

A theoretical study of electron drift mobility anisotropy in n-type 4H- and 6H-SiC

Velmre, Enn; Udal, Andres Abstracts of International Conference on Silicon Carbide and Related Materials : ICSCRM'99 : October 10-15, 1999, Research Triangle Park, North-Carolina, USA 1999 / paper no 395, 2 p

A theoretical study of electron drift mobility anisotropy in n-type 4H- and 6H-SiC

Velmre, Enn; Udal, Andres Proceedings of the International Conference on Silicon Carbide and Related Materials - 1999 (ICSCRM'99) : Research Triangle Park, North-Carolina, USA, Oct. 10-15, 1999. Vol. 1 2000 / p. 725-728

A theoretically accurate mobility model for drift-diffusion power device simulation

Velmre, Enn; Udal, Andres; Kocsis, T.; Masszi, F. 16th Nordic Semiconductor Meeting, Laugarvatn, Iceland, June 12-15, 1994 : abstracts 1994 / p. 92

A theoretically accurate mobility model for semiconductor device drift-diffusion simulation

Velmre, Enn; Udal, Andres; Kocsis, T.; Masszi, F. Physica scripta 1994 / p. 263-267

Ab initio study of GaN properties using VASP software package

Klopov, Mihhail; Kuusk, Ahto; Velmre, Enn; Udal, Andres BEC 2004 : proceedings of the 9th Biennial Baltic Electronics Conference : October 3-6, 2004, Tallinn, Estonia 2004 / p. 55-58 : ill

Advances in terahertz technology with emphasis on quantum cascade lasers

Reeder, Reeno; Velmre, Enn; Udal, Andres Elektronika ir elektrotehnika = Electronics and electrical engineering 2010 / 8, p. 47-50 <https://eejournal.ktu.lt/index.php/elt/article/view/9225>

An engineering approach to time-frequency uncertainty criteria

Udal, Andres; Kuk, Vello Elektronika ir elektrotehnika. T 121, Signa tehnoloija = Electronics and electrical engineering. T121, Signal technology 2012 / p. 3-8 : ill

Analyzes of competence based approach to learning

Umbleja, Kadri; Kuk, Vello; Jaanus, Martin; Udal, Andres; Gordon, Boris International Conference on Engineering Education 2012 : proceedings : Turku, Finland, July 30-August 3, 2012. Part 2 2012 / p. 418-425 : ill

Apparent decrease of diffusion coefficients due to the plasma-induced band gap narrowing

Udal, Andres; Velmre, Enn 19th Nordic Semiconductor Meeting : May 20-23, 2001, Copenhagen, Denmark : abstracts 2001 / p. 22 : ill

A brief survey of excitation concentration models for Si

Velmre, Enn; Udal, Andres The 7th Biennial Conference on Electronics and Microsystem Technology "Baltic Electronics Conference" : BEC 2000 : October 8 - 11, 2000, Tallinn, Estonia : conference proceedings 2000 / p. 19-22 : ill

Compact empirical model for droplet generation in a Lab-on-Chip cytometry system

Pärnamets, Kaiser; Udal, Andres; Koel, Ants; Pardy, Tamas; Gyimah, Nafisat; Rang, Toomas IEEE Access 2022 / p. 127708-127717 <https://doi.org/10.1109/ACCESS.2022.3226623> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Comparison of methods for solving the Schrödinger equation for multiquantum well heterostructure applications

Udal, Andres; Reeder, Reeno; Velmre, Enn; Harrison, Paul Proceedings of the Estonian Academy of Sciences. Engineering 2006 / 3-2, p. 246-261 : ill

Comparison of photon recycling effect in GaAs and GaN structures

Velmre, Enn; Udal, Andres Proceedings of the Estonian Academy of Sciences. Engineering 2004 / 3, p. 157-172

Comparison of Si and SiC devices surge current capability by means of numerical simulations

Velmre, Enn; Udal, Andres BEC'96 : the 5th Biennial Baltic Electronics Conference, October 7-11, 1996, Tallinn, Estonia : proceedings 1996 / p. 77-80: ill

Comparison of single-rate and two-rate neural control approaches for coaxial rotor/ducted-fan UAV for situational awareness applications

Pedai, Andrus; Astrov, Igor; Udal, Andres 2018 IEEE 16th International Symposium on Intelligent Systems and Informatics (SISY), 13-15 Sept. 2018 : proceedings 2018 / p. 63–68 : ill <http://dx.doi.org/10.1109/SISY.2018.8524720>

Comparison of uncertainty relations in quantum mechanics and signal processing

Udal, Andres; Kuk, Vello; Velmre, Enn; Klopov, Mihhail 11th International Conference on Squeezed States and Uncertainty Relations and 4th Feynman Festival : Olomouc, Czech Republic, June 22-26, 2009 2009 / p. 154

Comparison of uncertainty relations in quantum mechanics and signal processing [Electronic resource]

Udal, Andres; Kukkk, Vello; Velmre, Enn; Klopov, Mihhail 11th International Conference on Squeezed States and Uncertainty Relations and 4th Feynman Festival : Olomouc, Czech Republic, June 22-26, 2009 : conference proceedings 2009 / [16] p. [DVD]

Competence Based Interactive Learning with HomeLabKits : experience and work in progress

Jaanus, Martin; Umbleja, Kadri; Kukkk, Vello; Udal, Andres 2014 IEEE Global Engineering Education Conference (EDUCON) : Istanbul, Turkey, April 2-5, 2014 2014 / 1082-1084 : ill

Computer aided modeling of high frequency power M-S structures

Rang, Toomas; Udal, Andres Proceedings of the seventh Colloquium on Microwave Communication : Budapest, 6-10 Sept. 1982 1982 / p. 238-241

Computer aided simulation of power Scottky Diodes

Rang, Toomas; Koel, Ants; Udal, Andres Modeling, Simulation and Control 1985 / p. 1-13

Computer-aided analysis of the GTO thyristor current squeezing effect

Velmre, Enn; Udal, Andres Automation, simulation & measurement : ASM'91 : 3rd biennial conference, Tallinn, October 7-11, 1991. Section S / Tallinn Technical University 1992 / p. 159-171: ill

COMSPECT : a compact model for green vegetation reflectance spectra in the 400–900 nm wavelength range

