The 16th International Workshop on Tau Lepton Physics (TAU2021) (Virtual Edition)

Report of Contributions

Contribution ID: **14** Type: **Oral contribution**

Lepton-flavour violation in hadronic tau decays and $\mu-\tau$ conversion in nuclei

Monday, 27 September 2021 12:45 (20 minutes)

Within the Standard Model Effective Field Theory framework, with operators up to dimension 6, we perform a model-independent analysis of the lepton-flavour-violating processes involving tau leptons. Namely, we study hadronic tau decays and ℓ-τ conversion in nuclei, with $\ell = e, \mu$. Based on available experimental limits, we establish constraints on the Wilson coefficients of the operators contributing to these processes. The translation of these constraints into the most general leptoquark framework is also considered. Our work paves the way to extract the related information from Belle II and foreseen future experiments.

What is your topic?

Lepton universality and flavour violation

Primary author: MONSALVEZ POZO, Kevin (Instituto de Fisica Corpuscular (IFIC))

Co-authors: HUSEK, Tomas (Lund University); PORTOLES, Jorge (IFIC (CSIC-UV))

Presenter: MONSALVEZ POZO, Kevin (Instituto de Fisica Corpuscular (IFIC))

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **16** Type: **Oral contribution**

Measuring three-flavor neutrinos with FASERnu at the LHC

Thursday, 30 September 2021 09:05 (20 minutes)

FASERν at the LHC is designed to directly detect collider neutrinos for the first time and study their properties at TeV energies, where no such measurements currently exist. The detector will be located 480 m downstream of the ATLAS interaction point. With FASERnu, the three-flavor neutrino cross-sections will be measured in the currently unexplored energy range between 360 GeV and 5 TeV. In particular, tau-neutrino and electron-neutrino cross sections will be measured at the highest energy ever. In 2018 we performed a pilot run with the aims of measuring particle fluxes at the proposed detector location and of possibly detecting neutrino interactions for the first time at the LHC. We installed a 30-kg lead/tungsten emulsion detector and collected data of 12.2 fb^{-1}. The analysis of this data has yielded several neutrino interaction candidates, excluding the no-signal hypothesis with a statistical significance of 2.7σ. We have also studied the charged particle flux in regard to the characterization of the unprecedented collider neutrino beamline. During Run-3 of the LHC starting from 2022, we will deploy an emulsion detector with a target mass of 1.1 tons, coupled with the FASER magnetic spectrometer. This would yield roughly 2,000 ν_e, 7,000 ν_μ, and 30 ν_τ interacting in the detector. Here we present the status and plan of FASERν, as well as the neutrino detection in the 2018 data.

What is your topic?

Neutrino Physics

Primary author: ARIGA, Tomoko (Kyushu University (JP))

Presenter: ARIGA, Tomoko (Kyushu University (JP))

Session Classification: Session 4b: Neutrino and Dark Matter

Track Classification: Tau2021 Abstracts

Contribution ID: **17** Type: **Oral contribution**

A continuum determination of the strong isospin-breaking contribution to the muon anomalous magnetic moment

Thursday, 30 September 2021 15:15 (20 minutes)

We present a continuum determination of a_muˆSIB, the strong isospin-breaking contribution to a_mu, the anomalous magnetic moment of the muon, using ChPT and the formulation of a_mu as a weighted integral of the electromagnetic current two-point function over Euclidean Qˆ2. Flavor-breaking hadronic tau decay sum rules are shown to provide a determination of a key higher-order chiral LEC encoding numerically important resonance region contributions. Implications of the structure of the result for the lattice determination of a_muˆSIB are also discussed.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary authors: JAMES, Christopher (York University); MALTMAN, Kim (York University); LEWIS, Randy (York University)

Presenter: MALTMAN, Kim (York University)

Session Classification: Session 6: g-2

Track Classification: Tau2021 Abstracts

Contribution ID: **18** Type: **Oral contribution**

Latest results from the CUORE experiment

Thursday, 30 September 2021 08:25 (20 minutes)

The Cryogenic Underground Observatory for Rare Events (CUORE) is the first bolometric experiment searching for 0νββ decay that has been able to reach the one-tonne mass scale. The detector, located at the LNGS in Italy, consists of an array of 988 TeO2 crystals arranged in a compact cylindrical structure of 19 towers. CUORE began its first physics data run in 2017 at a base temperature of about 10 mK and in April 2021 released its 3rd result of the search for 0νββ, corresponding to a tonne-year of TeO2 exposure. This is the largest amount of data ever acquired with a solid state detector and the most sensitive measurement of 0νββ decay in 130Te ever conducted, with a median exclusion sensitivity of 2.8×10ˆ25 yr. We find no evidence of 0νββ decay and set a lower bound of 2.2 ×10ˆ25 yr at a 90% credibility interval on the 130Te half-life for this process. In this talk, we present the current status of CUORE search for 0νββ with the updated statistics of one tonne-yr. We finally give an update of the CUORE background model and the measurement of the 130Te 2νββ decay half-life, study performed using an exposure of 300.7 kg·yr.

