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Commission for Regulation of Communications
Association "Telecommunications"
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College of Telecommunications and Post**

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INTERCONNECTEDNESS**



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C O N T E N T S

1.	PRESENTATION FROM THE MINISTRY OF TRANSPORT, INFORMATION TECHNOLOGY AND COMMUNICATIONS STATE POLICY IN THE AREA OF ELECTRONIC COMMUNICATIONS - A PREREQUISITE FOR THE DEVELOPMENT OF THE SECTOR Dimitar Dimitrov - Head of "Radiocommunications Section" Directorate of "Communications " MTITC.....	6
2.	PRESENTATION FROM THE COMMUNICATIONS REGULATION COMMISSION.....	6
3.	USING ORTHOGONAL SUBCHANNELS IN THE GSM NETWORK Mihail Mihailov, Mobiltel EAD.....	6
4.	STRATEGY FOR ECONOMIC DEVELOPMENT AND INNOVATION IN THE NEW PROGRAM PERIOD 2015 – 2020 FOR MODERNIZING OF THE COMPLEX CONSTRUCTION OF THE SINGLE EUROPEAN RAILWAY NETWORK Nikola Durchev, BALKANTEL Ltd.....	6
5.	DIGITAL RADIO AND TELEVISION BROADCASTING - PRESENT STATE AND FUTURE DEVELOPMENT Kiril Konov - CEEC.....	6
6.	GLIMPSES ON TELECOMMUNICATIONS - III Kamen Rangelov – UBS.....	6
7.	PLANNING OF TELECOMMUNICATION NETWORKS Ignat Stanev - CEEC.....	6
8.	1.1. OPTIMIZING THE OPTICAL CHANNEL PARAMETERS IN THE CABLE MULTIMEDIA SYSTEMS Lidia Totkova Jordanova, Dobri Mihajlov Dobrev.....	7
9.	1.2. SECOND GENERATION SATELLITE TV SYSTEMS Lyubomir Bogomilov Laskov, Lidia Totkova Jordanova.....	7
10.	1.3. METHODES TO IMPRUE COMMUNICATION OVER THE REVERSE PATH CHANNEL OF A CABLE MULTIMEDIA SYSTEM Dobri Mihajlov Dobrev, Lidia Totkova Jordanova.....	7
11.	1.4. COMPUTER SIMULATION OF DISPERSION IN OPTICAL FIBER Kalin Dimitrov, Lidia Jordanova, Tsvetan Mitsev.....	8
12.	1.5. DETERMINING OPTIMAL DIVERGENCE OF TRANSMITTERs IRRADIANCE AT OWCS Tsvetan Asenov Mitsev, Nikolai Kondov Kolev.....	9
13.	1.6. PERFORMANCE ANALYSIS FOR DOA ALGORITHMS USED IN COGNITIVE RADIO SYSTEMS Todor Dimitrov Tsvetkov, Ilia Georgiev Iliev.....	9
14.	2.1. NEW ANALYTICAL RELATIONSHIPS RELATED TO COMPRESSED COSINES APPROXIMATION METHOD Peter Stoyanov Apostolov.....	10
15.	2.2. EXAMINATION OF THE ELECTROMAGNETIC FIELD IN A COIL WITH A FERRITE CORE Ivan Stefanov Bozev.....	10

