

APVV-0025-12: Mitigation of stochastic effects in high-bitrate all-optical networks	
Summary:	<p>The project is focused on the investigation in the area of linear and non-linear influences of the transmitted optical signals in the multichannel all-optical systems and networks. Main goal is to investigate origin of these effects and their impact on the transmission of various types of the high-order modulated optical signals and on mitigation of degradation mechanisms using switching and routing in all-optical multi-channel networks.</p> <p>The project has been solved in three phases. In the first phase the physical layer has been investigated considering different mainly stochastic effects. In the second phase also protocols for switching and routing in high-speed all-optical multichannel networks have been investigated. The third phase has been focused on the integration of the influences in the physical layer with the protocol design for switching and routing into one platform. It will be the main precognition for creation of the new properties of the reservation protocols which will meet basic requirements for achieving most effective data transmission with the high-level quality of service through the nodes of the high-speed multichannel all-optical networks based on the OBS with next targeting into all-optical IP networks.</p> <p>Within this project the IAS researchers cooperate with the Department of Telecommunications and Multimedia, Faculty of Electrical Engineering, University of Žilina, and the Department of Electronics and Multimedia Communications, Faculty of Electrical Engineering and Informatics, Technical University in Košice.</p>
Realization:	10/2013 – 09/2016
Coordinator:	Jarmila Müllerová (IAS)

APVV-15-0152: Research of physical properties and growth kinetics of black silicon layers	
Summary:	<p>Dominant aims of the project are focused on basic experimental, applied and theoretical research of black Si (c- Si and poly-Si) consisting of nanocrystalline objects. The research is oriented on i) forming of black Si in chemical wet solutions as well as in plasma using catalytic overlayer, ii) black Si layer growth kinetics, iii) research and modelling of basic physical parameters of black Si structures – such as optical, electrical and morphological ones, and iv) surface passivation of formed Si nanocrystalline objects using suitable technology (-ies) leading to the long termed durability of their properties. The project solves i) choice of suitable surface catalytic overlayer and chemical composition of used solutions, ii) formation of modified surface layers using catalytic overlayer and their physical properties also on GaAs, iii) formation and testing of pn black c-Si solar cells, and iv) antibacterial effect of black c-Si structures. Results of the above mentioned research will be compared with results obtained on the porous Si structures prepared electrochemically without catalytic overlayer.</p>
Realization:	07/2016 – 06/2019
Coordinator:	Emil Pinčík, Institute of Physics, Slovak Academy of Sciences
Sub-Coordinator from FEE:	Jarmila Müllerová (IAS)

APVV-0314-12: Research and development of new generation of power supplies based on converters with high power density, high efficiency, low EMI and circular energy	
Summary:	Project is focused on research and development of new generation of switched mode power supplies, which are based on LLC, LLCLC and LCTL topology with high power density and multifunction output and with double half-bridge DC/DC converter characterized by low circulating energy and low EMI. Co-operation with Elteco.
Realization:	10/2013 – 09/2017
Coordinator:	Branislav Dobrucký (DME)

APVV-15-0571: Research of the Optimum Energy Flow Control in the Electric Vehicle System	
Summary:	The project encompasses research into the multi energy storage system for a new generation of electric mobility applications focused on optimal use of energy stored in the primary electrochemical battery. The main criterion is thereby ensuring maximum range of the electric vehicle, at a given stored energy, which will be ensured by utilization of the recovery energy processes in changing the driving dynamics of the vehicles and optimum management of the bidirectional energy flow between the storages (batteries, supercapacitors) and traction drives. The main output of the project will be the simulator traction drive based on two-energy storage system designed to practical testing and optimization algorithms of the flow control and distribution of the power within the on-board network. Another output will be the software packets to manage and monitor on-board power system, including fault conditions and measurements of the relevant traction and energy quantities. The obtained results will be practically utilized in the design of the on-board power systems with optimal use of energy in the newly built university laboratory to teaching specialists in the field of electromobility.
Realization:	10/2016 – 09/2020
Coordinator:	Peter Drgoňa (DME)

