Stockholm University

Internal nomination form for *Wallenberg Academy Fellows 2025*

Send to sofia.irinarchos@su.se before 2024-10-18

Nomination date

Subject area review panels (select one)		
☐ Humanities	☐ Social sciences	☒ Natural sciences

Nominated researcher

Candidate status. 50% of the nominees must be *external*. At the time of nomination, an external candidate may neither have been employed, nor received salary or other financing in Sweden during the last four years.	☐ External (international) ☒ Internal

First name and surname	**Social security no.** (yymmdd-xxxx)
Oksana Iarygina	19920607-2960

Contact details (current university, department, address, postal code, city, country)
Nordic Institute for Theoretical Physics, AlbaNova, Hannes Alfvéns väg 12, 114 19 Stockholm, Sweden

E-mail	**Telephone number** (incl. area code, country code)
oksana.iarygina@su.se	+31613714578

Nominating Head of Dept./Director	**Department/Center at Stockholm University**
Prof. Dr. Jan Conrad	Department of Physics

***Nomination** (½-1 page). Motivate why your candidate should be nominated by the University; describe how the nominee will contribute to the department's research, and how the department will provide support to the candidate*

The nominee is a leading young researcher in theoretical cosmology, specializing in early universe physics. Her groundbreaking work has greatly advanced the understanding of inflation and reheating in multi-field scenarios, revealing new connections to astrophysical observables such as gravitational waves and primordial magnetic fields. Additionally, her research has extended to explore implications for dark matter, further broadening her impact in the field.

Dr. Iarygina's research has led to groundbreaking discoveries, including a discovery of backreaction attractor during axion inflation and a novel proposal for primordial magnetogenesis. Her high-impact publications in leading journals, such as Physical Review D and Journal of Cosmology and Astroparticle Physics, have garnered significant attention and have been widely cited. The nominee's innovative work on axion-gauge field interactions has set new benchmark predictions for primordial gravitational waves, of high relevance for upcoming observational surveys. She has received numerous awards and funding support, including the prestigious Nordita Postdoctoral Fellowship and Marie Sklodowska-Curie Postdoctoral Fellowship, recognizing her scientific maturity.

Dr. Iarygina has held leadership roles in several high-profile research projects, including serving as the principal investigator for the Marie Sklodowska-Curie project MASUGRAV, aiming to provide compelling scenarios for primordial magnetogenesis from axion inflation with non-Abelian gauge fields. Her collaborative work with top institutions, such as the University of Nottingham, Prague Institute of Physics, Leiden University, Case Western Reserve University, Chile University has strengthened interdisciplinary research and fostered valuable professional networks.

Dr. Iarygina is an active and engaged member of the academic community. Since arriving in Stockholm, she has organized the Theoretical Cosmology Seminar, which brings together scientists from Nordita, Stockholm University, and international participants. In addition, she secured funding to organize the First Nordic Cosmology Meeting, fostering collaboration among Nordic universities. This initiative has led to a series of meetings, with the Second Nordic Cosmology Meeting held in Helsinki. Further emphasizing her commitment to advancing the department's visibility, Dr. Iarygina is currently organizing a three-week program at Nordita scheduled for summer 2025. Her contributions to the field of theoretical cosmology have made her a prominent ambassador for Stockholm University and Nordita, significantly enhancing the institution's visibility and impact on the global stage. Besides that, the nominee actively participated in outreach activities and departmental open days. She has supervised students and delivered invited lectures at international institutions.Throughout the fellowship, Dr. Iarygina will continue actively contributing to the academic community by organizing seminars, workshops, and public lectures, further elevating the department's visibility and influence.

Her research aligns closely with the department's focus on cosmology and fundamental physics. Dr. Iarygina's innovative approaches to early universe physics will complement and enhance existing projects, directly leading to new research directions and interdisciplinary collaborations. In particular, Dr. Iarygina will introduce novel methodologies and numerical methods for axion-gauge fields dynamics and interactions with the Higgs field in the early universe, with a direct connection to existing expertise in collider physics, theoretical and observational probes of axion dark matter, astrophyiscal observations of primordial magnetic fields and large-scale structure surveys. Her expertise will contribute to developing new research initiatives and the next generation of numerical codes to probe the early universe.

