# Europass Curriculum Vitae

## Personal information


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| First name(s) / Surname(s) | **Giuseppe Dattoli** |
| Work Address | ENEA Centro Ricerche Frascati, Via E. Fermi, 45<br>00045 Frascati (Rome) Italy |
| Telephone(s) | +39 3204367153<br>+39 06 7022062 (home) |
| E-mail | Giuseppe.dattoli@enea.it |
| Nationality | |
| Date of birth | |
| Gender | Male |


## Professional Career

Theory of electromagnetic processes of classical and quantum nature, for the study of laser processes of conventional or Free Electron type.
Theory and Design of Free Electron Lasers including undulator based devices and millimetre waves
Theory of Special Functions and development of Algorithms based on new computational methods
Applied Analysis

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| Dates | 2016-2020 |
| Occupation or position held | ENEA CONSULTANT |
| | **Retired from may 1-st 2020** |
| **LAST POSITION** | Director Senior Scientist at ENEA Fusion Department |
| Main activities and responsibilities | Responsible of the CARM project task force. Theory of relativistic wave equations and development of new methods for the relevant solution. Development of the theory of Cyclotron Auto Resonance Maser (CARM), Task Force leader for the design of a new source of coherent radiation in the microwave range for plasma heating experiments and coordinator of the Conceptual Design Report, and from 2015 to 12019 Responsible (for ENEA) of the EUPRAXIA EU project and Responsible for ENEA of the FEL SPARC project. |
| Dates | 2010-2015 |
| Occupation or position held | Director of the unit of Mathematical models at ENEA FRASCATI CENTER |

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| Main activities and responsibilities | Development of symbolic computational methods for the solution of Evolution equations and of transport equationsandEnergetic Models for cancer mass evolution.<br>Theory of Undulator Free Electron Laser-Design of new operating Schemes-Theory of Instabilities in high current density accelerators-High Quality electron beam transport. |
| Dates | 2011 |
| Occupation or position held | Visiting professor at university Paris XIII |
| Main activities and responsibilities | Theory of indicial umbral calculus-Design of X-ray Free Electron Laser and study of the relevant performances-Study of non linear Harmonic generation in Free Electron Laser. |
| Dates | 1994-2010 |
| Occupation or position held | Director of the Unit of Theoretical Physics and applied Mathematics at ENEA FRASCATI CENTER |
| Main activities and responsibilities | Responsible for ENEA of the FEL SPARC projectDesign of SPARX FEL facility. Development of symbolic computational methods for the solution of Evolution equations and of transport equations. Development of MAGNETIC undulators- study of exotic undulators and theory of FEL operating with biharmonicundulators. |
| Dates | 1990-1995 |
| Occupation or position held | Responsible (for ENEA) of the FEL project for the fusion program with heavy ions |
| Main activities and responsibilities | Design of FEL operating in the VUV region of the spectrum-Study of FEL operating with Storage Ring Theory of high gain FEL and of FEL instability Theory of Saw Tooth instability Theory of Instability Suppression and Landau Damping. |
| Dates | 1985-1990 |
| Occupation or position held | Responsible for ENEA of the Cerenkov FEL in collaboration with Dartmouth college |
| Main activities and responsibilities | Development of new experimental lines for Cerenkov FEL and realization of the first FEL source operating with microtron at the ENEA FrascatiCenter. Development of FEL design theory. |
| Dates | 1984 |
| Occupation or position held | Visiting Scientist at Dartmouth College (Dartmouth, N. H. USA) |
| Main activities and responsibilities | Theory of Cerenkov Free Electron Laser-Development of FEL Quantum –Realization of A Cerenkov FEL at the ENEA Frascati centre. |
| Dates | 1983 |
| Occupation or position held | Visiting Scientist at university of California at Santa Barbara. |
| Main activities and responsibilities | Theory of FEL oscillators, modelling of Santa-Barbara FIR experiment Study of FEL oscillators operating at higher harmonics and design of a Cerenkov FEL to be operated at the ENEA RFRASCATI centre. |
| Dates | 1982 |
| Occupation or position held | Visiting Scientist at Stanford University |
| Main activities and responsibilities | Classical FEL theory, Theory of Mode locked FEL, theory of FEL super-modes , development of FEL design theories, development of techniques for the solution of time dependent Schroedinger equation. |
| Dates | 1979 |
| Occupation or position held | Visiting Lecturer at the International Center of Theoretical Physics (Trieste) |
| Main activities and responsibilities | Classical Free Electron Theory. |
| Dates | 1979-1982 |
| Occupation or position held | Staff Member at CNEN |

