Prof. İSMAİL RAFATOV

Personal Information

Office Phone: +90 312 210 3254
Fax Phone: +90 312 210 5099
Email: rafatov@metu.edu.tr
Web: http://users.metu.edu.tr/rafatov/

Education Information

Doctorate, Kırgızistan-Rusya Slav Üniversitesi, Fizik, Kyrgyzstan 1995 - 1999
Undergraduate, Yusuf Balasagin Kirgiz Milli Üniversitesi, Uygulamalı Matematik, Kyrgyzstan 1990 - 1995

Foreign Languages

English, B2 Upper Intermediate
Russian, C1 Advanced

Dissertations

Doctorate, Mathematical modelling of interaction of electromagnetic fields with plasma in a spheri-cal microwave discharge, Kırgızistan-Rusya Slav Üniversitesi, Fizik, 1999

Research Areas

Basic Sciences, Physics, Gases, Plasmas and Electrical Discharges Physics, Physics of Plasmas

Academic Titles / Tasks

Professor, Middle East Technical University, Faculty Of Arts And Sciences, Department Of Physics, 2018 - Continues
Associate Professor, Middle East Technical University, Faculty Of Arts And Sciences, Department Of Physics, 2010 - 2018
Assistant Professor, Middle East Technical University, Faculty Of Arts And Sciences, Department Of Physics, 2005 - 2009
Assistant Professor, Canakkale Onsekiz Mart University, Fen Ve Edebiyat Fakültesi, Matematik Bölümü, 2001 - 2002

Courses

Introduction to Plasma Physics, Undergraduate, 2020 - 2021
METHODS OF MATHEMATICAL PHYSICS I, Postgraduate, 2019 - 2020
Mathematical Methods in Physics I, Undergraduate, 2020 - 2021
MATHEMATICAL METHODS IN PHYSICS II, Undergraduate, 2019 - 2020
BASIC LINEAR ALGEBRA, Undergraduate, 2016 - 2017, 2018 - 2019

Advising Theses

RAFATOV İ., Investigation of nonlinear oscillations in the gas discharge-semiconductor system: Effect of different fluid modelling approaches, Postgraduate, C.YEŞİL(Student), 2018
RAFATOV İ., Numerical analysis of plasma properties in the glow discharge: Accuracy and applicability of simple and extended fluid models, Postgraduate, K.KAYMAZLAR(Student), 2017
RAFATOV İ., Derivation of the parallel PIC/MCC numerical code and its application to the kinetic analysis of photoresonance plasma and the problem of identification of impurities within the PLES method, Doctorate, C.KUŞOĞLU(Student), 2017
KARASÖZEN B., RAFATOV İ., Numerical modelling of spatio-temporal patterns in a DC-driven gas discharge-semiconductor system, Postgraduate, G.ÖZDEN(Student), 2015
ALEMDAROĞLU H. N. , RAFATOV İ., One dimensional numerical analysis of plasma properties in the discharge channel of a Hall effect thruster, Postgraduate, Ç.YÜNCÜLER(Student), 2014
RAFATOV İ., Simulation of glow discharge plasmas by using parallel particle in cell/Monte Carlo collision method: The effects of number of super particles used in the simulations, Postgraduate, E.ERDEN(Student), 2013
RAFATOV İ., Numerical investigation of self-organization and stable burning conditions of moderate pressure glow discharges in argon gas, Postgraduate, E.EYLENCEOĞLU(Student), 2011
RAFATOV İ., Numerical investigation of a DC glow discharge in an argon gas: Two-component plasma model, Postgraduate, E.KEMANECİ(Student), 2009

Jury Memberships

Associate Professor Exam, Associate Professor Exam, Middle East Technical University, October, 2020

Articles Published in Journals That Entered SCI, SSCI and AHCI Indexes

I. **Parametric study of coaxial dielectric barrier discharge in atmospheric pressure argon**
Li H., Yuan C., Kudryavtsev A., Katircioglu T. Y. , RAFATOV İ.
PHYSICS OF PLASMAS, vol.28, no.11, 2021 (Journal Indexed in SCI)

