ENERGEETIKATEADUSKONNA ELEKTRIAJAMITE JA JÕUELEKTROONIKA INSTITUUDI TEADUS- JA ARENDUSTEGEVUSE AASTAARUANNE 2011

1. Instituudi struktuur

Instituudi direktori kt Tõnu Lehtla

- Elektriajamite ja elektrivarustuse õppetool, Chair of Electrical Drivers and Electrical Supply
- Robotitehnika õppetool, Chair of Robotics, Tõnu Lehtla

2. Instituudi teadus- ja arendustegevuse (edaspidi T&A) iseloomustus

(NB! punktid 2.1- 2.6 täidab struktuuriüksus)

2.1 struktuuriüksuse koosseisu kuuluvate uurimisgruppide

2.1.1 teadustöö kirjeldus *(inglise keeles*);

Development of innovative semiconductor converters (qZS converters, intelligent converters, DC/DC converters with high power density, frequency converters);

DC/DC converters with inverter and high-frequency intermediate based on IGBT transistors for powering on-board systems of trams and electric trains, integrating renewable energy sources and electricity storage devices to power network

Basic research of commutation processes and electromagnetic compatibility, implementation research on scheme solutions, prototypes for product development

Electrical drives, industrial automation, electrical transport, including fast charging of electric cars in intelligent power networks (smart grids); Researching electrical drives, electrical transport, and fast-charging stations in case of the communication channels of different types of batteries, power supply and converter systems, and in case of intelligent network infrastructure

Electrical measuring, protection and safety in intelligent power networks; Modelling, simulation, investigating protection and safety problems

Power supply, electric lighting, and lighting and heating management in intelligent network; Power supply for companies and buildings; Researching the lighting characteristics (illumination, brightness, spectrum (colour), discomfort, etc.) of different types of lighting sources in the context of purpose (indoor and outdoor objects, and street lighting), Estonian global location, natural light, climate, and seasons; The power sources of LED-lightings, special lighting solutions, lightings with self-adaptive spectrum.

2.1.2 aruandeaastal saadud tähtsamad teadustulemused *(inglise keeles).*

Department of Electrical Drives and Power Electronics becomes the member of ECPE – *European Centre for Power Electronics* in 2011.

Most important scientific results achieved in 2011:

1) Novel topology of a high step-up galvanically isolated DC/DC converter was proposed and experimantally verified. Two utility models and one patent application were registered in Estonian Patent office.

2) New energy efficient high voltage semiconductor switch based on parallel connection of HV IGBT and IGCT was proposed. Patent application was registered in Estonian Patent office.

3) New power conditioning system for fuel cells with modular structure and unique control system (active ripple cancellation, possibility to eliminate unwanted operation states) was proposed, assemblem and experimentally verified. One utility model was registered in Estonian Patent office.

4) Novel magnetically coupled multiport DC/DC converter was proposed for hydrogen buffer interfacing with renewable energy systems. Theoretical assumptions were verifyed by help of 2 kW prototype assembled in the lab.

5) New 3-level neutral point clamped auasi-Z-source inverter (3L-NPC qZSI) was proposed and experimentally validated.

6) New modular concept of a solid state transformer (power electronic transformer) was proposed in order to replace the 50 Hz distribution transformers in power distribution grids.

2.2 Uurimisgrupi kuni 5 olulisemat publikatsiooni läinud aastal.

Vinnikov, D.; Laugis, J. (2011). An improved high-voltage IGBT-based half-bridge DC/DC converter for railway applications. COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engin, 30(1), 279 - 298.

Vinnikov, D.; Roasto, I. (2011). Quasi-Z-Source-Based Isolated DC/DC Converters for Distributed Power Generation. IEEE Transactions on Industrial Electronics, 58(1), 192 - 201.

Bisenieks, L.; Vinnikov, D.; Ott, S. (2011). Switched Inductor Quasi-Z-Source Based Back-to-Back Converter for Variable Speed Wind Turbines with PMSG. ELECTRONICS AND ELECTRICAL ENGINEERING, 8, 61 - 66.

Vinnikov, D.; Roasto, I.; Jalakas, T.; Ott, S. (2011). Extended Boost Quasi-Z-Source Inverters: Possibilities and Challenges. Electronics and Electrical Engineering, 112(6), 51 - 56.

Vinnikov, D.; Roasto, I.; Zakis, J.; Ott, S.; Jalakas, T. (2011). Analysis of Switching Conditions of IGBTs in Modified Sine Wave qZSIs Operated with Different Shoot-Through Control Methods. Electronics and Electrical Engineering, 111(5), 45 - 50.

