Boris Barmashenko January 21, 2018

CURRICULUM VITAE

- **Personal Details**

Name	Boris Barnashenko
Date and place of birth	August 7, 1957, Kiev, USSR
Date of immigration	February 7, 1991
Address and telephone number at work	Department of Physics, Ben-Gurion University of the Negev, P.O.B.653, Beer-Sheva, 84105; Tel. 08-6477127
Address and telephone number at home	Richard Shtein 28, Beer-Sheva, 8450528; Tel. 08-6441314

- **Education**

B.Sc.-	1974-1978, Moscow Institute of Physics and Technology, Aeromechanics
M.Sc.-	1978-1980, Moscow Institute of Physics and Technology, Aeromechanics Name of advisor: Prof. V. M. Kuznetsov Title of thesis: Nonequilibrium of gas - surface - solid in problems of relaxational gasdynamics
Ph.D.-	1980-1985, Institute of Physics (Dept. of Laser Physics) /Institute of Semiconductors (Dept. of Theoretical Physics), Academy of Sciences of the Ukrainian SSR Names of advisors: Prof. V. A. Kochelap & Prof. S. I. Pekar. Title of thesis: Theoretical studies of the dense active media for lasers with chemical and thermal pumping

- **Employment History**

2017 – pres.
Adjunct professor, experimental and theoretical studies and teaching
Department of Physics, BGU

1998 - 2017
Senior Researcher (grade A, Kamea Program), experimental and theoretical studies and teaching
Department of Physics, BGU

1991-1998
Researcher (Grade C, Gileadi Program), experimental and theoretical studies and teaching
Department of Physics, BGU

1980-1991
Researcher, Studies in laser physics

Institute of Semiconductors Academy of Sciences of the Ukrainian SSR, Kiev, USSR

1979-1980
Engineer-researcher, Studies of chemically reacting gas flows
N. E. Zhukovsky Central Aero-Hydrodynamical Institute, Moscow, USSR

- **Professional Activities**
  - (a) Positions in academic administration N/A
  - (b) Professional functions outside universities/institutions

2002-2012	Member of the International Advisory Committee, International Symposium on Gas Flow and Chemical Lasers&High Power Lasers.
2007	Member of the program committee, International Conference on Lasers, Applications, and Technologies (LAT 2007), Minsk.
2012-pres	Member of the International Advisory Committee, International Symposium on High Power Laser Systems&Applications.

  - (c) Significant professional consulting

2012-2013	Soreq Nuclear Research Center, Aggregation of nanoparticles in powder laser.

  - (d) Editor or member of editorial board of scientific or professional journal N/A
  - (e) Ad-hoc reviewer for journals
    J. Phys. Chem., Appl. Phys. Lett., Appl. Phys. B, Appl Optics, JOSA B, Opt. Lett., Opt Express, Opt. Commun., Opt. and Laser Technology, IEEE JQE, AIAA Journal
  - (f) Membership in professional/scientific societies
    1995-1996, American Institute of Aeronautics and Astronautics (AIAA)
    1996-1997, SPIE

- **Educational Activities**
  - (a) Courses taught

1991	Introduction to Physics, undergraduate, Faculty of Engineering, BGU
1996-2015	Radiation Theory, undergraduate+graduate, Dept. of Physics, BGU
2008-2009	Physics 3, undergraduate, Dept. of Materials Eng., BGU
2010	Physics 2B, undergraduate, Dept. of Materials Eng., BGU
2011	Physics 2C, undergraduate, Depts. of Life Sc. and Geological and Enviromental Sc.
2011-2016	Physics 2A, undergraduate, Dept. of Electrical and Computer Eng.
2011-2016	Lasers Seminar, graduate, Dept. of Physics
2015-2016	Physics 2B, undergraduate, Dept. of Industrial Eng., BGU
2016	Physics 2B, undergraduate, Dept. of Chemistry, BGU
2017	Physics 2B, undergraduate, Depts. of Chemical Engineering and Matherials Engineering, BGU
2017	Physics 2C, undergraduate, Depts. of Biology, Medicine and Geology, BGU

(b) Research students

I. Blayvas, M.Sc., 1996, BGU (jointly with Prof. S. Rosenwaks)
D. Furman, M.Sc. and Ph. D., 2000, BGU (jointly with Prof. S. Rosenwaks)
E. Bruins, M. Sc., 2001, BGU (jointly with Prof. S. Rosenwaks)
V. Rybalkin, M. Sc. and Ph. D., 2005, BGU (jointly with Prof. S. Rosenwaks)
A. Katz, Ph. D., 2005, BGU (jointly with Prof. S. Rosenwaks)
Z. Dahan, M. Sc., 2009, BGU (jointly with Prof. S. Rosenwaks)
I. Brami-Rosilio, M. Sc., 2011, BGU (jointly with Prof. S. Rosenwaks)
R. Kupfer, M. Sc., 2013, BGU (jointly with Prof. I. Bar)
T. Cohen, M. Sc., 2016, BGU (jointly with Prof. S. Rosenwaks and Dr. E. Lebiush)
I. Auslender, Ph.D, current student, BGU (jointly with Prof. S. Rosenwaks)
E. Yacoby, Ph.D., current student, BGU (jointly with Profs. S. Rosenwaks and O. Sadot)

- **Awards, Citations, Honors, Fellowships**

(a) Honors, Citation, Awards (including during studies)

2003, Record chemical efficiency, 33%, achieved in the chemical oxygen iodine laser (see Scientific publications, section (d), Ref.35) was mentioned in Opt.Org electronic journal as an extremely important achievement and then it was mentioned in the December 2003 issue of Aerospace America as one of the most important achievement in the development of lasers in 2003.

(b) Fellowships N/A

- **Scientific Publications**

a) H-index (from ISI): 17; H-index (from ISI) without self-citations: 14
b) Total number of citations of all articles (from ISI): 784
c) Total number of citations without self-citations (from ISI): 465

(a) Autorized books N/A
(b) Editorship of collective volumes N/A
(c) Refereed chapters in collective volumes, Conference proceedings, Festschrifts, etc. (running numbers).

Refereed chapters in collective volumes

1. **B.D. Barmashenko**[PI] and S. Rosenwaks[PI] (2003), "Chemical Lasers: COIL," *Handbook of Laser Technology and Applications*, Institute of Physics, Editors, C. Webb and J. Jones, Vol. 2, 861-880 [22 citations (GS)].

Conference proceedings:

2. **B.D. Barmashenko**[PI] and V. V. Naumov[CI] (1982) "Localization of light in the boundary layers with population inversion for the flows of CO_2 - N_2 - H_2O mixtures in a supersonic nozzles," *Kinetical and gasdynamic processes in nonequilibrium gases*/ Ed. A. M. Prokhorov, Moscow State University Publ., p. 26, in Russian.
3. **B.D. Barmashenko**[PI] (1982), "Amplification and localization of light in the boundary layer with the reaction of atomic photorecombination," *Kinetical and gasdynamic processes in nonequilibrium gases*/ Ed. A. M. Prokhorov, Moscow State University Publ., pp. 43 - 44, in Russian.

