

INSTITUTE FOR PARTICLE PHYSICS PHENOMENOLOGY

NEWSLETTER
MARCH 2026

 Durham
University

Ogden Centre
for
Fundamental
Physics

WELCOME TO THE IPPP!

Welcome to the March 2026 IPPP newsletter. This issue brings together contributions from across the institute and our wider community, covering recent research, events, and developments. We would like to thank all contributors for their time and effort in putting this together.

As many of you will be aware, UKRI's funding model is undergoing significant changes, creating substantial challenges for our field. We include a brief overview of recent developments and potential actions, and encourage readers to stay informed and engaged as the situation continues to unfold.

ANNOUNCEMENTS

1. New IPPP director: Valya Khoze was elected by the IPPP members and confirmed by Durham University and the IPPP Steering Committee to replace Michael Spannowsky as director from March 2026. A big thank you to Michael from everyone at the IPPP.

2. The IPPP is pleased to announce the following workshops:

- **24 Aug** - 04 Sept Effective Theories for Nonperturbative Physics 2026
- **13 Sept** - 19 Sept EOS Developer Meeting 2026
- **07 Sept** - 11 Sept High Precision Experiments for Light Dark Matter

3. The Associateship, Durham IPPP Visiting Award, and Senior Experimental Fellowship programmes are continuing. We encourage applications for all three schemes and invite you to consult the following web pages for application deadlines:

IPPP Associateship: <https://www.ippp.dur.ac.uk/ippp-associateships>

DIVA: <https://www.ippp.dur.ac.uk/diva>

Senior Exp. Fellowship: <https://www.ippp.dur.ac.uk/senior-experimental-fellowships>

Our next intake will be in September 2026.

4. We encourage organisers of workshops related to HEP theory to reach out for support. The IPPP can help organise workshops in the UK, administratively and financially.

CATASTROPHIC CUTS TO THE PPAN PROGRAMME

WHAT IS GOING ON?

The UK particle physics, astronomy and nuclear physics (PPAN) programme within STFC is facing a substantial funding contraction. The headline figure is a reduction of order ~30% in PPAN spend over the current spending review period. In practice, this has translated into internal planning scenarios in which programmes and grants are asked to model cuts in the range of ~20-60%, depending on priority and flexibility. These are not uniform reductions within STFC/UKRI: they arise from the need to protect fixed international subscriptions and facility operations, leaving research grants to bear the largest impact. This is a direct threat to the mechanism designed to shield research grants from these pressures, the Drayson partitions.

These pressures are already visible in programme delivery. The theory consolidated grant round has been significantly delayed, creating immediate uncertainty for groups and already impacting early-career researchers whose positions depend on internationally agreed timelines.

RECENT DEVELOPMENTS

The situation has evolved rapidly over the past two months, with a shift from internal planning to visible community impact:

- Late January 2026: STFC communicated to the community that significant reductions would be required within PPAN, outlining planning scenarios involving substantial cuts across grants and projects.

- February 2026: The implications became more concrete, as programmes and collaborations were asked to prepare for deep funding reductions. Concerns were raised about the UK's ability to maintain commitments to international experiments and upgrades, including participation in future CERN programmes, with the LHCb upgrade a particularly exposed case. [Early career scientists](#), [international academics](#), [advanced fellows](#) and [professional bodies](#) began issuing public statements warning of long-term damage to UK science capacity, particularly in fundamental research.

- Early March 2026: The issue reached the level of parliamentary scrutiny, with the UK Parliament Science, Innovation and Technology Select Committee examining STFC/UKRI decision making and the balance between strategic priorities and discovery science (e.g. on [4 March](#)): Chair Dame Chi Onwurah wrote [a critical open letter](#) to Lord Patrick Vallance, Minister of State for Science, Research and Innovation, and Sir Ian Chapman, CEO of UKRI.

- Mid-late March 2026: Parliamentary and media attention has shifted to the risks and consequences, including the impact on early-career researchers, international competitiveness and credibility, and the risk of talent migration out of the UK. On 24 and 25 March, the particle theory consolidated grant outcomes were announced, which confirmed a reduction in PDRA posts by more than 66% countrywide.

At the time of writing, many details remain unresolved, but the direction of travel is clear: a significant contraction of the PPAN programme is underway, with very limited clarity on how decisions are being made and communicated to the community.

WHAT CAN I DO?

- Write your MP (this is a useful tool: <https://www.writetothem.com/>).

