Martina Cataldi

Postdoktor i evolutionen av primordiala magnetfält
Ref nr: SU FV-4638-25-10
Datum för ansökan: 2026-01-09 16:40

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Kön	Kvinna

Frågor

1. *Nuvarande sysselsättning (ange huvudsaklig sysselsättning)*
Anställd vid lärosäte utanför Sverige

2. *Högsta examen*
Master-/magisterexamen

3. *Från vilket land har du din högsta examen?*
Italien

4. *Har du din högsta examen från Stockholms universitet?*
Nej

5. *Ange datum när du tog din doktorsexamen*
2026-09-01

6. *NUVARANDE ANSTÄLLNING. Ange arbetsplats och jobbtitel samt när anställningen påbörjades..*
I am a Ph.D. student at University of Hamburg, Germany, under the supervision of Prof. Géraldine Servant.

7. *REFERENSER. Ange namn, telefon och e-post för 2–3 referenspersoner som kan komma att kontaktas.*
Géraldine Servant, geraldine.servant@desy.de
Bibhushan Shakya, bibhushan.shakya@desy.de
Filippo Sala, f.sala@unibo.it
Alberto Mariotti, alberto.mariotti@vub.be

8. *SPRÅKKUNSKAPER. Beskriv kort dina språkkunskaper.*
I am fluent in English, both written and oral (level B2).

9. *FORSKNINGSPLAN/PROJEKTPLAN. Bifoga din plan som beskriver det tilltänkta projektet.*
Research_Statement_CosmoMag.pdf

10. *DOKTORSEXAMEN ELLER MOTSVARANDE. Ange doktorsexamen med ämne och lärosäte.*
I am about to finish my Ph.D. at the University of Hamburg, Germany. My supervisor is Géraldine Servant. I started my Ph.D. in September 2023 and I am planning to defend my thesis in September 2026. Thus, in the following box, I upload my PhD admission letter.

11. *EXAMENSBEVIS ELLER MOTSVARANDE. Bifoga examensbevis.*
2023-11-27_12-18-Cataldi-MIN02b_Zulassungsbescheid_Admission_letter_PM_D_PromO_2018.pdf

Eget uppladdat CV

Martina Cataldi

Postdoctoral candidate martina.cataldi@desy.de

II. Institute for Theoretical Physics,
Particle Cosmology Group,
University of Hamburg (UHH),
Luruper Chaussee 149, 22761
Hamburg, Germany

January 9, 2026

Nordita,
AlbaNova, Hannes Alfvéns väg 12,
114 19 Stockholm,
Sweden

Dear Committee Members,

I am writing this letter to apply for the postdoctoral position at Nordita in the context of the ERC Synergy Grant "COSMOMAG". I would be interested in pursuing my academic career and I will be pleased to gain the chance to join your group.

I am a Ph.D. student in the Particle Cosmology Group at University of Hamburg and in the Theory Group at the Deutsches Elektronen-Synchrotron (DESY), Germany, under the supervision of Prof. Géraldine Servant (DESY & University of Hamburg). I started my Ph.D. in September 2023 and I am planning to graduate by September 2026.
The leading research fields of the DESY Theory Group are particle physics beyond the Standard Model and cosmology. My main interests have been cosmological phase transitions, baryogenesis, leptogenesis, topological defects, electroweak phase transition, gravitational waves, axion-like particle (ALP) cosmology.
During my Ph.D., I have mainly been working on phenomenological aspects of cosmological phase transitions, such as baryogenesis or leptogenesis realized by first-order phase transitions, with analytical and numerical (lattice simulations of gauge field theories) approaches. During my Master, under the supervision of Prof. Sala, Prof. Mariotti and Prof. Pascoli, I focused on a non-thermal realization of leptogenesis within ALP cosmology, i.e. via decays of heavy ALPs into sterile right-handed neutrinos.
I am motivated in applying for this position within the project "COSMOMAG", since I am interested in studying the prospects of primordial magnetic field production and I could match the desiderable requirements given my experience with lattice gauge theory simulations (e.g., $U(1)$- and $SU(2)$-gauge theories in (3+1)D, compact lattice formulation).