What is your topic?

Neutrino Physics

Primary author: OLMI, Miriam (INFN (LNGS))

Presenter: OLMI, Miriam (INFN (LNGS))

Session Classification: Session 4b: Neutrino and Dark Matter

Track Classification: Tau2021 Abstracts

Contribution ID: **19** Type: **Poster contribution**

Search for Tau -> 3mu decays with CMS experiment at LHC

Friday, 1 October 2021 10:50 (2 hours)

New results are presented for a search for charged lepton flavor violating decays of tau leptons to three muons with the CMS detector. The search employs tau leptons produced in decays of heavy flavor B/D mesons and W bosons.

What is your topic?

Lepton universality and flavour violation

Primary authors: CMS COLLABORATION; SIMONE, Federica Maria (Universita e INFN, Bari (IT))

Presenter: SIMONE, Federica Maria (Universita e INFN, Bari (IT))

Session Classification: Poster session: Breakout room 2

Track Classification: Tau2021 Abstracts

Contribution ID: **20** Type: **Oral contribution**

Tau identification in CMS during LHC Run 2

Wednesday, 29 September 2021 13:10 (20 minutes)

The LHC Run 2 data-taking period was characterized by an increase in instantaneous luminosity and center-of-mass energy. Several techniques have been deployed in the CMS experiment to reconstruct and identify tau leptons in this environment. The DeepTau identification algorithm is used to identify hadronically decaying tau leptons from quark and gluon induced jets, electrons, and muons. Compared to previously used MVA identification algorithms, the use of deep-learning techniques brought a noticeable improvement in the tau identification and rejection of contaminating sources. Low transverse momentum topologies were addressed separately with a dedicated identification algorithm, while machine learning techniques were implemented to improve the identification of the tau hadronic decay channels. These algorithms have been already used for several published physics analyses in CMS. The algorithms are presented together with their measured performances.

What is your topic?

Hadronic decays

Primary authors: HASSANSHAHI, Mohammadhassan (Imperial College (GB)); HASSAN HASSANSHAHI, Mohammad

Presenter: HASSAN HASSANSHAHI, Mohammad

Session Classification: Session 5a: Proton-proton and e+e- colliders

Track Classification: Tau2021 Abstracts

Contribution ID: **21** Type: **Oral contribution**

Tau leptons as a tool to investigate the CP properties of the Higgs boson at CMS

Wednesday, 29 September 2021 12:50 (20 minutes)

Among the Higgs boson decay channels, the one to tau leptons can offer insight into the properties of the Higgs boson. The structure under CP symmetry of the Yukawa coupling between the Higgs boson and tau leptons was investigated in CMS by reconstructing the decay planes of the two tau leptons and measuring their angular separation. Tau decay planes are reconstructed depending on the studied decay channel to take advantage of the correlation between the tau lepton spin and the momenta of its decay products. Using the data collected during the LHC Run 2 data-taking period, the study revealed that the Yukawa coupling is largely dominated by a pure CP-even component. A pure CP-odd Yukawa coupling is excluded with a 99.7% allowing to constrain the allowed phase space for possible BSM scenarios.

What is your topic?

CP and T violation

Primary author: CARDINI, Andrea (Deutsches Elektronen-Synchrotron (DE))

Presenter: CARDINI, Andrea (Deutsches Elektronen-Synchrotron (DE))

Session Classification: Session 5a: Proton-proton and e+e- colliders

Track Classification: Tau2021 Abstracts

Contribution ID: **22** Type: **Oral contribution**

e+e- hadronic cross-sections with SND detector at VEPP 2000

Thursday, 30 September 2021 08:25 (25 minutes)

