

Academic Résumé

Tobias Schäfer

Personal Data

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Status Citizen of Germany
Born June 1st, 1973 in Neckargartach, Germany

Work Experience

- since Apr. 2001 Visiting Research Associate,
Brown University, Providence, RI. Currently visiting the
University of North Carolina at Chapel Hill.
- Feb. – Apr. 2001 Research Associate,
Heinrich-Heine-Universität, Düsseldorf, Germany.
- Jul. – Sep. 2000 Graduate Research Assistant,
Los Alamos National Laboratory, New Mexico.

Education

- Feb. 2001 Ph.D. in Physics, Heinrich-Heine-Universität, Düsseldorf,
Germany
- Oct. 1998 M.Sc. in Physics (highest grade with distinction), Heinrich-
Heine-Universität
- Apr. 1994 Military Service (1 year)
- Oct. 1992 Beginning of studies at the Heinrich-Heine-Universität

Düsseldorf (Physics, Philology of Roman Languages and Philosophy)

Jun. 1992 Abitur (high school diploma, highest grade)
Konrad-Heresbach Gymnasium, Mettmann, Germany

Oct. 1989 Beginning of studies at the Fernuniversität Hagen (Mathematics)

Fellowship

1992–1998 Fellow of the “Studienstiftung des deutschen Volkes”

Referee for Journal of Physics A: Mathematical and General
Physica D: Nonlinear Phenomena

Areas of Study in Theoretical Physics and Applied Mathematics

Courses in Theory of Solitons, Advanced Quantum Physics, General Relativity, Plasma Physics, Numerical Modeling of Partial Differential Equations, Ordinary Differential Equations, Dynamical Systems, Differential Geometry, Linear Operators in Hilbert Spaces.

Research Experiences

Analytical description of dispersion-managed solitons

Consideration of the cubic Nonlinear Schrödinger Equation (NLSE) with periodic coefficients. Approximation of the PDE by ODEs using an expansion in Gauss-Hermite eigenfunctions.

Perturbation of the NLSE

Impact of perturbations due to additional terms to the NLSE, numerical and analytical modeling.

Numerical optimization of fiber transmission lines

Numerical modeling of practical fiber transmission lines in the 40 Gb/s-regime in order to find optimal parameters for the operation of the line. Incorporation of amplifier noise and statistical evaluations. Joint work with Aston University and Deutsche Telekom.

High power ultra short pulses in optical fibers

Incorporation of third-order dispersion, Raman effect and polarization mode dispersion. Joint work with Los Alamos National Laboratory and Boston University.

Interests

Modeling of nonlinear physical systems

Theory of nonlinear partial differential equations

Existence and uniqueness of solutions. Equations with periodic boundary conditions. Numerical solution of PDEs. Stochastic equations.

Perturbation theory

Lie-transform and multiple-scale methods. Reduction of a PDE to an approximate system of ODEs. Validity of asymptotic expansions.

Publications

1. S. K. Turitsyn, I. Gabitov, E. W. Laedke, V. K. Mezentsev, S. L. Musher, E. G. Shapiro, T. Schäfer, K. H. Spatschek: *Variational approach to optical pulse propagation in dispersion compensated transmission systems*, Optics Communications 151 (1998) 117-135.
2. Sergei K. Turitsyn, Tobias Schaefer, Vladimir K. Mezentsev: *Generalized momentum method to describe high-frequency solitary wave propagation in systems with varying dispersion*, Physical Review E, Vol. 58, No. 5, (1998) R5264-R5267.
3. Turitsyn, S. K., Schafer, T., Mezentsev, V. K.: *Self-similar core and oscillatory tails of a path-averaged chirped dispersion-managed optical pulse*, Optics Letters 23, 17 (1998) 1351-1353.
4. Turitsyn, S. K., Schafer, T., Mezentsev, V. K.: *Generalized root-mean-square momentum method to describe chirped return-to-zero signal propagation in dispersion-managed fiber links*, IEEE Photonics Technology Letters, 11, 2 (1999) 203-205.