	2.3. DIGITAL TECHNOLOGY AND PMR	
16.	Alexey Kostadinov Stefanov, Ivan Dinkov Ivanov.....	10
17.	3.1. WI-FI BASED INDOOR LOCALISATION FOR INTELLIGENT LIGHTING CONTROL Marin Marinov.....	11
18.	3.2. PREDICTION OF THE PATH LOSS IN INDOOR ENVIRONMENT IN 4G LTE NETWORK AT 1.8 GHz Philip Atanasov and Zhivko Kiss'ovski.....	11
19.	3.3. APPLICATION OF ITILV3 IN PROJECT MANAGEMENT OF TELECOMMUNICATION NETWORKS Martin Kolev, Mario Ivanov.....	12
20.	4.1. VISIBLE LIGHT AS A COMMUNICATION MEDIUM – FROM ILLUMINATION TO DATA TRANSMISSION prof. eng. Boris Jovchev, Mrs. eng Rositza Mladenova.....	12
21.	4.2. STUDY ON PROTOCOLS FOR SECURE ACCESS CONTROL Nikolay Krastanov.....	12
22.	4.3. BASIC MEASUREMENTS IN CABLE DISTRIBUTION NETWORKS FOR TRANSMISSION OF TV SIGNALS Dr. Eng. Boyko Harlov, Eng. Ognian Velchev.....	13
23.	5.1. STUDYING THE WORKING REGIMES OF PARTS OF A PHOTOVOLTAIC SYSTEM FOR POWER SUPPLY OF A TELECOMMUNICATION EQUIPMENT Ivan Nedyalkov, Dimitur Arnaudov.....	14
24.	5.2. RESEARCH TECHNIQUES AND ENCRYPTION STEGANOGRAPHY Theodora Krumova, Maria Nenova.....	14
25.	6.1. COMPENSATION OF NET COST OF BTC Assoc. Prof. Ph.D. Valentin Todorov Tsenov.....	15
26.	6.2. IMPROVING THE CALCULATION OF THE USE OF UNIVERSAL POSTAL SERVICE Zdravko Mihaylov.....	15
27.	6.3. MODEL FOR EVALUATION AND ANALYSIS OF ITSM PROCESSES Mario Ivanov, Yoana Hristova.....	16
28.	7.1. ANALYSIS OF THE TRAFIK CAPACITY OF SCP-HAPS COMMUNICATION SYSTEMS Veselin Demirev.....	16
29.	7.2. PRIORITY SERVICING OF THE TRAFFIC IN IOT Dimitar Atamian.....	16
30.	7.3. INVESTIGATIONS OF HANDOVER DELAY EFFECT ON TCP TRAFFIC IN MOBILE IPv6 „MULTIHOMING” NETWORKS Kamelia Nikolova and Maria Dimova.....	17
31.	8.1. FOR THE INTEGRITIVE APPROACH OF THE TELECOMMUNICATIONS AND POSTAL SERVICES AND THE CUSTOMERS PROTECTION Bozhidar Simeonov, Assoc. Prof., PhD, Eng.....	17
32.	8.2. ITIL METRICS SUPPORTING MEASURING OF ITSM PROCESSES Mario Ivanov, Yoana Hristova.....	17

1.

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STATE POLICY IN THE AREA OF ELECTRONIC COMMUNICATIONS -
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**DIGITAL RADIO AND TELEVISION BROADCASTING - PRESENT STATE AND
FUTURE DEVELOPMENT
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6.

**GLIMPSES ON TELECOMMUNICATIONS - III
Kamen Rangelov – UBS**

7.

**PLANNING OF TELECOMMUNICATION NETWORKS
Ignat Stanev - CEEC**

1.1 OPTIMIZING THE OPTICAL CHANNEL PARAMETERS IN THE CABLE MULTIMEDIA SYSTEMS

Lidia Totkova Jordanova, Dobri Mihajlov Dobrev

Department of Telecommunications, Technical University of Sofia,
Kl. Ohridski, Blvd., 1756 Sofia, phone: +359 2 965 32 77,
e-mail: jordanova@tu-sofia.bg

The paper deals with the main parameters that must be optimized when designing the optical channel of hybrid fiber/coaxial multimedia system. A mathematical model of the optical channel is suggested that makes it possible for the signal minimum level at the optical receiver input to be calculated if the value of carrier-to-noise ratio and the number of RF channels transmitted are known. Analytical expressions to determine the RF signal level in the input of laser transmitter and optimal optical modulation depth are given that take into consideration the acceptable nonlinear distortion in the optical channel. Dependences to determine the parameters carrier-to-noise ratio and carrier-to-interference ratio at the optical channel output are shown which can be used in the design of cable multimedia systems.

Keywords: hybrid fiber/coaxial multimedia system, optical channel, carrier-to noise ratio, carrier-to-interference ratio, optical modulation depth

1.2. SECOND GENERATION SATELLITE TV SYSTEMS Lyubomir Bogomilov Laskov, Lidia Totkova Jordanova

Faculty of Telecommunication, Technical University of Sofia, 8 Kl. Ohridski Blvd,
Sofia 1756, e-mail: laskov@mail.com, jordanova@tu-sofia.bg

The consumers' demand for larger capacity and innovative services by satellite was the reason for development of the second-generation system for satellite broad-band services. The DVB-S2 system is based on four modulation modes (QPSK, 8PSK, 16APSK and 32APSK) and LDPC forward error correction (FEC), concatenated with BCH coding. In order to improve the efficiency of the satellite link, two modulation techniques are introduced: Adaptive Coding and Modulation (ACM) and Variable Coding and Modulation (VCM). The paper provides a tutorial overview of the DVB-S2 system, describing its main features and performance in various scenarios and applications. The mathematical description and circuit realization of BCH and LDPC encoders and decoders and APSK modulators and demodulators are given.

