

TALLINNA TEHNIKAÜLIKOOL
ENERGEETIKATEADUSKOND
ELEKTROTEHNIKA ALUSTE JA ELEKTRIMASINATE INSTITUUT

TEADUS- JA ARENDUSTEGEVUSE
AASTAARUANNE

TALLINN
2012

ENERGEETIKATEADUSKOND
ELEKTROTEHNIKA ALUSTE JA ELEKTRIMASINATE INSTITUUT
TEADUS- JA ARENDUSTEGEVUSE AASTAARUANNE 2012

1. Instituudi struktuur

Elektrotehnika aluste ja elektrimasinate instituut,
Department of Fundamentals of Electrical Engineering and Electrical Machines
Instituudi direktor Aleksander Kilk

- Elektrimasinate õppetool, Chair of Electrical Machines, **Kuno Janson**
- Elektrotehnika aluste õppetool, Chair of Fundamentals of Electrical Engineering, **Jaan Järvik**

Elektrimasinate õppetooli koosseis (seisuga 31. detsember 2012):

1. Kuno Janson professor, õppetooli juhataja, tehnikateaduste doktor
2. Anouar Belahcen professor 0,5, tehnikateaduste doktor
3. Viktor Bolgov vanemteadur, tehnikateaduste doktor
4. Ants Kallaste teadur, tehnikateaduste magister
5. Aleksander Kilk dotsent, filosoofiadoktor, instituudi direktor
6. Peep Kroos insener 0,5
7. Heigo Mõlder teadur, filosoofiadoktor
8. Toomas Vinnal teadur, filosoofiadoktor

Elektrotehnika aluste õppetooli koosseis (seisuga 31. detsember 2012):

1. Jaan Järvik professor, õppetooli juhataja, tehnikateaduste kandidaat
2. Lauri Kütt teadur, filosoofiadoktor
3. Tarmo Rosman lektor
4. Tiiu Sakkos vanemteadur 0,8, tehnikateaduste kandidaat
5. Jevgeni Šklovski vanemteadur, filosoofiadoktor
6. Andrei Škvorov lektor, tehnikateaduste magister

Lisaks ülaltooduile olid AM instituudi koosseisus (seisuga 31. detsember 2012):

1. Eda Ihlberg sekretär 0,8
2. Heljut Kalda haridustehnoloog, tehnikateaduste kandidaat
3. Aino Moor insener-modelleerija
4. Helar Niilo insener 0,5
5. Mati Tähemaa insener 0,5
6. Toomas Vaimann insener 0,5, assistent 0,5, tehnikateaduste magister

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

2.1 Struktuuriüksuse koosseisu kuuluvate uurimisgruppide teadustöö

2.1.1 Teadustöö kirjeldus

Research fields actively studied in the Department of Electrical Machines and Fundamentals of Electrical Engineering are related to electrical engineering focusing on the novel solutions in the fields of resonance converters, high-power electrotechnology, permanent magnet electrical machines, ultra-high frequency electromagnetic field, electromagnetic compatibility and power quality.

2.1.2 Aruandeaastal saadud tähtsamad teadustulemused

The scientific activities and main studies by researchers of the AM department have been carried out in the frames of next projects:

F10114

Novel electric power supply devices based on PSA converter – applied studies

(Uudsed PJV-muunduril põhinevad elektritoiteseadmed – rakendusuuring)

01.10.2010 – 31.03.2012

Principal investigator **Lauri Kütt**

(research staff – Kuno Janson, Helar Niilo, Jevgeni Šklovski)

The final stage of the research project was mainly devoted to testing of developed laboratory PSA (parallel and series resonance alternating) converter at different loads and its further design and control optimization.

The results of conducted research were published and presented in five international conferences. Along with testing of first laboratory device the second improved converter has been developed too. It is characterized by new improved design having smaller dimensions, weight and more suitable semiconductors selected for power circuit. The control circuit has been also modified in its hardware structure and in programme code so it is more optimized to the specific behaviour of PSA converter at different load conditions. The main research objectives are achieved and activities for the project further development and possible implementation are being undertaken.