Udal, Andres; Jürise, Martin; Kaugerand, Jaanus; Sell, Raivo Proceedings of the Estonian Academy of Sciences 2020 / p. 277-286 : ill <https://doi.org/10.3176/proc.2020.4.01> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Corrected accounting of electron-hole scattering in cross-term current equations for Si and SiC

Velmre, Enn; Udal, Andres Physica scripta 1999 / Proceedings of 18th Nordic Semiconductor Meeting, Linköping, Sweden, June 7-10, 1998, ISBN 91-87308-71-1, p. 193-197: ill <https://ui.adsabs.harvard.edu/abs/1999PhST...79..193V/abstract>

Corrected accounting of electron-hole scattering in cross-term current equations for Si and SiC

Velmre, Enn; Udal, Andres 18th Nordic Semiconductor Meeting, Linköping, June 7-10, 1998 : abstracts 1998 / p. F-88: ill

Critical analysis of uncertainty relations based on signal duration and spectrum width

Udal, Andres; Kukkk, Vello; Velmre, Enn Elektronika ir elektrotehnika = Electronics and electrical engineering 2009 / 6, p. 31-34 : ill

Department of Electronics

Min, Mart; Parve, Toomas; Laansoo, Ants; Männama, Vello; Velmre, Enn; Udal, Andres Research activities / Tallinn Technical University 1993 / p. 79-81 https://www.eester.ee/record=b1053754*est

Depopulation mechanism for incoherent terahertz source – THz Torch – based on GaAsBi/GaAs quantum well in GaAs/AlGaAs parabolic quantum well

Karaliunas, Mindaugas; **Udal, Andres**; Valušis, Gintaras Lithuanian journal of physics 2020 / p. 113-124 <https://doi.org/10.3952/physics.v60i2.4226> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Development and optimisation of modelling methods and algorithms for terahertz range radiation sources based on quantum well heterostructures = Kvantaukudega heterostruktuuridel põhinevate terahertsikiirgurite modelleerimismeetodite ja -algoritmide arendus ja optimeerimine

Reeder, Reeno 2014 https://www.eester.ee/record=b3084247*est

Development and testing of a compact voice command recognition algorithm for limited complexity microcontroller devices

Udal, Andres; Riid, Andri; Jaanus, Martin; Pärnamets, Kaiser; Lokuta, Madis 2018 22nd International Conference Electronics : Palanga, Lithuania, 18-20 June 2018 2018 / p. 1-4 : ill <http://doi.org/10.1109/ELECTRONICS.2018.8443645>

Development of numerical semiconductor device models and their application in device theory and design

Udal, Andres 1998 http://www.eester.ee/record=b1158907*est

Development of numerical semiconductor device models and their application in device theory and design =

Pooljuhtseadiste numbriliste mudelite väljatöötamine ja rakendamine seadiste teoorias ja disainis : [a thesis ... of doctor of philosophy in engineering]

Udal, Andres 1998 http://www.eester.ee/record=b2688054*est

Development of quantum cascade laser simulation software

Udal, Andres; Reeder, Reeno; Ikonic, Zoran; Harrison, Paul; Velmre, Enn BEC 2012 : 2012 13th Biennial Baltic Electronics Conference : proceedings of the 13th Biennial Baltic Electronics Conference : October 3-5, 2012, Tallinn, Estonia 2012 / p. 47-48 : ill

Development of the software tools for simulation of quantum well media for radiation amplification in MIR and THz

regions

Udal, Andres; Reeder, Reeno; Valusis, G.; Kasalynas, I.; Ikonic, Zoran; Indjin, D. 3rd Annual Conference of COST Action MP1204 & 6th International Conference on Semiconductor Mid-IR Materials and Optics SMMO2015 : book of abstracts : Institute of Photonics and Electronics, The Czech Academy of Sciences, Prague, Czech Republic, April 8-11, 2015 2015 / p. 63

Discussion of the development aspects of the quantum cascadelaser simulation software

Reeder, Reeno; Udal, Andres; Velmre, Enn International Conference on THz and Mid Infrared Radiation and Applications to Cancer Detection Using Laser Imaging : workgroup meetings of Cost Actions MP1204 and BM1205 : October 10-11, 2013, Sheffield Hallam University, United Kingdom 2013 / p. [36]

Easy to use empirical model for green vegetation reflection spectrum in VIS-NIR range

Udal, Andres; Jürise, Martin; Kaugerand, Jaanus; Sell, Raivo SPIE digital library 2020 / art. 115240H-1–14
<https://doi.org/10.1117/12.2570820> [Conference proceeding Article at Scopus](#) [Article at WOS](#)

Eesti keskkonnategevuskava [2001 - 2003]

Kiili, Jaanus; Kask, Ülo; Liik, Olev; Metsvahi, Tiit; Paadam, Katrin; Adamson, Alo; Hendre, Marju; **Hääl, Maire-Liis; Kändler, Nils; Loigu, Enn; Randla, Tiina; Reinsalu, Enno; Seepõld, Marit; Udal, Andres; Vilu, Raivo** 2001
https://www.ester.ee/record=b1550399*est

Efficiency estimation for a broadband 7 THz radiation source with GaAs/AlGaAs parabolic quantum wells

Reeder, Reeno; Ikonic, Zoran; Harrison, Paul; **Udal, Andres; Velmre, Enn** The proceedings of the Ninth International Conference on Intersubband Transitions in Quantum Wells : Ambleside, Cumbria, U.K., 9-14th September 2007 2007 / p. P67-2

Electrothermal simulation of power semiconductor devices

Freidin, Boris; Velmre, Enn; Udal, Andres Proceedings of the 1991 International Workshop on VLSI Process and Device Modeling, 26-27 May, 1991, Oiso, Kanagawa, Japan 1991 / p. 28-29

Electro-thermal simulations and forward surge current failure prediction for SiC diodes

Velmre, Enn; Udal, Andres Program of 17th Nordic Semiconductor Meeting, Trondheim, Norway, June 17-20, 1996 1996 / p. 28

Enhancement of photoluminescence of GaAsBi quantum wells by parabolic design of AlGaAs barriers

Pukiene, Simona; Karaliunas, Mindaugas; Jasinskas, A.; **Udal, Andres** Nanotechnology 2019 / art. 455001, 11 p. : ill
<https://doi.org/10.1088/1361-6528/ab36f3> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Experimentally adjusted modelling and simulation technique for a catamaran autonomous surface vessel

