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VITTORIO DE FALCO CURRICULUM VITAE

INFORMAZIONI PERSONALI (NON INSERIRE INDIRIZZO PRIVATO E TELEFONO FISSO O CELLULARE)

COGNOME	DE FALCO
NOME	VITTORIO
DATA DI NASCITA	16/05/1989

**INSERIRE IL PROPRIO CURRICULUM
(non eccedente le 30 pagine)**

Data

13 LUGLIO 2020

Luogo








NAPOLI

Dr. Vittorio De Falco

Curriculum Vitæ et Studiorum

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📖 Personal Data

Place and Date of Birth: Napoli, 16 May 1989
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👛 Current Position

January 2020 – Present **Associated collaboration as visiting scientist at University of Napoli
"Federico II"** 
I am working in the theoretical astrophysical and cosmological group led by Prof.
Dr. Salvatore Capozziello and Prof. Dr. Mariafelicia De Laurentis.

👛 Previous Positions

July 2019 – January 2020 **Post Doctoral Researcher as an expert for preparation of international
study programe from the European Commission** 
Research Institute: Silesian University in Opava, Department of Physics.
Research group of Prof. Dr. Pavel Bakala.
May 2018 – June 2019 **Post Doctoral Researcher as an international expert junior** 
Research Institute: Silesian University in Opava, Department of Physics.
Research group of Prof. Dr. Pavel Bakala.
July 2017 – April 2018 **Associated collaboration as visiting scientist** 
International Space Science Institute in Bern (Switzerland)

🏛 Education

Feb 2014 – Jul 2017 **Ph.D. in Theoretical Physics** 
University of Basel (Switzerland), Ph.D. title (7 June 2017): "*Coupling Poynting-
Robertson Effect in Mass Accretion Flow Physics*". Advisors: Prof. Dr. Maurizio
Falanga, Prof. Dr. Friedrich-Karl Thiemann. Final mark: magna cum laude.
2011 – 2013 **Master Degree in Mathematics** 
University of Napoli "Federico II" (Italy), Master Thesis Title (25 June 2013):
"*The classification of Bianchi homogeneous universes in presence of torsion, with
an application to a cosmological model in Bianchi IX with torsion*". Advisors: Prof.
Salvatore Capozziello, Prof. Antonio Romano. Final mark: 110/110 cum laude.

2009 – 2011 Bachelor Degree in Mathematics

University of Napoli "Federico II" (Italy), Bachelor Thesis Title (22 December 2011): *"On the mechanics of continuous systems"*. Advisor: *Prof. Florinda Capone*. Final mark: 110/110 cum laude.

Teaching Experience

2015 Physics Department of University of Basel. Teaching assistant for the student's exercises (2 hrs./week): *"Black Holes, Neutron Stars, and White Dwarfs in Binary systems"* held by *Prof. Maurizio Falanga*.

2016 – 2020 I gave seminars, exercises, and lectures on General Relativity and high-energy astrophysics topics for master and bachelor students in the framework of preparation of international study program from European Commission at the Physics Department of the Silesian University of Opava, Czech Republic. I have also been invited several times by *Prof. Maurizio Falanga* for having some main lectures in his academic courses. Last one was an Introduction to General Relativity for the course *"White Dwarfs, Neutron Stars, and Black Holes in Galaxies"* at the Physics Department of the University of Bern, Switzerland.

Supervising activity

November 2019 – Present Supervising the Master student *Marco Gallo* at the Mathematics Department of the University of Pisa, Italy, for the preparation of a Ph.D. project based on the application of the Poynting-Robertson effect to JUNO, NASA space mission.

May 2018 – Jan 2020 Co-supervising and co-mentoring MSc and Bsc students with *Prof. Pavel Bakala*, who are: *Zuzana Turoňová*, *Milan Herot*, *René Šprňa*.

