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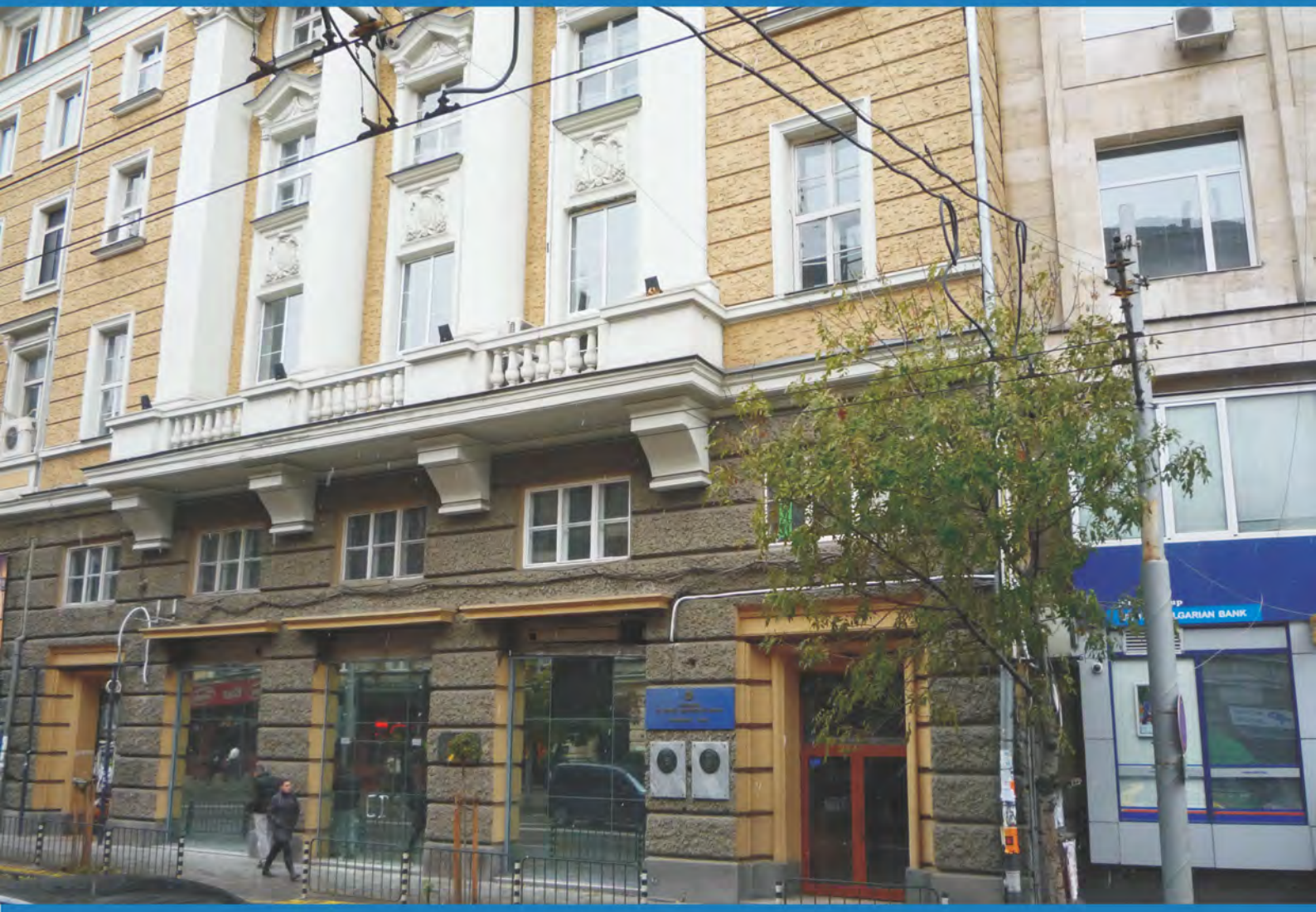