The department will provide access to a vibrant research environment and state-of-the-art computational resources, including Swedish supercomputer. Dr. Iarygina will benefit from internal funding opportunities and training, together with support from the Office for Research, Engagement and Innovation Services at Stockholm University on grant preparation and applications to secure external grants to advance her research. The department will offer mentoring and career development programs to support Dr. Irygina's professional growth. She will have opportunities to lead major research initiatives and participate in key departmental activities.

Brief description of the proposed research program *(max 2 pages). Academic quality, originality and feasibility of the proposed research will be assessed; subsidiary criteria include: quality of the research program, its degree of innovativeness and significance in terms of research development. Regarding feasibility: Can the research be carried out at the nominating university? Do the right infrastructure, resources and context exist?*

Research program: **Multi-messenger probes of cosmological phase transitions**

We live in an exceptional time of precision cosmology. Upcoming observational experiments of the cosmic microwave background (CMB) aim to detect primordial gravitational waves (GWs), while astrophysical observations of blazars seek to probe primordial magnetic fields. In parallel, various experiments are focused on uncovering the nature of dark matter, providing a multi-faceted approach to understanding the universe. The goal of this proposal is *to fit together these various independent signatures into a coherent framework.*

While the Standard Model (SM) is highly successful in describing particle physics at accessible energy scales, it leaves many questions unanswered about the nature of the universe. SM does not provide any particle candidate that can explain dark matter (DM) that is evidenced by the rotational curves of galaxies, gravitational lensing, and the cosmic microwave background (CMB) observations, constituting about 27% of the universe's total mass-energy content. Observations show our universe is composed almost entirely of matter, with very little antimatter. According to the SM, equal amounts of matter and antimatter should have been produced during the Big Bang. This problem requires a new mechanism called baryogenesis, where an excess of matter over antimatter is generated. The discovery of the Higgs boson confirmed existence of central component of SM, yet the fundamental properties of the Higgs sector, its potential and *the transition that gave mass to particles in the early universe* - electroweak phase transition (EWPT) - remain unexplored.

Understanding *the nature of the electroweak phase transition* is one of the key challenges in modern particle physics and cosmology. It has profound implications for the early universe's thermal history, particularly for baryogenesis, generation of primordial magnetic fields, gravitational waves (GW) and the evolution of DM. The Higgs boson interactions with dark matter particles can provide clues about the nature of dark matter and give rise to observable signatures in the distribution of dark matter or the CMB. This research program aims to *develop a novel approach to probe the nature of EWPT by multiple signatures from the early and late universe in a correlation.*

Axions are considered one of the most promising candidates for dark matter, predicted by theories beyond the Standard Model. Their unique properties are primarily governed by their shift symmetry, which imposes stringent constraints on the ways they can interact with other particles. In particular, the interaction of axions with gauge fields - fields associated with forces such as electromagnetism and the strong and weak nuclear forces - has intensified in recent years, particularly within the context of inflationary cosmology. During inflation, the universe undergoes a rapid exponential expansion, which can amplify small quantum fluctuations, including those involving axion-gauge field interactions. Non-Abelian interactions with axions can lead to distinctive and observable signatures in current and future experiments, such as unique patterns in the cosmic microwave background (CMB), gravitational waves, and primordial magnetic fields, all of which can offer crucial insights into the conditions of the early universe and the nature of dark matter. This has made a non-Abelian interaction with axion a focal point in the quest to understand the early universe and to uncover new physics beyond the Standard Model. However, the dynamics of axion-gauge field system after the end of inflation has not been studied, as well as its connection to the SM and interaction with the Higgs boson. This research program aims to combine expertise in the early universe physics, astrophysics, physics beyond the standard model and advanced numerical tools to *fill this gap by exploring axion-gauge field interactions with the Higgs sector during electroweak phase transition.*

