

Dr. Tommi Tenkanen

Curriculum vitae 2/26/2020

Basic information

- Born 3/10/1989, Harjavalta, Finland
- Cell phone: +1 443 854 1265
- Homepage: www.tommitenkanen.net
- 3400N Charles S, Baltimore, MD, USA
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Professional working experience

Only the most important appointments are listed.

Postdoctoral Fellow, *Dept. of Physics and Astronomy*, Johns Hopkins University, United States.

I do research at the interface of astrophysics, theoretical particle physics, and cosmology. I lead and develop my own research projects and actively participate in my colleagues' projects. I also supervise students and organize workshops, seminars, and the cosmology research group's weekly meetings.

2016–18 **Postdoctoral Researcher**, *Astronomy Unit, School of Physics and Astronomy*, Queen Mary University of London (QMUL), United Kingdom.

My job in London was very similar to my current post in the US. I did research on different topics in theoretical physics, published 13 research articles and 1 large review paper, and taught advanced mathematical techniques and cosmology to physics majors, supervised student research projects from the BSc to PhD level, and participated in organizing seminars. I also took the extracurricular courses "The Aspiring Leader – Leading and Motivating People" and "Public Engagement Masterclass" provided by QMUL to improve my leadership and communication skills.

2014–16 **Doctoral Candidate**, *Department of Physics*, University of Helsinki, Finland.

I worked at the Division of Particle Physics and Astrophysics doing research on theoretical physics. I published 7 peer-reviewed research articles and 2 conference proceedings on theoretical physics, and was the editor-in-chief of the abstract book of the "Physics Days 2015" conference. I also gave teaching on theoretical physics including graduate level courses on cosmology and general relativity. For my PhD research project I won an individual, highly competitive grant from The Research Foundation of the University of Helsinki (worth 160 kEUR), and was awarded with several prizes and grants. I also represented all of the university's graduate students (4000 in total) in a university-wide project group for the university's large "Big Wheel" study reform, where we successfully coordinated the development of all degree programmes the university provides, from the BSc to PhD level.

Higher education and honours

- 2017 **Habilitation (Adjunct Professor / Title of Docent)**, University of Helsinki, Finland.
I'm an adjunct professor (docent) of theoretical physics. The title may be awarded to a person who "has comprehensive knowledge of his or her own field, a capacity for independent research demonstrated through publications or some other manner, and good teaching skills". In the evaluation process I got the best possible grade ("Excellent").
- 2014–16 **Doctor of Philosophy**, University of Helsinki, Finland.
Major in theoretical physics (grade 5/5), studies in leadership and project work. PhD thesis *Cosmological Constraints on Higgs Portal Dark Matter*, supervisor Prof. Kari Enqvist. Official graduation day 1/24/2017.
- 2012–13 **Master of Science**, University of Helsinki, Finland.
Major in theoretical physics (grade 5/5), minors in experimental physics and mathematics, studies in computer science.
- 2009–12 **Bachelor of Science**, University of Helsinki.
Major in theoretical physics, minors in physics and astronomy.

Scientific publications

34 research articles including 1 large review paper and 2 proceedings with a total of 1125 citations. h-index 20, i10-index 27 (according to the [inSPIRE database](#)). All authors are listed in alphabetical order according to the particle physics convention.

- 2020 *Initial conditions for plateau inflation*, T. Tenkanen and E. Tomberg, *submitted*, arXiv:2002.02420.
- 2020 *Tracing the high energy theory of gravity: an introduction to Palatini inflation*, T. Tenkanen, *submitted*, arXiv:2001.10135.
- 2019 *Trans-Planckian Censorship, Inflation and Dark Matter*, T. Tenkanen, *accepted for publication in Phys. Rev. D*, arXiv:1910.00521.
- 2019 *Axion dark matter from Higgs inflation with an intermediate H_** , T. Tenkanen and L. Visinelli, *JCAP 08 (2019) 033*, arXiv:1906.11837.
- 2019 *Standard model Higgs field and hidden sector cosmology*, T. Tenkanen, *Phys. Rev. D 100, 083515 (2019)*, arXiv:1905.11737.
- 2019 *Dark matter from scalar field fluctuations*, T. Tenkanen, *Phys. Rev. Lett. 123, 061302 (2019) (Editors' Suggestion)*, arXiv:1905.01214.
- 2019 *Scalar correlation functions in de Sitter space from the stochastic spectral expansion*, T. Markkanen, A. Rajantie, S. Stopyra and T. Tenkanen, *JCAP 08 (2019) 001*, arXiv:1904.11917.
- 2019 *Minimal Higgs inflation with an R^2 term in Palatini gravity*, T. Tenkanen, *Phys. Rev. D 99, 063528 (2019)*, arXiv:1901.01794.
- 2018 *Towards distinguishing variants of non-minimal inflation*, T. Takahashi and T. Tenkanen, *JCAP 04 (2019) 035*, arXiv:1812.08492.
- 2018 *Hidden Inflaton Dark Matter*, J.P. Beltrán Almeida, N. Bernal, J. Rubio and T. Tenkanen, *JCAP 1903 (2019) 012*, arXiv:1811.09640.