Keywords: DVB-S2, BCH Codes, LDPC Codes, APSK Modulation

1.3. METHODES TO IMPRUE COMMUNICATION OVER THE REVERSE PATH CHANNEL OF A CABLE MULTIMEDIA SYSTEM

Dobri Mihajlov Dobrev, Lidia Totkova Jordanova

Department of Telecommunications, Technical University of Sofia,
Kl. Ohridski, Blvd., 1756 Sofia, phone: +359 2 965 32 77,
e-mail: dobrev@tu-sofia.bg

In this paper a mathematical model of the reverse path channel of hybrid fiber-coaxial multimedia system is suggested with the funnel effect being taken into consideration. The model makes it possible to optimize the topology of the coaxial distribution network and the number of optical nodes whose signals are summarized at the receiver input in the head-end. Experimental and analytical dependences are given that enable the engineer to determine the RF signal dynamic range at the modulation input of the reverse path lasers if both the bit error ratio at the receiver output and the acceptable laser clipping are given. An algorithm and method to set and maintain the balance of the reverse path are described. A special attention is drawn to the equalization of the signal levels from the subscribers' cable modems at the drop amplifier input.

Keywords: reverse path channel, funnel effect, noise and intermodulation distortion, balancing the reverse path

1.4.

COMPUTER SIMULATION OF DISPERSION IN OPTICAL FIBER

Kalin Dimitrov, Lidia Jordanova, Tsvetan Mitsev

Department of Radiocommunications and Videotechnologies,
Technical University of Sofia, 8, Kl. Ohridski, Blvd, e-mail: kld@tu-sofia.bg

A general classification is made using methods with finite differences and methods with splitting into parts. The methods with splitting are used because of the quickness and the acceptable accuracy. In particular, for a non-linear dispersive medium is used the Split Step Fourier Method. One of the essential advantages of this method is that FFT is typically used in the calculations, which has been developed and introduced successfully in many systems.

This work presents a simulation of the effects displayed in a single mode optical fiber. The model was created in the MatlabTM environment. The model is based on sequential Fourier and inverse Fourier transformations, as well as on other processing with the aim of a numerical solution of the nonlinear Schrodinger equation with acceptable accuracy.

We considered the simulation of a single channel as basic for further simulations of WDM systems. When using WDM, there are further complications resulting from effects such as FWM, XPM etc. In some additional research, on the basis of the published expressions we have developed a simulation in the programming environment of MatlabTM. We have created suitable values for time and angular frequency. We have considered the case for transmitting of rectangular pulses with different relative durations and the presence of high order dispersion. The choice of the rectangular pulse is not accidental. It is made to show what is the fiber effect using OOK modulation.

As a main result we considered that a high relative pulse duration dispersion effects occur, but they can easily be avoided. When reducing the length in full agreement with our expectations it is evident that the impulse is significantly influenced both in the time and the frequency domains.

When testing the model with Gaussian pulse we derived results, which are very close to basic results in literature.

1.5. DETERMINING OPTIMAL DIVERGENCE OF TRANSMITTERS IRRADIANCE AT OWCS

Tsvetan Asenov Mitsev, Nikolai Kondov Kolev
Department of Telecommunications, Technical University of Sofia,
Kl. Ohridski, Blvd., 1756 Sofia, phone: +3592 965 32 75, e-mail: mitsev@tu-sofia.bg

Determining the optimal divergence of transmitter's beam in optical wireless communication systems (OWCS) can largely compensate for the negative impact of the change in the direction of propagation of optical radiation due to various random factors. In this work is shown that, depending on the system parameters, the power of the transmitter, the length of the communication channel and meteorological conditions of work, the proper choice of the divergence of transmitters irradiation can significantly improve the reliability of information transmission. The influence of the optical power of the transmitter and the length of the communication channel on the value of the optimum divergence of the beam after transmitting antenna is studied.