This *multidisciplinary* research program bridges diverse areas of cosmology, ranging from formal theoretical frameworks to astrophysics and observational probes. It offers new methods to investigate the nature of the electroweak phase transition and correlate various signals from the dynamics of axion-gauge-Higgs interactions, spanning from the early universe to the present-day observational signals. Combining unique expertise and innovative research approaches, this program will foster cross-disciplinary collaborations and significantly enhance our understanding of cosmological phase transitions, revealing novel connections to observational probes related to the CMB, gravitational wave observatories, astrophysical observations, and dark matter experiments.

Project 1: Minimal extension of the Standard Model

One of the central goals of this research program is to develop a minimal extension of the SM to couple axion-gauge field system to the Higgs sector of the SM, and determine how the presence of axions affects the dynamics of the EWPT. The SM suggests that the EWPT is a crossover, meaning the transition happens smoothly, without a sharp distinction between the two phases. A crossover transition cannot generate the necessary conditions for baryogenesis, which explains the matter-antimatter asymmetry in the universe, and cannot trigger gravitational wave production. Presence of axions can significantly alter the potential associated with the Higgs field, that might modify the characteristics of the phase transition, such as whether it is a first-order or a crossover. By examining how the axion-gauge field system interacts with the Higgs field during this transition will determine its nature and strength.

Milestone 1.1: The phenomenology of axion-gauge field system strongly depends on their couplings to the Standard Model particles. General forms of interactions are restricted based on the symmetry properties and phenomenological constraints. High-precision measurements of the Higgs boson’s properties (mass, coupling strengths) places limits on possible axion-gauge-Higgs interactions. *The goal is to analyze theoretical constraints based on gauge symmetries of the SM and effective field theory methods to construct the minimal extension of the SM that incorporates axion-gauge field interactions with the Higgs boson.*

Milestone 1.2: The electroweak phase transition is driven by the Higgs field acquiring a vacuum expectation value as the universe cools. The additional coupling to the axion alters the overall shape of the Higgs potential that could make the phase transition steeper (more strongly first-order), creating a larger barrier between the symmetric and broken phases of the Higgs field. A strong first-order phase transition is necessary for generating a detectable gravitational wave signal and for explaining the matter-antimatter asymmetry through electroweak baryogenesis. Axion dynamics could also directly trigger or delay the phase transition. If the axion's potential undergoes rapid evolution (such as rolling or oscillating), it could induce a time-dependent contribution to the Higgs potential, stabilizing or destabilizing the Higgs field or creating multiple phase transitions, where the universe briefly transitions to the broken phase and then returns to the symmetric phase before settling into the broken phase permanently. Based on experience in phase transitions **[2]** and axion dynamics **[7]**, *the project will* *explore how the axion's coupling to gauge fields changes the Higgs potential and influences the phase transition dynamics and its order.*

Project 2: Gravitational wave signatures

If gravitational waves are produced at temperatures around the electroweak scale, their present-day frequency is just within the detection range of the planned space interferometer LISA. A correct interpretation of gravitational wave experiments strongly relies on understanding their production mechanism. Axion coupling to gauge fields can amplify the production of chiral gravitational waves during the phase transition, leading to distinctive gravitational wave signals. Such signatures would be *a smoking gun* for the presence of beyond the SM physics in the early universe. This project aims to provide precision predictions of gravitational wave power spectra from axion-gauge fields dynamics coupled to the Higgs sector.

Milestone 2.1: Gravitational waves production from axion-gauge field dynamics in an expanding universe was studied before only in a linear approximation for the gravitational wave equations. To provide precision predictions of the GWs power spectra, this project will go *beyond the linear approximation* and incorporate non-linearities coming from self-interaction terms of non-Abelian gauge fields and with the Higgs. Using advanced numerical tools such as the open-source Pencil Code developed at Nordita and experience in **[4,6]**, *the project will determine the GWs power spectrum from axion-gauge field-Higgs dynamics*.