Awards and Prizes

- 1 July 2019 I won the Post Doctoral Researcher position as an expert for preparation of international study program at the Silesian University in Opava (Czech Republic) working in the group of *Prof. Pavel Bakala*.
- 1 May 2018 I won the Post Doctoral Researcher position as an international expert junior at the Silesian University in Opava (Czech Republic) working in the group of *Prof. Pavel Bakala*.
- 6 June 2019 The figure 2 from the paper entitled *Three-dimensional general relativistic Poynting-Robertson effect: Radial radiation field*, PRD, 2019, 99, 023014, where I am the leading author, has been awarded for aesthetic merit by the Editor *Urs M. Heller* of the Physical Review D Journal and published on the Kaleidoscope section (January 2019) on the main webpage of the journal.
- 1 February 2014 Winner of the PhD position at the International Space Science Institute in Bern under the supervision of *Prof. Maurizio Falanga*. Position financed by the Swiss National Foundations Project 200021_149865.

Programming skills

Fortran, C++, Python, object oriented programming (OOP), Mathematica, Matlab, \LaTeX , Microsoft Office (Word, Excel, Power Point), Apple Inc. (Keynote, Numbers, Page).

Research proposals

I submitted the following funding research proposals.

- I was PI of 4 accepted INTEGRAL, Swift and XMM-Newton proposals to observe compact objects at high energies.
- I am also Co-PI in a number of observational accepted proposals related to compact objects. My involvement was in theoretical interpretations.

Professional Services

Referee or Reviewer (3-4 papers per year).

- Astronomy & Astrophysics
- Monthly Notices of the Royal Astronomical Society
- Advances in High Energy Physics
- International Journal of Geometric Methods in Modern Physics (IJGMMP)



Professional Membership

INTEGRAL consortium (ESA space science mission), Gruppo Nazionale Fisica Matematica (GNFM).



Scientific Interests

Theoretical interests.

- General Relativity Theory
- General Relativistic Poynting-Robertson effect
- Gravitational waves
- Wormholes
- Einstein-Cartan-Sciama-Kibble Theory (General Relativity with torsion)
- Cosmology, Dark Energy
- Mathematical and Numerical Analysis

Applicative and Observational interests.

- Black Holes and Neutron Stars Physics
- Accreting Millisecond X-ray Pulsars
- Eclipsing Binary Radio-Pulsars
- INTEGRAL, XMM-Newton, and Swift data analysis



Outreach activity

I actively took part to some outreach activities, mainly to the European's Researcher Night at Osservatorio Monte Porzio Catone, Rome, Italy in 2017, 2018, and 2019. I also participated to open day university at University of Bern in 2015. I was mainly giving divulgative speeches on elementary astrophysics, on General Relativity Theory, physics of compact objects, with particular interest on black hole and the electromagnetic processes occurring around them, which are related to my research topics.



Participation in Meetings, Conferences, and Schools

- 2020 Invited Talk: "*The physics of accretion phenomena around compact objects*". Osservatorio Astronomico Monte Porzio Catone, Roma (Italy), 22 January.
- Invited Talk: "*Chaos in General Relativity with an application to the Poynting-Robertson effect*". Physics Department at University of Napoli "Federico II", Napoli (Italy), 14 January.
- 2019 Talk: "*The general relativistic Poynting-Robertson effect*". National Congress on Compact Objects (CNOC XI) in Firenze (Italy), 19 – 22 November.
- Invited Talk: "*State of the art about the general relativistic Poynting-Robertson effect*". Osservatorio Astronomico Monte Porzio Catone, Roma (Italy), 21 September.
- Invited Talk: "*The general relativistic Poynting-Robertson effect: from the 2D to the 3D formulation*". Lunch talk at Department of Physics of University of Naples "Federico II", Italy, 3 July.
- Talk: "*The general relativistic Poynting-Robertson effect: non-linear dissipative system in General Relativity*". XX International Conference on Waves and Stability in Continuous Media (WASCOM), Maiori, Italy, 10 – 14 June.
- Invited Talk: "*Gravitational Wave Theory in General Relativity*". International Space Science Institute in Bern, Italy, 13 February.
- 2018 Invited Talk: "*The relativistic Poynting-Robertson effect: numerical models of accretion discs in the strong field regime*". University of Tübingen, Germany, 21 November.
- Invited Talk: "*General relativistic Poynting-Robertson effect in radiation processes*". University of Frankfurt, Institute for Theoretical Physics, Germany, 1 November.
- Invited Talk: "*Poynting-Robertson effect: from theory to observations*". Osservatorio Astronomico Monte Porzio Catone, Roma (Italy), 15 September.
- Talk: "*Dissipative radiation processes in General Relativity*". Summer School of Mathematical Physics in Ravello, 10 – 22 September.