4. V.A. Kochelap[PI], **B.D. Barmashenko**[PI], I.A. Ismailov[CI] and L.Yu. Mel'nikov[CI] (1984), "Singlet oxygen of high density and its utilisation in electronic transition lasers," *Gas Flow and Chemical Lasers*, Editors, A. S. Kaye and A. C. Walker, Adam Hilger Ltd., pp. 175 - 80.
5. **B. D. Barmashenko**[PI], V.A. Kochelap[PI] and L.Y. Melhnikov[CI] (1989), "Formation of active medium for IR and visible chemical lasers during the combustion of finely dispersed metal particles in the oxidizer," Proc. SPIE **1301**, 428-432.
6. **B. D. Barmashenko**[PI] and V.A. Kochelap[CI] (1991), "The possibility of long population-inversion in active media for IR chemical lasers," Proc. SPIE **1397**, 303-307.
7. **B.D. Barmashenko**[PI], A. Elior[S], E. Lebiush[S] and S. Rosenwaks[PI] (1993), "The effect of mixing on iodine dissociation, population inversion and lasing in chemical oxygen-iodine laser," Proc. SPIE **1810**, 513 – 516 (2 citations).
8. **B.D. Barmashenko**[PI] and S. Rosenwaks[PI] (1993), "Modeling of high pressure $O_2(^1\Delta)$ generator for chemical oxygen-iodine laser," Proc. SPIE **1810**, 517 - 520.
9. **B.D. Barmashenko**[PI], A. Elior[S], E. Lebiush[S] and S. Rosenwaks[PI](1994), "Gain and power in COILs - Theory and Experiment," AIAA **94-2434**.
10. S. Rosenwaks[PI], **B.D. Barmashenko**[PI], A. Elior[S], E. Lebiush[S] and I. Blayvas[S] (1995), "Parametric Studies of a Small Scale Supersonic COIL," Proc. SPIE **2502**, 238 - 243.
11. **B.D. Barmashenko**[PI] and S. Rosenwaks[PI] (1995), "Theoretical modeling of iodine dissociation in COILs," AIAA **95-1924**.
12. **B.D. Barmashenko**[PI] and S. Rosenwaks[CI] (1995), "Simple analytical expressions for the optical extraction efficiency from COILs with different kinds of resonators," AIAA **95-1925**.
13. S. Rosenwaks[PI], I. Blayvas[S], **B.D. Barmashenko**[PI], D. Furman[S] and M.V. Zagidullin[CI] (1997), "Experimental study of a small scale COIL using a jet type generator of singlet oxygen," Proc. SPIE **3092**, 690-693.
14. **B.D. Barmashenko**[PI] and S. Rosenwaks[CI] (1997), "Analysis of lasing in COILs with wide aperture of the mirrors in the resonator," Proc. SPIE **3092**, 682-685 (1 citation).
15. S. Rosenwaks[PI], **B. D. Barmashenko**[PI] and D. Furman[S] (1997), "Results of recent experiments on a small scale COIL/jet generator system," AIAA **97-2389**.
16. **B.D. Barmashenko**[PI], D. Furman[S] and S. Rosenwaks[CI] (1997), "Modeling of lasing in COILs with stable resonators," AIAA **97-2390**.
17. D. Furman[S], **B.D. Barmashenko**[PI] and S. Rosenwaks[PI] (1998), "Parametric studies of a small scale chemical oxygen-iodine laser/jet generator system: recent achievements," Proc. SPIE **3268**, 146-158.
18. **B.D. Barmashenko**[PI], D. Furman[S] and S. Rosenwaks[PI] (1999), "Chemical oxygen iodine laser investigations in Israel," Proc. SPIE **3574**, 273 – 280 (1 citation).
19. **B.D. Barmashenko**[PI], D. Furman[S], E. Bruins[S] and S. Rosenwaks[PI] (1999), "Iodine Dissociation and Small Signal Gain in Supersonic COILs," AIAA **99-3427**.
20. S. Rosenwaks[PI], D. Furman[PI], E. Bruins[PI] and **B.D. Barmashenko**[PI] (1999), "Gain Diagnostic in a Supersonic COIL with Transonic Injection of Iodine," AIAA **99-3428**.
21. S. Rosenwaks[PI], D. Furman[S], E. Bruins[S], V. Rybalkin[S] and **B.D. Barmashenko**[PI] (2000), "Gain, Yield and Water Vapor Diagnostics in Supersonic COILs with Different Schemes of Iodine Injection," AIAA **2000-2491**.
22. S. Rosenwaks[PI], E. Bruins[S], D. Furman[S], V. Rybalkin[S] and **B.D. Barmashenko**[PI] (2000), "Supersonic COIL with iodine injection in transonic and supersonic sections of the nozzle," Proc. SPIE **4184**, 19 – 22.

23. **B.D. Barmashenko**[PI], E. Bruins[S], D. Furman[S], V. Rybalkin[S] and S. Rosenwaks[PI] (2000), "Iodine Dissociation in Supersonic COILs with Different Schemes of Iodine Mixing," Proc. SPIE **4184**, 66 – 69.
24. S. Rosenwaks[PI], **B.D. Barmashenko**[PI], D. Furman[S], E. Bruins[S] and V. Rybalkin[S] (2001),"Current Status of Chemical Oxygen-Iodine Laser Research," Proc. SPIE **4351**, 72-80.
25. S. Rosenwaks[PI], **B. D. Barmashenko**[PI], E. Bruins[S], D. Furman[S], V. Rybalkin[S] and A. Katz[S] (2002), "Gain and temperature in a slit nozzle supersonic chemical oxygen-iodine laser with transonic and supersonic injection of iodine," Proc. SPIE **4631**, 23 – 33 (4 citations).
26. **B.D. Barmashenko**[PI], E. Bruins[S], D. Furman[S], V. Rybalkin[S] and S. Rosenwaks[PI] (2002), "Modeling of the gain, temperature, and iodine dissociation fraction in a supersonic chemical oxygen-iodine laser," Proc. SPIE **4631**,74 – 85(1 citation).
27. **B.D. Barmashenko**[PI], V. Rybalkin[S], A. Katz[S], E. Bruins[S], D. Furman[S] and S. Rosenwaks[PI] (2003), "Mechanisms of COIL operation: experiment and modeling," Proc. SPIE **5120**, 308-315 (5 citations).
28. S. Rosenwaks[PI], V. Rybalkin[S], A. Katz[S], and **B. D. Barmashenko**[PI] (2003), "Comparative Studies of Different Schemes of Iodine Injection in a High Efficiency Supersonic COIL," AIAA **2003-4302**.
29. **B.D. Barmashenko**[PI], V. Rybalkin[S], A. Katz[S] and S. Rosenwaks[PI] (2004), "Parametric study of the Ben-Gurion University efficient chemical oxygen-iodine laser," Proc. SPIE **5448**, 282-293 (2 citations).
30. S. Rosenwaks[PI], V. Rybalkin[S], A. Katz[S] and **B. D. Barmashenko**[PI] (2004), "Recent studies of Ben-Gurion University high efficiency supersonic chemical oxygen-iodine laser," Proc. SPIE **5777**, 87 – 95.
31. S. Rosenwaks[PI], V. Rybalkin[S], A. Katz[S] and **B. D. Barmashenko**[PI] (2005), "Diagnostic Studies of Ben-Gurion University High Efficiency Supersonic COIL," AIAA **2005-5165**.
32. **B. D. Barmashenko**[PI], V. Rybalkin[S], A. Katz[S] and S. Rosenwaks[PI] (2006), "Detailed gain measurements and analysis of a highly efficient supersonic COIL," Proc. SPIE **6053**, 605306.
33. K. Waichman[CI], V. Rybalkin[S], A. Katz[S], Z. Dahan[S], **B. D. Barmashenko**[PI] and S. Rosenwaks[PI] (2007), "A computational fluid dynamics simulation of a supersonic chemical oxygen-iodine laser," Proc. SPIE **6346**, 63462D.
34. V. Rybalkin[S], A. Katz[S], K. Waichman[CI], D. Vingurt[S], Z. Dahan[S], **B. D. Barmashenko**[PI] and S. Rosenwaks[PI] (2007), "Studies of iodine dissociation in the chemical oxygen-iodine laser," Proc. SPIE **6346**, 63460A.
35. S. Rosenwaks[PI], K. Waichman[PI], V. Rybalkin[S], A. Katz[S], Z. Dahan[S] and B. **Barmashenko**[PI] (2007), "Combined experimental and theoretical studies of I_2 dissociation in supersonic COILs," AIAA-**2007-4238**.
36. A. Katz[S], K. Waichman[CI], Z. Dahan[S], V. Rybalkin[S], **B.D. Barmashenko**[PI] and S. Rosenwaks[PI] (2007), "Dissociation of I_2 in chemical oxygen-iodine lasers: experiment, modeling and pre-dissociation by electrical discharge," Proc. SPIE **6735**, 673504.
37. I. Brami-Rosilio[S], K. Waichman[CI], **B.D. Barmashenko**[PI] and S. Rosenwaks[PI] (2009), "Supersonic COILs at Ben-Gurion University: (1) experiments on 10-cm gain-length device and (2) computational fluid dynamics modelling," Proc. SPIE **7131**, 71310D.
38. K. Waichman[CI], **B.D. Barmashenko**[PI] and S. Rosenwaks[PI] (2009), "A computational fluid dynamics simulation of a high pressure ejector COIL and comparison to experiments," Proc. SPIE **7131**, 71310R (1 citation).