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| Main activities and responsibilities | Theory of FEL and Design of FEL operating in the IR region with microtrons, study of the radiation emitted by relativistic in magnetic undulators-FEL oscillator design. |
| Dates | 1977-1978 |
| Occupation or position held | Fellowship at CNEN (now Enea) |
| Main activities and responsibilities | Theory of Free Electron Laser (FEL) and participation at the LEDA project (design of a Storage Ring FEL) . |
| Dates | 1976-1977 |
| Occupation or position held | INFN-LNF ASSOCIATE |
| Main activities and responsibilities | Construction of a source of high intensity GAMMA rays Via Compton Backscattering of laser photons on 1.5 GeV ADONE electrons (LADON PROJECT)<br>Study of the Nucleon Polarizabilities<br>Physics of high energy, electromagnetic properties of Charmed Hadrons and development of group theoretical particle classification. |

## Education and training

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| Dates | 1976-1977 |
| Title of qualification awarded | Postgraduate School in High Energy Physics |
| Principal subjects/occupational skills covered | High Energy Physics Theoretical and Experimental |
| Name and type of organisation providing education and training | University of Rome La Sapienza – Italy |
| Dates | 1971-1976 |
| Title of qualification awarded | Laurea Degree (cum laude) in Physics |
| Principal subjects/occupational skills covered | Thesis c/o LaboratoriNazionali di Frascati, LADON PROJECT, and work on Nuclear structure, nucleon structure and of electromagnetic properties of Charmed Hadron |
| Name and type of organisation providing education and training | University of Rome La Sapienza – Italy |

## Participation to committees

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| Dates | 2017-2020 |
| committee | Member of ENEA Scientific Technical Committee. |
| Dates | 2003-2008 |
| committee | Member of ARPA LAZIO technical board. |
| Dates | 2008-2012 |
| committee | Member of INFN board of directors. |
| Dates | 2000-2007 |
| committee | Member of SPARX project technical board. |
| Dates | 1994-1998 |
| committee | Member of Inertial Fusion with heavy ions project technical board. |
| Dates | Rome August 1994 |
| committee | Co-chairman of 1996 International FEL conference. |

## Professor Adjunct

Dates 2000-2016

Courses at Rome University, La Sapienza (Roma) – Italy (Department of Medicina e Chirurgia)

- General Physics (Undergraduate Level)
- Technical Physics (Graduate Level)
- ElementaryCalculus (under graduate level)

Dates 2008-2009

Courses at Third Rome University –Italy (Department of Physics)

- Group Theory (Graduate Level)
- Mathematical Methods for Physics (Graduate Level)
- Physics of Free Electron Laser (Graduate Level)

Dates 2003

Course of at Rome University La Sapienza (Roma) Italy - (Physics Department )

- Physics of Accelerators

Dates 1988

Courses at Napoli University Federico II - Italy

- Free Electron Lasers (Specialistic Course)

## Awards & Honors

Dates 1978

committee Recipient prize of Italian Society of Physics for young Scientists.

Dates 1994

committee Recipient of the International FEL prize.

2015

LOMONOSOV CONFERENCE (MOSCOW)

INVITED SPEAKER

2015

European Physical Society Conference (Lisbon)

Invited Speaker

2017

Award
Long Life Achievements
of the
Society For Applications of Mathematics
MANIPAL UNIVERSITY JAIPUR INDIA

## Supervisor Activity

Advisor of 20 Laurea thesis in Physics and Mathematics and of 2 P.h.D. thesis

## Personal skills and competences

Mother tongue(s) **Italian**

Other language(s)

| Self-assessment | Understanding | | | | Speaking | | | | Writing | |
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| *European level (*)* | Listening | | Reading | | Spoken interaction | | Spoken production | | | |
| **English** | C2 | Proficient user | C2 | Proficient user | C2 | Proficient user | C2 | Proficient user | C2 | Proficient user |
| **French** | C1 | Proficient user | C1 | Proficient user | C1 | Proficient user | C2 | Proficient user | B2 | Independent user |

**Hobbies**

**Scientific Divulgator**

**Novel Writer**

**Scientific publications 1977-2000**

Author of about 1000 papers on peer reviewed journals covering different aspects of physics and technology of accelerators, of lasers and Free Electron Lasers. A significant part of them is also devoted to mathematical physics and new computation techniques, including symbolic languages.