5. S. K. Turitsyn, T. Schäfer, K. H. Spatschek, V. K. Mezentsev: *Path-averaged chirped optical soliton in dispersion-managed fiber communication lines*, Optics Communications 163 (1999) 122-158.
6. E. W. Laedke, N. Goder, T. Schaefer, K. H. Spatschek, S. Turitsyn: *Improvement of optical fibre systems performance by optimisation of receiver filter bandwidth and use of numerical methods to evaluate Q-factor.*, Electronics Letters , Vol. 35, No. 24, (1999) 2131-2133.
7. Ildar Gabitov, Tobias Schäfer, Sergei K. Turitsyn: *Lie-transform averaging in nonlinear optical transmission systems with strong and rapid periodic dispersion variations*, Physics Letters A 265 (2000) 274-281.
8. T. Schäfer, V. Mezentsev, K. H. Spatschek and S. K. Turitsyn: *Dispersion-managed soliton as a ground state of a macroscopic nonlinear quantum oscillator*, Proc. R. Soc. Lond. A (2001) 273-282.
9. T. Schäfer, E. W. Laedke, M. Gunkel, C. Karle, A. Posth, K. H. Spatschek, and S. K. Turitsyn: *Optimization of dispersion-managed optical fiber lines*, IEEE J-LT, 20, 9, (2002) 964-952.
See also: JUASM 8D, (2000) 63-70.
10. Fiorenzo G. Omenetto, Yeojin Chung, Dzmitry Yarotski, Tobias Schaefer, Ildar Gabitov, Antoinette J. Taylor: *Phase analysis of nonlinear femtosecond pulse propagation and self-frequency shift in optical fibers*, Optics Communications 208 (2002) 191-196.
11. J. A. Posth, E. W. Laedke, T. Schäfer, K. H. Spatschek: *Dispersion-compensation for single-pulse propagation in complex optical fiber-lines*, submitted.
12. T. Schäfer, R. O. Moore, and C. K. R. T. Jones: *Pulse propagation in media with deterministic and random dispersion variations*, submitted.

Computer and Programming Experience

Operating Systems and Platforms

- Unix (Linux, Solaris) on Intel, SUN and IRIX.
- WinNT, Win9x, Win3.1 and DOS platforms.

Programming Language

- C++

Applications

GNU tools, GNU Emacs, L^AT_EX, Gnuplot, Mathematica and others.

Professional Work Experience

Creation of a database in Access (one month at “Wülfrather” enterprise in Hagen, Germany).

Languages

German, English, French, Spanish, Polish, Japanese.

Class

September – December 2001: AM 281 “Mathematics of optical communications” (special topics course) at Division of Applied Mathematics, Brown University. Class Notes:
<http://www.dam.brown.edu/lcds/nonlinoptics/course.html>

Visits, Conferences and Talks

- Sep. 1998 Ecole de Physique des Houches: “Optical Solitons: Concepts and Applications”, Les Houches, France.
- Aug. 1999 Conference: “Solitons, Collapses and Turbulence”, Chernogolovka, Russia.
- Oct. 1999 Visit to Aston University (Photonics Research Group), Birmingham, England.
- Dec. 1999 Nonlinear Science Festival II in Risø, Denmark.
- Nov. 2000 Conference: “14. Internationale Wissenschaftliche Konferenz”, Mittweida, Germany. Talk: “Optimization of dispersion-managed optical fiber lines”.

- Mar. 2001 Workshop: “Statistical and Nonlinear Physics of Fiber Communications” at Los Alamos, New Mexico. Talk: “Polarization mode dispersion in a medium with random birefringence”.
- May 2001 Visit to Universität Essen, Germany. Talk: “Der Einfluss von Dispersionskompensation auf Solitonen in optischen Übertragungsstrecken”.
- Jul./Aug. 2001 Visit to LANL, New Mexico.
- Feb. 2002 Visit to RPI, New York. Talk: “Dispersion-managed solitons and optical communications”.
- May 2002 Workshop: “Applied Mathematics and Analysis”, Brown University, RI. Talk: “Polarization Mode Dispersion in Optical Fiber Links”.
- Jun. 2002 Summer school: “Applied Analysis”, University of Twente, Holland. Lectures: “Derivation of the Nonlinear Schrödinger Equation” and “Random Dispersion and Gauss-Hermite Expansion”.
- Sep. 2002 Visit to Boston University, MA. Talk: “ A finite dimensional model describing pulse propagation in optical fibers”