Total amount of about 320 pbˆ{-1} of integrated luminocity has been collected with SND detector at VEPP-2000 collider. Here we present recent results on e+e- annihilation to hadrons below 2 GeV based on part of the data. In particular, we discuss measurements of the eˆ+eˆ-\to piˆ+\piˆ- and eˆ+eˆ- \to n\bar{n} cross sections, and study of the radiative processes eˆ+eˆ- \to \eta\gamma, eˆ+eˆ- \to \eta \piˆ0 \gamma and eˆ+eˆ- \to \eta \eta \gamma.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary author: Dr DIMOVA, Tatyana (Novosibirsk State University (RU))

Presenter: Dr DIMOVA, Tatyana (Novosibirsk State University (RU))

Session Classification: Session 5b: Proton-proton and e+e- colliders

Track Classification: Tau2021 Abstracts

Contribution ID: **23** Type: **Poster contribution**

Search for lepton-flavor-violating decays of the Tau lepton at a future muon collider

Friday, 1 October 2021 10:50 (2 hours)

Tau leptons can have lepton-flavor-violating (LFV) couplings to a muon or an electron and an Axion-Like Particle (ALP). ALPs are pseudo Nambu-Goldstone bosons associated with the spontaneously broken global $U(1)_{\rm PQ}$ symmetry. LFV ALPs have been of a great interest in the last several decades as they can solve some of the SM long-lasting problems. Assuming a future muon collider suggested by the Muon Accelerator Program (MAP), we search for LFV decays $\tau \to \ell a$ ($\ell = e, \mu$) of one of the tau leptons produced in the muon-anti muon annihilation. The ALP mass m_a is assumed to be in the range 100 eV to 1 MeV and three different chiral structures are considered for the LFV coupling. Using a multivariate technique and performing a realistic detector simulation, we obtain expected 95% confidence level upper limits on the LFV couplings $c_{\tau e}$ and $c_{\tau \mu}$. Limits are computed assuming the center-of-mass energies of 126, 350 and 1500 GeV which the future muon collider is supposed to operate at. Furthermore, we study the two cases of unpolarized and polarized muon beams independently and show that taking advantage of tau polarization-induced effects in the polarized muon beams case can significantly suppress the main SM background $\tau \to e/\mu + \nu\bar{\nu}$ which overwhelms the signal. The obtained results indicate that current experimental limits on the $c_{\tau e}$ and $c_{\tau \mu}$ couplings can be improved by roughly one order of magnitude with the help of the present analysis.

What is your topic?

Physics beyond the Standard Model

Primary authors: HAGHIGHAT, Gholamhossein (Institute for Research in Fundamental Sciences (IR)); MOHAMMADI NAJAFABADI, Mojtaba (Institute for Research in Fundamental Sciences (IR))

Presenter: HAGHIGHAT, Gholamhossein (Institute for Research in Fundamental Sciences (IR))

Session Classification: Poster session: Breakout room 6

Track Classification: Tau2021 Abstracts

Contribution ID: **24** Type: **Oral contribution**

On the scalar πK form factor beyond the elastic region

Wednesday, 29 September 2021 09:25 (20 minutes)

Pion-kaon (πK) pairs occur frequently as final states in heavy-particle decays.
A consistent treatment of πK scattering and production amplitudes over a wide energy range is therefore mandatory for multiple applications:
in Standard Model tests; to describe crossed channels in the quest for exotic hadronic states; and for an improved spectroscopy of excited kaon resonances.

In the elastic region, the phase shifts of πK scattering in a given partial wave are related to the phases of the respective πK form factors by Watson's theorem.
Going beyond that, we constructed in Ref.[1] a representation of the scalar πK form factor that includes inelastic effects via resonance exchange, while fulfilling all constraints from πK scattering and maintaining the correct analytic structure.

As a first application, we considered the decay $\tau \to K_S \pi \nu_\tau$, in particular, we studied to which extent the S-wave $K_0^*(1430)$ and the P-wave $K^*(1410)$ resonances can be differentiated and provide an improved estimate of the CP asymmetry produced by a tensor operator.

[1] Von Detten, L. and Noël, F. and Hanhart, C. and Hoferichter, M. and Kubis, B.
Eur. Phys. J. C 81, 420 (2021); DOI: 10.1140/epjc/s10052-021-09169-7

What is your topic?

