

# An L-shaped Frequency Reconfigurable MIMO Dielectric Resonator Antenna for PCS band Applications

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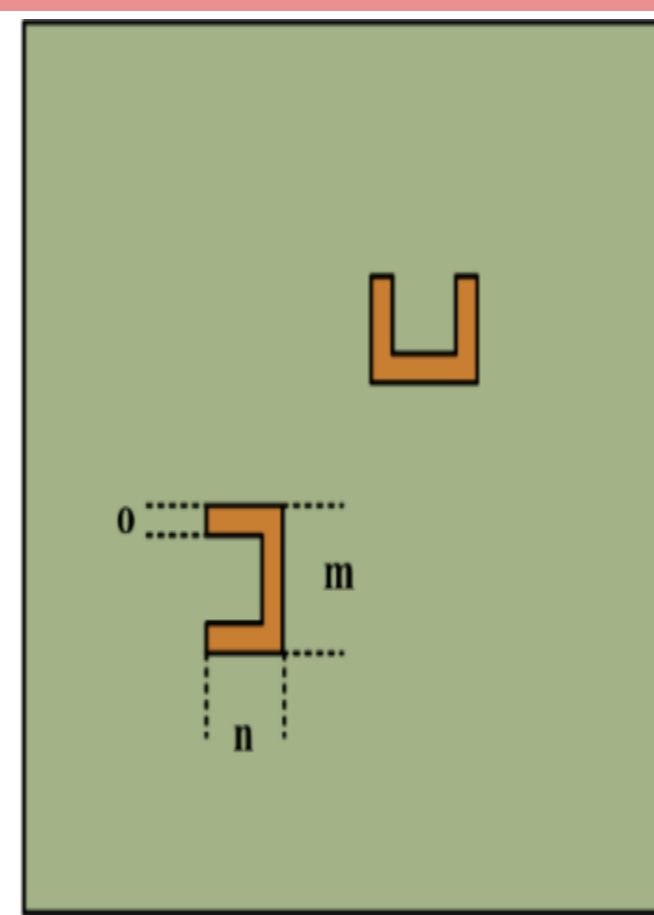
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Overview

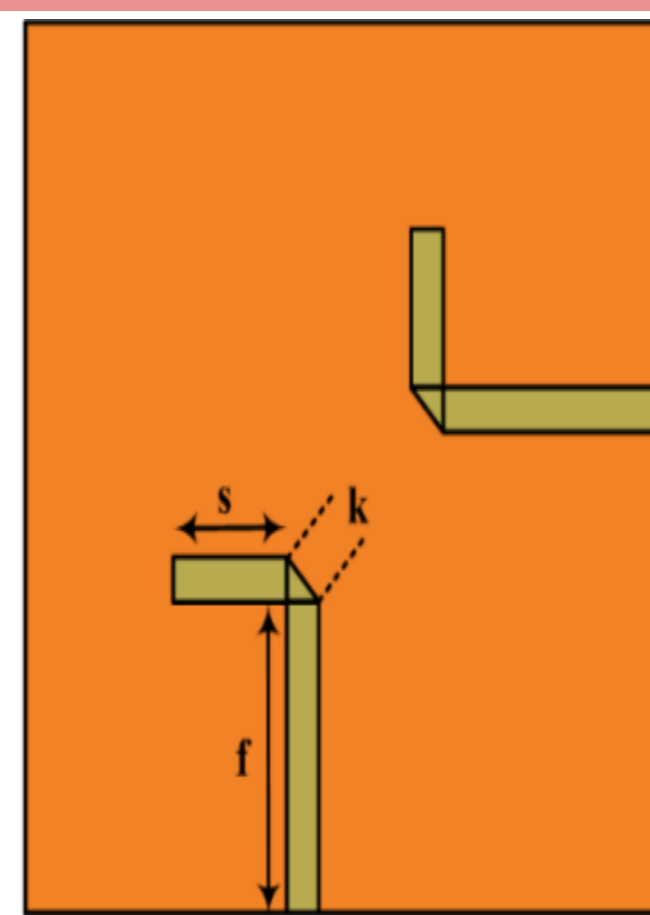
This work presents the design of a reconfigurable Multiple Input Multiple Output (MIMO) dielectric resonator antenna for Personal Communication Systems (PCS) bands. The proposed structure consist of L-shape dielectric radiator having parasitic metallic strips along with the wall of the dielectric resonator (DR). The switches are located on the top surface of the L-shaped dielectric resonator antenna (DRA) to achieve re-configurability. A total of six switches are positioned on the top of the design to perform re-configurability in three ways. The proposed antenna offers re-configurability from 1750 MHz to 1870 MHz for return loss below -10 dB which can be used in Korean Personal Communication Systems wireless (PCS) applications. The MIMO parameters like mutual coupling, envelope correlation coefficient, and diversity gain, are presented to validate the performance of the antenna. Measurements have been performed to validate the performance of the antenna in terms of return loss and mutual coupling between the two ports. A good agreement between measured and simulated results were found between 1750 MHz and 1850 MHz

