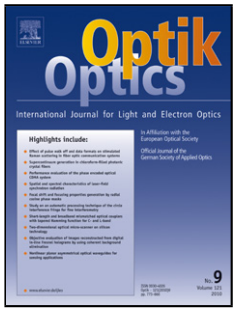

Title: A Novel Design of Microstrip Patch Antenna Array with Modified-I-shaped Electromagnetic Metamaterials Applied in Microwave Wireless Power Transmission

Authors: Tian-qian Li, Bo Ma, Xiao-feng Du, Hong-yuan Chen, Run-chun Deng, Xiao-ming Yang, Yu Yang, Hang He, Yuan-wen Chen, Wen-ran Lv

PII: S0030-4026(18)31125-2
DOI: https://doi.org/10.1016/j.ijleo.2018.08.012
Reference: IJLEO 61309

To appear in:

Received date: 1-1-2018
Accepted date: 7-8-2018

Please cite this article as: Li T-qian, Ma B, Du X-feng, Chen H-yuan, Deng R-chun, Yang X-ming, Yang Y, He H, Chen Y-wen, Lv W-ran, A Novel Design of Microstrip Patch Antenna Array with Modified-I-shaped Electromagnetic Metamaterials Applied in Microwave Wireless Power Transmission, *Optik* (2018), https://doi.org/10.1016/j.ijleo.2018.08.012

A Novel Design of Microstrip Patch Antenna Array with Modified-I-shaped Electromagnetic Metamaterials Applied in Microwave Wireless Power Transmission

All the authors' information are listed as the following:

Tian-qian Li[1], Bo Ma[1,2*], Xiao-feng Du[3], Hong-yuan Chen[4], Run-chun Deng[1], Xiao-ming Yang[1], Yu Yang[1], Hang He[5], Yuan-wen Chen[6],Wen-ran Lv[7]

[1]*School of Electrical Engineering and Electronic Information, Xihua University, Sichuan, Chengdu 610039, China*

[2]*No. 95786 Unit Troops of the People's Liberation Army, Sichuan, Chengdu, 611431, China*

[3]*State Grid Bazhong Power Supply Company, Sichuan, Bazhong 636000 , China*

[4]*Alps Electric Co., Ltd. 1-7 Yukigaya-Otsuka-machi, Ota-ku, Tokyo 145-0067, Japan*

[5]*Army Logistics University of PLA, Chongqing, Shapingba District, 401331, China*

[6]*Engineering University of the Chinese People's Armed Police Force , Xi'an , Weiyang District , 710086, China*

[7]*School of Communication and Information Engineering, University of Electronic Science and Technology of China, Sichuan, Chengdu 611731, China*

** Corresponding author. E-mail address: 793959599@qq.com (Bo Ma).*

Abstract:

Distinguished from conventional inductive or resonant method, this paper presents a novel high radiation gain and narrower half-power beamwidth microstrip patch antenna(MPA) array loading with modified-I-shaped(MIS) electromagnetic metamaterials(MTM) to apply in the microwave wireless power transmission(MWPT). The MIS MTM unit cell is simulated in HFSS and the effective parameters of the meta-atom is extracted by homogenization retrieval method. Detailed single MPA numerical computing and modeled simulation is proposed step by step and optimetrics procedure in HFSS is conducted to optimize the design parameters for optimum performance. To better take advantages of the higher directive radiation gain and planer structure, a 6×10×1 MIS MTM array acting as superstrate is placed above a 2×2 MPA array with delicate feeding network and power distribution system. Experiment investigation indicates that the MPA array with superstrate obtained the peak value gain of 17.66dB compared to original 13.18dB in the operating frequency of 10GHz. The half-power beamwidth decreased from 36.775° to 18.645° for the E-plane and reduced to 19.958° from 38.649° for the H-plane