ÜLTAP15-6

A high quality, efficient and sustainable energetics

(Kvaliteetne, säästlik ja jätkusuutlik energeetika)

1.08.2011 – 7.07.2013

Principal investigator **Lauri Kütt**

The goal is to create a science complex for energy quality, savings and sustainability of energetics, which makes it possible to increase the level of R&D regarding the related topics. During the project the laboratory of electromagnetic compatibility in Tallinn University of Technology will also be supplied with top-level scientific equipment.

Lep10025

Generator

(Püsimagnetgeneraatori arvutusliku mudeli analüüs ja täiustamine)

08.02.2010 – 31.12.2012

Principal investigator **Aleksander Kilk**

(research staff – Ants Kallaste)

In this research study was done on the slow speed ring constructed permanent magnet synchronous generator for wind application. There were studied two different power level generators: one with 3 MW and other with 5 kW.

On 5 kW machine main goal was the testing the machine and implementing it to windmills. Also developing windmill electric and control system were for the 5 kW generators. 5 kW generator was tested and based on the test results the calculation model was updated. Also some study was made on the generator construction accuracy and possible mistakes what may emerge because of it. Also prototype windmill with studied 5 kW generators was erected and testing the windmill is going on.

3 MW generator calculation model was improved and final prototype generator construction was finalized. Based on construction generator electrical parameters were calculated and also electrical part dimensions were found. Magnetic fields were studied on the machine and

forces what accrue on the construction because of it were studied. Also preparation were started to test the generator. For this the testing principle was developed for this type of machine. Also the electric system was designed for test system.

Lep12014

Development of strategy for optimal power supply system for "Viru Keemia Grupp Ltd."

Stage 1: Preliminary study of problems and possible solutions

(Ettevõtte AS Viru Keemia Grupp elektrivarustussüsteemi optimaalse arengukava väljatöötamine.

1. etapp – Eeluuringu läbiviimine lähteolukorra ja probleemide väljaselgitamiseks)

16.01.2012 – 16.05.2012

Principal investigator **Jaan Järvik**

(research staff – Toomas Vinnal, Kuno Janson, Heljut Kalda)

The present state of a MV industrial network has been studied. Problems including power losses in the network have been pointed out. Possible solutions and development trends have been described including new generating and consuming industrial units.

Lep12145

Development of the simulation model of the 110/6 kV power system of AS VKG

(Ettevõtte AS VKG 110/6 kV elektrisüsteemi kasutajamudeli väljaarendamine)

Principal investigator **Jaan Järvik**

1.10.2012 – 30.09.2013

(research staff – Toomas Vinnal, other staff – Marek Jarkovoi)

The load flow simulation model has been developed for the 110/6 kV industrial network of AS VKG. The end-user model includes transformers, lines, reactors, generators and loads. The model enables to calculate currents, power and power losses in different nodes of the network. Calculation results from user model will help to analyze the performance of the network and power losses in the components. Hence it is possible to optimize the network configuration and parameters of the system.

Additionally the researchers of the Department of Electrical Machines and Fundamentals of Electrical Engineering were participating in joint projects for some different departments: AR10126, AR12131, Lep12092, GERA1, and DAR8130.

AR10126

Optimization of the functioning of the Energy System to balance changeable loads

(Energiasüsteemi talitluse optimeerimine muutuvkoormuste tasakaalustamiseks)

01.11.2010 – 31.10.2013

Principal investigator **Alvar Kurrel**

Principal investigator from AM – **Kuno Janson**

(Jaan Järvik, Viktor Bolgov, Ants Kallaste, Lauri Kütt, Heigo Mölder)

The aim of the first project stages was to evaluate impact of existing wind parks on power quality, losses and power consumption in weak medium voltage networks. The 35 and 10 kV networks located on Saaremaa island, Sõrve peninsula, were considered as a basis for the research. The data of network equipment (connection diagrams, nameplate data of lines and transformers) and wind parks as well as records of operation parameters have been collected and used to model and simulate distribution grid. Field measurements to consider harmonics and flicker were carried out. The study has demonstrated that in some cases wind parks operation can cause unacceptable voltage variations up to 10% and big reversal power flows (from lower voltage grids into higher voltage grids). It results in remarkable rise of grid losses and end-customers consumption. To keep voltage stable, reactive power consumption by means of wind park converters or additional inductive loads has been proposed. The required power capabilities of additional reactive loads were evaluated. It has been shown that in worst

case there is need in 20% reactive power as compared to rated active power to keep voltage inside $\pm 2\%$.

