

Paul Ben Ishai

Curriculum Vitae

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Date: November 2022



CURRICULUM VITAE AND LIST OF PUBLICATIONS

Personal Details

Name:	Paul Ben Ishai
Date and place of birth:	10 th April 1965, London, UK
Date of immigration:	3 rd July 1985
Regular military service: (dates)	1990 - 1992
Telephone number at work:	+972-(0)3-9143091
Telephone number at home:	+972-(0)8-9750534

Education

Undergraduate and Graduate Studies

Ph.D./ D.Sc. / M.D.	2001 -2009 The Hebrew University of Jerusalem, Applied Physics, Prof. Yuri Feldman, “A Dielectric Study of KLTN Crystals as a Function of Dopant Concentrations”
M.A. / M.Sc.	1998 -2001 The Hebrew University of Jerusalem, Applied Physics, Prof. Yuri Feldman, “A Time Domain Dielectric Spectrometer”
B.A. / B.Sc.	1986 - 1990, The Hebrew University of Jerusalem, Physics and Mathematics

Post-Doctoral Studies

1st July 2010 – 4th September 2010, University of Tennessee, Department of Chemistry, Prof. Alexie Sokolov.

1st April 2012 – 30th September 2012, University of Nagoya, Department of Electrical Engineering, Prof. Kodo Kawase.

Academic Ranks and Tenure in Institutes of Higher Education

(in descending chronological order, including sabbatical leave)

Dates, Name of Institution and Department, Rank/Title/Function (indicate if tenured).

2021 (May) Department of Physics, Ariel University. Senior Lecturer (Tenured)

2018 - present Department of Physics, Ariel University. Senior Lecturer.

2016-2018(February) Department of Physics, Ariel University. Lecturer

2009-2016 Applied Physics Department, Hebrew University. Research Associate

2008-2016 Hebrew University, Administrative Manager of the Center for Electromagnetic Research and Characterization,

Professional Activities

(in descending chronological order)

Positions in academic administration (Departmental, Faculty and University)

1. July 2022, Appointments Committee, Department of Physics, Ariel University
2. July 2022, Purchasing Committee, Department of Physics, Ariel University

Professional functions outside universities/institutions (inter-university, national, international)

Dates, Name of Institution and Department, Rank/Title/Function.

1. Chairman of Intl. Conference “Expert Forum 2020: Wireless and Cellphone Radiation and Public Policy”, 10th – 11th February 2020, Department of Public Policy, Tel Aviv University. (<https://ehtrust.org/2020-tel-aviv-university-expert-forum-wireless-and-cellphone-radiation-and-public-policy/>)

Significant professional consulting

Dates, Name of Institution and Department, Rank/Title/Function.

2022-present	Consultant to Yeda/Weizmann Institute in Polymer mixes.
2020-present	Consultant to Ram Group GmbH of THz applications
2019-present	Consultant to Rafael Advanced Defence Systems Ltd. Dielectric Applications in Polymers.
2015 - 2018	Chief Research Officer (Consultant) to Neteera Technologies Ltd. Responsible for Terahertz applications and technologies.

Editor or member of editorial board of scientific or professional journal

2021 – 2022 Guest Editor Special Issue, Environmental Research

Membership in professional/scientific societies

Dates, Name of society.

2019 – present	American Chemical Society
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2015 – present	Institute of Physics (UK)
2014 – present	Member of the governing board of the IDS
2011 – present	Israel Physics Society
2001 – present	Member of the International Dielectric Society (IDS)

Educational activities

Courses taught in Recent Years

Dates, Name of course, Level, Institution(s) (Indicate if jointly taught).

2022 - Present	Physics and Electricity BSc. , Ariel University
2021-present	Electricity BSc., Ariel University
2018-present	Physics Lab 3, BSc. Ariel University
2016-present	Optical properties of condensed matter, MSc. & PhD., Ariel University
	Mechanics for Engineering, BSc., Ariel University (jointly taught)
	Physics Lab for Engineers, BSc., Ariel University (jointly taught)
	Physics Lab for Engineers 2, BSc., Ariel University (jointly taught)
2010-2016	Physics Lab for Engineers, BSc., The Hebrew University.
2015	Electricity and Magnetism, BSc., The Hebrew University
2005	Introduction to Solid State Physics, BSc., The Hebrew University (teaching assistant)
2001-2005	Statistical Mechanics, BSc., The Hebrew University (teaching assistant)

Supervision of Research Students

(Separated by degree and by year of completion, in descending chronological order)

<i>Year</i>	<i>Student</i>	<i>Degree</i>	<i>Thesis</i>	<i>Institute</i>
<i>current</i>	Roshlin Keruba	PhD.	“The dynamics of Thin films”	Ariel University
<i>current</i>	Subir Majumder	PhD.	“Complex dynamics of BFO ceramics”	Ariel University (2 nd superviros: Dr. Gilad Orr)
<i>current</i>	Chandradip Jadhav	PhD.	“Tin-based chalcogenides onto carbon nanotubes via simple solution chemistry for Supercapacitor application”	Ariel University (Co-supervised with Dr. Rafi Minnes)

<i>current</i>	Adnan Al-Haj	PhD.	“The construction of a single shot THz pulse detector for the FEL-THz source”	Ariel University (Co-supervised with Prof. Aharon Friedman)
<i>current</i>	Yaacov Gerasimov	PhD.	“The interplay of metalloproteins with the dynamic structure of water.”	Ariel University (Co-supervised with Prof. Aharon Friedman)
2021	Noa Betzalel	PhD.	“The Electromagnetic Properties of Human Skin in the Sub-THz Frequency Range”	The Hebrew University
2020	Omer Kovalsky	MSc.	“Study of THz generation and detection in Semiconductor Nanostructures and nonlinear crystal: a THz Spectroscopy Time Domain”	Ariel University (Co-supervised with Prof. Amir Abramovich)
2020.	Marcelo Martin David	PhD.	“Dielectric Monitoring of Storage-Induced Lesions in Human Red Blood Cells” (Co-supervised with Prof. Yuri Feldman)	The Hebrew University
2019	Shayke Stern	MSc.	“The Design of the Antenna Array for Small Tumor Microwave Ablation in the Digestive Tract” (Co-supervised with Prof. Yuri Feldman)	The Hebrew University.
2018	Anna Kochnev	MSc.	“The Emission and Reflection of the Human Skin Under Stress at sub-THz frequency Band” (Co-supervised with Prof. Yuri Feldman)	The Hebrew University.
2016	Daniel Agranovich	PhD.	“Application of Dielectric Spectroscopy for Evaluation of Bovine Milk Quality” (Co-supervised with Prof. Yuri Feldman)	The Hebrew University.
2011	Ziv Sobol	MSc.	Thesis: “Electrode Polarization: Characteristics models and ways of coping with it”. (Co-supervised with Prof. Yuri Feldman)	The Hebrew University
2009	Dmitry Babukh	MSc.	“Dielectric Study of Lyotropic liquid crystals HII mesophases” (Co-supervised with Prof. Yuri Feldman)	The Hebrew University.
2009	Tomer Rachamim	. MSc.	Thesis: “Electron Hopping in the PE&FE Phase of KLTN:Cu ⁺ Crystal” (Co-supervised with Prof. Yuri Feldman)	The Hebrew University.

Awards, Citations, Honors, Fellowships

Honors, Citation Awards (including during studies)

1. 2011 The International Dielectric Society, Prize for Best Poster, 6th Intl. Conf. Broadband Dielectric Spectroscopy and its Applications
2. 2008 The Hebrew University, Prize for “Best Poster of Applied Physics Department”, Open Day.
3. 2003 The Hebrew University, Prize for “Best Poster of Applied Physics Department”, Open Day.

Fellowships (e.g. Fullbright)

- 2011 The Matsumae International Foundation, \$20,000 + accommodation and insurance, for research in Nagoya University, Research Topic: “The Human Sweat Duct as a Terahertz Entity”.

Scientific Publications

Title in original language and translation into English. Suggested formats follow; this order is not essential, but all information should be included and consistent. The entries in each category should be numbered separately.

Only **two categories** of publications are recognized:

Published – articles that have already been published, complete bibliographical information is available.

Accepted – refereeing process has been completed and unconditional acceptance letter from the editor has been received, with expected date of publication.

