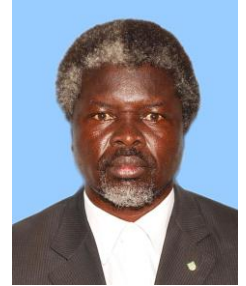


PROF. JOSEPH AKEYO OMOLO

PHD, HSC.



CURRICULUM VITAE

NAME	JOSEPH AKEYO OMOLO	BORN: 24 TH DECEMBER 1961
MARITAL STATUS	MARRIED	NUMBER OF CHILDREN : 11
PROFESSIONAL POSITION	PROFESSOR OF PHYSICS (MASENO UNIVERSITY)	

EDUCATION

1990-1993	PH.D – (THEORETICAL ELEMENTARY PARTICLE PHYSICS) IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY , UNIVERSITY OF LONDON, UK
1985-1987	M.SC. (PHYSICS) UNIVERSITY OF NAIROBI, KENYA
1981-1985	B.SC. FIRST CLASS HONOURS (PHYSICS) UNIVERSITY OF NAIROBI, KENYA

EMPLOYMENT / TEACHING EXPERIENCE

1987-1989	TUTORIAL FELLOW (PHYSICS) KENYATTA UNIVERSITY, KENYA
1989-1995	LECTURER (PHYSICS) KENYATTA UNIVERSITY, KENYA
1995-2003	SENIOR LECTURER (PHYSICS) MASENO UNIVERSITY, KENYA
2003-2010	ASSOCIATE PROFESSOR (PHYSICS) MASENO UNIVERSITY
2010	PROFESSOR OF PHYSICS MASENO UNIVERSITY, KENYA

COMPLETED POSTGRADUATE SUPERVISION

1998-TODATE	PHD---3	MSC---8
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APPOINTMENTS /ELECTIONS TO ACADEMIC ADMINISTRATIVE POSITIONS

2005-2007	DIRECTOR, SCHOOL OF GRADUATE STUDIES
2003-2005	DIRECTOR, KISUMU CITY CAMPUS
2001-2003	DEAN, FACULTY OF SCIENCE
1995-2001	CHAIRMAN, DEPARTMENT OF PHYSICS
1998-2005	EDITOR – IN – CHIEF, MASENO JOURNAL OF EDUCATION, ARTS AND SCIENCE (MJEAS)
1997-2006	MEMBER, MEDICAL SERVICES BOARD
1997-2000	CHAIRMAN, STUDENTS DISCIPLINARY COMMITTEE
2007-2012	FACULTY OF SCIENCE REPRESENTATIVE, SENATE

RESEARCH AND ACHIEVEMENTS

As a theoretical physicist, I have gained an understanding that mathematics is both a tool of investigation and a language of communication in physics. My research has therefore embraced and addressed challenging problems in both mathematics and diverse areas of theoretical physics, namely, quantum field theory, basic quantum mechanics, atomic physics, quantum optics, gravitation and algebraic properties of generators of symmetry groups. My purely original first principles approach has generally motivated me to focus attention on long standing unsolved problems in theoretical physics, thereby deriving and developing effective mathematical methods or algebraic operations to determine exact analytical solutions for an in-depth understanding of the dynamical evolution of the interacting physical systems. The results of my research so far, presented in the list of publications at the end of this CV, have been characterized with important achievements. In developing the mathematical techniques to determine the internal dynamics of interacting physical systems, I have (i) discovered composite Hermite and anti-Hermite polynomials and differential equation, generalizing the standard Hermite polynomials and differential equation [25] (ii) discovered a unit vector defined along an imaginary time-axis to generalize the Minkowski spacetime frame to a well defined complex Euclidean spacetime frame [22, 23] (iii) developed an exact method for determining generators of $SU(N)$ symmetry groups [35, 36, 38]. In atomic physics and quantum optics, I, together with graduate students in some cases, have (i) reformulated the repulsive electron-electron Coulomb interaction as a nuclear charge screening effect in two-electron atoms and ions [13, 14, 42] (ii) determined the first exact analytical solutions of fully quantized two-photon and multi-photon parametric amplification and oscillation processes [17, 19, 41] (iii) discovered the conserved excitation number operator of an anti-Jaynes-Cummings interaction and determined polariton/antipolariton qubits (photospins)

in the full quantum Rabi interaction [31 , 32 , 37 , 40] (iv) generalized the quantum Rabi model into a quantized atom-field quasiparticle spinor model specified by composite spinor angular momentum operators and an infinite spectrum of qubit states [39]. In the theory of gravitation, we have derived generalized relativistic field equations in non-inertial reference frames based on Finsler Geometry, thus generalizing the standard Einstein's general theory of relativity based on Riemann geometry [15]

CURRENT AND FUTURE RESEARCH INTEREST

The discoveries and advances we have made so far in mathematics and theoretical physics provide a broad spectrum of new research questions seeking answers in atomic physics, quantum optics, gravitation, quantum field theory and a new Euclidean spacetime geometry. Obviously, such a broad research project may extend far into the future, with a large input of both human and material resources. The research is generally driven through our original interlectual input, applying the analytical methods and algebraic properties we have developed over the years, supplemented by computational (numerical) methods where necessary. Details of the research interests are presented my profile section.