One thing to mention is that Peter Lamb, MP for Crawley, has agreed to collect signatories to a letter on "Safeguarding the United Kingdom's particle physics, astronomy, and nuclear research capability" in parliament. This will be signed 'in private', so the list of signatories will not be circulated. A template has been posted here:

<https://lheurrier.github.io/MPletter.html>.

- Contact people in your network to sign the open letter from ex-academics now working in industry: <https://industry-openletter-stfc.github.io/index.html>

- Gather case studies of current and former high-energy physics (or other PPAN areas) researchers whose training or spin-off ventures have led to direct impact in industry. These can be communicated to representatives of Particle Physics Advisory Panel (PPAP) and the Particle Astrophysics Advisory Panel (PAAP).

FURTHER READING

<https://www.theguardian.com/science/2026/feb/06/uk-scientists-cuts-funding-projects-research-facilities>

<https://www.bbc.co.uk/news/articles/czr0zmzpz84o>

<https://www.timeshighereducation.com/news/onwurah-uk-research-funding-cuts-wholly-unacceptable>

<https://www.ersatzben.com/p/the-bucket-stops-here>

<https://committees.parliament.uk/publications/52157/documents/289523/default/>

<https://www.theguardian.com/technology/2026/mar/19/lack-of-funding-is-stifling-scientific-research>

NEW POSTDOCS



TANMAY KUMAR PODDAR

Theoretical astroparticle physicist working at the interface of particle physics, gravity, and cosmology. His research focuses on exploring physics beyond the Standard Model and General Relativity. In particular, he investigates astrophysical and gravitational probes of axions and other ultralight particles, while also developing precision tabletop strategies to detect such particles. He works on neutrino physics, including their interactions with ultralight particles, as well as sterile neutrinos and their potential detection in beam-dump experiments. In addition, his research encompasses alternative theories of gravity formulated within the framework of effective field theory.

He joined IPPP, Durham, in January 2026 as postdoctoral research associate. He completed his PhD at the Physical Research Laboratory, India, in 2022, and subsequently held postdoctoral positions at TIFR Mumbai and INFN Salerno.



JONAS SPINNER

Joined the IPPP last October after completing his PhD at Heidelberg University in Germany. His doctoral research focused on developing machine learning tools for LHC applications, from amplitude surrogates to jet taggers, including uncertainty-aware generative networks and architectures with built-in Lorentz symmetry.

In Durham, he plans to continue developing physics-inspired machine learning tools while also exploring their application in areas of high-energy physics where such techniques have yet to gain traction.



ANTON OLSSON

Joined the IPPP last December after completing his PhD at the Institute for Theoretical Physics at Karlsruhe Institute of Technology. His research focuses on precision calculations within the Standard Model. In particular, he works on computing multi-loop scattering amplitudes for processes that involve many kinematic scales. These calculations improve the precision of Standard Model predictions for phenomena studied at particle collider experiments.



JIE XIAO

Completed his PhD at Peking University, Beijing, China, before joining IP2I (CNRS) in Lyon, France, where he spent approximately three years as a researcher. He subsequently joined the IPPP. His research bridges precision theoretical calculations and experimental particle physics. As a visiting researcher at Imperial College London, he works with the CMS experiment at the LHC. His interests span Higgs boson property measurements, vector boson scattering, and searches for physics beyond the Standard Model. He has a strong interest in leveraging state-of-the-art Monte Carlo generators to simulate higher-order and multi-leg processes, enabling detailed probes of higher-order effects in conjunction with the CMS data.

THE IPPP AT BOULBY

On Monday 17th November, a group of researchers from the IPPP travelled to the Boulby Underground Laboratory, located deep beneath the North Yorkshire coast within the Boulby potash and salt mine. After an early arrival for site and safety inductions, the group changed into full protective equipment before descending underground at 09:00.

Situated over a kilometre below the surface, Boulby offers an exceptionally low-background environment, shielded from cosmic radiation by the overlying rock. This makes it one of the UK's leading facilities for rare-event physics. During the tour, the group was introduced to key experiments hosted at the site, including dark matter searches.

A highlight of the visit was learning about ongoing excavation work to expand the laboratory's footprint. These new underground spaces are expected to host future large-scale experiments, enhancing the UK's capacity in dark matter detection, neutrino physics, and beyond. Looking ahead, Boulby is being considered as a potential site for next-generation experiments such as the Atomic Interferometer Observatory and Network (AION), which would use precision atom interferometry to probe fundamental physics, including ultralight particles and gravitational waves, as well as the proposed XLZD dark matter experiment, a next-generation liquid xenon detector building on the success of LUX-ZEPLIN and XENON.





