

# **GenHET Meeting in Beyond the Standard Model**

## **Report of Contributions**

Contribution ID: 1

Type: **not specified**

# Welcome

*Wednesday, 25 February 2026 09:00 (10 minutes)*

**Presenter:** COHEN, Tim (CERN)

Contribution ID: 2

Type: **not specified**

# The Case for Low Reheating Temperatures from Gravitational Particle Production and Multi-Stage Reheating

*Friday, 27 February 2026 11:00 (10 minutes)*

The early Universe is an efficient source of particle production, particularly for light scalar fields. We study the generation of stable scalars that interact only through gravity, focusing on their production during inflation and throughout single- and multi-stage reheating. Gravitational particle production mechanisms are known to be highly efficient and can easily lead to an overabundant relic density, threatening the viability of non-thermal dark-matter scenarios such as freeze-in. We extend previous studies by deriving the scalar abundance for general reheating histories and demonstrate how additional reheating stages can significantly modify the final relic density. Our results show that avoiding overproduction without fine-tuning the gravitational Wilson coefficients typically requires low reheating temperatures.

**Authors:** COSTA, Francesco (Dublin Institute for Advanced Studies, STP); KIM, Jinsu (CERN)

**Presenter:** COSTA, Francesco (Dublin Institute for Advanced Studies, STP)

**Session Classification:** Lightning Talks - 3

Contribution ID: 5

Type: **not specified**

## LFV decays of Resonance particles in the context of non-universal $Z'$ model

*Thursday, 26 February 2026 15:40 (10 minutes)*

The governing interaction in the subatomic world is the strong interaction, and it is explained by Quantum Chromodynamics (QCD), which is the final symmetry of the Standard Model (SM). Physics beyond the SM is required to explain numerous unsolved empirical and theoretical problems in high energy physics. Lepton Flavour Violation (LFV) is one of the tantalizing topics of High Energy Physics in recent days and quarkonia particles are one of the best nominee to explore early universe. Here, we have studied various LFV quarkonia decays incorporating the contribution of  $Z'$  boson. The New Physics (NP) couplings are constrained with the available experimental data using  $\chi^2$  fitting technique.

**Authors:** DAS, Debasish; Ms BISWAS, Swagata (National Institute of Technology Durgapur)

**Presenter:** Ms BISWAS, Swagata (National Institute of Technology Durgapur)

**Session Classification:** Lightning talks - 2

Contribution ID: 7

Type: **not specified**

## **Black Hole Scalar Sirens**

*Friday, 27 February 2026 14:00 (30 minutes)*

**Author:** SIMON, Olivier

**Presenter:** SIMON, Olivier

Contribution ID: 8

Type: **not specified**

## Unveiling Large CP Violation in the C2HDM: From eEDM Bounds to Hidden Sectors

In this talk, we investigate the conditions required to support large CP violation in the Complex Two-Higgs-Doublet Model (C2HDM). By performing a comprehensive global scan of Type-I and Type-II models—incorporating theoretical stability, collider constraints, and the stringent electron EDM (eEDM) bound—we identify distinct phenomenological pathways to large CP-violating effects. We show that the Type-I model faces a “no-lose” scenario: all viable points predict a strict lower bound on the eEDM within the reach of next-generation experiments, with sizable gauge-sector CP violation emerging only when the 125 GeV Higgs is nearly degenerate with a second neutral state. In contrast, Type-II suppresses gauge-sector CP violation but allows for maximal CP mixing in the heavy-Higgs Yukawa sector. Finally, we uncover a phenomenon of “hidden CP violation” in the Higgs alignment limit, where maximal CP mixing persists in the heavy sector despite decoupling from the weak gauge bosons; we demonstrate that this elusive scenario can be directly probed through specific cubic interactions involving the charged Higgs boson.