HONOURS AND AWARDS

2007	HEAD OF STATE COMMENDATION (HSC) Recognition by the President of Kenya for outstanding efforts in promoting the quality of education in Rachuonyo District Nyanza Province, Kenya
2001-2006	AWARDED IAEA RESEARCH FELLOWSHIP AS A REGULAR ASSOCIATE OF THE ABDUS SALAM INTERNATIONAL CENTER FOR THEORETICAL PHYSICS (ICTP), TRIESTE, ITALY
1997	NAME AND BIOGRAPHY PUBLISHED IN THE " MARQUIS WHO'S WHO IN THE WORLD , 14 TH EDITION 1997": AN INTERNATIONAL REGISTER OF OUTSTANDING PEOPLE IN THE WORLD
1990-1993	AWARDED ODA (BRITISH COUNCIL) SCHOLARSHIP FOR PHD STUDIES IN THEORETICAL PHYSICS AT INPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY, UNIVERSITY OF LONDON, UK
1985-1987	AWARDED UNIVERSITY OF NAIROBI SCHOLARSHIP FOR M.SC STUDIES IN PHYSICS

MEMBERSHIP OF INTERNATIONAL PROFESSIONAL ACADEMIES/SOCIETIES

1990-TODATE	MEMBER, KENYA PHYSICAL SOCIETY
1993	ELECTED ACTIVE MEMBER - THE NEW YORK ACADEMY OF SCIENCES, USA
2001-2006	REGULAR ASSOCIATE , THE ABDUS SALAM INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS (ICTP), TRIESTE, ITALY

MEMBERSHIP OF NATIONAL PROFESSIONAL BOARDS /SOCIETIES

2016-2022	MEMBER & CHAIRMAN , BOARD OF MANAGEMENT, NGETA MIXED SECONDARY SCHOOL
2005-2012	MEMBER & CHAIRMAN , BOARD OF GOVERNORS , KISUMU POLYTECHNIC
2009-2012	MEMBER, BOARD OF GOVERNORS, AGORO SARE HIGH SCHOOL
2009-2012	MEMBER RACHUONYO NORTH DISTRICT DEVELOPMENT COMMITTEE
2008-2012	CHAIRMAN KARACHUONYO CONSTITUENCY DEVELOPMENT FUND (CDF)
2008-2012	MEMBER BOARD OF GOVERNORS RAMBA SECONDARY SCHOOL
2008-2009	MEMBER RACHUONYO DISTRICT DEVELOPMENT COMMITTEE
2007-2009	DIRECTOR , KENYA UNION OF SAVINGS AND CREDIT CO-OPERATIVES LTD (KUSCCO)
2007-2012	MEMBER BOARD OF GOVERNORS RAMOGI INSTITUTE OF ADVANCED TECHNOLOGY (RIAT)
2005-2009	CHAIRMAN MASENO UNIVERSITY SAVINGS AND CREDIT SOCIETY LTD
2003-2009	MEMBER DISTRICT EDUCATION BOARD RACHUONYO DISTRICT
2000-2007	SECRETARY KENYA PHYSICAL SOCIETY
1995-1997	MEMBER KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT COUNCIL (NIREDCO)
1996-2012	CHAIRMAN PALA EDUCATION ZONE, RACHUONYO NORTH DISTRICT

