

Dr.K.Sakkaravarthi

Temporary Faculty
Department of Physics
National Institute of Technology
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Education

- 2010–2015/17 **Ph.D. Physics: Bharathidasan University,**
Thesis Submitted: 28.12.2015 & Degree Awarded: 17.04.2017,
Thesis Title: Multicomponent Solitons and their Collisions in Certain Physically Interesting Integrable Nonlinear Dynamical Systems,
Thesis Advisor: Dr. T. Kanna.
- 2008–2009 **M.Phil. Physics: Bharathidasan University,**
Project Title: Bright solitons and their collision in long-wave–short-wave system,
Project Supervisors: Dr. T. Kanna & Dr. Maria Eugine Pia,
First Class with Distinction (80.0%).
- 2006–2008 **M.Sc. Physics: Bharathidasan University,**
Project Title: Bright solitons in nonlinear Schrödinger equation,
First Class with Distinction (78.0%).
- 2003–2006 **B.Sc. Physics: Bharathidasan University,**
First Class with Distinction (78.8%).
- 2003 **Higher Secondary School (+2): State Board - Tamil Nadu,**
Infant Jesus Hr. Sec. School (82.5%).
- 2001 **High School (SSLC): State Board - Tamil Nadu,**
Infant Jesus Hr. Sec. School (85.8%).

Additional Qualification

- March 2018 **TN-SET: Qualified in State Eligibility Test for Assistant Professor,**
Conducted by Mother Teresa Women's University on behalf the State Govt. of Tamil Nadu & University Grants Commission (GoI).
- March 2008 **GATE: Qualified in Graduate Aptitude Test for Engineering,**
Conducted by Indian Institute of Science Bangalore on behalf of Ministry of Human Resources Development (MHRD–GoI).

Teaching & Research Experience

- August 2018– Present **Temporary Faculty (Assistant Professor)**,
National Institute of Technology, Tiruchirappalli.
- August 2016– July 2018 **National Post-Doctoral Fellow (SERB-NPDF)**,
Centre for Nonlinear Dynamics, Bharathidasan University, Tiruchirappalli.
- April 2013– March 2016 **Senior Research Fellow (CSIR-SRF)**,
Bishop Heber College, Tiruchirappalli.
- April 2011– March 2013 **DST Project Assistant (Research)**,
Bishop Heber College, Tiruchirappalli.
- October 2009 –March 2011 **Research Student**,
Bishop Heber College, Tiruchirappalli.

Awards & Recognitions

- July 2018 **Outstanding Reviewer**, by the reputed international journal '*Communications in Nonlinear Science and Numerical Simulations*'.
- July 2017 **Life Member in Academic Societies**, *Indian Physics Association (IPA)*, *Indian Laser Association (ILA)*, and *Indian Society of Industrial and Applied Mathematics (ISIAM)*, **Member** in *International Association of Mathematical Physics-IAMP*.
- July 2016 **National Post-Doctoral Fellowship**, by *Department of Science and Technology - Science and Engineering Research Board (DST-SERB)*, *Govt. of India*.
- March 2015 **Best Research Scholar**, by *Bishop Heber College, Tiruchirappalli*, in the academic year 2014-15.
- August 2014 **International Travel Grant**, by *National Board for Higher Mathematics, Govt. of India*, to participate and present a paper in the *SIAM Conference on Nonlinear Waves and Coherent Structures* at *University of Cambridge, UK*.
- July 2014 **International Travel Support**, from *Department of Science and Technology, Govt. of India*, to participate and present a paper in the *10th AIMS Conference on Dynamical Systems, Differential Equations and Applications* at *Instituto de Ciencias Matemáticas (ICMAT), Madrid, Spain*.
- March 2014 **Best Research Scholar**, by *Bishop Heber College, Tiruchirappalli*, in the academic year 2013-14.
- April 2013 **CSIR Senior Research Fellowship (Direct)**, from the *Council of Scientific and Industrial Research, Govt. of India*.
- January 2013 **Featured Front Cover Article**, Our research paper (*J. Math. Phys.* 54 (2013) 013701) got published as a *Front Cover Article* in *Journal of Mathematical Physics (American Institute of Physics)*.
- From 2014 **Serving as a reviewer in several reputed international journals**,
(i) *Proc. Royal Soc. London A*, (ii) *Commun. Nonlinear Sci. Num. Simul.*,
(iii) *Chaos Solitons Fractals*, (iv) *J. Ocean Eng. Sci.*,
(v) *Zeitschrift für Naturforschung A*, (vi) *East Asian J. Appl. Math.*,
(vii) *AIP Conf. Proc.* (viii) *Int. J. Mod. Nonlinear Theo. Appl.*, and
(ix) *Int. J. Appl. Math. Theor. Phys.*