2.3 Loetelu struktuuriüksuse töötajate rahvusvahelistest tunnustustustest.

Euroopa Jõuelektroonika Keskus (ECPE – *European Centre for Power Electronics*), mis koondab Euroopa tähtsamaid jõuelektroonikaga tegelevaid ettevõtteid ja ülikoole, võttis TTÜ **elektriajamite ja jõuelektroonika instituudi oma liikmeks** ning andis instituudile **kompetentsikeskuse tiitli**. Vastuvõttu toetasid 2 ECPE liikmeks olevat tööstusettevõtet – ABB ja Schneider Electric. ECPE eesmärgiks on edendada ja tugevdada Euroopa jõuelektroonikaalast teadus- ja arendustegevust ning teadmiste siiret võtmevaldkondades nagu energia tõhusam tootmine, jaotamine ning kasutamine.

Septembris 2011 ülendas IEEE (*The Institute of Electrical and Electronics Engineers*) vanemteadur **Dmitri Vinnikovi** organisatsiooni lihtliikmest tasemele ***Senior Member of the IEEE***. See on liikmete professionaalsuse kõrgeim tase, mis on omistatud vaid 8 %-le 400 000-st IEEE liikmest.

Riia Tehnikaülikooli 52. rahvusvahelise teaduskonverentsi *Power and Electrical Engineering* korralduskomitee autasustas 14. oktoobril 2011 **Dmitri Vinnikovi** kui *kõige täpsemat retsensenti* ***aukirjaga***.

2.4 Loetelu struktuuriüksuse töötajatest, kes on välisakadeemiate või muude oluliste T&A-ga seotud välisorganisatsioonide liikmed.

Prof. Endel Risthein on **Šveitsi Elektro-, Energia- ja Infotehnikaühingu** (*SEV Verband für Elektro-, Energie- und Informationstechnik)* liige.

Vanemteadur Dmitri Vinnikov on **IEEE** (*The Institute of Electrical and Electronics Engineers*) **Tööstuselektroonika Seltsi** (*IEEE Industrial Electronics Society, IES*) ja **Jõuelektroonika Seltsi** (*IEEE Power Electronics Society, PELS*) liige.

Vanemteadur Indrek Roasto on **IEEE ja IES** liige.

Vanemteadur Tanel Jalakas on **IEEE** liige.

2.5 Aruandeaasta tähtsamad T&A finantseerimise allikad.

Riigieelarveline T&A sihtfinantseerimine

Sihtfinantseerimise teema T016, Aktiivsete elektrijaotusvõrkude muundurite topoloogiad ja juhtimismeetodid, Dmitri Vinnikov summas 84540 eurot

Eesti Teadusfondi finantseerimine kokku summas 75819 eurot + 20%

Grant ETF7572 võimsad kõrgsagedusliku vahelüliga alalispingemuundurid, Tõnu Lehtla, 7278 eurot

Grant ETF8687, Intelligentne trafo – talitlusrežiimide analüüs, Indrek Roasto, 6000 eurot.

Grant ETF8538, Kvaasi-impedantsallikaga alalis- ja vahelduvpingemuundurid, Dmitri Vinnikov, 11300 eurot.

Grant ETF8020, Võimsate IGBT muundurite innovatiivsete juhtimis- ja diagnoostikasüsteemide uurimine, Valery Vodovozov, 9827 eurot.

Ühisgrant välisriikidega GERA1, Elektri tarkvõrgu kliendivalduse elektrikvaliteedi ja inimeste ning elektriseadmete ohutusnõuded, Tõnu Lehtla, 41414 eurot.

Riiklikud programmid

AR10126, Energiasüsteemi talitluse optimeerimine muutuvkoormuste tasakaalustamiseks, Toomas Rang, Tõnu Lehtla, Heiki Tammoja; Aadu Paist; Aleksander Kilk, 63334 eurot.

Infrastruktuur (nn „mini-infra“, „asutuse infra“):

AP016, Aktiivsete elektrijaotusvõrkude muundurite topoloogiad ja juhtimismeetodid, Dmitri Vinnikov, 66638 eurot.

ÜLTAP66, Arukad energiasüsteemid, Argo Rosin, 104409 eurot.

