

# Nashwan Sabti

✉ nashwan.sabti@kcl.ac.uk | INSPIRE-HEP | 🏠 nnssa.github.io | 📄 NNSSA | 🌐 NNSSA | 🐦 @NashIn0044

## Education

### PhD in Theoretical Physics

RESEARCH FIELD: PARTICLE PHYSICS AND COSMOLOGY – ADVISOR: DR. DIEGO BLAS

*King's College London, UK*

*2018 - Aug 2022 (expected)*

My research so far has covered a variety of directions: I have constrained particle physics and cosmological models with early Universe probes, measured the clustering and growth of matter with high-redshift galaxies, and probed new physics using systems in the local Universe and terrestrial experiments. I am an author of 9 articles and have presented my work at international conferences, workshops, journal clubs and seminar series. During my PhD I have also developed a cosmological code, organised a workshop and a journal club, worked as a teaching assistant and supervised MSc students.

### Master of Science in Theoretical Physics

THESIS: "HEAVY NEUTRAL LEPTONS DURING THE BIG BANG NUCLEOSYNTHESIS EPOCH"

*Leiden University, Netherlands*

*2016 - 2018*

GPA: 9.0/10 (Cum Laude)

### Double Bachelor of Science in Physics and Astronomy

THESIS: "CONSTRAINING COSMOLOGICAL PARAMETERS USING THE CLASS CODE"

*Leiden University, Netherlands*

*2013 - 2016*

GPA: 9.0/10 (Cum Laude) in both degrees

## Organisational Experience

### Latest advances in the physics of BBN and neutrino decoupling

CO-ORGANISER

*King's College London/TUM*

*April 2021*

Co-organised a 2-day online workshop on our current understanding of the physics of Big Bang Nucleosynthesis and neutrino decoupling. Speakers from both theoretical and experimental fields were invited to give a talk. See also [this](#) Indico link.

### PhD seminar series

CO-ORGANISER

*King's College London*

*Feb 2021 - May 2021*

Co-organised a local PhD seminar series, where PhD students could talk about their work and train their presentation skills.

## Computing Skills

**Expert:** Python, Mathematica,  $\text{\LaTeX}$

**Basic:** C++

**Scientific software:** CLASS, MontePython, PRIMAT, Resonance-DM, Sterile-DM, CalcHEP

**Developer:** pyBBN, GALLUMI

## Teaching and Working Experience

### Supervision of MSc students

SUPERVISOR

*King's College London*

*Oct 2020 - Apr 2021*

Co-supervised two MSc students on a project entailing the impact of warm dark matter on structure formation.

### Teaching undergraduate courses

TEACHING ASSISTANT

*King's College London*

*2018 - 2020*

1st year labs, 3rd year particle physics.

### Mentoring A-level student

SUPERVISOR

*King's College London*

*May 2019 - Sep 2019*

Mentored an A-level student in producing an academic piece of work as part of the Realising Opportunities programme.

## Development and guidance of research topic for secondary school students

Leiden University

SUPERVISOR

Dec 2016

Supervised pupils on a project that involved calculation of the mass of the black hole in the centre of the Milky Way using orbits of stars nearby Sgr A\*.

## Imaging and analysis of astrophysical data

Leiden University

PROJECT LEAD

May 2015

Project involved imaging and photometric analysis of the Cosmic Horseshoe gravitational lensing system using the Isaac Newton Telescope at the Roque de los Muchachos Observatory in La Palma with the goal of estimating the dark matter abundance within the lens.

## Publications

---

### Published

1. N. Sabti, J. Alvey, M. Escudero, M. Fairbairn and D. Blas, *Implications of LUNA for BBN and CMB constraints on MeV-scale Thermal Dark Sectors*, **JCAP** 08 (2021) A01 [2107.11232].
2. A. Boyarsky, M. Ovchinnikov, N. Sabti and V. Syvolap, *When FIMPs Decay into Neutrinos: The  $N_{\text{eff}}$  Story*, **Phys. Rev. D** 104, 035006 [2103.09831].
3. J. Alvey, N. Sabti, V. Tiki, D. Blas, K. Bondarenko, A. Boyarsky, M. Escudero, M. Fairbairn, M. Orkney and J. I. Read, *New Constraints on the Mass of Fermionic Dark Matter from Dwarf Spheroidal Galaxies*, **MNRAS** 501 (2021) 1, pp. 1188-1201 [2010.03572].
4. N. Sabti, J. B. Muñoz and D. Blas, *First Constraints on Small-Scale Non-Gaussianity from UV Galaxy Luminosity Functions*, **JCAP** 01 (2021) 010 [2009.01245].
5. N. Sabti, A. Magalich and A. Filimonova, *An Extended Analysis of Heavy Neutral Leptons during Big Bang Nucleosynthesis*, **JCAP** 11 (2020) 056 [2006.07387].
6. J. Alvey, N. Sabti, M. Escudero and M. Fairbairn, *Improved BBN Constraints on the Variation of the Gravitational Constant*, **Eur. Phys. J.** C80.2 (2020), p. 148 [1910.10730].
7. N. Sabti, J. Alvey, M. Escudero, M. Fairbairn and D. Blas, *Refined Bounds on MeV-scale Thermal Dark Sectors from BBN and the CMB*, **JCAP** 01 (2020) 004 [1910.01649].