Astrov, Igor; Udal, Andres; Mölder, Heigo; Jalakas, Tanel; Möller, Taavi International Conference on Electrical, Computer, and Energy Technologies, ICECET 2022, Prague, Czech Republic, July 20-22, 2022 2022 / 7 p. : ill
<https://doi.org/10.1109/ICECET55527.2022.9873069>

Failure prediction of power devices under reverse surge current conditions

Freidin, Boris; Velmre, Enn; Udal, Andres Proc. of the 4th International Symposium on Power Semiconductor Devices May 1992 Waseda University 1992 / p. 118-128: fig

GIGA - power semiconductor devices simulation software

Freidin, Boris; Velmre, Enn; Udal, Andres The Bug Exterminator (USA). Special issue, Santa Clara 1990 / Dec., p. 1-16: fig

GIGA: failure prediction of ESD protection devices

Freidin, Boris; Udal, Andres The Bug Exterminator : a monthly publication of Silvaco International 1992 / 11, p. 1-3

High phonon-drag thermoelectric efficiency of SiC at low temperatures

Velmre, Enn; Udal, Andres; Grivickas, V. Final program of the 10th International Conference on SiC and Related Materials : ICSCRM'2003 : Lyon, France, Oct. 5-10, 2003 2003 / p. ThP4-13

High precision parabolic quantum wells grown using pulsed analog alloy grading technique: Photoluminescence probing and fractional-dimensional space approach

Karaliunas, Mindaugas; Dudutiene, Evelina; Čerškus, Aurimas; Pagalys, Justas; Pūkiene, Simona; **Udal, Andres;** Butkute, Renata; Valušis, Gintaras Journal of luminescence 2021 / art. 118321, 9 p <https://doi.org/10.1016/j.jlumin.2021.118321> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Hüperspektraalsensorika rakendamise militaarobjektide signatuuride tuvastamiseks ja varjamiseks

Jürise, Martin; Udal, Andres; Kaugerand, Jaanus Sõjateadlane = Estonian journal of military studies 2018 / lk. 150–170 : ill
https://www.ksk.edu.ee/wp-content/uploads/2019/02/06_jyrise.pdf

Hyperspectral camera with polarized filter as modern supersensor device for cyber-physical systems [Online resource]

Jürise, Martin; Udal, Andres; Kaugerand, Jaanus; Sell, Raivo BEC 2018 : 2018 16th Biennial Baltic Electronics Conference (BEC) : proceedings of the 16th Biennial Baltic Electronics Conference, October 8-10, 2018 2018 / 4 p.: ill

Impact of phonon drag effect on seebeck coefficient in p-6H-SiC : experiment and simulation

Bikbajevs, V.; **Velmre, Enn**; **Udal, Andres** Material science forum 2003 / p. 407-410

Impact of phonon-drag effect on seebeck coefficient in SiC : experiment and simulation

Bikbajevs, V.; Grivickas, V.; Stölzer, M.; **Velmre, Enn**; **Udal, Andres** Abstracts of the Lithuanian National Physics Conference : LNPK-34 : Vilnius, 2003 2003 / p. 219

Implementation of the robot arm in the interactive learning environment

Jaanus, Martin; **Udal, Andres**; **Kukk, Vello**; **Umbleja, Kadri** 2014 International Conference on Signals and Electronic Systems (ICSES) : Poznań, Poland, 11-13 September 2014 2014 / [4] p. : ill

Improved C5D electronic realization of conductivity detector for capillary electrophoresis

Jaanus, Martin; **Udal, Andres**; **Kukk, Vello**; **Umbleja, Kadri**; **Gorbatšova, Jelena**; **Mölder, Lauri** Elektronika ir elektrotechnika = Electronics and electrical engineering 2016 / p. 29-32 : ill <http://dx.doi.org/10.5755/j01.eie.22.3.15311>

Influence of excitonic scattering on charge carrier ambipolar diffusion in silicon

Udal, Andres; **Velmre, Enn** ESSDERC'97 : proceedings of the 27th European Solid-State Device Research Conference, Stuttgart, Germany, 22-24 September 1997 1997 / p. 212-215: ill

Integrated labs for electrical engineering courses in competence based learning environment - practical experience

Jaanus, Martin; **Umbleja, Kadri**; **Udal, Andres**; **Pärnamets, Kaiser** 2019 Electric Power Quality and Supply Reliability Conference (PQ) & 2019 Symposium on Electrical Engineering and Mechatronics (SEEM), Kärdla, Estonia, June 12-15, 2019 : proceedings 2019 / 4 p. : ill <https://doi.org/10.1109/PQ.2019.8818266>

Interactive distance lab solution for robotic arm

Umbleja, Kadri; **Jaanus, Martin**; **Kukk, Vello**; **Udal, Andres** Joint International Conference on Engineering Education & International Conference on Information Technology ICEE/ICIT-2014 : June 2-6, 2014, Riga, Latvia 2014 / p. 339-348 : ill

Investigation of charge carrier lifetime temperature-dependence in 4H-SiC diodes

Velmre, Enn; **Udal, Andres** Silicon carbide and related materials 2006 2007 / p. 375-378
https://www.researchgate.net/publication/250348987_Investigation_of_Charge_Carrier_Lifetime_Temperature-Dependence_in_4H-SiC_Diodes

Investigation of silicon carbide diode structures via numerical simulations including anisotropic effects

Velmre, Enn; **Udal, Andres**; Masszi, F.; Nordlander, E. Simulation of semiconductor devices and processes. Vol. 6 1995 / p. 340-343: ill

Jõupooljuhtseadiste numbriliste mudelite väljatöötamine ja rakendamine : ainevaldkond : elektrotehnika : magistritöö

Udal, Andres 1992 http://www.ester.ee/record=b2630327*est

Kolmas kvantrevolutsioon: kvantarvutite tulekuga kaasnevad probleemid ja võimalused

Udal, Andres Pikksilm : ülevaade valitud trendidest 2020 / 8 lk https://www.ester.ee/record=b4815518*est
<https://www.riigikogu.ee/arenguseire/publikatsioonid/>