**Author:** Prof. SONG, Jeonghyeon (Konkuk University)

**Presenter:** Prof. SONG, Jeonghyeon (Konkuk University)

**Session Classification:** Lightning talks - 2

Contribution ID: 9

Type: **not specified**

## GenHET Introduction

*Thursday, 26 February 2026 12:00 (30 minutes)*

**Presenter:** CASTRO, Alejandra (University of Cambridge)

Contribution ID: 10

Type: **not specified**

## Higgs near-criticality at future colliders

*Wednesday, 25 February 2026 09:40 (30 minutes)*

**Presenter:** GAVELA LEGAZPI, Belen (Universidad Autonoma de Madrid and IFT-UAM/CSIC)

Contribution ID: 11

Type: **not specified**

## **Dark sector imprints on Cosmology**

*Wednesday, 25 February 2026 10:10 (30 minutes)*

**Presenter:** LOPEZ HONOREZ, Laura (Universite Libre de Bruxelles)

Contribution ID: 13

Type: **not specified**

# Exploring EFTs of Gauged Chiral Symmetries at the LHC and Beyond

*Wednesday, 25 February 2026 15:30 (30 minutes)*

**Presenter:** YU, Felix (Johannes Gutenberg University Mainz)

Contribution ID: 14

Type: **not specified**

## Shall we give up Lorentz invariance?

*Wednesday, 25 February 2026 16:30 (30 minutes)*

**Presenter:** Dr BLAS, Diego (ICREA/IFAE)

Contribution ID: 15

Type: **not specified**

## **Matter–Antimatter Asymmetry: With the SM and Beyond**

*Wednesday, 25 February 2026 16:00 (30 minutes)*

**Presenter:** IPEK, Seyda (Carleton University)

Contribution ID: 17

Type: **not specified**

## **CERN D&I Programme: seminar and interactive workshop**

*Wednesday, 25 February 2026 14:00 (1 hour)*

**Presenter:** CARVALHO, Louise (CERN)

Contribution ID: 21

Type: **not specified**

## **Dark and with a chance of showers: Strongly-interacting dark sectors at accelerators**

*Thursday, 26 February 2026 09:30 (30 minutes)*

**Presenter:** KAHLHOEFER, Felix (Karlsruhe Institute of Technology)

Contribution ID: 22

Type: **not specified**

## **Cosmological phase transitions and the generation of the matter-antimatter asymmetry**

*Thursday, 26 February 2026 09:00 (30 minutes)*

**Presenter:** VAN DE VIS, Jorinde (CERN)

Contribution ID: 23

Type: **not specified**

# Dark Matter Dynamics from Cosmic Colliders

*Wednesday, 25 February 2026 09:10 (30 minutes)*

**Presenter:** LISANTI, Mariangela (Princeton University)

Contribution ID: 27

Type: **not specified**

## Colloquium

*Thursday, 26 February 2026 14:00 (1 hour)*

**Presenter:** HILLIER, Judith (University of Oxford)

Contribution ID: 29

Type: **not specified**

## Cocktail and networking event

Contribution ID: 32

Type: **not specified**

# The Stochastic Schwinger Effect

*Friday, 27 February 2026 11:30 (30 minutes)*

**Presenter:** MALEKNEJAD, Azadeh (Swansea University)

Contribution ID: 33

Type: **not specified**

## Panel discussion — Strategies for cultivating diversity in physics

*Friday, 27 February 2026 09:30 (1 hour)*

**Presenters:** MALEKNEJAD, Azadeh (Swansea University); YU, Felix (Johannes Gutenberg University Mainz); HILLIER, Judith (University of Oxford); LISANTI, Mariangela (Princeton University); DOMCKE, Valerie (CERN)

Contribution ID: 34

Type: **not specified**

## Connecting the Higgs to flavour

*Friday, 27 February 2026 14:30 (30 minutes)*

**Presenter:** RENNEN, Sophie Alice (University of Glasgow (GB))

Contribution ID: 38

Type: **not specified**

# Running Couplings in High-Temperature Effective Field Theory

*Wednesday, 25 February 2026 11:50 (10 minutes)*

In this work, we study the renormalization-group evolution of parameters in the three-dimensional effective field theory (3D EFT) that describes the thermally driven electroweak phase transition of the Higgs field. We focus on the first-order case, triggered by beyond the Standard Model physics. We compute the two-loop running of the 3D EFT couplings, including the effect of the leading non-renormalizable terms.

