Institute of the Theory of Electrical Engineering and Electrical Measurements

REPORT 1996

Department of Electrical Engineering
Warsaw University of Technology

WARSAW UNIVERSITY OF TECHNOLOGY
Institute of the Theory of Electrical Engineering and Electrical Measurements

ANNUAL REPORT OF SCIENTIFIC ACTIVITY IN 1996

WARSAW, 1996

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I. SCIENTIFIC ACTIVITY OF THE INSTITUTE

1. OPTIMIZATION AND INVERSE PROBLEMS IN ELECTROMAGNETC FIELD THEORY
- S. Bolkowski, J. Sikora, S. Wincenciak, J. Starzynski, J. Korytkowski, M. Stodolski

Problem of analysis of electromagnetic fields: problem oriented language for field analysis; nonstandard elements for finite element method; neural network technique for mesh generation; pre- and postprocessing for data and results (visual presentation including animation); electric thermal coupled fields and eddy current problems (3D). Synthesis: efficient techniques for sensitivity analysis; optimization algorithms for nonlinear problems; identification of source functions and boundary conditions (application for computerized electrocardiography); optimal shape design; material derivative approach for optimal shape design; material structure identification.

2.ARTIFICIAL NEURAL NETWORK APPLICATION TO ELECTRICAL IMPEDANCE TOMOGRAPHY
- J. Sikora

Artificial Neural Network (ANN) application to inverse problem solution in particular for electrical impedance tomography, where the time of the solution is a very crutial point, algorithms of learning adjusted to impedance tomography, applications in different branches of engineering.

3. MATHEMATICAL MODELS DESCRIBING THE INTERACTION OF THE COUPLED FIELDS ON THE CONTINUOS MEDIA
- S. Krzeminski

Constitutive modeling of the interaction of the electromagnetic fields and moving electrodynamic media, methods of homogenization of nonuniform structures, analysis of the interaction of the electromagnetic fields and mobile non-Newtonian, electrically conducting fluids moving in the channels of the peristaltic walls, problems of magneto- and electrodynamic flows.

4. SYNTHESIS AND OPTIMIZATION OF POWER ELECTRONIC CIRCUITS
- K. Mikolajuk, Z. Filipowicz, A. Tobola

Synthesis of passive switching circuits: theory of LC switching one-ports and two-ports, creation of new thyristor and transistor switching structures, prticularly DC-DC converters, power electronic harmonic compensators, optimization of harmonic reduction in electrical power system, global optimization methods, computer simulation of the phenomena in the power electronic circuits.

5. RESEARCH IN THE AREA OF NEURAL NETWORKS
- S. Osowski, A. Cichocki, S. Filipowicz, M. Stodolski, K. Siwek, I. Sabała

Study of the properties and applications of neural networks (n.n.); development of new learning rules; methods of learning using global optimization algorithms, simulated annealing and genetic algorithms - applications in the field of electrical engineering; feedforward and recurrent dynamic n.n.; optimization using n.n., adaptive signal processing using n.n.; identification and estimation of signals for signal procesing systems using n.n.; application of n.n. in synthesis and design of electrical circuits, location of faults - application of feedforward and Kohonen networks, data compression, predictive properties of neural networks - application to load prediction of power electroenergetic system, neural fuzzy systems - study of learning rules and application in identification and prediction; blind separation and deconvolution of signals - development of new effective learning rules and its applications.

6. STUDY OF SINGULAR MULTIVARIABLE AND PARAMETER DISTRIBUTED SYSTEMS - DIRECT AND INVERSE PROBLEMS
- Z. Trzaska

Effective algorithms and computational procedures for analysis, synthesis, identification and design of singular dynamical multivariable systems; analysis and design of manipulators; studies of systems with distributed parameters; criogenic systems, fault diagnostic systems, geometrical approaches to dynamical system problems, electrical car drives; fundamentals and applications of the Fibonacci hyperbolic trigonometry and Fibonacci polynomials; direct and inverse problem solutions for 2-D and N-D systems.

7. THE ELECTRIZATION OF CONDUCTING ENVIRONMENTS IN ELECTRIC AND MAGNETIC FIELD AS SOURCE OF STATIC CHARGES
- H. Rawa

Mathematical modeling and analysis of the process of displacement of free charges towards the surface of the object under electrization in the electric and magnetic field, development of the theory and computer simulation of the phenomena.