Kullaga legeeritud ränidiodstruktuuride numbriline modelleerimine

Niinemets, J.; **Veikesaar, E.**; **Udal, Andres** XXXII üliõpilaste teaduslik-tehnilise konverentsi ettekannete teesid : pühendatud V. I. Lenini 110. sünniaastapäevale : 16.-18. aprill 1980 1981 / lk. 93-94 https://www.ester.ee/record=b1322611*est

Kvant-IT : väljakutse info- ja kommunikatsioonitehnoloogia valdkonnale : ettekanne 51. automaatikapäeval 12. märtsil 2013 TTÜs

Udal, Andres Tallinna Tehnikaülikooli aastaraamat 2013 2014 / lk. 290-297 : ill

Laterally pumped GaAs/AlGaAs quantum wells as sources of broadband terahertz radiation

Reeder, Reeno; Ikonic, Zoran; Harrison, Paul; **Udal, Andres**; **Velmre, Enn** Journal of applied physics 2007 / 7, [6] p. : ill
<https://pubs.aip.org/aip/jap/article/102/7/073715/987937/Laterally-pumped-GaAs-AlGaAs-quantum-wells-as>

Measurement of charge carrier lifetime temperature-dependence in 4H-SiC power diodes

Udal, Andres; **Velmre, Enn** Proceedings of the International Conference on Silicon Carbide and Related Materials - 1999 (ICSCRM'99) : Research Triangle Park, North-Carolina, USA, Oct. 10-15, 1999. Vol. 1 2000 / p. 781-784
<https://www.scientific.net/MSF.338-342.781>

Measurements of charge carrier lifetime temperature dependence in 4H-SiC power diodes

Velmre, Enn; **Udal, Andres** Abstracts of International Conference on Silicon Carbide and Related Materials : ICSCRM'99 : October 10-15, 1999, Research Triangle Park, North-Carolina, USA 1999 / paper no 394, 2 p

Militaarobjektide valvetehnoloogia areng

Udal, Andres; Kaugerand, Jaanus; Savimaa, Raul; Märten, Olev Sõjateadlane = Estonian journal of military studies 2023 / lk. 194-224 : ill <https://www.kvak.ee/sojateadlane22/> https://www.ester.ee/record=b4555087*est

A model-based adaptive control of an autonomous driving car for lane change maneuver

Astrov, Igor; Udal, Andres; Jaanus, Martin 2021 44th International Convention on Information, Communication and Electronic Technology (MIPRO), September 27 - October 1, 2021, Opatija, Croatia : proceedings 2021 / p. 1330-1335 : ill <http://www.mipro.hr/LinkClick.aspx?fileticket=RAMnkK6T5UQ%3d&tabid=196&language=hr-HR> <https://doi.org/10.23919/MIPRO52101.2021.9597195>

A model-based LQR control of an obstacle avoidance maneuver of a self-driving car

Astrov, Igor; Udal, Andres; Pikner, Heiko; Malayjerdi, Ehsan 2022 IEEE 20th Jubilee World Symposium on Applied Machine Intelligence and Informatics (SAMI) : Poprad, Slovakia, 2-5 March 2022 / p. 473-478 : ill <https://doi.org/10.1109/SAMI54271.2022.9780755>

Modeling of a carbon nanotube junction with ab-initio software VASP

Velmre, Enn; Klopov, Mihhail; Udal, Andres BEC 2008 : 2008 International Biennial Baltic Electronics Conference : proceedings of the 11th Biennial Baltic Electronics Conference : Tallinn University of Technology : October 6-8, 2008, Tallinn, Estonia 2008 / p. 75-78 : ill

Modeling of charge carrier non-isothermal transport parameters in silicon

Velmre, Enn; Udal, Andres BEC'98 : the 6th Biennial Conference on Electronics and Microsystems Technology, October 7-9, 1998, Tallinn, Estonia : proceedings 1998 / p. 71-74 : ill

Modeling of lattice heat conductivity and thermopower in SiC considering the four-phonon scattering processes

Velmre, Enn; Udal, Andres Material science forum 2003 / p. 391-394

Modeling of photon recycling in GaN-devices

Velmre, Enn; Udal, Andres; Klopov, Mihhail 5th European Conference on Silicon Carbide and Related Materials : book of abstracts : 31 August-4 September 2004, Bologna, Italy 2004 / p. 317-318

Modeling of photon recycling in GaN-devices

Velmre, Enn; Udal, Andres; Klopov, Mihhail Silicon carbide and related materials 2004 : ECSCRM 2004 : proceedings of the 5th European Conference on Silicon Carbide and Related Materials, August 31-September 4, 2004, Bologna, Italy 2005 / p. 1039-1042 : ill

Modeling of photon recycling in GaN-devices

Velmre, Enn; Udal, Andres; Klopov, Mihhail Material Science Forum. 483/485 2005 / p. 1039-1042

Modelling and simulation of autonomous vehicles and systems and their advanced control methods = Autonoomsete sõidukite ja süsteemide ning nende täiustatud juhtimismetoodikate modelleerimine ja simuleerimine

Pedai, Andrus 2021 https://www.ester.ee/record=b5391357*est <https://digikogu.taltech.ee/et/Item/654ccb12-0d81-4ae2-ae07-11248063913c> <https://doi.org/10.23658/taltech.9/2021>

Modelling of charge carrier non-isothermal transport in silicon and silicon carbide

Velmre, Enn; Udal, Andres Proceedings of the Estonian Academy of Sciences. Engineering 2000 / 2, p. 144-154 : ill

Multi-modal sensor data fusion in city environment monitoring projects SMENETE and IMO

Kaugerand, Jaanus; Ehala, Johannes; Riid, Andri; Preden, Jürge-Sören; Udal, Andres COST Action CA16101 MULTI-modal : Imaging of FOREnsic SciEnce Evidence tools for Forensic Science : Grant Period 2 Conference, 5-8 November 2018, Dubrovnik, Croatia. Forensic Imaging Techniques - an exploration of their potential as standalone tools and within a multimodal approach : book of abstracts 2018 / p. 36-37 : ill

NanoIT2010 : nanoinfotehnoloogia katsekursus info- ja kommunikatsioonitehnoloogia doktorikoolis

