PIERS 2015 Prague

Progress In Electromagnetics Research Symposium

Program

July 6 - 9, 2015
CZECH REPUBLIC

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09:20 Study of Hot Spots by Oncological Patients with Metal Implants in Head and Neck Region
Ondrej Fiser (*Czech Technical University in Prague, Czech Republic*); *Ilja Merunka* (*Czech Technical University in Prague, Czech Republic*); *Lucie Vojackova* (*Czech Technical University in Prague, Czech Republic*); *Jan Vrba* (*Czech Technical University in Prague, Czech Republic*);

09:40 A Couple of Methods for Power Focusing of Vector Felds in Non-homogenous Media
Domenica A. M. Iero (*Universita Mediterranea di Reggio Calabria, Italy*); *L. Crocco* (*Institute for Electromagnetic Sensing of the Environment, Italy*); *Tommaso Isernia* (*Mediterranea University of Reggio Calabria, Italy*);

10:00 **Coffee Break**

10:20 Biological Signals Transmitted by a Resonant L-C-oscillator; Transmission Controlled by Measuring the Growth of Plants
Konstantin Meyl (*Furtwangen University, Germany*); *Heide Schnabl* (*Universitat Bonn, Germany*);

10:40 Novel Microwave Applicators Inspired by Metamaterials for Hyperthermia Treatment of Cancer
David Vrba (*Czech Technical University in Prague, Czech Republic*); *Jan Vrba, Jr.* (*Czech Technical University in Prague, Czech Republic*); *Paul R. Stauffer* (*Thomas Jefferson University, USA*);

11:00 Phased Arrays Pre-treatment Evaluation in Antitumoral Hyperthermia
Piero Tognolatti (*University of L'Aquila, Italy*); *Fernando Bardati* (*University of "Tor Vergata", Italy*);

11:20 Complex Permittivity Measurement in Hyperthermia Treatment Planning
Jaroslav Vorlicek (*Czech Technical University, Czech Republic*); *Ladislav Oppl* (*Czech Technical University in Prague, Czech Republic*); *Jan Vrba* (*Czech Technical University in Prague, Czech Republic*);

11:40 Feasibility Study of Microwave Interstitial Applicator Array for Treatment Pancreatic Cancer
Lucie Vojackova (*Czech Technical University in Prague, Czech Republic*); *Jan Vrba* (*Czech Technical University in Prague, Czech Republic*); *Ondrej Fiser* (*Czech Technical University in Prague, Czech Republic*); *Ilja Merunka* (*Czech Technical University in Prague, Czech Republic*); *Katerina Cervinkova* (*Czech Technical University in Prague, Czech Republic*);

Session 4A8
Microstrip Antennas and Defected Ground Structure (DGS) Filters

Thursday AM, July 9, 2015

Room H

Organized by Ahmed Boutejdar

Chaired by Yongchae Jeong

08:00 A Microstrip Line with Additional Capacitive and Inductive Effects Loaded
Jongsik Lim (*Soonchunhyang University, Republic of Korea*); *Kyunghoon Kwon* (*Soonchunhyang University, Republic of Korea*); *Seungwook Lee* (*Chonbuk National University, Republic of Korea*); *Seok-Jae Lee* (*Soonchunhyang University, Republic of Korea*); *Sang-Min Han* (*Soonchunhyang University, Republic of Korea*); *Dal Ahn* (*Soonchunhyang University, Republic of Korea*); *Yongchae Jeong* (*Chonbuk National University, Republic of Korea*);

08:20 Applications of Artificial Magnetic Conductors to the Innovative Design of Various RFID Tag Antennas
Dongho Kim (*Sejong University, Korea*);

08:40 Design of the Wide-tuning-range Notch Filter with Wide Constant Absolute Bandwidth
Ching-Wen Tang (*National Chung Cheng University, Taiwan*); *Wei-Min Chuang* (*National Chung Cheng University, Taiwan*);

09:00 A Simple Tunable Filter Antenna Design with No Bias Lines
Mohammed Al-Husseini (*American University of Beirut, Lebanon*); *Karim Y. Kabalan* (*American University of Beirut, Lebanon*); *Ali El-Hajj* (*American University of Beirut, Lebanon*);

09:20 Investigation of Slotted EBG Structures on the Ground Plane of Golden Spiral Antenna
Bhaskar Harsha (*Vishveshwarya Technological University, India*); *G. S. Karthikeya* (*Visvesvaraya Technological University, India*); *Praveenkumar Patil Kedar* (*Vishveshwarya Technological University, India*); *Gowda N. G. Monish* (*Vishveshwarya Technological University, India*);