H-Index

**42-with self citations**
**34-without self citations**

***A partial list summarizing 43 years of scientific career is given below***

The complete list can be found at

**https://www.researchgate.net/profile/Giuseppe_Dattoli2/research**

**PEER-REVIEWED JOURNAL ARTICLES (PARTIAL)**

G. Dattoli, G. Matone and D. Prosperi, Hadron polarizabilities and quark models, Lett. Nuovo Cimento, 19, 601 (1977)

G. Dattoli and A. Renieri, Storage Ring operation of the Free Electron Laser: The oscillator, Il NuovoCimento 59-B, 1 (1980)

G. Dattoli, A. Marino, A. Renieri and F. Romanelli, Progress in the Hamiltonian Picture of Free Electron Laser, IEEE-JQE 17, 1371 (1981)

G. Dattoli, S. Solimeno and A. Torre, Algebraic time-ordering techniques and harmonic oscillator with time-dependent frequency, Phys. Rev. A , 34, 2646 (1984)

W. B. Colson, G. Dattoli and F. Ciocci, Angular-Gain Spectrum in Free Electron Laser, Phys. Rev. A 31828 (1985)

G. Dattoli, J. C. Gallardo and A. Torre, Binomial Sates of the Quantized Radiation Field: A Comment, JOSA B-4, 185 (1987)

G. Dattoli, J. C. Gallardo and A. Torre, An Algebraic View to Operator Ordering and to its Application in Optics, La Rivista del NuovoCimento Vol. 11-1 (1988)

G. Dattoli, R. Mignani and A. Torre, Non Hermitian Evolution of two-level quantum systems, Phys. Rev. A42, 1467 (1990).

F. Ciocci, G. Dattoli, A. De Angelis, B. Faatz , F. Garosi, L. Giannessi, P. L. Ottaviani and A. Torre, Design Considerations of a High power VUV FEL, IEEE-JQE 31, 1242 (1995)

G. Dattoli, P. L. Ottaviani, A. Torre and L. Vazquez, Evolution operator equations: Integration with algebraic and finite difference methods. Applications to physical problems in classical and quantum mechanics and quantum field theory, La Rivista del NuovoCimento, vol. 20-1, (1997)

G. Dattoli, Generalized polynomials, operational identities and their applications. J Comp Appl Math Elsevier. 2000;118(12):111–123.

G. Dattoli and P. L. Ottaviani, Semi analytical models of free electron laser saturation, Optics Commun. 204, 283 (2002)

G. Dattoli, C. Guiot, P. P. Delsanto, P. L. Ottaviani, S. Pagnutti, T. S. Deisboeck, Cancer Metabolism and Dynamics of metastasis, Journal of theoretical biology, (2008)

D. Babusci, G. Dattoli and M. Quattromini, Relativistic equations with fractional and pseudo-differential operators, Phys. Rev. 83- A (2011)

G. Dattoli, K. Gorska, K. Penson, D. Babusci and G. H. E. Duchamp, Operator Solution for Fractional Fokker Planck equations, Phys. Rev. E, 85, 031138 (2012)

M. Artioli and G. Dattoli, “The Geometry of Hermite Polynomials"
http://demonstrations.wolfram.com/TheGeometryOfHermitePolynomials/ Wolfram Demonstrations Project Published: March 4, 2015

E. Di Palma, G. Dattoli, E. Sabia, S. Sabchevski and I. Spassovsky, “Beam-wave interaction from FEL to CARM and associated scaling laws”, IEEE Transection on Electron Device, Vol. 99, 21August 2017, pp.1-8.