Udal, Andres A & A 2010 / 4, lk. 10-15 : ill

Nanotehnoloogia : hirmud, müüdid ja võimalused

Udal, Andres Tallinna Tehnikaülikooli aastaraamat 2011 2012 / lk. 18-33 : ill

National environmental action plan 2001-2003 : Estonia

Kiili, Jaanus; Kask, Ülo; Vares, Villu; Liik, Olev; Metsvahi, Tiit; Paadam, Katrin; Adamson, Alo; Hendre, Marju; Hääl, Maire-Liis; Kask, Ülo; Kändler, Nils; Loigu, Enn; Randla, Tiina; Reinsalu, Enno; Seepõld, Marit; Udal, Andres; Veiderma, Mihkel; Vilu, Raivo 2001 https://www.ester.ee/record=b1593753*est

Neural predictive tracking control of catamaran model sailboat for situation awareness applications

Astrov, Igor; Udal, Andres INES 2020 : IEEE 24th International Conference on Intelligent Engineering Systems, July 8-10, 2020,

Reykjavik, Iceland : proceedings 2020 / p. 153-158 : ill <https://doi.org/10.1109/INES49302.2020.9147126>

New concepts of automatic answer evaluation in competence based learning

Umbleja, Kadri; Kuk, Vello; Jaanus, Martin; Udal, Andres 2014 IEEE Global Engineering Education Conference (EDUCON) : Istanbul, Turkey, April 2-5, 2014 / p. 922-925 : ill

Nonisothermal numerical simulation of semiconductor power devices

Velmre, Enn; Udal, Andres Automation, simulation & measurement : ASM'91 : 3rd biennial conference, Tallinn, October 7-11, 1991. Section S / Tallinn Technical University 1992 / p. 139-145: ill

Numerical analysis of the on state of diode structures based on direct-gap semiconductors

Velmre, Enn; Freidin, Boris; Udal, Andres Physica scripta : an international journal for experimental and theoretical physics 1981 / p. 468-471 https://www.ester.ee/record=b2244094*est

Numerical aspects of the development of quantum cascade laser simulation software

Reeder, Reeno; Udal, Andres; Velmre, Enn; Valavanis, Alexander BEC 2014 : 2014 14th Biennial Baltic Electronics Conference : proceedings of the 14th Biennial Baltic Electronics Conference : Tallinn University of Technology, October 6-8, 2014, Tallinn, Estonia 2014 / p. 37-40 : ill

Numerical investigation of digitised parabolic quantum wells for terahertz AlGaAs/GaAs structures

Reeder, Reeno; Udal, Andres; Velmre, Enn; Harrison, Paul BEC 2006 : 2006 International Baltic Electronics Conference : Tallinn University of Technology, October 2-4, 2006, Tallinn, Estonia : proceedings of the 10th Biennial Baltic Electronics Conference 2006 / p. 51-54 : ill

Numerical investigation of SiC devices performance considering the incomplete dopant ionization

Velmre, Enn; Udal, Andres Silicon carbide and related materials 2005 2006 / p. 1383-1386 <https://www.scientific.net/MSF.527-529.1383>

Numerical simulation of a silicon carbide diode

Velmre, Enn; Udal, Andres BEC : Baltic Electronics Conference : proceedings of the 4th Biennial Conference, October 9-14, 1994, Tallinn (Estonia). 2 1994 / p. 559-566: ill

Numerical simulation of electrothermal effects in ESD protection devices

Hellstrom, S.; **Freidin, Boris; Velmre, Enn; Udal, Andres** Techn. Dig. of the 3rd European Symposium on Reliability of Electron Devices, Failure Physics and Analysis, 1992, Oct. 5-8, Schwabisch Gmünd, Germany 1992

Numerical simulation of electrothermal interactions in semiconductors under electrostatic energy pulse conditions

Freidin, Boris; Velmre, Enn; Udal, Andres Techn. Dig. of International Workshop on Computational Electronics, 1992 May 28-29, Beckman Institute, Univ. of Illinois at Urbana Champaign, USA 1992

A numerical transient analysis of a bulk-barrier diode

Udal, Andres Solid state electronics : an international journal 1983 / p. 1130-1131 https://www.ester.ee/record=b1202249*est

Nõmme linnaosa vajab liikluse mujale suunamist

Udal, Andres Eesti Päevaleht 1999 / 30. sept., lk. 5: ill

An optimal control method for an autonomous surface vessel for environment monitoring and cargo transportation applications

Astrov, Igor; Udal, Andres; Mölder, Heigo 2021 25th International Conference Electronics : Proceedings of the 25th International Conference : ELECTRONICS 2021, Kaunas University of Technology, 14th-16th June, 2021, Palanga, Lithuania 2021 / 6 p <https://doi.org/10.1109/IEEECONF52705.2021.9467483>

Power diode transient characteristics modeling in inductive load circuits

Freidin, Boris; Velmre, Enn; Udal, Andres The Bug Exterminator (USA) 1991 / 3, p. 1-5: fig

Practical path planning techniques in overtaking for autonomous shuttles

Malayjerdi, Ehsan; Sell, Raivo; Malayjerdi, Mohsen; Udal, Andres; Bellone, Mauro Journal of field robotics 2022 / p. 410-425 <https://doi.org/10.1002/rob.22057> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Progress in development of the resonant tunneling diodes as promising compact sources at the THz gap bottom

Udal, Andres; Jaanus, Martin; Valušis, Gintaras; Kašalynas, Irmantas; Ikonic, Zoran; Indjin, Dragan THz for CBRN and explosives detection and diagnosis 2017 / p. 169-178 http://doi.org/10.1007/978-94-024-1093-8_20

Quantum mechanical transforms between [hij]- and [kapa]-space as a signal processing problem

Udal, Andres; Kuk, Vello; Velmre, Enn; Klopov, Mihhail BEC 2008 : 2008 International Biennial Baltic Electronics Conference : proceedings of the 11th Biennial Baltic Electronics Conference : Tallinn University of Technology : October 6-8, 2008, Tallinn, Estonia

Recent progress in development of the resonant tunneling diode sources for the critical part of THz gap

Udal, Andres; Jaanus, Martin; Valušis, Gintaras; Kašalynas, Irmantas; Ikonic, Zoran; Indjin, Dragan 4th Annual Conference of COST Action MP1204 & SMMO2016 Conference : Lisbon, Portugal, 21-24 March 2016 2016 / [1] p