8. SIMULATION OF POWER SYSTEM LOADED BY THE HIGH POWER NONLINEAR LOAD
- W. Brociek

Modeling of the elements of power system, interaction of the system and nonlinear load of quickly changing parameters (arc furnaces, traction substations), electromagnetic compatibility of the high power nonlinear load and power system in dynamic conditions, analysis of higher harmonics using simulation languages including PCNAP and PCSPICE, quality of the delivered energy under nonsinusoidal conditions.

9. SYNTHESIS AND IDENTIFICATION OF PARAMETERS OF THE CURRENT CIRCUIT OF THE THE IMPULSE PLASMA GENERATOR
- T. Karwat

Analytic and experimental investigation leading to the identification of the electrical parameters of the plasma generator, mathematical description of the plasma chamber, quality of the titanium nitride coating of the cutting instruments in the process of thermal - chemical treatment performed in the plasma chamber and its connection with the electrical parameters of the plasma.

10. RESEARCH IN THE AREA OF DYNAMIC SYSTEMS SIMULATION AND OPTICAL CHARACTER RECOGNITION
- M. Stabrowski,

Development of dynamic systems simulation languages, computer implementation of simulation languages in integrated environment; Image processing, computer implementation of typewritten characters recognition of

polish national characters, context based methods.

11. RESEARCH IN THE AREA OF PERMALLOY AND AMORPHOUS THIN FILMS
- W. Kwiatkowski, J.Konopa, E. Misiuk

Optimization of manufacturing of thin films, design of optimal layout of thin films for measurement applications, application of thin sensors for measurement of magnetic and mechanical quantities. Studies of the new approach of applicatiojn of the thermobimetals in the meaurement techniques.

12. RESEARCH IN THE AREA OF METHODS OF METROLOGY AND EXPERIMENTATION TECHNIQUES
- J. Jaworski, T. Swiderski, J. Oledzki

Mathematical modelling of physical objects and phenomena, fundamentals of the design and execution of measurement-type and identification-type experiments, design and exploitation of the measuring devices and measuring systems , design and execution of advanced experiments, mathematical methods of the measurement of data processing. Parameter identification concept of measurement, system theory and techniques of experimentation and measurement.

13. RESEARCH IN THE AREA OF OPTIMIZATION OF TEMPERATURE TRANSDUCERS
- J. Czajewski, M. Poninski, B. Zyla

Development of new generation of temperature transducers based on wide range of sensors: metal resistors, semiconductor resistors termo- couples, junction elements, microcomputer's method of linearization, simulation and hardware implementation.

14. RESEARCH IN THE AREA OF METHODS AND SYSTEMS FOR TESTING MAGNETIC MATERIALS AND SYSTEMS FOR MEASURING IMPEDANCE WITHIN THE ACOUSTIC FREQUENCY RANGE
- J. Olędzki

Parameter identification approach to magnetic material testing, adaptive techniques in testing magnetic materials, e.g. adaptive control of demagne-

tization, of measurement process, adaptive digital synthesis of magnetizing current waveform. Methods of identification of two- and three-terminal networks in the harmonic current circuits when model accuracy in a frequency range is specified, computer parameter identification supplemented with an automatic selection of a model structure of adequate accuracy.

15. MAGNETIC FIELD MEASUREMENTS AND THEIR APPLICATIONS
- S. Tumanski, M.Stabrowski

Sensors of magnetic fields, magnetic fields measurements, construction of magnetometers, measurements of power frequency magnetic and electric fields, nondestructive testing of electric steel sheets. Computer controlled measurement system of magnetic fields. Computer aided processing of measurement data.

16. RESEARCH IN THE AREA OF APPLICATION ON MIS STRUCTURES AS NONELECTRICAL QUANTITIES TRANSDUCERS
- B. Moeschke, A. Siedlecki

Analysis of the relation between physical quantities, particularly mechanical and semiconductor materials, application of semiconductors, monocristalic and policristalic structures and p-n structures as nonelectric quantities transducers, application of MIS-structures as nonelectric quantities measurement transducers, experiments with selected structure, designing nonelectric quantities transducer with MIS structure and joint-structure.

17. RESEARCH IN THE AREA OF ELECTROMAGNETIC FLOW MEASUREMENTS IN OPEN CHANNELS
- A. Michalski, A. Kalicki

Study of the features of electromagnetic method, development of new generation of electromagnetic flow meter dedicated for industrial open channels, optimization of primary transducer (coil, electrodes) based on the finite element idea and generalized Newton algorithm, designing small measurements systems based on one chip microcomputers.