- 2018 *Spectator Dark Matter*, T. Markkanen, A. Rajantie and T. Tenkanen, *Phys.Rev. D* 98 (2018) 123532, arXiv:1811.02586.
- 2018 *Scalar singlet dark matter in non-standard cosmologies*, N. Bernal, C. Cosme, T. Tenkanen and V. Vaskonen, *Eur. Phys. J. C* 79 (2019) no.1, 30, arXiv:1806.11122.
- 2018 *Attractor Behaviour in Multifield Inflation*, P. Carrilho, D. Mulryne, J. Ronayne and T. Tenkanen, *JCAP* 06 (2018) 032, arXiv:1804.10489.
- 2018 *Primordial Black Hole Formation During Slow Reheating After Inflation*, B. Carr, K. Dimopoulos, C. Owen and T. Tenkanen, *Phys. Rev. D* 97 (2018) no.12, 123535, arXiv:1804.08639.
- 2018 *Phenomenology of self-interacting dark matter in a matter-dominated universe*, N. Bernal, C. Cosme and T. Tenkanen, *Eur. Phys. J. C* 79 (2019) no.2, 99, arXiv:1803.08064.
- 2018 *Prospects for indirect detection of frozen-in dark matter*, M. Heikinheimo, T. Tenkanen and K. Tuominen, *Phys. Rev. D* 97 (2018) no.6, 063002, arXiv:1801.03089.
- 2017 *The Palatini side of inflationary attractors*, L. Järv, A. Racioppi and T. Tenkanen, *Phys. Rev. D* 97 (2018) no.7, 083513, arXiv:1712.08471.
- 2017 *Quantum corrections to quartic inflation with a non-minimal coupling: metric vs. Palatini*, T. Markkanen, T. Tenkanen, V. Vaskonen and H. Veermäe, *JCAP* 03 (2018) 029, arXiv:1712.04874.
- 2017 *A novel way to determine the scale of inflation*, K. Enqvist, R.J. Hardwick, T. Tenkanen, V. Vennin and D. Wands, *JCAP* 02 (2018) 006, arXiv:1711.07344.
- 2017 *Resurrecting Quadratic Inflation with a non-minimal coupling to gravity*, T. Tenkanen, *JCAP* 12 (2017) 001, arXiv:1710.02758.
- 2017 *The Dawn of FIMP Dark Matter: A Review of Models and Constraints*, N. Bernal, M. Heikinheimo, T. Tenkanen, K. Tuominen and V. Vaskonen, *Int. J. Mod. Phys. A* 32 (2017) no.27, 1730023, arXiv:1706.07442.
- 2017 *Primordial black holes from inflaton and spectator field perturbations in a matter-dominated era*, B. Carr, T. Tenkanen and V. Vaskonen, *Phys. Rev. D* 96 (2017) no.6, 063507, arXiv:1706.03746.
- 2017 *Primordial black hole constraints for extended mass functions*, B. Carr, M. Raidal, T. Tenkanen, V. Vaskonen and H. Veermäe, *Phys. Rev. D* 96 (2017) no.2, 023514, arXiv:1705.05567.
- 2017 *WIMP miracle of the second kind*, M. Heikinheimo, T. Tenkanen and K. Tuominen, *Phys. Rev. D* 96 (2017) no.2, 023001, arXiv:1704.05359.
- 2016 *Inflation and pseudo-Goldstone Higgs Boson*, T. Alanne, F. Sannino, T. Tenkanen and K. Tuominen, *Phys. Rev. D* 95 (2017) no.3, 035004, arXiv:1611.04932.
- 2016 *Feebly Interacting Dark Matter Particle as the Inflaton*, T. Tenkanen, *JHEP* 1609 (2016) 049, arXiv:1607.01379.
- 2016 *A Strong Electroweak Phase Transition from the Inflaton Field*, T. Tenkanen, K. Tuominen and V. Vaskonen, *JCAP* 1609 (2016) no.09, 037, arXiv:1606.06063.
- 2016 *Reheating the Standard Model from a Hidden Sector*, T. Tenkanen and V. Vaskonen, *Phys. Rev. D* 94 (2016) no.8, 083516, arXiv:1606.00192.