Resonant tunneling devices as the promising sources in THz gap bottom for the security imaging and detection

Udal, Andres; Valušis, G.; Kasalynas, I.; Ikonic, Zoran; Indjin, D. Abstract book of Tera-MIR 2015 : NATO Advanced Research Workshop on THz Diagnostics of CBRN Effects and Detection of Explosives & CBRN : Izmir, Turkey, 3-6 November 2015 2015 / p. 65

SiC-diode forward surge current failure mechanisms : experiment and simulation

Velme, Enn; Udal, Andres ESREF'97 : proceedings of the 8th European Symposium on Reliability of Electron Devices, Failure Physics and Analysis, Oct. 7-10, 1997, Bordeaux, France 1997 / p. 1671-1674

SiC-diodes forward surge current failure mechanisms : experiment and simulation

Udal, Andres; Velme, Enn Microelectronics and reliability 1997 / 10/11, p. 1671-1674

Simulink/MATLAB based comparison of neural and basic tracking control for an autonomous surface vessel for situation awareness applications

Astrov, Igor; Udal, Andres; Pedai, Andrus; Sell, Raivo 2019 IEEE 19th International Symposium on Computational Intelligence and Informatics and 7th IEEE International Conference on Recent Achievements in Mechatronics, Automation, Computer Sciences and Robotics (CINT-MACRo) 2019 / p. 000105 - 000110 : ill

Single-Rate versus Three-Rate Neural Assisted Control Approaches for Coaxial Rotor Ducted Fan UAV for Situation Awareness Applications

Pedai, Andrus; Astrov, Igor; Udal, Andres; Sell, Raivo 2019 IEEE International Systems Conference (SysCon 2019), Orlando, FL, USA, April 8-11, 2019 2019 / p. 457-463 : ill <https://doi.org/10.1109/SYSCON.2019.8836871>

Smart elevator with unsupervised learning for visitor profiling and personalised destination prediction

Leier, Mairo; Riid, Andri; Alumäe, Tanel; Pihlak, Rene; Udal, Andres; Heinsar, Risto; Vainküla, Sven 2021 IEEE International Conference on Cognitive and Computational Aspects of Situation Management (CogSIMA) : Virtual Conference, 14-22 May 2021 : proceedings 2021 / p. 9-16 <https://doi.org/10.1109/CogSIMA51574.2021.9475921>

Spectral properties of incoherent terahertz torch based on parabolic Ga(As,Bi)/AlGaAs quantum wells

Karaliunas, Mindaugas; Pagalys, Justas; Jakštas, Vytautas; Norkus, Ričardas; Urbanowicz, Andrzej; Devenson, Jan; Devenson, Renata; **Udal, Andres;** Valušis, Gintaras Terahertz Emitters, Receivers, and Applications X : SPIE Optical Engineering + Applications, 11-15 August 2019, San Diego, California, United States : proceedings SPIE digital library 2019 <https://doi.org/10.1117/12.2528428> [Conference proceeding at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Student behavior changes in Estonia revealed by e-learning technology

Udal, Andres; Kukk, Vello; Jaanus, Martin; Umbleja, Kadri; Piho, Gunnar Digital Turn in Schools - Research, Policy, Practice : proceedings of ICEM 2018 Conference 2019 / p. 83-90 https://doi.org/10.1007/978-981-13-7361-9_6 [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Study of radiative recombination influence in GaN and GaAs bipolar transistor structures

Velme, Enn; Udal, Andres; Verbitski, Irina BEC 2004 : proceedings of the 9th Biennial Baltic Electronics Conference : October 3-6, 2004, Tallinn, Estonia 2004 / p. 59-62 : ill

TalTech osaleb esimese Eesti ülikoolina Euroopa Kaitsefondi projektis

geenius.ee 2023 [TalTech osaleb esimese Eesti ülikoolina Euroopa Kaitsefondi projektis](#)

Target tracking by neural predictive control of autonomous surface vessel for environment monitoring and cargo transportation applications

Astrov, Igor; Udal, Andres; Roasto, Indrek; Mölder, Heigo 2020 17th Biennial Baltic electronics conference, Tallinn, Estonia, October 6-8, 2020 : proceedings 2020 / 4 p <https://doi.org/10.1109/BEC49624.2020.9277115>

Task-based mobile learning ISC-system: built-in Coronavirus immunity confirmed

Udal, Andres; Jaanus, Martin; Piho, Gunnar Educating Engineers for Future Industrial Revolutions : Proceedings of the 23rd International Conference on Interactive Collaborative Learning (ICL2020). Volume 2 2021 / p. 604-616 https://doi.org/10.1007/978-3-030-68201-9_59 [Article collection metrics at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Taskukohane spordikeskus ohus

Udal, Andres Eesti Päevaleht 2000 / 20. jaan., lk. 4

Tehnikaülikooli teadlased lähevad Euroopale appi – kuidas tuvastada biorelvi senisest kiiremini?

postimees.ee novaator.err.ee 2023 [Tehnikaülikooli teadlased lähevad Euroopale appi – kuidas tuvastada biorelvi senisest kiiremini? Eesti teadlased asuvad otsima võimalust keemia- ja biorelvade tuvastamiseks](#)

The experimental results of reverse recovery effects in power fastrecovery diodes analyzed by numerical model

Velmre, Enn; Udal, Andres; Vaher, G.T.; Tarma, Mati Proceedings International AEGEAN Conference on Electrical Machines and Power Electronics, Kusadasi 27-29 May, 1992 1992 / p. 738-743: fig

The method of quantum optical communication based on entangled photon pairs

Udal, Andres; Jaanus, Martin; Umbleja, Kadri; Reeder, Reeno BEC 2014 : 2014 14th Biennial Baltic Electronics Conference : proceedings of the 14th Biennial Baltic Electronics Conference : Tallinn University of Technology, October 6-8, 2014, Tallinn, Estonia 2014 / p. 33-36 : ill

Thermopower measurements in 4H-SiC and Theoretical calculations considering the phonon drag effect

Grivickas, V.; Stölzer, M.; **Velmre, Enn; Udal, Andres;** Grivickas, P.; Syväjärvi, M.; Yakimova, R.; Bikbajevs, V. Abstracts of the 3rd European Conference on Silicon Carbide and Related Materials : ECSCRM'2000 : Sept. 3-7, 2000, Kloster Banz, Germany 2000 / p. 144