APVV-15-0462: Research on Sophisticated Methods for Analysing the Dynamic Properties of Respiratory Epithelium's Microscopic Elements	
Summary:	The project is focused on research of sophisticated methods based on image analysis, intended to improve the objectivity, efficiency and automation of diagnostic processes in medicine. Its main objective is to identify the dynamic properties of biological objects of interest, which are the cilia of respiratory epithelium. Movement of such objects will be captured using high-speed video microscopy, while recording and data analysis will be carried out by high-power computer system. The recorded data will be then processed by our software system designed for segmentation of the objects of interest. The main criterion for segmentation will be the identification of pathological structures that are, due to disease or structural changes, static and do not contribute to cilia's primary function in vivo. Identification and subsequent analysis of segmented regions will notably contribute to an accurate specification of patient's diagnosis, and thus to determination of early and effective therapy. Although the results of the project are intended to be applied in the medical field, the project is mainly about the research of optimal technical solutions for modern diagnostic methods in medicine also in terms of international research in this area. The dominant project outcome will be the device enabling the analysis of high-speed videos.

Realization:	10/2016 – 09/2020
Coordinator:	Libor Hargaš (DME)

APVV-15-0396: Research of Perspective High Frequency Converter Systems with GaN Technology	
Summary:	The project is focused on the issue of increasing the efficiency and power density of power semiconductor systems, while reducing the electromagnetic interference, which ultimately reduces negative environmental aspects of their application. Its main task is to research the phenomena related to applications of advanced semiconductor structures based on GaN transistors in power electronic systems, including research of commutation techniques applied in the switching frequency range of MHz units. Investigators will be outgoing from the results of the projects addressed at the national (ELTECO Ltd.), respectively international level (Panasonic Gmhb Lueneburg SNR). Another task of the project is to research phenomena affecting the efficiency of the practical application of those facilities. Specifically, the economic burden of production, reduction of CO2 and return on investment. The project also highlighted the issue of the reliability analysis and research methodology for the estimation of mean lifetime of power electronic systems based on GaN technology. At the same time, the project deals with draft measures on the possibility of extending the operation of such systems through multi-level multi-physics simulations. The main outcome of the project will be functional sample of the system meeting the declared goals, intended for direct use in industrial applications of electromobility application or respectively of wireless transmission of electricity. Another output will be a set of knowledge and measures for the optimal design of these systems, reducing the failure rate and lifetime extensions. Based on preliminary discussions with companies ELTECO Ltd. and Delta Electronics, it can be assumed rapid utilization of the results obtained in industrial practice.
Realization:	10/2016 – 09/2020
Coordinator:	Michal Frivaldský (DME)

APVV-0433-12: Research and Development of Intelligent System for Wireless Energy Transfer in Electromobility Application	
Summary:	The project is focused on problem of systems for wireless energy transfer, representing progressive solution for supplying of mobile and industrial devices. Task of this project is research of major effects on efficiency of systems for wireless energy transfer, usable for realization of charging points in the area of electromobility.
Realization:	10/2013 – 09/2017
Coordinator:	Pavol Špánik (DME)

APVV-395-12: Photonic structures for integrated optoelectronics	
Summary:	Project focuses on research and realization of active and passive elements with implemented photonic structures for integrated optoelectronics and optics. In the area of active elements the project focuses on research and realization of semiconductor LEDs and photodetectors with photonic structures. For passive elements, the project aims to the research of optical waveguides with integrated photonic structures inside the waveguide.
Realization:	10/2013-12/2016

Coordinator:	Dušan Pudiš (DPH)
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APVV-15-0441: Measurement system with optical sensor for systems Weight In Motion	
Summary:	Proposed project of applied research will be focused on design, optimization and creation of a device for weight measurement of a vehicle (or its axle) in movement according to the currently valid traffic regulations on the road or highway. Project will discuss the selection of proper sensor hardware for the system, its mounting into existing solutions Measure-in-Motion® previously designed by project partner and compatibility of the used optical sensor output with the interface of the existing processing unit.
Realization:	07/2016 – 06/2020
Coordinator:	Daniel Káčik (DPH)