On the next step, the research of off-grid hybrid power supply as an alternative for conventional power supply via cables and transformers was fulfilled. Three types of systems were studied: summer cottage supplied from photovoltaic (PV) panels, residential house supplied from PV, and residential house supplied from wind turbine and diesel engine – generator set. It has been shown that off-grid systems are economically feasible at distances from nearest distribution point longer than 1000 m and project lifetime more than 20 years.

AR12131

Permanent magnets for sustainable energy application (MagMat)

(Püsomagnetid jätkusuutliku energeetika rakendustes (MagMat))

17.03.2012 – 31.12.2014

Principal investigator **Renno Veinthal**

(research staff from AM – Anouar Belahcen, Ants Kallaste, Aleksander Kilk, Toomas Vaimann)

Investigation of suitable generator topologies is underway. The needed measurement equipment has been selected and the purchase of the equipment is being prepared.

Partnering units are dealing with the investigation of NdFeB alloys, their use and implementation. Weekly meetings to share results and report the state of the work in partnering units are held regularly. Papers on the topic are to be published in near future.

Lep12092

Analysis and evaluation of technology based on nonconventional instrument transformers

(Mittetraditsioonilistel mõõtetrafodel põhineva tehnoloogia analüüs ja hindamine)

24.05.2012 – 30.11.2012

Principal investigator **Tõnu Lehtla**

(research staff from AM – Jaan Järvi, Lauri Kütt, Heigo Mölder)

The aim of the project was to conduct a preliminary study of a new technology and knowledge transfer to Estonia. The preliminary study showed that by 2012, various non-conventional measurement converters have been tested in field conditions for a long time, including the Alstom/NxtPhase company products for at least 10 years.

Series of reports on various experiments have been written both from manufacturers and system operators. However, in literature, little information on full analysis can be found disclosing the details of introducing these products, including the project management mistakes and lessons learned. Most system operators possessing this kind of information describe general instructions and confirm that they have a high level of expertise in this field.

The most perspective opportunity to use the new type of measurement converters in Estonia is power quality measurements, including the measurement of harmonics in voltage and current. For this, functionality in substations must be guaranteed via controllers and other data acquisition systems. During the preliminary study, a plan was prepared for introducing the new type of measurement converters in Estonian electrical system.

GERA1

Power Quality and Safety Requirements for People and Electrical Equipment in Smart Grid Customer Domain

(Elektri tarkvõrgu kliendivalduse elektrikvaliteedi ja inimeste ning elektriseadmete ohutusnõuded)

01.11.2010 – 31.10.2013

Principal investigator **Tõnu Lehtla**

(research staff from AM – **Toomas Vaimann**, Jaan Järvi, Toomas Vinnal, Lauri Kütt, and Heigo Mölder)

Studies relevant to the topic regarding SmartGrids and optimization of energy consumptions as well as the impacts of dispersed generation and implementation of new small scale generation units to the traditional centralized grid are being investigated.

Other partners are dealing with safety issues and protection challenges. Also control of and implementation of different converter topologies is researched in partnering universities.

Meetings to share new results and define related problems are held regularly. Papers with results and explanations of the problems regarding the topic are published in a regular basis.

DAR8130

Doctoral school of energy and geotechnology

(Energia ja geotehnika doktorikool II)

01.12.2008 – 31.08.2014

Principal investigator **Dmitri Vinnikov**

One of main investigators: **Kuno Janson**

2.2 Uurimisgrupi olulisemad publikatsioonid 2012. aastal

- Shafiq, M.; Kütt, L.; Isa, M.; Hashmi, M.; Lehtonen, M. (2012). Directional calibration of Rogowski coil for localization of partial discharges in smart distribution networks. *International Review of Electrical Engineering*, 7(5), 5881–5890.
- Shklovski, J.; Janson, K.; Sakkos, T. (2012). Natural mode constant power source for manual arc welding. *Electronics and Electrical Engineering*, 18(9), 31–34.
- Vaimann, T.; Niitsoo, J.; Kivipõld, T.; Lehtla, T. (2012). Power quality issues in dispersed generation and smart grids. *Electronics and Electrical Engineering*, 18(8), 23–26.
- Vaimann, T.; Kallaste, A.; Kilk, A. (2012). Using Clarke vector approach for stator current and voltage analysis on induction motors with broken rotor bars. *Electronics and Electrical Engineering*, 123(7), 17–20.
- Vinnal, T.; Janson, K.; Järvik, J.; Kalda, H.; Sakkos, T. (2012). Supply voltage quality in low voltage industrial networks of Estonia. *Estonian Journal of Engineering*, 18(2), 102–126.