We then analyze how the new contributions to the beta functions compare with those in the super-renormalizable case, highlighting their impact on perturbative computations of the scalar potential, which describes the vacuum structure of the theory.

By incorporating higher-order corrections in the mass parameter evolution, as well as the running of other effective operators, we set the stage for testing their impact on phase transition dynamics in lattice simulations.

**Authors:** Mr DASHKO, Andrii (University of Granada); GUEDES, Guilherme; CHALA, Mikael (Universidad de Granada)

**Presenter:** Mr DASHKO, Andrii (University of Granada)

**Session Classification:** Lightning talks - 1

Contribution ID: 40

Type: **not specified**

## Could electron-top interactions spoil the measurement of the Higgs trilinear? A quantitative estimate at future lepton colliders

Thursday, 26 February 2026 15:30 (10 minutes)

The measurement of the Higgs self-coupling is considered the next milestone in the study of the Higgs boson properties. At future  $e^+e^-$  facilities below the double Higgs production threshold, this is extracted from the  $Zh$  production cross-section, which is sensitive to the trilinear coupling at the one-loop level. At the same perturbative order, potential effects beyond the Standard Model (SM) may affect the Higgstrahlung rate and distort the self-coupling determination. We study the question focusing especially on contact interactions containing two electron and two top-quark fields. We conclude that, in the context of FCC-ee and its planned runs at different energies,  $e\bar{t}t$  interactions change the Higgs self-coupling sensitivity below the percent level. Even in the most pessimistic scenarios, we confirm a robust sensitivity of the order of 17% at the  $1\sigma$  confidence level under the assumption of otherwise SM-like Higgs couplings. A crucial role in these results is played by the measurement of fermion pair production above the  $Z$  resonance.

**Authors:** GROJEAN, Christophe (DESY (Hamburg) and Humboldt University (Berlin)); TABATT, Lucine (Humboldt Universität zu Berlin); ALLWICHER, Lukas

**Presenter:** TABATT, Lucine (Humboldt Universität zu Berlin)

**Session Classification:** Lightning talks - 2

Contribution ID: 41

Type: **not specified**

# The Strong-CP Problem and its Gauge Axion Solution as Evidence for Fundamental Strings

*Wednesday, 25 February 2026 11:40 (10 minutes)*

The topological susceptibility of the QCD vacuum provides an understanding of  $\theta$ -vacua as vacua of a Chern-Simons gauge theory. In this way, it gives an immediate proof of the physicality of the boundary  $\theta$ -term. This makes the essence of the strong-CP puzzle very transparent and offers a solution in form of the gauge axion, which has exact quality. This axion represents an intrinsic part of the QCD gauge redundancy without any reference to an anomalous global symmetry. It is a two-form transforming under the QCD gauge symmetry. Due to its pure gauge nature, the gauge axion represents a powerful tool to monitor physics of  $\theta$ -vacua in various regimes. Unlike the ordinary Peccei-Quinn axion, which is UV-completed into a Goldstone phase of a complex scalar and thereby suffers from the quality problem, the gauge axion is UV-completed directly into a fundamental theory of gravity. We study the domain wall and string structure of the gauge axion and show that the strings sourcing it must be a part of this fundamental theory. We thus observe that the absence of the axion quality problem motivates the presence of fundamental strings. This provides a new argument for a connection between the axion and gravity.

**Authors:** WACHOWITZ, Anja (Arizona State University); DVALI, Gia (Max Planck Institute for Physics & LMU Munich); KOMISEL, Lucy Elisabeth (Max Planck Institute for Physics & LMU Munich); SAKHELASHVILI, Otari (Max Planck Institute for Physics & LMU Munich)

**Presenter:** KOMISEL, Lucy Elisabeth (Max Planck Institute for Physics & LMU Munich)

**Session Classification:** Lightning talks - 1

Contribution ID: 42

Type: **not specified**

## How large can lepton mixing be?

*Wednesday, 25 February 2026 12:10 (10 minutes)*

We show that, contrary to common expectations, the observed charged leptons can have a substantial mixing with new heavier fermions, at the level of 20%.