- 2016 *Observational Constraints on Decoupled Hidden Sectors*, M. Heikinheimo, T. Tenkanen, K. Tuominen and V. Vaskonen, *Phys. Rev. D* 94 (2016) no.6, 063506, arXiv:1604.02401.
- 2016 *Isocurvature Constraints on Portal Couplings*, K. Kainulainen, S. Nurmi, T. Tenkanen, K. Tuominen and V. Vaskonen, *JCAP* 1606 (2016) no.06, 022, arXiv:1601.07733.
- 2015 *Inflationary Imprints on Dark Matter*, S. Nurmi, T. Tenkanen and K. Tuominen, *JCAP* 1511 (2015) no.11, 001, arXiv: 1506.04048.
- 2014 *Standard Model with a real singlet scalar and inflation*, K. Enqvist, S. Nurmi, T. Tenkanen and K. Tuominen, *JCAP* 1408 (2014) 035, arXiv: 1407.0659.

Conference proceedings

- 2016 *Observational Properties of Feebly Coupled Dark Matter*, M. Heikinheimo, T. Tenkanen, K. Tuominen and V. Vaskonen, *PoS ICHEP2016* (2016) 825, arXiv:1611.04951.
- 2015 *Cosmic Inflation Constrains Scalar Dark Matter*, T. Tenkanen, *Cogent Phys.* 2 (2015) no.1, 1029845.

Doctoral dissertation

- 2016 *Cosmological Constraints on Higgs Portal Dark Matter*, T. Tenkanen, Helsinki Institute of Physics Internal Report Series, HIP-2016-03.

Scientific presentations

In total 99 talks in international conferences and research institutes (including 36 invited talks), 5 poster presentations.

Recent talks

- 2020 *Probing the early universe with isocurvature perturbations*, Invited talk, Inflationary Reheating Meets Particle Physics Frontier, Santa Barbara, CA, USA, 2/4/2020.
- 2019 *Spectator Dark Matter*, Invited talk, LPTHE Jussieu, Paris, France, 12/17/2019.
- 2019 *Probing Dark Matter with the Large Scale Structure*, Invited talk, Helsinki, Finland, 12/13/2019.
- 2019 *Inflationary Imprints on Dark Matter*, Invited talk, Carleton University, Ottawa, Canada, 11/11/2019.
- 2019 *Spectator Dark Matter*, Invited talk, University of Delaware, Newark, DE, USA, 11/7/2019.
- 2019 *What is dark matter?*, Seminar talk, Aalto University, Espoo, Finland, 10/18/2019.
- 2019 *Spectator Dark Matter*, Cosmic Controversies, Chicago, IL, USA, 10/8/2019.
- 2019 *Spectator Dark Matter*, Seminar talk, Harvard University, Cambridge, MA, USA, 9/18/2019.

Recent posters

- 2019 *Spectator Dark Matter*, Cosmic Controversies, Chicago, IL, USA, 5.10.2019.
- 2017 *Inflation and pseudo-Goldstone Higgs boson*, Higgs Cosmology Meeting, Milton Keynes, United Kingdom, 27.3.2017.

Acquired funding

Only the most important grants are listed. The total value is approx. 370,000 EUR (approx. 420,000 USD).