APVV-14-0519: Smart Textiles and Clothing for Mobile Monitoring of Human Vital Functions	
Summary:	Basic idea of the project is to contribute to implementation of platforms of the future based on wireless monitoring and transfer of human vital functions with a possibility of subsequent healthcare in real time. The project will focus on preparation of functional components of smart clothing, development and testing innovative algorithms for analysis, evaluation, display and storage of the monitored biomedical signals and preparation of a prototype of smart clothing. Anticipated result of the project will be a prototype of smart clothing with incorporated textile sensors, textile electrodes with microelectronics, communication interface and terminal with user interface.
Realization:	07/2015-06/2017
Coordinator:	Ladislav Janoušek (DEBE)

APVV-14-0560: PatRec- Resistive Switching Structures for Pattern Recognition	
Summary:	Verification of the possibility of application of memristors for realisation of logic circuits. Prepared memristors will be connected to simple logic circuits for implementation of fuzzy logic and switching functions. Final goal of the project is to demonstrate ability of memristor circuits to recognize patterns based on experiments and computer models.
Realization:	07/2015-06/2018
Coordinator:	Karol Frohlich (Slovak Academy of Sciences), Martin Klimo (Faculty of Management Science and Informatics)
Co-operators:	Roman Jarina, Michal Kuba, Michal Chmulík (DTM)

APVV-15-0464: Efficiency Improvement of Electrical Power Transmission in Slovakia	
Summary:	The project deals with research and development of power losses caused by asymmetrical impedance of selected electric components (transformers, catenary, compensation chokes) of electrical power grid in Slovakia. The aim is to develop a series of steps and technology needed to determine impedance and admittance matrixes and to minimize the power losses due to the asymmetry of the components. Power losses optimization is still the most effective way of improving the energy resources utilization. Importance of such subject is supported by European Commission statement from 10/23-24/2014 aiming to the climate and energy policies frame, which expresses minimum 27% improvement of energy efficiency by 2030.
Realization:	1/2016 – 12/2020
Coordinator:	Juraj Altus (DPES)

APVV-15-0718: Research of boundaries of warning message broadcasting in terrestrial broadcasting	
Summary	Project is focused on research of novel way of warning messages propagation using terrestrial digital broadcasting and setting of boundary conditions for integration of the warning messages with possibility to transform results into wider international area.
Realization:	07/2016 – 12/2018
Coordinator:	Juraj Oravec (Research Institute of Posts and Telecommunications)
Co-operators:	Vladimír Wieser, Bohumil Adamec (DTM)

Scientific Grant Agency of the Slovak Ministry of Education, Science, Research and Sport and the Slovak Academy of Sciences (VEGA)

VEGA 1/0491/14: Optoelectrical and optical devices with photonic structures	
Summary:	Project is focused on fabrication of photonic and optic structures for optoelectrical devices using maskless lithographic techniques. These lithographic methods and their combination with imprinting technique allow fabrication of photonic structures with period of order of few hundreds of nanometers and various optical structures. These will be patterned in the surface of optoelectrical and optical devices and in polydimethylsiloxane followed by direct application on light emitting diodes and waveguides. In combination with optimization of optical properties in simulation program, there is a great opportunity to develop unique optoelectrical and optical devices.
Realization:	01/2014 – 12/2017
Coordinator:	Dušan Pudiš (DPH)