Citation Index

H-index (ISI / Google Scholar):

ISI 20 / Google Scholar 24

Total number of citations of all articles (ISI / Google Scholar):

ISI 1,239/ Google Scholar 2007

Total number of citations without self-citations (ISI / Google Scholar):

ISI 1,051

Authored books

Scientific Books (Monographs)

Names of all authors (in the same order they appear in the publications), Year, Title of book, Publisher, Pages (inclusive). Provide reference(s) to published review(s) of book.

Other Books

Names of all authors (in the same order they appear in the publications), Year, Title of book, Publisher, Pages (inclusive). Provide reference(s) to published review(s) of book.

Editorship of collective volumes

Names of all editors (in the same order they appear in the publications), Year, Title of volume, Publisher, Page.

Books Chapter

(Conference proceedings, Festschrifte, etc., consecutive numbers).

Names of all authors (in the same order they appear in the publications), Year, Title of chapter, Editor(s), Title of Volume, Publisher, Pages.

- 25 **P. Ben Ishai**, A. Greenbaum Gutina, I. Lunev and Y. Feldman, 2021, “The State of Water in Frozen Fish”, 13th International Conference on Electromagnetic Wave Interaction with Water and Moist Substances (ISEMA)

- 24 Y. Feldman, **P. Ben Ishai** and A. Caduff, 2021, “Water and its Dielectric Signature. New Marker for Biosensing”, 13th International Conference on Electromagnetic Wave Interaction with Water and Moist Substances (ISEMA)
- 23 Y. Feldman & **P. Ben Ishai**, 2021, “The Microwave Response of Water as the Measure of Interactions in a Complex Liquid” in “Broadband Dielectric Spectroscopy: A Modern Analytical Technique”, Ed. W.H.H. Woodward, ACS Symposium Series, American Chemical Society, DOI: 10.1021/bk-2021-1375.ch013
- 22 A Kochnev, A Puzenko, **P Ben Ishai** and Y Feldman, 2019, “Electromagnetic Reflectance Measurements of Human Palms in Sub-THz Frequency Band”, 44th International Conference on Infrared, Millimeter, and Terahertz Waves (IRMMW-THz)
- 21 N. Betzalel, A. Puzenko, **P. Ben Ishai** and Y. Feldman, 2019, “Electromagnetic Modeling of Human skin as a Receiving and Transmitting Antenna Array in sub-THz”, 44th International Conference on Infrared, Millimeter, and Terahertz Waves (IRMMW-THz)
- 20 Kochnev A., Puzenko A., **Ben Ishai P.**, Feldman Y., (2019) “*Electromagnetic Reflectance Measurements of Human Palms in Sub-THz Frequency Band*”, IEEE 44th International Conference on Infrared, Millimeter and Terahertz Waves (IRMMW-THz), DOI: 10.1109/IRMMW-THz.2019.8873765 (Citations: 2)
- 19 Betzalel N., Puzenko A., **Ben Ishai P.**, Feldman Y., (2019), *Electromagnetic modeling of Human Skin as a Receiving and Transmitting Antenna Array in sub-THz*”, IEEE 44th International Conference on Infrared, Millimeter and Terahertz Waves (IRMMW-THz), DOI: 10.1109/IRMMW-THz.2019.8874357
- 18 Y. Feldman and **P. Ben Ishai**, 2018, “Water in Heterogeneous Matter Interfacial Water-From Non-Organic to Organic Systems”, 12th International Conference on Electromagnetic Wave Interaction with Water and Moist Substances (ISEMA)
- ===== Promotion to Senior Lecturer, Ariel University =====
- 17 Greenbaum A, **Ben Ishai P**, Feldman Y., 2015, “Analysis of Experimental Data and Fitting Problems.”, Ed. Yu. Feldman & V. Riacu, “Dielectric Relaxation in Biological Systems: Physical Principles, Methods, and Applications.” Oxford, UK: Oxford University Press;.p. 170 - 184.
- 16 Feldman Y, **Ben Ishai P**, Raicu V. 2015, “Electrode Polarization” Ed. Yu. Feldman & V. Riacu, “Dielectric Relaxation in Biological Systems: Physical

- Principles, Methods, and Applications.” Oxford, UK: Oxford University Press; p. 140 - 164.
- 15 Kaatze U, Feldman Yu., **Ben Ishai P**, Greenbaum A, Raicu V., 2015, “Experimental Methods.” Ed. Yu. Feldman & V. Riacu, “Dielectric Relaxation in Biological Systems: Physical Principles, Methods, and Applications.” Oxford, UK: Oxford University Press;. p. 109 - 132.
 - 14 Feldman Y, **Ben Ishai P**, Puzenko A, Raicu V., 2015, “Elementary Theory of the Interaction of Electromagnetic Fields with Dielectric Materials.”, Ed. Yu. Feldman & V. Riacu, “Dielectric Relaxation in Biological Systems: Physical Principles, Methods, and Applications.” Oxford, UK: Oxford University Press p. 33 - 55.
 - 13 E. Shumaker, D. Corcos, **P. Ben Ishai**, I. Gutman, Yu. Feldman, A. Puzenko and D. Elad, 2015 ,“Towards mm-wave camera assisted human stress gauging”, IRMMW-THz 2015, Hong Kong
 - 12 Feldman, Yu. **Ben Ishai P.**, Goldberger H., Puzenko A. and Gutman I., 2015, “Can the sub-THz image of skin be the new fingerprint? Visions in Biometrics”, IRMMW-THz 2015, Hong Kong
 - 11 **Ben Ishai P.**, Tripathi, S.R. Kawase K., Puzenko A. and. Feldman Yu., “The origin of water's dielectric excess wing”, IRMMW-THz 2015, Hong Kong 2015.
 - 10 Feldman Yu. and **Ben Ishai, P.**, 2015 ,“When dielectric spectroscopy meets THz spectroscopy; the tale of two estranged brothers”, Proceedings IEEE Topical Conference on Biomedical Wireless Technologies, Networks, and Sensing Systems (BioWireleSS), San Diego
 - 9 Feldman Y, Puzenko AA, **Ben Ishai P**, Levy E., 2015, “Dielectric Relaxation of Water in Complex Systems”, .” Ed. Yu. Kalmykov, Recent Advances in Broadband Dielectric Spectroscopy. Springer; 2013. p. 1–18. (cited: 3)
 - 8 **Ben Ishai P**, Lerner S, Puzenko AA, Feldman Y., 2013, “Anomalous Diffusion, Cole-Cole Relaxation and the Space in Which They Occur: Puzzles and Problems.” Ed. Yu. Kalmykov, “Recent advances in broadband dielectric spectroscopy”. Springer;. p. 37–48.
 - 7 Feldman Yu., Puzenko A., **Ben Ishai P.**, Greenbaum A., Segev Y., Vasilyeva M. and Gusev Yu., 2012, “The Variety of States of Adsorbed Water in Heterogeneous Materials and Their Dielectric Response”, Proceedings SDCS 2012,
 - 6 Feldman, Yu., Safrai, E., **Ben Ishai, P.**, Puzenko, A., Caduff, Agranat, A. J., 2012, “The unexplored avenues of human skin: electromagnetic properties in the sub-

- THz band.”, in SPIE BiOS 82210Q–82210Q–9 (International Society for Optics and Photonics, 2012), San Fransisco, California.
- 5 Feldman, Yu., Puzenko, A. & **Ben Ishai, P.**, 2011, “The State of Water in Complex Materials”, Proceedings ISEMA 2011, Kansa City Missouri.
- 4 **Ben Ishai, P.**, Feldman, Yu., Puzenko, A., Caduff, A. & Agranat, A. J., 2010, “The unexplored avenues of human skin; electromagnetic properties in the sub THz band”, pp.1 - 4 In proceeding of: 10th IEEE International Conference on Solid Dielectrics (ICSD), Potsdam
- 3 Feldman, Yu., Puzenko, A. **Ben Ishai, P.** and Greenbaum (Gutina), A., 2009, “Dielectric Properties of Bound Water in Biological Systems”, Proceedings ISEMA 2009, Helsinki Finland.
- 2 Lerner, S., **Ben Ishai, P.**, Feldman, Yu., Mierzwa, M. & Paluch, M. 2008 “The effects of pressure on the cooperative and non-cooperative dielectric processes in KTN ferroelectric crystals”, . BDS 2008, Lyon France.
- 1 Feldman, Yu., Puzenko, A., **Ben Ishai, P.**, Caduff, A. & Agranat, A. J., 2007, “The electromagnetic response of human skin in the submillimeter wave range”,, Joint 32nd International Conference on Infrared and Millimeter Waves and the 15th International Conference on Terahertz Electronics (2007), Cardiff UK.