Välisriikide lepingud

VA431, Integration of Renewable Energy Sources and Improvement of Energy Conversion Efficiency in Microgrids, Dmitri Vinnikov

2.6 Soovi korral lisada aruandeaastal saadud T&A-ga seotud tunnustusi (va punktis 2.3 toodud tunnustused), ülevaate teaduskorralduslikust tegevusest, teadlasmobiilsusest ning anda hinnang oma teadustulemustele.

2.7 Instituudi teadus- ja arendustegevuse teemade ja projektide nimetused *(Eesti Teadusinfosüsteemi, edaspidi ETIS, andmetel)*

- Haridus- ja Teadusministeerium

sihtfinantseeritavad teemad:

- T016, Aktiivsete elektrijaotusvõrkude muundurite topoloogiad ja juhtimismeetodid, Vinnikov Dmitri

baasfinantseerimise toetusfondist rahastatud projektid (sh TTÜ tippkeskused):
riiklikud programmid:

- Teiste ministeeriumide poolt rahastatavad riiklikud programmid:

- Uurija-professori rahastamine:

- SA Eesti Teadusfond

grandid:

- ETF7572, Võimsad kõrgsagedusliku vahelüliga alalispingemuundurid, Lehtla Tõnu
- ETF8020, Võimsate IGBT muundurite innovatiivsete juhtimis- ja diagnoostikasüsteemide uurimine , Vodovozov Valery
- ETF8687, Intelligentne trafo – talitlusrežiimide analüüs, Indrek Roasto
- ETF8538, Kvaasi-impedantsallikaga alalis- ja vahelduvpingemuundurid, Dmitri Vinnikov

ühisgrandid välisriigiga:

- GERA1,Elektri tarkvõrgu kliendivalduse elektrikvaliteedi ja inimeste ning elektriseadmete ohutusnõuded, Lehtla Tõnu

järeldoktorite grandid (SA ETF ja Mobilitas):

- MJD42, Research and Development of Bi-Directional Power Converters for Energy Storage Applications, Zakis Janis

tippteadlase grandid (Mobilitas):

- Ettevõtluse Arendamise SA

eeluuringud:
arendustoetused:

- SA Archimedesega sõlmitud lepingud

infrastruktuur (nn „mini-infra“, „asutuse infra“):

- AP016, Aktiivsete elektrijaotusvõrkude muundurite topoloogiad ja juhtimismeetodid, Vinnikov Dmitri
- ÜLTAP66, Arukad energiasüsteemid, Argo Rosin

Eesti tippkeskused:
riiklikud programmid:

- AR10126, Energiasüsteemi talitluse optimeerimine muutuvkoormuste tasakaalustamiseks, Toomas Rang, Tõnu Lehtla, Heiki Tammoja; Aadu Paist; Aleksander Kilk

muud T&A lepingud:

- SA Keskkonnainvesteeringute Keskusega sõlmitud lepingud:

- Siseriiklikud lepingud:

- Lep9122, Kütuseelementide baasil autonoomse toiteallika alalispingemuundur, Vinnikov Dmitri

- <u>EL Raamprogrammi projektid:</u>

- <u>Välisriiklikud lepingud:</u>
- VA431, Integration of Renewable Energy Sources and Improvement of Energy Conversion Efficiency in Microgrids, Vinnikov Dmitri

2.8 Struktuuriüksuse töötajate poolt avaldatud sihtfinantseeritava teadusteema taotlemisel arvestatavad eelretsenseeritavad teaduspublikatsioonid *(ETIS klassifikaatori alusel 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 4.1 ja 5.1).*

<u>1.1</u>

Vinnikov, D.; Laugis, J. (2011). An improved high-voltage IGBT-based half-bridge DC/DC converter for railway applications. COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engin, 30(1), 279 - 298.

Vinnikov, D.; Roasto, I.; Zakis, J.; Ott, S.; Jalakas, T. (2011). Analysis of Switching Conditions of IGBTs in Modified Sine Wave qZSIs Operated with Different Shoot-Through Control Methods. Electronics and Electrical Engineering, 111(5), 45 - 50.

Roasto, I.; Vinnikov, D.; Jalakas, T.; Strzelecki, R. (2011). Digital Current Mode Control Algorithms for High-Power Half-Bridge DC/DC Converters. Przeglad Elektrotechniczny, 8, 180 - 186.

Vinnikov, D.; Roasto, I.; Jalakas, T.; Ott, S. (2011). Extended Boost Quasi-Z-Source Inverters: Possibilities and Challenges. Electronics and Electrical Engineering, 112(6), 51 - 56.

