

## TALYA ARUSI-PARPAR - SENIOR RESEARCHER

Applied Physics Division • NRC Soreq • Yavne 81800 • Israel

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### PERSONAL DATA

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Born in Hamburg, Germany, December 1962  
IDF, Air Force service, Electro-optics technician 1981-1985  
Status: Married + 3  
Marganit 48, Yavne 8151338, Israel  
Languages: Hebrew, English and German – fluently

### RESEARCH INTERESTS

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Laser research and development, Non-linear Optics, Mode- and Bond-Selective Photochemistry, Laser Chemistry, Molecular Dynamics, Quantum Optics, Optical Detection of Chemical Species, Hazardous and Illicit Materials, Remote Detection of Explosives, Ultrafast Phenomena, Atto-second Science.

### ACADEMIC EDUCATION

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1985 - 1988 B.Sc. Physics, Ben-Gurion University of the Negev, Israel  
1989 - 1992 M.Sc. Physics, Ben-Gurion University of the Negev, Israel  
Title of thesis: "Isotopic Effect in Photodissociation and Reactions of Vibrationally Excited Molecules", Supervision: Prof. S. Rosenwaks  
1992 - 1997 Ph.D. Physics, Ben-Gurion University of the Negev, Israel  
Title of thesis: "The Influence of Rovibrational Excitation on Selective Bond Fission in C<sub>2</sub>H<sub>2</sub> and C<sub>2</sub>HD", Supervision: Prof. S. Rosenwaks

### EMPLOYMENT

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1989 - 1996 Laboratory Instructor and Assistant, Physics Department, Ben-Gurion University  
1997 - today Research and Development, Applied Physics Department, Soreq NRC.  
2009 - 2010 Sabbatical at Quantum Optics Group, Weizmann Institute of Science, Rehovoth, Israel.  
2017 – 2019 Sabbatical at Atto-second Group, Weizmann Institute of Science, Rehovoth, Israel.

### APPOINTMENTS

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1997 - 1998 NRC Soreq, Member of Research Staff - Remote Sensing Group  
1998 - 2003 NRC Soreq, Senior Scientist - Explosive Detection Project Manager  
2003 - 2009 NRC Soreq, Head of Explosive Detection Group  
2009 - 2010 Weizmann Institute of Science, Sabbatical - Visiting Scientist  
2011 - 2012 NRC Soreq, High Power Fiber Laser Project Management

2012 - 2017	NRC Soreq, Head of Spectroscopic Sensing and Detection Technologies
2017 - 2019	Weizmann Institute of Science, Sabbatical - Consulting Scientist
2019	NRC Soreq, Senior Researcher at Remote Sensing Group

## PROFESSIONAL EXPERTISE

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### Laser Spectroscopy (1989- today)

Bond-selective photochemistry, at the electro-optic laboratories of Prof. Rosenwaks during M.Sc. and Ph.D. at Ben-Gurion University.

- ♦ Pulsed laser photofragmentation (PLP)
- ♦ Laser induced fluorescence (LIF)

Raman and Coherent Anti-Stokes Raman Spectroscopy (CARS) at Ben-Gurion University.

Photo-Acoustic Raman Spectroscopy (PARS) at Ben-Gurion University.

Resonance Enhanced Multi-Photon Ionization (REMPI) at Ben-Gurion University.

Generation of VUV Radiation (Ly- $\alpha$ ) to detect Hydrogen from photodissociation of molecules by Laser induced fluorescence, University of Heidelberg in Germany, visiting scientist.

PLP/LIF (PF-method): Detection and identification of explosives and harmful species. NRC Soreq, leading research in collaboration with Ben-Gurion University.

Differential Absorption for detection of improvised explosives, leading research at NRC Soreq.

FM Spectroscopy as a sensitive method for detection of explosives, NRC Soreq, leading research in collaboration with Tel-Aviv University.

Raman: Sensitive measurement of gases with fiber sensors using Raman spectroscopy. Leading research at NRC Soreq.

High Harmonic Generation (HHG): Electron dynamic studies via HHG in gas and solids generated by ultrafast lasers. Attosecond pulse generation reaching XUV and Soft X-ray region.

### Development of detection methods and systems (1997-2018)

Development of PLP/LIF method (PF-method) as a technique for remote detection of NO containing explosives.

- ♦ Project manager and chief scientist of remote detection of explosives funded by TSWG and Israeli Ministry of Defense (project nr. 507 US-ISRAEL Counterterrorism R&D M.O.U.)
- ♦ Project manager and chief scientist "Remote detection of TATP" funded by TSWG and Israeli Ministry of Defense.

Development and invention of Enhanced-PF method. Patent Application No. US 2010/0064768.

Development of Differential Absorption LIDAR (DIAL) system: detection of improvised explosives, Project manager and chief scientist, NRC Soreq

Development of a method and device for the remote detection of assorted metallic objects on human beings by RF reflection pattern, internal funding.