Articles

Refereed articles and refereed letters in scientific journals, running numbers

Names of all authors (in the same order they appear in the publications), Year, Title of article, Name of journal, Volume number, Pages (inclusive), (Citations, journal impact factor (IF), journal ranking (JR, e.g., 13/87), quartile (Q1, etc.).

- 59 Orr G., Gorychev A., **Ben Ishai P.***, (2022) Complex dielectric behaviours in BiFeO₃/Bi₂Fe₄O₉ ceramics, *Applied Physics A*, 128(12),1095, doi.org/10.1007/s00339-022-06234-0 (Citations:0, IF: 2.983, JR 72/161, Q2)
- 58 Barbora A., Yazbak F., Lyssenko S., Nave V., Nakonechny F., **Ben Ishai P.**, Minnes R., (2022) Second harmonic generation nanoparticles enables Near-Infrared Photodynamic Therapy from visible light reactive photosensitizer conjugates, *PLoS One*, 17(9), e0274954 (Citations:0, IF: 3.752, JR: 29/74, Q2)
- 57 Hashimoto K., **Ben Ishai P.**, Bründermann E., Tripathi S., (2022) Dielectric property measurement of human sweat using attenuated total reflection terahertz time domain spectroscopy, *Biomed. Opt. Express*, 13(9), 4572-4582, doi.org/10.1364/BOE.467450 (Citations:0, IF: 3.562, JR: 31/101, Q2)

- 56 Betzalel N., **Ben Ishai P.**, Puzenko A., Feldman Y., (2022) Emission from human skin in the sub THz frequency band, *Scientific Reports* 12(1), 1-11 ((Citations:0, IF: 3.998, JR: 17/71, Q2))
- 55 Betzalel N., **Ben Ishai P.**, Einav S., Feldman Y., (2021) The AC conductivity of human sweat ducts as the dominant factor in the sub-THz reflection coefficient of skin, *Journal of Biophotonics*, doi.org/10.1002/jbio.202100027 (Citations: 1, IF: 3.032, JR: 25/71, Q2).
- 54 Baksheeva K., Ozhegov R., Goltsman G., Kinev N., Koshelets V., Kochnev A., Betzalel N., Puzenko A., **Ben Ishai P.**, Feldman Y., (2021), The Sub THz Emission of the Human Body under Physiological Stress, *Transactions on Terahertz Science and Technology*, doi: 10.1109/TTHZ.2021.3066099 (Citations: 2, IF: 2.593, JR: 60/155, Q2)
- 53 Caduff A., Feldman Y., **Ben Ishai P.**, Launer S., (2020), Physiological monitoring and hearing loss: toward a more integrated and ecologically validated health mapping., *Ear and Hearing*, 41, Supplement 1, 120S-130S (Citations: 6, IF: 3.129, JR: 2/27, Q1)
- 52 **Ben Ishai P***, Kidder M. K., Kolesnikov A. I., Anovitz L. M., (2020), The 1-Dimensional Glassy Behavior of Ultraconfined Water Strings, *Journal of Physical Chemical Letters*, 11, 18, 7798–7804 (Citations: 1, IF: 6.710, JR: 35/159, Q1).
- 51 David M., Levy E., Barshtein G., Livshits L., Arbell D., **Ben Ishai P.**, Feldman Y., (2020), The dielectric spectroscopy of human red blood cells during 37-day storage: β -dispersion parameterization, *Biochimica et Biophysica Acta (BBA)-Biomembranes* 1862 (11), 183410 (Citations:1, IF: 3.411, JR: 133/397, Q2).
- 50 Betzalel N., Feldman Y., **Ben Ishai P***, (2020), Response to the Comment of Foster Et Al. Titled "Comments on Betzalel Et Al. "The Human Skin as a sub-THz receiver-Does 5G Pose a Danger to It or Not?" [Environ. Res. 163 (2018): 208-216]", *Environmental Research* 183, 109008 (Citations: 1, IF: 5.715, JR: 15/193, Q1)
- 49 Caduff A., **Ben Ishai P.**, Feldman Y., (2019), Continuous noninvasive glucose monitoring; water as a relevant marker of glucose uptake in vivo, *Biophysical Reviews* 11, 1017–1035 (Citations: 11)
- 48 Kochnev A. , Betzalel N., **Ben Ishai P.** , Feldman Yu., (2018), Human sweat ducts as helical antennas in the sub-THz frequency range-an overview, *International Journal of Terahertz Science and Technology*, 11(2), 43-56 (Citations: 10)
- 47 Orr G., **Ben Ishai P***, Roth M., (2018), High-temperature time domain measurement system for solid and molten materials, *Measurement Science and Technology*, 29(10), 105502 (Citations:0, IF: 1.857, JR: 32/64, Q2)
- 46 Betzalel N., **Ben Ishai P.**, Feldman Yu., (2018), The human skin as a sub-THz receiver – Does 5G pose a danger to it or not?, *Environmental Research*, 163, 208-216 (Citations:69, IF: 5.715, JR: 15/193, Q1).
- 45 Tripathi S. R., **Ben Ishai P.**, Kawase K., (2018), Frequency of the resonance of the human sweat duct in a normal mode of operation, *Biomedical Optics Express*, 9 (3), 1301-1308 (Citations:7, IF: 3.921, JR: 24/134, Q1)

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===== Promotion to Senior Lecturer, Ariel University =====

- 44 Betzalel N., Feldman Yu., **Ben Ishai P.***, (2017), The Modelling of the absorbance of sub-THz Radiation by Human Skin, *IEEE Transactions on Terahertz Science and Technology*, **7** (5), 521 – 528 (Citations:31, IF: 2.593, JR: 60/155, Q2).
- 43 Levy E., David M., Barshtein G., Yedgar S., Livshits L., **Ben Ishai P.**, Feldman Y., (2017), Dielectric Response of Cytoplasmic Water and Its Connection to the Vitality of Human Red Blood Cells. II. The Influence of Storage. *The Journal of Physical Chemistry B*, **121** (20), 5273 – 5278 (Citations:8, IF: 2.857, JR: 79/159, Q2).
- 42 David M., Levy E., Feldman Yu., **Ben Ishai P.***, Zelig O., Yedgar S. and Barshtein G., (2017), The dielectric spectroscopy of human Red Blood Cells: The differentiation of old from fresh cells:” *Physiological Measurement*, **38** (7), 1335 – 1348 (Citations:8, IF: 2.309, JR: 49/87, Q3).
- 41 Gribova O., Shamir O., Levy E., **Ben Ishai P.**, Greenbaum (Gutina) A., Feldman Yu., (2017), Dielectric properties of a novel oral matrix drug carrier. *Colloids and Surfaces B:Biointerfaces*, **155**, 223-228 (Citations:2, IF: 4.389, JR: 56/159, Q2).
- 40 Agranovich D., **Ben Ishai P.**, Katz G., Dezman D. and Feldman Yu., (2017), Microwave dielectric spectroscopy study of water dynamics in normal and contaminated raw bovine milk. *Colloids and Surfaces B:Biointerfaces*, **154**, 391-396 (Citations:10, IF: 4.389, JR: 56/159, Q2).
- 39 Agranovich D., Polygalov E., Popov I., **Ben Ishai P.** and Feldman Yu., (2017) , Inductive dielectric analyser. *Measurement Science and Technology* **28** (8), 035103 (Citations:3, IF: 1.857, JR: 32/64, Q2).
- 38 Levy E., Barshtein, G. Livshits, L. **Ben Ishai, P.** and Feldman, Yu., (2016), Dielectric Response of Cytoplasmic Water and Its Connection to the Vitality of Human Red Blood Cells: I. Glucose Concentration Influence *Journal of Physical Chemistry B*, **120**, 10214-10220 (Citations:17, IF: 2.857, JR: 79/159, Q2).