VEGA 1/0794/14: Unconventional Actuators Control System Research and Development	
Summary:	The research project is focused on the research and development of optimized motion control systems of rotary and linear motors as well as actuators exploiting electromagnets. The core of the project is based on the methods for optimization of actuators power components and their control systems, including the design of the corresponding sensors and if application allows then sensorless control (without controlled variables measurements). Developed intelligent motion systems will use variable structure control or forced dynamics control capable to reduce the order of control system, to achieve precise tracking of the prescribed trajectory with a defined accuracy. Speed and position control algorithms developed on the principles of motion systems parameters identification will be capable to achieve set-point for speed or position with prescribed responses.
Realization:	01/2014 – 12/2016
Coordinator:	Ján Vittek (DPES)

VEGA 1/0957/16 Research and Development of Novel Construction of Switched Reluctance Machines for Automotive Traction Applications	
Summary:	This project deals with scientific research of modern electrical drive with switched reluctance motor (SRM) and with investigation of its performances and parameters for traction application in electrical vehicles. In the frame of

	<p>this project, the detail analysis of a new SRM construction design and optimized construction of SRM will be carried out to obtain the best performances from point of view efficiency, distance range and reliability of electrical car. The modern methods of design as finite element method will be used for these SRM. The research of new control algorithms for this drive will be analysed with cooperation with power converter to obtain best efficiency for all working range. On the base of scientific research of these motors, some recommendations will be given for their manufacturing.</p>
Realization:	01/2016 – 12/2018
Coordinator:	Pavol Rafajdus (DPES)

VEGA 1/0610/15: Scientific research of fractional winding of synchronous machines with permanent magnets	
Summary:	<p>This project will address</p> <ul style="list-style-type: none"> - Research of synchronous machines with simple design, which will be optimized with respect to cost reduction of construction materials, where the geometry should, according to the latest research, tend to concentrated windings, - Increasing the efficiency of the machine by reducing the coil dimensions, by the possible use of superconducting coils as well by reduction of losses in the magnetic circuit. <p>To achieve these two main objectives it is necessary in this project</p> <ul style="list-style-type: none"> - Extend the theory of the windings to the windings with concentrated coils
Realization:	2015 – 2017
Coordinator:	Valéria Hrabovcová (DPES)

VEGA 1/0579/14: Research of topological structures of segments of power electronic system for wireless energy transfer	
Summary:	<p>The basis of the project is optimization of the main circuit topology of power electronic converters, primarily designed to control of energy flow in wireless energy transfer systems, with anticipated application in charging stations for electric cars. It deals about systems with frequency from 500kHz to 1,5MHz at kW power range. The research will be focused on achieving the maximum efficiency of converter, and thus whole system, at required switching frequency. Baseline platform will be the analysis of properties of optimal energy transfer process, aimed on determination of the switching frequency. On the base of this platform, the research of possibilities of efficiency improvement will be realized, as well as their implementation through suitable technologies. During research of the project, verified scientific procedures, based on computer simulations will be used, as in time domain, as well as in 3D analysis. Experimentally verified results will be used in process of further applied research.</p>
Realization:	01/2014 – 12/2016
Coordinator:	Pavol Špánik (DME)

VEGA 1/0558/14: Research of methodology for optimization of lifetime of critical components in perspective electronic appliances through the use of system level simulation	
Summary:	<p>The project fundamental is research of procedure serving for estimation and possible optimization of critical components lifetime in perspective electronic systems (photovoltaic, LED luminaries). Method is based on selection of</p>

	suitable simulation instruments, by which the system of multilevel simulation can be realized. Basis of the proposal is simultaneous run of multiple simulation instruments, where each serves for individual investigation of the problem. Global result is subsequently represented as intersection of partial results. The investigation of operating condition itself (temperature, mechanical and electrical stresses, moisture, etc.), from the perspective of critical components aging (electrolytic capacitors, semiconductor devices), will be during multilevel simulation realized only by use of exact simulation models, with high degree of validity. The contribution of the project is in possible optimization of operation of electrical system, in order to increase the durability and economic return.
Realization:	01/2014 – 12/2016
Coordinator:	Michal Frivaldský (DME)