2.3 Loetelu struktuuriüksuse töötajate rahvusvahelistest tunnustustest

Toomas Vaimann:

Kõige kõrgemalt hinnatud noor autor Energeetika ja Elektrotehnika sektsioonis Elektrimasinate, ajamite ja robotika valdkonnas (53. Riia Tehnikaülikooli Rahvusvaheline Teaduskonverents)

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

Jaan Järvik –

IEEE (The Institute of Electrical & Electronics Engineers) liige

IEEE Power & Energy (PES) Seltsi liige

IEEE Communications Seltsi liige

IEEE Industry Applications Seltsi liige

IEEE Industrial Electronics Seltsi (IES) liige

IEEE Power Electronics Seltsi (PELS) liige

Jevgeni Šklovski –

IEEE&IES liige

Toomas Vaimann –
IEEE üliõpilasliige

2.5 Aruandeaasta tähtsamad T&A finantseerimise allikad

Ettevõtlike Arendamise SA

F10114

Uudsed PJV-muunduril põhinevad elektritoiteseadmed – rakendusuuring
1.10.2010 – 31.03.2012, kokku 126 747.47 €
Vastutav täitja Lauri Kütt

SA Archimedesega sõlmitud leping

ÜLTAP15-6

Kvaliteetne, säästlik ja jätkusuutlik energeetika
1.08.2011 – 7.07.2013, kokku 193 074.41 €
Vastutav täitja Lauri Kütt

Siseriiklikud lepingud

Lep10025

Püsिमagnetgeneraatori arvutusliku mudeli analüüs ja täiustamine
8.02.2010 – 31.12.2012, kokku 22 034.22 €
Vastutav täitja Aleksander Kilk

Lep12014

Ettevõtte AS Viru Keemia Grupp elektrivarustussüsteemi optimaalse arengukava väljatöötamine. 1. etapp – Eeluuringu läbiviimine lähteolukorra ja probleemide väljaselgitamiseks
16.01.2012 – 16.05.2012, 11 000.00 €
Vastutav täitja Jaan Järvik

Lep12145

Ettevõtte AS VKG 110/6 kV elektrisüsteemi kasutajamudeli väljaarendamine
1.10.2012 – 30.09.2013, kokku 33 000.00 €
Vastutav täitja Jaan Järvik

Lisaks neile AM-instituudi arvel olevatele objektidele osalesid instituudi töötajad instituutidevaheliste ühisprojektide **AR10126**, **AR12131**, **Lep12092** ja **GERA1** täitmisel, mida saab samuti käsitleda AM-instituudi finantseerimise allikatena vastavas palgakulude ja ostetud seadmete maksumuse mahus.

AR10126

Energiasüsteemi talitluse optimeerimine muutuvkoormuste tasakaalustamiseks
01.11.2010 – 31.10.2013, kogusumma 1 011 368.00 €
Vastutav täitja **Alvar Kurrel**
Vastutav täitja AM-instituudist – **Kuno Janson**
(Jaan Järvik, Viktor Bolgov, Ants Kallaste, Lauri Kütt, Heigo Mölder, Jevgeni Šklovski)

AR12131

Püsिमagnetid jätkusuutliku energeetika rakendustes (MagMat))
17.03.2012 – 31.12.2014, kogusumma 471 770.00 €
Vastutav täitja **Renno Veinthal**
(Anouar Belahcen, Ants Kallaste, Aleksander Kilk, Toomas Vaimann)

Lep12092

Mittetraditsioonilistel mõõtetrafodel põhineva tehnoloogia analüüs ja hindamine
24.05.2012 – 30.11.2012, kogusumma 25 000.00 €

Vastutav täitja **Tõnu Lehtla**

(Jaan Järvik, Lauri Kütt, Heigo Mölder)

GERA1

Elektri tarkvõrgu kliendivalduse elektrikvaliteedi ja inimeste ning elektriseadmete
ohutusnõuded