39. **B. D. Barmashenko**[PI] (2009), "Analysis of lasing in COILs with positive and negative branch unstable resonators using a simple geometrical-optics model," Proc. SPIE **7131**, 71310S.
40. S. Rosenwaks[PI], **B. Barmashenko**[PI] and K. Waichman[CI] (2010), **"**Modeling of the Gain and the Power in Chemical Oxygen-Iodine Lasers**,"** AIAA-**2010-4755**.
41. S. Rosenwaks[PI], **B.D. Barmashenko**[CI] and K Waichman[CI] (2010), "A historical overview on the mechanism of the COIL kinetics," Proc. SPIE, **7751**, 775106.
42. **B.D. Barmashenko**[PI], K Waichman[CI] and S. Rosenwaks[PI] (2010), "Lasing in supersonic chemical oxygen-iodine lasers: recent modeling and comparison with experiment," Proc. SPIE, **7751**, 775107.
43. S. Rosenwaks[PI], I. Brami-Rosilio[S], K. Waichman[CI] and **B. D. Barmashenko**[PI] (2012), "I_2 Dissociation Mechanisms in the Chemical Oxygen-Iodine Laser Revisited Using Three- and One- Dimensional Computational Fluid Dynamics Modeling," AIAA-**2012-3088**.
44. **B.D. Barmashenko**[PI] and S. Rosenwaks[PI] (2012), "Modeling of Static and Flowing-Gas Diode Pumped Alkali Lasers", SPIE **8547**, 854710.
45. S. Rosenwaks[PI], **B.D. Barmashenko**[PI] and K. Waichman[CI] (2013), "What Can We Gain from Supersonic Operation of Diode Pumped Alkali Lasers: Model Calculations," Proc. SPIE **8898**, 88980X (7 citations).
46. **B.D. Barmashenko**[PI], S. Rosenwaks[PI] and K. Waichman[CI] (2013), "Model Calculations of Kinetics and Fluid Dynamics in Diode Pumped Alkali Lasers", Proc. SPIE **8898**, 88980W (5 citations).
47. S. Rosenwaks[PI], **B.D. Barmashenko**[PI] and K. Waichman[CI] (2014), "Semi-analytical and 3D CFD DPAL modeling: Feasibility of supersonic operation," SPIE **8962**, 896209 (9 citations).
48. **B.D. Barmashenko**[PI], S. Rosenwaks[PI] and K. Waichman[CI] (2014), "Kinetic and fluid dynamic processes in diode pumped alkali lasers: semi-analytical and 2D and 3D CFD modeling," SPIE **8962**, 89620C (4 citations).
49. K. Waichman[CI], **B.D. Barmashenko**[PI] and S. Rosenwaks[PI] (2014), "CFD DPAL modeling for various schemes of flow configurations," SPIE **9251**, 92510U (4 citations).
50. S. Rosenwaks[PI], **B.D. Barmashenko**[PI] and K. Waichman[CI] (2014), "Theoretical studies of the feasibility of supersonic DPALs," SPIE **9251**, 92510W (2 citations)
51. **B.D. Barmashenko**[PI], S. Rosenwaks[PI] and K. Waichman[CI] (2014), "Comparison of semi-analytical to CFD model calculations and to experimental results of subsonic flowing-gas and static DPALs," SPIE **9251**, 92510V.
52. **B.D. Barmashenko**[PI], S. Rosenwaks[PI] and K. Waichman[CI] (2015), "Semi-analytical and CFD model calculations of subsonic flowing-gas DPALs and their comparison to experimental results," SPIE **9255**, 925520.
53. S. Rosenwaks[PI], E. Yacoby[S], K. Waichman[CI], O. Sadot[CI] and **B.D. Barmashenko[PI]** (2015), "Supersonic diode pumped alkali lasers: Computational fluid dynamics modeling," Proc. SPIE **9650**, 96500A.
54. K. Waichman[CI], **B.D. Barmashenko**[PI] and S. Rosenwaks[PI] (2015), "CFD assisted simulation of temperature distribution and laser power in pulsed and CW pumped static gas DPALs," Proc. SPIE **9650**, 96500C (1 citation).
55. **B.D. Barmashenko**[PI], I. Auslender[S], S. Rosenwaks[PI], B. Zhdanov[CI], M. Rotondaro[CI] and R.J. Knize[CI] (2015), "Modeling of pulsed K DPAL taking into account the spatial variation of the pump and laser intensities in the transverse direction," Proc. SPIE **9650**, 96500B.

56. E. Yacoby[S], O. Sadot[CI], **B.D. Barmashenko**[PI] and S. Rosenwaks[PI] (2015), "3D CFD modeling of subsonic and transonic flowing-gas DPALs with different pumping geometries," Proc. SPIE **9650**, 96500E.
57. **B.D. Barmashenko**[PI], I. Auslender[S], E. Yacoby[S], K. Waichman[CI], O. Sadot[CI] and S. Rosenwaks[PI] (2016), "Modeling of static and flowing-gas diode pumped alkali lasers," Proc. SPIE **9729**, 972904.
58. **B.D. Barmashenko**[PI], T. Cohen[S], E. Lebiush[CI], I. Auslender[S] and S. Rosenwaks[PI] (2016), "Experimental and theoretical study of the performance of optically pumped cesium vapor laser as a function of the pump-to-laser beam overlap," Proc. SPIE **9990**, 99900F.
59. E. Yacoby[S], K. Waichman[CI], O. Sadot[CI], **B.D. Barmashenko[PI]** and S. Rosenwaks[CI] (2017), "3D CFD Modeling of flowing-gas DPALs with different pumping geometries and various flow velocities," Proc. SPIE **10254**, 102540O.
60. I. Auslender[S], T. Cohen[S], E. Lebiush[CI], **B.D. Barmashenko[PI]** and S. Rosenwaks[CI] (2017), "Optically-pumped Cs vapor lasers: pump-to-laser beam overlap optimization," Proc. SPIE **10254**, 102540P.
61. E. Yacoby[S], O. Sadot[CI], B.D. Barmashenko[PI] and S. Rosenwaks[CI] (2017), "Scaling up and controlling beam quality of flowing-gas diode pumped potassium laser with different pumping geometries: 3D CFD modeling," Proc. SPIE **10436**, 104360D.
62. I. Auslender[S], B. D. Barmashenko[PI] and S. Rosenwaks[CI] (2017), "Modeling of multi-transversal mode lasing in static alkali vapor lasers," Proc. SPIE **10436**, 104360E.
63. S. Rosenwaks[PI], I. Auslender[S], E. Yacoby[S] and B. D. Barmashenko[PI] (2017), "Experimental studies of static Cs DPALs: Measurements of the power and M^2 factor as a function of different parameters," Proc. SPIE **10436**, 104360C.
64. K. Waichman[PI], B. D. Barmashenko[PI] and S. Rosenwaks[CI] (2017), "Three-dimensional simulation of beam propagation and heat transfer in static gas DPALs using wave optics and fluid dynamics models," Proc. SPIE **10436**, 104360F.