Milestone 2.2: The axion field's interaction with the gauge fields can amplify one polarization mode of the gravitational waves more than the other. The result is that gravitational waves produced in such a scenario become "chiral". This effect is more pronounced at certain wavelengths or frequencies, while at others, the chirality might diminish or behave differently, leading *to the scale-dependent chirality*. Observing chiral gravitational waves would suggest the presence of parity-violating processes in the early universe, such as the interaction of axions with gauge fields. *This project will study how the chirality of gravitational waves changes with scale when the axion interacts with gauge fields and the Higgs.*

Project 3: CMB and imprints from scalar perturbations

Understanding scalar perturbations is a key to connecting several outstanding questions in cosmology and particle physics. Scalar perturbations during inflation create the CMB anisotropies we observe today and seed large-scale structures in the universe. These perturbations also effect on the processes of baryogenesis and the matter-antimatter asymmetry by influencing how regions of space transition into states favorable for baryogenesis.

Milestone 3.1: The coupling of axions to non-Abelian gauge fields during inflation must satisfy constraints imposed by CMB observations. In this project I will confront the set-up with CMB constraints and *investigate scalar perturbations arising from axion-gauge field dynamics coupled to the Higgs during both inflation and the radiation-dominated era, with implications for primordial black hole formation.*

Milestone 3.2: Scalar perturbations shape the initial distribution of baryons (matter) in the early universe. One well-known mechanism for baryogenesis is electroweak baryogenesis, where the asymmetry is produced during the EWPT. The axion-Higgs interaction can modify the phase transition dynamics by introducing additional parity violating terms, which are crucial for baryogenesis, and modify the transition temperature that could affect the efficiency of baryogenesis, influencing how much asymmetry is generated. This project will study *the implications of axion-gauge field-Higgs interaction for baryogeneisis and production of matter-antimatter asymmetry in the universe.*

Project 4: Blazar observations

Primordial magnetic fields could be generated during inflation or phase transitions in the early universe and provide a natural way to explain the presence of femto Gauss magnetic fields in the intergalactic medium. The search for primordial magnetic fields is further inspired by recent gamma-ray observations of distant blazars, which set lower limits on the magnetic field strength and suggest the existence of magnetic fields in intergalactic voids. Physical properties of primordial magnetic fields is an additional independent probe of early universe physics.

Milestone 4.1: It has been shown that non-Abelian gauge field coupling to axion during inflation can explain the generation of primordial magnetic fields consistent with current blazar observations. However, additional coupling with the Higgs can significantly alter observational predictions. *This project will investigate how the coupling to the Higgs field influences primordial magnetogenesis.*

Milestone 4.2: Due to complicated non-linear dynamics, the transition of axion-gauge system through electroweak phase has not been studied. So far the approach was to match solutions in different epochs of universe's evolution (inflation and radiation-dominated era), neglecting non-linear dynamics during the EWPT. In this project I will go beyond the current understanding and *develop advanced numerical methods to trace the evolution through the EWPT*. I will further *account for interactions with primordial plasma* and possible damping effects to provide the precision prediction for blazar astrophysical observations.

Project 5: Dark matter searches

Axion appears quite generically in extensions of the SM and in recent years has emerged as a leading particle candidate for dark matter. Its coupling to the Higgs field could link the dynamics of the EWPT to the generation of axion dark matter. Depending on the interaction strength and axion mass, the axion could impact the dynamics of the phase transition that influences the production or annihilation rates of axions in the early universe, altering the axion dark matter relic density. If both the axion and gravitational waves are produced during the EWPT, they could leave correlated signatures that connect dark matter searches with gravitational wave observatories.

Milestone 5.1: Axion and axion-like-particles searches are driven by experimental and technological advances at the so called "precision frontier" of particle physics. *This project will explore if the axion, coupled to the gauge sector and the Higgs, can be a viable dark matter candidate.* I will perform scan of the parameter space of the model and identify potential signatures in correlation for collider, laboratory and astrophysical searches of axion dark matter.