This can happen, in the language of effective theories, when the effect of mixing with heavier fermions vanishes at tree level in operators of mass-dimension 6 (or it is suppressed by the small charged lepton masses), a cancellation that can be naturally ensured by symmetries.

Using a model that realizes this scenario we consider all current direct and indirect constraints and show that experimental constraints on the mixing are so mild that, given the current direct limit on the mass of the heavy fermions, theoretical considerations

become the leading current constraints on the mixing. We also estimate the sensitivity to the mixing at future experiments, including the high-luminosity phase of the LHC and, most notably, the FCC-ee, and FCC-hh. We find a pattern in which the reach of direct searches in hadron machines makes theoretical considerations lead the limits while the precision of lepton machines can beat these theoretical considerations. We find that the FCC can finally reach  $\sim 1\%$  precision in the mixing squared of the charged leptons.

**Authors:** GIULIANO, Chiara (Universidad de Granada); GUEDES, Guilherme; DE BLAS, Jorge (Universidad de Granada (ES)); SANTIAGO, Jose (Universidad de Granada (ES)); Mr SANCHEZ LOPEZ, Rafael (Universidad de Granada)

**Presenter:** GIULIANO, Chiara (Universidad de Granada)

**Session Classification:** Lightning talks - 1

Contribution ID: 43

Type: **not specified**

## Benchmarking dark matter candidates in the 2HDMS: Prospects for future colliders

*Thursday, 26 February 2026 16:00 (10 minutes)*

The Two Higgs Doublet model extended with a complex scalar singlet (2HDMS) is a well-motivated Beyond-the-Standard Model candidate with the potential to explain dark matter (DM). The extended scalar sector results in three scalar, two charged, one pseudo-scalar and one pseudo-scalar DM candidate. The DM candidate is provided by the imaginary component of the complex scalar singlet. It is stabilized by a  $Z_2$  symmetry, which is broken spontaneously by the real part of the complex scalar singlet acquiring a vacuum expectation value.

In this presentation, we study the DM phenomenology of this model and identify different benchmarks. The main focus lies on analyzing the prospects at future colliders, the High-Luminosity Large Hadron Collider (HL-LHC), the International Linear Collider (ILC), a Future Circular Collider in electron-positron mode (FCC-ee, CEPC), the Compact Linear Collider (CLIC), and a muon collider, for different benchmarks. These benchmarks cover different regions of the allowed parameter space, while taking into account theoretical as well as experimental constraints. We discuss both possibilities, i.e. with and without accommodating an experimental excess at 95 GeV observed both at the Large Electron Positron Collider (LEP) and at the Large Hadron Collider (LHC).

**Authors:** LI, Cheng; MOORTGAT-PICK, Gudrid; LAHIRI, Jayita (Hamburg U.); DUTTA, Juhi; ZIEGLER, Julia (UNI/TH (Uni Hamburg, Institut fuer Theoretische Physik)); TABIRA, Sheikh Farah

**Presenter:** ZIEGLER, Julia (UNI/TH (Uni Hamburg, Institut fuer Theoretische Physik))

**Session Classification:** Lightning talks - 2

Contribution ID: 44

Type: **not specified**

## Hot News on the phase structure of the SMEFT

*Wednesday, 25 February 2026 12:00 (10 minutes)*

We study the high-temperature behavior of the electroweak sector of the Standard Model Effective Field Theory (SMEFT), including dimension-six operators, by performing dimensional reduction up to  $\mathcal{O}(g^4)$  in the gauge couplings. Our derivation accounts for one-loop corrections to kinetic terms and scalar quartic couplings, as well as two-loop contributions to thermal mass parameters. The latter include effects from purely bosonic operators and from four-fermion interactions. The resulting three-dimensional theory provides a suitable framework for non-perturbative investigations of the thermal history of the early universe within the SMEFT. In particular, we discuss how existing lattice results can be employed to assess the viability of a phase transition in this extended setup, even in the absence of modifications to the vacuum structure at zero temperature.

