

Markus Mosbech

Curriculum Vitae

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Education

- 2020 **Ph.D., The University of Sydney, Australia**
Supervisors: Prof. Celine Boehm, A.Prof. Yvonne Y. Y. Wong
Peering into the Dark: Investigating dark matter and neutrinos with cosmology and astrophysics
Education: as well as regular coursework, helped organize pedagogical journal clubs on advanced astrophysics and particle physics topics.
- 2019 **Master of Science (Physics), Aarhus University, Denmark**
Supervisor: Steen Hannestad
Thesis: Linear modeling of baryon-dark matter interactions with CLASS
- 2017 **Bachelor of Science (Physics), Aarhus University, Denmark**

Papers

My research interests center on how we can use cosmology and astrophysics to learn more about the fundamentals of our universe, in particular the nature of dark matter.


- 2022 **Hybrid multi-fluid-particle simulations of the cosmic neutrino background**, *J.Z. Chen, M.R. Mosbech, A. Upadhye, Y.Y.Y. Wong*, 2022
2210.16012 [astro-ph.CO], DOI: 10.1088/1475-7516/2023/03/012, JCAP 03 (2023) 012
- 2022 **Gravitational-wave event rates as a new probe for dark matter microphysics**, *M.R. Mosbech, A.C. Jenkins, S. Bose, C. Boehm, M. Sakellariadou, Y.Y.Y. Wong*, 2022
2207.14126 [astro-ph.CO], Accepted for publication in Phys. Rev. D
- 2022 **Probing dark matter interactions with 21cm observations**, *M. Mosbech, C. Boehm, Y.Y.Y. Wong*, 2022
2207.03107 [astro-ph.CO], DOI: 10.1088/1475-7516/2023/03/047, JCAP 03 (2023) 047
- 2022 **Recoil imaging for dark matter, neutrinos, and physics beyond the Standard Model**, *C.A.J. O'Hare, et al.*, 2022
2203.05914 [physics.ins-det], Snowmass 2021 Contribution
- 2022 **Effects of Hawking evaporation on PBH distributions**, *M.R. Mosbech, Z.S.C. Picker*, 2022
arXiv:2203.05743 [astro.ph.HE], DOI: 10.21468/SciPostPhys.13.4.100, SciPost Phys. 13, 100 (2022)
- 2021 **The full Boltzmann hierarchy for dark matter-massive neutrino interactions**, *M.R. Mosbech, C. Boehm, S. Hannestad, O. Mena, J. Stadler, Y.Y.Y. Wong*, 2021
arXiv:2011.04206 [astro.ph.CO], DOI: 10.1088/1475-7516/2021/03/066, JCAP 03 (2021) 066

Talks and Presentations




Invited Talks

- 2022 **Centre Annual Workshop**, *ARC Centre of Excellence for Dark Matter Particle Physics*, 10 mins
'Probing dark matter microphysics with gravitational waves and cosmology'
- 2022 **TEPAPP Seminar**, *UCLA*, 50 mins
'Probing dark matter microphysics with gravitational waves and cosmology'
- 2022 **ICTP-AP Seminar**, *International Centre for Theoretical Physics Asia-Pacific*, 50 mins
'Probing dark matter microphysics with gravitational waves and cosmology'
- 2022 **ICAP seminar series**, *IAP Paris*, 20 mins
'Dark matter microphysics with next generation observatories'
- 2022 **SIFA Morning tea**, *Sydney Institute for Astronomy*, 15 mins
'Probing dark matter with next-gen observatories'
- 2022 **Invited Seminar**, *Aarhus University*, 60 mins
'Constraining DM-neutrino interactions and primordial black holes'
- 2022 **Fortnightly Centre meeting**, *ARC Centre of Excellence for Dark Matter Particle Physics*, 15 mins
'Constraining dark matter-neutrino interactions with linear and non-linear cosmology'

