impedance of part A and B. Considering with impedance of Strip 2, it is more complicate. The combined impedance of part C and D is around 100ohm and the combined impedance of part E, F, and G is around 100ohm. By checking the overall impedance from the junction of part D and E, it will be around 50ohm which is satisfied with the design target.

## III. RESULT AND DISCUSSION

Fig. 2 shows the individually measuring result of returned loss of Strip 1 and Strip. Both of Strip 1 and Strip 2 can support 2 bands. Strip 1 supports the bands on 704MHz for low band and 1710MHz for high band. Strip 2 supports the bands on 960MHz for low band and 2700MHz for high band. Thus, Strip 1 and Strip 2 will be suitable to be adopted on mobile device if the supporting bands are in these required bandwidths.

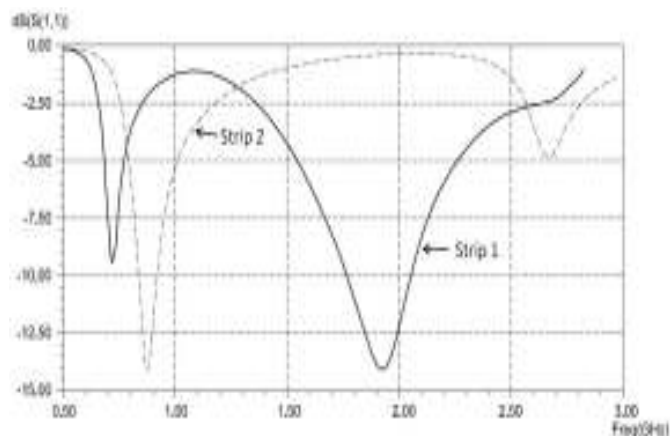


Fig. 2. Individual returned loss of S1 and S2 antenna

For antenna design for LTE mobile device, it requires to cover 3 bands, especially support the band on 700MHz to 960MHz. Because Strip 1 and Strip 2 support different bands, the proposed antenna design wishes to combine these 2 bands to be 3 bands. Fig. 3 shows the returned loss of 2-strip antenna design.

Fig. 3 shows proposed antenna can support for 3 bands, and the supporting band are from 704MHz to 960MHz for low band and from 1710MHz to 2900MHz for high band. Thus, this antenna design has reached the original design concept to come out 3 supporting bands by combining 2 antenna strips.

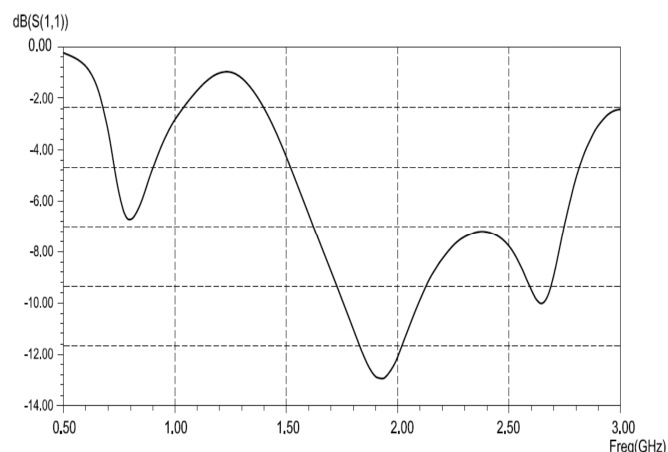


Fig. 3. The returned loss of proposed antenna design

Fig. 4 shows another 3 kinds of antenna designs, and these 3 kinds of are modified based on proposed antenna

design. The idea of these 3 designs is to extend the antenna feed-in terminal of part A, C, and G corresponding to Fig. 1. The length of emission bodies of part A, C, and G are extended, and the antenna filed will be changed.

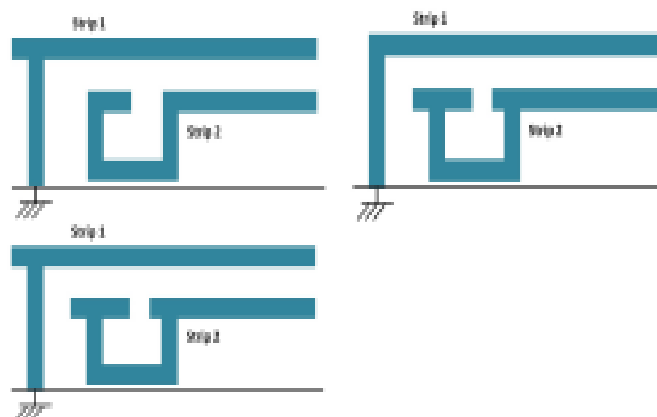


Fig. 4. Another 3 kind of antenna designs modified by proposed antenna design

#### IV. CONCLUSION AND FUTURE WORK

This paper proposes a new antenna design which is using 2 antenna strips to be a combined antenna. Because of using 2 antenna strips, the antenna signal emission bodies have 2 which will increase the feed-in terminals and emitting fields to be 2. By using this kind of design, the test result shows that the returned loss is smaller and supporting band has increased from 2 band to 3 bands. Thus, this design will be more suitable to be adopted on LTE mobile device to support for LTE band requirement.

To expand the antenna bands for mobile device to support LTE for the future, the next design idea has come out which is to modify the antenna strips dimension of Strip 1 and Strip 2 and the modifications are on antenna signal feed-in location. This idea is has explained on Fig. 4. Referring to the test result of Fig. 2 and Fig. 3, the returned loss of these 3 kind of designs will be expecting to be smaller.

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