Milestone 5.2: The observational consequences of axion dark matter significantly depend on the nature of the gauge sector coupled to it. This project will explore *the observational consequences when the non-Abelian gauge sector is associated with* *the SM gauge bosons versus hidden sector photons (or other hidden sector gauge fields).* This would increase the possibility of scanning possible dark matter signatures.

***Brief CV** (max. 2 pages). Include year of doctoral dissertation/PhD award, information on national and international awards; documented academic breakthroughs; positions held; postdoctoral research positions (or equivalent; expected for all nominees in medicine, engineering and technology, natural sciences and, social sciences). Also, provide information that supports the nominee's potential as an independent researcher and as a research leader, e.g. professional positions and positions of trust held; leadership training courses attended and appraised leadership capacity; communicative ability.*

Academic breakthroughs: During her Ph.D. (Leiden University), the nominee has mastered and contributed to develop novel theoretical and numerical methods in the area of early universe physics. She introduced **[7]** a novel class of multi-field inflationary models that challenges perceived wisdom regarding dynamics of coupled inflationary perturbations. This highly-cited work led to a publication in *Physical Review D* and has attracted great attention in the community due to its connection to the ultraviolet complete theories beyond the Standard Model. Nominee's works on reheating **[8,9]** introduced a novel universal way to compute a reheating efficiency, taking a first step towards an Effective Field Theory description of complicated non-linear dynamics after inflation. The results she obtained at the end of her PhD on gravitational waves production from gauge fields during inflation **[6]** opened up a new approach to primordial gravitational way production. This work garnered significant attention, as evidenced by invitations to conferences like PASCOS. These results laid the groundwork for successful Marie Skłodowska-Curie Actions proposal and subsequent collaborative projects.

The nominee then joined the high-energy physics group at the Nordic Institute for Theoretical Physics (Nordita) as a Nordita Postdoctoral Fellow, where she initiated two *interdisciplinary research collaborations*: with the theory group at Stockholm University and the astrophysics group at Nordita. The nominee performed the first analytical computation **[5]** of the local non-Gaussianity in the cosmic microwave background for multi-field inflationary models, *solving an open problem* since these models proliferated. Additionally, she contributed to the development of a new theory of axion dark matter based on cosmological phase transitions **[2]**. Laboratory experiments to astrophysical observations can probe this new dark matter scenario.

Building on her expertise in non-Abelian gauge fields, a research area previously unexplored at Nordita, the nominee secured a Marie Skłodowska-Curie Actions Fellowship. She led and coordinated a multidisciplinary team in Stockholm, Prague and the US to perform the first state-of-the-art numerical computation of the backreaction regime during axion inflation with non-Abelian gauge fields [4]. This work resulted in *the first discovery* of a backreaction attractor that is now one of the *benchmark predictions* for gravitational waves generation from axion inflation. Underscoring its scientific significance, this work has led to numerous invited plenary talks, including at Kavli IPMU, EPFL, UMass Amherst and Groningen University.

Furthermore, the nominee proposed a novel scenario for inflationary magnetogenesis, consistent with the required intergalactic magnetic fields for explaining the spectra of high energy gamma rays from distant blazars. Her numerical codes are publicly available, ensuring full reproducibility of the results. Throughout her career, she has demonstrated *leadership potential* as an independent researcher and as a research leader in coordinating multi-disciplinary teams in Europe and the US, driving significant progress in the field. The nominee's contributions **[1,2,4,6,7]** have positioned her as a leading figure in the field of axion-gauge field physics, directly aligning with the focus of the research proposal.

Frequent invitations to seminars, conferences, and workshops demonstrate the nominee's international impact. During her Marie Skłodowska-Curie fellowship she visited UMass Amherst, EPFL, CERN and MIT, where she presented her results and interacted with world leaders in the field as well as initiated collaborations to work on lattice simulations. The nominee's is a referee in scientific journals and recently qualified in a global multi-step selection process and participated in the Lindau Nobel Laureate meeting in physics 2024, being the one of 5 members from the Swedish delegation. She has co-supervised students, with some projects led to publications **[3]**, taught exercise sessions during her PhD, and delivered invited lectures as a PostDoc. Currently the nominee is preparing a graduate course at Stockholm University on Advanced Quantum Field Theory. To make science more accessible to the public, she contributed to a short physics video series on YouTube, assisted at Nordita Open Days and gave newspaper interviews.