**Author:** FIORE, Maria Cristina (University of Granada)

**Co-authors:** GIL, Luis (Universidad de Granada); CHALA, Mikael (Universidad de Granada)

**Presenter:** FIORE, Maria Cristina (University of Granada)

**Session Classification:** Lightning talks - 1

Contribution ID: 45

Type: **not specified**

## Beyond one loop phase transitions

*Friday, 27 February 2026 11:10 (10 minutes)*

Previous work has shown that the standard Coleman-Weinberg one loop effective potential with one loop thermal masses is both gauge and renormalisation dependent. It also poorly predicts the critical temperature of the electroweak phase transition compared to lattice simulations. One can improve on this approach by using the dimensionally reduced effective potential generated by DRalgo. However DRalgo only computes the effective potential symbolically, and so is unable to compute the critical temperature. To address this limitation we developed BLOOP (Beyond one LOOp Phase transition). BLOOP is a new python code which uses the symbolic expressions from DRalgo to numerically minimise the effective potential at one-or two-loop for any model. I will demonstrate the power of BLOOP by finding the parameter space that gives a strong first-order phase transition in a  $Z_2$ -symmetric 3-higgs doublet model, and show the discrepancy between one- and two-loop predictions.

**Authors:** Ms THOMSON-COOKE, Jasmine (Dublin Institute for Advanced Studies); LEWITT, Lucy (University of Sheffield (GB)); Dr KEUS, Venus (Dublin Institute for Advanced Studies (DIAS))

**Presenter:** Ms THOMSON-COOKE, Jasmine (Dublin Institute for Advanced Studies)

**Session Classification:** Lightning Talks - 3

Contribution ID: 46

Type: **not specified**

## Ultralight Vector Dark Matter from non-slowroll Inflation

*Friday, 27 February 2026 11:20 (10 minutes)*

The longitudinal mode of a massive vector field, generated during inflation, offers a well motivated and phenomenologically rich candidate for dark matter. We show that a rapid variation in the mass of the vector boson, occurring during a brief phase of non-slowroll inflationary evolution, can naturally give rise to extremely small vector masses after inflation ends, corresponding to an ultralight dark matter candidate, with masses as low as  $m \approx 10^{-19}$  eV or even smaller. This represents a refined and self-contained production mechanism: it does not rely on additional assumptions beyond the inflationary dynamics itself and the presence of a massive field.

It also predicts, as a probe, a stochastic gravitational-wave background, generated at second order by non-adiabatic longitudinal vector fluctuations. This constitutes a distinctive observational signature of our framework.

By leveraging a brief departure from slowroll dynamics, this framework also establishes a novel connection between ultralight vector dark matter and primordial black hole physics, suggesting a possible unified setting for mixed dark matter scenarios.

**Author:** LA ROSA, Martina (Università degli Studi di Padova, INFN Padova)

**Co-author:** TASINATO, Gianmassimo (Swansea University)

**Presenter:** LA ROSA, Martina (Università degli Studi di Padova, INFN Padova)

**Session Classification:** Lightning Talks - 3

Contribution ID: 48

Type: **not specified**

## **A simple mechanism for dynamical “Dark Energy”**

*Friday, 27 February 2026 12:00 (30 minutes)*

**Presenter:** NARDI, Enrico (NICPB, Tallinn (EE) & INFN-LNF (IT))

Contribution ID: 49

Type: **not specified**

## **An Introduction to the Tunneling Potential Formalism**

*Friday, 27 February 2026 09:00 (30 minutes)*

**Presenter:** ESPINOSA SEDANO, Jose Ramon (IFT-UAM/CSIC, Madrid (ES))

Contribution ID: 50

Type: **not specified**

## Panel discussion – A thriving career in BSM physics

*Thursday, 26 February 2026 10:30 (1h 30m)*

**Presenters:** BLAS, Diego (ICREA/IFAE); NARDI, Enrico (NICPB, Tallinn (EE) & INFN-LNF (IT)); LOPEZ, Laura (Universite Libre de Bruxelles); IPEK, Seyda (Carleton University (CA-US)); KEUS, Venus (Dublin Institute for Advanced Studies (DIAS))