Keywords: optical wireless communication systems, laser beam divergence

1.6. PERFORMANCE ANALYSIS FOR DOA ALGORITHMS USED IN COGNITIVE RADIO SYSTEMS

Todor Dimitrov Tsvetkov, Ilia Georgiev Iliev
Dep. Radio communications and Video technologies, Technical University - Sofia,
Kliment Ohridski Blvd No.8, 1000 Sofia, Bulgaria, phone: +359 2 965 26 76,
e-mail: sonny@mail.bg

In recent years, the number and capacity of wireless devices using licensed frequency bands is increased. Cognitive radio technology gives the opportunity for more efficient frequency usage. Dynamic spectrum access allows secondary users to access licensed frequency bands as long as they are not interrupting primary users' transmission. Cognitive radio users must be able to identify the presence of the licensed users as quickly as possible. Users who have legacy rights on the usage of spectrum bands are called primary (licensed) users while secondary (unlicensed) users have lower priority in the same frequency bands without causing unnecessary interference to the primary users. All secondary users must use devices with cognitive radio capabilities in order to provide the necessary quality of service for primary users and for their own requirements. Primary users can use their frequency band at anytime while cognitive radio is operating in the same band. All unlicensed users have to constantly change their transmission parameters in order to avoid interference to the licensed users.

In this paper the precision of various direction of arrival (DOA) algorithms used in cognitive radio networks is researched. The investigated algorithms are MUSIC, Capon (MVDR), ROOT MUSIC, ESPRIT-LS and ESPRIT-TLS. The comparison is made by using the number of array elements, processing time and number of iterations. Wide and narrow angular separation modes are used for analyzing the performance of DOA algorithms in different detection and environment conditions. The results obtained in this work give an idea of the effectiveness of the DOA algorithms and their applicability to improve quality performance in cognitive radio devices.

Keywords: cognitive radio, direction of arrival, MUSIC, ROOT MUSIC, CAPON, MVDR, ESPRIT

2.1.

NEW ANALYTICAL RELATIONSHIPS RELATED TO COMPRESSED COSINES APPROXIMATION METHOD

Peter Stoyanov Apostolov

Department Wireless Communications and Broadcasting, College of Telecommunications and Post, Acad. Stefan Mladenov №1, 1700 Sofia, Bulgaria, phone: +359 2 86 22 893, e-mail: p_apostolv@abv.bg

In the paper a new approximation method of compressed cosines for approximation of ideal band pass filter response is discussed. Comparisons with other approximations are made. A new analytical relationship to determine two important approximation parameters is proposed. The proposed relationships allow implementations of digital filters with high selectivity and minimization of the computations.

Keywords: Polynomial approximation, compressed cosines, digital filter, transition band, stopband attenuation

2.2.

EXAMINATION OF THE ELECTROMAGNETIC FIELD IN A COIL WITH A FERRITE CORE

Ivan Stefanov Bozev

Department of "Basic Training", Higher School - "College of Telecommunications and Post", 1700, Sofia, "Academic Stefan Mladenov" № 1, Bulgaria, e-mail: IBozev@hctp.acad.bg

In the report is presented an experimental study of the electromagnetic field of the coil with ferrite core. The aim of the study was to confirm and eventually complete mathematical model proposed by the author to describe the electromagnetic field in a coil with ferrite core. From experimental studies it is obtained a picture of the electromagnetic field in the ferrite. Because the energy density of the electric field at the performed experiments is insignificant in terms of the energy density of the magnetic field, it was concluded that the distribution of the field is determined by the condition of minimum of the magnetic energy. In this situation speed of movement of the magnetic field lines in the area around the ferrite can be determined by the condition of minimum energy of the electric field. The experimental mock does not allow experimental determination of the electric field. Recommendations are made for further experimental studies to establish the validity of the proposed mathematical model.

Keywords: electromagnetic induction, ferrite coil, transformer.

2.3.

DIGITAL TECHNOLOGY AND PMR

Alexey Kostadinov Stefanov, Ivan Dinkov Ivanov

College of Telecommunications and Post
Acad. Stefan Mladenov № 1, 1700 Sofia, tel. 02 8062 146 ; 02 8062 236,
e-mail: astefanov@hctp.acad.bg, ivanivanov@hctp.acad.bg

The article examines the features and functionality of each of the digital PMR technologies, as they exist in the drafted standards. It will also compare what products are

available in the marketplace, and what products and developments are expected in the future.

TETRA is already a mature and well supported standard that is well suited to the needs of the emergency services and other "mission critical" purposes, as well as professional users.

DMR and dPMR, on the other hand, are still developing, and it remains to be seen whether manufacturers will support the variety of modes that a likely to emerge.

What DMR and dPMR do provide today is a solution for the consumer and commercial user starting from the lower to the middle end of the scale.

Key words: PMR, TETRA, DMR, dPMR

3.1.