Blinov, A.; Vinnikov, D.; Jalakas, T. (2011). Loss Calculation Methods of Half-Bridge Square-Wave Inverters. Elektronika ir Elektrotechnika, 7, 9 - 14.

Rosin, A.; Auväärt, A; Lebedev, D. (2011). Operation Times Analysis and Electrical Storage Dimensioning for Energy Consumption Shifting and Balancing in Residential Area. Electronics and Electrical Engineering, xx - xx. [ilmumas]

Vinnikov, D.; Roasto, I. (2011). Quasi-Z-Source-Based Isolated DC/DC Converters for Distributed Power Generation. IEEE Transactions on Industrial Electronics, 58(1), 192 - 201.

Bisenieks, L.; Vinnikov, D.; Ott, S. (2011). Switched Inductor Quasi-Z-Source Based Back-to-Back Converter for Variable Speed Wind Turbines with PMSG. ELECTRONICS AND ELECTRICAL ENGINEERING, 8, 61 - 66.

<u>1.2</u>

Beldjajev, V.; Roasto, I.; Lehtla, T. (2011). Intelligent Transformer: Possibilities and Challenges. Scientific Journal of Riga Techical University: Power and Electrical Engineering, 29, 95 - 100.

Ivakhno, V.; Zamaruev, V.; Lastovka, A.; Blinov, A.; Vinnikov, D. (2011). About possibility of

improvement of energetic characteristics of two-stage dc/dc converter with separated commutation. Технічна електродинаміка, 88 - 92.

Zakis, J.; Rankis, I.; Vinnikov, D. (2011). Analysis of operating modes of the step-up dc/dc converter with a commutating lc-filter. Технічна електродинаміка, 87 - 92.

Andrijanovitsh, A.; Steiks, I.; Zakis, J.; Vinnikov, D. (2011). Analysis of State of the Art Converter Topologies for Interfacing of Hydrogen Buffer with Renewable Energy Systems. Scientific Journal of Riga Technical University. Power and Electrical Engineering, 29, 87 - 94.

Ott, S.; Roasto, I.; Vinnikov, D.; Lehtla, T. (2011). Analytical and Experimental Investigation of Neutral Point Clamped Quasi-Impedance-Source Inverter. Scientific Journal of Riga Techical University: Power and Electrical Engineering, 29, 113 - 118.

Blinov, A.; Vinnikov, D.; Lehtla, T. (2011). Cooling Methods for High-Power Electronic Systems . Scientific Journal of Riga Techical University: Power and Electrical Engineering, 29, 79 - 86.

Rosin, A.; Rosin, K. (2011). Dimensioning and feasibility of PV-systems for residential area in Estonia . Scientific Journal of Riga Techical University: Power and Electrical Engineering, xx - xx. [ilmumas]

Husev, O.; Bisenieks, L.; Vinnikov, D. (2011). FRONT-END ACTIVE RECTIFIER FOR GRID-CONNECTED PMSG BASED WIND TURBINES. Journal of Chernihiv State Technological University, 3, 132 - 138.

Vinnikov, D.; Husev, O.; Roasto, I. (2011). Lossless Dynamic Models of the Quasi-Z-Source Converter Family. Scientific Journal of Riga Techical University: Power and Electrical Engineering, 29, 73 - 78.

Vinnikov, D.; Husev, O.; Andrijanovitš, A.; Roasto, I. (2011). New high-gain step-up dc/dc converter for a fuel cell interfacing in hydrogen buffer. Технічна електродинаміка, 93 - 100.

Blinov, A.; Vinnikov, D.; Ivakhno, V. (2011). Study of performance improvement methods for 6.5 kv IGBT based two-level half-bridge converters. Технічна електродинаміка, 56 - 62.

Zakis, J.; Vinnikov, D. (2011). Study of Simple MPPT Converter Topologies for Grid Integration of Photovoltaic Systems. Scientific Journal of Riga Techical University: Power and Electrical Engineering, 29, 67 - 72.

1.3

2.1

2.2

Rosin, A. (2011). Control and Operation Diagnostics of Light Rail Electric Transport: Research and Development. Saarbrücken, Germany: LAP LAMBERT Academic Publishing GmbH & Co. KG

Roasto, I.; Jalakas, T.; Vinnikov, D. (2011). High-voltage IGBT based converters for rolling stock: Possibilities and Challenges. Saarbrücken, Germany: Lambert Academic Publishing AG & Co. KG

3.1

Beldjajev, V.; Roasto, I.; Vinnikov, D. (2011). Analysis of Current Doubler Rectifier Based High Frequency Isolation Stage for Intelligent Transformer. In: 7th International Conference-Workshop Compatibility and Power Electronics (CPE2011), Tallinn, Estonia, June 01-03, 2011: Tallinn, Eesti:, 2011, 336 - 341.

