TRANS BLACK SEA REGION UNION OF APPLIED ELECTROMAGNETISM (BSUAE)

Volume 9 Number 2 December 2007

CONTENTS

DESIGN AND SIMULATION OF RADON-MULTIWAVELET BASED OFDM SYSTEM

O. Q. J. Al-Thahab, W. A. Mahmoad, M. S. Abdul-Wahab……..1

In this work, the Orthogonal Frequency Division Multiplexing (OFDM) system is designed based on Finite radon transform (FRAT) instead of 16QAM, and QPSK mapping schemes, while using Discrete Multiwavelet Transform (DMWT) as multi-carier modulation technique. The system is proposed to improve the Bit Error Rate (BER) and spectral efficiency of the traditional OFDM system over multi-path Rayleigh selective and flat fading channels followed by Additive White Gaussian Noise (AWGN) and taking into account the effect of varying the Doppler shift frequency, and the variation of channel parameters.

It can be seen from the proposed system that a good performance was obtained over the traditional OFDM which uses the fast Fourier Transform (FFT) as multi-carrier modulation technique. This is because the advantages of DMWT of providing multi-filter banks which reduces the BER, while the use of FRAT provided the enhancement of spectrum of the transmitted symbols.

PERFORMANCE ANALYSIS OF OPTICAL RING NETWORK

L.A.Al-Mayahi, Ali Y. Fattah……..17

In this paper the background theory of the WAN protocols with their different ring topologies is given. The two architectures considered in this work are 1) A circuit-switched ring, such as Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) ring [1] and 2) A packet -switched ring, such as Spatial Reuse Protocol (SRP) [2]. Then we calculate the throughput under different traffic pattern before and after the ring failure and prove that SRP is better than SONET/SDH in term of throughput.

EM FIELD DISTRIBUTION AMD PROPAGATION IN SOME REALISTIC SCENARIOS

D. Kakulia, L. Manukyan, D. Mazmanov, A. Razmadze, R. Zaridze…….39

This is an overview article related to methodology of evaluating the exposure to EM energy in various realistic scenarios and for better understanding of the field EM distributions in the outdoor and indoor environments nearby powerful EM sources or base stations [1]. Several scenarios are considered. First, is a closed or semi-open objects that are analyzed as a resonators with some Q-factor for which a numerical EMC study related to the resonant enhancement of the EM fields within the volume is described with the particular example of in-vehicles scenario. Second is the studying outdoor field propagation nearby and around some obstacles and evaluation of the field distribution in this case. The list topic is related to investigation of human exposure to EM fields in a wide frequencies range. All the simulated scenarios are reasonably realistic and include many practical exposure and propagation conditions.

A PLANAR VACUUM DIODE WITH ELECTRONS POSSESSING VELOCITY DISTRIBUTION FUNCTION

D. G. Stoyanov…….54

The current-voltage characteristic of a planar vacuum diode with electrons possessing velocity distribution function during an emission from the cathode (electron beam) is theoretically considered in this article. The electron beam movement in the volume is examined. An integral-differential equation for the electric field potential is got in a correct form. A current-voltage characteristic of the diode for a model function of the velocity distribution of the emitted electrons is obtained.

SOME IMPLEMENTATIONS OF STOCHASTIC PRINCIPLES IN ELECTROMAGNETICS

A. G. Tyzhnenko……..65

Stochastic comparison of signals in electromagnetic form or in numerical one is addressed. Due to such a comparison, one can identify a stochastic signal with some binary unit of information. That is, each bit of information can be transmitted as a stochastic signal with or without carrier. At a receiver, the identification of bits (1s or 0s) is proposed to do by measuring the correlation coefficient between received signal and two replicas, one of which corresponds to 1s and the other corresponds to 0s. This principle is used in the work for constructing a highly confidential scheme of communication, in which the security problem is solved on combined physical and mathematical level. Besides, stochastic comparison of electromagnetic signals is considered regarding to low-power radars and remote-managing locks.

DECIMATIVE SPECTRUM ESTIMATION METHOD FOR HIGH RESOLUTION RADAR PARAMETER ESTIMATES

A. V. Karakasiliotis, P. V. Frangos.....88

Scattering center extraction for radar targets is strongly related to high-resolution parameter estimation. In this paper, we propose the use of a decimative spectrum estimation method (DESED) for the estimation of the parameters of a synthetic radar signal.DESED is compared to two variants of the widely applied root-MUSIC algorithm,in terms of range and amplitude estimation errors. The proposed method outperforms root-MUSIC with modified spatial smoothing pre-processing, for both well-separated and closely spaced point scatterers. Additionally, it appears to be slightly more accurate than root-MUSIC with decimation, especially for low signal-to-noise ratio and in the case of well-separated point scatterers.

AN INVESTIGATION ON PROPAGATION AND ABSORPTION OF ELECTROMAGNETIC SIGNALS THROUGH BIOLOGICAL MEDIA

D.Tz.Dimitrov……...…98

A basic knowledge of biological material properties, their uniqueness, and their variability among living systems may provide a basis for the exploitation of electromagnetic interaction mechanisms. The macroscopic approach deals with the whole biological material exposed to electromagnetic fields generated by the exogenous fields. This approach requires complete knowledge of the electromagnetic properties of the material. Ability to solve Maxwell's equations with the appropriate boundary conditions is also required.

A mathematical analysis of the processes of propagation and absorption of electromagnetic signals in the live tissues have been done in the paper taking in account some specific values of the conductivity of biological materials σ*, the real part of the complex relative permittivity of biological materials* ε' *and the imaginary part of the complex relative permittivity of biological materials* ε''*.*

The principal results of present investigation is connected with mathematical description of the processes of propagation and absorption of electromagnetic signals in the live tissues.

THE ULTRASONIC TRANSDUCER PREAMPLIFIER NOISE PERFORMANCE

V. Dumbrava, L. Svilainis……107

The preamplifier noise performance is important in the case of a medical ultrasonic inspection.In this paper we analyze the noise by using the complete mathematical model for input stage, incorporating transducer,transformer, operational amplifier and the external passive components.The analysis is used for noise parameters prediction. The theoretical results have been tested experimentally. The system for signal propagation and an absolute noise level measurement over the frequency range has been developed. The experimental results have been used to calculate the noise performance. The

theoretical and experimental investigation confirmed the ability to improve the ultrasonic preamplifier noise performance.

INVESTIGATION OF NONSYMMETRICAL LOAD INFLUENCE TO THE THREE-PHASE GRID VOLTAGE

G. Ganev……...……...…..…….118

The results of investigation of nonsymmetrical load influence to the power grid voltage are presented. A different point of view is presented and the relationship between three-phase current magnitudes and phase angles and distribution transformer supply voltage is explored.