I enclose my Curriculum Vitae, my Research Statement and a list of publications. Letters of reference will be provided by my Ph.D. supervisor Prof. Géraldine Servant (geraldine.servant@desy.de), and by Dr. Bibhushan Shakya (bibhushan.shakya@desy.de), Prof. Filippo Sala (f.sala@unibo.it) and Prof. Alberto Mariotti (alberto.mariotti@vub.be).

I would like to thank you for your time and consideration. I hope to hear from you soon. Please feel free to contact me by e-mail.

Sincerely,

Martina Cataldi

Martina Cataldi

inspirehep.net

Personal Data

Date of birth: 06/03/1999
Place of birth: Parma, Italy
Nationality: Italian

Contact

University of Hamburg (UHH)
Faculty of Mathematics, Informatics and Natural Sciences II. Institut für Theoretische Physik
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Education

Ph.D. at University of Hamburg (UHH) Sept.2023 - July 2026 (expected)
Advisor: Prof. Géraldine Servant (DESY & University of Hamburg)
Thesis: *New baryogenesis mechanisms during cosmological first-order phase transitions*

Master degree in Theoretical Physics at University of Bologna (UNIBO) Sept.2021 - July 2023
Advisor: Prof. Filippo Sala (University of Bologna)
Co-advisors: Prof. Silvia Pascoli (University of Bologna), Prof. Alberto Mariotti (Vrije Universiteit Brussel)
Thesis: *ALP leptogenesis*
Grade: 110/110 *cum laude*

Bachelor degree in Physics at University of Parma (UNIPR) Sept.2018 - Sept.2021
Advisor: Prof. Massimo Pietroni (University of Parma)
Thesis: *The Hubble Tension*
Grade: 110/110 *cum laude*

Ph.D. Schools

Cargese2025 International Summer School -
BSM Odyssey: turns and twists in particle theory, Cargese, France July 2025

Invisibles School 2024, Bologna, Italy July 2024

GGI Lectures on the Theory of Fundamental Interactions 2024,
Galileo Galilei Institute, Florence, Italy Jan. 2024

Cosmolattice School 2023, online Sept. 2023

Research visits

CERN May 2026 (planned)
Theory Division, Geneva, Switzerland

CERN May 2024
Theory Division, Geneva, Switzerland

Vrije Universiteit Brussel (VUB) Feb.-Jun. 2023
Theory Group, Brussels, Belgium

Publications

5. S.Blasi, M.Cataldi, M.Gorghetto, G.Servant
Cold electroweak baryogenesis from Higgs bubble collisions: The baryon asymmetry from (3+1)D lattice simulations — In preparation

4. N.Bhusal, S.Blasi, M.Cataldi, A.Chatrchyan, M.Gorghetto, G.Servant — Submitted to PRL
Standard Model Baryon Number Violation at Zero Temperature from Higgs Bubble Collisions — arXiv:2508.21825

3. M.Cataldi, K. Müürsepp, M.Vanvlasselaer — Accepted for publication in JHEP
CP-violation in production of heavy neutrinos from bubble collisions — arXiv:2506.12123

2. M.Cataldi, B.Shakya — JCAP 11 (2024) 047
Leptogenesis via bubble collisions — arXiv:2407.16747

1. M.Cataldi, A.Mariotti, F.Sala, M.Vanvlasselaer — JHEP 12 (2024) 125
ALP leptogenesis: non-thermal right-handed neutrinos from axions — arXiv:2407.01667

Talks at workshops or conferences

All that Antimatters in the Universe, CERN, Geneva, Switzerland — Jan.2026 (scheduled)
Title: *Zero-temperature baryon number violation from the dynamics of Standard Model electroweak textures*

DESY Theory Workshop2025, DESY, Hamburg, Germany — Sept.2025
Title: *Standard Model Baryon Number Violation at Zero Temperature from Higgs Bubble Collisions*

Invisibles2025, CERN, Geneva, Switzerland — Sept.2025
Title: *Standard Model Baryon Number Violation at Zero Temperature from Higgs Bubble Collisions*

Cargese2025 International Summer School - BSM Odyssey: turns and twists in particle theory, Cargese, France — July 2025
Title: *Standard Model Baryon Number Violation at Zero Temperature from Higgs Bubble Collisions*