01.11.2010 – 31.10.2013, kogusumma 149 700.00 €

Vastutav täitja **Tõnu Lehtla**

(**Toomas Vaimann**, Jaan Järvik, Toomas Vinnal, Lauri Kütt, and Heigo Mölder)

2.6 Aruandeaastal saadud T&A-ga seotud tunnustused (va punktis 2.3 toodud tunnustused), ülevaade teaduskorralduslikust tegevusest, teadlasmobiilsusest ning hinnang teadustulemustele

Tunnustused:

Toomas Vaimann:

- Eesti Üliõpilaste Toetusfond USAs stipendium
- Jaan Poska stipendium
- Tallinna Tehnikaülikooli Arengufondi Mati Jostovi nimeline stipendium

Teaduskorralduslik tegevus:

11.–13. 06. 2012 toimus Tartus järjekordne rahvusvahelise teaduskonverents „Power Quality and Supply Reliability 2012“ (PQ2012), mis oli AM-instituudi korraldusel toimivate konverentside seerias juba kaheksas. Antud konverents on hetkel ainuke elektri kvaliteedi ja varustuskindluse probleeme käsitlev konverents Põhja- ning Baltimaade regioonis. Konverentsil osales 83 elektri kvaliteedi ja varustuskindluse probleemidega tegelevat spetsialisti 11st erinevast riigist, sh Soomest, Austriast, Lätist, Venemaalt. Konverentsi sponsoriks oli AS Elering, samuti oli konverentsil elektri- ja elektroonikainseneride ühenduse IEEE (Institute of Electrical and Electronics Engineers) tehniline tugi, mis on tõestuseks konverentsi kõrgest tasemest.

Anouar Belahcen

Member of the Committee for the Quality of Teaching (Aalto/ELEC, Finland)
PQ2012 teaduskomitee liige

Viktor Bolgov

IEEE Transactions on Power Delivery, retsensent
PQ2012 teaduskomitee liige

Kuno Janson

TTÜ Elektrotehnika aluste ja elektrimasinate instituudi nõukogu liige
Energia ja geotehnika doktorikool II (projekt DAR8130), põhitäitja
PQ2012 teaduskomitee liige

Jaan Järvik

TTÜ Energeetikateaduskonna nõukogu liige
TTÜ Elektrotehnika aluste ja elektrimasinate instituudi nõukogu liige
Eesti Moritz Hermann Jacobi Selts, liige
Konverentsi EPE2012 (Brno) rahvusvahelise teaduskomitee liige
Konverentsi BEC 2012 (Tallinn) retsensent
PQ2012 organiseerimiskomitee esimees

Heljut Kalda

TTÜ Elektrotehnika aluste ja elektrimasinate instituudi nõukogu liige

Ants Kallaste

TTÜ Elektrotehnika aluste ja elektrimasinate instituudi nõukogu liige

PQ2012 organiseerimiskomitee, assistent

Aleksander Kilk

TTÜ Energeetikateaduskonna nõukogu liige

TTÜ Elektrotehnika aluste ja elektrimasinate instituudi direktor

TTÜ Elektrotehnika aluste ja elektrimasinate instituudi nõukogu liige

PQ2012 teaduskomitee liige

Lauri Kütt

TTÜ Elektrotehnika aluste ja elektrimasinate instituudi nõukogu liige

PQ2012 organiseerimiskomitee, koordinaator ja sekretär

Heigo Mölder

MTÜ Eesti Tuumajaam, liige

TTÜ Lennunduse ja kosmoloogia klubi, liige

Eesti Elektronenergeetika selts, liige

PQ2012 organiseerimiskomitee, assistent

Tiiu Sakkos

PQ2012 organiseerimiskomitee, toimetaja

Jevgeni Šklovski

PQ2012 teaduskomitee liige

Toomas Vaimann

Eesti Moritz Hermann Jacobi Selts, liige

Eesti Elektroenergeetika Selts, liige

PQ2012 organiseerimiskomitee, sekretär

Toomas Vinnal

PQ2012 teaduskomitee liige

Teadlasmobiilsus:

Anouar Belahcen

10.10.–11.10. Läti, töökoosolek Riia Tehnikaülikoolis, läbirääkimised koostööks

Jaan Järvik

12.01.–14.01. Saksamaa, Michael von Dolivo-Dobrowolsky 150. a juubeliüritusel Saksamaal Darmstadt'i Tehnikaülikoolis