IPPP 25TH ANNIVERSARY CELEBRATION

The IPPP 25th Anniversary meeting, held on 24-25 September 2025, brought together current members, alumni, and collaborators to celebrate a quarter-century of the Institute for Particle Physics Phenomenology. Over two days, participants took part in a programme of scientific talks, historical retrospectives, and personal reflections on the institute's development and impact.

Sessions explored the early years and evolution of the IPPP, alongside discussions of its future direction. The event also included a formal dinner and reception, providing opportunities for reconnection and community building within the IPPP network. Well-wishes from around the world were shared in a dedicated video: <https://www.youtube.com/watch?v=ltvipy1f5WA>.



ANNUAL THEORY MEETING 2025

The Annual Theory Meeting, held on 15–17 December 2025 at Durham University, brought together researchers from across the particle physics theory community for its 58th edition. Over three days, the programme featured invited talks from leading international speakers reviewing recent developments across the field. Topics included classical gravity and quantum field theory (Gabriele Travaglini), generalised symmetries (Sungwoo Hong), and the growing role of AI in fundamental physics (Sven Krippendorf), alongside discussions of dark matter and baryogenesis (Julia Harz).

Further sessions covered lattice approaches to flavour and beyond-the-Standard-Model physics (Tobias Tsang, David Schaich), modified gravity (Peter Millington), and collider phenomenology, including Higgs physics and early-universe connections (Christoph Englert, Georg Weiglein). Broader perspectives were provided by Clare Burrage on phenomenology beyond colliders and Jonathan Butterworth on the future of collider physics. At last, an STFC town hall (Anja Berndt and Grahame Blair) provided an open forum for concerns about the evolving funding landscape.

HIGGS MAXWELL MEETING 2026

On 11 February, members of the IPPP travelled to the Royal Society of Edinburgh for the annual Higgs-Maxwell Workshop. This year, the meeting celebrated the 50th anniversary of the discoveries of the charm quark and the tau lepton.

The workshop opened with remarks by Valya Khoze, the newly appointed director of the IPPP. He addressed the current challenges facing research funding in the UK and expressed concern about the limited number of postdoctoral positions available in particle physics. He concluded by highlighting ongoing efforts to address these issues, most notably the open letter from early-career researchers, an initiative of Simon Williams (Durham University, IPPP).

Following this introduction, Harald Fox from Lancaster University presented recent results from the ATLAS experiment in a talk titled “Higgs to Tau Charm”. He emphasised the importance of developing efficient machine-learning algorithms to improve the detection and analysis of these decays. He discussed motivations for studying these decays, noting that $H \rightarrow \tau + \tau$ is an excellent probe of the CP properties of the Higgs boson. He also mentioned that the $H \rightarrow \tau^+ \tau^-$, $H \rightarrow c \bar{c}$, $D^0 \rightarrow K^+ K^-$, $D^0 \rightarrow \pi^+ \pi^-$ has not yet been detected, leaving opportunities for future study.

The next speaker was Alexander Lenz from Siegen University, who presented a talk titled “The Short Lifetime of Charm”. In his presentation, he gave an overview of several open puzzles in charm physics, both theoretical and experimental. He covered topics ranging from the lifetimes of charmed hadrons to D-meson mixing. He presented these with increasing levels of complexity, showcasing the diversity of research in charm physics.

Next, Patrick Spradlin (University of Glasgow) presented the history of charm observations at LHCb in his talk “Recent Charm Results from LHCb”. He traced the development of charm physics at LHCb from its early stages to its current state through a detailed description of the upgrades the detector underwent between runs. He discussed the observation of the Ξ_{cc}^{++} and the absence of its isospin partner Ξ_{cc}^+ , illustrating remaining opportunities for charm physics at LHCb.

Rajnandini Mukherjee and Matthew Black from the University of Edinburgh presented the next talk. Together, they discussed two lattice QCD methods to calculate the charm quark mass. In their talk entitled “Charm Quark Mass from Lattice QCD”, Rajnandini Mukherjee started by presenting the theoretical basis behind the massive momentum-subtraction scheme. Next, Matthew Black introduced a complementary method: gradient flow combined with short-flow-time expansion. They showed that both methods provide accurate determinations of the charm quark mass.

To close the day, Alex Veltman from the University of Edinburgh presented a short talk: “Displaced Tau Jets: An Exercise in Unconventional Signatures at the ATLAS Experiment”. In this talk, he discussed the possibility of probing new physics through the detection of long-lived particles that do not fit within the Standard Model.

