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Regular paper

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PII: S1434-8411(17)32454-8  
DOI: <https://doi.org/10.1016/j.aeue.2017.12.027>  
Reference: AEUE 52177

To appear in: *International Journal of Electronics and Communications*

Received Date: 16 October 2017  
Accepted Date: 22 December 2017

Please cite this article as: A. Kayabasi, A. Toktas, E. Yigit, K. Sabanci, Triangular quad-port multi-polarized UWB MIMO antenna with enhanced isolation using neutralization ring, *International Journal of Electronics and Communications* (2017), doi: <https://doi.org/10.1016/j.aeue.2017.12.027>

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**Triangular quad-port multi-polarized UWB MIMO antenna with enhanced isolation  
using neutralization ring**

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**Abstract:** In this study, quad-port multi-polarized ultra-wideband (UWB) multiple input multiple output (MIMO) antenna system with a new isolation technique is designed for wireless devices. The antenna structure consists of four triangular monopole elements and neutralization ring (NR) structures. The monopoles are back-to-back positioned in symmetrical and orthogonal arrangement. Therefore, they radiate towards four directions without interference, and thus the diversity performance is improved. A novel NR is formed by combining a rectangular ring and a straight line to reduce the mutual coupling due to interoperation of the elements. Each triangular monopole is fed by 50 Ohm microstrip transmission line (MTL) with a thin strip line for ensuring impedance matching. Antenna performance in terms of impedance bandwidth, current distribution, radiation pattern, peak gain and envelope correlation coefficient (ECC) is also investigated. The MIMO antenna system has 3.1-17.3 GHz impedance bandwidth, 1-5 dBi peak gain variation, less than 0.1 ECC. The results indicate that the proposed antenna has the characteristics of larger UWB bandwidth, high isolation by the NR structure, multi-polarization, uniform gain and quasi-omnidirectional pattern.

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