Quantum Universe Day 2/2025, DESY, Hamburg, Germany — June 2025
Title: *Baryon number violation from Standard Model $SU(2)$-textures induced by Higgs bubble collisions at $T \approx 0$*

Planck2025-The 27th International Conference from the Planck Scale to the Electroweak Scale, University of Padova, Padova, Italy — May 2025
Title: *News on Cold Baryogenesis*

DESY Theory Workshop2024, DESY, Hamburg, Germany — Sept.2024
Title: *Leptogenesis via Bubble Collisions*

Invisibles24 Workshop, University of Bologna, Bologna, Italy — July 2024
Title: *ALP leptogenesis*

Quantum Universe Day 2/2024, DESY, Hamburg, Germany — June 2024
Title: *Leptogenesis via Bubble Collisions*

18.Kosmologietag, Bielefeld Univeristy, Bielefeld, Germany May 2024

Title: *Leptogenesis via Bubble Collisions*

New Physics Directions in the LHC era and beyond, MPIK, Heidelberg, Germany April 2024

Title: *Leptogenesis via Bubble Collisions*

Quantum Universe Day 3/2023, DESY, Hamburg, Germany Nov. 2023

Title: *ALP leptogenesis*

Seminars at research institutes

Mainz Institute for Theoretical Physics (MITP) Dec. 2025

Johannes Gutenberg-Universität, Mainz, Germany

Title: *Standard Model Baryon Number Violation at Zero Temperature from Higgs Bubble Collisions*

CERN May 2024

'BSM Forum', Theory Division, Geneva, Switzerland

Title: *Leptogenesis via Bubble Collisions*

Vrije Universiteit Brussel (VUB) June 2023

Theory Group, Brussels, Belgium

Title: *ALP leptogenesis*

Poster presentations

All that Antimatters in the Universe, CERN, Geneva, Switzerland Jan.2026 (scheduled)

Title: *Zero-temperature baryon number violation from the dynamics of Standard Model electroweak textures*

Invisibles2025, CERN, Geneva, Switzerland Sept.2025

Title: *Standard Model Baryon Number Violation at Zero Temperature from Higgs Bubble Collisions*

Graduate week of Quantum Universe Research School, DESY, Hamburg, Germany Feb. 2025

Title: *Leptogenesis via Bubble Collisions*

Invisibles School 2024, University of Bologna, Bologna, Italy July 2024

Title: *ALP leptogenesis*

4th EUCAPT Annual Symposium, CERN, Geneva, Switzerland May 2024

Title: *ALP leptogenesis*

New Physics Directions in the LHC era and beyond, MPIK, Heidelberg, Germany April 2024

Title: *Leptogenesis via Bubble Collisions*

Awards

Poster Prize April 2024

Workshop **New Physics Directions in the LHC era and beyond**, MPIK, Heidelberg, Germany

Technical Skills

Programming: Wolfram Mathematica, MatLab, OriginLab, Python (basic), C++ (basic), LaTeX
Tools: CosmoLattice, FindBounce, VisualStudio, Jupiter, Git, High Performance Computing

Service

Co-organizer of MITP Virtual Workshop, Mainz, Germany — 27-30 Jan.2026 (scheduled)

Youngst@rs at the MITP 2025/2026:
Shaping the Universe: Framework and Footprints of Cosmological Phase Transitions

Teaching experience

Teaching assistant, University of Hamburg (UHH) — Winter 2023/2024

Tutorial leader in the bachelor course of Physics degree
Thermodynamics and Statistical Physics

Outreach

Volunteer at *European Researchers' Night*, University of Parma, Parma, Italy — September 2022

Languages

Italian: Native Speaker

English: fluent (First Certificate in English - Level B2
Cambridge English Level 1 Certificate in ESOL International)

References

Prof. Géraldine Servant (DESY & Hamburg University, Hamburg, Germany)	geraldine.servant@desy.de
Dr. Bibhushan Shakya (Johns Hopkins University, Baltimore, USA)	bibhushan.shakya@desy.de
Prof. Alberto Mariotti (Vrije Universiteit Brussel, Brussels, Belgium)	alberto.mariotti@vub.be
Prof. Filippo Sala (University of Bologna, Bologna, Italy)	f.sala@unibo.it

Research Statement

Research Experience

The quest for new physics beyond the Standard Model (SM), capable of addressing its theoretical and experimental shortcomings, remains as pressing as ever. New promising avenues, complementary to laboratory and collider searches, have been recently opened up by the interplay between High Energy Physics and Cosmology, especially thanks to the latest advancements in e.g. Cosmic Microwave Background (CMB), Large-Scale Structure, Big Bang Nucleosynthesis (BBN) and notably Gravitational Wave (GW) measurements: thus, this novel synergy offers tremendous opportunities for developments in fundamental physics.

