

Thomas Tram

Rønbjergvej 4

8240 Risskov

Denmark

☎ (+45) 26 397 398

✉ thomas.tram@phys.au.dk

★ 18 December 1984



Research positions

2017– Fellow at Aarhus Institute of Advanced Studies (AIAS), Aarhus University.

2017–2017 Postdoc at Department of Physics and Astronomy, Aarhus University.

2014–2017 Senior research associate at Institute of Cosmology and Gravitation (ICG), Portsmouth.

2012–2014 Postdoc at École Polytechnique Fédérale de Lausanne (EPFL), Lausanne.

2010–2011 Research visit at the CERN Theory Division, Geneva.

2008–2012 PhD at IFA, Aarhus University, awarded 28 September 2012.

2004–2008 Undergraduate at IFA, Aarhus University.

Teaching

In spring 2017 I co-lectured the undergraduate cosmology course at Aarhus University. In 2014 I gave the cosmology course at the GraSPA2014 summer school at LAPTh in Annecy and in 2015 and 2016 I gave PhD-lectures on mathematical methods at the ICG in Portsmouth. I have also taught `CLASS` and `MONTEPYTHON` at several workshops around the world including UNAM in Mexico City, University of Geneva, Kings College and UCL in London, ICC at the University of Barcelona and Kavli IPMU in Tokyo. In September 2017 I will teach `CLASS` and `MONTEPYTHON` at the CANTATA summer school “Cosmology from Observations to Modified Gravity”.

Supervision

I have supervised several undergraduate student projects. I also co-supervised Luc Voruz on his master thesis and subsequently on a 5 months research project which we later published [11]. I co-supervised Robert Vallance for a 6 week summer research project and we published a paper based on this project [4]. I am currently co-supervising a bachelor student and a PhD-student at IFA.

Talks, seminars and workshops

I have given talks at several international conferences including PASCOS 2012, COSMO13, COSMO15 and COSMO16. I have also given seminars at several occasions, including CERN, EPFL, MPIK Heidelberg, DESY, University of Sussex, ICG Portsmouth, MPP Munich, MPA Munich, CP3 Louvain and the Helsinki Institute of Physics.

Code authoring

I am a co-author of the code `CLASS`, I am the main author of the code `LASAGNA` and I have contributed to the codes `MONTEPYTHON` and `SONG`. `CLASS` is being used by many cosmologists around the world and is considered state-of-the-art.

