

CV of Róbert Szipócs, Ph.D.



Róbert Szipócs, Ph.D.

Senior Research Fellow

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Education:

1983-87 M.Sc. in Electrical Engineering, Technical University of Budapest (BME)

1987-90 Doctoral degree in Technical Physics, Technical University of Budapest (BME)

2001 Ph.D. degree in Laser Physics and Optics, University of Szeged

Title of Ph.D. dissertation:

Dispersive Properties of Dielectric Laser Mirrors and their Use in Femtosecond Pulse Lasers

Professional Experience

Since 1987, I have been working as a research fellow at the Institute for Solid State Physics and Optics (which is currently a part of HUN-REN Wigner Research Center for Physics). Between 1987 and 1990, I investigated nonlinear optical properties of optical interference filters containing compound semiconductors. Parallel to this work and in the early nineties, I developed an optical thin film design software for analysis and computer optimization of their spectral amplitude (e.g. $R(\lambda)$, $T(\lambda)$) properties.

Starting from 1992, my research interest was focused on dispersive properties optical multilayer dielectric mirrors and their use in ultrafast laser systems. My related work included design and numerical optimization of dielectric mirrors for prescribed phase properties such as their second- or third order dispersion functions, analytic design of chirped mirrors by the use of Fourier-transform or spatial frequency-domain optimization, development of spectral interferometry for phase-characterization of dielectric mirrors, laser crystals or optical fibers, construction of mode-locked solid-state lasers or parametric oscillators, pulse compression techniques using single-mode, photonic crystal of hollow core fibers and ultrafast spectroscopy. Between 1993 and 2000, I achieved outstanding scientific result in the field of ultrafast laser science, thanks to the invention and my first development of the so-called "chirped" (or dispersive) dielectric mirrors in 1993. Just to take a few examples: the shortest laser pulses at that time (4.5 fs duration) were produced in 1997 by a Ti-sapphire laser at the University of Groningen (The Netherlands) using ultrabroadband chirped mirrors for dispersion compensation. The result was listed in the Guinness Book of Records and also on the poster for the 1999 Nobel Prize in Chemistry (by Zewail). Between 1992 and 1997, I worked with Prof. Ferenc Krausz, winner of the 2023 Nobel Prize in Physics, at the Vienna University of Technology in the framework of an Austrian-Hungarian TÉT collaboration on the development of a Ti-sapphire-based laser amplifier, pulse compression system generating sub-fs, 5 fs laser pulses being suitable for isolated attosecond laser generation by high-harmonic generation in noble gases for the first time.

Since 1997, I have also been working as managing director of R&D Ultrafast Lasers Ltd (see: www.szipocs.com). In 1998, I founded a new laboratory for femtosecond laser physics, ultrafast spectroscopy and nonlinear microscopy at the Institute of Solid State Physics and Optics. In 2005 and 2006, I worked as a head of a new two-photon microscope research laboratory at the Institute of Experimental Medicine, Department of Drug Research of the Hungarian Academy of Sciences. My current research topics include: design of optical thin films, ultrafast solid-state (e.g. Ti:sapphire) and fiber (e.g. Yb- Er-) lasers, nonlinear propagation of femtosecond pulses in photonic crystal optical fibres, photonic crystal fibre design, ultrafast optical parametric oscillators, development of nonlinear microscopy methods (e.g. 2P, SHG, CARS, FLIM) for *in vivo* pathology applied in oncology, dermatology or brain research, real time, *in vivo* imaging in drug research or metabolic investigations of living tissues by FLIM related to oncology, diabetes research, or sport science.

Publications:

<https://m2.mtmt.hu/gui2/?type=authors&mode=browse&sel=authors195>

Scientometry:

Number of referenced papers published: 62

Number of independent citations: 3763

Hirsch-index: 24

USA patents held: 2 (on „Dispersive dielectric mirrors” and „Random access 3D nonlinear microscopy”)

Founding member of companies:

Optilab Ltd. (optical coatings, in 1991)

R&D Lézer-Optika Inc. (dispersive mirrors, in 1995)

R&D Ultrafast Lasers Ltd. (ultrafast lasers, 1997)

Femtonics Ltd. (two-photon microscopy, 2005)

Membership: Optica (previously Optical Society of America) since 1995
Roland Eötvös Physical Society (ELFT)

International Awards:

1996 International Gábor Dennis Award

2002 ICO/ICTP Award