My Ph.D. research lies at this interface: my main interests have been cosmological Phase Transitions (PTs), baryogenesis, leptogenesis, topological defects, electroweak phase transition, GWs and axion-like particle (ALP) cosmology. In this context, PTs in the early Universe have received a boosted interest, as potential forge of new physics and one of the most promising cosmological sources of a stochastic GW background. In particular, first-order PTs, proceeding via nucleation of true vacuum bubbles in a false/metastable vacuum background, are well-motivated in many beyond the SM scenarios (e.g. composite Higgs, extended Higgs sectors, axion models, $B-L$ breaking sectors), and entail a rich variety of phenomenological applications, such as baryogenesis, leptogenesis and Dark Matter (DM) production. Thus, I have mostly focused on probing new mechanisms of physics beyond the SM that can be realized via cosmological first-order PTs.

Baryon number violation from Higgs Bubble Collisions In [1], I calculated a new sizable source of baryon number violation from Higgs bubble collisions in a strongly first-order electroweak PT at zero temperature. This is particularly relevant for electroweak PTs that reheat the Universe at temperatures lower than the electroweak scale, when sphaleron processes are inefficient (see [2, 3, 4, 5] for original cold baryogenesis and [6] for first idea within a first-order PT). The production of baryon number in this work can be attributed to the dynamics of electroweak textures: non-trivial Higgs field configurations, mapping the vacuum manifold onto a three-sphere S^3, which form upon spontaneous electroweak symmetry breaking. The energy of a texture is entirely due to the field gradient: thus, once bubbles collide, textures can decay leading to a non-zero Chern-Simons number, which is eventually converted in baryon number via SM chiral anomaly. Hence, Higgs bubble collisions generate electroweak gauge bosons, ultimately producing an effective sphaleron rate which can be of the same order as that from thermal sphalerons in the symmetric phase at electroweak temperatures. This study has been carried out by relying on Lattice Gauge Theory techniques to capture its non-perturbative nature: we perform large-scale (3+1)D real-time lattice simulations of the Higgs and $SU(2)$-gauge bosons, where true vacuum critical bubbles are nucleated at initial time.
This work opens up new possibilities of realizing electroweak baryogenesis in models with a low reheat temperature and large bubble wall velocity (i.e. exceeding the speed of sound), such as in first-order supercooled electroweak PTs (particularly motivated in composite Higgs models [7, 8, 9]). Notice that standard electroweak baryogenesis via charge-transport mechanism is highly suppressed in the aforementioned regime.
Finally, the new source of SM baryon number violation we have advocated may also play a role in some regimes of standard electroweak baryogenesis as a new source of washout. We leave such investigation (that requires modelling the plasma) for future work.

Non-thermal leptogenesis via Bubble Collisions In addition, first-order PTs in the early Universe can act as high-energy 'cosmic colliders': they are powerful emitters of particles with energies or masses far above the scale of symmetry breaking as well as the temperature of the surrounding thermal plasma, upon the collisions of ultra-relativistic bubble walls [10, 11, 12] (see [13] for an overview). Thus, they offer broad phenomenological prospects, such as heavy DM production [14], baryogenesis [15] and leptogenesis which I have recently addressed in my works [16], [17]. First, I proposed in [16] a novel realization from CP-violating and out-of-equilibrium decays of sterile right-handed neutrinos (RHNs) which are produced from runaway bubble collisions in a first-order PT driven by a generic dark scalar field. This non-thermal production mechanism of RHNs is successful in addressing some undesirable aspects of standard leptogenesis: i) it is efficient for RHN masses $\gtrsim 10^{14}$ GeV, the natural scale for type-I seesaw with $\mathcal{O}(1)$ couplings, since it avoids strong suppression from washout processes which instead would be experienced by standard thermal leptogenesis, ii) it enables high scale leptogenesis without requiring high reheat