VEGA 1/0165/14: Pharmacological modulation of oscillation frequency of the respiratory epithelium cilia	
Summary:	Mucociliary apparatus of the respiratory epithelium plays an important role in the cleansing of the respiratory tract from excessive amounts of mucus and other pathogens. Slowdown of the cilia motion leads to stagnation of phlegm in the respiratory tract, secondary infections, which require further treatment. Although there is more specialized information about the role of anti-asthmatics, expectorants and antitussives in the treatment of respiratory diseases, it is unknown how much the drug can pharmacologically affect the function of cilia in pathological conditions, in particular during respiratory tract inflammation. The results of our project would in future be applied in clinical practice in choosing the appropriate drug for the treatment of inflammatory respiratory diseases, which in addition to its primary role (bronchodilation, anti-inflammatory, antitussive and expectorant effect) also supported the defensive function of the mucociliary transport.
Realization:	01/2014 – 12/2016
Coordinator:	Soňa Fraňová (Jessenius Medical Faculty in Martin)
Co-operators:	Miroslav Hrianka, Libor Hargaš, Dušan Koniar (DME)

VEGA 2/0076/15: Research of black silicon structures	
Summary:	Project is oriented towards basic experimental and theoretical investigation of black silicon starting with its preparation chemically in liquid media and/or using high frequency plasma, electrochemistry of formation of such structure, investigation of basic properties of the structure, passivation of formed nano-crystalline objects using proper technology leading to tunnelling dielectric layers, research of electrical transport mechanisms in passivated structures, its structural and optical properties. The structures are prepared on the following substrates: i) c-Si, ii) poly-Si, and ii) proper type of amorphous Si and/or mc-Si thin film. The project will resolve selection of a proper type of doping of surface area of black silicon in order to form pn junction, to study its electrical properties and to fabricate corresponding black silicon based solar cell.
Realization:	01/2015 – 12/2017
Coordinator:	Emil Pinčík, Institute of Physics, Slovak Academy of Sciences, Bratislava

Sub-Coordinator:	Jarmila Müllerová (IAS)
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VEGA 1/0278/15: Research and development of optical waveguides and waveguide structures from polydimethylsiloxane	
Summary:	Design and development of waveguides, fibers and waveguide structures from polydimethylsiloxane with the aim to use them for photonic and sensor applications. Optical properties of waveguides and structures will be investigated in the visible and the near infrared region of the electromagnetic spectrum. Photonic elements on the basis of polydimethylsiloxane will be designed such as tunable waveguide optical attenuators, optical waveguide power limiters, optical fiber switches and optical planar and fiber sensors.
Realization:	01/2015 – 12/ 2018
Coordinator:	Ivan Martinček (DPh)

VEGA 1/0123/15: Ultra-high-cycle fatigue of welds with nanostructured layers	
Summary:	The aim of the project is to examine the procedure for evaluation of weld quality with nanostructured layers when applied ultra-high-cycle fatigue process.
Realization:	01/2015 – 12/2017
Coordinator:	Otakar Bokůvka (Faculty of Mechanical Engineering)
Co-operators:	Dagmar Faktorová (DMAEE)

VEGA 1/0928/15: Research of electronic control of power transmission and motion of road ICE- hybrid HEV and EV vehicles	
Summary:	The project deals with research in the area automotive electronics - Autotronics - identifying structures and advanced management methods of power transmission and motion ICE internal combustion vehicles, hybrid HEV and EV using their controllers and fieldbus (CAN) communication with them. Then there is the research of embedded processor systems for the electronic transmission control of performance of HEV and EV vehicles with central and distributed electric propulsion systems, as well as research into the power structure for optimal energy management and vehicle research and development environment for programming autotronics systems. The research results will be used for the education of specialists for the automotive industry, where it appears at present scarcity.
Realization:	01/2015 – 12/2017
Coordinator:	Branislav Dobrucký (DME)