18.RESEARCH IN THE AREA OF HIGH RESOLUTION SPECTRAL ANALYSIS, CODING AND ESTIMATION
- Z. Staroszczyk, R. Rak, D. Sawicki, A. Majkowski

Interpolating FFT methods for distorted signals measurements, power systems measurement and identyfications, parametric spectral estimation of noisy signals, transfer function measurements, digital filters applications to high resolution spectral analysis, vector quantization of FFT spectrum, two dimensional spectrumśignal presentation.

II. PUBLICATIONS

The results of the scietific activity of the Institute of the Theory of Electrical Engineering and Electrical Measurements, Warsaw University of Technology have been published in 21 journal papers (both international and national) and 44 contributions of the proceedings of the national and international conferences. Below there is a list of papers published in 1996 as well as list of books written by members of the scientific staff of the Institute.

1. THE PAPERS IN SCIENTIFIC JOURNALS: (alphabetical order)

- **International journals**

1. Czarnecki L., Staroszczyk Z., On-line measurement of equivalent parameters of distribution system and its loads for harmonic frequencies, IEEE Trans. on Instrumentation and Measurements, vol. 45, no. 2, 1996, pp. 467-472.
2. Czarnecki L., Staroszczyk Z., Dynamic on-line measurement of equivalent parameters of three- phase systems for harmonic frequencies, European Transactions on Electrical Power, vol.6, no.5, 1996 , pp. 329-336.
3. Kaleta J., TumańskiS., Żebracki J., Magnetoresistors as a tool for investigating the mechanical properties of ferromagnetic materials, J. Magn. Mat., v.160, p.199-200, 1996
4. Krzemiński S., Cała A., Śmiałek M., Numerical Simulation of 2D Mhd Flows, Psi-ksi-A Method , IEEE Transaction on Magnetics, May 1996, pp. 990-993.

5. Mikołajuk K., The problem of Harmonic Compensators Location, European Trans. on Electrical Power Engineering, No. 6, 1996.
6. Osowski S., Stodolski M., Bojarczak P., Fast second order learning algorithm for feedforward multilayer neural networks, Neural Networks, 1996, vol. 9, pp. 1583 - 1597
7. Osowski S., Multilayer Volterra filter and its applications, Neural Computing and Applications, 1996, vol. 4, pp. 228 - 236
8. Stabrowski M., Efficient Algorithm for Solving Stiff Ordinary Differential Equations, Simulation Practice and Theory, 1996.
9. Stabrowski M., The Pivoted Block Solvers for Large Banded Linear Equation Systems, Communications in Numerical Methods in Engineering, 1996.
10. Tumański S., Stabrowski M., Magnetovision system: new method of investigating steel sheets, J. Magn. Mat., v. 160, p. 165-166, 1996
11. Trzaska Z., On the Fibonacci hyperbolic trigonometry and modified numerical triangles, The Fibon. Quarterly, Nr.3, 1996, pp. 34-42
12. Trzaska Z., Fundamental and Applications of the Fibonacci Hyperbolic Trigonometry Zeitschrift fur Angewandte Mathematik und Mechanik, vol.76, 1996, S2., pp.693-694
13. Trzaska Z., Fibonacci Polynomials, their Properties and Applications", Zeitschrift fur Analysis und ihre Anwendungen, Vol.15, 1996, Nr 3, pp. 729-746
14. Trzaska Z., On links between continued fractions and modified numerical triangles" CATCF, vol. V, 1996, pp.17-26

- **National journals**

1. Kwiatkowska A., Miłosz M., Sikora J., Material Derivative Concept for Optimal Shape Design: One Dimensional Case, Archives of Electrical Engineering, Vol. XLV, No 1, pp. 3- 12, 1996
2. Michalski A., Wincenciak S., Projektowanie przetwornika pierwotnego do pomiaru strumienia objętości cieczy metodą elektromagnetyczną, Biuletyn Naukowy Wojskowej Akademii Technicznej, nr 12, 1996

3. Michalski A., Kalicki A., Chwaleba A., Problemy praktycznej realizacji strumieniomierzy elektromagnetycznych i ich zastosowania w stacjach monitoringu wód powierzchniowych Biuletyn Naukowy Wojskowej Akademii Technicznej, nr 12, 1996
4. Michalski A., Kalicki A., A.Chwaleba, Uniwersalny zestaw kontrolno pomiarowy do wspomagania procesów galwanotechnicznych, Biuletyn informacyjny Aparatura Badawcza i Dydaktyczna COBRABiD, 1996, No 1
5. Rawa H., Mechanizmy gromadzenia ładunków elektrycznych - zastosowania i zagrożenia, Prace Naukowe Instytutu Elektrotechniki, 1996
6. Rymarczyk T., Sikora J., Nondestructive testing of the copper - mine ceiling, Archives of Electrical Engineering, Vol. XLV, No 1, pp. 23-29, 1996.
7. Stabrowski M.: New Efficient Implementation of Brayton - Gustavson - Hatchel Method for Solving Stiff Ordinary Differential Equation Systems, Kwartalnik Elektroniki i Telekomunikacji, 1996, (41), v.3, pp. 293 - 303