(d) Refereed articles and refereed letters in scientific journals, running numbers

1. V. P. Agafonov[PI], **B.D. Barmashenko**[S] and M. M. Kuznetsov[CI] (1980), "Simulation of nonequilibrium heat flux allowing for dependencies of the catalytic recombination coefficients on partial pressures and temperatures," Uchenie zapiski CAGI (The notes of N. N. Zhukovsky Central Aerohydrodynamical Institute), No. 4, pp. 46 – 55.
2. **B.D. Barmashenko**[S], V.M. Kuznetsov[PI] and M.M. Kuznetsov[CI] (1983), "Nonequilibrium of gas - surface - solid in problems of relaxational gasdynamics," J. Appl. Mech. and Tech. Phys. (USA) **24**, No.2,135 – 44
3. **B.D. Barmashenko**[PI] (1984), "Visible-light localization and amplification in the boundary-layer under a flow around the critical point of a cooled blunt body," Ukr. Fiz. Zh. (USSR) **29**, No.2, 178-83.
4. **B.D. Barmashenko**[PI] and V.V. Naumov[CI] (1984), "Amplification of radiation in the boundary layer on the intensively cooled walls of a Laval nozzle," Kvantovaya elektron., Kiev (USSR), No.26, 30 - 38.
5. **B.D. Barmashenko**[PI], V.A. Kochelap[PI] and V.V. Naumov[CI] (1984), "Waveguide phenomena in solid relaxation gases and its utilization in chemical and gas-dynamic lasers," Sov. Phys.- Tech. Phys. (USA) **29**, 1027-1032 (0 citations, IF 0.344, 58/66, Q4).
6. **B.D. Barmashenko**[PI] (1985), "Theoretical model for photostimulated combustion of dispersed mixtures in an optical resonator," Kvantovaya electron., Kiev (USSR), No.28, 14 - 28.

7. **B.D. Barmashenko**[PI] (1985), "Amplification of radiation behind the front of shock wave in high pressure H_2 - F_2 mixtures", Sov. J. Quant. Electron. (USA) **15**, 777-780 (0 citations, IF 0.758, 55/208, Q2).
8. **B. D. Barmashenko**[PI], V.A. Kochelap[CI], E.A. Shvarchuk[PI] and M.T. Shpak[CI] (1985), "On the formation mechanism of an active chemical laser medium during the electrical explosion of conductors in the oxidizer atmosphere," Ukr. Fiz. Zh. (USSR) **30**/7, 980 - 983.
9. **B.D. Barmashenko**[PI], V.A. Kochelap[PI] and L.Yu. Mel'nikov[CI] (1985), "Singlet oxygen generator of the atomizer type," Sov. J. Quantum. Electron. (USA) **15**, 1346 – 1352 (1 citation, IF 0.758, 55/208, Q2).
10. **B.D. Barmashenko**[PI], V.A. Kochelap[PI] and L.Yu. Mel'nikov[CI] (1985), "Concerning a generator of singlet oxygen of the atomizing type," Kvantovaya electron., Kiev (USSR), No.29, 3 - 11.
11. **B. D. Barmashenko**[PI], V. A. Kochelap[PI] and L.Yu. Mel'nikov[CI] (1987), "Formation of active medium for visible range lasers with chemical pumping by radiational vaporization of metal particles in an oxidizer atmosphere," Sov. Phys.- Tech. Phys. (USA) **32**, 786 – 790 (4 citations, IF 0.344, 58/66, Q4).
12. **B.D. Barmashenko**[PI] and V.A. Kochelap[PI] (1988), "IR chemical lasers: active medium formation via combustion of finely dispersed metal particles in an oxidizing atmosphere," Chem. Phys. Lett.**149**, 68 – 72 (1 citations, IF 2.441, 7/31, Q1).
13. **B.D. Barmashenko**[PI] and V.A. Kochelap[CI] (1989), "Self-accelerating photostimulated combustion of disperse media in the optical cavity," Ukr. Fiz. Zh. **34**, No. 9, 1327 - 1330.
14. **B. D. Barmashenko**[PI], V. A. Kochelap[CI], E. A. Shvarchuk[PI] and M. T. Shpak[CI] (1989), "Formation of the active medium of an infrared chemical laser by combustion of finely dispersed metal particles in the oxidizer," Sov. Phys.- Tech. Phys. (USA) **34**, 432 – 438 (1 citation, IF 0.344, 58/66, Q4).
15. **B.D. Barmashenko**[PI], V.A. Kochelap[PI] and A.I. Landa[CI] (1989),"Self-accelerated photostimulated combustion of dispersion media in an optical resonator," Sov. Phys.- Tech. Phys. (USA) **34**, 72 – 82 (0 citations, IF 0.344, 58/66, Q4).
16. **B. D. Barmashenko**[PI] and V. A. Kochelap[CI] (1991), "The possibility of long population inversion in active media for IR chemical lasers," Chem. Phys. **190**, 29 - 38.
17. **B. D. Barmashenko**[PI] and S. Rosenwaks[PI] (1993), "Theoretical modeling of chemical generators producing $O_2(^1\Delta)$ at high pressure for chemically pumped iodine laser," J. Appl. Phys. **73**, 1598 – 1611 (15 citations, IF 1.63, 7/62, Q1).
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(e) Published scientific reports and technical papers N/A
(f) Unrefereed professional articles and publications N/A
(g) Classified articles and reports N/A

- **Lectures and Presentations at Meetings and Invited Seminars**

References to proceedings are listed above in Scientific Publications, section (c).

(a) Invited plenary lectures at conferences/meetings

1. May 1998, “Modeling of power dependence on flow parameters in the transonic mixing COIL,” COIL-R&D Workshop, Prague’98, Czech Republic.
2. August 1998, "COIL investigations in Israel," XII International Symposium on Gas Flow and Chemical Lasers and High Power Laser Conference, St.Petersburg, Russia (Ref. 18).
3. Sept. 1999, "Iodine dissociation and small signal gain in supersonic COILs,” COIL-R&D Workshop, Prague’99, Czech Republic.
4. May 2001,“One-Dimensional Modeling of the Gain and Temperature in a Supersonic Chemical Oxygen-Iodine Laser with Transonic Mixing of Iodine,” COIL-R&D Workshop, Prague’2001, Czech Republic.
5. Aug. 2002, ”Mechanisms of COIL operation: experiment and modeling,” XIV International Symposium on Gas Flow and Chemical Lasers and High Power Laser Conference, Wrotslav, Poland (Ref. 27).
6. Sept. 2003, “Experimental study of the gain, temperature and iodine dissociation in a supersonic COIL,” COIL-R&D Workshop, Stuttgart’2003, Germany.
7. Sept. 2005, “Detailed Diagnostic Studies and Analysis of a Highly Efficient Supersonic COIL," COIL-R&D Workshop, Stuttgart’2005, Germany.
8. June 2006,"Detailed diagnostic study of the iodine dissociation in a highly efficient supersonic COIL," Laser Optics 2006 Conference, St-Petersburg, Russia.
9. Oct. 2006, "Energy losses for iodine dissociation in the chemical oxygen - iodine laser," ILLA/LTL '2006 (International conference on laser and laser-information technologies/symposium on laser technologies and lasers), Smolyan, Bulgaria.
10. May 2007,"Dissociation of I_2 in chemical oxygen-iodine lasers: experiment, modeling and pre-dissociation by electrical discharge," ICONO/LAT 2007 (Int’l Conference on Coherent and Nonlinear Optics/Lasers, Applications and Technologies), Minsk, Belarus (Ref. 36).
11. June 2008, "Supersonic COILs at Ben-Gurion University: experimental and theoretical studies," Laser Optics 2008 Conference, St-Petersburg, Russia.
12. Oct. 2009, “Modeling of Lasing in Chemical Oxygen-Iodine Lasers with Unstable Resonators," COIL-R&D Workshop, Stuttgart’2009, Germany.
13. Oct. 2009, "Modeling of lasing in chemical oxygen-iodine lasers with unstable resonators," ILLA / LTL '2009 (International conference on laser and laser-information technologies/symposium on laser technologies and lasers), Smolyan, Bulgaria (Proc. of Int. conference and symposium: X International Conference “Laser and laser-information technologies: fundamental problems and applications”, ILLA’2009; VI International Symposium “Laser technologies and lasers”, LTL’2009. Published by: OPTELA-Laser Technologies JSC, March, 2010, ISSN 1314-068X, 133-145).
14. June 2010, "I_2 dissociation and lasing in supersonic chemical oxygen-iodine lasers: recent kinetic-fluid dynamics modeling," Laser Optics 2010 Conference, St-Petersburg, Russia.
15. Aug. 2010, "Lasing and I_2 dissociation in supersonic chemical oxygen-iodine lasers: recent modeling and comparison with experiment," ICONO/LAT 2010 (Int’l Conference on Coherent and Nonlinear Optics/Lasers, Applications and Technologies), Kazan, Russia.