- Talk: *Relativity of observer splitting formalism and some astrophysical applications*. "Domoschool, International Apline School of Mathematical Physics on Einstein Equations: physical and mathematical aspects of General Relativity". Domodossola, Italy, 16 – 20 July.
- Invited Talk: *"General relativistic Poynting-Robertson effect in 3D"*. Osservatorio Astronomico Monte Porzio Catone, Roma (Italy), 4 July.
- Invited Talk: *"Approximate ray tracing equations in Schwarzschild metric: applications and future perspectives"*. International Space Science Institute in Bern (Switzerland), 15 February.
- "The Retrospective of Horizon 2000 Symposium in honor of Roger Bonnet's 80th birthday"*. ESTEC, Noordwijk, The Netherlands, 8 – 9 February.
- 2017 2 Invited Talks: *"Introduction to the basic concepts of General Relativity and some numerical issues"* and *"Polynomial approximation of photon geodesics around static compact object in General Relativity"*. University of Napoli, Italy, 30 October.
- Invited Talk: *"Approximate analytical calculations of photon geodesics in the Schwarzschild metric"*. University of Oxford, UK, 3 – 7 July.
- Invited Talk: *"Approximate analytical calculations of photon geodesics in the Schwarzschild metric"*. ZARM, University of Bremen, Germany, 26 February – 2 March.
- Invited Talk: *"Approximate analytical calculations of photon geodesics in the Schwarzschild metric"*. ISSI Team led by S. Motta and T. Belloni on *There it Spins: the Hunt for Black Hole Spins*, 6 – 9 February.
- Invited Talk: *"The bursts of three different Accreting Millisecond X-ray Pulsars using the Integral data: IGR J00291+5934, IGR J18245-2452, and SAX J1748.9-2021"*. ISSI team led by D. Galloway on *Nuclear Reactions in Superdense Matter - From the Laboratory to the Stars*, 30 January – 3 February.
- Invited Talk: *"The outbursts of three different Accreting Millisecond X-ray Pulsars using the Integral data: IGR J00291+5934, IGR J18245-2452, and SAX J1748.9-2021"*. ISSI team led by A. Papitto su *The Disk-Magnetosphere Interaction Around Transitional Millisecond Pulsars*, 23 – 27 January.
- 2016 Invited Talk: *"Accretion disks in Kerr metric including the Poynting Robertson effect"*. Silesian University of Opava (Czech Republic), 20 April.
- 2015 Talk: *"Approximation of relevant elliptical equations in the Schwarzschild metric and some astrophysical applications"*. 28th Texas Symposium in Geneva (Switzerland), 13 – 18 December.
- Talk: *"Approximation of relevant elliptical equations in the Schwarzschild metric and some astrophysical applications"*. National Congress on Compact Objects (CNOC IX) in Roma (Italy), 21– 26 September.
- 2015 Award for the best scientific and technical space mission. Summer School in Alpbach (Austria), 13 – 24 July.
- 2014 Talk: *"A cosmological Model in Bianchi IX with torsion"*. Summer School of Mathematical Physics in Ravello, 17 – 29 September.
- Summer School on Geometric Measure Theory and Geometric Analysis at University of Basel, 23 – 27 June.
- Invited Talk: *"The Poynting-Robertson effect"*. ISSI Bern (Switzerland), 11 March.
- Conference on "Testing Alternative Theories of Gravity with LPF Workshop" at University Irchel in Zurich, 10 March.
- 2013 Talk: *"Parallel transport in General Relativity"*. Winter School of Theoretical Physics in Ladek Zdroj (Poland), 10 – 16 February.
- 2012 Talk: *"Maslov-Hormander theorem: parametrization of lagrangian submanifolds"*. Summer School of Mathematical Physics in Ravello, 17 – 29 September.
- Talk: *"A fluido dynamics approach to vehicle traffic"*. Summer School of Mathematical Physics in Ravello, 19 September – 1 October.
- 2011 Attended and completed the courses: *Functional Anlysis* and *Differential Equations in Mathematical Physics*. SMI (Scuola Matematica Interuniversitaria) in Perugia (Italy), 31 July – 2 September.