Research Interests

Nonlinear Dynamics, *Nonlinear Phenomena; Nonlinear Differential Equations; Integrable Systems; Symmetries; Nonlinear Waves; Solitons; Nonlinear Optical Systems; Bose-Einstein Condensates.*

Brief Research Contributions

Being motivated to pursue research and as a beginner to know the insights of the field *Nonlinear Dynamics*, I have mastered a few analytical techniques to deal with nonlinear dynamical systems and carried out project works during my post-graduation courses (M.Sc. Physics in 2008 and M.Phil. Physics in 2009) under the guidance of Dr. T. Kanna. Then, I have registered for full-time doctoral program (Ph.D. Physics) in July 2010 with Bharathidasan University under the supervision of Dr. T. Kanna and started working on new research problems.

My doctoral thesis mainly focuses the study of integrable systems and fascinating dynamics of associated multicomponent solitons. Particularly, I have identified a set of new integrable models arising in the context of nonlinear optics, Bose-Einstein condensates, and water waves. Also, I have found interesting results on the propagation dynamics of multicomponent solitons in certain integrable nonlinear systems and identified a few types of energy-sharing as well as energy-switching collisions of bright solitons. Furthermore, the dynamics of other related coherent (soliton-like) structures are also studied. The obtained results are significant addition of knowledge in the field of soliton theory and they can find multifaceted applications. Presently, I am working on the dynamics and characterization of nonlinear dynamical systems through symmetries. My research results are published in reputed international journals and presented at several conferences held in India and abroad, which have attracted considerable interest among the researchers in the field and received a reasonable number of citations.

Research Publications

- **Papers in Peer-Reviewed International Journals - 12**
- **Papers in Renowned International/National Conferences - 6**
- **Presentations (only) in Renowned Conferences - 5**

No. of Journal Publications	No. of Citations	h-index
12	175	8

Ref.: Google Scholar <https://scholar.google.co.in/citations?user=UvN12R8AAAAJ>

List of Publications: *Annexure A*

List of Participation in Scientific Programs: *Annexure B*

Grants & Fellowships Received

- Rs. 17,49,333** **National Post-Doctoral Fellowship**, (August 2016 – July 2018),
Title: *Symmetry and Geometry Associated with Certain Nonlinear Evolution Equations*,
Agency: DST - Scientific and Engineering Research Board (GoI).
- Rs. 10,54,391** **CSIR Senior Research Fellowship**, (April 2013 – March 2016),
Title: *Soliton dynamics in certain new integrable nonlinear models*,
Agency: Council of Scientific & Industrial Research (GoI).
- Rs. 91,500** **International Travel Grant**, (August 2014),
Agency: National Board for Higher Mathematics (GoI).
- Rs. 94,509** **International Travel Support**, (July 2014),
Agency: DST - Scientific and Engineering Research Board (GoI).
- Rs. 1,90,933** **DST Project Assistantship**, (April 2011 – March 2013),
Source: DST sponsored major research project of Dr. T. Kanna,
Project Title: *Multicomponent solitons in nonlinear optics*.