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===== As a member of Ariel University =====

- 37 Popov, I., **Ben Ishai, P.**, Khamzin, A. & Feldman, Y. , (2016), The mechanism of the dielectric relaxation in water. *Physical Chemistry Chemical Physics* **18**, 13941–13953 (Citations:100, IF: 3.430, JR: 66/159, Q2).
- 36 Agranovich, D. Renhart, I. **Ben Ishai, P.** Katz, G. Bezman D. and Feldman, Yu., (2016), A microwave sensor for the characterization of bovine milk. *Food Control* **63**, 195–200 (Citations:30, IF: 4.258, JR: 19/139, Q1).
- 35 Agranovich, D., **Ben Ishai, P.**, Katz, G., Bezman, D. & Feldman, Y. (2016), Dielectric spectroscopy study of water dynamics in frozen bovine milk. *Colloids and Surfaces B: Biointerfaces* **141**, 390–396 (Citations:10, IF: 4.389, JR: 56/159, Q2).
- 34 Tripathi, S. R., Miyata, E., **Ben Ishai, P.** & Kawase, K. (2015), Morphology of human sweat ducts observed by optical coherence tomography and their

- frequency of resonance in the terahertz frequency region. *Scientific Reports* **5**, 9071 (Citations:46, IF: 3.998, JR: 17/71, Q2)
- 33 Mishraki-Berkowitz, T., **Ben Ishai, P.**, Aserin, A., Feldman, Y. & Garti, N. (2015) The dielectric study of insulin-loaded reverse hexagonal (H II) liquid crystals. *Physical Chemistry Chemical Physics* **17**, 9499–9508 (Citations:7, IF: 3.430, JR: 66/159, Q2).
- 32 **Ben Ishai, P.***, Tripathi, S. R., Kawase, K., Puzenko, A. & Feldman, Y. (2015), What is the primary mover of water dynamics? *Physical Chemistry Chemical Physics* **17**, 15428–15434. (Citations:33, IF: 3.430, JR: 66/159, Q2).
- 31 Vasilyeva, M. A. Gusev, Yu. A. Shtyrlin, V.G. Greenbaum (Gutina), A. Puzenko, A. **Ben Ishai, P.** and Feldman Yu., (2014), Dielectric relaxation of water in clay minerals. *Clays and Clay Minerals* **62**, 62–73 (Citations:40, IF: 1.507, JR: 16/30, Q3).
- 30 Safrai, E., **Ben Ishai, P.**, Polsman, A., Einav, S. & Feldman, Y. (2014) The Correlation of ECG Parameters to the Sub-THz Reflection Coefficient of Human Skin. *IEEE Transactions on Terahertz Science and Technology* **4**, 624–630 (Citations:12, IF: 2.593, JR: 60/155, Q2).
- 29 Lerner, S. E. Feldman, Yu. Mierzwa, M. Paluch, M. Agranat, A. J. and **Ben Ishai, P.** (2014), Multivariate pressure effects on an electron hopping process in ferroelectric $\text{KTa}_{1-x}\text{Nb}_x\text{O}_3$. *The European Physical Journal B* **87**, 1–9 (Citations:2, IF: 1.347, JR: 51/69, Q3).
- 28 Kurzweil-Segev, Y., Brodsky M., Polsman A., Safrai E., Feldman Yu., Einav S., **Ben Ishai P.***, (2014), Remote monitoring of phasic heart rate changes from the palm. *IEEE Transactions on Terahertz Science and Technology* **4**, 618–623 (Citations:9, IF: 2.593, JR: 60/155, Q2).
- 27 Hayut, I., **Ben Ishai, P.**, Agranat, A. J. & Feldman, Y. (2014), Circular polarization induced by the three-dimensional chiral structure of human sweat ducts. *Physical Review E* **89**, 042715 (Citations:24, IF: 2.296, JR: 13/34, Q2).
- 26 Feldman, Y., Puzenko, A., **Ben Ishai, P.** & Greenbaum, A. G., (2014), The dielectric response of interfacial water—from the ordered structures to the single hydrated shell. *Colloid and Polymer Science* **292**, 1923–1932 (Citations:22, IF: 1.536, JR: 63/89, Q3).
- 25 Mishraki, T. **Ben Ishai, P.**, Babukh, D. Aserin, A. Feldman, Yu and Garti, N. (2013), Modulation of physical properties of reverse hexagonal mesophases: A dielectric spectroscopy study. *Journal of colloid and interface science* **396**, 178–186 (Citations:8, IF: 7.489, JR: 31/159, Q1).
- 24 Lerner, S. E., Mierzwa, M., Paluch, M., Feldman, Y. & **Ben Ishai, P.*** (2013) Dielectric relaxation in weakly ergodic dilute dipole systems. *The Journal of chemical physics* **138**, 204501 (Citations:4, IF: 2.991, JR: 77/159, Q2).
- 23 Hayut, I. Puzenko, A. **Ben Ishai, P.** Polsman, A. Agranat, A. J. and Feldman, Yu., (2013), The helical structure of sweat ducts: Their influence on the electromagnetic reflection spectrum of the skin. *IEEE Transactions on Terahertz Science and technology* **3**, 207–215 (Citations:41, IF: 2.593, JR: 60/155, Q2).

- 22 **Ben Ishai, P.**, Talary, M. S., Caduff, A., Levy, E. & Feldman, Y. (2013), Electrode polarization in dielectric measurements: a review. *Measurement Science and Technology* **24**, 102001 (Citations:297, IF: 1.857, JR: 32/64, Q2).
- 21 **Ben Ishai, P.***, Mamontov, E., Nickels, J. D. & Sokolov, A. P. Influence of Ions on Water Diffusion - A Neutron Scattering Study., (2013), *The Journal of Physical Chemistry B* **117**, 7724–7728 (Citations:53, IF: 2.857, JR: 79/159, Q2).
- 20 Anovitz, L. M., Mamontov, E., **Ben Ishai, P.** & Kolesnikov, (2013). A. I. Anisotropic dynamics of water ultraconfined in macroscopically oriented channels of single-crystal beryl: A multifrequency analysis. *Physical Review E* **88**, 052306 (Citations:29, IF: 2.296, JR: 13/34, Q2).
- 19 Safrai, E., **Ben Ishai P.**, Caduff A., Puzenko A., Polsman A., Agranat A.J., Feldman Yu., (2012), The remote sensing of mental stress from the electromagnetic reflection coefficient of human skin in the sub-THz range. *Bioelectromagnetics* **33**, 375–382 (Citations:24, IF: 2.278, JR: 41/93, Q2).
- 18 Levy, E., Puzenko, A., Kaatze, U., **Ben Ishai, P.** & Feldman, Yu., (2012), Dielectric spectra broadening as the signature of dipole-matrix interaction. I. Water in nonionic solutions. *The Journal of chemical physics* **136**, 114502 (Citations:68, IF: 2.991, JR: 77/159, Q2).
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- 15 Puzenko, A., **Ben Ishai, P.** & Feldman, Yu., (2010), Cole-Cole broadening in dielectric relaxation and strange kinetics. *Physical review letters* **105**, 037601 (Citations:70, IF: 8.385, JR: 6/85, Q1).
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- 12 Libster, D., **Ben Ishai, P.**, Aserin, A., Shoham, G. & Garti, N., (2009), Molecular interactions in reverse hexagonal mesophase in the presence of Cyclosporin A. *International Journal of Pharmaceutics* **367**, 115–126 (Citations:40, IF: 4.845, JR: 152/271, Q3)
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- 4 **Ben Ishai, P.***, Sader, E., Feldman, Y., Felner, I. & Weger, M., (2005), Dielectric properties of Na_{0.7}CoO₂ and of the superconducting Na_{0.3}CoO₂·1.3H₂O. *Journal of Superconductivity* **18**, 455-459. . (Citations:29, IF: 1.244, JR: 52/69, Q3)
- 3 **Ben Ishai, P.**, De Oliveira, C. E. M., Ryabov, Y., Agranat, A. J. & Feldman, Y., (2005) Unusual glass-like systems—relaxation dynamics of Cu⁺ ions in ferroelectric KTN crystals. *Journal of non-crystalline solids* **351**, 2786–2792. . (Citations:12, IF: 2.929, JR: 138/314, Q2)
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- 1 Axelrod, N. Axelrod, E. Gutina, A. Puzenko, A. **Ben Ishai, P.** Feldman Yu. (2004), Dielectric spectroscopy data treatment: I. Frequency domain. *Measurement Science and Technology* **15**, 755-764 (Citations:60, IF: 1.857, JR: 32/64, Q2).

