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Design and ground plane optimization of a CPW-fed ultra-wideband antenna

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Mohammed AL-HUSSEINI¹, Ali RAMADAN¹, Youssef TAWK², Ali EL-HAJJ¹, Karim Y. KABALAN¹

¹Department of Electrical and Computer Engineering, American University of Beirut, Beirut, 1107 2020, LEBANON

e-mails: husseini@ieee.org, {ahr06, elhajj, kabaln}@aub.edu.lb

²Department of Electrical and Computer Engineering, University of New Mexico, Albuquerque, NM 87131, USA

e-mail: yatawk@ece.unm.edu

 [Keywords](#)
 [Authors](#)



elektrik@tubitak.gov.tr

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Abstract: In this paper, an ultra-wideband antenna based on an egg-shaped conductor and a co-planar waveguide (CPW) feed is presented. The ground plane incorporates an egg-shaped slot with parametrized center and dimensions. By resizing the slot and moving its center, a slotted or a partial ground can be obtained. Based on this configuration, a parametric study that aims at achieving the best ultra-wideband (UWB) response of the antenna is done. The study shows that an excellent UWB response is achieved for a certain ground slot size, beyond which the response starts to degrade. However, as the slot size tends to infinity, thus leading to a partial rectangular ground plane, the UWB property again emerges. A second parametric study is done to find the length of the partial rectangular ground plane that gives the best UWB profile. As a result, two optimal designs are generated. Prototypes of the two are fabricated and their return loss is measured. Other characteristics are computed using a Finite-Element-based EM solver. The radiation patterns, peak gain, and radiation efficiency of both optimal configurations are presented and compared. The results show that the design with the slotted ground yields better omni-directional patterns and higher gains in the principal planes. The second design has slightly larger radiation efficiency and larger peak gains at highfrequencies.

Key words: Printed antennas, UWB, CPW

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