temperature and iii) the corresponding PTs at scales $\gtrsim 10^9$ GeV produce high-frequency GW signals from bubble collisions, which notably could be detected at future experiments like Einstein Telescope (ET), Cosmic Explorer and Deci-hertz Interferometer Gravitational wave Observatory.
While in [16] I considered a first simplistic framework where CP-violation is only present in the *decay* of RHNs produced by bubble collisions, I extend and generalize this picture in [17]: if the sterile neutrinos coupling to the bubble wall have CP-violating interactions, the CP-violation can originate from different channels during bubble collisions, which have been only partially addressed in the literature. Thus, I presented a systematic analysis including: i) the *decay* of heavy particles, ii) the *production* of heavy particles and iii) the *production* of light and relativistic SM particles in $1 \to 3$ processes via an off-shell heavy state. Crucially, the contribution to the asymmetry from the CP-violation in the *production* of heavy states turns out to be relevant. As an example, I introduced a model of cogenesis, which separates a positive and negative lepton number in the SM and a dark sector respectively, with the first capable of explaining the baryon asymmetry of the Universe (BAU) while the latter responsible of determining the DM abundance. Moreover, the masses of light neutrinos can be understood via the inverse seesaw mechanism, with the lepton-violating Majorana mass originating from the first-order PT. The viable parameter space features sterile heavy neutrinos with masses $M_N \gtrsim 10^{11}$ GeV and a first-order PT at scales $\gtrsim 10^7$ GeV producing a GW signal that could be largely probed at ET.

Non-thermal leptogenesis via ALP decay Moreover, during my Master I investigated how an ALP interacting with RHNs could affect the production of the BAU. ALPs are a natural target to search for new physics, since they inevitably arise in many UV extensions of the SM. While in the literature non-thermal leptogenesis typically comprises RHN production via inflaton's decay [18, 19, 20], I proposed in [21] a non-thermal leptogenesis sourced via an out-of-equilibrium ALP's decay into RHN through a coupling $\frac{\partial_\mu a}{f_a}\overline{N}_R\gamma^\mu N_R$, with ALP decay constant f_a. This new mechanism, that we dubbed as 'ALP leptogenesis', lowers by two orders of magnitude the RHN mass, or the tuning in the RHN mass splittings in the case of resonant leptogenesis, needed to reproduce the BAU and the neutrino masses, and require heavy ALP masses $m_a \gtrsim 10^4$ GeV and $f_a \gtrsim 10^{11}$ GeV. Eventually, we provided a viable supersymmetric realization of ALP leptogenesis where the ALP is the R-axion, which accommodates GeV gravitino DM and predicts RHN below 10 TeV.

Future Prospects

In my future research, I would like to pursue my studies on probing new phenomena of physics beyond the SM, exploiting for instance the potential of cosmological PTs, the impact of topological defects, investigating the mechanism underlying the electroweak symmetry breaking and the prospects for the corresponding cosmological GW signal and primordial magnetic field production. Thus, I would be really interested in joining your project "COSMOMAG". Indeed, I am already planning to compute via lattice simulations the production of primordial magnetic fields from Higgs bubble collisions in the context of my work [1], as explained in the next paragraph. Moreover, I think I could contribute to your project given the expertise that I have gained during my Ph.D., on both analytical (e.g., model-building, baryo-/leptogenesis) and numerical side. In particular, for what concerns the computational skills, I became familiar with lattice gauge theory simulations in C++: $U(1)$- and $SU(2)$-gauge theories with compact lattice formulation, link and plaquette techniques, in (3+1)D (as well as lower dimensions, e.g., (1+1)D). Therefore, I have experience in modifying the equations of motion by including new terms and in testing their evolution via energy conservation and Gauss constraint checks, in the context of the electroweak PT. Eventually, let me stress that, during my Ph.D., I used lattice gauge theory techniques to simulate e.g. parametric resonance of scalar fields, first-order PTs and topological defects such as cosmic strings, domain walls and textures (see e.g. [1], where I provided the first simulations of bubble collisions on the lattice involving the full $SU(2)$-gauge fields and Higgs doublet in (3+1)D).