16. June, 2012, "Revisiting mechanisms of I_2 dissociation in the chemical oxygen-iodine laser using three- and one- dimensional computational fluid dynamics modeling," Laser Optics 2012 Conference, St-Petersburg, Russia.
17. Feb. 2014, "Semi-analytical and 3D CFD DPAL modeling: Feasibility o supersonic operation," LASE 2014: High Energy/Average Power Lasers and Intense Beam Applications VII, San Francisco, USA (Ref. 47).
18. Feb. 2016, "Modeling of static and flowing-gas diode pumped alkali lasers," LASE 2016, LASE 2016: High Energy/Average Power Lasers and Intense Beam Applications IX, San Francisco, USA (Ref. 57).
19. June, 2017, "DPAL studies in Israel," 2017 Symposium on Laser Science and Technology, Chengdu, China.

(b) Presentation of papers at conferences/meetings (oral or poster)

1. **B.D. Barmashenko** and V.V. Naumov (1982, poster), "Localization of light in the boundary layers with population inversion for the flows of CO_2 - N_2 - H_2O mixtures in a supersonic nozzles," Workshop on kinetical and gasdynamic processes in nonequilibrium gases, Moscow, Russia (Ref. 2).
2. **B.D. Barmashenko** (1982, poster), "Amplification and localization of light in the boundary layer with the reaction of atomic photorecombination," Workshop on kinetical and gasdynamic processes in nonequilibrium gases, Moscow, Russia (Ref. 3).
3. **B. D. Barmashenko**, I. A. Ismailov, V. A. Kochelap and L. Yu. Mel'nikov (1982, poster), "Chemical production of singlet oxygen and its utilization in lasers," Second Soviet symposium on laser chemistry, Zvenigorod, Russia (Book of abstracts, pp. 99-100).
4. **B. D. Barmashenko** (1984, poster), "Concerning the possibility of sefaccelerating photostimulated combustion of dispersed mixtures in the optical resonator," Workshop on kinetical and gasdynamic processes in nonequilibrium gases, Moscow, Russia (Moscow State University Publ., Editor A. M. Prokhorov, p. 35).
5. V.A. Kochelap, **B.D. Barmashenko**, I.A. Ismailov and L.Yu. Mel'nikov (1984, poster), "Singlet oxygen of high density and its utilisation in electronic transition lasers,"5th Int. Symposium on Gas Flow and Chemical Lasers, Oxford, UK (Ref. 4).
6. **B. D. Barmashenko**, V.A. Kochelap and L.Y. Melhnikov (1988, poster), "Formation of active medium for IR and visible chemical lasers during the combustion of finely dispersed metal particles in the oxidizer," 7th Int. Symposium on Gas Flow and Chemical Lasers, Vienna, Austria (Ref. 5).
7. **B. D. Barmashenko** and V.A. Kochelap (1990, poster), "The possibility of long population-inversion in active media for IR chemical lasers," 8th Int. Symposium on Gas Flow and Chemical Lasers, Madrid, Spain (Ref. 6).
8. **B.D. Barmashenko**, A. Elior, E. Lebiush and S. Rosenwaks (1992, poster), "The effect of mixing on iodine dissociation, population inversion and lasing in chemical oxygen-iodine laser," 9th Int. Symposium on Gas Flow and Chemical Lasers, Heraklion, Greece (Ref. 7).
9. **B.D. Barmashenko** and S. Rosenwaks (1992, poster) "Modeling of high pressure $O_2(^1\Delta)$ generator for chemical oxygen-iodine laser," 9th Int. Symposium on Gas Flow and Chemical Lasers, Heraklion, Greece (Ref. 8).
10. **B.D. Barmashenko**, A. Elior, E. Lebiush and S. Rosenwaks (1994, oral), 25th AIAA Plasmadynamics and Lasers Conference, Colorado-Springs, USA (Ref. 9).