2. CONFERENCE PROCEEDINGS REPORTS:

- **International conferences**

1. Brociek W., Wąsowski A., Wilanowicz R., Białek J., Electromagnetic compability of LAF and supply power system - UIE XII Congress on Electricity Applications, Birmingham, 16-20.06.96, pp. 69 - 76 MI.
2. Krzemiński S., Śmiałek M., Włodarczyk M., Biharmonic Mathematical Model of the Magnetic Field Influence on a Fluid Conductor, 6th International Journal of Theoretical Electrotechnics, Thessaloniki, 1996. pp.114-120.
3. Krzemiński S., Śmiałek M., Włodarczyk M., Cała A., Analysis of Magnetohydrodynamic Pressure in Conducting Fluid, Procced. Third International Conference on Electromagnetic Field Problems and Applications, ICEF'96. Wuhan 1996, 1 str.

4. Krzemiński S., Śmiałek M., Włodarczyk M., Numerical Study on MHD Flow of Non-Newtonian Fluid, Proc. Seventh Biennial IEEE Conference on Electromagnetic Field Computation, Okayama, 1996, 1 str.
5. Michalski A., Wincenciak S., Method of optimization of primary transducer dedicated for electromagnetic flow meter, IEEE Instrumentation & Measurement Technology Conference, 1996, Bruksela, IMTC Proceedings, pp 1350–1553.
6. Osowski S., Cichocki A., Application of SFG in learning algorithms of neural networks, NICROSP, 1996, Wenecja
7. Osowski S., Dębowski W., Synthesis of electrical circuits through global optimization, MIDWEST Symposium, Ames, USA, 1996
8. Osowski S., Cichocki A., SFG approach to the sensitivity determination of dynamic recurrent systems, WCNN, San Diego, 1996,
9. Podsiadły J., Ratajewicz-Mikołajczak E., Sikora J., Neural Network Representation of the Forward and Inverse Problem Approximated by FEM, 7-th International IGTE Symposium on Numerical Field Calculation in Electrical Engineering and International TEAM - Workshop, Graz (Austria), 23-26 Sept. 1996.
10. Rak R., A system for transform vector coding of images, Third International Conference on Signal Processing ICSP'96, Pekin, Chiny, 1996.
11. Ratajewicz-Mikołajczak E., Sikora J., Neural Network Approach for Structural Optimization: Boundary Conditions Case, The 4-th International Workshop on Optimization and Inverse Problems in Electromagnetism, Brno, Czech Republic, June 19- 21,1996.
12. Sikora R., Sikora J., Chady T., Neural Network Approach to Crack Identification, The 4-th International Workshop on Optimization and Inverse Problems in Electromagnetism, Brno, Czech Republic, June 19-21,1996.
13. Sikora R., Sikora J., Pańczyk B., Crack identification by eddy current tomography, The 4-th International Workshop on Optimization and Inverse Problems in Electromagnetism, Brno, Czech Republic, June 19-21,1996.
14. Sikora R., Sikora J., Pańczyk B., Kamińska A., Infinite Elements in Eddy Current Tomography, 7-th International IGTE Symposium on Numerical Field Calculation in Electrical Engineering

and International TEAM - Workshop, Graz (Austria), 23-26 Sept. 1996.