- 2019 Grant for writing a book on dark matter, Otto A. Malm Foundation, 2000 EUR
- 2019 Royal Astronomical Society Specialist Discussion Meeting Grant
- 2018 Marie Skłodowska-Curie Individual Fellowship, European Commission, 183,500 EUR (declined)
- 2018 Grant for public information, The Committee for Public Information (Finland), 3500 EUR
- 2018 Travel grant for a Research and conference visit to South Korea and Japan, Magnus Ehrnrooth foundation, 4500 EUR
- 2017 Nordita Fellowship, Nordita (declined)
- 2016 Travel grant for a Research and conference visit to the USA, Emil Aaltonen foundation, 5000 EUR
- 2015 Travel grant for a Research visit to the USA, Alfred Kordelin foundation, 4200 EUR
- 2015 Travel grant for the COSMO'15 conference, Doctoral School in Natural Sciences, University of Helsinki, 1200 EUR
- 2014 Doctoral Program Position for four years, The Research Foundation of the University of Helsinki, 160,000 EUR
- 2012 Student grant, The Mathematics and Science Fund of the University of Helsinki, 1000 EUR

Awards

- 2019 Shared "Best Poster" prize, Cosmic Controversies conference, Chicago, IL, USA, 10/8/2019.
- 2016 "Best Talk" award, PAP-PAPU doctoral school meeting, Helsinki, Finland, 12/12/2016.
- 2016 Stipend of the Dr. Mikael Björnberg Memorial Foundation (awarded by the Finnish Society of Sciences and Letters), 7000 EUR.
- 2013 & 2011 Teaching Assistant of the year (elected by students), Department of Physics, University of Helsinki.

Teaching and supervision

The feedback from students has generally been from good to excellent. I have twice been awarded as the Teaching Assistant of the year at Department of Physics, U. Helsinki. I have constantly been developing both my own teaching and the teaching conditions at my department by e.g. being a member of my department's teaching committee.

Teaching experience

- 2018 Physical Cosmology (QMUL, undergrad level)
- 2017 Mathematical Techniques 2 (QMUL, undergrad level)

- 2016 General Relativity (U. Helsinki, graduate level)
- 2015 Analytical Mechanics (U. Helsinki, undergrad level)
- 2014 Cosmology I-II (U. Helsinki, graduate level)
- 2013 Radiation Fields and Photons (U. Helsinki, undergrad level)
- 2011–13 Mathematical Methods I-II (U. Helsinki, undergrad level)
- 2012 Waves and Fields (U. Helsinki, undergrad level)
- 2011–12 Thermophysics (U. Helsinki, undergrad level)
- 2011 Electrodynamics (U. Helsinki, undergrad level)

Supervision experience

- 2017–18 Co-supervisor of 2 PhD research projects on cosmology; P. Carrilho (now a postdoc in QMUL) & J. Ronayne (now a postdoc in IAP, Paris), QMUL
- 2018 Supervisor of an MSc research project on cosmology, QMUL
- 2017 Supervisor of a BSc research project on cosmology, QMUL
- 2012–16 Mentor for 3 students in the Researcher Education Program, U. Helsinki
- 2010–12 Tutor for 50 new students, U. Helsinki

Professional activities

Only the most important ones listed.

- 2019– Main organizer, weekly meetings of the JHU cosmology group.
- 2019– Main organizer, Royal Astronomical Society Specialist Discussion Meeting.
- 2015– Referee for the *Monthly Notices of the Royal Astronomical Society*, *Astrophysical Journal Letters*, *Journal of High Energy Physics*, *General Relativity and Gravitation*, *Universe*, *European Physical Journal C*, *Mathematical Reviews*.
- 2019 International Advisor, *Mecanismos no Estándares de Producción de Materia Oscura en el Universo Primordial* research project, Universidad Antonio Nariño, Colombia.
- 2019 Grant Application Referee, Estonian Research Council.
- 2017–19 Columnist, *Arkhimedes* Magazine.
- 2017 Member, Editorial Board of the Conferment Ceremony Book, University of Helsinki.
- 2016–17 Team Leader, Conferment Ceremony Committee, University of Helsinki.
- 2016 Auditor, Association of Doctoral Students at the University of Helsinki.
- 2015–16 Member, Project Group of the "Big Wheel" Study Reform, University of Helsinki.
- 2015–16 Member, Outreach Group, Department of Physics, University of Helsinki.
- 2014–16 Member of the Board, The Finnish Physical Society.
- 2014–16 Member, Finnish National Committee of IUPAP.
- 2015 President, Association of Doctoral Students at the University of Helsinki.
- 2014–15 Member, Organizing Committee, Physics Days 2015 conference.
- 2014 Vice-President, Association of Doctoral Students at the University of Helsinki.
- 2014 Team Leader, The CLIMATE Project, Helsinki Challenge competition.