Ants Kallaste

31.01.–03.02. Soome, Masinaehituse kursus

23.05.–25.05. Tšehhimaa, osavõtt konverentsist „13th International Scientific Conference Electric Power Engineering 2012“

04.09.–07.09. Ungari, tutvumine masinaehitusega Budapestis

23.09.–26.09. Soome, osavõtt õppekursusest Aalto Ülikoolis

24.10.–29.10. Kanada, osavõtt artikliga rahvusvahelisest konverentsist IECON 2012 – 38th Annual Conference of IEEE Industrial Electronics

Lauri Kütt

25.04.–26.04. Soome, doktoritöö raames kontrollkatsete läbiviimine Aalto ülikooli kõrgepingelaboris

02.05.–04.05. Leedu, osavõtt ettekandega konverentsil „The 7th International Conference on Electrical and Control Technologies“

- 18.05.–27.05. Itaalia, osavõtt ettekandega konverentsist: 11th International Conference on Environment and Electrical Engineering (EEEIC), Venice, IEEE
24.09.–26.09. Soome, täiendkoolitus ja koostöö Aalto Ülikooliga

Heigo Mölder

- 18.05.–27.05. Itaalia, osavõtt ettekandega konverentsist: 11th International Conference on Environment and Electrical Engineering (EEEIC), Venice, IEEE
24.09.–26.09. Soome, täiendkoolitus ja koostöö Aalto Ülikooliga

Helar Niilo

- 23.05.–25.05. Tšehhimaa, osavõtt konverentsist „13th International Scientific Conference Electric Power Engineering 2012“

Toomas Vaimann

- 31.01.–03.02. Soome, Lappeenranta Tehnikaülikool, sünkroonmasinate ehituse kursus
23.05.–25.05. Tšehhimaa, osavõtt konverentsist „13th International Scientific Conference Electric Power Engineering 2012“
23.09.–26.09. Soome, osavõtt elektrimasinate alase intensiivkursusest Aalto Ülikoolis
17.06.–21.06. Leedu, osavõtt ettekandega 16ndast rahvusvahelisest konverentsist ELECTRONICS'2012
10.10.–13.10. Läti, koosolek koostööks, osavõtt ettekandega konverentsist: 53rd International Scientific Conference
24.10.–29.10. Kanada, osavõtt artikliga rahvusvahelisest konverentsist IECON 2012 – 38th Annual Conference of IEEE Industrial Electronics

Külalisprofessor:

Professor **Frank Jenau**, Technische Universität Dortmund, Saksamaa, 02.10.–03.10.2012. Loeng Doktorikooli II raames: “Non-conventional instrument transformers (NCIT) for high voltage electrical network”.

Hinnang teadustulemustele:

Olulisemate positiivsete tulemustena Elektrimasinate ja elektrotehnika aluste instituudi teadustöös 2012. a tuleks ära märkida suhteliselt heal tasemel teadustulemuste publitseerimist ja kahe doktoritöö edukat kaitsmist. Kokku ilmus instituudi liikmete poolt aruandeaastal 33 teaduspublikatsiooni, sealhulgas ETISe klassifikaatori alusel 1.1 publikatsioone 5, 1.2 publikatsioone 1 ja 3.1 publikatsioone 20. Doktoritöö kaitsesid teadusrid Lauri Kütt ja Heigo Mölder.

Olulise teadustegevuse sündmusena korraldas instituut 11.–13.06.2012 Tartus järjekorras kaheksanda rahvusvahelise teaduskonverentsi „Power Quality and Supply Reliability 2012“ (PQ2012), kus osales 83 elektri kvaliteedi ja varustuskindluse probleemidega tegelevat spetsialisti 11st erinevast riigist. Konverentsil oli elektri- ja elektroonikainseneride ühenduse IEEE (Institute of Electrical and Electronics Engineers) tehniline tugi, mis on tõestuseks konverentsi kõrge tasemest.

Kokkuvõttes võib instituudi teadustegevust ja selle tulemuslikkust aruandeaastal hinnata rahuldavaks.