Visiting Scientist

- 2020 Osservatorio Astronomico Monte Porzio Catone in Rome (Italy) working with *Prof. Luigi Stella*, 20 – 24 January.
- 2019 Osservatorio Astronomico Monte Porzio Catone in Rome (Italy) working with *Prof. Luigi Stella*, and *Dr. Pavel Bakala*, 18 – 30 September.
- Sardinia Radio Telescope in Cagliari (Italy) working with *Dr. Alessandro Ridolfi*, 30 April – 7 May.
- International Space Science Institute in Bern (Switzerland) working with *Dr. Emmanuele Battista* and *Dr. Maurizio Falanga*, 6 – 25 February.
- 2018 University of Tübingen (Germany) working with *Dr. Sebastian Völkel*, 19 – 26 November.
- Osservatorio Astronomico Monte Porzio Catone in Rome (Italy) working with *Prof. Luigi Stella*, *Dr. Pavel Bakala*, and *Prof. Maurizio Falanga*, 23 – 29 September.
- Osservatorio Astronomico Monte Porzio Catone in Rome (Italy) working with *Prof. Luigi Stella* and *Dr. Pavel Bakala*, 2 – 6 July.
- Instituto Superior Tecnico in Lisbon (Portugal) working with *Prof. Mario Pinheiro*, 4 – 27 June.
- Max Planck Institut für Radioastronomie in Bonn (Germany) working with *Dr. Alessandro Ridolfi*, 8 – 18 March.
- International Space Science Institute in Bern working with *Prof. Maurizio Falanga*, 12 February – 7 March.
- 2017 International Space Science Institute in Bern working with *Prof. Maurizio Falanga*, 11 – 17 December. Theoretical lecture for a course at University of Basel for master students entitled "Black holes: from theory to observation", 12 December 2017.
- International Space Science Institute in Bern working with *Prof. Maurizio Falanga*, 2 – 25 November.
- University of Oxford (UK) working with *Dr. Sara Motta*, 3 – 7 July.
- Osservatorio di Monte Porzio Catone, Roma (Italy) working with *Prof. Luigi Stella*, *Dr. Pavel Bakala* and his research group, and *Prof. Alessandra De Rosa*, 22 – 27 May.
- ZARM, University of Bremen (Germany) working with *Dr. Eva Hackmann*, 26 February – 2 March.
- 2016 Silesian University of Opava (Czech Republic) working with *Dr. Pavel Bakala* and his research group, 11 – 22 April.
- 2015 Silesian University of Opava (Czech Republic) working with *Dr. Pavel Bakala* and his research group, 2 – 14 March.
- ISDC Data Center for Astrophysics in Geneva working with *Dr. Enrico Bozzo* and *Dr. Carlo Ferrigno*, 27 March – 2 May.
- Roma (Italy) working with *Prof. Luigi Stella*, 28 – 30 July.
- 2014 Prague and Opava (Czech Republic) working with *Dr. Pavel Bakala* and his research group, 12 – 21 December.
- ISSI Beijing (China) working with *Prof. Mario Pinheiro* and *Prof. Maurizio Falanga*, 16 – 30 November.