15. Staroszczyk Z., Accuracy problems in on-line one-phase distributionload system identification , Proc. of the IEEE Int. Symposium on Industrial Electronics ISIE'96, vol.1, Warszawa, czerwiec 1996, pp. 354-357.
16. Trzaska Z., New Efficient Tools for Modelling and Simulation of 2-D Heat Transfer Problems, Proc. CSA'96, Genova, 1996
17. Trzaska Z., On 2-D system approach for high-voltage earthing devices, Proc. Int. Conf., Teheran, 1996
18. Trzaska Z., Applications of 2-D discrete models for effective solutions of heat transfer problems, Proc. CESA'96, Lille, 1996

- **National conferences**

1. Brociek W., Wilianowicz R., Wpływ odkształcenia prądu na pobór mocy odbiornika nieliniowego - XIX SPETO, maj 1996, Materiały Konferencyjne str. 387 - 390.
2. Dębowski W., Osowski S., Global optimization techniques in application to circuit synthesis, KKTOiUE, Karpacz, 1996, pp. 175 - 180
3. Jaworski, J.M.: Pomiar, modelowanie, eksperyment, identyfikacja. XXVIII Międzyuczelniana Konferencja Metrologów. Częstochowa, 1996. Materiały Konferencyjne, T. I, str. 244-257. Wyd. Politechniki Częstochowskiej.
4. Kamińska A., Kałdunek D., Sikora J., Komputerowe wspomaganie doboru uziemień ochronnych i roboczych w liniach SN. SPETO'96, XIX Seminarium z Podstaw Elektrotechniki i Teorii Obwodów, Gliwice-Ustroń, 15-18, Maj 1996, Vol. II, pp. 253-256
5. Korytkowski J., Starzyński J., Wincenciak S., Komputer w laboratorium podstaw elektromagnetyzmu, Materiały Konferencji Naukowo-Technicznej "Zastosowania Komputerów w Elektrotechnice", Poznań - Kiekrz, kwiecień 1996, str.401–406.
6. Krzemiński S., Nieliniowa Mikropolarna Teoria Magnetycznych Cieczy Przewodzących, Prace SPETO 1996, ss. 183-188.
7. Kwiatkowska A., Sikora J., Podejście analityczne do optymalnego projektowania kształtu, SPETO'96, XIX Seminarium z Podstaw

Elektrotechniki i Teorii Obwodów, Gliwice-Ustroń, 15- 18, Maj 1996, Vol. II, pp. 79-82.

8. Majkowski A. Cyfrowy analizator widma jako przyrząd wirtualny, Międzyuczelniana Konferencja Metrologów, Częstochowa, 1996r.
9. Michalski A., Kalicki A., Wykorzystanie karty Lab PC+ do wielopunktowego pomiaru strumienia objętości metodą elektromagnetyczną, Konferencja Systemy Pomiarowe w Badaniach Naukowych i w Przemyśle, WSI w Zielonej Górze 1996, ss. 133 - 141
10. Michalski A., Kalicki A., Chwaleba A., Wykorzystanie przepływomierza elektromagnetycznego do budowy stacji monitoringu jakości wód, Międzynarodowa Konferencja Naukowo - Techniczna: Inżynieria Środowiska w Eksploatacji Kompleksów Wojskowych, 1996, Hel-Jurata, ss. 37-46
11. Osowski S., Siwek K., Sieci Kohonena w zastosowaniu do rozpoznawania wzorców, SPETO, Gliwice-Ustroń, 1996
12. Osowski S., Siwek K., Kądzielawa A., Neural network approach to load forecasting, II Konf. Sieci Neuronowe i ich Zastosowania, Szczyrk, 1996
13. Osowski S., Cichocki A., Linh T. H., Learning in recurrent neural dynamic systems using signal flow graphs, KKTOiUE, Karpacz, 1996, pp. 669-674
14. Pańczyk B., Sikora J., Analiza wrażliwościowa w tomografii prądów wirowych, SPETO'96, XIX Seminarium z Podstaw Elektrotechniki i Teorii Obwodów, Gliwice-Ustroń, 15-18, Maj 1996, Vol. II, pp. 545-548.
15. Rak R., Kodowanie wektorowe transformat sygnałów dwuwymiarowych, Krajowe Sympozjum Telekomunikacji KST'96, Bydgoszcz 1996.
16. Rak R., Siedlecki A., Klasyczna a wirtualna realizacja systemu pomiarowego - dyskusja na przykładzie wybranych systemów, Konferencja Naukowa Systemy Pomiarowe w Badaniach Naukowych i w Przemyśle SP'96, Zielona Góra, 1996.
17. Ratajewicz-Mikołajczak E., Sikora J., Metoda wrażliwościowa kontroli warunków brzegowych III-go rodzaju, Konferencja Naukowo - Techniczna "Zastosowania Komputerów w Elektrotechnice", Poznań/Kiekrz, 15-17 Kwietnia 1996, paper R- 152, pp. 233-236.