Academic & Teaching Assignments

- **Member of the Department Technical Committee** for National Board for Accreditation (NBA) at Department of Physics, National Institute of Technology, Tiruchirappalli.
- **Teaching of Courses at Postgraduate and Undergraduate levels**
 - (i) **Post-Graduate level:**
 - Atomic and Molecular Spectroscopy (II M.Sc. Physics)
 - Nanoscience and Technology (Ph.D. & I M.Sc. Physics)
 - Fracture Mechanics and Failures of Materials (Ph.D. & I M.Tech. N.D.T.)
 - Electronics Laboratory (I M.Sc. Physics)
 - (ii) **Under-Graduate level:**
 - Nanoscience and Technology & Applications (II & IV B.Tech.)
 - Engineering Physics Laboratory 1 & 2 (I B.Tech.)

Technical Skills

- An elementary knowledge in numerical analysis of nonlinear models with Fortran & Matlab.
- Good knowledge in working with symbolic packages like *Mathematica*, *Maple* and *Matlab*.
- Completed a certificate course *Advanced Post Graduate Diploma in Computer Application (APGDCA)* offered by IEC Technologies, Chennai, from its Tiruchirappalli centre.
- Hands on experience in working on Linux, Windows and Mac operating systems.

Personal Details

Date of Birth	: 30 July 1986	Father Name	: V. Karuppaiya
Marital Status	: Unmarried	Mother Name	: K. Malarkodi
Nationality	: Indian	Religion	: Hindu
Languages Known	: Tamil & English		

Research Publications

(a) Papers in peer-reviewed journals

1. **K. Sakkaravarthi**, A.G. Johnpillai, A. Durga Devi, T. Kanna and M. Lakshmanan, *Lie symmetry analysis and group invariant solutions of nonlinear Helmholtz equations*, *Appl. Math. Comput.* **331** (2018) 457 (16 pages).
2. K. Nakamura, T. Kanna and **K. Sakkaravarthi**, *Protocol of networks using energy sharing collisions of bright solitons*, *Pramana J. Phys.* **85** (2015) 1091 (14 pages).
3. T. Kanna, **K. Sakkaravarthi** and M.Vijayajayanthi, *Novel energy-sharing collisions of multicomponent solitons*, *Pramana J. Phys.* **85** (2015) 921 (17 pages).
4. T. Kanna, **K. Sakkaravarthi**, M. Vijayajayanthi and M. Lakshmanan, *Dynamics of solitons in multicomponent long wave-short wave resonance interaction system*, *Pramana J. Phys.* **84** (2015) 327 (12 pages).
5. **K. Sakkaravarthi**, T. Kanna, M. Vijayajayanthi and M. Lakshmanan, *Multicomponent long wave - short wave resonance interaction system: Bright solitons, Energy sharing collision, soliton bound states and resonant solitons*, *Phys. Rev. E*, **90** (2014) 052912 (14 pages).
6. T. Kanna, R. Babu Mareeswaran and **K. Sakkaravarthi**, *Non-autonomous bright matter wave solitons in spinor Bose-Einstein condensates*, *Phys. Lett. A* **378** (2014) 158 (13 pages).
7. T. Kanna, **K. Sakkaravarthi** and K. Tamilselvan, *General multicomponent Yajima-Oikawa system: Painlevé analysis, soliton solutions and energy sharing collisions*, *Phys. Rev. E* **88** (2013) 062921 (14 pages).
8. **K. Sakkaravarthi** and T.Kanna, *Dynamics of bright soliton bound states in (2+1)-dimensional multicomponent long wave-short wave system*, *Eur. Phys. J. Special Topics* **222** (2013) 641 (13 pages).
9. **K. Sakkaravarthi** and T.Kanna (**Featured Front Cover Article**) *Bright solitons coherently coupled nonlinear Schrödinger equations with alternate signs of nonlinearities*, *J. Math. Phys.* **54** (2013) 013701 (14 pages).
10. T.Kanna and **K. Sakkaravarthi**, *Multicomponent coherently coupled and incoherently coupled solitons and their collisions*, *J. Phys. A: Math. Theor.* **44** (2011) 285211 (30 pages).
11. T.Kanna, **K. Sakkaravarthi**, C.Senthil Kumar, M.Lakshmanan and M.Wadati, *Painlevé singularity structure analysis of three component Gross-Pitaevskii type equations*, *J. Math. Phys.* **50** (2009) 113520 (11 pages).
12. T.Kanna, M.Vijayajayanthi, **K. Sakkaravarthi** and M.Lakshmanan, *Higher dimensional bright solitons and their collisions in multicomponent long wave-short wave system*, *J. Phys. A: Math. Theor.* **42** (2009) 115103 (20 pages).