VEGA 1/0367/15: Research and development of a new system for autonomous robot trajectory control	
Summary:	The scientific project is focused on the implementation of hybrid sensors – Inertial Navigation System (INS), into robot's control. A system with such a control can acquire a precise position of robot's effector in space. The application can be used for calibration of a robotic workplace. The calibration is necessary in order to adapt a simulated model of a production device to real geometric conditions. A simulation model of a production device and robot programming set represent an accurate representation of reality. However, an

	absolute correspondence with the reality cannot be expected. The deviations of reality from simulation occur because of several reasons. The implemented INS will be used for calibration without the use of calibration equipment, thereby enabling a significant simplification of calibration in praxis.
Realization:	01/2015 – 12/2017
Coordinator:	Pavol Božek (Institute of applied informatics, automation and mechatronics, MTF)
Sub-Coordinator:	Rastislav Pirník (DCIS)

VEGA 1/0427/15: Access Network Structures and Their Research in Terms of Performance and Time Characteristics	
Summary:	Research project will work on modelling and emulation of access network in terms of required demands for network services (audio, video and data) in the relation to the qualitative and quantitative system parameters. Performance and time characteristics will be the subject of an analytical model. Necessary part of research project will be the technological model realized by modern network technology (including a modern emulator AVALANCHE 290 which allows to realize the real network traffic in the access network), the content of which will be a separate access network. The goal of proposed research project is the resolving of QoS problem for critical (real-time) network services (voice and video traffic). Because the part of the research project will be the real access network, the obtained results will be directly applicable in practice.
Realization:	01/2015 – 12/2017
Coordinator:	Vladimír Hottmar (DTM)

VEGA 1/0263/16: Research of integrated localization system based on wireless systems and sensors implemented in smart mobile devices	
Summary:	With the increasing amount of localization based services (LBS) also demands on the quality of positioning systems increase. Providers try to provide such LBS without restrictions about environment in which the user is located. High demands on the quality can be fulfilled only by the systems that utilize combination of all available technologies. The project is focused on proposal of positioning system, which will integrate systems commonly used for positioning of mobile device (MD) - smartphones. Systems that are assumed to be utilized are based on wireless networks, GNSS and sensors which are integrated in MD. The project will be focused on research of localization algorithms based on fingerprinting method, which will utilize data from available sensors in order to improve the method performance. Crucial part of the research is algorithms development that will integrate all available data in order to estimate position of MD. Proposed algorithms will represent core of the developed integrated positioning system.
Realization:	01/2013 – 12/2015
Coordinator:	Peter Brída (DTM)

VEGA 2/0045/13 Sensitivity of liquid crystals with nanoparticles to external magnetic field	
Summary:	Some processes in systems with nanoparticles are studied, in particular in magnetic fluids and magneto-optic films with significant Faraday effect. First part of the project is devoted to studies of the structure and dielectric properties, heat conduction, ageing process, partial discharges and both d.c.

	and a.c. hopping in new magnetic fluids based on transformer oils. The purpose is to prepare transformer oils with better dielectric and thermal properties as in the case of clean transformer oil, so they could be used as more effective cooling medium as a result of the magneto-convection. The purpose is to utilize them in various areas of high-power electronic. The second part of project is oriented towards the preparation of magneto-optical films in the form of polymeric, in magnetic field structuralized nanoparticles of various shape and to the study of their magneto-optic properties.
Realization:	01/2013 – 2016
Coordinator:	Peter Kopčanský (ÚEF SAV Košice)
Coordinator for FEE	Peter Bury (DPh)

Cultural & Education Grant Agency of the Slovak Ministry of Education, Science, Research and Sport (KEGA)

KEGA 003TU Z-4/2015: Development of conceptual thinking at technical universities	
Summary:	The goal is to create materials for modern interactive methods and their application in the teaching process. These methods will make the study of physics easier and will help students develop their imagination, creativity and will fill in missing logical and abstract thinking.
Realization:	01/2015 – 12/2017
Coordinator:	Peter Hockicko (DPh)

