

CURRICULUM VITAE  
Nataliia Rossokhata,  
D.Sc., Ph.D., Senior Researcher

*EDUCATION:*

- 2009**      **D.Sc (Doctor of Sciences) in Physics and Mathematics (Mathematical Modeling and Numerical Analysis),**  
V.M. Glushkov Institute of Cybernetics of the National Academy of Sciences of Ukraine
- 1996**      **Awarded the academic title of *Senior Scientific Fellow*, by the Highest Attestation Commission of Ukraine,**  
specializing in Computational Mathematics
- 1991**      **Ph.D. in Physics and Mathematics (Numerical Mathematics)**  
Taras Shevchenko National University of Kiev
- 1983**      **M. Sc. (Honors) in Applied Mathematics**  
Taras Shevchenko National University of Kiev
- 1981**      **B.Sc. in Applied Mathematics**  
Taras Shevchenko National University of Kiev

*EMPLOYMENT HISTORY:*

- 08.2014 – Present      **LTA Assistant Professor** (limited term appointment)
- 2008 - 2011      Concordia University, Department of Mathematics and Statistics
- 2003 – 2008      **Research Associate (on leave)**  
Institute of Mathematics of the National Academy of Sciences of Ukraine,  
Department of Numerical Mathematics
- 1993 – 2003      **Senior Researcher**  
Taras Shevchenko National University of Kiev, Department of Cybernetics, Numerical Methods for Mathematical Physics Group
- 1990 - 1993      **Researcher**  
Taras Shevchenko National University of Kiev,  
Department of Cybernetics  
Numerical Methods for Mathematical Physics Group
- 1983 – 1987      **Software Engineer**  
Kiev Radio-Electronic Company

*RESEARCH INTERESTS:*

- Development of numerical methods with exponential convergence rate for linear and nonlinear eigenvalue problems with continuous and discontinuous eigenfunctions
- Development of numerical methods with high order of accuracy for time and space discretization for initial boundary value problems and transmission problems for partial differential equations
- Mathematical modeling (analytical and numerical methods) of physical processes in semiconductors and semiconductor devices
- Mathematical modeling of semiconductor based biosensor systems

*TEACHING EXPERIENCE:*

**Concordia University, Department of Mathematics and Statistics:**

- Differential and Integral Calculus (MATH 203, MATH 205)
- Applied Advanced Calculus (ENGR 233)
- Applied Ordinary Differential Equations (ENGR 213)
- Operations Research (MATH 361)
- Numerical Analysis (MATH 354)
- Vectors and Matrices (MATH 204)
- Elementary Functions (MATH 201)
- Multivariable Calculus (MAST218)
- Mathematical Modeling (MAST331)

**Taras Shevchenko National University of Kiev, National Aviation University, National Agriculture University (Ukraine)**

- Numerical Analysis
- Numerical Algorithms with High Order of Accuracy for Partial Differential Equations
- Mathematical Modeling of Semiconductor Devices
- Mathematical Modeling of Biosensors
- Mathematical Modeling of Radioelectronic Devices
- Mathematical Modeling of Management in Avia Shipping
- Mathematical Modeling in Biology
- Mathematical Modeling in Agriculture
- Introduction to Wavelets
- Applied Mathematics