Academic positions

- **2023 – present:** Marie Sklodowska-Curie Fellow, Nordic Institute for Theoretical Physics, Stockholm, Sweden.
- **2021 – 2023:** Nordita Postdoctoral Fellow, Nordic Institute for Theoretical Physics, Stockholm, Sweden.

Education

- **2016 – 2021:** PhD, Lorentz Institute for Theoretical Physics, Leiden University, The Netherlands.
  PhD awarding date: 3 November 2021.
  July – Nov. 2017; May – Sept. 2019: Maternity leave.
- **2014 – 2016:** Master of Science, Ludwig Maximilian University of Munich and Technical University of Munich, Germany. *With distinction.*
  2013 – 2015: Master of Science, Taras Shevchenko National University of Kyiv, Ukraine. *With distinction.*
- **2009 – 2013:** Bachelor of Science, Taras Shevchenko National University of Kyiv, Ukraine. *With distinction.*

Awards and fellowships

- Marie Sklodowska-Curie Postdoctoral Fellowship (HORIZON-MSCA-2022-PF-01)
  MASUGRAV – ID 101106874 (€ 222 727,68), 2023 – 2025.
- Ragnar Söderbergs Foundation (€ 5500), July 2024.
  To participate in the Lindau Nobel Laureate meeting in physics 2024, Lindau, Germany.
- DAAD Study scholarship for graduates of all disciplines (ID 50026247), 2014 – 2016, (€ 22 000).

- Vladimir N. Gribov Diploma from Ettore Majorana Centre for Scientific Culture, Erice, Italy, 2014.

Speaker at international conferences/workshops

- COSMO'24, Kyoto, Japan, October 2024.
- Kavli Institute for the Physics and Mathematics of the Universe, Tokyo, Japan, October 2024.
- 4th EuCAPT Annual Symposium, CERN, Switzerland, May 2024.
- *Workshop "Generation, evolution, and observations of cosmological magnetic fields",* EPFL, Switzerland, May 2024.
- *Multifield Cosmology: Inflation, Dark Energy and More*, The Simons Center for Geometry and Physics , Stony Brook, USA, February 2024.
- COSMO'23: International Conference on Particle Physics and Cosmology, Instituto de Física Teórica, Madrid, Spain, September 2023.
- Cosmology from Home 2023, July 2023.
- Third EuCAPT Annual Symposium, CERN, June 2023.
- A Cosmic Window to Fundamental Physics: Primordial Non-Gaussianity and Beyond, Instituto de Física Teórica, Madrid, Spain, September 2022.
- PASCOS: International Symposium on Particles, Strings and Cosmology, Max Planck Institute, Heidelberg, Germany, July 2022.
- Physics@Veldhoven Conference, Veldhoven, The Netherlands, January 2021.

Invited seminar speaker

- UMass Amherst, USA, February 2024
- Tufts / MIT Cosmology Seminar, Boston, USA, February 2024.
- Dutch Theoretical Cosmology Meeting, University of Groningen, December 2023.
- Oskar Klein Centre Colloquium, Stockholm University, Sweden, May 2023.
- Helsinki Cosmology Seminar, Helsinki, Finland, November 2022.
- Central European Institute for Cosmology and Fundamental Physics, Prague, Czech Republic, December 2020.
- DESY Theory Group (Deutsches Elektronen-Synchrotron), Hamburg, Germany, December 2020.
- Institute for Theoretical Physics, Madrid, Spain, December 2020.
- University of the Basque Country, Bilbao, Spain, November 2020.
- Perimeter Institute, Waterloo, Canada, November 2020.
- Syracuse University, USA, November 2020.
- Max Planck Institute for Astrophysics, Garching, Germany, October 2020.
- Kavli Institute for the Physics and Mathematics of the Universe, Tokyo, Japan, October 2020.
- DRSTP Winter School, Dalfsen, The Netherlands, February 2017 and January 2019.
- Veldhoven Conference, Veldhoven, The Netherlands, January 2017.
- "International School of Subnuclear Physics", Ettore Majorana Centre, Erice, Italy, June 2016.