2.7 Instituudi teadus- ja arendustegevuse teemade ja projektide nimetused

(Eesti Teadusinfosüsteemi, edaspidi ETIS, andmetel)

- Haridus- ja Teadusministeerium
- sihtfinantseeritavad teemad:
- baasfinantseerimise toetusfondist rahastatud projektid (sh TTÜ tippkeskused):
- riiklikud programmid:

- Teiste ministeeriumide poolt rahastatavad riiklikud programmid:
- Urija-professori rahastamine:
- SA Eesti Teadusfond/Eesti Teadusagentuur
 - grandid:
 - ühisgrandid välisriigiga:
 - järel doktorite grandid (SA ETF ja Mobilitas):
 - tippteadlase grandid (Mobilitas):
 - Ettevõtluse Arendamise SA
- eeluuringud:
 - F10114**
 - Uudsed PJV-muunduril põhinevad elektritoiteseadmed – rakendusuuring
Lauri Kütt (1.10.2010 – 31.03.2012)
- arendustoetused:
 - SA Archimedesega sõlmitud lepingud
- infrastruktuur (nn „mini-infra“, „asutuse infra“):
 - ÜLTAP15-6**
 - Kvaliteetne, säästlik ja jätkusuutlik energeetika,
Lauri Kütt (1.08.2011 – 7.07.2013)
- Eesti tippkeskused:
- riiklikud programmid:
- muud T&A lepingud:
- SA Keskkonnainvesteeringute Keskusega sõlmitud lepingud:
- Siseriiklikud lepingud:
 - Lep10025**
 - Püsimagnetgeneraatori arvutusliku mudeli analüüs ja täiustamine
Aleksander Kilk (8.02.2010 – 31.12.2012)
 - Lep12014**
 - Ettevõtte AS Viru Keemia Grupp elektrivarustussüsteemi optimaalse arengukava väljatöötamine. 1. etapp – Eeluuringu läbiviimine lähteolukorra ja probleemide väljaselgitamiseks
Jaan Järvik (16.01.2012 – 16.05.2012)
 - Lep12145**
 - Ettevõtte AS VKG 110/6 kV elektrisüsteemi kasutajamudeli väljaarendamine
Jaan Järvik (1.10.2012 – 30.09.2013)
- EL Raamprogrammi projektid:
- Välisriiklikud lepingud:

2.8 Struktuuriüksuse töötajate poolt eelretsenseeritavad teaduspublikatsioonid

(ETISE klassifikaatori alusel 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 4.1 ja 5.1)

1.1

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1.2

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1.3

2.1

2.2

3.1

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3.2

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3.3

4.1

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5.1

2.9 Struktuuriüksuses kaitstud doktoriväitekirjad

Lauri Kütt, elektrotehnika aluste ja elektrimasinate instituut

Teema:

Analysis and Development of Inductive Current Sensor for Power Line On-Line Measurements of Fast Transients

(Induktiivse voolutajuri uurimine ja välja töötamine kiirete siirdeprotsesside mõõtmiseks elektrivõrgus)

Juhendaja: prof Jaan Järvik

Kaitses: 15.06.2012

Omistatud kraad: filosoofiadoktor (energia- ja geotehnika)

Heigo Mölder, elektrotehnika aluste ja elektrimasinate instituut

Teema:

Vedelmetalli juhitava segamisvõimaluse uurimine alalisvoolu kaarleekahjus

(Analysis of Liquid Metal Controlled Stirring Method in DC Electric Arc Furnace)

Juhendaja: prof Jaan Järvik

Kaitses: 15.06.2012

Omistatud kraad: filosoofiadoktor (energia- ja geotehnika)

2.10 Struktuuriüksuses järeldoktorina T&A-s osalenud isikute loetelu

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2.11 Struktuuriüksuses loodud tööstusomandi loetelu

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3. Struktuuriüksuse infrastruktuuri uuendamise loetelu

Andmehõive süsteem	20.01.2012	1376.96 €
Tarkvara MATLAB Lic. nr. 720754	24.01.2012	1700.00 €
Ostsillokoop, 2 tk	26.03.2012	2582.76 €
Elektrotehnika paneel, 4 tk	26.03.2012	1878.76 €
Generaator GW INSTEK, 2 tk	26.03.2012	691.08 €
Multimeeter AGILENT U3606A	26.03.2012	898.70 €
Printer Canon i-SENSYS LBP7660	25.06.2012	280.59 €