Selected publications

- [1] I. M. Oldengott, T. Tram, C. Rampf, and Y. Y. Y. Wong, “Interacting neutrinos in cosmology: Exact description and constraints,” [arXiv:1706.02123](#) [[astro-ph.CO](#)].
- [2] C. Fidler, T. Tram, C. Rampf, R. Crittenden, K. Koyama, and D. Wands, “Relativistic initial conditions for N-body simulations,” *JCAP* **1706** (2017) no. 06, 043, [arXiv:1702.03221](#) [[astro-ph.CO](#)].
- [3] J. Brandbyge, C. Rampf, T. Tram, F. Leclercq, C. Fidler, and S. Hannestad, “Cosmological N -body simulations including radiation perturbations,” *Mon. Not. Roy. Astron. Soc.* **466** (2017) L68–L72, [arXiv:1610.04236](#) [[astro-ph.CO](#)].
- [4] T. Tram, R. Vallance, and V. Vennin, “Inflation Model Selection meets Dark Radiation,” *JCAP* **1701** (2017) no. 01, 046, [arXiv:1606.09199](#) [[astro-ph.CO](#)].
- [5] C. Fidler, T. Tram, C. Rampf, R. Crittenden, K. Koyama, and D. Wands, “Relativistic Interpretation of Newtonian Simulations for Cosmic Structure Formation,” *JCAP* **1609** (2016) no. 09, 031, [arXiv:1606.05588](#) [[astro-ph.CO](#)].
- [6] A. Poursidou and T. Tram, “Reconciling CMB and structure growth measurements with dark energy interactions,” *Phys. Rev.* **D94** (2016) no. 4, 043518, [arXiv:1604.04222](#) [[astro-ph.CO](#)].
- [7] T. Tram, C. Fidler, R. Crittenden, K. Koyama, G. W. Pettinari, and D. Wands, “The Intrinsic Matter Bispectrum in Λ CDM,” *JCAP* **1605** (2016) no. 05, 058, [arXiv:1602.05933](#) [[astro-ph.CO](#)].
- [8] C. Fidler, C. Rampf, T. Tram, R. Crittenden, K. Koyama, and D. Wands, “General relativistic corrections to N -body simulations and the Zel’dovich approximation,” *Phys. Rev.* **D92** (2015) no. 12, 123517, [arXiv:1505.04756](#) [[astro-ph.CO](#)].
- [9] B. Audren, J. Lesgourgues, G. Mangano, P. D. Serpico, and T. Tram, “Strongest model-independent bound on the lifetime of Dark Matter,” *JCAP* **1412** (2014) no. 12, 028, [arXiv:1407.2418](#) [[astro-ph.CO](#)].
- [10] M. Archidiacono, S. Hannestad, R. S. Hansen, and T. Tram, “Cosmology with self-interacting sterile neutrinos and dark matter - A pseudoscalar model,” *Phys. Rev.* **D91** (2015) no. 6, 065021, [arXiv:1404.5915](#) [[astro-ph.CO](#)].
- [11] L. Voruz, J. Lesgourgues, and T. Tram, “The effective gravitational decoupling between dark matter and the CMB,” *JCAP* **1403** (2014) 004, [arXiv:1312.5301](#) [[astro-ph.CO](#)].
- [12] J. Lesgourgues and T. Tram, “Fast and accurate CMB computations in non-flat FLRW universes,” *JCAP* **1409** (2014) no. 09, 032, [arXiv:1312.2697](#) [[astro-ph.CO](#)].
- [13] T. Tram, “Computation of hyperspherical Bessel functions,” *Commun. Comput. Phys.* **22** (2017) 852–862, [arXiv:1311.0839](#) [[astro-ph.IM](#)].
- [14] S. Hannestad, R. S. Hansen, and T. Tram, “How Self-Interactions can Reconcile Sterile Neutrinos with Cosmology,” *Phys. Rev. Lett.* **112** (2014) no. 3, 031802, [arXiv:1310.5926](#) [[astro-ph.CO](#)].
- [15] I. Tamborra, S. Hannestad, and T. Tram, “Sterile Neutrinos in the Early Universe,” *Nucl. Phys. Proc. Suppl.* **237-238** (2013) 256–258.
- [16] T. Tram and J. Lesgourgues, “Optimal polarisation equations in FLRW universes,” *JCAP* **1310** (2013) 002, [arXiv:1305.3261](#) [[astro-ph.CO](#)].
- [17] S. Hannestad, I. Tamborra, and T. Tram, “Thermalisation of light sterile neutrinos in the early universe,” *JCAP* **1207** (2012) 025, [arXiv:1204.5861](#) [[astro-ph.CO](#)].
- [18] D. Blas, J. Lesgourgues, and T. Tram, “The Cosmic Linear Anisotropy Solving System (CLASS) II: Approximation schemes,” *JCAP* **1107** (2011) 034, [arXiv:1104.2933](#) [[astro-ph.CO](#)].
- [19] J. Lesgourgues and T. Tram, “The Cosmic Linear Anisotropy Solving System (CLASS) IV: efficient implementation of non-cold relics,” *JCAP* **1109** (2011) 032, [arXiv:1104.2935](#) [[astro-ph.CO](#)].
- [20] S. Hannestad and T. Tram, “Sommerfeld Enhancement of DM Annihilation: Resonance Structure, Freeze-Out and CMB Spectral Bound,” *JCAP* **1101** (2011) 016, [arXiv:1008.1511](#) [[astro-ph.CO](#)].