WI-FI BASED INDOOR LOCALISATION FOR INTELLIGENT LIGHTING CONTROL

Marin Marinov

Faculty of Electronic Engineering and Technology, Technical University of Sofia, bul. Kliment. 8.1000 Ohridski Sofia, Bulgaria, e-mail: lvl@tu-sofia.bg

The market for lighting controls in industrial buildings has changed and expanded significantly in recent years. In industrial environments with conventional lighting control, illumination is usually left on permanently, regardless of whether activities are performed or not in the area. This leads to unnecessary energy expenditure.

In this work a more specific application related to energy-efficient lighting control in industrial buildings is considered. According to the proposed solution, illumination levels in the different building areas are controlled depending on the presence or absence of persons or vehicles in the corresponding areas. The research presented in this paper aims to evaluate the possibility for using relatively low-cost and easily expandable Wi-Fi-based indoor localization techniques for lighting control in industrial environments. The implementation of the localization system utilizes the RSSI of a Wi-Fi network and fingerprinting positioning algorithms.

Keywords: energy saving, indoor localization, lighting control, RSS, Wi-Fi.

3.2.

PREDICTION OF THE PATH LOSS IN INDOOR ENVIRONMENT IN 4G LTE NETWORK AT 1.8 GHz

Philip Atanasov and Zhivko Kiss'ovski

Sofia University, Faculty of Physics, 5 J. Bourchier Blvd., BG-1164, Sofia, Bulgaria
phone : 02/8161 643, e-mail : ph_atanasov@phys.uni-sofia.bg

Nowadays, the need to provide high-speed broadband access is increasing. Issues associated with the deployment and implementation of wireless communication networks of new generation - 4G, which offer high-speed internet in an office environment are becoming increasingly relevant. Path loss of signals is a key element in their planning. In this study is simulated path loss of the signal in a part of the Physics Faculty building of Sofia University "St. Kliment Ohridski", which has the characteristics of a typical office building in Sofia.

Models are used to predict the path loss of the signal in an office environment for femto-cell at LTE network on 1.8 GHz. In this study we used models WINNER II - indoor model and Cost 231-multi walls- multi floors model. Based on these empirical models

software programs are developed and path loss of the signal is simulated. This process includes counting the number of walls, corridors and floors through which the signal penetrates.

The results indicate the zones of the building with good coverage, which can provide high-speed access. Part of the building will be with restricted speed because of the path loss of the signal which is due to the topology of the building, the number of walls, floors, and the type of the construction material.

Keywords: 4G, LTE, empirical models, path loss of signal, indoor

3.3.

APPLICATION OF ITILV3 IN PROJECT MANAGEMENT OF TELECOMMUNICATION NETWORKS

Martin Kolev, Mario Ivanov

Technical University - Sofia, 1000 Sofia, Bulgaria, Bul. "Kl. Ohridski "№.8, Bl. 1, e-mail: martin.kolevv@gmail.com, mario@tu-sofia.bg

ITIL (Information Technology Infrastructure Library) is a set of best practices in planning, designing, implementation and maintenance of information technologies and services. The Service Life Cycle provides us a structured, well-defined guidance at each stage from the idea for competitive service until its deployment and support. Why don't we use these guidelines for designing a telecommunications network? In Service Strategy stage we define our goals, policies and requirements of the designed network. The Service Design processes aim to achieve the specified goals in the best possible way taking in mind the technical and financial restrictions. In Service Transition stage, processes are orientated in the smooth deployment, while Service Operation and Continual Service Improvement guarantee the best performance of the network in the long run.

4.1.

VISIBLE LIGHT AS A COMMUNICATION MEDIUM – FROM ILLUMINATION TO DATA TRANSMISSION

prof. eng. Boris Jovchev, Mrs. eng Rositza Mladenova

Visible light communication through Li-Fi technology will turn every LED fixture into Internet access point (AP), where data can be transmitted at rates of 10 Gbit/s and where the risk to having your personal information hijacked will be a thing of the past. Every user will move from light source to light source without interrupting the flow of data. The unique physical properties of light promise to deliver high-speed networks with high density. The realization of these solutions is achieved by using versions of OFDM and novel algorithms for light intensity processing.

4.2.

STUDY ON PROTOCOLS FOR SECURE ACCESS CONTROL

Nikolay Krastanov

Communication Networks, TU-Sofia, 8, Kl. Ohridski blv, 1000 Sofia, e-mail: nikolai.krastanov@gmail.com

The report presents a study on protocols for secure remote login in Internet Protocol-based communications. Protocols for secure access control are analyzed. A modification of Boneh-Franklin scheme for key management in Secure Shell (SSH) protocol is proposed. Implementation aspects are discussed.