Scientific works

Published

19. **De Falco, V.**; P. Bakala; M. Falanga; "Three-dimensional general relativistic Poynting-Robertson effect. III. Static and nonspherical quadrupolar massive source", PRD, 2020, 101, 124031 ( doi.org/10.1103/PhysRevD.101.124031)
18. **De Falco, V.**; "New approaches to the general relativistic Poynting-Robertson effect", Emerging Science Journal, 2020, 4, 3 ( doi.org/10.28991/esj-2020-01225)
17. **De Falco, V.**; E. Battista; S. Capozziello; M. De Laurentis; "General relativistic Poynting-Robertson effect

to diagnose wormholes existence: static and spherically symmetric case”, PRD, 2020, 101, 104037 (doi.org/10.1103/PhysRevD.101.104037)

16. **De Falco, V.**; Battista E., “Poynting-Roberston effect as a dissipative system in general relativity”, PRD, 2020, 101, 064040 ([doi 10.1103/PhysRevD.101.064040](https://doi.org/10.1103/PhysRevD.101.064040))
15. R. La Placa, L. Stella, A. Papitto, P. Bakala, T. Di Salvo, M. Falanga, **De Falco, V.**, et al.; “Neutron Star Radius-to-mass Ratio from Partial Accretion Disc Occultation as Measured through Fe K α Line Profiles”, ApJ, 2020, 893, 129 ([doi 10.3847/1538-4357/ab8017](https://doi.org/10.3847/1538-4357/ab8017))
14. **De Falco, V.**; Pavel Bakala “Stable attractors in the three-dimensional general relativistic Poynting-Robertson effect”, PRD, 2020, 101, 024025 ([doi 10.1103/PhysRevD.101.024025](https://doi.org/10.1103/PhysRevD.101.024025))
13. Bakala, P., **De Falco, V.**; et al. “Three dimensional general relativistic Poynting-Robertson effect II: Radiation field from a rigidly rotating spherical source”, PRD, 2019, 100, 104053 ([doi 10.1103/PhysRevD.100.104053](https://doi.org/10.1103/PhysRevD.100.104053))
12. **De Falco, V.**; Battista, E.; “Analytical Rayleigh potential for the general relativistic Poynting- Robertson effect”, Europhysics Letters, 2019, 127, 30006 ([doi 10.1209/0295-5075/127/30006](https://doi.org/10.1209/0295-5075/127/30006))
11. **De Falco, V.** “Relativity of observer splitting formalism and some astrophysical applications”, chapter of the book “Einstein Equations: Physical and Mathematical Aspects of General Relativity” – Publisher: Birkhäuser Basel, 2018 ([doi 10.1007/978-3-030-18061-4](https://doi.org/10.1007/978-3-030-18061-4))
10. **De Falco, V.**; “Coupling Poynting-Robertson effect in mass accretion flow physics”, PhD Thesis at the University of Basel (Switzerland), 2019 ([doi 10.5451/unibas-007073960](https://doi.org/10.5451/unibas-007073960))
9. **De Falco, V.**, “Three-dimensional general relativistic Poynting-Robertson effect: Radial radiation field”, PRD, 2019, 99, 023014 ([doi 10.1103/PhysRevD.99.023014](https://doi.org/10.1103/PhysRevD.99.023014))
8. Li, Z.; **De Falco, V.**; et al. “Mixed H/He bursts in SAX J1748.9–2021 during its 2015 outburst”, A&A, 2018, 620, 6 ([doi 10.1051/0004-6361/201833857](https://doi.org/10.1051/0004-6361/201833857))
7. **De Falco, V.**; Kuiper, L.; Bozzo, E.; Ferrigno, C.; Poutanen, J.; Stella, L.; Falanga, M. “The transitional millisecond pulsar IGR J18245–2452 during its 2013 outburst at X-rays and soft gamma-rays”, A&A, 2017, 603, 9 ([doi 10.1051/0004-6361/201730600](https://doi.org/10.1051/0004-6361/201730600))
6. **De Falco, V.**; Battista, E.; Falanga M. “Lagrangian formulation of the Poynting-Robertson effect”, PRD, 2018, 97, 8 ([doi 10.1103/PhysRevD.97.084048](https://doi.org/10.1103/PhysRevD.97.084048))
5. **De Falco, V.** & Motta, S. “Polynomial approximation of the Lense-Thirring precession frequency”, MNRAS, 2017, 476, 2040–2044 ([doi 10.1093/mnras/sty361](https://doi.org/10.1093/mnras/sty361))
4. Lančová, D.; Bakala, P.; Goluchová, K.; Falanga, M.; **De Falco, V.**; Stella, L. “The study on behaviour of thin accretion disc affected by Poynting-Robertson effect”, Proceedings of RAGtime 17-19: Workshops on black holes and neutron stars, 17-19/23-26 Oct., 1-5 Nov. 2015/2016/2017, Opava, Czech Republic, Z. Stuchlik, G. Török and V. Karas editors, Silesian University in Opava, 2017, ISBN 978-80-7510-257-7, ISSN 2336-5676, p. 127-136 ([doi 2017bhns.work..127L](https://doi.org/2017bhns.work..127L))
3. Capozziello, S.; **De Falco, V.**; Pincak, R. “Torsion in Bianchi IX cosmology”, Int. J. Geom. Methods Mod. Phys., 2017, 14, 12 ([doi 10.1142/S0219887817501869](https://doi.org/10.1142/S0219887817501869))
2. **De Falco, V.**; Kuiper, L.; Bozzo, E.; Galloway, D. K.; Poutanen, J.; Ferrigno, C.; Stella, L.; Falanga, M. “The 2015 outburst of the accretion-powered pulsar IGR J00291+5934: INTEGRAL and Swift observations”, A&A, 2016, 599, 8 ([doi 10.1051/0004-6361/201629575](https://doi.org/10.1051/0004-6361/201629575))
1. **De Falco, V.**; Falanga, M.; Stella, L. “Approximate analytical calculations of photon geodesics in the Schwarzschild metric”, A&A, 2016, 595, 38 ([doi 10.1051/0004-6361/201629075](https://doi.org/10.1051/0004-6361/201629075))