Teaching

Graduate course "Advanced Quantum Field Theory", Stockholm University, spring 2025 (in preparation).
Invited lecturer for Theoretical Cosmology master course at Leiden University, The Netherlands, April 2023.
Lecture "Reheating and inflation: state of the art", Leiden University, May 2021.
Teaching Assistant at Leiden University, The Netherlands, for the following courses:
Theoretical Cosmology, Feb. – May 2021.
Quantum Field Theory, Feb. – May 2020.
Physics of Machine Learning, Feb. – May 2019.
Advanced Topics in Modern Cosmology, Feb. – May 2018.

Supervision

MSc student: Raul Wolters, Leiden University, (Sept. 2023 – May 2024).
BSc student: Annet van den Hul, Leiden University, (Sept. 2019 – March 2020).

Organization

Theoretical Cosmology seminar organizer, Nordita and Stockholm University, Sweden, (Oct. 2022 – current time).
First Nordic Cosmology Meeting, Nordita, Sweden, (October 2023).
Nordita Program "Axions in Stockholm", Nordita, Sweden, (June 2025).

Outreach

Newspaper interview during Lindau Nobel Laureate meeting in physics, July 2024.

Nordita Open Day, November 2023.

Short physics video series on YouTube, 2014.

Publications. *Provide a list of your publications in peer-reviewed journals,* ***with the ten most important publications marked*** *(*). If relevant, provide an H-index (Web of Science, Scopus or Google Scholar) together with number of publications and number of quotes the H-index is based on. For Google Scholar preferably use Harzing's Publish or Perish. Reviewers will assess quality from an international perspective and productivity/quantity.*

*[1] A. Brandenburg, O. Iarygina, E. I. Sfakianakis, R. Sharma, *"Magnetogenesis from axion-SU(2) inflation",* arXiv: 2408.17413

*[2] P. Carenza, J. Eby, O. Iarygina, M.C. David Marsh , *"Axion Relic Pockets - a theory of dark matter"*, JHEP 09 (2024) 023

*[3] R. Wolters, O. Iarygina, A. Achucarro, *"Generalised conditions for rapid-turn inflation",* JCAP 07 (2024) 079

*[4] O. Iarygina, E. I. Sfakianakis, R. Sharma, A. Brandenburg, *"Backreaction of axion-SU(2) dynamics during inflation",* JCAP 04 (2024) 018

*[5] O. Iarygina, M.C. David Marsh, G. Salinas, *"Non-Gaussianity in rapid-turn multi-field inflation",* JCAP 03 (2024) 014

*[6] O. Iarygina and E. I. Sfakianakis, *"Gravitational waves from spectator Gauge-flation",* JCAP 11 (11), 023.

*[7] A. Achúcarro, E. J. Copeland, O. Iarygina, G. A. Palma, D. G. Wang and Y. Welling, *"Shift-Symmetric Orbital Inflation: single field or multi-field?"*, Phys. Rev. D 102 (2020) no.2, 021302.

*[8] O. Iarygina, E. I. Sfakianakis, D. G. Wang and A. Achúcarro, *"Universality and scaling in multi-field alpha-attractor preheating"*, JCAP 1906, 027 (2019).

*[9] O. Iarygina, E. I. Sfakianakis, D. G. Wang, A. Achúcarro, *"Multi-field inflation and preheating in asymmetric alpha-attractors",* arXiv:2005.00528 [astro-ph.CO].

h-index: 6 (based on 9 citable papers, 161 citations)

Source: Google Scholar, Harzing's Publish or Perish.