KEGA 030ŽU - 4/2014: The innovation of technology and education methods oriented to area of intelligent control of power distribution networks (Smart Grids)	
Summary:	The aim of the project is to provide students with new forms and education methods, which will help them to build up required professional knowledge and technical skills, especially in the area of intelligent control of distribution networks. The innovated and newly created educational tools will be accessible for students from other universities (home and abroad) and public use through created interactive web page.
Realization:	01/2014 – 12/2016
Coordinator:	Juraj Altus (DPES)

KEGA 031ŽU-4/2016 Implementation of Geometric product specifications (GPS) into the teaching process of engineering study programs and putting them into the technical practice.	
Summary:	The goal of the project is modernisation, improving and supplementing of teaching contents and form within the education of study programs at universities of technical orientation and support for students to achieve such level of knowledge's and skills, which increase their competitiveness at the labour market. The project deals with the implementation of the latest findings introduced in the latest international technical standards in the field of Geometrical product specifications (GPS) into the contents of teaching materials of subjects as Engineering Drawing, Design, Methodology of Design, Engineering metrology and Metrology. The project is multidisciplinary. It is aimed at problems of designing and tolerances prescription for dimension, for geometry and form prescription within the product designing. It is also aimed at the field of geometrical quantities measuring and evaluation as well as at using of latest measuring equipment. The goal of the project is creating of educating

	program and publishing of textbook for university students. The book will be supplemented with digital annexes available at the information system with exercises assignments and results. Within the annexes there will be teaching tools and tests for students. One part of exercises will be in English. Another result of the solution of the project will be completion of laboratory for 3D measurement. That will be a benefit for students preparing themselves for future occupation in international firms – mainly in the field of automobile and bearings industry.
Realization:	01/2016 – 12/2018
Coordinator:	Jozef Bronček (Faculty of Mechanical Engineering UNIZA)
Co-operators:	Ivan Litvaj (DPES)

KEGA 006ŽU-4/2014: Advanced computer locomotive simulator for electric traction and railway based lectures	
Summary:	The aim of the project is to increase a practical education and the attractiveness of electric traction, rolling stock and rail transport fields of study for students of technical universities, as well as related disciplines for students of high schools. As shown in recent years, the practical training of students of electrical and mechanical engineering, as well as transportation engineering faces the legislative and organizational problems. Practical and interactive contact with such difficult fields of study is required, while denied to most of students. Development of advanced computer locomotive simulator we offer students this interactive, safe and access to the practical problems of railway and traction drives. The simulator will also contribute to the attractiveness of study fields, which are currently required by industry again.
Realization:	01/2014 – 12/2016
Coordinator:	Matěj Pácha (DPES)

KEGA 003STU-4/2014: Advanced methods of image processing used in visual systems and their implementation to the educational process	
Summary:	<p>Development of a new modern university textbooks and didactic tools requires innovative research in the scientific field. The effective usage of such research within the teaching process assumes a preparation on the methodology of this research in education process, creating of the modern didactic tools and teaching aids, and university textbooks. The aim of the project is research in the field of advanced image processing in visual systems and the usage of such research especially in subjects of 1st, 2nd and 3rd level of university education. The ambition of the project is to create such aids and textbooks, which can be used in several technical disciplines and study programs at Slovak universities. There is an assumption, that they will be also used in specialized secondary schools or in the professional public.</p> <p>The visual system as a sensory system is applied in a variety of technical areas, so this project has an interdisciplinary nature. With the development of visual systems hardware, it is needed to explore new and analyze existing image processing methods in these systems. The nature of the project presumes the employment of modern software and hardware resources into a teaching process. These resources will enable the students to better understand the possibilities of employment of visual systems in different technical areas. The content of the project is to explore advanced methods for filtering and image segmentation, identification of objects in the image, the reconstruction of 3D scenes from an image, and the detection of significant features in the image.</p>

	The project will also focus on progressive trends in the visual systems, including high-speed imaging in mechatronic systems or 3D interpretation of the scene
Realization:	01/2014 – 12/2016
Coordinator:	František Duchoň, FEI, Slovak Technical University in Bratislava
Co-operators:	Libor Hargaš, Dušan Koniar (DME)