18. Sawicki D., Staroszczyk Z., Analiza możliwości wykorzystania lokalnej sieci komputerowej Novell NetWare do realizacji rozproszonego systemu pomiarowego. - Konferencja Systemy Pomiarowe w Badaniach Naukowych i Przemyśle, Zielona Góra, 1996
19. Stabrowski M.: Niektóre problemy rozwiązywania dużych układów sztywnych równań różniczkowych, Materiały VI Sympozjum Modelowanie i Symulacja Systemów Pomiarowych, Kraków 1996, pp. 20-27.
20. Starzyński J., Wincenciak S., Projektowanie symulatora prądów wirowych z wykorzystaniem pakietu DIFFPACK. XIX Seminarium z Podstaw Elektrotechniki i Teorii Obwodów, SPETO'96, Gliwice - Ustroń, maj 1996, vol. 2, str.115–118.
21. Tumański S., Magnetorezystancyjny czujnik do badania właściwości blach elektrotechnicznych, Mat. IV Konf. Czujniki optoelektroniczne i elektroniczne, p.209-212, Szczyrk, 1996
22. Tumański S., Wykorzystanie magnetowizji do badania jakości blach elektrotechnicznych, Mat. Konf 25 lat Zakładu Przetwórstwa Hutniczego pp.125-130, Krynica, 1996
23. Trzaska Z., Identyfikacja źródeł w układzie 2-D, Materiały SPETO, Gliwice-Wisla, 1996r.
24. Trzaska Z., Równoważność układów dynamicznych wielowymiarowych, Materiały SPD-9, Polana Chocholowska, 1996
25. Trzaska Z., Studies of a 2-D Nonlinear System, Proc. MMAR'96, Miedzyzdroje, wrzesien 1996
26. Winek T., System wieloparametrowy do badań maszyn elektrycznych wirujących, XXVIII Konferencja Metrologów MKM'96 Częstochowa.

- **Patents**

1. Czajewski J., Urządzenie napędzające zwłaszcza statki, patent nr 168335, 1996
2. Czajewski J., Reja, wzór użytkowy, nr Ru 54078
3. Czajewski J., Reja, wzór użytkowy, nr Ru 54079
4. Karwat T., Zdunek K., Sposób pomiaru pola magnetycznego w akceleratorze komory plazmowej, zgłoszenie patentowe, 1996

5. Karwat T., Zdunek K., Stanowisko do badania pola magnetycznego w akceleratorze komory plazmowej, zgłoszenie patentowe, 1996

3. THE BOOKS PUBLISHED IN 1994

1. Chwaleba A., Moeschke B., Płoszajski G., Electronics (in Polish: Elektronika, kolejne wydanie), WSiP Warszawa 1996
2. Chwaleba A., Moeschke B., Pilawski M., Workshop of electronics (in Polish: Pracownia elektroniczna Cz. I, kolejne wydanie), WSiP Warszawa, 1996
3. Czajewski J., Encyclopaedia of sailing (in Polish: Encyklopedia żeglarstwa), PWN, 1996 (editor of the volume)
4. Czajewski J., Universal Encyclopaedia (in Polish: Encyklopedia Powszechna, PWN, 1996, (coeditor of the volume)
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III. KBN GRANTS

1. Conditions of electromagnetic compatibility of the high power nonlinear load and power system in dynamic conditions - dr W. Brociek

2. Algorithms of analysis of the interaction of the magnetic fields and the non-Newtonian fluid in open flow chanels - doc. dr hab. S. Krzemiński

3. New generation of rail measurement carriage - dr A. Michalski

4. Practical aspects of neural networks approach to signal processing - prof. dr hab. S. Osowski

5. Recognition and description of the mechanisms of electrization of technical objects and human beeings - prof. dr hab. H. Rawa

6. Distributed control and multiparameter measurement systems - dr A. Siedlecki

7. Computer measurement system for visualization of distributed magnetic fields - dr hab. S. Tumański

8. Methods of optimization and identification of objects in electromagnetic fields, dr hab. S. Wincenciak

IV. PHD DISSERTATIONS

1. Korytkowski J., Effective method for the analysis of the transient electrothermal field, PHD dissertation, promotor dr hab. S. Wincenciak

2. Rzesiowski D., Neural methods of vector quantization for application to image compression, PHD dissertation, promotor prof. dr hab. S. Osowski

3. Starzyński J., Optimal shape design for 2D steady state eddy currents, PHD dissertation, promotor dr hab. S. Wincenciak

4. Wasiluk-Hassa M., Computer simulation of quick random changes of the parameters of the power subsystem using the chaotic generators, PHD dissertation, promotor prof. dr hab. H. Rawa