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C O N T E N T S

Internet evolution, teletraffic and QoS: a survey of network traffic

Seferin T. Mirtchev

Over the last decade, there is tremendous growth of the Internet traffic. The new applications can easily overload inter-domain links, disrupting the performance of other applications using the same network resources. This forces Internet Service Providers (ISPs) either to continuously invest in infrastructure upgrades in order to support the Quality of Service (QoS) expected by customers or use special techniques when handling Internet traffic. In this article, it is presented a survey of network traffic. It is begun with the description of Internet evolution. Then it is described teletraffic engineering and QoS in IP networks. It is discussed the best practices and approaches developed so far to deal with management IP traffic, identifying those that may provide long-term benefits for both ISPs and users. With the emergence of new network technologies, researchers have to decide how to implement them and to ensure that the internet network provide quality services. It is shown that in this area, there are many improvements, but much remains to be done. The survey shows the great effort which has been undertaken by the research community in order to address the topic. There is an enormous pressure on ISPs to make available adequate services for the traffics like VoIP and Video on demand. Since the resources like computing power, bandwidth etc. are limited, the teletraffic engineering is needed to evaluate QoS.

Развитие на Интернет, телетрафик и качество на обслужване: Обзор на мрежовия трафик (Сеферин Тодоров Мирчев). *През последното десетилетие има огромен растеж на интернет трафика. Новите приложения могат лесно да претоварят линиите в опорните мрежи, нарушавайки работата на други приложения, като използват същите мрежови ресурси. Това принуждава доставчиците на интернет услуги (ISP) или непрекъснато да инвестира в подобряване на инфраструктурата, за да се поддържа качеството на обслужване (QoS), което се очаква от абонатите, или да използват специални техники за управление на интернет трафика. В тази статия, се представя обзор на мрежовия трафик. Започва се с описание на развитието на интернет. След това се описва телетрафичното инженерство и QoS в IP мрежи. Обсъждат се най-добрите практики и подходи, разработени досега, за да се справят с управлението на IP трафика, идентифицирайки тези, които могат да доведе до дългосрочни ползи както за доставчиците на интернет услуги, така и за абонатите. С появата на нови мрежови технологии, изследователите трябва да решат как да ги внедрят и да гарантират, че в интернет мрежата се предоставят качествени услуги. Показва се, че в тази насока има доста подобрения, но остава още много да се направи. Проучването показва големите усилия, които са били предприети от научната общност, за да се акцентира на темата. Има огромен натиск върху ISP да предоставят адекватно обслужване на трафика като VoIP и видео по заявка. Тъй като ресурсите като изчислителна мощност, честотна лента и т.н. са ограничени, телетрафичното инженерство е необходимо, за да се оцени качеството на обслужване.*

Experts predict the Internet will become 'like electricity' — less visible, yet more deeply embedded in people's lives for good and ill [7].

1. Introduction

The world is moving rapidly towards ubiquitous connectivity that will further change how and where people associate, gather and share information, and consume media. Three major technology revolutions have occurred during development of the digital technology – broadband communication, mobile connectivity and social networking. The Internet has profoundly changed our perception of society and our approach to everyday life. Today with billions of

A general concept and implementation of a DSP-based QAM digital modulator

Emil E. Vladkov

The versatility of a Digital Signal Processor (DSP) can be used to implement easily various Quadrature Amplitude Modulation (QAM) tasks on a prototype board interconnected to the ADSP21061 EZ-KIT LITE DSP evaluation system extension ports. The article describes the allocation of the different subtasks associated with the digital modulation to the DSP hardware and to the extension board respectively. The prototype board consists of two high speed Digital-to-Analog Converters for the I- and Q-components of the QAM signal, a dedicated QAM modulator chip working in the analog domain and a RF local oscillator chip to supply the carrier signal to the modulator. The different constellation diagrams the proposed modulator can carry out are synthesized by the DSP hardware through symbol remapping look-up tables. The complete hardware circuit diagram of the prototype board DM9753 is presented and discussed in the article and the future investigation and experimental measurement works to be performed on the digital modulator proposal are outlined.