Contribution ID: 52

Type: **not specified**

## Gauge theories from scattering amplitudes with minimal assumptions

*Thursday, 26 February 2026 16:40 (10 minutes)*

We revisit the emergence of a Yang-Mills symmetry in theories with massless spin 1 particles from fundamental physical properties of scattering amplitudes. In the standard proofs, some symmetry and reality properties of the coupling constants in three-point amplitudes are assumed. These properties cannot be justified using only three-point amplitudes but we show that they arise as consequences of the consistent factorization of four-particle amplitudes, for particular choices of the particle basis. This applies to self-interactions of massless spin 1 particles and also to their interactions with spin 0 and 1/2 particles. CP invariance is a derived property, not an additional assumption. The situation for gravity interactions is analogous and it is dealt with in the same fashion.

**Authors:** FONSECA, Renato (University of Granada); HERNÁNDEZ GARCÍA, Clara (Universidad de Granada); LIZANA, Javier (IFT UAM-CSIC); PEREZ-VICTORIA MORENO DE BARREDA, MANUEL MARIA

**Presenter:** HERNÁNDEZ GARCÍA, Clara (Universidad de Granada)

**Session Classification:** Lightning talks - 2

Contribution ID: 53

Type: **not specified**

## Are quantum observables sensitive to CP-violation in $t\bar{t}$ pairs?

*Thursday, 26 February 2026 16:20 (10 minutes)*

Within the framework currently adopted for the description of the fundamental interactions, the particles involved in high-energy collisions are expected to exhibit a basic quantum behaviour. As a consequence of this statement, a novel class of “quantum” observables for collider studies naturally arises, whose physical interpretation is rooted in the characteristics of the underlying quantum states.

We present a study on the sensitivity of quantum observables to new sources of CP-violation in top-antitop pairs ( $t\bar{t}$ ), taking into account different production mechanisms. We also investigate how the same additional sources would affect the quantum tomography protocol adopted for the reconstruction of quantum states in collider environments. The ability to discriminate the stage where new physics would modify the current theoretical predictions is also discussed.

**Author:** MINIATI, Olimpia (Università degli Studi di Bologna and INFN)

**Presenter:** MINIATI, Olimpia (Università degli Studi di Bologna and INFN)

**Session Classification:** Lightning talks - 2

Contribution ID: 54

Type: **not specified**

## How robust is the QCD axion? A systematic study in a non-minimal model

*Wednesday, 25 February 2026 11:30 (10 minutes)*

The axion is one of the most compelling candidates for physics beyond the Standard Model, as it simultaneously provides a solution to the strong CP problem and a viable dark matter candidate. In post-inflationary scenarios, the minimal QCD axion model leads to strong constraints on the axion mass from the dark matter relic abundance. Specific quantization relations hold for the axion-gauge couplings which constrain further the parameter space. In this work, we test how robust these phenomenological features are in multiple-axion scenarios. Considering a two-axion framework, we explore whether new regions of parameter space remain theoretically and phenomenologically motivated.

**Author:** VICHES BRAVO, Fuensanta (Universidad de Granada)

**Presenter:** VICHES BRAVO, Fuensanta (Universidad de Granada)

**Session Classification:** Lightning talks - 1

Contribution ID: 55

Type: **not specified**

## Supernovae as Laboratories for sub-GeV Millicharged Particles

*Wednesday, 25 February 2026 11:20 (10 minutes)*

We study the transport of self-interacting millicharged particles (MCPs) coupled to a massless dark photon in core-collapse supernovae (SNe), focusing on masses above the MeV scale. In this regime, strong self-couplings drive the formation of a relativistic fluid rather than a free-streaming gas. We extend the hydrodynamic framework developed for light MCPs to heavier masses, revisiting production, thermalization, and transport. Neglecting self-interactions at higher masses can lead to a qualitatively incomplete description of energy deposition and particle outflows. The interplay between self-interactions and trapping modifies the boundary between free-streaming and hydrodynamic regimes, indicating that standard SN cooling arguments may require revision. This framework provides a basis to account for fluid effects when assessing supernova constraints across sub-GeV and multi-MeV dark sectors.