PUBLICATIONS

1. **J Akeyo Omolo** and H.F.Jones, *Optimization in the extended variational approach to SU(2) lattice gauge theory*, **Phys.Rev.D47,1668 (1993)**
2. **J Akeyo Omolo** and H.F.Jones, *The extended variational approach to lattice gauge theory: Mixed SU(2)-SO(3) Action*, **Z.fur.Phys.C58,629 (1993)**
3. **J Akeyo Omolo**, C.S.Parker and H.F.Jones, *The extended variational approach to lattice gauge theory: The SU(2) Mass Gap*, **Imperial /TP93-94/37**
4. **J Akeyo Omolo**, C.S.Parker and H.F.Jones, *Scalar glue-ball mass in pure SU(2) Lattice gauge theory*, **Phys.Rev.D51,1298(1995)**
5. **J Akeyo Omolo**, *Electrodynamics as a theory of interacting complex charges*, **ICTP Internal Report-ICTP/IR/2003-2**
6. **J Akeyo Omolo**, *Electrical conductivity tensor for charged harmonic Oscillators subjected to a constant magnetic field*, **Indian Journal of Theoretical Physics, Vol.51 No.3,221(2003)**
7. **J Akeyo Omolo**, *The quantized oscillator: an alternative solution procedure and general commutation brackets*, **Indian Journal of Theoretical Physics, Vol.53 No.3, 177(2005)**
8. **J Akeyo Omolo**, *Factorization procedure for the harmonically bound Brownian particle*, **Kenya Journal of Sciences Series A Vol.11 No.2, 227 (2006)**
9. **J Akeyo Omolo**, *The time evolution matrix for classical and quantum mechanics*, **(Accepted) Indian Journal of Theoretical Physics (January 2007)**
10. **J Akeyo Omolo**, *The WKB approximation through a factorization procedure*, **Kenya Journal of Sciences Series A Vol.12 No.1,31(2007)**
11. **J Akeyo Omolo**, *Revisiting Yuen's, two-photon coherent state theory*, **Indian Journal of Theoretical Physics, Vol.56 No.4, 241 (2008)**
12. **J Akeyo Omolo**, *Revisiting non-degenerate parametric down-conversion*, **Pramana – Journal of Physics, Vol.71 No.6, 1311 (2008)**
13. B.O.Ndinya and **J Akeyo Omolo**, *Repulsive Coulomb interaction and nuclear charge screening in helium and helium-like ions*, **Indian Journal of Theoretical Physics, Vol.58, 81 (2010)**
14. B.O.Ndinya and **J Akeyo Omolo**, *A direct calculation of first-order wave function of helium*, **Communications in Theoretical Physics Vol.54 No. 4, 647 (2010)**
15. D.S.WAMALWA and **J Akeyo Omolo**, *Generalized relativistic dynamics in a non-inertial reference frame*, **Indian J. Phys. Vol 84, 1141 (2010) : DOI:10.1007/s12648-010-0108-x**
16. D.S.WAMALWA and **J Akeyo Omolo**, *Relativistic dynamics in a non-inertial reference frame*, **(Accepted) International Journal of Pure and Applied Mathematics (January 2010)**

17. **J Akeyo Omolo**, *Exact analytical solutions for fully quantized parametric oscillation dynamics*, **J.Mod.Opt.Vol 60, No.7, 578 (2013)**
DOI:10.1080/09500340.2013.798039
18. Ndinya, A. Oduor and **J. Akeyo Omolo**, *Energy transfer approach in the generation of atomic entangled states*, **The African Review of Physics Vol.8: 0021, 139 (2013)**
19. **J Akeyo Omolo**, *Some new features of photon statistics In fully quantized parametric amplification processes*, **Journal of Modern Physics, Vol. 5, 706 (2014):**
20. **J Akeyo Omolo**, *Fully quatized multi-photon parametric amplification*, **(Accepted) Spring International Conference on Advances in Physics, 16- 18 April 2014, Shanghai, China**
21. **J Akeyo Omolo**, *On a derivation of a unit vector in the temporal direction of spacetime*, **(Accepted) 2014 Spring International Conference on Advances in Physics, 16-18 April 2014, Shanghai, China.**
22. **J Akeyo Omolo**, *Complex spacetime frame: Four-vector identities and tensors*, **Advances in Pure Mathematics, Vol. 4, 567-579 (2014); DOI:10.4236/apm.2014.411065**
23. **J Akeyo Omolo**, *Complex spacetime frame: new foundation for physics and mathematics* **Maseno University Journal, Vol. 1, No. 1, 305 (2015): Proceedings of the Multidisciplinary Conference, Maseno University, 30 June – 01 July, 2014**
24. B.O. Ndinya, F.M. D’ujanga, J.O. Oduogo, A.O. Oduor, **J Akeyo Omolo**, *First-order expectation values of electron correlation operators for two-electron atoms*, **American Journal of Modern Physics, Vol. 4, No. 2, 70 (2015):**
DOI: 10.11648/j.ajmp.20150402.14
25. **J. Akeyo Omolo**, *Composite Hermite and Anti-Hermite Polynomials*, **Advances in Pure and Applied Mathematics, Vol. 5, 817 (2015): DOI:10.4236 / apm.2015.514076**
26. **J. Akeyo Omolo**, *Negative-positive energy partner states and conjugate quantum polynomials for a linear harmonic oscillator*, **Fundamental Journal of Mathematics and Mathematical Sciences, Vol. 2, No.1, 55 (2015): [http://www.frdint.com /](http://www.frdint.com/)**
27. **J. Akeyo Omolo**, *Progressively accurate WKB approximations through factorization and successive boost transformations*, **(Accepted) Journal of Modern Physics (April-May 2016)**
28. **J. Akeyo Omolo**, *Loss of degeneracy in a fully quantized parametric amplification process*, **(Accepted) Journal of Modern Physics (April-May 2016)**
29. G. Muraya Lisamadi, B. Otieno Ndinya, **J. Akeyo Omolo**, *The test of entanglement of polarization states of a semi-classical optical parametric oscillator*, **American Journal of Modern Physics, Vol.6 , No.3 , 37 (2017) :**
DOI: 10.11648/j.ajmp.20170603.11