(b) Full Papers in Renowned Conferences

1. **K. Sakkaravarthi**, T. Kanna and M. Lakshmanan,
Bound States of Multicomponent Solitons in Coherently Coupled Optical Media,
41st OSI International Conference on Advances in Optics and Photonics,
23–26 November 2017, Guru Jambheshwar University of Science and Technology, Hisar (India).
2. **K. Sakkaravarthi**, T. Kanna and M. Lakshmanan,
Resonant solitons and breathers in higher dimension: A study on long wave-short-wave system,
Tenth Conference on Nonlinear Systems and Dynamics,
16–18 December 2016, Indian Institute of Science Education and Research, Kolkata (India).
3. **K. Sakkaravarthi** and T. Kanna,
Dark solitons in multicomponent Yajima-Oikawa system,
10th AIMS Conference on Dynamical Systems, Differential Equations and Applications,
7–11 July 2014, Instituto de Ciencias Matemáticas, Madrid (Spain).
4. T. Kanna and **K. Sakkaravarthi**,
Bilinearization of three component Gross-Pitaevskii equations using a non-standard approach and soliton solutions, 6th International Federation of Nonlinear Analysts conference,
26 June – 1 July 2012, University of Athens (Greece).
5. **K. Sakkaravarthi** and T. Kanna,
Soliton collision dynamics in the general coupled nonlinear Schrödinger system,
Heber International Conference on Applications of Mathematics and Statistics,
3–5 January 2012, Bishop Heber College, Tiruchirappalli (India).
6. T. Kanna and **K. Sakkaravarthi**,
Novel double-hump solitons in coherently coupled nonlinear Schrödinger equations,
Sixth National Conference on Nonlinear Systems and Dynamics,
27–30 January 2011, Bharathidasan University, Tiruchirappalli (India).

(c) Papers (presentation only) in Conferences

1. **K. Sakkaravarthi**, *Integrable symmetry reductions of a non-integrable model and their solutions: Nonlinear Helmholtz equation*, ICTS Program on Integrable systems in Mathematics, Condensed Matter and Statistical Physics, 16 July – 10 August 2018, International Centre for Theoretical Sciences, Bangalore (India).
2. **K. Sakkaravarthi**, *Non-Paraxial Nonlinear Schrödinger Equation: Lie Symmetry and Traveling/Solitary Wave Solutions*, 5th International Conference on Complex Dynamical Systems and Applications, 4–6 December 2017, Indian Institute of Technology Guwahati, Assam (India).
3. **K. Sakkaravarthi** and T. Kanna, *Dynamics of mixed bright-dark solitons and their collisions in multicomponent Yajima-Oikawa system*, SIAM Conference on Nonlinear Waves and Coherent Structures, 11–14 August 2014, Churchill College of University of Cambridge, Cambridge (UK).
4. **K. Sakkaravarthi** and T. Kanna, *Dynamics of bright soliton bound states in the multicomponent long wave-short wave resonance interaction system*, Seventh National Conference on Nonlinear Systems and Dynamics, 12–15 July 2012, Indian Institute of Science Education and Research, Pune (India).
5. **K. Sakkaravarthi**, J. Chandramohan, and T. Kanna, *Solitons in left-handed materials*, National Conference on Nanomaterials: Preparation, Characterization and Devices, 16th March 2008, Department of Physics, Bishop Heber College, Tiruchirappalli (India).