II. **Analysis of parameters of coaxial dielectric barrier discharges in argon flow at atmospheric pressure**
Li H., Yuan C., Kudryavtsev A., Astafiev A., Bogdanov E., Katircioglu T. Y. , RAFATOV İ.
JOURNAL OF APPLIED PHYSICS, vol.129, no.15, 2021 (Journal Indexed in SCI)

III. **Transition from periodic to chaotic oscillations in a planar gas discharge-semiconductor system**
Yuan C., YEŞİL C., Yao J., Zhou Z., RAFATOV İ.
PLASMA SOURCES SCIENCE & TECHNOLOGY, vol.29, no.6, 2020 (Journal Indexed in SCI)

IV. **Numerical evidence of spontaneous division of dissipative solitons in a planar gas discharge-semiconductor system**
RAFATOV İ.
PHYSICS OF PLASMAS, vol.26, no.9, 2019 (Journal Indexed in SCI)

V. **Transition from homogeneous stationary to oscillating state in planar gas discharge-semiconductor system in nitrogen: Effect of fluid modelling approach**
RAFATOV İ., YEŞİL C.
PHYSICS OF PLASMAS, vol.25, no.8, 2018 (Journal Indexed in SCI)

VI. **PIC/MCC analysis of a photoresonance plasma sustained in a sodium vapor**
SARIKAYA C. K. , RAFATOV İ., KUDRYAVTSEV A. A.
PHYSICS OF PLASMAS, vol.24, no.8, 2017 (Journal Indexed in SCI)

VII. **An evidence of period doubling bifurcation in a dc driven semiconductor-gas discharge plasma**
MANSUROGLU D., UZUN-KAYMAK I. U. , RAFATOV İ.

PHYSICS OF PLASMAS, vol.24, no.5, 2017 (Journal Indexed in SCI)

VIII. **Spectroscopic study and numerical simulation of low-pressure radio-frequency capacitive discharge with argon downstream**
Tanisli M., RAFATOV İ., Sahin N., Mertadam S., Demir S.
CANADIAN JOURNAL OF PHYSICS, vol.95, no.2, pp.190-200, 2017 (Journal Indexed in SCI)

IX. **Three-dimensional numerical modelling of temporal and spatial pattern formation in a dc-driven gas discharge-semiconductor system**
RAFATOV İ.
PLASMA SOURCES SCIENCE & TECHNOLOGY, vol.25, no.6, 2016 (Journal Indexed in SCI)

X. **Multiple stationary filamentary states in a planar dc-driven gas discharge-semiconductor system**
RAFATOV İ.
PHYSICS OF PLASMAS, vol.23, no.12, 2016 (Journal Indexed in SCI)

XI. **Particle in cell/Monte Carlo collision analysis of the problem of identification of impurities in the gas by the plasma electron spectroscopy method**
SARIKAYA C. K. , RAFATOV İ., KUDRYAVTSEV A. A.
PHYSICS OF PLASMAS, vol.23, no.6, 2016 (Journal Indexed in SCI)

XII. **Two-dimensional hybrid Monte Carlo-fluid modelling of dc glow discharges: Comparison with fluid models, reliability, and accuracy**
EYLENCEOGLU E., RAFATOV İ., KUDRYAVTSEV A. A.
PHYSICS OF PLASMAS, vol.22, no.1, 2015 (Journal Indexed in SCI)

XIII. **Extension of spatiotemporal chaos in glow discharge-semiconductor systems**
AKHMET M., RAFATOV İ., FEN M. O.
CHAOS, vol.24, no.4, 2014 (Journal Indexed in SCI)

XIV. **Particle in Cell/Monte Carlo Collision Method for Simulation of RF Glow Discharges: Effect of Super Particle Weighting**
ERDEN E., RAFATOV İ.
CONTRIBUTIONS TO PLASMA PHYSICS, vol.54, no.7, pp.626-634, 2014 (Journal Indexed in SCI)

