

Coupling element strategy for future borderless smartphone

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1 Introduction

In the last decade, the smartphone screen size has constantly increased, and it is now covering the large majority of the terminal. Touch screen are inherently made of conductive material and thus are limiting the space available for the antenna design. In order to guarantee the multiple bands operation required for the future 5G standards and due to the limited antenna space, a maximal coupling with the chassis is mandatory to cover the lower frequencies. Moreover, most of the 5G bands will also need multiple decorrelated antennas for MIMO. Several strategies have been studied to enlarge antenna bandwidth in mobile phones, and most of the solutions are based on complex resonating structures [2]. The objective of this work is to understand the optimal antenna strategy to maximize use of the chassis for an optimal integration of multiple and wide-band antennas. In this preliminary study, the smartphone chassis is modeled with a rectangular metal plate and the antenna is placed within the chassis housing at a given height.

2 Comparison between the single or dual antenna configuration

In this test case, a $140 \times 73 \text{ mm}^2$ rectangular chassis is considered. The space dedicated to the antenna is only $3 \times 73 \text{ mm}^2$ and it is located on top of the chassis at 6mm from the plate (Fig.1(a)). Two different cases are considered : the first case is a single rectangular coupling element with a quality factor of 7.55 at 800 MHz. Using a 6 elements matching network, the structure can be matched with a -6 dB criteria from 710 to 950cMHz. The second case is based on two rectangular plates with a 2mm separation fed by two 50Ω ports. A quality factor of 15.2 is simulated at 800MHz for both antennas. With a 4-elements matching network on each ports, it is possible to match the first antenna from 690 MHz to 810 MHz and the second one from 810 MHz to 962 MHz. More cases will be presented at the conference.

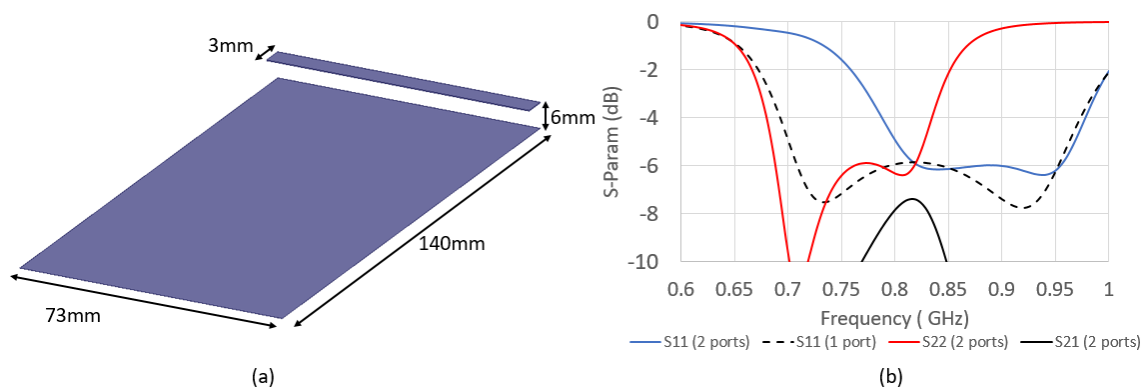


Figure 1. (a) Geometry of the simulated model for 1 port case and (b) Simulated reflection coefficient for 1 port and 2 port case.

References

- [1] Y. L. Ban, C. Li, C. Y. D. Sim, G. Wu and K. L. Wong, "4G/5G Multiple Antennas for Future Multi-Mode Smartphone Applications," in *IEEE Access*, vol. 4, pp. 2981-2988, 2016.
- [2] Z. Xu, Q. Q. Zhou, Y. L. Ban and S. S. Ang, "Hepta-band Coupled-fed Loop Antenna for LTE/WWAN Unbroken Metal-Rimmed Smartphone Applications," in *IEEE Antennas and Wireless Propagation Letters*, vol. PP, no. 99, pp. 1-1.