Обща концепция и реализация на базиран на цифров сигнален процесор квадратурно-амплитуден (QAM) модулатор (Емил Е. Владков). *Гъвкавостта на цифровите сигнални процесори (DSP) може да бъде използвана за лесно осъществяване на различни задачи, свързани с квадратурно-амплитудната модулация (QAM), посредством прототипна система, свързана към разширителните портове на ADSP21061 EZ-KIT LITE DSP развойната система. Статията описва разпределението на различните подзадачи, свързани с цифровата модулация, към апаратното осигуряване на цифровия сигнален процесор и към разширителната платка съответно. Прототипната система се състои от два високоскоростни цифрово-аналогови преобразувателя за I- и Q-компонентата на QAM сигнала, специализирана интегрална схема, съществяваща QAM модулатицята в аналоговата област, и интегрална схема на радиочестотен локален осцилатор, осигуряващ носещия сигнал на модулатора. Различните констелационни диаграми, които предложеният модулатор може да осъществява, се синтезират от апаратното осигуряване на DSP посредством таблично представяне на координатите на отделните символи данни. Представена и дискутирана е пълната схемна реализация на прототипната система DM9753 и са очертани задачите на бъдещата изследователска и експериментална измервателна работа по предложения цифров модулатор.*

I. Introduction

A state of the art versatile digital modulator is a piece of equipment, which not only serves various purposes at the test bench but is also indispensable for the in-depth understanding of this widespread new technology – digital modulation. For engineering students not familiar with high-speed digital modulation the proposed concept and design is an opportunity to draw the curtains in this field, of course in combination with the study of various excellent books on digital communications [1]. For engineers dealing with the various aspects of QAM, QPSK and the like in their everyday professional life the proposed concept will offer a new versatile (and this is perhaps the most important aspect in this context) device for generating digital sequences, which can be programmed by themselves to suit their individual needs. The presented idea is to be tested in a future work with a custom build evaluation board wired to the ADSP-21061 floating-point digital signal processor (DSP) evaluation system. The combined DSP-based digital modulator will also have the

Narrow beamwidth antenna for DTH satellite television

Peter Z. Petkov, Boncho G. Bonev

The exponential growth of channel number and services transmitted lead to exhaustion of existing satellite orbital positions, and traced the path for new regulations in an industry last regulated in the mid of 20-th century. Recent developments in DTH satellite television, particularly HDTV and SHDTV put a high requirements to the whole receive subsystem. One of the most problematic issues is the adjacent satellite interference in DTH receive systems. Due to fact that user terminals are relatively small in size, the antenna receives signals along with the primary satellite, at least from one or two neighbors in addition, which leads to decreased Eb/No and may totally disrupt the service in adverse weather conditions. In this paper a new, shaped, narrow beamwidth offset antenna for DTH satellite television is developed and proposed. Radiation pattern and antenna gain for three different frequencies are simulated, experimentally estimated, and compared with these of conventional offset antenna with the approximately same size.

Антена със стеснена диаграма на насочено действие за спътникова телевизия (Петър Ж. Петков, Бончо Г. Бонев). *Експоненциалният ръст на каналите и услугите предлагани от сателит (спътник) доведе до изчерпване на наличните орбитални позиции и стана причина за началото на нови регулации в индустрия, в която не бяха правени промени през последните 40 години. Последните нововъведения в сателитната телевизия за домашно ползване - висока и свръхвисока разрешаваща способност поставят високи изисквания към цялата приемна подсистема. Един от най-големите проблеми са смущенията по съседен сателит в приемната част. Заради относително малкият размер на приемната антена, едновременно се приемат сигналите от основния и съседни сателити, което води до понижаване на отношението Eb/No и може напълно да преустанови услугата в случаи на влошаване на времето. За потискане на тези смущения, в настоящата статия е предложена модифицирана антена с елиптична апертура. Симулирани и измерени са ДНД и сравнени с такива на обикновена, серийно произвеждана антена с идентичен геометричен размер.*