The ‘*’ refers to corresponding author

Published scientific reports and technical papers

(internally refereed publications of government research institutions and surveys, industrial research organizations, etc.)

Names of all authors (in the same order they appear in the publications), Year, Title of report, Name of publishing organization, Report series, Number, Pages (inclusive).

1. **Paul Ben Ishai**, Mikka Ahonen, Hugo Conçalves Silva, Devra Davis, 2020
“Proposed FCC changes to Measuring and Evaluating Human Exposure to Radiofrequency Electromagnetic Fields and Wireless Power Transfer Devices are Flawed: need for biologically-based standards (ET Docket No. 19–226; FCC 19–126; FRS 16618)” Public Comment to the Federal Communication Commission.

Unrefereed professional articles and publications

(book reviews, encyclopedia articles, museum catalogs etc.)

Year, Title of article, review, etc. Name of journal or publication, Pages (inclusive).

- 2022 “RE: Cellular telephone use and the risk of brain tumors: update of the UK Million Women Study”, Birnbaum L., Taylor H., Baldwin H., **Ben Ishai P.**, Davis D., JNCI: Journal of the National Cancer Institute , doi.org/10.1093/jnci/djac110

Classified articles and reports

Names of all authors, Year, Subject matter, Institution.

Lectures and Presentations at Meetings and Invited Seminars not Followed by Published Proceedings

Invited plenary lectures at conferences/meetings

- 5 **P. Ben Ishai**, “A New Approach to an Old Idea: Understanding the Fröhlich B(T) Function”, 11th Conference on Broadband Dielectric Spectroscopy and its Applications, Donostia -San Sebastian, Spain, 4th – 9th September, 2022
- 4 **P. Ben Ishai**, “Are the Current ICNIRP Exposure Limits for Radio Frequencies for the General Population Safe? “, VII International Conference “Innovative Concepts and Technologies for Biomedical Applications”, Moscow, Russia, May 24th -May 26th 2021
- 3 **P. Ben Ishai**, “Terahertz Spectroscopy – Great Expectations”, 10th Conference on Broadband Dielectric Spectroscopy and its Applications, Brussels, Belgium, 26th -31st August 2018
- 2 **P. Ben Ishai**, Yu. Feldman, “The Dawn of Sub-THz Communication Channels – Are they Safe?”, IVth International Conference on Engineering and Telecommunication, Moscow 29th – 30th November 2017.
- 1 **P. Ben Ishai**, Yu. Feldman, “Have we reached the zenith of Dielectric Science?”, Dielectrics 2015, IOP, National Physics Labs, Teddington, UK 22nd -24th April, 2015

Presentation of papers at conferences/meetings

Name of all authors, Year, Title of paper/lecture, Name of meeting, Place.
N.B. Give reference to abstracts or proceedings volume.

- 22 A. Kochnev Goldstein, Y. Goldstein, **P. Ben Ishai**, Yu. Feldman, "Classification of mental state from sub-THz reflections from the skin", The 47th Intl. Conference on Infrared, millimeter and THz Waves – 2022, Delft University, The Netherlands August 28th – September 2nd 2022.
- 21 **P. Ben Ishai**, "A New Approach to an Old Idea", Israel Physical Society Annual Meeting, Ben Gurion University, February 22nd , 2022
- 20 **P. Ben Ishai**, A. Greenbaum (Gutina), I. Lunev, Yu. Feldman, "The Dielectric Response of Frozen Food (Fish)", Online ISEMA 2021 Conference, Halle, Germany , July 27th – 30th , 2021
- 19 **P. Ben Ishai** and Y. Feldman, "The dielectric response of frozen food", "Online IDS 2020 Workshop", Dortmund, Germany September 28th - September 30th 2020
- 18 **P. Ben Ishai**, "2020 Expert Forum: Wireless and Cellphone Radiation and Public Policy", Tel Aviv University, Israel, February 10th – 11th , 2020.
- 17 **P. Ben Ishai**, "Workshop on Dynamics in Disordered Materials", Dortmund, Germany, August 25th -27th , 2019.
- 16 **P. Ben Ishai**, "The Glass transition of a one-dimensional Water string in Cordierite", Spring 2019 ACS National Meeting, Orlando, USA, March 31st – April 4th 2019
- 15 **P. Ben Ishai**, "The Real Exposure to Cellular Radiation – Is the SAR Rating Fair?", Electromagnetic Compatibility 2018", Holon Institute of Technology, Holon, Israel 10/05/2018
- 14 **P. Ben Ishai**, "Are the Safety Concerns for 5G Justified?", Vth International Conference on Engineering and Telecommunication, Moscow 15th – 16th November, 2018.
- 13 Feldman Y., **Ben Ishai P.**, (2018) "*Water in Heterogeneous Matter Interfacial Water-From Non-Organic to Organic Systems*", IEEE 12th International Conference on Electromagnetic Wave Interaction with Water and Moist Substances (ISEMA), DOI:10.1109/ISEMA.2018.8442295
- 12 **P. Ben Ishai**, "The behavior of water in the ultra-confinement of natural minerals", 8th Intl. Discussion Meeting on Relaxations in Complex Systems, Wisla, Poland 23-28/07/2017.
- 11 **P. Ben Ishai**, " Dielectric spectroscopy of water in ultra-confinement of cordierite minerals", Dielectrics 2017, National Physics Labs, Teddington, London UK, 19-21/04/2017.
- 10 **P. Ben Ishai**, "Ultra-confinement: The Mysteries of Ancient Water Imprisoned in Sub-Nano Channels in Natural Minerals", 9th International Conference on Broadband Dielectric Spectroscopy and its Applications, Pisa, Italy 18/09/2016 – 22/09/2016, Keynote.
- 9 **P. Ben Ishai**; E. Safrai; A. Puzenko, A. Polsman; Yu. Feldman, "Tissue Morphology and Bio-metamaterials as the Driving Mechanism of Human Electromagnetic Response in the sub-THz frequency Range.", POEM

- meeting Laser and Tera-Hertz Science and Technology (LTST), Wuhan, China 1-2/11/2012.
- 8 **P. Ben Ishai**, E. Mamontov, A. Sokolov, J. Nickels, K. Kawase and Yu. Feldman, “Water Revisited – Unifying a Myriad of Beliefs”, Broadband Dielectric Spectroscopy (BDS) and its Application 7th conference of the International Dielectric Society and 13th conference on Dielectric & Related Phenomena, 03/09-07/09/2012, University of Leipzig, Germany.
- 7 **P. Ben Ishai**, M. Brodski, Y. Segev, A. Polsman and Yu. Feldman, “Sensing the Heartbeat in the sub-THz Region of the Spectrum”, 2nd Intl. Symposium on Terahertz Nanoscience (TeraNano 2012), Okinawa, Japan, 04/07-05/07/2012.
- 6 **P. Ben Ishai**, A. Puzenko and Yu. Feldman, “Anomalous Diffusion, Cole-Cole relaxations and the Space in which they occur: Puzzles and Problems.”, Recent Advances in Broadband Dielectric Spectroscopy, NATO-ARW, Perpignan, France 21-24/9/2011
- 5 **P. Ben Ishai**, Yu. Feldman, A. Puzenko and A. J. Agranat, Keynote Lecture, “The Unexplored Avenues of the Human Skin – Its Electromagnetic Response in the Sub THz band”, 10th IEEE International Conference on Solid Dielectrics, Potsdam, Germany, 4-9/07/2010.
- 4 **P. Ben Ishai**, Yu. Feldman, E. Safrai, A. Puzenko and A.J. Agranat, “The Extremely High Frequency Electromagnetic Response of Human Skin – From Physical to Mental Aspects”, Technologies for Remote Sensing, Detecting and Imaging, Ariel College, Israel, 1/6/2010.
- 3 **P. Ben Ishai**, Yu. Feldman, A. Puzenko and A. J. Agranat, “The tyranny of Polar Nano-regions in KTN Ferroelectric Crystals -Engineering the nanoscale for the sake of macroscopic behavior.”, Isranalytica 2010, Tel Aviv, Israel, 19-20/01/2010
- 2 **P. Ben Ishai**, Yu. Feldman, A. Puzenko, A. Caduff, A. J. Agranat, “The Unexplored Avenues of Human Skin Electromagnetic Properties in the Sub THz band”, Dielectrics 2009, University of Reading, UK, 17/04/09
- 1 **P. Ben Ishai**, A. Puzenko, A. Caduff, A. J. Agranat, Yu. Feldman, “The Remote Sensing of the Human State via the Sub-Terahertz Response of Human Skin”, Applications of Electromagnetic Radiation and Electro-Optics in Homeland Security, Ariel, Israel, 28/2/2008.