XV. **Account of nonlocal ionization by fast electrons in the fluid models of a direct current glow discharge**
RAFATOV İ., BOGDANOV E. A. , KUDRYAVTSEV A. A.
PHYSICS OF PLASMAS, vol.19, no.9, 2012 (Journal Indexed in SCI)

XVI. **On the accuracy and reliability of different fluid models of the direct current glow discharge**
RAFATOV İ., BOGDANOV E. A. , KUDRYAVTSEV A. A.
PHYSICS OF PLASMAS, vol.19, no.3, 2012 (Journal Indexed in SCI)

XVII. **Effect of focusing geometry on the continuous optical discharge properties**
Rafatov I.
PHYSICS LETTERS A, vol.373, no.37, pp.3336-3341, 2009 (Journal Indexed in SCI)

XVIII. **Radiative gas-dynamic model of a continuous optical discharge in a gravitational field: quasi-optical approximation**
Rafatov I.
JOURNAL OF PHYSICS D-APPLIED PHYSICS, vol.42, no.15, 2009 (Journal Indexed in SCI)

XIX. **Modelling of a continuous optical discharge stabilized by a gas flow in quasi-optical approximation**
RAFATOV İ., YEDİERLER B., KULUMBAEV E. B.
JOURNAL OF PHYSICS D-APPLIED PHYSICS, vol.42, no.5, 2009 (Journal Indexed in SCI)

XX. **Spatiotemporal patterns in a dc semiconductor-gas-discharge system: Stability analysis and full numerical solutions**
Rafatov I. R. , SIJACIC D. D. , EBERT U.
PHYSICAL REVIEW E, vol.76, no.3, 2007 (Journal Indexed in SCI)

XXI. **Modelling of non-uniform DC driven glow discharge in argon gas**
Rafatov I. R. , AKBAR D., BILIKMEN S.
PHYSICS LETTERS A, vol.367, pp.114-119, 2007 (Journal Indexed in SCI)

XXII. **On modelling of microwave heating of a ceramic material**
KOZLOV P. V. , Rafatov I. R. , KULUMBAEV E. B. , LELEVKIN V. M.
JOURNAL OF PHYSICS D-APPLIED PHYSICS, vol.40, no.9, pp.2927-2935, 2007 (Journal Indexed in SCI)

XXIII. **On the modelling of a nonequilibrium spherical microwave discharge at atmospheric pressure**
Rafatov I. R.
CONTRIBUTIONS TO PLASMA PHYSICS, vol.47, no.3, pp.139-146, 2007 (Journal Indexed in SCI)

XXIV. **Self-consistent model of thermal and ionization non-equilibrium spherical microwave discharge**
Rafatov I., LELEVKIN V.
JOURNAL OF PHYSICS D-APPLIED PHYSICS, vol.38, no.13, pp.2227-2236, 2005 (Journal Indexed in SCI)

XXV. **Oscillations in dc driven barrier discharges: Numerical solutions, stability analysis, and phase diagram**
SIJACIC D., EBERT U., Rafatov I.
PHYSICAL REVIEW E, vol.71, no.6, 2005 (Journal Indexed in SCI)

XXVI. **Modelling of a nonequilibrium spherical electric discharge under higher modes of incident microwaves**
Rafatov I., CAKIR S.
PHYSICS LETTERS A, vol.338, pp.353-365, 2005 (Journal Indexed in SCI)

XXVII. **Modelling of a spherical electric discharge at atmospheric pressure under higher modes of incident microwaves**
Rafatov I., KOZLOV P., LELEVKIN V.
CONTRIBUTIONS TO PLASMA PHYSICS, vol.45, no.2, pp.139-154, 2005 (Journal Indexed in SCI)

XXVIII. **Period doubling cascade in glow discharges: Local versus global differential conductivity**
SIJACIC D., EBERT U., Rafatov I.
PHYSICAL REVIEW E, vol.70, no.5, 2004 (Journal Indexed in SCI)