Introduction

The rapid development of information technologies and in particular satellite communications requires the transmission of increasing amounts of information. This poses a number of challenges for satellite communications technologies, using geostationary orbit. Decision may be sought on the one hand with the use of higher frequency bands and on the other by reducing the distance between satellites in geostationary orbit and increasing their number. The latter approach, however, is also connected to another problem - interference from adjacent satellites. The downlink protection criteria in the Plan for GSO BSS systems with national coverage based on a completely digital technology for television programs transmissions for Regions 1 and 3 countries (Europe, Africa, Asia and Australia) adopted by the World Radiocommunication Conference 2000 (WRC-2000) are based on the 60 cm reference antenna radiation pattern for the BSS receiving earth stations. It is taken from ITU-R Recommendation BO.1213 with a half power beamwidth of 2.86° and included in Annex 5 of RR Appendix 30 [1]. One of possible ways to avoid this interference is to use antennas with a narrow main beam in the azimuthal plane, while maintaining their size in the same range, and retention of their relatively low cost.

In this article are proposed such an antenna with elliptical aperture equivalent to about 60 cm circular aperture. The experimental researches of its gain and co-polar and cross-polar radiation patterns in the open range are presented. The results are analyzed and compared with these of the standard 60 cm offset antenna for DTH television. It is of highest importance the fact that both antennas has identical area (therefore identical windload and mass), which highlights the efficiency of the proposed model.

Recent trends and future developments of SCP-RPSC high altitude platform systems

Veselin B. Demirev

A new technology for broadband wireless access to the fixed networks, named High Altitude Platform Systems (HAPS) is under development now as an effective solution of the "Last mile" communication problems. The application of the proposed by the author SCP-RPSC approach in broadband HAPS communications was reported in several previous reports. It is based on a new principle for virtual electronic beam steering of high gain antennas with sufficient isolation among the space distributed radio sources. A retrospective review of the step by step approach, used by the author for development of SCP-RPSC technology in HAPS, is given in this report. Applications, dealing with Line of Sight, Non-Line of Sight and Feeder Lines are considered too. The traffic capacity of such systems is compared with the conventional HAPS system, based on multiple "spot beams" approach.

Последни тенденции и бъдещото развитие на SCP-RPSC системи на високи платформи (Веселин Демирев). *Една нова технология за широколентов радиодостъп до фиксираните мрежи, наречена Системи на високи платформи (HAPS) навлиза в борбата за евтина и ефективна "Последна миля – Last mile" на широколентовия пренос. Приложението на разработения от автора принцип SCP-RPSC в широколентовите HAPS комуникации е изложено в няколко предишни публикации. При технологията SCP-RPSC се осъществява виртуално електронно сканиране на един или няколко антенни лъча с голям коефициент на усилване и с висока пространствена избирателност. В настоящата работа са представени различните етапи от развитието на предлагания подход за условия на директна радиовидимост, многолъчево разпространение и за фидерни HAPS линии. Резултатите от анализа на трафичния капацитет на една SCP-HAPS система са сравнени с тези на конвенционална HAPS система, използваща технологията "spot beams".*

Introduction

The HAPS (High Altitude Platform System) denomination was defined in the World Radio communications Conference (WRC-97) as a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the earth. The systems based on HAPS represent a technological alternative that has been under development for the last few years [1, 2], although the investigation of unmanned aerial vehicles had started around the world about 40 years ago.

These systems could have many advantages compared with both terrestrial and satellite systems. Various applications and services are planned to be provided by HAPS, which could be classified as narrowband or broadband, depending on the bandwidth required, as well as fixed or mobile. Subscribers will transmit their information directly to the platform, where on-board switching devices will route traffic directly to other subscribers within the same platform coverage area or through heterogeneous networks. A system based on HAPS will allow a better signal quality to be obtained in the receiver, owing to the fact that during most of the transmission time, the system is under a Line-Of-Sight (LOS) condition. This reduces shadowing effects in comparison with terrestrial systems. HAPS also experiences less propagation delay with regards to satellite systems. On the other hand, HAPS and satellite systems suffer less from shadowing and multipath distortions because they are exposed to high angle of arrival signals. Each HAPS can deploy a multi-beam antenna capable of projecting numerous spot beams within its potential coverage area. The platforms act as the highest cell tower in town. In a system based on HAPS, the platform is positioned