Key words: Remote-login, authentication, encryption, key management

4.3.

BASIC MEASUREMENTS IN CABLE DISTRIBUTION NETWORKS FOR TRANSMISSION OF TV SIGNALS

Dr. Eng. Boyko Harlov

Higher School "College of Telecommunications and Posts"

Sofia 1700, "Student City" Street "Academician Stefan Mladenov" № 1,

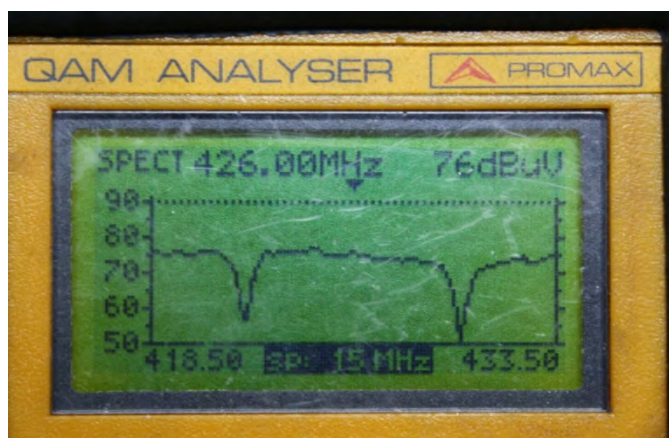
tel. 02 86 22 893, harlov@hctp.acad.bg

Eng. Ognian Velchev

"Multimedia-BG" Ltd, 1-5, "Balkandji Yovo" St. 1612 Sofia,

tel.+359 89 990 64 77, ognian.velchev@gmail.com

The aim of this work is to make an overview of some relevant essential parameters for correct operation of a cable distribution system for TV signals and measurement methods, namely stability carrier frequency fluctuation, signal level, the influence of noise – own and from external sources, interference of second and third order cross modulation. To assess the quality of the reception quality the most common ways is to use spectrum analyzers of signals:



Spectrogram of the real digital channel

An overview of modern measuring equipment, such as Spectrum Analyzers, Network Analyzers, measure of the signal/noise (Noise figure meter), a measure the depth of modulation and her enveloping curve, Frequency counters, Power meters. Addressed are the main block diagrams of some measurement procedures with which this work could be used as a basic guide for diagnosis and control of cable distribution system for TV signals.

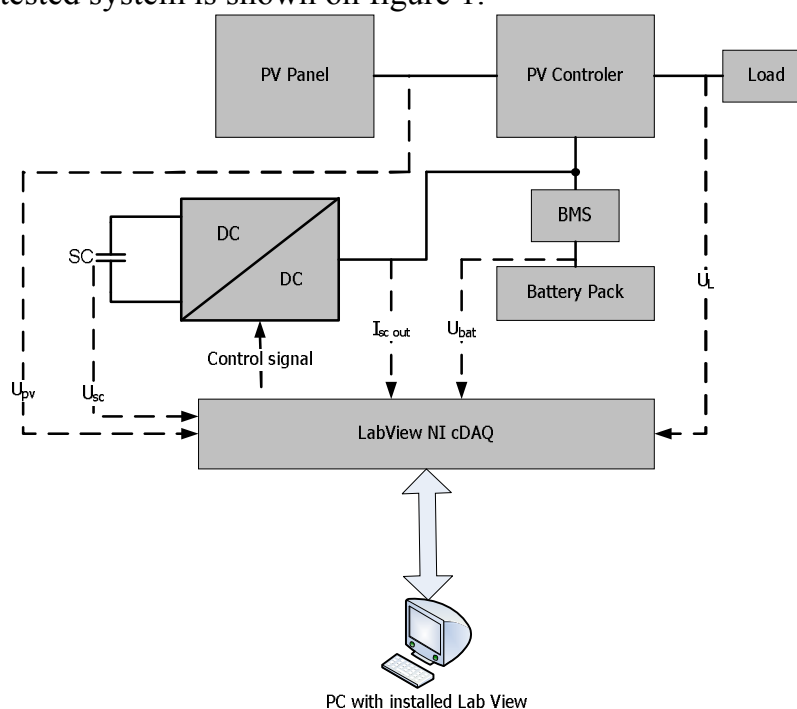
Keywords: Measurements, Quality, CATV

5.1. STUDYING THE WORKING REGIMES OF PARTS OF A PHOTOVOLTAIC SYSTEM FOR POWER SUPPLY OF A TELECOMMUNICATION EQUIPMENT

Ivan Nedyalkov, Dimitur Arnaudov

Department of Telecommunication technologies, Higher Scholl College of telecommunications and post, Sofia, i.nedialkov@icloud.com, d_arnaudov@abv.bg