In summary, the Higgs-Maxwell Workshop was an excellent platform for discussing the most recent advances in charm and tau physics, offering both historical perspectives and new opportunities for future research.

RESEARCH HIGHLIGHT:

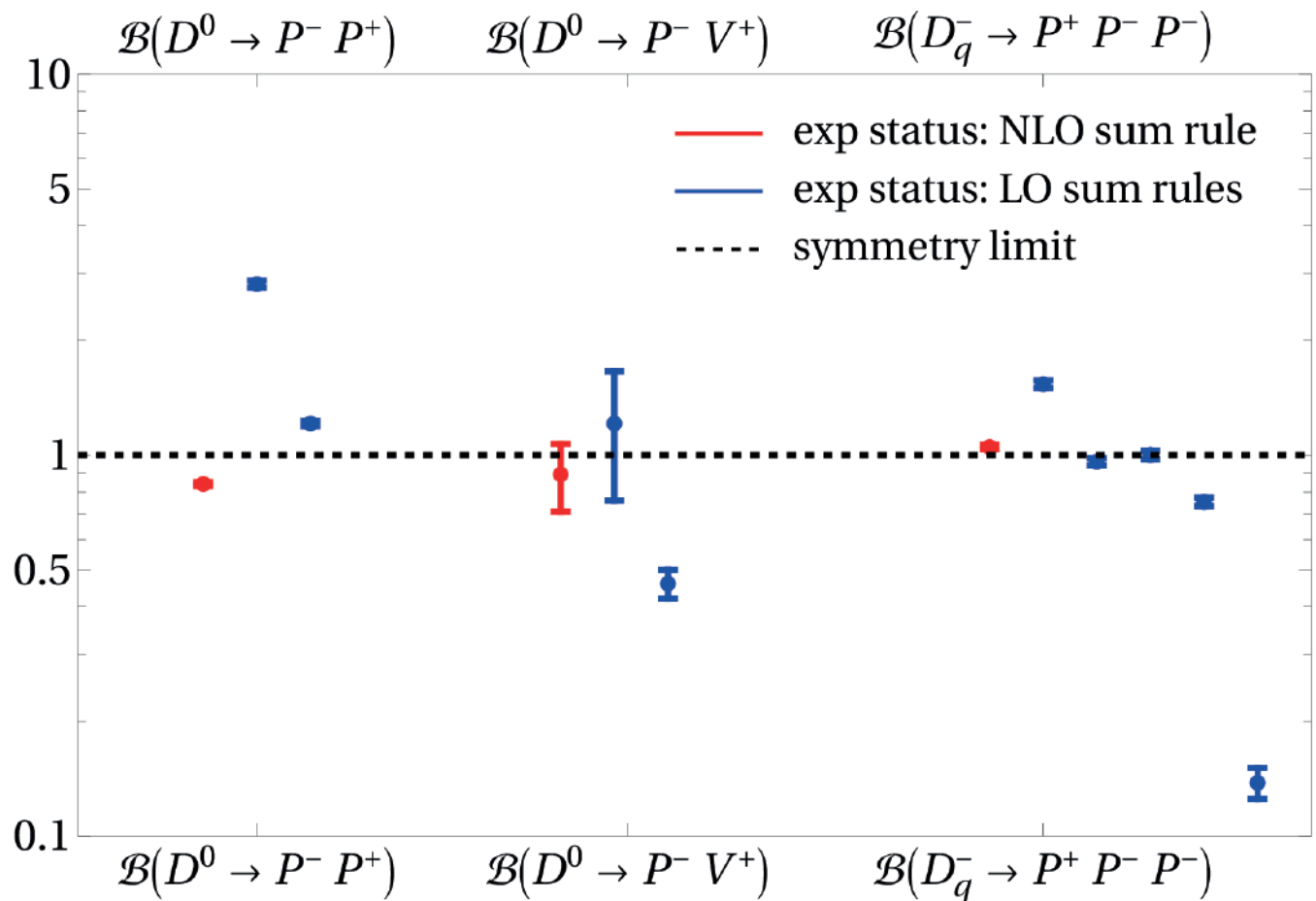
A SECOND ORDER MASTER RATE SUM RULE FOR CHARM DECAYS

In a landmark measurement, LHCb has discovered charm CP violation [1], thereby opening a new field and a unique gate to the study of the flavour structure of up-type quark decays. Before that, CP violation has only been seen in decays of strange and beauty quarks, i.e. in the down-type quark sector. On the theory side, the treatment of charm decays is challenging due to the intermediate mass of the charm quark compared to the scale of QCD. As a consequence, tools that work very well for B decays, like the heavy-quark expansion and QCD factorization, can not be assumed to work as well for non-leptonic charm decays. Because of that, in order to describe the hadronic part of charm decays, the most important tool is the approximate SU(3)-flavour symmetry of the QCD Lagrangian under unitary rotations of up, down and strange quarks.