## List of publications

### Articles in referred journals:

1. V.L. Makarov, N. O. Rossokhata, D. A. Dragunov. Exponentially convergent functional-discrete method for solving Sturm-Liouville problems with a potential including the Dirac  $\delta$ -function. *Journal of Computational and Applied Mathematics*, **250**(2013), N1, pp. 39-57.
2. V.L. Makarov, N. O. Rossokhata, D. A. Dragunov. Exponentially convergent functional-discrete method for eigenvalue transmission problems with discontinuous flux and potential as a function in the space  $L_1$ . *Computational Methods in Applied Mathematics*, **12**(2012), N1, pp. 46-72.
3. V.L. Makarov, N.O. Rossokhata. A review of functional-discrete technique for eigenvalue problems. *Journal of Numerical and Applied Mathematics*, **97**(2009), pp.79-102.
4. I.P. Gavrilyuk, A.V. Klimenko, V.L. Makarov, N.O. Rossokhata. Exponentially convergent algorithm for nonlinear eigenvalue problems. *IMA Journal of Numerical Analysis*, **27**(2007), N4, pp.818-838.
5. I.P. Gavrilyuk, A.V. Klimenko, V.L. Makarov, N.O. Rossokhata. FD-method for eigenvalue problems with nonlinear potential. *Ukrainian Mathematical Journal*, **59**(2007), N1, pp.14-28.
6. V.L. Makarov, N.O. Rossokhata. FD-method for nonlinear eigenvalue problems with discontinuous eigenfunctions. *Nonlinear Oscillations*, **10**(2007), N1, pp.119-136.
7. N.O. Rossokhata. FD-method for eigenvalue transmission problems with potential in space  $L_1$ . *Bulletin of the University of Kiev*, **2**(2007), pp.177-180 (Ukr).
8. N.O. Rossokhata, V.K.Rossokhaty. Finite-difference schemes for modeling of biosensor systems. *Bulletin of the University of Kiev*, **3**(2007), pp.176-180 (Ukr).
9. N.Rossokhata. Study of an eigenvalue transmission problem by using FD-method. *Bulletin of the University of Kiev*, **1**(2006), pp.194-203(Ukr).
10. V.Makarov, N.Rossokhata. Estimates of convergence rate for FD-method for Sturm-Liouville problem with potential in  $L_1$ . *Collected works of Institute of Mathematics NAS of Ukraine*, **1**(2005), N3, pp. 1-16. (Ukr).
11. V.Makarov, N.Rossokhata, B.Bandursky. Functional-discrete method for an eigenvalue transmission problem with periodic boundary conditions. *Computational Methods in Applied Mathematics*, **5**(2005), N2, pp.201-220.
12. V.Makarov, N.Rossokhata, B.Bandursky. Functional-discrete method with high order of accuracy for eigenvalue transmission problem. *Computational Methods in Applied Mathematics*, **4**(2004), N3, pp.324-349.
13. N.Rossokhata, V.Rossokhaty. Mathematical model of biosensor with multilayer charged membrane. *Computer Physics Communication*, **147**(2002), N1-2, pp.366-369.
14. V.Makarov, N.Rossokhata, V.Rossokhaty, I.Gavrilyuk. Theoretical and numerical study of heat transfer problems in biosensor systems. *Computational and Applied Mathematics*, **85**(2000), N1, pp.61-75, (Ukr).

15. N.Rossokhata, V.Makarov, V.Rossokhaty, I.Gavrilyuk. Mathematical model of the graded band-gap semiconductor structure with high internal quantum efficiency. SIAM Journal Applied Mathematics, **59**(1999), N6, pp.2121-2138.
16. V.Rosookhaty, N.Rossokhata. A mathematical model of silicon-based thermobiosensors. IMA Journal of Mathematics Applied in Business & Industry, **10**(1999), pp.41-53.
17. V.Burkivs'ka, I.Gavrilyuk, V.Makarov, M.Moskal'kov, V.Rossokhaty, N.Rossokhata. Numerical simulation of graded semiconductors. Bulletin of the University of Kiev, 1999, N1, pp.141-150. (Ukr).
18. I.Gavrilyuk, V.Makarov, N.Rossokhata, V.Rossokhaty. Analysis and numerical simulation of structures based on graded semiconductor compounds. Matematicheskoe modelirovanie, **10**(1998), N11, pp.63-87 (Russ).
19. V.Makarov, I.Gawriljuk, N.Rossokhata. Rate of convergence of the method of lines for the nonlinear parabolic integral-differential equation describing a photon recycling diode. J.Math.Scienc., **72**(1994), N2, pp.2982-2992.
20. V.Makarov, I.Gawriljuk, N.Rossokhata. Two-dimensional mathematical model of the diode structure based on graded-band-gap semiconductors with high internal quantum efficiency. II. Bulletin of the University of Kiev, 1994, pp.212-220 (Ukr).
21. V.Makarov, I.Gawriljuk, N.Rossokhata. Two-dimensional mathematical model of the diode structure based on graded-band-gap semiconductors with high internal quantum efficiency. I. Bulletin of the University of Kiev, **3**(1993), pp.167-177 (Ukr).
22. I.Gawriljuk, V.Makarov, N.Rossokhata. Analysis and numerical solution of integral-differential equation for diode structure based on graded-band-gap semiconductors with high internal quantum efficiency. Z.Angev.Math.Mech., **73**(1993), N7/8, pp.T653-656.
23. V.Makarov, I.Gawriljuk, N.Rossokhata. About the convergence rate of the method of lines scheme for nonlinear integral-differential equation of the parabolic type describing the operation of graded-band-gap diode with the reemission effect. Comput. Appl. Math., **74**(1992), pp.21-31 (Russ).
24. V.Makarov, I.Gawriljuk, N.Rossokhata. About existence and uniqueness of solution in  $W_2^{1,2}(Q_T)$  for initial-boundary value problem for charge carrier density distribution in graded-band-gap semiconductor diode under photon recycling effect. Bulletin of the University of Kiev, **2**(1991), pp.14-20 (Ukr).
25. I.Gawriljuk, V.Makarov, N.Rossokhata. Mathematical model of a variable-band semiconductor diode with re-emission. Comput. Maths. and Math. Phys., **31**(1991), pp.76-87.