Conference Poster Presentations:

- 29 **P. Ben Ishai** and Yu. Feldman, “Potential Risks to Human Health Originating from Future Sub-MM Communication Systems”, 2017 Expert Forum: Wireless Radiation and Human Health, Hebrew University Medical School, Givat Ram, Israel 23-26/1/2017
- 28 S. Lerner, **P. Ben Ishai** and Yu. Feldman, “Entropy-Enthalpy Compensation in Glass Formers”, 9th International Conference on

- Broadband Dielectric Spectroscopy and its Applications, Pisa, Italy
18/09/2016 – 22/09/2016, Oral Presentation.
- 27 I. Popov, **P. Ben Ishai**, A. Khamzin and Yu. Feldman, “The Mechanism of Dielectric Relaxation in Water”, 9th International Conference on Broadband Dielectric Spectroscopy and its Applications, Pisa, Italy 18/09/2016 – 22/09/2016, Oral Presentation.
- 26 **P. Ben Ishai**, Yu. Feldman, “The Dawn of Sub-THz Communication Channels – Are the Safe?”, IEEE - HIT International Conference on Electromagnetic Compatibility - EMC 2016, Holon, Israel 3/05/2016.
- 25 **P. Ben Ishai**, S. R. Tripathi, K. Kawase, A. Puzenko and Yu. Feldman, “The Origin of Water’s Dielectric Excess Wing” , IRMMW-THz 2015, Hong Kong, China, 23/08/2015-28/08/2015, Oral Presentation.
- 24 D. Agranovich, **P. Ben Ishai**, G. Katz, D. Bezman and Yu. Feldman, “A Dielectric Spectroscopy Study of Quenched Milk“, 8th International Conference on Broadband Dielectric Spectroscopy and its Applications, Wisla, Poland 14/09/2014 – 19/09/2014, Poster Presentation
- 23 S. Lerner, **P. Ben Ishai** and Yu. Feldman, “Meyer-Neldel Compensation as a feature of the Johari-Goldstein β -relaxation.” 8th International Conference on Broadband Dielectric Spectroscopy and its Applications, Wisla, Poland 14/09/2014 – 19/09/2014, *Oral Presentation*
- 22 **P. Ben Ishai**, A. Puzenko and Yu. Feldman, “A Proton Cascade as the Origin of Water's Dielectric Relaxation“, 8th International Conference on Broadband Dielectric Spectroscopy and its Applications, Wisla, Poland 14/09/2014 – 19/09/2014, *Oral Presentation*
- 21 **P. Ben Ishai**, A. Puzenko, K. Kawase and Yu. Feldman, “The Origin of Water Relaxation up to the Boson Peak”, 7th International Discussion Meeting on Relaxation in Complex Systems, Barcelona, Spain, 21/07/2013-26/07/2013, *Oral Presentation*
- 20 **P. Ben Ishai**, E. Mamontov, A. Sokolov, J. Nickels, K. Kawasa and Yu. Feldman, “Water Revisited: Unifying a Myriad of Beliefs”, Terahertz and Ultrashort Electromagnetic Pulses for Biomedical Applications, SPIE BiOS 2013, San Francisco, USA, 06/02/2013 – 07/02/2013, *Oral Presentation*.
- 19 **P. Ben Ishai**, A. Puzenko, Yu. Feldman, “What is the Origin of Water’s Relaxation Peak?”, Israel Physical Society Annual meeting, 1/12/2013, Weizmann Institute, Rehovot, Israel., *Oral Presentation*.
- 18 **P. Ben Ishai**, E. Mamontov, A. Sokolov, J. Nickels, K. Kawasa and Yu. Feldman, “Water Revisited – Unifying a Myriad of Beliefs”, Israel Physics Society Annual Meeting 2012, Jerusalem, 09/12/2012, *Oral Presentation*

- 17 **P. Ben Ishai**, Yu. Feldman, A. Puzenko, E. Safrai, A. Caduff and A. J. Agranat, “Tracing the Activity of the Sympathetic Nerve System from the Reflection Coefficient of Human Skin in the Sub Terahertz Band.”, Society for Thermal Medicine Annual Meeting 2011, New Orleans, USA, 29/04/2011 – 02/05/2011, *Oral Presentation*.
- 16 Yu. Feldman, A. Puzenko, and **P. Ben Ishai**, “The State of Water in Complex Materials”, ISEMA 2011, Washington, USA, 31/05-03/06/2011, *Oral Presentation*.
- 15 **P. Ben Ishai**, D. Libster, A. Aserin, N. Garti and Yu. Feldman, “Exposing the Dielectric Behavior of ‘Exotic’ Gels”, 6th Intl. Conference on Broadband Dielectric Spectroscopy and its Applications, Madrid, Spain, 07-10/09/2010, *Oral Presentation*.
- 14 Yu. Feldman, A. Puzenko, **P. Ben Ishai**, A. Caduff, and A. J. Agranat, “Human Skin as Arrays of Helical Antennas in the Millimeter and Submillimeter Wave Range”, IRMMW-THz-2008, Pasadena, USA, 15 – 19/09/08, *Oral Presentation*.
- 12 **P. Ben Ishai**, Yu. Feldman, A. Puzenko, “Structural Insights from the Cole-Cole Function”, 5th Intl. Conference on Broadband Dielectric Spectroscopy and its Applications, Lyon, France, 26-29/08/08, *Oral Presentation*.
- 11 Yu. Feldman, A. Puzenko, **P. Ben Ishai**, A. Caduff, A. J. Agranat, “The Electro Magnetic Response of Human Skin in the Submillimeter Wave Range”, IRMMW-THz2007, Cardiff, Wales, 3-7/09/2007, *Oral Presentation*.
- 10 Y. Feldman, A. Puzenko, **P. Ben Ishai**, A. Caduff, A. J. Agranat, , “The electromagnetic response of human skin in submillimeter frequency range”, MSMW’07 and TERATECH’07, Kharkov, Ukraine, 25-30/06/2007, *Oral Presentation*.
- 9 **P. Ben Ishai** and Yu. Feldman, “Strange Kinetics and the Energy Landscape”, Nato workshop “Meeting the Challenges of the 21st Century & Novel Applications of Broadband Dielectric Spectroscopy”, Suzdal Russia 22-26/07/2007, *Poster Presentation*.
- 8 **P. Ben Ishai**, S. Lerner, Yu. Feldman and A.J. Agranat, “The Ferroelectric Phase Transition – Percolation or not in KTN?”, 4th Intl. Conference on Broadband Dielectric Spectroscopy, Poznan, 4-7/9/2006, *Oral Presentation*.
- 7 **P. Ben Ishai**, Yu. Feldman and A.J. Agranat, “The Thermal Analysis of Disorder over an Ordered System” (opening speaker), Thermal Analysis Conference, Jerusalem 5/2/2006, *Oral presentation*.
- 6 **P. Ben Ishai**, S. Lerner, A.J. Agranat and Yu. Feldman, “The Percolative Nature of the Ferroelectric Phase Transition in KTN”, 5th International Discussion Meeting on Relaxations in Complex Systems, New results, Directions and Opportunities, Lille, France 7-13/7/2005, *Poster presentation*.