11. S. Rosenwaks, **B.D. Barmashenko**, A. Elior, E. Lebiush and I. Blayvas (1994, oral), "Parametric Studies of a Small Scale Supersonic COIL," 10th Int. Symposium on Gas Flow and Chemical Lasers, Friedrichshafen, Germany (Ref. 10).
12. **B.D. Barmashenko** and S. Rosenwaks (1995, oral), "Theoretical modeling of iodine dissociation in COILs," 26th AIAA Plasmadynamics and Lasers Conference, San-Diego, USA (Ref. 11).
13. **B.D. Barmashenko** and S. Rosenwaks (1995, oral), "Theoretical modeling of iodine dissociation in COILs," 26th AIAA Plasmadynamics and Lasers Conference, San-Diego, USA (Ref. 12).
14. S. Rosenwaks, I. Blayvas, **B.D. Barmashenko**, D. Furman and M.V. Zagidullin (1996, oral), "Experimental study of a small scale COIL using a jet type generator of singlet oxygen," 11th International Symposiums on Gas Flow and Chemical Lasers and High Power Laser Conference, Edinburgh, UK (Ref. 13).
15. **B.D. Barmashenko** and S. Rosenwaks (1996, oral), "Analysis of lasing in COILs with wide aperture of the mirrors in the resonator," 11th International Symposiums on Gas Flow and Chemical Lasers and High Power Laser Conference, Edinburgh, UK (Ref. 14).
16. S. Rosenwaks, **B. D. Barmashenko** and D. Furman (1997, oral), "Results of recent experiments on a small scale COIL/jet generator system," 28th AIAA Plasmadynamics and Lasers Conference, Atlanta, USA (Ref. 15).
17. **B.D. Barmashenko**, D. Furman and S. Rosenwaks (1997, oral), "Modeling of lasing in COILs with stable resonators," 28th AIAA Plasmadynamics and Lasers Conference, Atlanta, USA (Ref. 16).
18. D. Furman, **B.D. Barmashenko** and S. Rosenwaks (1998, oral), "Parametric studies of a small scale chemical oxygen-iodine laser/jet generator system: recent achievements," LASE'98, High power lasers and applications, San Jose, USA (Ref. 17).
19. **B.D. Barmashenko**, D. Furman, E. Bruins and S. Rosenwaks (1999, oral), "Iodine Dissociation and Small Signal Gain in Supersonic COILs," 30th AIAA Plasmadynamics and Lasers Conference, Norfolk, USA (Ref. 19).
20. S. Rosenwaks, D. Furman, E. Bruins and **B.D. Barmashenko** (1999, oral), "Gain Diagnostic in a Supersonic COIL with Transonic Injection of Iodine," 30th AIAA Plasmadynamics and Lasers Conference, Norfolk, USA (Ref. 20).
21. S. Rosenwaks, D. Furman, E. Bruins, V. Rybalkin and **B.D. Barmashenko** (2000, oral), 30th AIAA Plasmadynamics and Lasers Conference, Denver, USA (Ref. 21).
22. S. Rosenwaks, E. Bruins, D. Furman, V. Rybalkin and **B.D. Barmashenko** (2000, oral), "Supersonic COIL with iodine injection in transonic and supersonic sections of the nozzle," 13th International Symposiums on Gas Flow and Chemical Lasers and High Power Laser Conference, Florence, Italy (Ref. 22).
23. **B.D. Barmashenko**[PI], E. Bruins[S], D. Furman[S], V. Rybalkin[S] and S. Rosenwaks[PI] (2000, poster), "Iodine Dissociation in Supersonic COILs with Different Schemes of Iodine Mixing," 13th International Symposiums on Gas Flow and Chemical Lasers and High Power Laser Conference, Florence, Italy (Ref. 23).
24. S. Rosenwaks, **B.D. Barmashenko**, D. Furman, E. Bruins and V. Rybalkin (2001, oral),"Current Status of Chemical Oxygen-Iodine Laser Research," Laser Optics 2000 Conference, St-Petersburg, Russia (Ref. 24).
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27. S. Rosenwaks, V. Rybalkin, A. Katz and **B.D. Barmashenko** (2003, oral), "Comparative Studies of Different Schemes of Iodine Injection in a High Efficiency Supersonic COIL," 34th AIAA Plasmadynamics and Lasers Conference, Orlando, USA (Ref. 28).
28. **B.D. Barmashenko**, V. Rybalkin, A. Katz and S. Rosenwaks (2004, oral), "Parametric study of the Ben-Gurion University efficient chemical oxygen-iodine laser," High Power Laser Ablation Conf., Taos, USA (Ref. 29).
29. S. Rosenwaks, V. Rybalkin, A. Katz and **B. D. Barmashenko** (2004, oral), "Recent studies of Ben-Gurion University high efficiency supersonic chemical oxygen-iodine laser," 15th International Symposium on Gas Flow, Chemical Lasers, and High-Power Lasers, Prague, Czech Republic (Ref. 30).
30. S. Rosenwaks, V. Rybalkin, A. Katz and **B. D. Barmashenko** (2005, oral), "Diagnostic Studies of Ben-Gurion University High Efficiency Supersonic COIL," 36th AIAA Plasmadynamics and Lasers Conference, Toronto, Canada (Ref. 31).
31. **B. D. Barmashenko**, V. Rybalkin, A. Katz and S. Rosenwaks (2006, oral), "Detailed gain measurements and analysis of a highly efficient supersonic COIL," International Conference on Lasers, Applications, and Technologies 2005: High-Power Lasers and Applications, St-Petersburg, Russia (Ref. 32).
32. K. Waichman, V. Rybalkin, A. Katz, Z. Dahan, **B. D. Barmashenko** and S. Rosenwaks (2006, oral), "A computational fluid dynamics simulation of a supersonic chemical oxygen-iodine laser," 16th Int. Symposium on Gas Flow, Chemical Lasers, and High-Power Lasers, Gmunden, Austria (Ref. 33).
33. V. Rybalkin, A. Katz, K. Waichman, D. Vingurt, Z. Dahan, **B. D. Barmashenko** and S. Rosenwaks (2006, oral), "Studies of iodine dissociation in the chemical oxygen-iodine laser," 16th Int. Symposium on Gas Flow, Chemical Lasers, and High-Power Lasers, Gmunden, Austria (Ref. 34).
34. S. Rosenwaks, K. Waichman, V. Rybalkin, A. Katz, Z. Dahan and **B**. **Barmashenko** (2007, oral), "Combined experimental and theoretical studies of I_2 dissociation in supersonic COILs," 38th AIAA Plasmadynamics and Lasers Conference, Miami, USA (Ref. 35).
35. I. Brami-Rosilio, K. Waichman, **B.D. Barmashenko** and S. Rosenwaks (2008, oral), "Supersonic COILs at Ben-Gurion University: (1) experiments on 10-cm gain-length device and (2) computational fluid dynamics modelling," 17th Int. Symposium on Gas Flow, Chemical Lasers, and High-Power Lasers, Lisbon, Portugal (Ref. 37).
36. K. Waichman, **B.D. Barmashenko** and S. Rosenwaks (2008, poster), "A computational fluid dynamics simulation of a high pressure ejector COIL and comparison to experiments," 17th Int. Symposium on Gas Flow, Chemical Lasers, and High-Power Lasers, Lisbon, Portugal (Ref. 38).
37. **B. D. Barmashenko** (2008, poster), "Analysis of lasing in COILs with positive and negative branch unstable resonators using a simple geometrical-optics model," 17th Int. Symposium on Gas Flow, Chemical Lasers, and High-Power Lasers, Lisbon, Portugal (Ref. 39).
38. S. Rosenwaks, **B. Barmashenko** and K. Waichman (2010, oral), **"**Modeling of the Gain and the Power in Chemical Oxygen-Iodine Lasers**,"** 41th AIAA Plasmadynamics and Lasers Conference, Chicago, USA (Ref. 40).
39. S. Rosenwaks, **B.D. Barmashenko** and K Waichman (2010, oral), "A historical overview on the mechanism of the COIL kinetics," 18th International Symposium on

Gas Flow, Chemical Lasers, and High-Power Lasers Location: Sofia, Bulgaria (Ref. 41).

40. **B.D. Barmashenko**, K Waichman and S. Rosenwaks (2010, oral), "Lasing in supersonic chemical oxygen-iodine lasers: recent modeling and comparison with experiment," 18th International Symposium on Gas Flow, Chemical Lasers, and High-Power Lasers Location: Sofia, Bulgaria (Ref. 42).
41. S. Rosenwaks, I. Brami-Rosilio, K. Waichman and **B. D. Barmashenko** (2012, oral), "I_2 Dissociation Mechanisms in the Chemical Oxygen-Iodine Laser Revisited Using Three- and One- Dimensional Computational Fluid Dynamics Modeling," 43th AIAA Plasmadynamics and Lasers Conference, New Orleans, USA (Ref. 43).
42. **B.D. Barmashenko** and S. Rosenwaks (2012, oral), "Modeling of Static and Flowing-Gas Diode Pumped Alkali Lasers," High-Power Lasers 2012: Technology and Systems, Edinburgh, UK (Ref. 44).
43. S. Rosenwaks, **B.D. Barmashenko** and K. Waichman (2013, oral), "What Can We Gain from Supersonic Operation of Diode Pumped Alkali Lasers: Model Calculations," High-Power Lasers 2013: Technology and Systems, Dresden, Germany (Ref. 45).
44. **B.D. Barmashenko**, S. Rosenwaks and K. Waichman (2013, oral), "Model Calculations of Kinetics and Fluid Dynamics in Diode Pumped Alkali Lasers," High-Power Lasers 2013: Technology and Systems, Dresden, Germany (Ref. 46).
45. **B.D. Barmashenko**, S. Rosenwaks and K. Waichman (2014, oral), "Kinetic and fluid dynamic processes in diode pumped alkali lasers: semi-analytical and 2D and 3D CFD modeling," LASE 2014: High Energy/Average Power Lasers and Intense Beam Applications VII (Ref. 48).
46. K. Waichman, **B.D. Barmashenko** and S. Rosenwaks (2014, oral), "CFD DPAL modeling for various schemes of flow configurations," High-Power Lasers 2014: Technology and Systems, Amsterdam, Netherlands (Ref. 49).
47. S. Rosenwaks, **B.D. Barmashenko** and K. Waichman (2014, oral), "Theoretical studies of the feasibility of supersonic DPALs," High-Power Lasers 2014: Technology and Systems, Amsterdam, Netherlands (Ref. 50).
48. **B.D. Barmashenko**, S. Rosenwaks and K. Waichman (2014, oral), "Comparison of semi-analytical to CFD model calculations and to experimental results of subsonic flowing-gas and static DPALs," High-Power Lasers 2014: Technology and Systems, Amsterdam, Netherlands (Ref. 51).
49. **B.D. Barmashenko**, S. Rosenwaks^{PI} and K. Waichman^{CI} (2015, oral), "Semi-analytical and CFD model calculations of subsonic flowing-gas DPALs and their comparison to experimental results," 20th International Symposium on High Power Laser Systems and Applications (HPLS&A), Chengdu, China (Ref. 52).
50. S. Rosenwaks, E. Yacoby, K. Waichman, O. Sadot and **B.D. Barmashenko** (2015, oral), "Supersonic diode pumped alkali lasers: Computational fluid dynamics modeling," High-Power Lasers 2015: Technology and Systems, Toulouse, France (Ref. 53).
51. K. Waichman, **B.D. Barmashenko** and S. Rosenwaks (2015, oral), "CFD assisted simulation of temperature distribution and laser power in pulsed and CW pumped