In this paperwork an experiment study of the working regimes of Lithium-ion battery pack has been made. The battery pack is made of several series connected lithium-ion cells. The battery pack is part of a photovoltaic power supply system for telecommunication equipment. The processes of charging and discharging of the battery pack is managed by a BMS – Battery Management System. The combine work between the battery pack and the supercapacitor is provided by the bi – directional converter, which is part of the study too. Different kinds of circuit for balancing of lithium-ion cells are examined and tested. The block diagram of the tested system is shown on figure 1.



Фиг.1 Блокова схема на изследваната система

Key words: BMS, Lithium-ion battery, Photovoltaic system

5.2. RESEARCH TECHNIQUES AND ENCRYPTION STEGANOGRAPHY

Theodora Krumova, Maria Nenova

Department of Communication networks, Technical University of Sofia, 8 Kl. Ohridski Blvd., 1756 Sofia, Bulgaria, phone: +359 2 965 21 34, e-mail: mvn@tu-sofia.bg

In the present paper are presented various Cryptographic and Steganography techniques. The main encryption algorithms are discussed and various methods for hiding of information their analysis. Moreover, a special attention is paid to stego- and cryptanalysis.

The paper is focused on Steganography and crypto techniques and their practical implementation. In details is investigated the Steganography algorithm LSB and is given a proposal for its application in real situations.

6.1.

COMPENSATION OF NET COST OF BTC

Assoc. Prof. Ph.D. Valentin Todorov Tsenov

New Bulgarian University, Department "Telecommunications", 1618 Sofia, 21

Montevideo St., tel. + 359-2-8110-609, e-mail: vtzenov@nbu.bg

JEL: D22, L 96

We examined the need for compensation of the net cost of the telecom operator. They are the result of imposed obligations to provide universal service. Defined are main categories. Shown is the interpretation of the USO Directive on "unfair burden" and the practice in EU countries. The results from conducted an independent audit to verify the net cost of the BTC that indicate their compensation. Specifically considered the behavior of the regulator following the audit and made it further analyzes. Their purpose is to determine whether the proven net cost of BTC represent an unfair burden. The decision of the regulator's consent to compensate the net cost of 2009 and 2010 Expressed possible disagreement with this decision. It was concluded to compensate for the net costs and the level of compensation to be fixed at a level where ROCE is equal to the WACC.

Keywords: imposed obligations, net costs compensation.

6.2.

IMPROVING THE CALCULATION OF THE USE OF UNIVERSAL POSTAL SERVICE

Zdravko Mihaylov

Chief of Department "Postal policies and market analyzes", Bulgarian Posts, 1700

Sofia, Acad. St. Mladenov 1, Phone 02-949-32-39, e-mail: zdrm@abv.bg

JEL: L, L 8, L 87

Despite the differences in the scope and the regulation of the universal postal in the EU, that service is made available as a package and into no country is divided into separate services. Therefore the calculation of the consumption of the universal postal service in practice boils down to calculating the consumption of the service package, under whose form is providing a universal postal service.

In the report is made analysis of the applicability of the methods for calculating the consumption of postal services in the calculation of the consumption of the universal postal service.

The report presents a new method for calculating the consumption of the universal postal service. Proposed are formulas, basic conclusions about the advantages and applicability of the new method.

Keywords: universal postal service, consumption of the universal postal service, new method of calculating the consumption of the universal postal service.

6.3.

MODEL FOR EVALUATION AND ANALYSIS OF ITSM PROCESSES

Mario Ivanov, Yoana Hristova

Technical University - Sofia, 1000 Sofia, Bulgaria, Bul. "Kl. Ohridski "№.8, Bl. 1 e-mail: mario@tu-sofia.bg, hristova.joana@gmail.com

IT service management (ITSM) refers to the implementation and management of quality information technology services. ITSM is process-focused and has ties and common interests with process improvement frameworks and methodologies. The discipline is not concerned with the details of how to use a particular vendor's product, or necessarily with the technical details of the systems under management. Instead, it focuses upon providing a framework to structure IT-related activities and the interactions of IT technical personnel with business customers and users.

7.1.