- 5 **P. Ben Ishai**, C.E.M. de Oliveira, Ya. Ryabov, A.J. Agranat and Yu. Feldman, “Unusual glass like systems – relaxation dynamics of dopants in ferroelectric crystals”, 3rd Intl. Conference on Broadband Dielectric Spectroscopy, Delft, 23-26/8/2004, *Oral presentation*.
- 4 **P. Ben Ishai**, A.J. Agranat, L. Secondo and Yu. Feldman , “The Slow Dynamics of a Disordered System of Dopants in Ferroelectric Crystals”, 3rd Intl. Conference on Slow Dynamics in Complex Systems, Sendai Japan, 3/11-8/11/2003, *Poster presentation*.
- 3 **P. Ben Ishai**, L. Secondo, Yu. Feldman and A.J. Agranat, “Novel Dielectric Behavior in KTN photorefractive Crystals”, Dielectrics for Emerging Technologies, Edinburgh, UK, 23-27/3/2003,. *Oral presentation*.
- 2 **P. Ben Ishai**, A.J. Agranat, L. Secondo and Yu. Feldman, “Novel Dielectric Behavior in KLTN Photorefractive Crystals”, 2nd International Conference on Broadband Dielectric Spectroscopy Leipzig, Germany 2-6/09/2002, *Poster presentation*.
- 1 **P. Ben Ishai** E. Polygalov, I. Ermolina, A. Puzenko and Yu. Feldman “An extension of the TDS-2 measurement system from sample holders to open-ended coaxial probes” ,1st International Conference on Dielectric Spectroscopy, Jerusalem 12-15/03/2001, *Poster presentation*.

Presentations at informal international seminars and workshops (do not repeat meetings listed above)

Invited Tutorials

- 4 “An eclectic approach to complex relaxation”, in the Tutorial Session of the 8th International Discussion Meeting on Relaxations in Complex Systems, Wisla Poland, 23/07/17-28/07/17.
- 3 “The Data treatment of complex dielectric behavior”, in the Tutorial Session of the 6th Intl. Conference on Broadband Dielectric Spectroscopy and its Applications, Madrid, Spain, 06/09/2010
- 2 “The data treatment of complex dielectric behavior”, in the Tutorial Session of the 6th International Discussion Meeting on Relaxations in Complex Systems, Rome, 30/08/09-5/09/09
- 1 “High K-nano smart materials”, in the Tutorial Session of the 6th International Discussion Meeting on Relaxations in Complex Systems, Rome, 30/08/09-5/09/09

Seminar presentations at universities and institutions

4	P. Ben Ishai , “Water in the ultra-confinement of natural minerals - Evidence of a 1D structural glass transition”, Department of Environmental Physics and Solar Energy, Ben-Gurion University, 19/06/2018
3	P. Ben Ishai , S. Lerner, “Universality of the compensation law for secondary processes in glass formers?” , Viscous Liquids and the Glass Transition (XIII), Holbæk, Denmark, 28/05 – 30/05/2015.
2	P. Ben Ishai , Invited lecture before Students and Staff, Physics Dept. Tokai University, Kanagawa, Japan , 17/11/2003.
1	P. Ben Ishai , C.E.M. de Oliveira, Ya. Ryabov, A.J. Agranat and Yu. Feldman , 3 rd Intl. Symposium on Trends in Modern Physics – Hokkaido University, Sapporo, Japan, 11/11/2003 “Glass Forming Liquid like behaviour of Dopants in KTN”

Patents

Year, Name(s) of inventor(s), Title of patent, Country of registration.

- | | | |
|---|------|---|
| 4 | 2019 | Yuri Feldman, Paul Ben-Ishai , Saul Yedgar, Gregory Barshtein, Andreas Caduff, EP3432793B1 “System for non-invasive monitoring of blood conditions”, EP,CN,US,WO |
| 3 | 2018 | Yuri Feldman, Paul Ben-Ishai Alexander Puzenko, Haim Goldberger, “System and method for biometric detection based on sweat ducts”, US20170004368A1, Year 2018, USA |
| 2 | 2017 | Yuri Feldman, Paul Ben-Ishai , Alexander Puzenko, US9816945B2 2017-11-14, "System and method for determining properties of liquids" ,US, WO, CN (cited: 1) |
| 1 | 2012 | Yuri Feldman, Paul Ben-Ishai , Alexander Puzenko, Andreas Caduff, Aharon Agranat, United States Patent US8311616B2, Year:2012, “Method and System for Determination of Physiological Conditions and Emotional States”, USA (cited : 7), WO, JP |

Research Grants

Dates, Granting Institution, Names of all grantees (note which are principal investigators), Subject, Period of grant, Annual amount in \$, Total amount in \$.

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|---|------|--|
| 7 | 2022 | Ariel University-HIT collaboration grant, “Development and characteristic a new organic magnetoresistance (OMAR) material based on conductive polymers doped with ferromagnetic nanoparticles”, RA2200000120, Total 34,000 NIS |
| 6 | 2019 | Ministry of Science “AI methods for THz Optical Design”, RA20000000080, Total : 600,000 NIS |

- 5 2018 Sub-contractor grant, , “Smart Packaging” RA1900000091, HUJI University Agrinnovation grant, Total 108,000 NIS
- 4 2017 Internal Research Grant, “Measuring the real levels of cellular radiation”, Ariel University, RA1700000443, Total: 19,900 NIS.
- 3 2017 Start-up Grant, Ariel University, RA1700000316, 400,000 NIS. PI: P. Ben Ishai
- 2 2013 ISF Grant N. 1661/13 “Dielectric Spectroscopy for the monitoring of storage-induced lesions to red blood cells” – 240,000 NIS/year for 3 years, Total 720,000 NIS. PIs: P. Ben Ishai and G. Barshtein.
- 1 2011 ORNL Neutron Scattering Science Proposal IPTS-4206 for NScD 2011-A – 4 days beam time on BASIS Neutron scattering, Oak Ridge National Laboratories. Collaborators: P. Ben Ishai, Yu. Feldman, E. Mamontov, J. Nickels and A. Sokolov

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

An overriding theme of my research has been the quest to understand the link between structure and dynamic in Soft Matter. This has been pursued both theoretically (Articles 7, 15, 17, 18, 24, 29, 32 and 52. Book chapters 2, 3, 5, 7, 8, 9, 11, 14, 17 and 18) and experimentally. I have found intrigue in the existence of relaxation behaviors of dopants in solid state that is reminiscent of liquid like behavior (Articles 2, 3, 5, 6, 24). I have pursued this interest into the THz regime, where the relaxations are related to molecular vibration and H-bond dynamics. In short this can be summed up as studying the mesoscale (Articles 9, 10, 12, 13, 15, 25 and 52 Book Chapters 9, 11 and 13), a borderland between cooperative and single bond dynamics. As many of these Soft matter systems are dipolar in nature, Dielectric and THz spectroscopies have been a natural tool for their investigation.

My general education is the field of dielectric physics. My MSc. degree dealt with the construction and programming of a high frequency (10^3 - 10^{10} Hz) time domain dielectric spectrometer, a subject I have continued throughout PhD work with the supervision of MSc. students in the use of high frequency time domain techniques and the construction of a low frequency (10^{-6} – 10 Hz) time domain dielectric spectrometer. (Student supervision: Tomer Rachamim). My Post Doc. work in Japan extended my capabilities to the THz regime by mastering the technique of Time Domain Terahertz Spectroscopy (Articles 32 and 34).

During my PhD., I specialized in the relaxation dynamics of impurities in Potassium Tantalate Niobate (KTN) ferroelectric crystals. The research was carried out in a variety of techniques including Broadband frequency based (10^{-2} – 10^6 Hz) dielectric spectroscopy, Differential Scanning Calorimetry and dynamic Kerr effect spectroscopy. I succeeded in demonstrating liquid like behaviour in the dielectric relaxation of Copper dopants in KTN,

a feature of solid state not before noted, and showed that Polaron hopping processes were responsible for the degradation of switching efficiency in electro-holographic optical switches based on KTN. (Articles 2,3, 5-6, 24)

Other research projects I have worked on include the dielectric behaviour of water/glycerol mixtures (Articles 7, 15), microemulsions, complex gels (Articles 9, 10, 12, 13, 15 and 33) and superconducting ceramics (Article 4). My research interests have been extended to include topics from molecular biophysics (Articles 17,18, 35, 36, 38, 40, 42 and 43), including the dielectric behavior of proteins, and complex biological liquid systems such as blood and milk (Articles 35, 36, 39, 42, 49, Book Chapters 23, 24). In this framework I spent time in Oak Ridge National Laboratories, by the invitation of Prof. A. Sokolov, exploiting the techniques of Neutron Scattering to better understand the dynamics of water in aqueous salt solutions. This led to a significant paper demonstrating that the diffusion coefficient water increases or decreases according to whether the dissolved ion is structure making or breaking (Article 21). Part of my time there was to instruct them on the use of high frequency Vector Network Analyzers as dielectric spectrometers. I also studied the low frequency problems of ion accumulation at the electrode/liquid sample interface, a phenomenon known as Electrode Polarization (Articles 16 and 22). This work culminated in an important review paper on the subject (Article 22) and one MSc. Thesis (Student Supervision: Zvi Sobel). During this sojourn I also became aware of intriguing problems of ultra-confinement in natural minerals (Article 20 and 52), a subject I am still actively studying.