Three different SU(2) subgroups connect u and d quark (isospin), d and s quark (U-spin) and u and s quark (V-spin). These approximate flavour symmetries of QCD imply correlations and sum rules between various charm decay amplitudes. Importantly, in some cases we can also use these symmetries in order to find connections directly between observables, i.e., branching ratios and CP asymmetries. However, in most cases the flavour-symmetry relations are broken at $O(\epsilon)$, where ϵ indicates the size of the mass splitting between the quarks normalized by the relevant mass scale, which is in general process-dependent. The splitting between kaon and pion decay constants suggests $\epsilon \sim 20\%$. Recent experimental results indicated very large U-spin breaking between the CP asymmetries of $D^0 \rightarrow K^+K^-$ and $D^0 \rightarrow \pi^+\pi^-$ [2]. This makes the further exploration of the anatomy of U-spin breaking effects in charm decays very important.

As a step into this direction, Margarita Gavrilova (Caltech), Yuval Grossman (Cornell), Guglielmo Papiri (Cornell) and Stefan Schacht (IPPP Durham) derived an NLO master sum rule which applies to any system of hadronic charm decay rates connected by U-spin and, importantly, is valid up to corrections of $O(\epsilon^2)$. In this sum rule they used the common classification scheme of charm decays as Cabibbo-favoured (CF), doubly Cabibbo-suppressed (DCS) and singly-Cabibbo suppressed (SCS) decays, according to their suppression from elements of the Cabibbo-Kobayashi-Maskawa (CKM) matrix. The derived NLO sum rule should hold to much better precision than LO sum rules which are broken already at $O(\epsilon)$. Fig. 1 demonstrates that this is indeed the case.

For charm decay systems with missing branching ratios, Ref. [3] uses the NLO master sum rule to predict unmeasured branching ratios. Future measurements of these rates will allow us to study the convergence of the U-spin expansion in more detail. An improved understanding of the anatomy of QCD in charm decays is a necessary condition in order to probe for physics beyond the Standard Model using charm CP asymmetry measurements.



References:

- [1] R. Aaij et al. (LHCb), Phys. Rev. Lett. 122, 211803 (2019), arXiv:1903.08726 [hep-ex].
- [2] R. Aaij et al. (LHCb), Phys. Rev. Lett. 131, 091802 (2023), arXiv:2209.03179 [hep-ex].
- [3] M. Gavrilova, Y. Grossman, G. Papiri, and S. Schacht, (2026), arXiv:2602.22320 [hep-ph].

RESEARCH HIGHLIGHT:

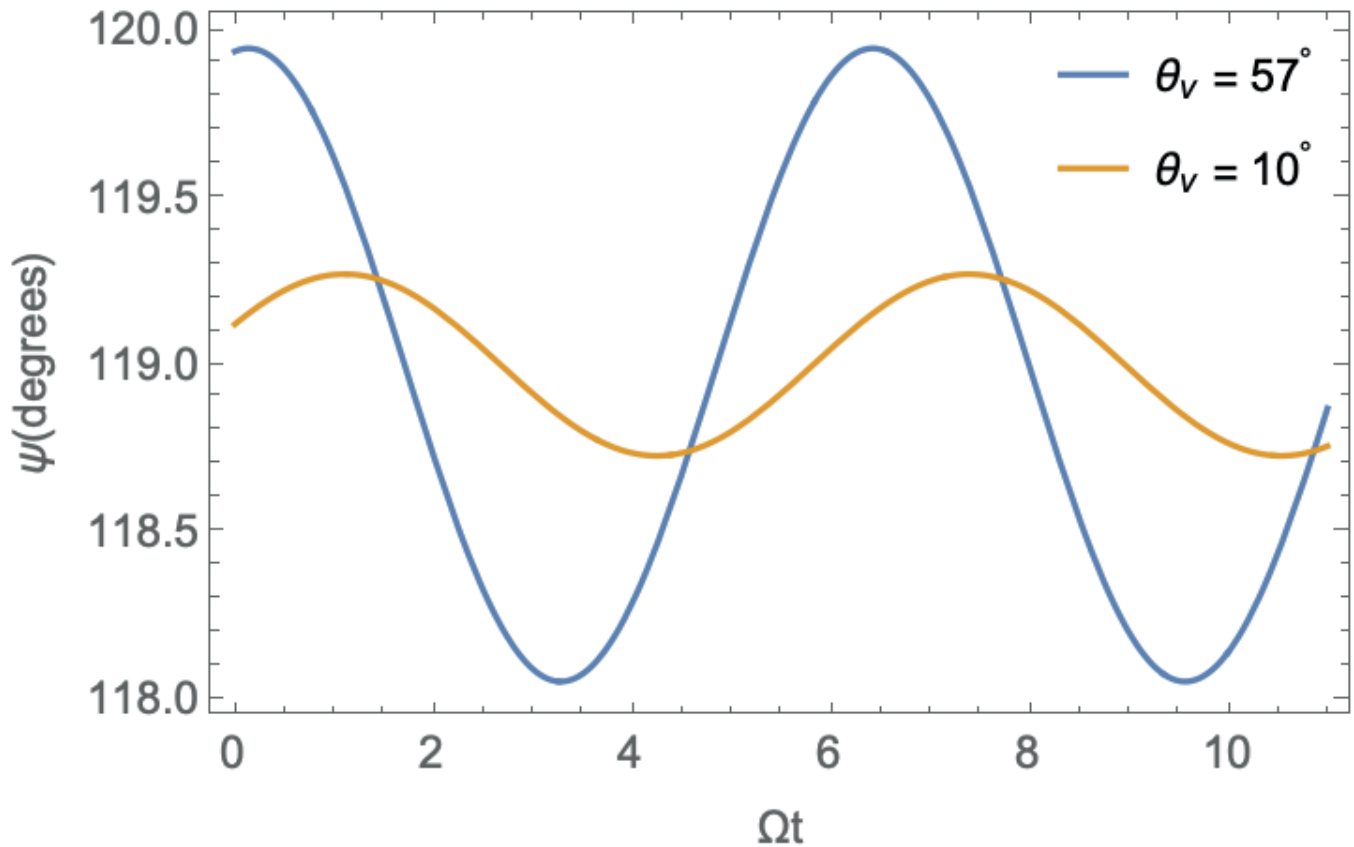
SEARCHING FOR AXIONS WITH TIME RESOLVED PULSAR POLARIMETRY

Axions are one of the leading candidates for physics Beyond the Standard Model. They are light pseudo-scalar particles which can constitute Dark Matter, explain null measurements of the neutron electric dipole moment and arise generically in string theory compactifications. The pseudo-scalar nature of axion interactions means they do not contribute to fifth forces, and hence they are more difficult to observe than new light scalars. Extreme astrophysical environments can offer ideal conditions to search for axions.

For example, the axion interacts with photons via an interaction with $E \cdot B$ (the scalar product of the electric and magnetic fields), meaning a background magnetic field is generally required to observe this interaction. Much research has been devoted to searching for radio line signals from axion dark matter conversion for photons in the strong magnetic fields of pulsars. At IPPP, Francesca Chadha-Day and Tanmay Poddar have recently shown that, even if axions do not make up the dark matter, axion signals could be seen in pulsars if they exist in nature.

As well as converting axions into photons, the pulsar's magnetic field acts as a source of axions. Therefore, a macroscopic axion field configuration would exist around every pulsar. This axion field could then be detected through its effect on light from the pulsar itself. The axion-photon interaction leads to birefringence – photons travelling through an axion background undergo rotation of their polarisation angle. This birefringence could be observable in pulsar light due to the axion background sourced by the pulsar itself. This effect has a number of distinctive characteristics. It is frequency independent, oscillates with the pulsar's rotation, and depends on the angle between the line of sight to the pulsar and its rotation axis, as the effect must be integrated over the hemisphere facing the Earth. This leads to a distinctive oscillation pattern and dependence on pulsar viewing angle, as shown in the figure.

Pulsars offer an exceptional environment to probe new physics, and further study of new physics effects and of pulsars themselves is key to this goal.



Oscillating linear polarization angle of the crab pulsar (blue) due to the axion field sourced by the pulsar's magnetic field. The yellow curve shows the linear polarization angle of an identical pulsar with viewing angle $\theta_v = 10^\circ$.

Reference:

[1] <https://arxiv.org/abs/2603.10189>