- 2013 Member, Teaching Committee, Department of Physics, University of Helsinki.
- 2013 Member, Doctoral Studies Committee, Department of Physics, University of Helsinki.
- 2012–13 Leader, Researcher Education Program for Students, Department of Physics, University of Helsinki.
- 2010–11 Member of the Board, Meridiaani ry.
- 2010–15 Group Leader, Research group on the history of the *prima inter pares* of the Finnish Reserve Officer School.

Other publications

Only the most important ones are listed.

- Book *Pimeän aineen arvoitus (The mystery of dark matter)*, T. Tenkanen, 233 pages, Tähtitieteellinen yhdistys Ursa ry, 2019.
- Book *Keväisten toivojen riemua (Celebrating the Joys of Spring)*, S. Thilman et al., 226 pages, University of Helsinki, 2017.
- Book *Proceedings of the XLIX Annual Conference of the Finnish Physical Society*, T. Tenkanen (editor-in-chief), 357 pages, Report Series in Physics, HU-P-268, 2015.
- Matricula *Invitation to the conferment ceremony of the Faculty of Philosophy*, T. Tenkanen (editor-in-chief), 194 pages, University of Helsinki, 2017.
- Matricula *RUK:n priimukset 1920–2014 (Prima inter pares of the Reserve Officer School 1920–2014)*, T. Tenkanen (editor-in-chief), 344 pages, RUK museum, 2015.
- Matricula *Halla – RUK Course 233*, T. Tenkanen (editor-in-chief), 390 pages, Supporting Association of the Student Union of the Finnish Reserve Officer School, 2009.
- Report *Tutkijapiirin vetäjän käsikirja (Handbook of the Leader of the Researcher Education Program)*, T. Tenkanen, 29 pages, University of Helsinki, 2013.
- Article *The first years of the PhD association*, T. Tenkanen, The University of Helsinki PhD students' association's blog, 4/29/2019.
- Article *Ghosts in the universe*, T. Tenkanen, The Science Basement Digest, 3/31/2019.
- Article *Ratkeaako pimeän aineen mysteeri? (Can the dark matter enigma be solved?)*, T. Tenkanen, Dimensio, 2/2019.
- Article *Gravitational Waves from the Heavens*, T. Tenkanen, The Science Basement Digest, 11/28/2017.
- Article *Tutkimus yhdistää Reserviupseerikoulun priimukset kautta aikain (Studies on prima inter pares of the Reserve Officer School)*, T. Tenkanen, S. Holopainen, J. Nivala and A. Vanhoja, Reserviläinen, 1/2015.
- Article *Fysiikan tutkijankoulutuslinja tarjoaa monipuolista toimintaa (The Physics' Researcher Education Program for Students provides versatile activities)*, T. Tenkanen, Arkhimedes, 4/2014.
- Letter *Kuka mahdollistaa arkipäivän ihmeen? (Who make the miracle of everyday life possible?)*, K. Enqvist, E. Kilpua, S. Räsänen, T. Tenkanen and E. Valtaoja, Turun Sanomat, 4/10/2019.

Letter *Tieteen säätiörahoitusta on tarkasteltava uudelleen (Foundations' role in science funding should be revisited)*, T. Tenkanen, Helsingin Sanomat, 6/21/2017.

Outreach and other talks

Only the most important ones are listed.