 Submitted

1. **De Falco, V.**; “Testing wormhole solutions through the general relativistic Poynting-Robertson effect: Static

and spherically symmetric case”, PRD, 2020

2. **De Falco, V.**; *”Chaos in the general relativistic Poynting-Robertson effect: Kerr equatorial plane*”, PRD, 2020
3. A. Papitto, E. Bozzo, W. Hemsén, S. Mereghetti, **De Falco, V.**, et al.; *”The INTEGRAL view of the pulsating hard X-ray sky: from accreting and transitional millisecond pulsars, to rotation-powered pulsars and magnetars*”, ApJ, 2020
4. **De Falco, V.**; L. Stella; *”Epicyclic frequencies in the general relativistic Poynting-Robertson effect: Radial radiation field*”, PRD, 2020
5. **De Falco, V.**; et al. *”Three-dimensional general relativistic Poynting-Robertson effect. IV. Slowly rotating and nonspherical quadrupolar massive source*”, A&A, 2020
6. **De Falco, V.**; et al. *”General relativistic Poynting-Robertson effect: study of the trajectories*”, A&A, 2020
7. **De Falco, V.**; A. Ridolfi; *”Dynamical model for orbital period modulation in close binaries*”, PRD, 2020
8. Falanga, M. et al.; *”Higher order image contributions in disk iron line profile*”, MNRAS, 2020
9. E. Battista; **De Falco, V.**; *”First-post-Newtonian generation of gravitational waves in Einstein-Cartan theory*”, PRD, 2020