

BRDA 2025: Selected topics in (B)SM

Report of Contributions

Contribution ID: 1

Type: **not specified**

Jonathan Kriewald: No track left behind

Wednesday 29 October 2025 15:00 (35 minutes)

Contribution ID: 3

Type: **not specified**

Shaikh Saad: Beyond Neutrino Mass: Observable $n-\bar{n}$ Oscillations in UV Complete Seesaw Models

Wednesday 29 October 2025 10:00 (35 minutes)

Next-generation experiments like DUNE and NNBAR will greatly enhance sensitivity to neutron-antineutron oscillations, a direct probe of baryon number violation ($\Delta B = 2$) beyond the Standard Model. This talk discusses such oscillations in unified frameworks that also explain fermion and neutrino masses via seesaw mechanisms. Two scenarios will be discussed: (1) Type II seesaw with two color-sextet scalars, realizable in $SO(10)$ /Pati-Salam models, and (2) Type III seesaw with a sextet scalar and color-octet fermion, naturally embedded in $SU(5)$. In both cases, the same dynamics linking fermion masses induces baryon violation, tying oscillations to flavor structure. Upcoming searches can probe new colored states up to 10^{11} GeV—far beyond collider reach—making $n-\bar{n}$ oscillations a rare low-energy window into grand unification and ultra-heavy new physics.

Contribution ID: 4

Type: **not specified**

Katarina Trailović: Stable Evaluation of Lefschetz Thimble Intersection Numbers: Towards Real-Time Path Integrals

Wednesday 29 October 2025 12:40 (25 minutes)

Contribution ID: 5

Type: **not specified**

Pietro Baratella: Thermodynamics from the S-matrix

Wednesday 29 October 2025 12:05 (35 minutes)

Contribution ID: **10**

Type: **not specified**

Luka Jevšenak

Contribution ID: 12

Type: **not specified**

Patrick Bolton: Hunting for a light Z' portal to the dark side at Belle II'

Wednesday 29 October 2025 15:35 (35 minutes)

Contribution ID: 13

Type: **not specified**

Nikiša Plešec: Indirect Constraints on Higgs-mediated FCNCs

Thursday 30 October 2025 11:55 (25 minutes)

Contribution ID: **14**

Type: **not specified**

Lovre Pavičić: Flavored color scalars for neutrino masses

Wednesday 29 October 2025 10:35 (25 minutes)

Contribution ID: 15

Type: **not specified**

Ivan Vujmilović: Electromagnetic form factors and structure of the T_{bb} tetraquark from lattice QCD

Thursday 30 October 2025 10:35 (25 minutes)

Contribution ID: 19

Type: **not specified**

Amelia Drew: Axion String Source Modelling

Wednesday 29 October 2025 16:40 (35 minutes)

Axion strings are topological defects that arise in particle physics models with a spontaneously broken global $U(1)$ symmetry, motivated, for example, by the Peccei-Quinn mechanism. They are predicted to emit massless axions, massive particles and gravitational waves. If we are to detect axion dark matter in the post-inflationary symmetry breaking scenario, understanding the spectrum of the axions emitted from a network of strings will be crucial. I will detail my work modelling the dependence of axion string radiation on the string curvature using adaptive mesh refinement simulations, reconciling with Nambu-Goto effective action predictions.

Contribution ID: **21**

Type: **not specified**

Ilja Doršner: On the doublet-triplet splitting problem

Wednesday 29 October 2025 11:30 (35 minutes)

Contribution ID: 23

Type: **not specified**

Rafal Maselek: Machine learning the likelihoods

Thursday 30 October 2025 12:20 (35 minutes)

Contribution ID: 24

Type: **not specified**

Zachary Polonsky: (B)eyond the Anomalies

Thursday 30 October 2025 10:00 (35 minutes)

Contribution ID: 26

Type: **not specified**

Lovro Dulibic: Nonperturbative contributions of QCD condensates to $D\bar{D}$ mixing

Thursday 30 October 2025 11:30 (25 minutes)

A naive leading-order perturbative calculation of the charm meson mixing parameters falls short of the experimental values by several orders of magnitude. This discrepancy arises from the Glashow-Iliopoulos-Maiani (GIM) mechanism, which strongly suppresses the leading contributions. Higher-order corrections, nonperturbative effects, and possible BSM effects can lift this suppression through flavour $SU(3)$ breaking. In this work, we investigate the nonperturbative long-distance contributions arising from QCD condensates, incorporating for the first time the effects of mixed and four-quark condensates. Our results show an improvement in the predicted mixing parameters by up to two orders of magnitude compared with the perturbative NLO result, providing valuable insights into nonperturbative QCD dynamics. Although our estimates remain below experimental measurements, this study represents an important step toward narrowing the gap between theory and observation - an essential step in assessing potential contributions from BSM physics.

Contribution ID: 29

Type: **not specified**

Takuya Okawa: Probing the Dirac-Majorana nature of neutrinos

Wednesday 29 October 2025 17:15 (35 minutes)

The question of whether neutrinos are Dirac or Majorana remains open. This is mainly because almost all of the accessible neutrinos, such as laboratory neutrinos and neutrinos of astrophysical origin, are ultra-relativistic, erasing signatures that distinguish Dirac from Majorana neutrinos. We thus consider heavy neutrinos and discuss the possibility of distinguishing their Dirac versus Majorana nature. In particular, we allow a heavy neutrino to decay into another neutrino and an intermediate particle, which subsequently decays into the Standard Model particles. Then, we analyze the angular distribution of decay products for both Dirac and Majorana heavy neutrinos.