### Preprints:

1. I.Gavrilyuk, V.Burkivs'ka, V.Makarov, N.Rossokhata and V.Rossokhaty. Mathematical Aspects of Modeling of Biosensor Systems. Universitat Leipzig, Naturwissenschaftlich-Teoretisches Zentrum, Preprint-Nr. 40/98, 19p.
2. Gawriljuk, V.Makarov, N.Rossokhata. Mathematical model of the graded-band-gap semiconductor structure with high internal quantum efficiency. Universitat Leipzig, Naturwissenschaftlich-Teoretisches Zentrum, Preprint-Nr. 3/95, 1995, 21p.
3. I.Gawriljuk, V.Makarov, N.Rossokhata. Mathematical simulation of diode structure based on graded-band-gap semiconductors with position dependent carrier mobilities. Universitat Leipzig, Naturwissenschaftlich-Teoretisches Zentrum, Preprint-Nr. 34/95, 1995, 15p.

### **Referred conference articles:**

1. N.Rossokhata. A method for discretization in time based on Cayley transform for parabolic transmission problem. In V.Kumar, M.Gavrilova, C.J.K.Tan, V.L'Ecuyer (Eds.) Computational Sciences and its Applications (ICCSA) 2003. International Conference, Montreal, Canada, May 18-21, 2003. Proceedings, Part I, pp.1016-1024.
2. V.Makarov, N.Rossokhata, B.Bandursky. Eigenvalue transmission problem modeling vibrations of composit shanks. Proceedings of VI International Conference on Mathematical Problems in Mechanics of Heterogeneous Structures. Lviv, Ukraine, May 26-29, 2003, pp.131-132.
3. V.Burkivs'ka, I.Gavrilyuk, V.Makarov, M.Moskal'kov, V.Rossokhaty, N.Rossokhata. Analysis of mathematical models of graded compounds semiconductor devices. Proceedings of International Conference on Informatics, Numerical and Applied Mathematics, October 1996, Kiev, Ukraine, Kiev University, 1998, pp.45-52.
4. N.Rossokhata. Fully Discrete Approximation Based on Cayley Transform for Parabolic Transmission Problem. Proceedings of the World Multiconference on Systemics, Cybernetics and Informatics, Vol. 2 (4th International Conference on Information Systems, Analysis and Synthesis), Orlando, USA, 12-16 July 1998, pp.373-377.
5. N.Rossokhata, V.Rossokhaty. Computer simulation of biosensors based on semiconductor structures. Proceedings of the Fourth European Computational Fluid Dynamics Conference, 7-11 September 1998, Athens, Greece, John Wiley & Sons, 1998, vol.1, pp.1312-1316.
6. V.Rossokhaty, N.Rossokhata. Mathematical simulation of enzyme biosensor with multilayer charged membranes. Proceedings of the 11th European Conference on Solid State Transducers, Warsaw, Poland, September, 21-24, 1997, pp.941-944.

### **Research reports:**

1. V.Burkivs'ka, S.Voitsekhovsky, N.Rossokhata et al. Development of numerical algorithms with high order of accuracy and their implementation for modeling of processes in biosystems. Research report on grant of the Ministry of Education of Ukraine N01BF15, 2005 (Ukr).
2. N.Rossokhata. Wavelets and spike detection. Report on International Research Program "Project study in industry", University of Kaiserslautern, Institute of Techno- and Industrial Mathematics, LMS-company, 2002.
3. V.Makarov, N.Rossokhata, S.Voitsekhovsky, V.Burkivs'ka. Methods without error accumulation for differential and pseudo-differential equations. Research report on grant of the Ministry of Education of Ukraine N97057, 2000 (Ukr).
4. I.Gawriljuk, V.Makarov, N.Rossokhata, V.Rossokhaty, M.Moskal'kov, V.Burkivs'ka. Mathematical modeling of light emitting semiconductor devices based on III-V graded compounds. Research report on grant of the Ministry of Education of Ukraine N296, 1995 (Russ).
5. I.Gawriljuk, V.Makarov, N.Rossokhata, V.Rossokhaty, M.Moskal'kov, V.Burkivs'ka. Computer modeling of degeneration mechanisms and failures in

semiconductor devices. Research report on grant of the Ministry of Electron Industry of the USSR N406-86, 1990 (Russ).