G. Dattoli, Di Palma E, Sabia E, et al. Operational versus umbral methods and the Borel transform. Int J Appl Comput Math. 2017;3:1–22.

G. Dattoli, E. Di Palma, S. Pagnutti, E. Sabia, “Free Electron Coherent Sources: from Microwave to X-rays”, Physics Reports (A Review Section of Physics Letters) 739 (2018), 1-51.

G. Dattoli and F. Nguyen, Free Electron Laser and Fundamental Physics,
Progress In Particles and Nuclear Physics, 2018

https://doi.org/10.1080/10652469.2019.1684487

Reference: JPPNP 3659

Dattoli G, Licciardi S, Pidatella RM. Theory of generalized trigonometric functions: from Laguerre to airy forms. J Math Anal Appl. 2018;468(1):103–115.

N. Behr, G. Dattoli, A. Lattanzi and S. Licciardi, Dual Numbers and Operational Umbral Methods Axioms, 83 (7), 77 (2019)

G. Dattoli and S. Licciardi, Operational, umbral methods and negative operator techniques,

INTEGRAL TRANSFORMS AND SPECIAL FUNCTIONS 2020, VOL. 31, NO. 3, 192–220

***BOOKS***

D. Babusci, G. Dattoli, S. Licciardi and E. Sabia " Mathematical Methods For Physicists" World Scientific (Singapore) 2019

G. Dattoli, A. Doria, E. Sabia and M. Artioli, Charged Beam Dynamics, Particle Accelerators and Free Electron Lasers (IOP Expanding Physics) (English Edition) IOP publishing 2017

M. Artioli e G. Dattoli, Appunti di Relatività Ristretta, Aracne Editrice Rome (2013)

F. Ciocci, G. Dattoli and A. Boccia, Lezioni di Calcolo, Edizioni universitarie Kappa (2009)

F. Ciocci, G. Dattoli, A. Torre and A. Renieri, InsertionDevices, World Scientific (2000)

G. Dattoli and A. Torre Theory and Application of Generalized Bessel Functions, Aracne-Editrice (Rome) (1996)

G. Dattoli, A. Renieri and A. Torre, Lectures on Free Electron Laser Theory and on Related Topics, World Scientific, (1995)

G. Dattoli and A. Torre "Theory of Generalized Bessel functions and applications to electromagnetic problems" Aracneeditrice (Rome) 1990

G. Dattoli and A. Renieri, Theoretical and Experimental Aspects of Free Electron Laser,
In Laser Handbook Vol. IV ed. by M. L. Stitch and M. Bass, North Holland (1985).

F. Ciocci and G. Dattoli "Appunti di Fisica Generale Applicata"
Available at
https://www.researchgate.net/profile/Giuseppe_Dattoli2/publication/260750163_APPUNTI_DI_FISICA_GENERALE_APPLICATA/links/0deec5321e69aacb77000000/APPUNTI-DI-FISICA-GENERALE-APPLICATA.pdf
the lectures are divided in three parts covering Mechanics, Physics of fluids, Thermodynamics and electromagnetism
The book has been used as support text for the Lectures given at the Courses of General Physics at Rome university

G. Dattoli, J. V. Rau, M. Del Franco, Elementi Di Fisica Tecnica Ambientale, RT/2012/14/ENEA

Available at
https://www.researchgate.net/publication/233857483_ELEMENTI_DI_FISICA_TECNICA_AMBIENTALE

The book has been used as support text for the Lectures given at the Courses

Fisica Tecnica Ambientale At the university la Sapienza (Rome)

**In preparation**

G. Dattoli, E. Di Palma, S. Sebacevsky and I. Spassovsky, High Frequency Coherent Radiation Sources and Applications to Fusion Plasmas (to be published by IOP Expanding Physics in 2020)

G. Dattoli and S. Licciard "Umbral Methods and Special Functions" ( to be published by World Scientific Singapore in 2021)

G. Dattoli and S. Licciardi, A new point of view to the theory of Bessel Functions,
(to be published by World Scientific, Singapore 2022)

G. Dattoli, Elements of Quantum Mechanics ( to be published by Taylor and Francis in 2022)