XXIX. **Self-consistent model of non-equilibrium spherical microwave discharge**
Rafatov I., LELEVKIN V.
JOURNAL OF PHYSICS D-APPLIED PHYSICS, vol.37, no.20, pp.2876-2885, 2004 (Journal Indexed in SCI)

Articles Published in Other Journals

I. **One-dimensional fluid and hybrid numerical analysis of the plasma properties in the discharge channel of a Hall thruster**
YUNCULER C., RAFATOV İ., Ulusen D.
TURKISH JOURNAL OF PHYSICS, vol.42, no.6, pp.649-658, 2018 (Journal Indexed in ESCI)

II. **VALIDATION OF THE PARTICLE IN CELL MONTE CARLO COLLISION NUMERICAL CODE FOR THE RF DISCHARGE SIMULATION**
KUŞOĞLU SARIKAYA C., RAFATOV İ., ÇAKIR S.
Balkan Physics Letters, vol.24, pp.36-47, 2016 (Refereed Journals of Other Institutions)

III. **Difference schemes for the class of singularly perturbed boundary value problems**
Sklyar S. N. , RAFATOV İ.
Applied Numerical Analysis & Computational Mathematics, vol.1, no.1, pp.223-230, 2004 (Refereed Journals of Other Institutions)

Books & Book Chapters

I. **Introduction to Simulation Methods for Gas Discharge Plasmas**
Rafatov İ., Kudryavtsev A.
Institute of Physics Publishing (IOP) , Bristol, 2020

Refereed Congress / Symposium Publications in Proceedings

I. **Transition to Chaos in Planar Gas Discharge-Semiconductor System in Nitrogen: Effect of Fluid Modelling Approach**
YEŞİL C., RAFATOV İ.
Computational Science and Engineering Conference BEYOND 2019, Ankara, Turkey, 2 - 11 September 2019, pp.61

II. **Plasma physics research at METU and other research institutions in Turkey**
RAFATOV İ.
Symposium on Plasma Physics and Fusion Energy, American University of Beirut, Beyrut, Lebanon, 07 November 2017

III. **Incorporation of the electron energy equation into the hybrid Monte Carlo fluid model for glow discharge the applicability and reliability of the model**
EYLENCEOĞLU E., RAFATOV İ., Kudryavtsev A.
69th Annual Gaseous Electronics Conference, Bochum, Germany, 10 - 14 October 2016, vol.61

IV. **Particle in Cell Monte Carlo Collision Analysis of the Problem of Identification of Impurities in Gas within the Plasma Electron Spectroscopy Method**
KUŞOĞLU SARIKAYA C., RAFATOV İ., Kudryavtsev A.
69th Annual Gaseous Electronics Conference, Bochum, Germany, 10 - 14 October 2016, vol.61

V. **ARC DISCHARGE SIMULATIONS FOR MAGNETOPLASMADYNAMIC THRUSTER WITH HOLLOW CATHODE**
Eliseev S., Saifutdinov A., Kudryavtsev A., ÇAKIR S., RAFATOV İ.
VIII International Conference on Plasma Physics and Plasma Technology (PPPT-8), Minsk, Belarus, 14 - 18 September 2015

VI. **NUMERICAL ANALYSIS OF FORMATION OF HEXAGONAL ANDBAND STRUCTURES IN THE GAS DISCHARGE SEMICONDUCTORSYSTEM**
RAFATOV İ.
VIII International Conference on Plasma Physics and Plasma Technology (PPPT-8), Minsk, Belarus, 14 - 18 September 2015

VII. **Study of Self organization and Current Filamentation in the Glow Gas Discharge System**
RAFATOV İ., ÇAKIR S.
International Workshop "Nonlinear Photonics: Theory, Materials, Applications"!, Sankt-Peterburg, Russia, 29 June - 02 July 2015, pp.21

VIII. **Density Gradient Instability in Hall Thrusters**
ÇAKIR S., RAFATOV İ.
International Workshop "Nonlinear Photonics: Theory, Materials, Applications", Sankt-Peterburg, Russia, 29 June - 02 July 2015, pp.20

