# Nils Albin Nilsson

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### Profile

Highly analytical early-career researcher in physics with teaching experience. My main research interests are phenomenology of new physics in gravity and cosmology, in particular bridging theory and observations, along with early Universe physics and General Relativity.

Education & Academic Positions	
• CNES Postdoctoral Fellow SYRTE, Observatoire de Paris	Paris, France December 2022 - Present
<ul> <li>Postdoctoral Researcher</li> <li>Centre for Quantum Spacetime (CQUeST), Sogang University</li> <li>– Remote part-time November 2020 - August 2021</li> </ul>	Seoul, Korea August 2021 - October 2022
<ul> <li>Ph.D. in Physics         National Centre for Nuclear Research         – Title of thesis: Aspects of Lorentz and CPT Violation in Cosmolo         – Supervisor: Mariusz P. Dąbrowski     </li> </ul>	Warsaw, Poland September 14, 2020 gy
<ul> <li>MSc. Engineering physics</li> <li>Lund Institute of Technology         <ul> <li>Title of thesis: Astrophysical Probes of Models of Quantum Gravit</li> <li>Supervisor: John Ellis</li> </ul> </li> </ul>	Lund, Sweden June 15, 2015 ty

# Publications

### **Refereed Journal Articles**

- N.A.Nilsson, Christophe Le-Poncin Lafitte Reexamining aspects of spacetime-symmetry breaking with CMB polarization arXiv:2311.16368, Accepted in Physical Review D
- Quentin G. Bailey, Alexander S. Gard, N.A.Nilsson, Rui Xu, Lijing Shao Classical radiation fields for scalar, electromagnetic, and gravitational waves with spacetime-symmetry breaking arXiv:2307.13374, Accepted in Annals of Physics
- N.A.Nilsson, Christophe Le-Poncin Lafitte Spacetime-symmetry breaking effects in gravitational-wave generation at the first post-Newtonian order arXiv:2307.13302, Accepted in Physical Review D
- N.A. Nilsson, Eleonora Di Valentino, Mu-In Park A new test of dynamical dark energy models and cosmic tensions in Hořava gravity Mon.Not.Roy.Astron.Soc. 519 (2023) 4, 5043-5058, arXiv:2212.07683

• N.A. Nilsson Explicit Spacetime-Summetry Breaking an

Explicit Spacetime-Symmetry Breaking and the Dynamics of Primordial Fields Phys.Rev.D 106 (2022) 10, 104036, arXiv:2205.00496

- N.A. Nilsson, Mu-In Park Tests of Standard Cosmology in Hořava Gravity Eur.Phys.J. C, 82, 873 (2022), arXiv:2108.07986
- K.O'Neil Ault, Q.B.Bailey, N.A. Nilsson, 3+1 Formulation of the Standard-Model Extension Gravity Sector Phys.Rev.D 103 (2021) 4, 044010, I.F 4.83
- N.A. Nilsson Preferred-frame Effects, the H<sub>0</sub> tension, and Probes of Hořava-Lifshitz Gravity, Eur.Phys.J.Plus 135 (2020) 4, 361, I.F 2.612
- N.A.Nilsson, E.Czuchry Hořava-Lifshitz Cosmology in Light of New Data Phys.Dark Univ. C23 (2019) 100253, I.F 6.509
- N.A.Nilsson, M.Dąbrowski Energy Scale of Lorentz Violation in Rainbow Gravity Phys.Dark Univ. 18 (2017) 115-122, I.F 5.425
- M.Fairbairn, N.A.Nilsson, J.Ellis, J.Hinton, R.White The CTA Sensitivity to Lorentz-Violating Effects on the Gamma-Ray Horizon JCAP 1406 (2014) 005, I.F 5.81

# Articles under review or in preparation

- N.A.Nilsson Dark-energy properties of a spacetime-symmetry breaking cosmological solution – late-time behaviour and phantom crossing arXiv:2307.10290, under review at JCAP
- Ewa Czuchry, N.A.Nilsson
   On the energy flow of λ in Hořava-Lifshitz cosmology arXiv:2304.09766, under review at PRD
- Hocheol Lee, Bum-Hoon Lee, Wonwoo Lee, **N.A.Nilsson**, Somyadip Thakur On the Dynamical Generation and Decay of Cosmological Anisotropies arXiv:2209.15225, under review at PDU

# **Conference Proceedings**

- N.A.Nilsson SME Gravity in the Early Universe arXiv:2206.07925, Citations: 1
- N.A.Nilsson, K.O'Neil Ault, Q.B.Bailey *A 3+1 Decomposition of the Minimal Standard-Model Extension Gravitational Sector* CPT and Lorentz Symmetry, pp. 198-200 (2020), Citations: 4

### **Other Publications**

 B. Jones, G. Burns, H.V. Cavanagh, D. Findlay, S. Karbassi, N.A. Nilsson, G. Skoro, P.N.M Wright, 2021 Unexpected <sup>13</sup>N concentrations in ISIS synchrotron room air Applied Radiation and Isotopes 182 (2022) 110139, IF 1.513 • N.A. Nilsson