Development of a field system for remote detection of explosives based on the E-PF method. Project manager and chief scientist, NRC Soreq funded by Winner Global Defense.

- ♦ Field detection of explosives from 30 meters in ambient environmental conditions.

- ◆ Successful detection of explosive traces in a blind test conducted by the Department of Homeland Security as pretest for the "Standoff Laser or Non-laser optical techniques for the detection of trace amounts of explosives on vehicles" program.

Development of a detection method to identify materials according to their difference in thermal response to remote laser heating.

- ◆ Development of the method and algorithm.
- ◆ Development of laser based system
- ◆ Successful demonstration in the field.

### Laser development (1997-2013)

Development of 1.3 micron laser and characterization of Nd:YVO<sub>4</sub> zig-zag slab laser. Research at NRC Soreq.

Development of UV laser sources for laser induced fluorescence detection. Project leader and chief scientist, NRC Soreq.

Research towards development of a novel laser concept "Nano Particle Laser". Research at NRC Soreq.

High Power Fiber Laser Project (HPFL). Project management at NRC Soreq in collaboration with El-Op, Elbit Systems, funded by the Israeli Ministry of Defense.

### Applied and Basic Research (1989-today)

Molecular dynamics research utilized by rovibrational excitation, Ben-Gurion University.

Remote Detection of Explosives. Leading Research Group at NRC Soreq, Development and demonstration of detection concepts.

Remote detection of peroxides. Leading research group at a multidisciplinary research consortium, in cooperation with Prof. J. Oxley Univ. of Rhode Island USA, Prof. R. Kosloff, Hebrew Univ., Prof Yehuda Zeiri, Ben Gurion Univ., Prof J. Almog, Kasali Inst. Jerusalem, Prof. E. Keinan, Technion, etc.. Funded by the Science for Peace Program NATO. Group project leader and chief scientist, NRC Soreq.

Experimental quantum optics, production of cold atoms: Sabbatical at Dr. Barak Dayan's Research Group at the Chemical Physics Department, Weizmann Institute of Science, Rehovoth Israel. My work was mainly constructing and characterizing an experimental setup to produce cold atoms which interact with chip-based micro resonators.

Successful application as Research group leader at the "Center of Excellence for Explosives Detection, Mitigation, and Response", lead by Prof. J. Oxley, University of Rhode Island (URI).

Thermal Imaging - Remote material identification in the field based on thermal properties, NRC Soreq, for the Israeli Ministry of Defense.

Laser-matter interaction, NRC Soreq, for the Israeli Ministry of Defense

Ultrafast Phenomena - High Harmonic Generation: Sabbatical at Prof. Nirit Dudovitch's Research Group at the Physics Department, Weizmann Institute of Science, Rehovoth Israel. My contribution was mainly performing High Harmonic Generation experiments in gases and solids following analysis of experimental results (MatLab) and design and construction of dedicated spectrometer for HHG (SolidWorks).

## AWARDS AND SCHOLARSHIPS

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- President's medal of distinction, IDF, 1984
- Aharon Katzir scholarship for outstanding Israeli scientists, 1997-2003
- Annual award, Electro-optics Department, Soreq, 1998
- Annual award, Electro-optics Department, Soreq, 2005
- Annual outstanding employee, NRC Soreq, 2007
- Annual award, Electro-optics Department, Soreq, 2008
- Annual award, Applied Physics Department, Soreq, 2015

## MISCELLANEOUS

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- 2001 - 2013 Participation in numerous Internal Committees, NRC Soreq.
- 2000 - 2009 Participation in Defense against Terrorism Forums.
- 2001 - 2005 Participation at Workshops in Subjects such as Lasers (Israel-Germany), Homeland Security (USA) and Stand-off detection of suicide bombers (NATO - Germany)
- 2006 Lecturer at NRC Soreq Education Department
- 2008 Member of the organizing committee of the 1<sup>st</sup> International Conference on Improvised Explosives at Rosh Hanikrah, Israel, Mai 2008.
- 1998 - 2011 Performance of numerous laser system acceptance tests (ATPs) abroad and confrontation with legal purchase issues with companies abroad.
- 2009 - 2010 Sabbatical at Dr. Barak Dayan's Research Group at the Chemical Physics Department, Weizmann Institute of Science, Rehovoth Israel - Quantum Optics.
- 2010 - 2017 Member of the Jehuda Yinon Award selection committee. The award is granted at the annually Isranalytica conference in Israel.
- 2012 - 2017 Financial Manager of the Israel Researchers Organization Committee
- 2012 Member of EFQM (European Foundation Quality Management) Excellence Model team evaluating the Applied Physics Division, NRC Soreq.
- 2010 Reviewer for International Journal of Energetic Materials and Chemical Propulsion
- 2015 - 2017 Academic Students Guidance at NRC Soreq.
- 2017 - 2019 Sabbatical at Prof. Nirit Dudovitch's Atto-second Science Research Group at the Physics Department, Weizmann Institute of Science, Rehovoth Israel.