ANALYSIS OF THE TRAFIK CAPACITY OF SCP-HAPS COMMUNICATION SYSTEMS

Veselin Demirev

Radio Communications and Video Technologies Department, TU-Sofia, Kl. Ohridski blv. № 8, 1756-Sofia, phone: 0352-965-26-60, e-mail: demirev_v@tu-sofia.bg

Liana Lincheva

Radio Communications and Video Technologies Department, TU-Sofia, Kl. Ohridski blv. № 8, 1756-Sofia

A new technology for broadband wireless access to the fixed networks, named High Altitude Platform Systems (HAPS) is under development now as a cheap and effective solution of the "Last mile" communication problems. The application of the proposed by the author technology SCP-RPSC in broadband HAPS communications was reported in several previous reports. This technology is based on new principle for virtual electronic beam steering of high gain antennas with sufficient isolation among the space distributed radio sources (satellites). An analysis of the traffic capacity of a SCP - HAPS system is given in this report. The results are compared with the similar results of a conventional HAPS system, based on multiple "spot beams" approach.

Keywords: HAPS, SCP, RPSC, communication, systems, capacity

7.2.

PRIORITY SERVICING OF THE TRAFFIC IN IOT

Dimitar Atamian

Department Communication Networks, Technical University of Sofia, Kl. Ohridski blvd No 8, 1000, Sofia, e-mail: dka@tu-sofia.bg

The paper analyses the possibilities for priority servicing of different traffic flows in the Internet of Things environment. The main goal is to model the possibility of using a priority scheme, which is optimal for both the priority and non-priority served traffic flows. The base is using a preemptive and non preemptive priority. A new schema is proposed, in which the pre-emptiveness might occur with a predefined or dynamically changed probability. The idea is to obtain minimum served time, resp. queuing time for the high priority traffic flow, and to keep the waiting time for the non priority flow within an acceptable range. A real time simulation program is created which allows the analysis to be

made with two traffic flows. Arrival rate and service time can be easily changed. Single channel serving can be made without priorities, with a non pre-emptive priority, and with changing the probability of the pre-emptiveness in case of pre-emptive priority. The results show the possibility to use such p-pre-emptive serving in case of IoT traffic flows.

Keywords: IoT, preemptive priority, queuing

7.3.

INVESTIGATIONS OF HANDOVER DELAY EFFECT ON TCP TRAFFIC IN MOBILE IPv6 „MULTIHOMING” NETWORKS

Kamelia Nikolova and Maria Dimova

Department of Communication networks, Technical University of Sofia, 8 Kl. Ohridski Blvd., 1756 Sofia, Bulgaria, phone: +359 2 965 21 34, e-mail: ksi@tu-sofia.bg and maria.dimova@abv.bg

"Multihoming" is a service where there is connectivity to more than one Internet Service Provider. "Multihoming" is a desired functionality that becomes a part of our contemporary diary because of its fault-tolerance and guaranteed for users continuous Internet connectivity. The handover delay effect on TCP traffic in mobile "multihoming" IPv6 networks is presented in this paper. A network simulator called Network Simulator 2 (NS2) is used in order to simulate the functionality of a mobile IPv6 network. An interfering TCP traffic with exponential distribution is added to the current TCP traffic only for 10s. The transmitted information is analyzed for three different delay's value respectively 0s, 1s or 2s.

Keywords: IPv6, mobile networks, multihoming

8.1.

FOR THE INTEGRATIVE APPROACH OF THE TELECOMMUNICATIONS AND POSTAL SERVICES AND THE CUSTOMERS PROTECTION

Bozhidar Simeonov, Assoc. Prof., PhD, Eng.

Union of Electronics, Electrical engineering and Communications, 108 Rakovski str. 1000 Sofia, Bulgaria, phone+359 2 987 97 67, e-mail: ceec@mail.bg

The article presents one possibility for the integrative approach of the telecommunications and postal services and customer protection.

Keywords: integrity, telecommunication, health, protection, service.

8.2.

ITIL METRICS SUPPORTING MEASURING OF ITSM PROCESSES

Mario Ivanov, Yoana Hristova

Technical University - Sofia, 1000 Sofia, Bulgaria, Bul. "Kl. Ohridski" №.8, Bl. 1 e-mail: mario@tu-sofia.bg, hristova.joana@gmail.com

A business metric is any type of measurement used to gauge some quantifiable component of a company's performance, such as return on investment (ROI), employee and customer churn rates, revenues, and EBITDA. Business metrics are part of the broad arena of business intelligence, which comprises a wide variety of applications and technologies for gathering, storing, analyzing, and providing access to data to help enterprise users make better business decisions.