Specialized controller for managment of industrial and consumer lighting

Lyuben A. Iliev, Daniel L. Todorov, Nikolay P. Mihailov, Petko K. Mashkov

A lighting controller prototype is presented, which is intended to be used for lighting control in poultry farms, where a precise control of the lighting cycle and intensity is required. Such farms require 24 hours per day control of the lighting in order to provide optimal results for the production and also the best living conditions possible for the poultry. The suggested controller can be used also in industrial or domestic buildings and facilities in order to provide intelligent and energy efficient lighting control. Several wide spread analog dimming control interfaces and digital communication interfaces are implemented for maximum with lighting power supplies. The implemented control interfaces are: Digital potentiometer with range from 0 to 100 KΩ with 255 steps; two PWM outputs, frequency controlled, from 100 to 10000 Hz and resolution of 255 steps; Phase control dimming module up to 16A mainly for incandescent lighting. Three different communication interfaces are implemented for data and command exchange: RS485, USB and RF 2,4GHz, with range up to 100 meters indoors. Operational data tables can be stored in 1 Mbit EEPROM and a Real Time Clock, battery buffered, is used for real time lighting programs.

Специализиран контролер за управление на индустриално и битово осветление (Любен А. Илиев, Даниел Л. Тодоров, Николай П. Михайлов, Петко К. Машков). *В тази статия се разглежда проектирането и изработката на прототип на контролер за осветление, предназначен за управление на осветлението в птицеферми, където е необходим непрекъснат прецизен контрол на осветлението за постигане на максимална ефективност при отглеждането на животните и минимални разходи на енергия. Представеният контролер също може да бъде използван за управление на индустриално и битово осветление с цел автоматизация и ефективност. Вградени са някои широко разпространени аналогови интерфейси за димиране на осветителни тела. Те са: цифров потенциометър с обхват от 0 до 100 KΩ с 255 степени, два широчинно импулсни изхода с управляема честота от 100 до 10000 Hz и 255 стъпки, фазов димер с възможност за управление на ток до 16A. Три отделни комуникационни интерфейса са имплементирани за обмяна на данни между устройствата: RS485, USB и безжичен RF 2,4GHz с обхват до 100m в затворени помещения. Предвидена е енергонезависима памет EEPROM с обем 1 Mbit за съхранение на оперативни данни и часовник за реално време за изпълнение на осветителни програми.*

I. Introduction

A lot of advances were made the last few years in the field of lighting systems and sources. New more energy efficient LEDs are being placed on the market every day, replacing the old incandescent lighting fixtures. The lowered energy consumption of the lighting sources is only one side of optimum energy consumption as a whole. The other side is creating intelligent energy management systems to control the lighting in the most efficient ways. A great amount of energy is being wasted for inefficient lighting due to bad design of the lighting system, lighting fixtures used and other factors. The article presents a lighting controller which has the purpose to provide intelligent control of industrial and consumer lighting in order to achieve maximum efficiency, comfort and ease of control.

II. Design

The designed lighting controller is a prototype and includes various modules for communication and control (Fig. 1).

The device is intended to provide control for different dimmable lighting power supplies (LED, Flu-

Model order reduction for a single machine infinite bus power system

Kamen L. Perev

The paper considers the problem of model order reduction for a single machine infinite bus power system by using a Legendre polynomials approximation based balanced residualization method. The model examines the small signal behavior and explores the existence of dynamic stability for a synchronous generator connected to a large system through transmission lines. The single machine infinite bus is a linearized power system model consisting of two inputs, two outputs and ten state variables. The goal for model reduction is to facilitate the excitation, the governor controller and the stabilizing circuits design and to reduce the computational complexity in exploring the synchronous machine. The proposed method for model reduction is a two stage method, where a balanced realization is initially obtained and then, it is subjected to a singular perturbation approximation. Legendre polynomials approximation for the system gramians is used to avoid solving the usual large-scale Lyapunov equations and thus, reducing the complexity of the computational procedure. Several numerical experiments are performed, showing the good approximation properties of the presented method.