Bisenieks, L.; Vinnikov, D.; Zakis, J. (2011). Analysis of Operating Modes of the Novel Isolated Interface Converter for PMSG Based Wind Turbines . In: Proceedings of the 2011 International Conference on Power Engineering, Energy and Electrical Drives: International Conference on Power Engineering, Energy and Electrical Drives, POWERENG2011. IEEE, 2011, 1 - 8.

Lehtla, M.; Müür, M.; Kõivastik, I.; Müül, K. (2011). Application of Databases for Compatibility of Electrical Installation Design. In: 2011 7th International Conference-Workshop Compatibility and Power Electronics (CPE) Conference Proceedings: 2011 7th International Conference-Workshop Compatibility and Power Electronics, June 01-03 2011, Tallinn. , 2011, 299 - 302.

Vinnikov, D.; Roasto, I.; Strzelecki, R.; Adamowicz, M. (2011). CCM and DCM Operation Analysis of Cascaded Quasi-Z-Source Inverter. In: Proceedings of IEEE International Symposium on Industrial Electronics ISIE'2011, 27-30 June 2011, Gdansk, Poland: IEEE, 2011, 159 - 164.

Palamar, A.; Karpinskyy, M.; Vodovozov, V. (2011). Design and Implementation of a Digital Control and Monitoring System for an AC/DC UPS. 7th International Conference-Workshop "Compatibility and Power Electronics" CPE 2011, Tallinn, Estonia. , 2011, 173 - 177.

Vodovozov, V.; Egorov, M. (2011). Discontinuous Space Vector Modulation Technique For Motor Supply. In: EUROCON 2011, Lisbon, Portugal, April 27-29: IEEE, 2011, paper 259.

Raud, Z.; Vodovozov, V. (2011). Educational Thesaurus of Power Electronics. In: EUROCON 2011, Lisbon, Portugal, April 27-29.: IEEE, 2011, Paper 249.

Rassõlkin, A.; Hõimoja, H.; Teemets, R. (2011). Energy Saving Possibilities in the Industrial Robot IRB 1600 Control . In: Conference Info 7th International Conference-Workshop "Compatibility and Power Electronics" CPE 2011:, 2011, 226 - 229.

Blinov, A.; Vinnikov, D.; Ivakhno, V. (2011). Energy-Efficient High-Voltage Switch Based on Parallel Connection of IGBT and IGCT. In: 7th IEEE Conference-Workshop "Compatibility and Power Electronics CPE'2011". 01.06.-03.06.2011, Tallinn, Estonia:, 2011, 360 - 364.

Vinnikov, D.; Andrijanovitš, A.; Roasto, I.; Jalakas, T. (2011). Experimental study of new integrated DC/DC converter for hydrogen-based energy storage. 10th International Conference on Environment and Electrical Engineering (EEEIC´11), Rome (Italy), May 2011. IEEE, 2011, 1 - 4.

Vinnikov, D.; Roasto, I. (2011). Impact of Component Losses on the Voltage Boost Properties and Efficiency of the qZS-Converter Family . In: 7th International Conference-Workshop Compatibility and Power Electronics (CPE2011), Tallinn, Estonia, June 01-03, 2011:, 2011, 303 - 308.

Vodovozov, V.; Egorov, M.; Raud, Z.; Lehtla, T. (2011). Inverters with Reduced Switching Losses for Industrial Applications. 9th IEEE International Conference on Industrial Informatics INDIN 2011. Caparica, Lisbon, Portugal: IEEE, 2011, 274 - 279.

Husev, O.; Ivanets, S.; Vinnikov, D. (2011). Neuro-fuzzy Control System for Active Filter with Load Adaptation. In: 7th International Conference-Workshop Compatibility and Power Electronics (CPE2011), Tallinn, Estonia, June 01-03, 2011:, 2011, 28 - 33.

Ott, S.; Roasto, I.; Vinnikov, D. (2011). Neutral Point Clamped Quasi-Impedance-Source Inverter. 7th International Conference-Workshop Compatibility and Power Electronics (CPE2011), Tallinn, Estonia, June 01-03. IEEE, 2011, 348 - 353.