09:40 Sierpinski Gasket Fractals Implemented as Electromagnetic Band Gap (EBG) Structures on a Multiband Antenna for WLAN/WiMAX Applications
Praveenkumar Patil Kedar (*Vishveshwarya Technological University, India*); *G. S. Karthikeya* (*Vishveshwarya Technological University, India*); *Gowda N. G. Monish* (*Vishveshwarya Technological University, India*); *Bhaskar Harsha* (*Vishveshwarya Technological University, India*);

A Microstrip Line with Additional Capacitive and Inductive Effects Loaded

Jongsik Lim[1], **Kyunghoon Kwon**[1], **Seungwook Lee**[2], **Seok-Jae Lee**[1], **Sang-Min Han**[1], **Dal Ahn**[1], **and Yongchae Jeong**[2]

[1]Soonchunhyang University, Republic of Korea
[2]Chonbuk National University, Republic of Korea

Abstract— Microstrip line depicted in Fig. 1 is one of representative transmission lines, and its characteristic impedance (Z_o) is proportional to the ratio of the equivalent inductance (L) to capacitance (C) per unit length with the mathematical expression of ($Z_o = \sqrt{L/C}$). If a perturbation structure is added to the normal microstrip line, the additional parasitic inductance and capacitance arise and make the characteristic impedance change from the normal value. The changed characteristic impedance depends on the property of the added perturbation structure, so Z_o would increases or decreases depending whether the perturbation is an inductive or capacitive structure, respectively. Fig. 2 shows SIAD (substrate integrated artificial dielectric) structure proposed by Coulombe et al. in 2007. This structure has a lot of metalized via-holes through the second dielectric substrate. One of major effects of SIAD falls on the increased equivalent capacitance. The realizable limitation of the characteristic impedance goes down further to the lower side if SIAD is added. This means when a specified characteristic impedance of microstrip line is required after SIAD has been combined, the line width maybe much thinner than normal one, so sometimes it is necessary to compensate the line width. Fig. 3 is a defected microstrip structure (DMS), which has the additional equivalent inductance per unit length. If a DMS pattern is inserted alone on the microstrip line, characteristic impedance increases. It means one need to enlarge the line width to keep the same specific characteristic impedance. When SIAD and DMS structures are combined to a normal microstrip line as illustrated in Fig. 4, the characteristic impedance and line width are preserved similarly to the normal ones while the advantages of adding perturbation structure such as the increased slow-wave effect and enlarged electrical length. These advantages are fruitful in reducing the physical length of a fixed specific electrical length. Fig. 5 shows dimensions of DMS as example in this work. One can compare the physical lengths of four microstrip lines for the same frequency (1 GHz) and fixed electrical length ($\lambda/4$) in Table 1.

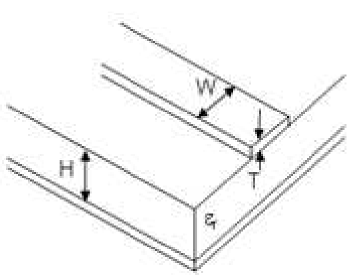

Figure 1.

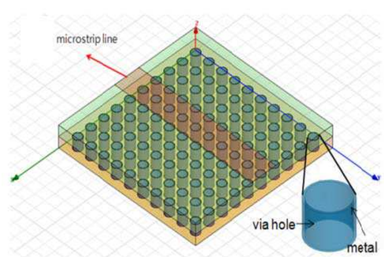

Figure 2.

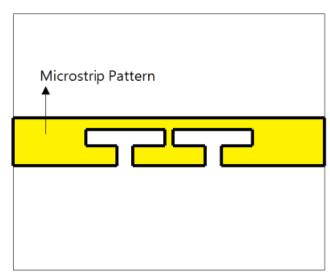

Figure 3.

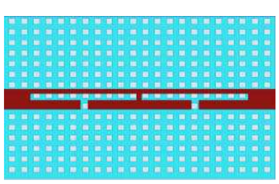

Figure 4.

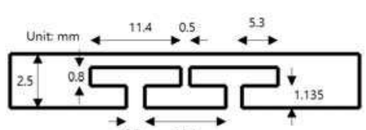

Figure 5.

	Normal	With SIAD	With DMS	With SIAD+DMS
W	2.37	1.28	3.4	2.5
λ/4@1GHz	53.71	41.92	43.21	29.11
Remarks	H=(31+5)mils, ε_r=2.2, T=0.018 Diameter of via-holes=0.8, pitch=1.3 Zo=50Ω, Unit: mm			

Table 1.