Thermopower measurements in 4H-SiC and theoretical calculations considering the phonon drag effect

Grivickas, V.; Stölzer, M.; **Velmre, Enn; Udal, Andres;** Grivickas, P.; Syväjärvi, M.; Yakimova, R.; Bikbajevs, V. Silicon Carbide and Related Materials : ECSCRM2000 : proceedings of the 3rd European Conference on Silicon Carbide and Related Materials : Kloster Banz, Germany, September 2000 2001 / p. 491-494 : ill

A trajectory control method for a strongly underactuated spherical underwater surveillance robot

Astrov, Igor; Udal, Andres; Mölder, Heigo 2021 IEEE 25th International conference on intelligent engineering systems (INES), 7-9 July 2021 : conference proceedings 2021 / p. 43–48 <https://doi.org/10.1109/INES52918.2021.9512931>

Two-dimensional nonisothermal analysis of the current crowding effect at nonuniform SiC Schottky contacts using device simulator DYNAMIT-2DT

Kurel, Raido; Udal, Andres BEC 2002 : proceedings of the 8th Biennial Baltic Electronics Conference : October 6-9, 2002, Tallinn, Estonia 2002 / p. 51-54 : ill

Two-dimensional surge current modeling of packaged power devices

Udal, Andres; Freidin, Boris; Velmre, Enn The Bug Exterminator : a monthly publication of Silvaco International 1992 / 12, p. 6-7

Ultra-fast turn-on medium power thyristor

Vaher, G.; **Udal, Andres;** Typpö, J.; Paomets, V.; Sivonen, M. BEC : Baltic Electronics Conference : proceedings of the 4th Biennial Conference, October 9-14, 1994, Tallinn (Estonia). 2 1994 / p. 567-572: ill

Ultra-fast-turn-on medium power double thyristor

Vaher, G.; **Udal, Andres;** Sivonen, M.; Paomets, V. ESSDERC'95 : proceedings of the 25th European Solid State Device Research Conference, the Netherlands Congress Centre, the Hague, the Netherlands, 25th-27th September 1995 1995 / p. 647-650: ill

USB audio chip based oscilloscope and signal generator for mobile laboratories

Jaanus, Martin; Udal, Andres ICSES 2012 : September 18–21, 2012, Wrocław, Poland : the conference proceedings 2012 / [4 p.] : ill <https://ieeexplore.ieee.org/document/6382229>

Using microcontrollers for high accuracy analogue measurements

Jaanus, Martin; Udal, Andres; Kuk, Vello; Umbleja, Kadri Elektronika ir elektrotehnika = Electronics and electrical engineering 2013 / p. 51-54 : ill

Wind force model and adaptive control of catamaran model sailboat

Astrov, Igor; Udal, Andres; Mölder, Heigo; Jalakas, Tanel; Möller, Taavi 2022 8th International Conference on Automation, Robotics and Applications, ICARA 2022 2022 / p. 202-208 : ill <https://doi.org/10.1109/ICARA55094.2022.9738524>

Би-одномерное численное моделирование запираемых тиристоров

Udal, Andres Численные методы и средства проектирования и испытания элементов твердотельной электроники : тезисы докладов республиканского совещания. Том I = Tahkekeha elektroonika elementide projekteerimise ja katsetamise numbrilised meetodid ja vahendid : Vabariikliku nõupidamise ettekannete teesid. Kõide I 1989 / с. 146-149 : ill https://www.ester.ee/record=b1272248*est

Двумерное неизотермическое численное моделирование процесса выключения запираемого тиристора

Udal, Andres Численные методы и средства проектирования и испытания элементов РЭА : тезисы докладов. Том 1 1987 / с. 139-142 : ил https://www.ester.ee/record=b1273986*est

Двумерное численное моделирование процесса выключения запираемого тиристора

Udal, Andres Измерение и моделирование в электронике 1987 / с. 65-77

Двумерное численное моделирование физических процессов в силовой транзисторной структуре

Köverik, Kait; Udal, Andres Численные методы и средства проектирования и испытания элементов РЭА : тезисы докладов. Том 1 1987 / с. 135-138 : ил https://www.ester.ee/record=b1273986*est

Инжекционные зависимости времени жизни неосновных носителей заряда в кремнии, легированном золотом и платиной

Udal, Andres Силовые быстродействующие полупроводниковые приборы : сборник статей. Часть II 1989 / с. 101-105 : ил., табл https://www.ester.ee/record=b1264433*est

Исследование динамических характеристик силовых высоковольтных транзисторов

Köverik, Kait; Rudski, V.A.; Udal, Andres Тезисы докладов Республиканской научно-технической конференции, посвященной Дню радио, октябрь 1983. Секция "Силовые полупроводниковые приборы" 1983 / с. 18-21
https://www.ester.ee/record=b1295312*est

Исследование процесса выключения запираемого тиристора с помощью двумерной численной модели

Udal, Andres Силовые быстродействующие полупроводниковые приборы : сборник статей. Часть II 1989 / с. 106-110 : ил https://www.ester.ee/record=b1264433*est

Исследование процесса переключения диодных структур низковольтных диодов с эпитаксиальной базовой областью

Vaher, G.; Velmre, Enn; Lumi, J.; Tarma, Mati; Udal, Andres Полупроводниковые приборы : сборник статей 1982 / с. 13-17
https://www.ester.ee/record=b1356516*est

Исследование эффективности численных алгоритмов моделирования силовых полупроводниковых структур в проводящем состоянии

Velmre, Enn; Udal, Andres; Freidin, Boris Электронное моделирование = Electronic modeling : международный научно-теоретический журнал 1981 / с. 85-88 https://www.ester.ee/record=b1291241*est

О влиянии электронно-упрочного рассеяния на коэффициент передачи лико микроэлектронного биполярного транзистора

Velmre, Enn; Udal, Andres Математическое моделирование физических процессов в полупроводниках и полупроводниковых приборах : тезисы докладов II всесоюзного совещания (г. Ярославль, сентябрь 1988 г.) 1988 / с. 40

Определение характеристик силовых диодных структур методом фотохронографии рекомбинационного излучения