Antenna Geometry

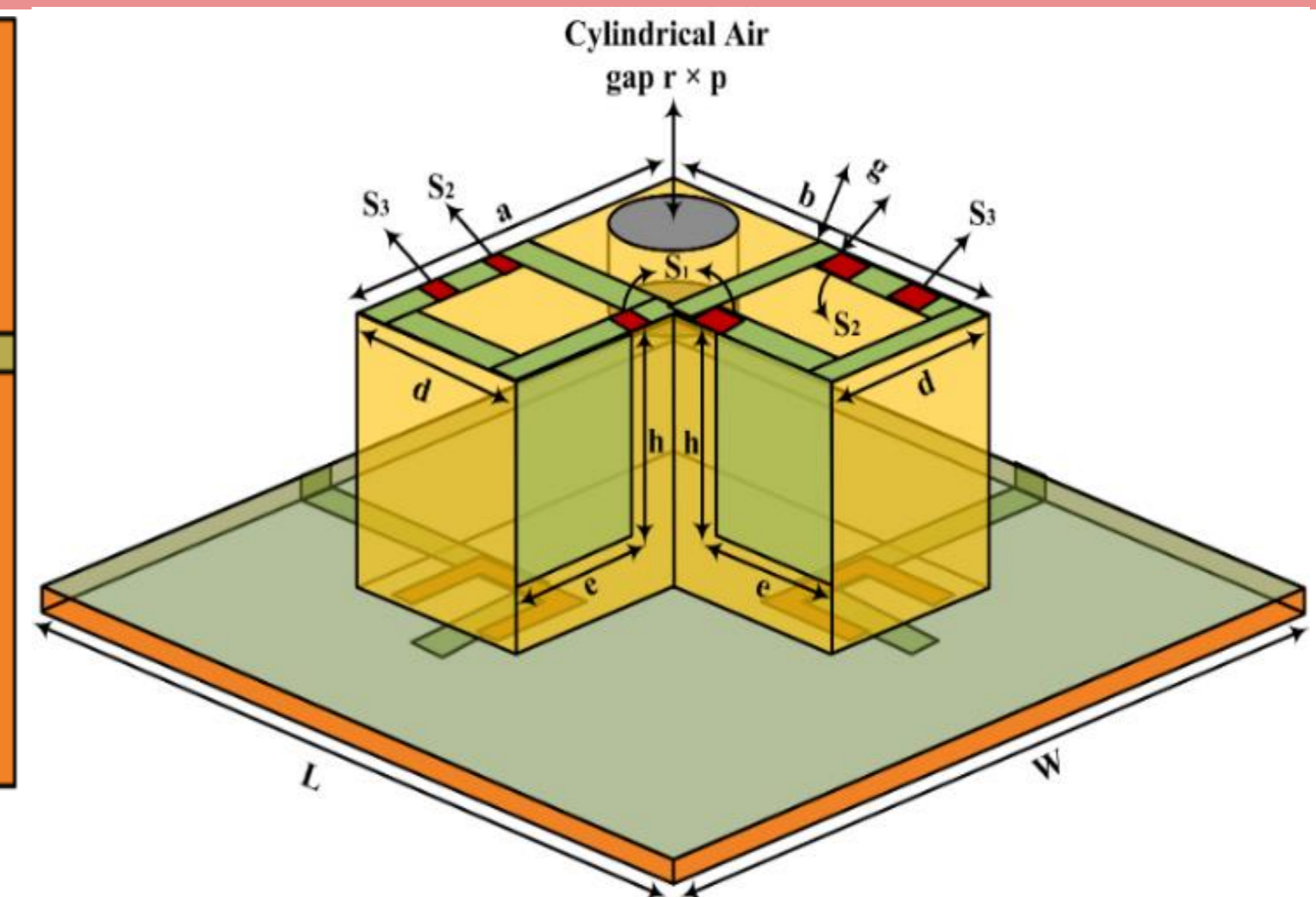
In the left Figure detailed antenna geometry has been resented. Two C-shaped slots of the same dimensions with 2mm\*6mm i-e "o" and "m" have been made on the top surface of the ground plane and DR is fed by two L-shaped micro strip lines. In the right side figure 3D view of antenna has been presented. Three Switches have been positioned on the top of DR with the help of six PIN-Diodes. Two walls of DR have parasitic micro strip patches and a cylindrical air gap to enhance the return loss and improve the bandwidth.