Bisenieks, L.; Vinnikov, D.; Galkin, I. (2011). New Converter for Interfacing PMSG based Small-Scale Wind Turbine with Residential Power Network. In: 7th International Conference-Workshop Compatibility and Power Electronics (CPE2011), Tallinn, Estonia, June 01-03, 2011:, 2011, 354 - 359.

Bisenieks, Lauris; Vinnikov, Dmitri; Galkin, Ilya (2011). New Isolated Interface Converter for Grid-Connected PMSG based Wind Turbines. 2011 10th International Conference on Environment and Electrical Engineering. IEEE, 2011, 869 - 872.

Auväärt, A.; Rosin, A.; Belonogova, N.; Lebedev, D. (2011). NordPoolSpot price pattern analysis for households energy management. In: 7th International Conference-Workshop Compatibility and Power Electronics (CPE2011), Tallinn, Estonia, June 01-03, 2011: IEEE, 2011, 103 - 106.

Rassõlkin, A. (2011). Possible Solutions of Using Multi-Engine Power Systems for Switching Locomotives. In: Conference Info 7th International Conference-Workshop "Compatibility and Power Electronics" CPE 2011, Student Forum: (Toim.) Janis Zakis. Tallinn, Estonia: IEEE, 2011, 7 - 10.

Zakis, J.; Vinnikov, D.; Roasto, I.; Ribickis, L. (2011). Quasi-Z-Source Inverter Based Bi-Directional DC/DC Converter: Analysis of Experimental Results. 7th International Conference-Workshop, Compatibility and Power Electronics (CPE 2011). IEEE, 2011, 1 - 6.

Brindfeldt, E.; Grinko, A.; Müür, M. (2011). Some Aspects of Blended Learning for Tallinn University of Technology and Tallinn Center of Industrial Education. In: 7th International Conference-Workshop Compatibility and Power Electronics (CPE2011) Conference Proceedings: 7th International Conference-Workshop Compatibility and Power Electronics (CPE2011), Tallinn, Estonia, June 01-03, 2011. IEEE, 2011, 365 - 370.

Zakis, J.; Vinnikov, D.; Bisenieks, L. (2011). Some Design Considerations for Coupled Inductors for Integrated Buck-Boost Converters. III International Conference On Power Engineering, Energy And Electrical Drives (POWERENG`2011). IEEE, 2011, 1 - 6.

Egorov, M.; Vodovozov, V. (2011). Space Vector Modulation with Reduced Switching Losses for Motor Drive Inverters. 7th International Conference-Workshop "Compatibility and Power Electronics" CPE 2011, Tallinn, Estonia. , 2011, 388 - 393.

Raud, Z.; Vodovozov, V. (2011). Staff Training for Servicing Special Power Electronic Applications. In: 7th International Conference-Workshop "Compatibility and Power Electronics" CPE 2011:, 2011, 319 - 324.

Andrijanovitš, A.; Vinnikov, D.; Roasto, I.; Blinov, A. (2011). Three-level half-bridge ZVS DC/DC converter for electrolyzer integration with renewable energy systems. 10th International Conference on Environment and Electrical Engineering (EEEIC´11), Rome (Italy), May 2011. IEEE, 2011, 1 - 4.

Adamowicz, M.; Guzinski, J.; Strzelecka, N.; Vinnikov, D. (2011). Trans-Z-Source-Like Inverter with Built-in DC Current Blocking Capacitors. In: 7th International Conference-Workshop

Compatibility and Power Electronics (CPE2011), Tallinn, Estonia, June 01-03, 2011:, 2011, 137 - 143.

Vodovozov, V.; Raud, Z. (2011). Web-Based Learning Content Management System of Power Electronics . In: EUROMEDIA'2011: 16th Annual Scientific Conference on Web Technology, New Media, Communications and Telematics Theory, Methods, Tools and Applications EUROMEDIA'2011. (Toim.) Hasan Al-Saedy. London, UK: EUROSIS, 2011, 21 - 23.