Kruusing, Arvi; Udal, Andres; Vaher, G. Силовые быстродействующие полупроводниковые приборы : сборник статей. Часть II 1989 / с. 129-133 https://www.ester.ee/record=b1264433*est

Приближенная теория для расчета характеристик обратного восстановления высоковольтных диффузионных диодов в индуктивных цепях

Udal, Andres Силовые полупроводниковые приборы : сборник статей 1986 / с. 54-58 : ил https://www.ester.ee/record=b1591355*est

Применение численных моделей для усовершенствования технологии производства силовых полупроводниковых приборов

Velmre, Enn; Udal, Andres; Freidin, Boris Системы автоматизированного проектирования изделий микроэлектроники, новые методы и технологии микроминиатюрных элементов : Сборник докладов постоянно действующего семинара "Современная технология производства приборов, средств автоматизации и систем управления" 1981 / с. 51-56

Применение численных моделей при разработке полупроводниковых приборов и технологии их изготовления

Velmre, Enn; Udal, Andres; Freidin, Boris Системы автоматизированного проектирования изделий микроэлектроники, новые методы и технологии микроминиатюрных элементов : Сборник докладов постоянно действующего семинара "Современная технология производства приборов, средств автоматизации и систем управления" 1981 / с. 51-56

Проблемы оптимизации аксиального профиля времени жизни носителей заряда в структуре быстродействующего тиристора

Surma, A.; Udal, Andres; Assina, Svetlana Силовые быстродействующие полупроводниковые приборы : сборник статей. Часть II 1989 / с. 18-21 : ил https://www.ester.ee/record=b1264433*est

Программа "Динамит-1" для одномерного численного моделирования тиристорных структур

Velmre, Enn; Udal, Andres Силовые полупроводниковые приборы : сборник статей 1986 / с. 59-63 : ил https://www.ester.ee/record=b1591355*est

Расчет и оптимизация параметров запираемых тиристоров с учетом внешней цепи

Куузик Э.И.; Кыверик К.Х.; Свирин А.В.; Udal, Andres Automation, simulation & measurement : ASM'91 : 3rd biennial conference, Tallinn, October 7-11, 1991. Section S / Tallinn Technical University 1992 / с. 184-199: ил

Расчет и оптимизация параметров запирающих тиристоров с учетом внешней цепи

Kuusik, E.; Kõverik, Kait; Svirin, A.V.; Udal, Andres Силовая полупроводниковая техника и ее применение в народном хозяйстве : (Тезисы докладов) 1989 / с. 30

Численное моделирование диода Шоттки на ЭВМ

Rang, Toomas; Udal, Andres Проблемы моделирования полупроводниковых структур и сложных схем на ЭВМ 1982 / с. 21-31

Численное моделирование диодных структур с учетом Оже-рекомбинации и фотогенерации

Udal, Andres Проблемы моделирования полупроводниковых структур и сложных схем на ЭВМ 1982 / с. 3-20

Численное моделирование мощных диодов Шоттки на ЭВМ

Rang, Toomas; Udal, Andres Известия высших учебных заведений : международный ежемесячный научно-технический журнал. Радиоэлектроника 1983 / с. 92-93 https://www.ester.ee/record=b2768571*est

Численное моделирование процесса выключения одномерных кремниевых тиристорных структур

Velme, Enn; Udal, Andres Полупроводниковые приборы : сборник статей 1982 / с. 74-79
https://www.ester.ee/record=b1356516*est

Численное моделирование процессов в полупроводниковых структурах с учетом рекомбинации через многозарядные центры

Velme, Enn; Opštški, A.; Udal, Andres Численные методы и средства проектирования и испытания элементов РЭА : тезисы докладов. Том 1 1987 / с. 131-134 https://www.ester.ee/record=b1273986*est

Численное моделирование статических неизотермических процессов в кремниевых силовых диодных и тиристорных структурах в открытом состоянии

Velme, Enn; Udal, Andres; Freidin, Boris Всесоюзный научно-технический семинар "Повышение параметров силовых полупроводниковых приборов на основе новых конструктивных решений и методов изготовления" (Запорожье, 1981) 1981 / с.37-38

Численное моделирование физических процессов в одномерных кремниевых диодных структурах в стационарном режиме

Velme, Enn; Freidin, Boris; Udal, Andres Алгоритмы и программы : информационный бюллетень 1980 / с.?

Численное моделирование эксперимента Шокли-Хейнса

Velme, Enn; Udal, Andres Силовые полупроводниковые приборы : сборник статей 1986 / с. 49-53 : ил
https://www.ester.ee/record=b1591355*est

Численное моделирование электрофизических процессов в полупроводниках с учетом электронно-дырочного рассеяния

Velme, Enn; Piroženko, Aleksander; Udal, Andres Электронное моделирование = Electronic modeling : международный научно-теоретический журнал 1985 / с. 66-71 https://www.ester.ee/record=b1291241*est

Численный расчет диода с точным учётом электронно-дырочного рассеяния

Velme, Enn; Udal, Andres Силовые быстродействующие полупроводниковые приборы : сборник статей 1984 / с. 39-43
https://www.ester.ee/record=b1238033*est

Электротехника и автоматика

Tamm, Uljas; Udal, Andres; Rang, Toomas; Freidin, Boris; Velme, Enn; Nurste, Ivar; Laansoo, Ants; Männama, Vello; Järvalt, Aldur; Gurjanov, Boris; Pikkov, Otto; Rebane, Jüri; Aarna, Olav; Teder, Toomas 1982
https://www.ester.ee/record=b1339926*est

Электротехника и автоматика

Kukk, Vello; Tamm, Uljas; Pikkov, Otto; Min, Mart; Velme, Enn; Udal, Andres; Nurste, Ivar; Freidin, Boris; Rang, Toomas; Opotski, Aleksei; Laansoo, Ants; Männama, Vello; Järvalt, Aldur; Gurjanov, Boris; Lavrov, Mihhail; Belkina, I.I.; Plakk, Paul; Plakk, Peeter; Plakk, T. 1987 https://www.ester.ee/record=b1224910*est

Эффективный алгоритм для одномерного численного моделирования полупроводниковых структур

Udal, Andres Численные методы и средства проектирования и испытания элементов РЭА : тезисы докладов. Том 1 1987 / с. 146-149 https://www.ester.ee/record=b1273986*est