Other Presentations

- 2022 **Dark Side of the Universe**, *UNSW Sydney*, 20 mins
'Probing dark matter microphysics with gravitational waves and 21cm emission'
- 2022 **Cosmology from Home 2022** , *Online*, 18 mins
'Signatures of dark matter interactions at high and higher redshifts'
- 2022 **Invisibles 2022 workshop**, *Orsay*, 5 mins
'Mixed messages: constraining dark matter with astrophysical signals (or lack thereof)'
- 2021 **Bright Ideas for a Dark Universe**, *DESY Hamburg*, 15 mins
'Easing the σ_8 -tension with ν -DM interactions'
- 2021 **Asia-Pacific Workshop on Particle Physics and Cosmology**, *Yonsei University*, 15 mins
'Easing the σ_8 -tension with ν -DM interactions'
- 2021 **Invisibles 2021 Workshop**, *Madrid*, 5 mins
'Easing the σ_8 -tension with ν -DM interactions'
- 2021 **First Euclid annual symposium**, *CERN*, 5 mins
'Easing the σ_8 -tension with ν -DM interactions'
- 2021 **Sydney CPPC annual meeting**, *The University of Sydney*, 20 mins
'This one weird trick could solve the σ_8 tension!'
- 2020 **Sydney CPPC annual meeting**, *UNSW Sydney*, 20 mins
'Linear modeling of Baryon-DM Interactions'

Outreach and Other Content

- 2021 **Easing the σ_8 -tension with ν -DM interactions**, *poster*
Second Centre Annual Workshop, ARC Centre of Excellence for Dark Matter Particle Physics, 2021
Invisibles2021 Workshop, 2021
- 2021 **Dark Chatter** , *Episode 8*, 30 mins, Interviewer
'Lyman alpha data and dark matter interactions'
- 2020 **Dark Chatter** , *Episode 2*, 20 mins, Interviewee
'Dark matter-neutrino interactions in cosmology'
- 2020 **Dark Chatter** , *Episode 1*, 30 mins, Interviewer
'Primordial black holes'

Teaching and Academic Duties

I enjoy teaching and have been doing it for most of my PhD. I am also passionate about fostering a good research environment, and was selected for the **Collaboration and Centre Values Award** for my contributions, including committee work, at the ARC Centre of Excellence for Dark Matter Particle Physics.

University teaching

2021–
University Tutor, *The University of Sydney*, Australia
Astronomy modules, 1st-3rd year courses: ‘Earth to exoplanets’, ‘Stars to black holes’, ‘Big bang to darkness’
Including running tutorial classes, marking assignment and exams, and running observing sessions with a teaching telescope.

2019
2018
Mentor, *Aarhus University*, Denmark
Mentor program for first year students

2017
University TA, *Aarhus University*, Denmark
Philosophy and Ethics of Science: Physics, Chemistry and Geology,
Running tutorial classes and marking weekly assignments

Other duties

2022–
Research Committee, *ARC Centre of Excellence for Dark Matter Particle Physics*, Australia
Graduate student representative, duties include organising the annual Early Career Researcher workshop

2021–
Equity, Diversity, and Inclusion Committee, *ARC Centre of Excellence for Dark Matter Particle Physics*, Australia

2020–
Physics Early and Mid Career Researcher committee, *The University of Sydney*, Australia

2019
2018
ISR Coordinator, *Aarhus University*, Denmark
Coordinator of the Student Representation at the Department of Physics and Astronomy (ISR), facilitating dialogue between the student body and department leadership.

Other Work

2019
2015
Writer, *Mads Føk*
Writer for the Aarhus University student magazine Mads Føk.

2018
2017
Board member, *Fysisk Fredagsbar*
The physics student bar at Aarhus University. Bartender and in charge of craft beer.

2017
Tutor, *Mat/Fys-Tutorgruppen - Aarhus University*
Non-academic tutor for a group of first-year physics students and part of the L^AT_EX-workgroup.

Et Cetera

Citizenships

Denmark, Norway

Date of birth

October 8, 1995

Place of birth

Voss, Norway

References

Prof. Celine Boehm, *University of Sydney*
celine.boehm@sydney.edu.au

A. Prof. Yvonne Y.Y. Wong, *University of New South Wales*
yvonne.y.wong@unsw.edu.au

Prof. Steen Hannestad, *Aarhus University*
steen@phys.au.dk