3.2

Milaševski, I.; Armas, J.; Teemets, R. (2011). A Concept of Using LED Lamps in Conjunction with Traditional Light Sources. R. Lahtmets (Toim.). 10th International Symposium "Topical Problems in the Field of Electrical and Power Engineering", Doctoral Scholl of Energy and Geotechnology, Pärnu, Estonia, 10-15.01.2011 (170 - 174). Tallinn: Estonian Society of Moritz Hermann Jacobi

Andrijanovitš, A; Vinnikov, D. (2011). New bidirectional multiport DC/DC converter for interfacing of hydrogen buffer with wind turbines. Lahtmets, R. (Toim.). 10th International Symposium Pärnu 2011 "Topical Problems in the Field of Electrical and Power Engineering" and "Doctoral School of Energy and Geotechnology II" (85 - 90). Tallinn: Estonian Society of Moritz Hermann Jacobi

Niitsoo, J. (2011). An overview of the impacts of CFLs implementation. 10th International Symposium "Topical Problems in the Field of Electrical and Power Engineering" Pärnu, Estonia, January 10-15, 2011. (Toim.) Lahtmets, Rain. Estonian Society of Moritz Hermann Jacobi, 2011, 242 - 245.

Beldjajev, V.; Roasto, I.. (2011). Analysis of New Bidirectional DC-DC Converter Based on Current Doubler Rectifier. In: 11th International Symposium Pärnu 2011 "Topical Problems In The Field Of Electrical And Power Engineering" and "Doctoral School of Energy and Geotechnology II", Pärnu, Estonia, January 10 - 15, 2011: Doctoral school on energy and geotechnology II. , 2011.

Ott, S.; Roasto, I.; Vinnikov, D. (2011). Comparison of pulse width modulation methods for a quasi impedance source inverter. 10th International Symposium „Topical Problems in the Field of Electrical and Power Engineering", Pärnu, Estonia, January 10-15, 2011. (Toim.) Lahtmets, R.., 2011, 25 - 29.

Brindfeldt, E.; Grinko, A.; Müür, M. (2011). Course of automation in industrial processes based on the blended learning approach. In: 10th International Symposium "Topical Problems in the Field of Electrical and Power Engineering", Doctoral School of Energy and Geotechnology II: 10th International Symposium ""Topical Problems in the Field of Electrical and Power Engineering * Doctoral School of Energy and Geotechnology II", Pärnu, Estonia, 10.01-15.01.2011. (Toim.) Rain Lahtmets. Tallinn, Estonia: Estonian Society of Moritz Hermann Jacobi, 2011, 187 - 192.

Raud, Z.; Vodovozov, V. (2011). Curricula Scheduling with Educational Thesaurus. The 2011 World Congress on Computer Science and Information Technology WCSIT'11, 24-27 January 2011 Cairo, Egypt. Cairo, Egypt:, 2011, paper nr - 092.

Raud, Z. (2011). Management of Learning Content in Power Electronics. 10th International Symposium "Topical Problems in the Field of Electrical and Power Engineering" and "Doctoral School of Energy and Geotechnology II", Pärnu, Estonia, January 10 - 15, 2011. (Toim.) Rain Lahtmets. Eesti Moritz Hermann Jacobi Selts, 2011, 145 - 150.

Bisenieks, Lauris; Vinnikov, Dmitri; Galkin, Ilya (2011). New isolated converter for interfacing

PMSG based wind turbine with distribution network . In: 10th International Symposium, Topical Problems in the Field of Electrical and Power Engineering, Pärnu, Estonia: (Toim.) Rain Lahtmets. Tallinn, Estonia:, 2011, 100 - 107.

Auväärt, A.; Rosin, A.; Müür, M.; Lebedev, D. (2011). Nord Pool Spot price fluctuation analysis for energy management of household appliances. In: 10th International Symposium ""Topical Problems in the Field of Electrical and Power Engineering", Doctoral School of Energy and Geotechnology. Pärnu, Estonia, January 10-15: (Toim.) R. Lahtmets. Tallinn, Estonia: Estonian Society of Moritz Hermann Jacobi, 2011, 91 - 94.

Soots, G.; Hõimoja, H.; Pettai, E. (2011). Perspective solutions of SmartGrid and Vehicle-to-grid connectivity problems. In: 10th International Symposium ""Topical Problems in the Field of Electrical and Power Engineering", Doctoral School of Energy and Geotechnology. Pärnu, Estonia, January 10-15: (Toim.) Lahtmets, R.. Estonian Society of Moritz Hermann Jacobi, 2011, 113 - 116.

Rassõlkin, A.; Hõimoja, H.; Pettai, E.; Tšurkina, N. (2011). Review of the Estonian Railroad rolling stock and solutions for locomotive modernization. In: 10th International Symposium ""Topical Problems in the Field of Electrical and Power Engineering", Doctoral School of Energy and Geotechnology. Pärnu, Estonia, January 10-15: (Toim.) Rain Lahtmets. Estonian Society of Moritz Hermann Jacobi, 2011, 57 - 61.