Top View

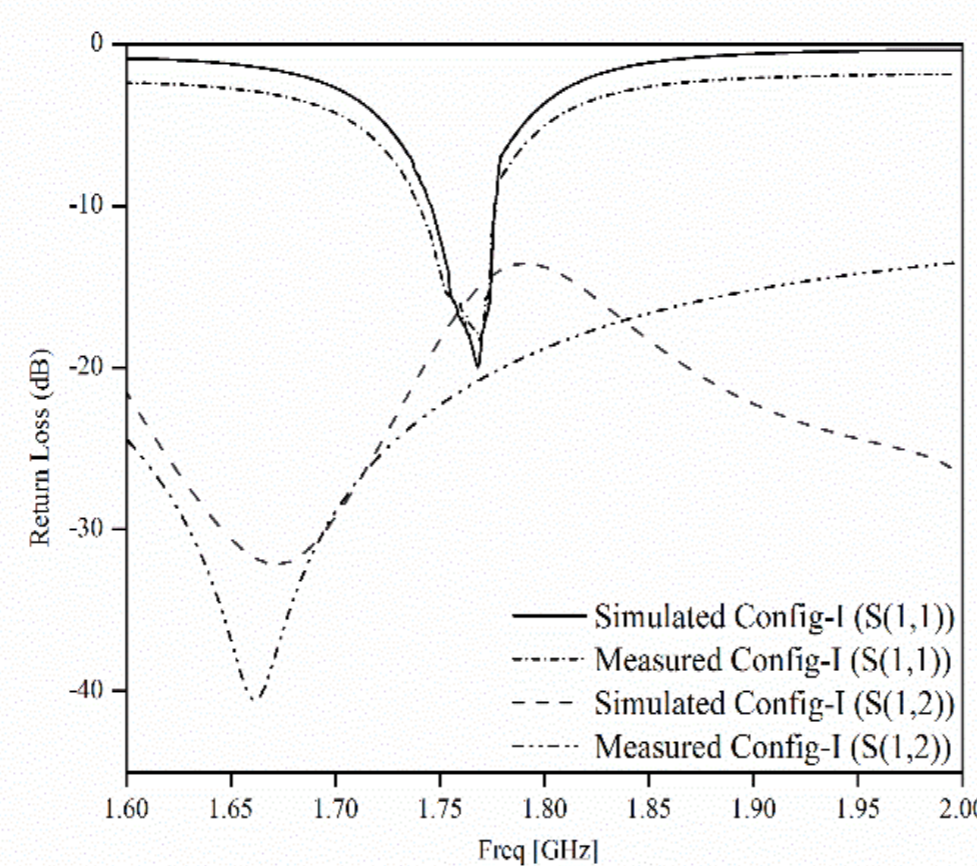


Bottom View

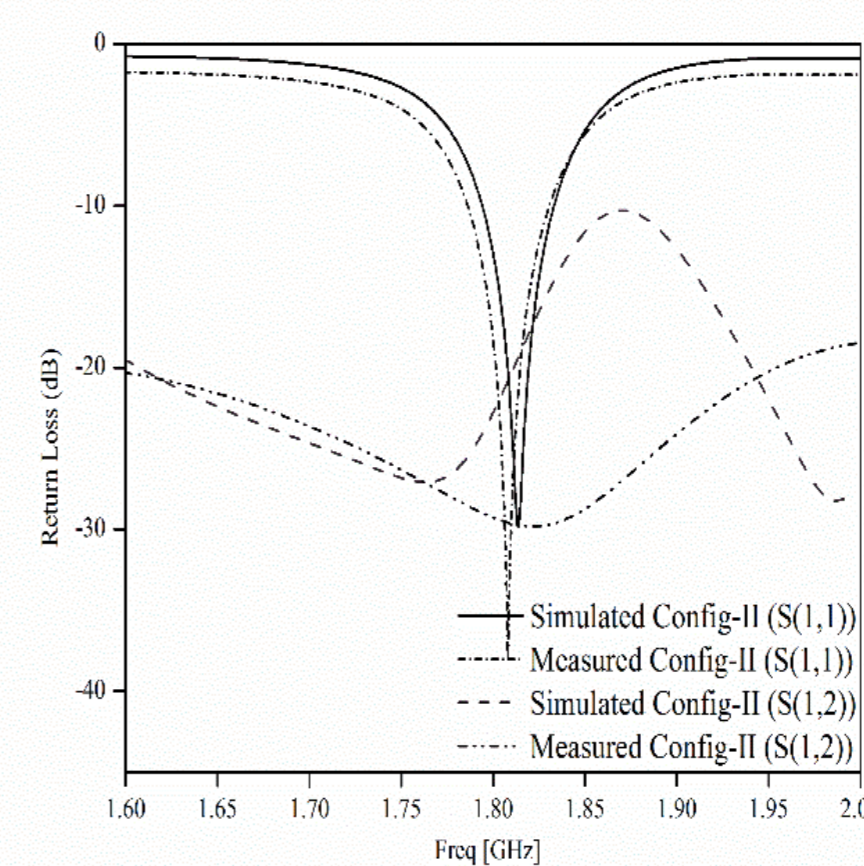


Dimension Table, S11 and mutual coupling Simulated and measured results

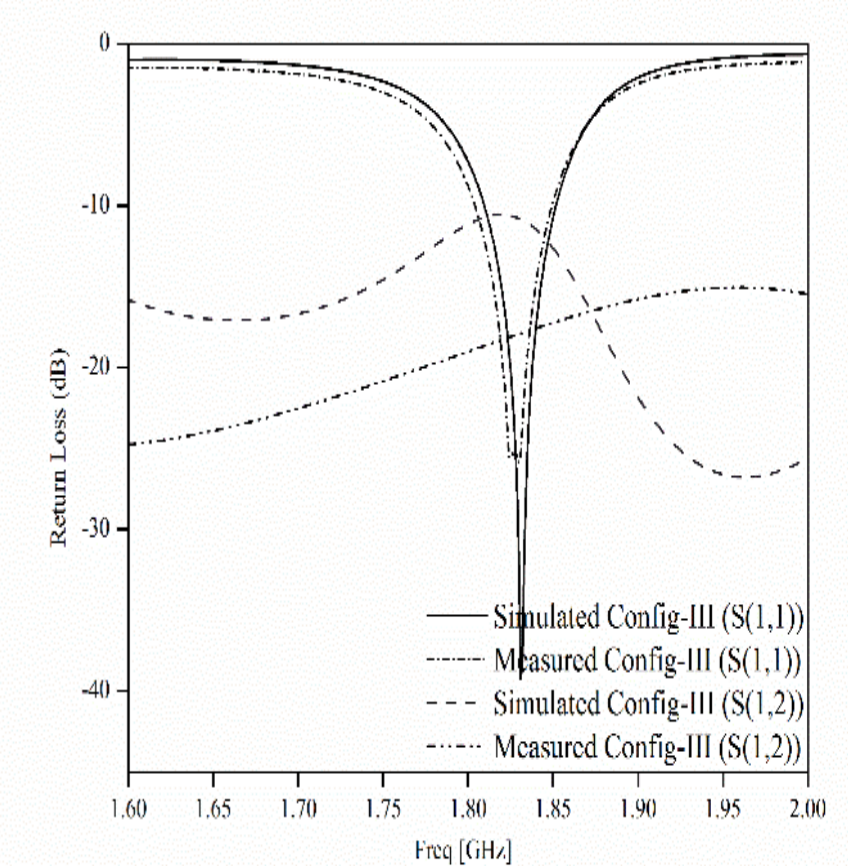
Dimension	Size (mm)	Dimension	Size (mm)
a	30	L	60
b	30	W	60
d	15	r	4.5
e	10.92	p	5.5
g	3	-	-



The above figure shows the Return loss when only Switches 2 and 3 are ON. The value below -10dB is considered. It cover the first band for Korean PCS communication.