Towards Cold Electroweak Baryogenesis from Higgs Bubble Collisions Currently, I am working on a natural continuation of my work [1], aiming at presenting a complete electroweak baryogenesis realization in a future publication [22] by including a dynamical CP-violating source in the (3+1)D lattice implementation. The CP-violation would bias the baryon number production from gauge texture decays by inducing an effective chemical potential, hereby reproducing the BAU. For instance, the CP-violating source could be activated by the Higgs field variation during the PT, via a six-dimensional operator $\frac{1}{\Lambda^2}\phi^\dagger\phi W_{\mu\nu}\tilde{W}^{\mu\nu}$ (experimentally constrained by the electron Electric Dipole Moment), as considered in [5]. Another appealing avenue that I would like to study is to consider

the strong CP-violation and the QCD-axion, in the spirit of [23]. Indeed, even though the strong CP-violating parameter is very small today, in the early Universe the QCD-axion has not yet relaxed to its QCD-cancelling minimum: this could possibly source the BAU production.
Moreover, I am willing to compute the rate of baryon number violation in the regime of steady bubble wall velocity, since in [1] we simulate runaway bubbles, i.e. with accelerating bubble walls: this effective sphaleron rate could indeed act as a new source of washout for models of standard electroweak baryogenesis.

Multi-messenger cosmological signals Moreover, I plan to investigate the detection prospects of this mechanism [1]. Indeed, multi-messenger cosmological signals, e.g. a stochastic background of GWs and primordial magnetic fields, could be produced from bubble collisions during a strongly first-order electroweak PT. The GW background could lead to observable signals in upcoming GW interferometers and the magnetic field contribution could be equally promising. In the last years, studies on the formation and subsequent evolution of primordial magnetic fields have proliferated: the non-observation of GeV gamma-ray from blazars suggests the presence of coherent magnetic fields in the intergalactic medium (IGMFs) [24], which would notably seem to require a primordial origin. Cosmological explanations from first-order PTs can easily accommodate magnetic fields with very large coherence lengths [25, 26]. Hence, potential sources from early Universe cosmological processes such as first-order PTs have become very attractive. A natural extension of my work will be to add the $U(1)_Y$ hypercharge gauge field in my lattice simulations and predict the magnetic fields that can be triggered during Higgs bubble collisions.

BBN as new probe of Eletroweak Baryogenesis Finally, I would be interested in quantifying the potential connection between BBN abundances of light elements and the baryon asymmetry inhomogeneities produced in the early Universe (recently suggested by [27]). This could offer a novel manner, complementary to stochastic GW searches, to probe some models of baryogenesis. Indeed, baryogenesis mechanisms occurring too close to BBN epoch and/or producing too large inhomogeneities in the baryon-to-photon ratio would unavoidably alter the light-element formation (such as the deuterium-to-hydrogen ratio D/H), whose abundances are instead measured with great accuracy. Thus, BBN, in combination with CMB, would place strong constraints on low-temperature baryogenesis mechanisms. Generally, I would like to contribute to this new research area by studying quantitatively the baryon asymmetry inhomogeneities which can be induced by e.g. standard electroweak baryogenesis via charge-transport and other alternative scenarios.

References

[1] N. Bhusal, S. Blasi, M. Cataldi, A. Chatrchyan, M. Gorghetto, and G. Servant arXiv:2508.21825.

[2] L. M. Krauss and M. Trodden *Phys. Rev. Lett.* 83 (1999) 1502–1505, [hep-ph/9902420].

[3] J. García-Bellido, D. Grigoriev, A. Kusenko, and M. Shaposhnikov *Phys. Rev. D* 60 (Nov, 1999) 123504.

[4] E. J. Copeland, D. Lyth, A. Rajantie, and M. Trodden *Phys. Rev. D* 64 (Jul, 2001) 043506.

[5] A. Tranberg and J. Smit *JHEP* 11 (2003) 016, [hep-ph/0310342].

[6] T. Konstandin and G. Servant *JCAP* 07 (2011) 024, [arXiv:1104.4793].

[7] T. Konstandin and G. Servant *JCAP* 12 (2011) 009, [arXiv:1104.4791].