Egorov, M. (2011). Simulation Study of Inverter-Fed Motor Drives. 10th International Symposium "Topical Problemsin the Field of Electrica and Power Engineering" and "Doctoral School of Energy and Geotechnology II", Pärnu, Estonia, January 10 - 15, 2011. (Toim.) Rain Lahtmets. Eesti Moritz Hermann Jacobi Selts, 2011, 165 - 168.

Vodovozov, V.; Lehtla, T. (2011). Ways to Reduce Switching Losses in Motor Drive Inverters. 10th International Symposium "Topical Problems in the Field of Electrical and Power Engineering" and 2nd Doctoral School of Energy and Geotechnology . Tallinn: Eesti Moritz Hermann Jacobi Selts, 2011, 3 - 9.

3.3

4.1

5.1

2.9 Struktuuriüksuses kaitstud doktoriväitekirjade loetelu *(NB! struktuuriüksus lisab struktuuriüksuse töötaja juhendamisel mujal kaitstud doktoriväitekirjade loetelu)*

Mikhail Egorov, elektriajamite ja jõuelektroonika instituut
Teema: *Research and Development of Soft-Commutated High-Voltage IGBT Based Converters*
(Kõrgepingelistel IGBT-del baseeruva pehmelülitusega muunduri uurimine ja väljatöötamine)
Juhendaja: prof Valery Vodovozov
Kaasjuhendaja: vanemteadur Dmitri Vinnikov
Kaitses: 5.09.2011
Omistatud kraad: filosoofiadoktor (energia- ja geotehnika)

2.10 Struktuuriüksuses järeldoktorina T&A-s osalenud isikute loetelu *(ETIS-e kaudu esitatud taotluste alusel)*

MJD42, Research and Development of Bi-Directional Power Converters for Energy Storage Applications, Zakis Janis

2.11 Struktuuriüksuses loodud tööstusomandi loetelu

EE201100013
Meetod lühisolekute tekitamiseks plokkjuhtimisega impedants-, kvaasi-impedants- ja trans-impedants-tüüpi vahelditele
Taotlus esitatud: 28.02.2011
Autorid: Dmitri Vinnikov, Indrek Roasto, Tanel Jalakas, Hannes Agabus, Kristi Tammet
Omanik: TTÜ
Instituut: AA

EE201100020
Energiasäästlik hübriid-kõrgepingelüliti
Taotlus esitatud: 16.03.2011
Autorid: Andrei Blinov, Tanel Jalakas, Dmitri Vinnikov, Tõnu Lehtla
Omanik: TTÜ
Instituut: AA

EE05445B1
Elektrisõiduki veoajam
Patent välja antud: 15.08.2011
Autorid: Jüri Joller, Juhan Laugis, Elmo Pettai
Omanik: TTÜ
Instituut: AA

EE00126U1
Tandem-alalispingemuundur
Tunnistus välja antud: 15.04.2011
Autorid: Dmitri Vinnikov, Hardi Hõimoja, Indrek Roasto, Tanel Jalakas, Hannes Agabus, Kristi Tammet
Omanik: TTÜ
Instituut: AA

EE00127U1
Pinget tõstev galvaaniliselt isoleeritud alalispingemuundur
Tunnistus välja antud: 15.04.2011
Dmitri Vinnikov, Tanel Jalakas, Indrek Roasto, Janis Zakis, Hannes Agabus, Kristi Tammet
Omanik: TTÜ
Instituut: AA

3. Struktuuriüksuse infrastruktuuri uuendamise loetelu

- Voolumõõtesond TCP305 mõõte, 18.03.2011, 2 703 €
- Koormusseade Chroma 63204, 22.03.2011, 9 322 €
- Hooratta komplekt, VII-102, 29.06.2011, 22 000 €
- Trükiplaadi automaatfrees, 3.10.2011, 13 930 €
- Ostsilloskoop Tekstroninix MSO, 6.10.2011, 32 280 €

- Koormusseade Chroma 63204, 4.10.2011, 9 322 €
- Gaasiturbiin Capstone HP C30, 21.11.2011, 45 000 €
- Laadimissüsteemi katseseadmed koos tarkvaraga summas , ,1 136 €

Kokkuvõtteks võib väita, et Elektriajamite ja jõuelektroonika instituudi teadus- ja arendustegevus 2011. aastal oli aktiivne ja tulemusrikas.

Prof. Tõnu Lehtla
Instituudi direktori kt.