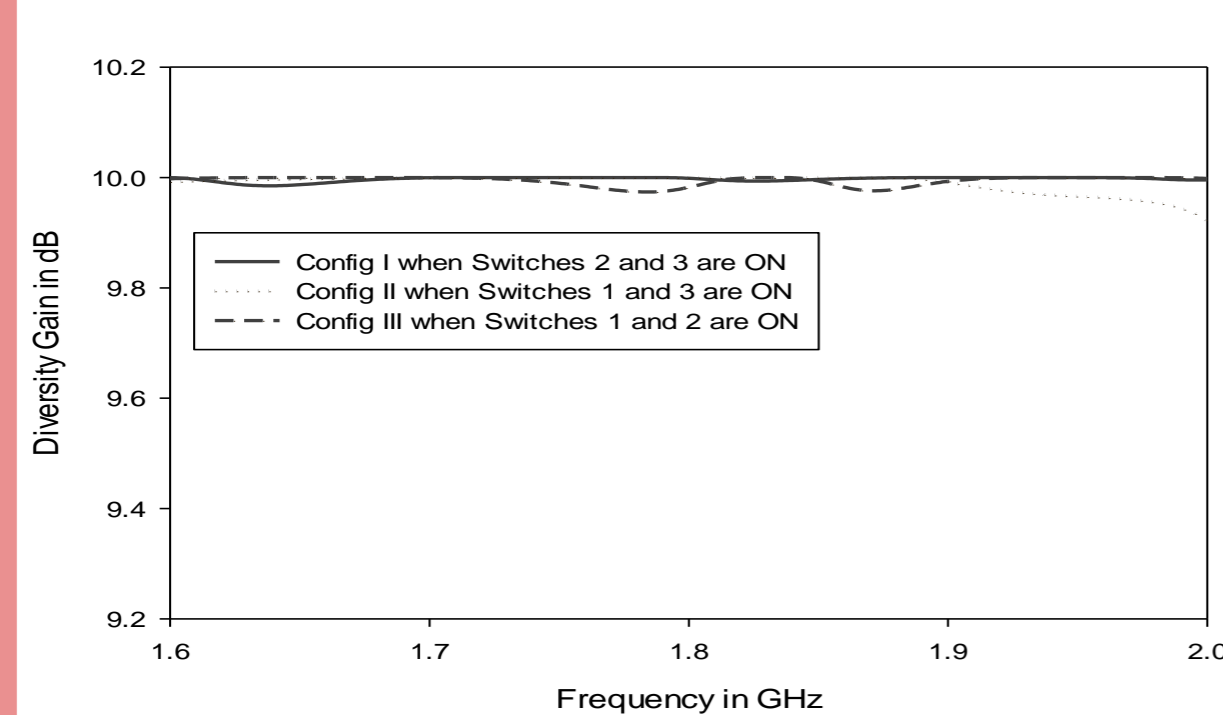


The above middle figure specify return loss of the second switching arrangement when switches 1 and 3 are ON. This arrangement cover the 2<sup>nd</sup> band of the Korean PCS.



This right most figure shows the return loss for the third switching arrangement when 1 and 2 kept ON. This switching arrangement help to achieve third PCS band.