### Submitted to journal

1. N. Sabti, J. B. Muñoz and D. Blas, *New Roads to the Small-Scale Universe: Measurements of the Clustering of Matter with the High-Redshift UV Galaxy Luminosity Function*, [2110.13161].
2. N. Sabti, J. B. Muñoz and D. Blas, *GALLUMI: A Galaxy Luminosity Function Pipeline for Cosmology and Astrophysics*, [2110.13168].

### White papers

1. *EuCAPT White Paper: Opportunities and Challenges for Theoretical Astroparticle Physics in the Next Decade*, [2110.10074]. Contributed to the section ‘Astroparticle observables for dark matter’.

### To appear

1. N. Sabti, J. Alvey, M. Escudero and T. Schwetz, *Cosmic Neutrino Background Detection In Large Neutrino Mass Cosmologies*, November 2021.
2. N. Sabti, J. Alvey and M. Escudero, *Phenomenology of Large Neutrino Mass Cosmologies*, November 2021.

## Presentations

---

### Talks

1. Seminar at IFPU in Trieste, 27/10/2021  
– *Astrophysical Probes of Dark Matter*

2. Seminar at Perimeter Institute, 19/10/2021  
– *Cosmological and Astrophysical Probes of Sterile Neutrinos*
3. 2021 Meeting of the Division of Particles and Fields of the American Physical Society (DPF21), Florida State University, 13/07/2021  
– *When FIMPs Decay into Neutrinos: The  $N_{\text{eff}}$  Story*
4. PPC 2021: XIV International Workshop on Interconnections between Particle Physics and Cosmology, University of Oklahoma, 15/05/2021  
– *Cosmology with UV Luminosity Functions*
5. First EuCAPT Annual Symposium, 06/05/2021  
– *Cosmology with UV Luminosity Functions*
6. MPA Cosmology Seminar, MPA Garching, 30/03/2021  
– *Probing Small-Scale Non-Gaussianity with UV Luminosity Functions*
7. High-z Galaxy Evolution Meeting, Harvard-CfA, 08/02/2021  
– *Cosmology with UV Luminosity Functions*
8. KCL PhD Seminar Series, 08/02/2021  
– *How do FIMPs that can decay into neutrinos affect  $N_{\text{eff}}$ ?*
9. London Cosmology Discussion Meeting, 21/01/2021  
– *What BBN can tell us about thermal dark sectors*
10. CTA Dark Matter Journal Club, 12/11/2020  
– *New Constraints on the Mass of Fermionic Dark Matter from Dwarf Spheroidal Galaxies*
11. UK Cosmology, University of Sheffield, 22/09/2020  
– *Probing Small-Scale Non-Gaussianity with UV Galaxy Luminosity Functions*

## Posters

1. COSMO 2021, University of Illinois, 02-06/08/2021  
– *When FIMPs Decay into Neutrinos: The  $N_{\text{eff}}$  Story*
2. Weak Interactions and Neutrinos 2021, University of Minnesota. 07-12/06/2021  
– *When FIMPs Decay into Neutrinos: The  $N_{\text{eff}}$  Story*
3. RAS Early Career Poster Exhibition 2020, 14-28/09/2020  
– *First Constraints on Small-Scale Non-Gaussianity from UV Galaxy Luminosity Functions*

## Awards and Certificates

---

### Hendrik Casimir Prize

Dec 2017

Awarded by the Casimir Research School for best performance during the Master's program in physics.

### Young Talent Encouragement Award

Nov 2014

Awarded by the Royal Holland Society of Sciences and Humanities for best performance during the first year of the Bachelor's program in physics.

## Languages

---

**Fluent:** English, Dutch

**Intermediate:** Arabic

**Basic:** Russian

## References

---

- **Dr. Diego Blas** – Departament de Física, Universitat Autònoma de Barcelona, Institut de Física d'Altes Energies (IFAE), The Barcelona Institute of Science and Technology, Bellaterra, Spain, [dblas@ifae.es](mailto:dblas@ifae.es)

- **Prof. Malcolm Fairbairn** – Department of Physics, King's College London, London, UK,  
*malcolm.fairbairn@kcl.ac.uk*
- **Dr. Julian B. Muñoz** – Center for Astrophysics | Harvard & Smithsonian, Cambridge, USA,  
*julianmunoz@cfa.harvard.edu*
- **Dr. Alexey Boyarsky** – Lorentz Institute for Theoretical Physics, Leiden University, Leiden, Netherlands,  
*boyarsky@lorentz.leidenuniv.nl*