30. W. Kibande, S. Otimo, **J. Akeyo Omolo**, *Total gravitational force re-cast in complex space-time frame*, **World Journal of Applied Physics**, Vol. 2 , No. 3, 43 , (2017)
31. **J. Akeyo Omolo**, *Conserved excitation number and $U(1)$ -symmetry operators for the antirotating (anti-Jaynes-Cummings) term of the quantum Rabi Hamiltonian*, **Preprint-ResearchGate**, DOI: [10.13140/RG.2.2.30936.80647](https://doi.org/10.13140/RG.2.2.30936.80647) (2017)
32. **J. Akeyo Omolo**, *Polariton and antipolariton qubits in the quantum Rabi model*, **Preprint-ResearchGate**, DOI: [10.13140/RG.2.2.11833.67683](https://doi.org/10.13140/RG.2.2.11833.67683) (2018)
33. **J. Akeyo Omolo**, *Quadrature fluctuation energy, effective Hamiltonians, quasiparticle modes and quantum phase transitions in the quantum Rabi and Dicke models*, **Preprint-ResearchGate**, (2018)
34. **J. Akeyo Omolo**, *A note on momentum and energy conservation in dynamics under arbitrary forces in Newtonian and relativistic classical mechanics*, **Preprint-ResearchGate**, DOI: [10.13140/RG.2.2.33709.18401](https://doi.org/10.13140/RG.2.2.33709.18401) (2018)
35. **J. Akeyo Omolo**, *Determining $SU(N)$ symmetry group generators*, **Preprint-ResearchGate**, DOI: [10.13140/RG.2.2.17815.21920](https://doi.org/10.13140/RG.2.2.17815.21920) (2018)
36. **J. Akeyo Omolo**, *$SU(N)$ generator spectrum*, **Preprint-ResearchGate** : DOI: [10.13140/RG.2.2.36540.49285](https://doi.org/10.13140/RG.2.2.36540.49285) (2018)
37. **J. Akeyo Omolo**, *Photospins in the quantum Rabi model*, **Preprint-ResearchGate** : DOI: [10.13140/RG.2.2.27331.96807](https://doi.org/10.13140/RG.2.2.27331.96807) (2019)
38. **J. Akeyo Omolo**, *Shell structure of the $SU(N)$ generator spectrum : interpretation as spin angular momentum operators*, **Preprint-ResearchGate** : DOI: (2020)
39. **J. Akeyo Omolo**, *Quasiparticle spinors in light-matter interactions : generalized Jaynes-Cummings and antiJaynes-Cummings models*, **Preprint-ResearchGate** : DOI: [10.13140/RG.2.2.24498.43200](https://doi.org/10.13140/RG.2.2.24498.43200) (2020)
40. C. Mayero, **J. Akeyo Omolo** and O. S. Okeyo, *Rabi oscillations, entanglement and teleportation in the anti-Jaynes-Cummings model*, **Preprint-arXiv: 2021.07336v1 [quant-ph]** 18 Jan 2021

TEXT BOOKS

41. **Joseph Akeyo Omolo**, *Parametric processes and quantum states of light*, ISBN: 978-3-659-40846-5 (2014) Lambert Academic Publishing AG & Co.KG, Germany (LAP International)
42. **Boniface Ndinya and Joseph Akeyo Omolo**, *Repulsive electron-electron Interaction and Nuclear Charge Screening: Ground state of two –electron atoms*, Lambert Academic Publishing (LAP) AG & Co. KG, Colne, Germany, ISBN: 103846540684; ISSN-139783846540688 24/07/2012