- Public interview Pimeän aineen arvoitus (*The mystery of dark matter*), Helsinki Book Fair, Helsinki, Finland, 10/25/2019.
- Blog *Akatemian jalkaväki (Foot Soldiers of Academia)*, in total 50+ texts during 2015–2019.
- Lecture *The current state and future of scientific publishing*, Physics Days 2019, Helsinki, Finland, 3/6/2019.
- Lecture *Dark Matter and the Hidden Cosmos*, Queen Mary University of London, London, United Kingdom, 5/24/2018.
- Lecture *Pimeä aine ja kätketty kosmos (Dark Matter and the Hidden Cosmos)*, The Finnish Science Centre Heureka, Vantaa, Finland, 11/26/2017.
- Lecture *Alkuräjähdyksen aikana syntyneet mustat aukot (Primordial Black Holes)*, University of Helsinki, Helsinki, Finland, 4/24/2018.
- TV interview *Kosmos – Maailmankaikkeus viidessä minuutissa (Cosmos – The universe in five minutes)*, Yle Tiede, 4/6/2018.
- Radio interview *Kosmologille syksyn pimeys avaa ikkunan maailmankaikkeuteen (For a cosmologist, darkness of the fall opens a window to the universe)*, Yle Radio Suomi, 10/19/2017.
- Lecture *Topics in Modern Cosmology*, Meeting of the Finnish Young Minds, Helsinki, Finland, 12/13/2016.
- Lecture *Pimeä aine ja kosminen inflaatio (Dark Matter and Cosmic Inflation)*, Annual meeting of the Research Foundation of the University of Helsinki, Finland, 3/21/2016.
- Lecture *Cosmologist's world view*, Popular lecture for Suomen Humanistiliitto ry, Helsinki, Finland, 11/12/2015.
- TV interview *Väärinkäsitys: alkuräjähdyks oli kaiken alku (A Misnomer: Big Bang was the beginning of everything)*, Yle Tieteen Prisma Studio, 7/3/2015.
- Lecture *RUK:n priimukset 1920–2014 (Prima inter pares of the Reserve Officer School 1920–2014)*, 95th Anniversary of the Reserve Officer School, 6/5/2015.
- Panelist *Kosmoksen valoja (Lights of Cosmos)* event, University of Helsinki, Finland, 4/23/2015.
- Lecture *Matkalla maailmankaikkeudessa – 2000-luvun löytöretkeilyä (En route in the universe – Expeditions at the 21st century)*, Monthly meeting of the Kanta-Helsingin Kansalliset Seniorit association, Helsinki, Finland, 5/13/2014.

In media News and articles about me and my research have appeared in e.g. the following media: *Forbes*, *Newsweek*, *Gizmodo*, *phys.org*, *Medium*, *The Johns Hopkins News-Letter* (in English), *Helsingin Sanomat*, *yle.fi*, *Aamulehti*, *Iltalehti*, *Suomen Kuvalehti*, *Tekniikka ja talous*, *Tekniikan maailma* (in Finnish) and *Hufvudstadsbladet* (in Swedish), as well as in other magazines in e.g. Chinese, French, German, Spanish, and Russian. I have also served as an expert for the *All About Space* magazine, the Academy of Finland's outreach forum *tietysti.fi*, the *Helsingin Sanomat* newspaper, and the *Tähdet ja avaruus*, *Tekniikan maailma* and *Tiede* magazines.

Professional development courses

- 2019 *Professional Development Day workshops*, Johns Hopkins University, 11/8/2019.
- 2018 *The Aspiring Leader – Leading and Motivating People*, Queen Mary University of London, spring 2018.
- 2017 *Public Engagement Masterclass*, Queen Mary University of London, fall 2017.
- 2015 *Project Management and Leadership*, University of Helsinki, fall 2015.
- 2015 *Introduction to Project Work*, University of Helsinki, spring 2015.

Memberships in professional societies

Only the most important ones are listed.

- 2019– The American Physical Society
- 2016– The Royal Astronomical Society
- 2014– The Finnish Physical Society

Language skills

- Finnish Excellent oral and written skills.
- English Excellent oral and written skills.
- Swedish Good oral and satisfactory written skills.
- German Basics

Extracurricular interests

- Literature, creative writing, comic books, movies.
- Sports – in particular soccer, ice hockey, cycling, and badminton.

References

- Prof. Marc Kamionkowski (kamion@jhu.edu), Johns Hopkins U.
- Prof. Kari Enqvist (kari.enqvist@helsinki.fi), U. Helsinki, PhD supervisor
- Prof. Arttu Rajantie (a.rajantie@imperial.ac.uk), Imperial Coll. London
- Prof. Bernard Carr (b.j.carr@qmul.ac.uk), Queen Mary U. of London
- Prof. David Wands (d.wands@port.ac.uk), U. of Portsmouth