[8] S. Bruggisser, B. Von Harling, O. Matsedonskyi, and G. Servant *JHEP* 12 (2018) 099, [arXiv:1804.07314].

[9] S. Bruggisser, B. von Harling, O. Matsedonskyi, and G. Servant *JHEP* 08 (2023) 012, [arXiv:2212.11953].

[10] A. Falkowski and J. M. No *JHEP* 02 (2013) 034, [arXiv:1211.5615].

[11] R. Watkins and L. M. Widrow *Nuclear Physics B* 374 (1992), no. 2 446–468.

[12] H. Mansour and B. Shakya *Phys. Rev. D* 111 (2025), no. 2 023520, [arXiv:2308.13070].

[13] B. Shakya, *Cosmic Colliders: High Energy Physics with First-Order Phase Transitions*, in *Particle Physics and Cosmology in the Himalayas*, 12, 2024. arXiv:2412.18752.

[14] G. F. Giudice, H. M. Lee, A. Pomarol, and B. Shakya *JHEP* 12 (2024) 190, [arXiv:2403.03252].

[15] A. Katz and A. Riotto *JCAP* 11 (2016) 011, [arXiv:1608.00583].

[16] M. Cataldi and B. Shakya *JCAP* 11 (2024) 047, [arXiv:2407.16747].

[17] M. Cataldi, K. Müürsepp, and M. Vanvlasselaer *Accepted for publication in JHEP* [arXiv:2506.12123].

[18] D. J. H. Chung, E. W. Kolb, and A. Riotto *Phys. Rev. D* 60 (1999) 063504, [hep-ph/9809453].

[19] G. F. Giudice, M. Peloso, A. Riotto, and I. Tkachev *JHEP* 08 (1999) 014, [hep-ph/9905242].

[20] F. Hahn-Woernle and M. Plumacher *Nucl. Phys. B* 806 (2009) 68–83, [arXiv:0801.3972].

[21] M. Cataldi, A. Mariotti, F. Sala, and M. Vanvlasselaer *JHEP* 12 (2024) 125, [arXiv:2407.01667].

[22] S. Blasi, M. Cataldi, M. Gorghetto, and G. Servant *Cold electroweak baryogenesis from Higgs bubble collisions: The baryon asymmetry from (3+1)D lattice simulations. In preparation.*

[23] G. Servant *Phys. Rev. Lett.* 113 (2014), no. 17 171803, [arXiv:1407.0030].

[24] MAGIC Collaboration, V. A. Acciari et al. *Astron. Astrophys.* 670 (2023) A145, [arXiv:2210.03321].

[25] T. Vachaspati *Physics Letters B* 265 (1991), no. 3 258–261.

[26] J. Ellis, M. Fairbairn, M. Lewicki, V. Vaskonen, and A. Wickens *JCAP* 09 (2019) 019, [arXiv:1907.04315].

[27] H. Bagherian, M. Ekhterachian, and S. Stelzl arXiv:2505.15904.

Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

FAKULTÄT
FÜR MATHEMATIK, INFORMATIK
UND NATURWISSENSCHAFTEN

UHH · Promotionsbüro Physik · Jungiusstraße 9 · 20355 Hamburg

Frau
Martina Cataldi
Luruper Chaussee 149
22761 Hamburg

Theresa Kertz

Fakultät für Mathematik, Informatik
und Naturwissenschaften
Fachbereich Physik
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promotionen@physik.uni-hamburg.de
https://www.physik.uni-hamburg.de/promotion

27.11.2023

Promotionsverfahren - Martina Cataldi
Zulassung zur Promotion im Fach Physik mit dem Grad Dr. rer. nat. mit Teilnahme in einem strukturierten Promotionsprogramm

Sehr geehrte Frau Cataldi,

im Auftrag des Fach-Promotionsausschusses darf ich Ihnen mitteilen, dass Sie am 27.11.2023 zur Promotion im Fach Physik im Rahmen der Promotionsordnung MIN-Fakultät (2018) in ihrer jeweils gültigen Fassung zugelassen wurden (Link zur Promotionsordnung und ihren Änderungen).