**Author:** INGICCO, Mariachiara (Università degli Studi di Padova, INFN Padova)

**Co-authors:** FIORILLO, Damiano Francesco Giuseppe (Niels Bohr Institute, University of Copenhagen); VITAGLIANO, Edoardo

**Presenter:** INGICCO, Mariachiara (Università degli Studi di Padova, INFN Padova)

**Session Classification:** Lightning talks - 1

Contribution ID: 56

Type: **not specified**

## Quantum spin correlations at colliders

*Thursday, 26 February 2026 15:50 (10 minutes)*

The study of beyond-classical correlations in final states at colliders has received a lot of attention recently. For example, entanglement of particle pairs has been observed at the LHC. Most importantly, measurements of such correlations provide new tests of the Standard Model. More complicated final states are being studied and future colliders with polarized initial states will boost the interest even further.

Experimentally, the challenge is to reconstruct the spin-density matrix of a final state from phase space distributions. As a practical matter, the computation of spin-density matrices is beyond the reach of analytical calculations for multi-particle final states. While the event generator Whizard has computed the spin density matrix from the beginning, most of it is projected out in the common event formats.

We present first results from an automated framework for the computation of general density matrices and quantum observables using event samples generated by Whizard. We discuss applications for spin-1/2 (qubit) and spin-1 (qutrit) particles in bipartite and tripartite quantum states at colliders.

**Author:** WÜST, Monika (University of Würzburg)

**Co-author:** Prof. OHL, Thorsten (University of Würzburg)

**Presenter:** WÜST, Monika (University of Würzburg)

**Session Classification:** Lightning talks - 2

Contribution ID: 57

Type: **not specified**

## Black hole hair transplant with ultra light dark matter

*Wednesday, 25 February 2026 11:10 (10 minutes)*

You can create a black hole bomb using a Kerr black hole by putting mirrors around it. This can happen because of a phenomenon called superradiance using which an incident wave can get reflected back with larger energy. The mirror then reflects it back and you can keep on extracting energy until the limit is reached. For a massive field, the mass itself acts as a natural barrier. Ultra light dark matter fields, if they exist, can in principle satisfy the superradiance condition, and form a cloud around a Kerr black hole. We will talk about how the signatures of such a cloud can be detected or used to constrain masses of these particles. In particular, we focus on the Hz band in frequency, and also discuss how a stipulated IMBH population would affect it.

**Authors:** MCCABE, Christopher (King's College London); PATHAK, Dhruv (King's College London); Dr BLAS, Diego (ICREA/IFAE)

**Presenter:** PATHAK, Dhruv (King's College London)

**Session Classification:** Lightning talks - 1

Contribution ID: 58

Type: **not specified**

## Mixing it Up: New Paths to Sterile Neutrino Dark Matter

*Thursday, 26 February 2026 16:30 (10 minutes)*

Sterile neutrinos are attractive dark matter candidates due to their feeble interactions with the Standard Model, cosmological longevity, and natural emergence in extensions of the neutrino sector. Early production mechanisms based on non-resonant active–sterile oscillations, most notably the Dodelson–Widrow (DW) mechanism, are now known to be insufficient to account for the observed dark matter abundance. Recently, modifications of the DW scenario involving physics beyond the Standard Model have shown promising results by altering the effective active–sterile mixing angle during production. Such BSM effects can change the sterile neutrino abundance while remaining consistent with current constraints. In this talk, I will present an overview of these attempts to revive sterile neutrino dark matter through modified DW mechanisms. I will also discuss preliminary results on sterile neutrino dark matter with vector-mediated sterile self-interactions.

**Author:** MULDER, Finn Anthony (University of Padova, INFN Padova)

**Presenter:** MULDER, Finn Anthony (University of Padova, INFN Padova)

**Session Classification:** Lightning talks - 2

Contribution ID: **60**

Type: **not specified**

## Closing remarks

*Friday, 27 February 2026 15:00 (10 minutes)*