Participation in Conferences & Workshops

- **Poster Presentation:** ICTS Program on Integrable systems in Mathematics, Condensed Matter and Statistical Physics, 16 July – 10 August 2018, International Centre for Theoretical Sciences, Bangalore (India).
- **Participant:** GIAN course on Complex Systems: Modelling and Analysis, 11–15 December 2017 Bharathidasan University, Tiruchirappalli (India).
- **Poster Presentation:** 5th International Conference on Complex Dynamical Systems and Applications, 4–6 December 2017, Indian Institute of Technology Guwahati, Assam (India).
- **Paper Presentation:** 41st OSI International Conference on Advances in Optics and Photonics (ICAOP 2017), 23–26 November 2017, Guru Jambheshwar University of Science and Technology, Hisar, Haryana (India).
- **Paper Presentation:** Tenth Conference on Nonlinear Systems and Dynamics, 16–18 December 2016, Indian Institute of Science Education and Research, Kolkata (India).
- **Participant:** DST – SERC School on Lasers and Nonlinear Optics, 22 March – 11 April 2016, Pondicherry University, Puducherry (India).
- **Paper Presentation:** SIAM Conference on Nonlinear Waves and Coherent Structures, 11–14 August 2014, Churchill College of University of Cambridge, Cambridge (UK).
- **Paper Presentation:** 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications, 7–11 July 2014, Instituto de Ciencias Matemáticas (ICMAT – Institute of Mathematical Sciences), Madrid (Spain).
- **Participant:** National Mathematics Initiative workshop on Nonlinear Integrable Systems and their Applications, 24 February – 1 March 2014, Centre for Nonlinear Dynamics, Bharathidasan University, Tiruchirappalli (India).
- **Participant:** Science Academies' lecture workshop on Nonlinear Physics, 23–25 January 2014, Bishop Heber College, Tiruchirappalli (India).
- **Poster Presentation:** National Conference on Nonlinear Systems and Dynamics, 12–15 July 2012, Indian Institute of Science Education and Research Pune, Pune (India).
- **Paper Presentation:** Heber International Conference on Applications of Mathematics and Statistics, 5–7 January 2012, Bishop Heber College, Tiruchirappalli (India).
- **Participant:** National Conference on Nonlinear Systems and Dynamics, 27–30 January 2011, Centre for Nonlinear Dynamics, Bharathidasan University, Tiruchirappalli (India).
- **Participant:** DST-SERC School on Nonlinear Dynamics (Integrable Systems), 4–26 January 2011, Centre for Nonlinear Dynamics, Bharathidasan University, Tiruchirappalli (India).
- **Participant:** Workshop on High Performance Computing, 23–27 August 2010, Centre for Nonlinear Dynamics, Bharathidasan University, Tiruchirappalli (India).
- **Participant:** International Congress of Mathematicians' satellite conference on Integrable Systems and Geometry, 12–17 August 2010, Pondicherry University, Puducherry (India).

- **Participant:** TPSC workshop on Nonlinear Physics: Theory, Experiments and Applications, 29–31 March 2010, Nehru Memorial College, Puthanampatti (India).
- **Participant:** National seminar on Frontier Areas in Fundamental Physics, 30–31 March 2009, Bharathidasan University, Tiruchirappalli (India).
- **Participant:** National conference on Nanomaterials for Energy Conversion and Conservation, 26 March 2009, Bishop Heber College, Tiruchirappalli (India).
- **Participant:** Seminar on Nonlinear Electronics and Spintronics, 20–21 March 2009, Centre for Nonlinear Dynamics, Bharathidasan University, Tiruchirappalli (India).
- **Participant:** TPSC workshop on Recent Advancements in Theoretical Physics and Quantum Computation, 17–19 March 2009, NGM College, Pollachi (India).
- **Poster Presentation:** National conference on Nanomaterials: Preparation, Characterization and Devices, 16 March 2008, Bishop Heber College, Tiruchirappalli (India).
- **Participant:** Science Academies' Lecture workshop on Frontier Topics in Physics, 4–5 February 2008, Bishop Heber College, Tiruchirappalli (India).
- **Displayed a model** in the exhibition program PHY-X-BIT, 19 March 2007, Bishop Heber College, Tiruchirappalli (India).