Die Betreuung Ihres Promotionsvorhabens übernimmt bzw. übernehmen:

Prof. Dr. Géraldine Chantal Servant, Betreuung
Dr. Thomas Konstandin, Co-Betreuung

In einem **nächsten Schritt** müssen Sie sich über das Campus-Center in den **Studiengang ‚Physik - Grad. School'** immatrikulieren/einschreiben. Die Immatrikulation ist für Promovierende im Hamburgischen Hochschulgesetz gemäß § 70 Absatz 5 vorgeschrieben. Sie muss gemäß o.g. Promotionsordnung spätestens zum folgenden Semester nach Zulassung zur Promotion erfolgen: d.h. Sie müssen sich **spätestens** bis zum **30.09.2024** immatrikuliert/eingeschrieben haben. Informationen zur Beantragung der Immatrikulation/Einschreibung finden Sie unter diesem Link; die Bearbeitung der Immatrikulationsanträge dauert i.d.R. 4 Wochen.
Bitte beachten Sie: Erfolgt keine Immatrikulation bis zum oben genannten Zeitpunkt, erlischt die Zulassung zur Promotion. Promovierende müssen bis zum Abschluss des Promotionsverfahrens immatrikuliert bleiben (d.h. mindestens bis zur Abhaltung der Disputation bzw. sofern zutreffend bis zum Abbruch des Promotionsverfahrens ohne Abschluss).

Die Dissertation sollte innerhalb von 3 Jahren abgeschlossen werden. Die Zulassung zur Promotion gilt ab **18.09.2023** für 4 Jahre und kann spätestens 3 Monate vor Ablauf der Frist auf Antrag verlängert werden.

Weitere Informationen finden Sie unter diesem Link.

Wir wünschen Ihnen viel Erfolg bei Ihrem Promotionsvorhaben.

Rechtsbehelfsbelehrung: Gegen diesen Bescheid können Sie innerhalb eines Monats nach Bekanntgabe Widerspruch bei der Universität Hamburg, Fakultät für Mathematik, Informatik und Naturwissenschaften, Fach-Promotionsausschuss Physik, Promotionsbüro Physik, Jungiusstraße 9, 20355 Hamburg einlegen.

Mit freundlichem Gruß

gez. Theresa Kertz

Doctoral proceedings Martina Cataldi
Admission to doctoral procedures in the subject of Physics with the academic degree of Dr. rer. nat. with participation in a structured doctoral program

Dear Martina Cataldi,

On behalf of the subject doctoral committee, I would like to inform you that you have been admitted to doctoral procedures according to the Doctoral Degree Regulations MIN Faculty (2018) in its current version on 11/27/2023 (link to the doctoral degree regulations and their amendments).

Your dissertation will be supervised by:

Prof. Dr. Géraldine Chantal Servant, supervision
Dr. Thomas Konstandin, co-supervision

In **a next step**, you have to enroll for the **degree program 'Physik - Grad. School'** via the Campus Center. The enrollment/matriculation of doctoral candidates is stipulated by the Hamburg Higher Education Law in accordance with Section 70, subsection 5. According to the above-mentioned doctoral degree regulations, it must take place no later than the semester following admission to doctoral procedures: i.e. you must have enrolled **no later than 09/30/2024**. Information on how to apply for enrollment can be found at this link; enrollment applications usually take 4 weeks to process.
Please note: If you do not enroll as a doctoral student at the Universität Hamburg within the above-mentioned time, your admission to doctoral procedures will be rescinded. Doctoral candidates must remain enrolled until completion of the doctoral procedure (i.e. at least until the oral defense/disputation is held or, if applicable, until the doctoral procedure is discontinued without completion).

As a rule, the dissertation should be completed within 3 years. The admission to doctoral procedures is valid for 4 years starting from **09/18/2023** and may be extended upon your request. The extension application should be submitted at the latest 3 months prior to the expiry of the four-year period.

Please see this link for further information.

We wish you every success with your doctoral project.

Instruction on the right of appeal: An appeal may be filed within one month after notification to the Universität Hamburg, Faculty of Mathematics, Informatics and Natural Sciences, Subject Doctoral Committee Physics, Doctoral Office of the Department of Physics, Jungiusstraße 9, 20355 Hamburg.

Sincerely

p. p. Theresa Kertz

The English version is for information only and not legally binding.