IX. **VALIDATION AND PARALLELIZATION OF THE PARTICLE IN CELL/MONTE CARLO COLLISION NUMERICAL CODE FOR THE RF DISCHARGE SIMULATIONS**
SARIKAYA C. K. , RAFATOV İ., ÇAKIR S.
IEEE International Conference on Plasma Sciences (ICOPS), Belek, Turkey, 24 - 28 May 2015

X. **3D numerical model for a temporal and spatial pattern formation in a dc glow discharge semiconductor system**
RAFATOV İ.
The XXII Europhysics Conference on Atomic and Molecular Physics of Ionized Gases (ESCAMPIG, Greifswald, Germany, 15 - 19 July 2014, pp.453-454

XI. **Three dimensional numerical modelling of structure formation in the plasma of a dc driven barrier discharge**
RAFATOV İ.
International Conference on Physics of Low Temperature Plasma, Kazan, Russia, 20 - 23 May 2014

XII. **Investigation of pattern formation in planar gas discharges**
UZUN KAYMAK İ. Ü. , RAFATOV İ.

IMEPS International Middle East Conference on Plasma Science, Antalya, Turkey, 23 - 25 April 2014

XIII. **Fluid and hybrid numerical modeling of plasma properties in the discharge channel of a Hall thruster**
Yüncüler Ç., RAFATOV İ., Uluşen D.
The International Middle East Plasma Science (IMEPS), Antalya, Turkey, 23 - 25 April 2014

XIV. **Validation of the Particle in Cell Monte Carlo Collision numerical code for the RF discharge simulations**
KUŞOĞLU SARIKAYA C., RAFATOV İ., ÇAKIR S.
The International Middle East Plasma Science (IMEPS), Antalya, Turkey, 23 - 25 April 2014

XV. **Numerical study of nonlinear oscillations and pattern formation in glow discharge semiconductor system**
RAFATOV İ., UZUN KAYMAK İ. Ü. , ÇAKIR S.
Zvenigorod International Conference on Plasma Physics and Controlled fusion, Zvenigorod, Russia, 10 - 14 February 2014, pp.178

XVI. **Two-dimensional hybrid model for a glow discharge: comparison with fluid and kinetic (particle) models, reliability and accuracy**
EYLENCEOGLU E., RAFATOV İ.
16th Russian Youth Conference on Physics and Astronomy (PhysicA.SPb), St Petersburg, Russia, 23 - 24 October 2013, vol.572

XVII. **PIC MCC method for numerical simulation of RF glow discharges Effect of super particle weighting and parallelization**
Erden E., RAFATOV İ.
4th Workshop on Radiofrequency Discharges, Presqu'ile de Giens, France, 29 - 31 May 2013

XVIII. **Hybrid modelling of a dc glow discharge with account of nonlocal ionization by fast electrons**
RAFATOV İ., Bogdanov E., Kudryavtsev A.
VII International Conference Plasma Physics and Plasma Technology (PPPT-7), Minsk, Belarus, 17 - 21 September 2012, vol.1, pp.14-17

XIX. **On the numerical modelling of a dc driven glow discharge plasma**
RAFATOV İ., Bogdanov E., Kudryavtsev A.
30th International Conference on Phenomena in Ionized Gases (ICPIG), Belfast, United Kingdom, 28 August - 02 September 2011, pp.1-4

XX. **Fluid model of dc glow discharge with nonlocal ionization source term**
RAFATOV İ., BOGDANOV E. A. , KUDRYAVTSEV A. A.
12th European Plasma Conference on High-Tech Plasma Processes (HTPP), Bologna, Italy, 24 - 29 June 2012, vol.406

Activities in Scientific Journals

Anadolu Üniversitesi Bilim ve Teknoloji Dergisi: B-Teorik Bilimler, Committee Member, 2019 - Continues
ANADOLU UNIVERSITY JOURNAL OF SCIENCE AND TECHNOLOGY - A Applied Sciences and Engineering, Committee Member, 2019 - Continues

Citations

Total Citations (WOS):307
h-index (WOS):9