Редуциране на реда на модела на генератор свързан към енергийната мрежа (Камен Л. Перев) *Тази статия разглежда задачата за редуциране на реда на модела на синхронен генератор свързан към енергийната мрежа по метода на балансовата резидюализация с използване на полиномна апроксимация по Лежандър. Разгледаният модел изследва поведението на системата при малки сигнали и изучава динамичната устойчивост на синхронния генератор. Моделът представлява линеаризирано математично описание на електрическата система, което се състои от два входа, два изхода и десет променливи на състоянието. Целта е да се опрости синтеза на веригата на възбуждане, регулатора и стабилизиращите устройства, както и да се намали изчислителната сложност при изследване на синхронната машина. Предложеният метод се състои от две стъпки: при първата стъпка се генерира балансова реализация на първоначалния модел, а при втората стъпка се изчислява апроксимация по метода на сингулярните смущения. В изчислителната процедура грамианите на системата се апроксимират в ортогонален ред на Лежандър, като по този начин се избягва решаването на обичайните уравнения на Ляпунов. Проведени са няколко експеримента, които потвърждават добрите апроксимиращи свойства на метода.*

1. Introduction

Dynamical system modeling is concerned with describing the relations and interconnections characterizing the explored physical processes. There always exists a trade-off between the complexity of the model and its accuracy. As higher is the accuracy of the mathematical description, as larger is the number of the differential equations representing this description. In such cases it is desirable to reduce the equations number while preserving the key features of the examined physical phenomenon. The procedure of model simplification by decreasing the dimensionality of the primary model is called model order reduction. Model order reduction finds application in simulation of physical processes and for implementation of lower-order controllers in feedback systems.

Parallel with increasing the complexity of the system model, increases the complexity of the corresponding system controllers. Implementation of high-order controllers is usually accompanied with high computational cost, low reliability and different maintenance problems [1]. There exist three main approaches in reducing the size of the controller [2]: *i)* the direct methods, where low-order controllers are directly designed for high-order plants, *ii)* the indirect methods, where for high-order plants we design first

Study of the elements of the photovoltaic system

**Dimitar D. Arnaudov, Nikolay L. Hinov,
Ivan I. Nedyalkov**

In this paperwork has been made a study of the elements of an off-grid photovoltaic system for power supplying of telecommunication systems and telecommunication modules. The laboratory model is described. The bi-directional converter provides mutual work between a supercapacitor and a battery in the system. The stage of charge and discharge of the battery is managed by BMS. The working algorithms of the converters in the system are studied. The information-measuring system of the stand is realized by the software LabView.

Изследване на елементи от фотоволтаична система (Димитър Д. Арнаудов, Николай Л. Хинов, Иван И. Недялков). *В работата са изследвани елементи от автономна фотоволтаична система за захранване на телекомуникационни системи и устройства. Описан е стенд за изследване на системата. Двупосочен преобразувател осигурява съвместната работа на суперкондензатор и акумулаторна батерия в системата. Процесът на заряд и разряд на батерията се управлява от BMS. Изследвани са алгоритми на работа на преобразувателите в системата. Информационно измервателната система на стенда е реализирана със софтуера LabView.*

Introduction

From conducted analysis for power supply needs of telecommunication equipment in places where such power cannot be provided from the grid, the best way to deliver power is by using the power of the sun. The photovoltaic systems, for power supply of telecommunication equipment, which are not connected to the grid and are intended to supply constant current loads, are made of the following blocks: photovoltaic, photovoltaic controller, battery and load. For improving the lifecycle of the battery, a supercapacitor can be added to the system [1], [2], [3].