static gas DPALs," High-Power Lasers 2015: Technology and Systems, Toulouse, France (Ref. 54).

52. **B.D. Barmashenko**, I. Auslender, S. Rosenwaks, B. Zhdanov, M. Rotondaro and R.J. Knize (2015, oral), "Modeling of pulsed K DPAL taking into account the spatial variation of the pump and laser intensities in the transverse direction," High-Power Lasers 2015: Technology and Systems, Toulouse, France (Ref. 55).
53. E. Yacoby, O. Sadot, **B.D. Barmashenko** and S. Rosenwaks (2015, oral), "3D CFD modeling of subsonic and transonic flowing-gas DPALs with different pumping geometries," High-Power Lasers 2015: Technology and Systems, Toulouse, France (Ref. 56).
54. **B.D. Barmashenko**, T. Cohen, E. Lebiush, I. Auslender and S. Rosenwaks (2016, oral), "Experimental and theoretical study of the performance of optically pumped cesium vapor laser as a function of the pump-to-laser beam overlap," High-Power Lasers 2016: Technology and Systems, Edinburgh, UK (Ref. 58).
55. I. Auslender, T. Cohen, E. Lebiush, **B.D. Barmashenko** and S. Rosenwaks (2016, oral), "Optically-pumped Cs vapor lasers: pump-to-laser beam overlap optimization," 21th International Symposium on High Power Laser Systems and Applications (HPLS&A), Gmunden, Austria (Ref. 60).
56. E. Yacoby, K. Waichman, O. Sadot, **B.D. Barmashenko** and S. Rosenwaks (2016, oral), "3D CFD Modeling of flowing-gas DPALs with different pumping geometries and various flow velocities," 21th International Symposium on High Power Laser Systems and Applications (HPLS&A), Gmunden, Austria (Ref. 59).
57. **B.D. Barmashenko**, T. Cohen, E. Lebiush, I. Auslender and S. Rosenwaks (2017, oral), "Pump-to-laser beam overlap optimization in Ti:Sapphire pumped and diode pumped alkali lasers (DPALs)," Oasis 6, Conference and Exhibition on Optics and Electrooptics, Tel-Aviv, Israel.
58. E. Yacoby, O. Sadot, **B.D. Barmashenko** and S. Rosenwaks (2017, oral), "Scaling up and controlling beam quality of flowing-gas diode pumped potassium laser with different pumping geometries: 3D CFD modeling," High-Power Lasers: Technology and Systems, Platforms, and Effects, Warsaw, Poland (Ref. 61).
59. I. Auslender, B. D. Barmashenko and S. Rosenwaks (2017, oral), "Modeling of multi-transversal mode lasing in static alkali vapor lasers," High-Power Lasers: Technology and Systems, Platforms, and Effects, Warsaw, Poland (Ref. 62).
60. S. Rosenwaks, I. Auslender, E. Yacoby and **B. D. Barmashenko** (2017, oral), "Experimental studies of static Cs DPALs: Measurements of the power and M2 factor as a function of different parameters," High-Power Lasers: Technology and Systems, Platforms, and Effects, Warsaw, Poland (Ref. 63).
61. K. Waichman, **B. D. Barmashenko** and S. Rosenwaks (2017, oral), "Three-dimensional simulation of beam propagation and heat transfer in static gas DPALs using wave optics and fluid dynamics models," High-Power Lasers: Technology and Systems, Platforms, and Effects, Warsaw, Poland (Ref. 64).

(c) <u>Presentations at informal international seminars and workshops</u> N/A

(d) <u>Seminar presentations at universities and institutions</u>

1. 2010, Department of Physics, Ben-Gurion University of the Negev, "Shooting down ballistic missiles: the chemical oxygen-iodine laser, main achievements and physical and chemical processes in the active medium".
2. 2014, Department of Applied Physics, Hebrew University of Jerusalem, "Diode pumped alkali lasers (DPALs): The next generation of high power lasers".
3. 2014, Southwest Institute of Technical Physics, Chengdu (China), "The chemical oxygen iodine laser: main achievements and physical and chemical processes in the active medium".
4. 2015, High Energy Laser Joint Technology Office, Albuquerque (USA), "Modeling of diode pumped alkali lasers at Ben-Gurion University".

- **Patents** N/A
- **Research Grants**
  1. 1991-1998; Israeli Ministry of Defense; B.D. Barmashenko (CI), S. Rosenwaks (PI); Subject: Supersonic chemical iodine laser; Annual: $71400; Total: $500,000.
  2. 1991-1995; Israeli MOST; B.D. Barmashenko (CI), S. Rosenwaks (PI); Subject: Studies of industrial chemical oxygen-iodine laser; Annual: $32500; Total: $130,000.
  3. 1993-1994; US Air Force; B.D. Barmashenko (CI), S. Rosenwaks (PI); Subject: Studies of industrial chemical oxygen-iodine laser; Annual: $24000; Total: $24000.
  4. 1994-1995; Israeli MOST; B.D. Barmashenko (PI), S. Rosenwaks (PI); Subject: Studies of industrial chemical oxygen-iodine laser; Annual: $45000; Total: $45000.
  5. 1996-1998; US Air Force; B.D. Barmashenko (CI), S. Rosenwaks (PI); Subject: Diagnostics of the Chemical oxygen-iodine laser; Annual: $33000; Total: $66000.
  6. 1998-2009; Israeli Ministry of Defense; B.D. Barmashenko (PI), S. Rosenwaks (PI); Subject: Supersonic chemical oxygen-iodine laser; Annual: $50000; Total: $500000.
  7. 2004-2005; US Air Force; S. Rosenwaks (PI), B.D. Barmashenko (PI); Subject: Mechanism of iodine dissociation in chemical oxygen iodine lasers; Annual: $25000; Total: $25000.
  8. 2004-2005; Technion: Institute of the Future Defence Research; S. Rosenwaks (PI), B.D. Barmashenko (PI); Subject: Development of an extremely efficient small scale chemical oxygen-iodine laser as a prototype of an advanced Israeli anti-missile weapon system; Annual: $15000; Total: $15000.
  9. 2005-2006; US Air Force; B.D. Barmashenko (PI), S. Rosenwaks (PI); Subject: Improving COIL efficiency by iodine pre-dissociation via corona discharge in the transonic section of the secondary flow; Annual: $40000; Total: $40000.
  10. 2008-2009; Soreq Nuclear research center; B.D. Barmashenko (PI), S. Rosenwaks (PI); Subject: Modeling of non-linear frequency conversion for non_uniform transverse intensity profiles of the pumping beam; Annual: $15000; Total: $15000.
  11. 2012-2013; Soreq Nuclear research center; B.D. Barmashenko (PI), S. Rosenwaks (PI); Subject: Powder laser; Annual: $15000; Total: $15000.
  12. 2013-2015; Laser Branch, MAFAT; B.D. Barmashenko (PI), S. Rosenwaks (PI); Subject: Flowing-gas diode pumped alkali lasers: The next generation of high power lasers; Annual: $50000; Total: $100000.