KEGA 008ŽU-4/2015: Innovation of HW and SW tools and methods for laboratory education with focus on ICT security aspects in safety-critical process control applications

Summary:	The goal of the project is to focus on the research in the field of evaluation of cryptographic mechanisms used for safety-critical process control applications based on modelling approach. The outcomes will be presented in a form of collective publications and a prepared monograph, as well. One of the objectives of the project is also to build up workplaces in AB 315 and AB 320 laboratories for the needs of education of subjects focusing information security.
Realization:	01/2015 – 12/2017
Coordinator:	Mária Franeková (DCIS)

KEGA 034ŽU-4/2016: Implementation of modern technologies into education with focus on safety PLC control

Summary:	The project is focused on bridging the shortcomings resulting from the growing demands of industry for the theoretical knowledge and practical experiences in deployment of control systems with safety PLC. The project aim is to build a laboratory in which control systems with safety PLC will be together with the physical models allowing simulation of real situations in industry. The laboratory will allow the emergence of a new subject "Control systems with safety PLC" and subsequent solution of bachelor's thesis, master's thesis and dissertations. Under the project will be developed the teaching materials supported by examples. This allows to make studying more attractive and to train students for the practical needs and finally to develop cooperation with practice primarily in the area of consultation about achieving the required safety integrity level (SIL - Safety Integrity Level) of realized applications.
Realization:	01/2016 – 12/2018
Coordinator:	Juraj Ždánsky (DCIS)

Structural Funds

ITMS 26220220184: Science park of the University of Zilina

Summary:	Aim of the project is to build up a unique excellent research infrastructure on the international level with emphasis on regional growth and development. The purpose of the science park is to increase competitiveness of Slovakia through application of innovations into praxis.
Realization:	06/2013 – 06/2015
Coordinator:	Michal Záborský (USP)

Other National Research Projects

IBM-10/2016: Exploration of Smart City Services with IBM within UNIZA Campus	
Summary:	The aim of the project is to follow up the IOT activities within UNIZA Campus, bring new solutions & innovations and help more students to get familiar with IBM technology in this area (IOT, BigData, Analysis). It will also deepen the relation between IBM and UNIZA.
Realization:	10/2016 – 10/2018
Coordinator:	Peter Holečko (DCIS)

Other National Non-research Projects

HOOP – a playful form of OOP education for middle school teachers	
Summary:	The project focuses on a change of the Informatics course curricula at the secondary schools and a preparation of informatics teachers for OOP education, specifically in JAVA and Greenfoot and BlueJ environments.
Realization:	09/2016 – 09/2018
Coordinator:	Michal Varga (Faculty of Management Science and Informatics)
Co-operators:	Alžbeta Kanáliková (DCIS), Emil Kršák, Michal Varga, Norbert Adamko, Ľubomír Sadloň (Faculty of Management Science and Informatics)

Phenomenology and Outreach (FEPO), Agreement between Ministry of Education SR and University of Žilina	
Summary:	Department of Physics will collaborate with CERN in the area of research and outreach in particle physics. In the research part we will collaborate with the Theory Department in the area of Heavy Ion Physics and mechanism of Electroweak Symmetry Breaking. Our department will coordinate Particle Physics Masterclasses at the national level (Masterclasses, http://fyzika.uniza.sk/mc/) at 6 Slovak universities, will co-organize international competition Beamline for Schools and develop portal svetcastic.sk for outreach and communication of particle physics.
Realization:	01/2016 – 12/2016
Coordinator:	Ivan Melo (DPh)

K61 Žilina Childrens University 2016 (Grant scheme of city Žilina)	
Summary:	Goal of the project is to focus the attention of school age children from Žilina area on STEM subjects and show them applications of research for everyday life.
Realization:	02/2016 – 11/2016
Coordinator:	Peter Hockicko (DPh)
Co-operators:	Teachers from UNIZA