For the last 10 years I have been deeply involved in a project investigating the sub terahertz and terahertz response of human skin (Articles 8, 11, 19, 23, 27, 28, 30, 34, 44, 45, 48, 50,54 and 56, Book chapters: 7, 10, 12, 14 and 16). This project is ground breaking as for the first time it considers the electromagnetic properties of morphological features (particularly sweat ducts) of the human skin and their response to extremely high frequencies (75 GHz – 700 GHz), using both direct measurements and simulations. As a member of the Dielectric team of the Applied Physics Department of the Hebrew University of Jerusalem I was central to their research in sub-terahertz and terahertz spectroscopy for a number of non- biological systems. In particular, the excess wing and boson peak, existent in a number of glass formers (such as glycerol), the phonon spectrum of ferroelectric crystals and materials characterization in solid state. I was involved in the planning and experimentation in all of these fields.

During my Post. Doc. work in Nagoya University I studied the THz response of H-bonded liquids such as water. A result of this work was the new observation that the excess wing in the dielectric spectra of water (the departure from regular Debye relaxation in the high frequencies before the Boson peak) scales with temperature in the same way as the dominant dielectric peak, noted around 20 GHz. The implication of this is that they most likely share a common molecular root and a model based on this idea was developed (Article 32). These ideas were further developed theoretically (Article 37).

Continuing with the motive of water in biological systems in recent years I have led an extensive study of packaged Red Blood Cells (ISF grant 1661/13, Articles 38, 42 and 43). The motivation for a such a study was the observation that aging of the Red Blood Cell

(RBC) in the packaging lead to significant storage lessons that modified the nature of the RBC membrane. Apart from rendering the use RBC in infusions hazardous, these cellular modifications lead to differences in the beta dispersion in the dielectric spectra of RBC suspensions. The beta dispersion in the dielectric spectra of biological systems arises because of interfacial polarizations along cellular membranes. More surprisingly we discovered that the dielectric signal arise from cytoplasmic water inside the cell would also reflect changes to the cell vitality as it aged or the cells were immersed in a glucose solution (38).

My main research thrust as the present is the subject of water contained by ultra-confinement in natural minerals, such as Beryl (20) and Cordierite (Keynote presentations: 10, 11 and 12, Article 52). By imprisoning the molecule in channels with a diameter comparable to that of the water molecule all trace of inter-molecular H-bonding is removed. This leads to new and unusual physics, like incipient Ferroelectricity, 1 dimensional glass systems (Article 52) and anisotropic dielectric behaviors. These minerals have important technological applications (Cordierite is an important element of modern car catalyzers). This project is carried out in cooperation with Oak ridge National Laboratories and will be extended to other natural minerals in this class, such as Hemimorphite and Modenite.

I have also become interested in the effects of Electromagnetic radiation from Cellular phones on the Human body. This interest stemmed from simulation work I have carried out on models of Human Skin containing a sweat duct in the frequency range 10 GHz to 700 GHz (Articles: 34 and 44, Conference presentation 25 and 28, Keynote presentation 2) and the onset of the 5G standard for cellular and wireless communication. Using proprietary application software I have found that the most models of cell phones frequently subject the user to higher EM field densities than the advised standards allow. I am currently carrying out research (Grant 4) using 50 volunteers to map out exposure levels in Israel today. Preliminary findings have already been presented in the annual Electromagnetic Compatibility conference (Invited talk presentation 13). In February 2020 I organized an international conference on the subject of exposure to cell phone radiation, "Expert Forum 2020: Wireless and Cellphone Radiation and Public Policy", held in the department of Public Policy of Tel Aviv University. As an outcome of this meeting, I have prepared expert opinions, submitted to the Washington Court of Appeals in a case against the Federal Communications Commission refusal to consider scientific opinion when establishing its standards (Published scientific report 1).

A new direction in my laboratory is the study of hydration shells in metalloproteins such as ferritin. This research is being done in cooperation with San Sebastian University of Spain. A joint student was hosted in my lab during the summer of 2019 in order to carry out a number of measurements on Ferritin, Myoglobin and Lysozyme solutions using Raman Spectroscopy, FTIR, UV-Vis Spectroscopy and THz spectroscopy. This work is ongoing and has been expanded to include the THz signatures of viral components, including Covid 19 in conjunction with a German company, Ram Group GmbH.

In cooperation with the Crystal Science laboratory of Ariel University I have returned to my earlier work by studying ceramic such as Bismuth Ferrite Oxide, BFO, and single non-linear

crystals like Barium Borate Oxide, BBO. BBO is sometimes referred to as the poster boy of multi-ferroics. It possesses the ability to host concurrently both ferroelectric and ferromagnetic properties. The duality of this nature leads to a rich dielectric landscape, reflecting a multitude of relaxation processes, linked to domain and defect motion with consequences for both its magnetic and electric phases.

Barium Borate Oxide (BBO) is a well known non-linear optic crystal. However, the dynamics of its formation are not simple, as in the melt it tends to form glass rather than crystal. Along with Dr. Orr of the Crystal Science Laboratory of Ariel University I designed and built a high temperature Time Domain Dielectric Spectrometer (Article 47), capable of measuring the crystallization from the melt at temperatures in excess of 900 °C. at these temperatures a crystal melt is more akin to an ionic liquid and one can trace process of glass formation, percolation and crystallization. An article on the glass forming processes in BBO is currently under preparation.

Finally, in cooperation with the Accelerator department of Ariel University we are designing and producing novel adaptive optical components in the THz regime using 3D printing. Part of this work is the beam profiling of the output from the optical element (grant MOST RA20000000080). For this purpose a bespoke beam profiler, based on solid state CW Terahertz sources and a THz calibrated pyrometer, is being built in my lab. I current mentor 2 PhD. students, both in the field of Terahertz spectroscopy and applications. A flagship project being carried out is the design and construction of a detector for the FEL THz source being built in the Accelerator department. This detector is based on the electrooptic effect and a specialized fiber optic stretcher to allow single pulse detection.

Present Academic Activities

Research in progress

1. 2019 Ultra-Confinement in Natural minerals
Dr. Larry Anovitz, Oak Ridge National Laboratories
2. 2019 Exposure to EMF Cellular radiation
3. 2020 Smart Food Packaging
Prof. Yuri Feldman, The Hebrew University
4. 2020 High Temperature Super Conducting Ceramics.
Prof. Leonid Trakhtenberg, Lomonosov Moscow State University
5. 2020 Multiferroic Ceramics
Dr. Gilad Orr
6. 2020 Glassy Dynamics in Polymers
Dr. Elad Pollak, Rafael Industries
7. 2022 organic magnetoresistance (OMAR) material based on conductive polymers
Dr. Amos Bardea, Holon Institute of Technology

Books and articles to be published

In preparation

1. P. Ben Ishai, D. Davis, H. Taylor, L. Birnbaum, "Problems in Evaluating the Health Impacts of Radio Frequency Radiation", Environmental Research, Under review 2022.
2. Paul Ben Ishai, Gilad Orr, "Dielectric Relaxation in High Temperature Melts of BBO"
3. Marcelo David, Andrey Shendrik, Vladimir Rozenstein, Paul Ben Ishai, Yuri Feldman, "Full Multiple Reflections Method Improves Accuracy in Time-Domain Dielectric Spectroscopy".

Additional Information

I have trained in Shotokan Karate for over 28 years, attaining a 3rd level Black belt, and run my own karate school for 20 years, where I teach both children and adults. I also give private tuition on practical self defense.