Incentives, Rewards, and Recognition - What Really Motivates a Researcher? First prize essay published for the MDPI essay contest Judging Research - How Should Research and Researchers Be Evaluated and Rewarded? ISBN 978-3-03928-314-9

 N.A. Nilsson *Commodity or Public Property?*  Essay published for the MDPI essay contest The Global Benefits of Open Research ISBN 978-3-03897-009-5

### Awards and Honours

- 2019: Winner of the MDPI English Writing Competition for the essay "Incentives, Rewards and Recognition What Really Motivates a Researcher?", 460 EUR
- 2019: NCBJ Award for Outstanding Achievements for PhD Students, 600 EUR
- 2018: NCBJ Award for Outstanding Achievements for PhD Students, 600 EUR

### Grants and Fellowships

- 2022: CNES Postdoctoral Fellowship (France) (accepted)
- 2022: JSPS Postdoctoral Fellowship (Japan), 3 years (declined)
- 2022: FONDECYT Postdoctoral Fellowship (Chile), 3 years (declined)
- 2018: PI and sole applicant for NCBJ Young Scientist Grant MNiSW 212737/E-78/M/2018, Title: Tensor Lorentz Violation in Cosmology with Antisymmetric Tensor Fields, 3300 EUR

### Invited Talks

• "Spacetime-Symmetry Breaking in Gravitational-Wave Generation"	Bloomington, USA
Second IUCSS Workshop on Gravitational Aspects of Lorentz Violation	March 14, 2023
• "Aspects of Explicit Spacetime-Symmetry Breaking"	Szczecin, Poland
Szczecin University Cosmology Group Seminar	December 17, 2021
• "Testing General Relativity with Spacetime Symmetries"	Pohang, Korea
The 63rd Workshop on Gravity and Cosmology	November 16, 2021
• "Aspects of Lorentz Violation in Gravity & Cosmology"	Paris, France
Paris Observatory	October 17, 2019
• "Successes and Problems of the ACDM Model"	Prescott, USA
Embry-Riddle Aeronautical University	April 4, 2019
• "Quantum Gravity, Lorentz Violation, and Rainbows"	Szczecin, Poland
University of Szczecin	December 9, 2016

# Physics Meetings

# **Oral Contribution**

Trieste, Italy September 8, 2023
Online July 4, 2023
La Thuile, Italy March 23, 2023
Bloomington, USA May 19, 2022
Waseda, Japan December 7, 2021
Pohang, Korea October 5, 2021
Gangneum, Korea September 25, 2021
Bloomington, USA March 14, 2021
Krakow, Poland May 26, 2020
Szczecin, Poland September 23, 2019
Bloomington, USA May 12, 2019
Vancouver, Canada January 23, 2019
Bloomington, USA June 15, 2018
Warsaw, Poland May 21, 2018
Zeuten, Germany May 19, 2018
Azores, Portugal August 27, 2017
Międzyzdroje, Poland May 19, 2017

### Meetings Organised

• Sixth Conference of the Polish Society of Relativity

Szczecin, Poland September 23-26, 2019

> Warsaw, Poland May 21-25, 2018

### • Singularities in General Relativity and their Quantum Fate

### **Research Visits**

- Embry-Riddle Aeronautical University Visiting Professor Quentin G. Bailey
- Lagrange Institute Visiting Professor Patrick Peter
- Embry-Riddle Aeronautical University Visiting Professor Quentin G. Bailey

### Teaching and Supervising Experience

- Supervisor Course: Structure of the Universe, SYRTE, Paris, France - Project title: "Successes and problems of the  $\Lambda CDM$  model" November 2023 - Present • **Co-supervisor** - MSc. level summer student, SYRTE, Paris, France - Project title: "Two-body problem in relativistic field theory" Summer 2022 • Teaching Assistant - Electrodynamics (PhD course) NCBJ, Warsaw, Poland
- Pimlico, London, UK • Student project supervisor - Supervised a group of high-school students building a 3D printer. 2015-2016

#### Academic Service

- Member of GWECS Career Opportunities Office
  - Co-organised the GWECS Job Fair 2022 and 2023
- Involved in the outreach program "Her Teach Future" at Lund Institute of Technology. 2013

### Non-Academic Experience

- ISIS Duty Technician Rutherford Appleton Laboratory
- Physics Science Technician Pimlico Academy
- Research Engineer Radiation Safety MAX IV Laboratory
- Summer Student **Diamond Light Source**

Harwell, United Kingdom 2020 - 2021

London, United Kingdom 2015-2016

> Lund, Sweden 2014-2015

Harwell, United Kingdom June-September 2013

Prescott, USA January 25-31, 2020

Paris, France October 21-25, 2019

> Prescott, USA April 3-18, 2019

Autumn 2019

Present

### • Tutor in Mathematics

# Language & IT

- Computers/IT
  - Windows, Ubuntu Linux & Debian Linux
  - MS Word & Excel
  - $IAT_EX$
  - Mathematica: xAct, Markov-Chain Monte Carlo cluster computations
  - Python: numpy, scipy, matplotlib, pandas, seaborn, skikit-learn, image processing
- Languages
  - Native level: Swedish, English. Average: French. Beginner: Polish level A1+