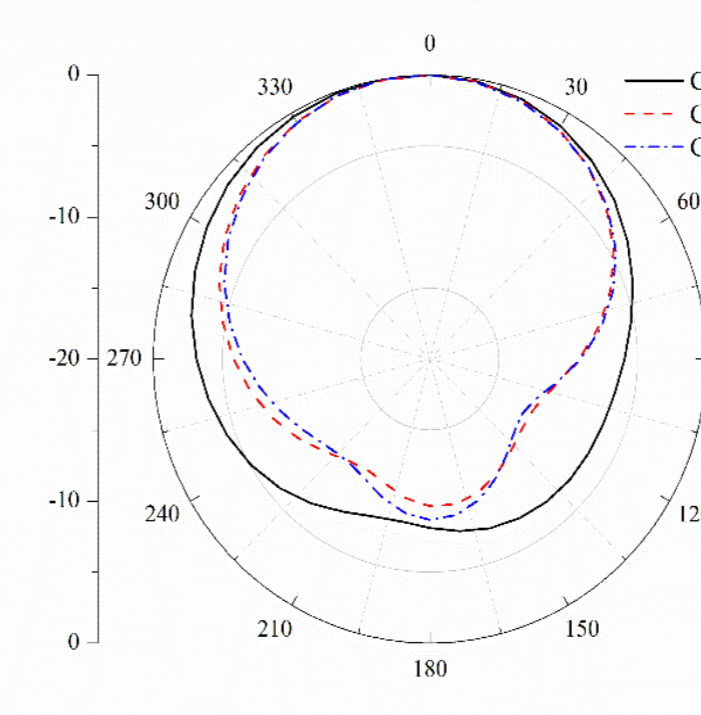
Simulated results of Diversity Gain, Envelop Correlation Coefficient and Radiation pattern



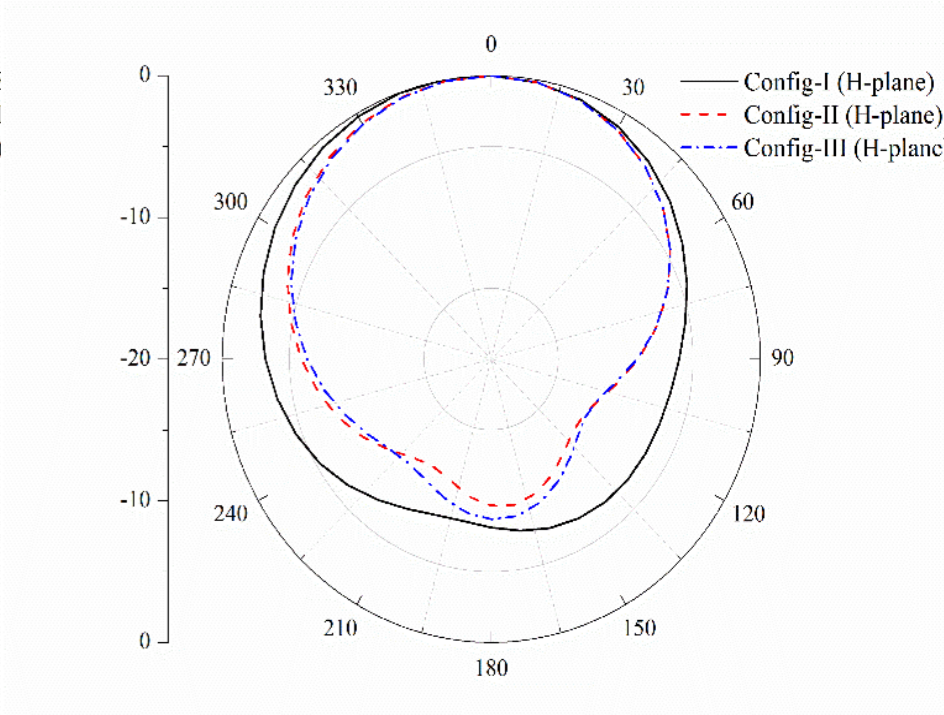
Diversity Gain for the all the three switching arrangements. The diversity gain for all the switching arrangement is 10dB.



Envelop Correlation for all the switching arrangement shows a good value i-e less than 2 which is considered good one.



E-field of the radiation pattern for all the switching arrangements with stable values



H-Field of the radiation pattern for all the switching arrangements.

## Conclusion

In this work, a L-shaped MIMO, reconfigurable DRA for Korean PCS bands has been proposed. The DRA is placed on Fr-4 ground plane with 60x60mm<sup>2</sup> volume. The DR is stacked with micro-strip patches and an air gap has also been introduced. To keep the bandwidth narrow, the proposed MIMO Reconfigurable DRA has aperture coupled feedings. Switches are positioned on the top of the DR. Six PIN diodes are simulated to make three configurations for re-configurability. The three configurations are OFF-ON-ON, ON-OFF-ON, ON-ON-OFF. The antenna performance was examined in terms of simulated values of return loss, ECC, Diversity Gain, Radiation pattern and Efficiencies. Antenna prototype was fabricated and return loss and mutual coupling of the proposed design were measured. Experimental results have shown a good agreement between measured and simulated results.