13. 2013-2015; US Air Force; B.D. Barmashenko (PI), S. Rosenwaks (PI); Subject: Feasibility of supersonic diode pumped alkali lasers: model calculations; Annual: $55000; Total: $110000.
14. 2014-2015; B. G. Negev Technologies and applications ltd./Ministry of economy, Chief scientist; B.D. Barmashenko (PI), I. Bar (PI); Subject: Feasibility of supersonic diode pumped alkali lasers: model calculations; Annual: $100000; Total: $100000.
15. 2015-2017; US Air Force; B.D. Barmashenko (PI), S. Rosenwaks (PI); Subject: Advanced Diode Pumped Alkali Lasers:Theoretical Investigations and Modeling; Annual: $80000; Total: $160000.
16. 2015-2019; Israel Science Foundtion; B.D. Barmashenko (PI), S. Rosenwaks (PI); Subject: Optically pumped alkali vapor lasers: Combined theoretical and experimental studies and novel approaches; Annual: $70000; Total: $280000.
17. 2016-2017; US Office of Naval Research; B.D. Barmashenko (PI), S. Rosenwaks (PI); Subject: Comparative study of cesium DPAL for high-power efficient laser; Annual: $150000; Total: $150000.

- **Present Academic Activities**

Research in progress

1. Subject: Experimental and theoretical study of the optically pumped alkali lasers; Other participants: Prof. S. Rosenwaks, Dr. K. Waichman, Dr. O. Sadot, I. Auslender and E. Yacoby; Expected date of completion: 2020.
2. Subject: Experimental and theoretical study of the stimulated Raman scattering in liquids; Other participants: Prof. I. Bar and Dr. Y. Ganot; Expected date of completion: 2019.

Books and articles to be published

(a) In preparation:
1. Paper: Y. Ganot, **B.D. Barmashenko** and I. Bar, "Experimental and theoretical study of the stimulated Raman scattering in saturated $NaNO_3$ solutions".
2. Chapter in the book: **B.D. Barmashenko** and S. Rosenwaks, "Chemical lasers: COIL" that will be published in *Handbook of Laser Technology & Applications (Second Edition)*, Editor-in-Chief**:** Chunlei Guo, Taylor&Francis Books Inc., 2017.

(b) Submitted for publication:
1. K. Waichman, **B.D. Barmashenko** and S. Rosenwaks, "Beam propagation in inhomogeneous medium of static gas Cs DPAL: Three-dimensional wave optics and fluid dynamics simulation," submitted to JOSA B.

- **Synopsis of research, including reference to publications and grants in above lists**

1. Theoretical and experimental study of diode pumped alkali lasers (DPALs).
DPALs are currently the most promising and extensively studied gas lasers due to their great potential as moderate and high power lasers. These recently invented lasers combine the positive characteristics of gas/chemical lasers and solid-state/fiber lasers and are scalable to high powers. Our research was stimulated by recent experiments aimed at increasing DPALs output power, which have revealed some limiting effects such as output power degradation in time causing a decrease in laser efficiency and termination of lasing. Several fundamental physical processes can be

responsible for these limiting effects. These processes include finite relaxation rate between the fine-structure levels of the alkali atoms, photoexcitation and ionization of the atoms, quenching of the high electronic levels of these atoms, chemical reaction, heating of the gain medium, and thermal breakdown of the hydrocarbons. Our basic research is targeted at studying these and other possible fundamental processes affecting operation of DPALs. Both theoretical modeling based on computational fluid dynamics codes and experimental study of the optically pumped alkali lasers are preformed.

References to publications: section (c): Refs.44-64; section (d): Refs. 47-61.
Grants No. 12-17.

2. Experimental and theoretical study of chemical oxygen iodine lasers (COILs).
The COIL, operating at 1315 nm, is the only known example of a high power chemically driven electronic transition laser. Extremely high values of both CW power (>1 MW), and chemical efficiency (~40%) made it possible to use the COIL for military applications. Recently the megawatt class COIL installed on the board of the Boeing-747 shot down a ballistic missile. A small scale supersonic COIL with a record (40%) chemical efficiency and 0.7 kW power was developed and studied in BGU. Experimental and theoretical studies of the gas dynamic and chemical processes in the COIL were performed and in particular three-dimensional computational fluid dynamics modeling employed to calculate the flow field and densities of the excited species and photons in the COIL resonator. Comparison between the calculated and measured gain and power made it possible to establish the mechanism of the iodine dissociation in the COIL, the most important process which determines the energy losses and lasing power.

References to publications: section (c): Refs.1, 4, 7-43; section (d): Refs. 9, 10, 17-46.
Grants No. 1-9.

3. Experimental and theoretical study of the stimulated Raman scattering in liquids.
Frequency conversion of laser beams, based on stimulated Raman scattering (SRS) is an appealing technique for generating radiation at new wavelengths. We investigated experimentally and theoretically the SRS due to a single pass of a collimated second harmonic (532 nm) of a Nd:YAG laser beam through water and nonodiamond particles and a saturated $NaNO_3$ solutions. Thermal self-defocusing, competition with backward stimulated Brillouin scattering and four-wave mixing were found to be the major limiting factors for forward SRS generation.

References to publications: section (d): Ref. 53.
Grant No. 14.

4. Modeling of non-linear frequency conversion for non_uniform transverse intensity profiles of the pumping beam.

The aim of this study was to theoretically study new methods for obtaining high quality laser beams and conditions for maximum brightness in the far field. The numerical modeling of the second harmonic generation for an arbitrary transverse profile of the pump beam was carried out. It was shown that single high order transverse mode pump beam can be converted to diffraction limited second harmonic (SH) beam of much higher brightness, and indicate that similar conversion should be possible for multi-transversal mode non-monochromatic beam.

Grant No. 10.

5. Aggregation of nanoparticles in powder laser.
   Nanoparticle powders are attractive candidates as new laser media for high-power lasers. The heat generated in the particles can be removed by circulating the media and cooling it outside the cavity. The nanoparticles in the liquid tend to stick to each other. The aggregation is undesirable for the powder laser operation where insulated particles uniformly distributed over the liquid or gas volume are required. The objective of the study was finding equations for interacation between the hydrophobic nonoparticles, creation a numerical model which is able to predict the conditions for stability of the colloidal mixture and application of this model to the nanoparticles of the lasing materials employed in the solid state powder lasers.

   Grant No. 11.

6. Computational modeling of laser-plasma interactions
   The nonlinear interaction of intense femtosecond laser pulses with a self-induced plasma channel in air and the energy transfer between two intersecting laser pulses were simulated using the finite-difference time-domain particle-in-cell method.

   References to publications: section (d): Refs. 51, 52.

7. Gasdynamics of the sudden expansion of a gas cloud into vacuum.
   References to publications: section (d): Refs. 18, 19.

8. Theoretical studies of the dense active media for lasers with chemical and thermal pumping.
   References to publications: section (c): Refs. 2-7; section (d): Refs. 3-16.

9. Nonequilibrium of gas - surface - solid in problems of relaxational gasdynamics.
   References to publications: section (d): Refs. 1, 2.