The battery in the system mostly is lead-acid. It can be replaced with lithium battery. The photovoltaic controllers are designed to work with lead-acid batteries, which output voltages are 12V, 24V and 48V. To obtain a battery with these voltages and needed capacity, it is necessary to connect some lithium cells together (in series and/or in parallel). If we don't want to overcharge the single cells of the lithium battery, it is strongly recommended to use a device, which provides charging equalization (BMS) and also provides correct and even charging of the separated cells [4], [5], [6].

The main functions which this kind of devices should perform are:

- Stop charging of the cell when the cell voltage reach its maximum;
- Prevent temperature rising over a certain limit, by ending the charging current;
- Prevent the discharge of the cell under a certain limit;
- Restrict the charging and discharging current in allowed limits.

1. Photovoltaic off-grid system

On Figure 1 the block diagram of studied system is shown. The system is made by the following blocks:

- PV Panel – photovoltaic panel, which is the main power source in the system;
- PV Controller – the controller is used to provide the working modes of the battery, and MPPT;
- DC-DC – bi–directional converter which provides the mutual work between the supercapacitor and the battery;
- Battery – made of lithium cells connected in series;
- BMS – this device provides the charging equalization of the battery;

40th anniversary of ELMA 1975-2015

FOURTEENTH INTERNATIONAL CONFERENCE ON ELECTRICAL MACHINES, DRIVES AND POWER SYSTEMS

October 1-3, 2015
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♦ SCOPE OF THE CONFERENCE

The main aim of the conference ELMA 2015 is to give an opportunity to academics, scientists, engineers, PhD students, manufacturers and users to discuss and exchange information about the results of their theoretical and experimental investigation, the utilization of new materials and application of new technologies in the field of electrical machines, drives, power electronics and power systems.

♦ TOPICS

A) Electrical Machines and Transformers
B) Control Systems, Electrical Drives, Robotics and Mechatronics
C) Power Electronics and Microelectronics
D) Power Systems
E) Renewable Energy Sources
F) Energy Efficiency and Power Quality
G) Electrotechnologiy, micro and nanoengineering
H) New Materials and Components
I) Monitoring and Diagnostics
J) Problems of Education and Training

♦ VENUE

Technical University – Varna, BULGARIA

♦ LANGUAGE

English will be the official language of the conference.

♦ PAPER PRESENTATION

Papers will be presented in oral and poster sessions. Authors are asked to suggest the preferred form of presentation while the Organizing Committee will make the final decision.

♦ EXHIBITION

Companies are kindly invited to take part in the conference exhibition. To ensure participation, together with the application form and abstract, please inform us about: including the name and the technical performances of the exhibition, the requested area and necessary voltage.

♦ SUBMISSION OF PAPERS

Participant who wish to submit a paper are requested **to register at the Web-site of the conference** and send an extended abstract of two A4 pages, with full name and mailing address by **June 15, 2015**. The abstract will be reviewed and should outline the object of the paper, the methodology and main conclusions.

The full size of the papers should be submitted by **July 31, 2015**. All papers will be reviewed by two independent reviewers. Accepted papers will be published in the Conference Proceedings.

♦ REQUIREMENTS TO THE PAPERS

Original previously unpublished contributions are expected. The papers should have:

1. Title
2. Author's name, affiliation, full address and e-mail
3. Abstract (up to 10 lines)
4. The full paper with subtitled introduction, body, and conclusion, bibliography.

The full version of the paper will be required by **July 31, 2015** for inclusion in the Conference Proceedings. The papers should be edited according to the Instructions and template published at the web-site of the Conference. Authors are responsible for obtaining publications approval from their employer.

♦ DEADLINES

15.06. 2015	Receipt of Abstracts	http://www.elma.vtp-tuv.com or elma@vtp-tuv.com
10.07. 2015	Notification of Abstract acceptance	
31.07. 2015	Receipt of full papers	http://www.elma.vtp-tuv.com or elma@vtp-tuv.com
15.08. 2015	Notification of full paper acceptance	
10.09. 2015	Fee payment	Participants – 200 EURO Students and Phd students – 100 EURO

Further information can be obtained on the Conference Web Site: http:// **www.elma.vtp-tuv.com**

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