Hadronic decays

Primary authors: NOËL, Frederic (Universität Bern); VON DETTEN, Leon (Forschungszentrum Jülich); HANHART, Christoph (IAS/IKP Forschungszentrum Jülich); HOFERICHTER, Martin (University of Bern); KUBIS, Bastian (Bonn University)

Presenter: NOËL, Frederic (Universität Bern)

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **25** Type: **Oral contribution**

New τ-based evaluation of the hadronic contribution to the vacuum polarization piece of the muon anomalous magnetic moment

Thursday, 30 September 2021 14:20 (20 minutes)

We review the isospin-breaking and electromagnetic corrections to the $\tau^- \to \pi^-\pi^0\nu_\tau$ decays, which are used as an input to the two-pion contributions to the hadronic vacuum polarization (at LO) of the anomalous magnetic moment (a_μ). We extend previous analyses by Cirigliano et al. working with ChPT with resonances. As an outcome, we improve the agreement between this determination and the other based on e^+e^- data. The new results are in better agreement with an old estimation that uses Vector Dominance Model (VMD), and the discrepancy between the SM prediction and the combined results from BNL and FNAL is reduced to 2.1σ at $\mathcal{O}(p^4)$ and 2.3σ at $\mathcal{O}(p^6)$.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary author: MIRANDA HERNANDEZ, Jesus Alejandro (Cinvestav)

Co-author: ROIG GARCÉS, Pablo

Presenter: MIRANDA HERNANDEZ, Jesus Alejandro (Cinvestav)

Session Classification: Session 6: g-2

Track Classification: Tau2021 Abstracts

Contribution ID: **26** Type: **Oral contribution**

Measuring the inclusive cross section of e+ e- annihilation into hadrons at the KEDR experiment

Thursday, 30 September 2021 09:15 (25 minutes)

We present the results on the inclusive cross section of e+e- single
photon annihilation into hadrons in the energy range from 1.84 to 3.72 GeV obtained at the KEDR experiment, which include values of the R measurement in 22 points and of leptonic widths of J/psi and psi(2S) mesons. The results are important or determination of the muon anomalous magnetic moment, the fine structure constant at the Zˆ0 peak, the strong coupling constant as function of energy, and the heavy-quark masses.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary author: TODYSHEV, Korneliy (BINP)

Presenter: TODYSHEV, Korneliy (BINP)

Session Classification: Session 5b: Proton-proton and e+e- colliders

Track Classification: Tau2021 Abstracts

Contribution ID: **27** Type: **Poster contribution**

The tau mass measurement at Belle II

Friday, 1 October 2021 10:50 (2 hours)

Using the Belle II data from the early Phase III data taking, we reconstructed the tau leptons using the 3-prong τ decays. This decay mode is used for the tau-lepton mass measurement using the pseudomass technique developed by the ARGUS experiment. Though this measurement is expected to be limited by statistics and imperfect knowledge of the detector performance, we foresee that Belle II will provide the best tau mass measurement using the pseudomass technique once a larger data set with fully understood and operational detector components is available.

What is your topic?

Precision SM tests

Primary authors: LIBBY, James (Indian Institute of Technology Madras (IN)); RAD, Navid Khandan (Deutsches Elektronen-Synchrotron DESY)

Presenter: RAD, Navid Khandan (Deutsches Elektronen-Synchrotron DESY)

Session Classification: Poster session: Breakout room 1

Track Classification: Tau2021 Abstracts

Contribution ID: **28** Type: **Poster contribution**

Tau lifetime measurement at Belle II

Friday, 1 October 2021 10:50 (2 hours)

The tau-lepton lifetime represents a fundamental parameter within the Standard Model framework, contributing to the test of lepton flavor universality. Exploiting the vertex detector resolution and the tiny beam spot size at the interaction point, Belle II is expected to improve the present tau-lifetime value. The event topology where one tau decays to three charged pions (3-prong) and the other tau goes to a charged rho meson (1-prong), allows to have an higher event yield respect to 3-prong vs 3-prong topology studied by Belle. Therefore, a measurement with a statistical uncertainty competitive with the world average could already be performed with an early Belle II dataset.

What is your topic?

Precision SM tests

Primary authors: LIBBY, James (Indian Institute of Technology Madras (IN)); MONETA, Stefano (INFN - National Institute for Nuclear Physics)

Presenter: MONETA, Stefano (INFN - National Institute for Nuclear Physics)

Session Classification: Poster session: Breakout room 1

Track Classification: Tau2021 Abstracts

Contribution ID: **29** Type: **Oral contribution**

First results and prospects for tau LFV decay tau -> e + alpha(invisible) at Belle II

Tuesday, 28 September 2021 14:35 (20 minutes)

The Belle II experiment at SuperKEKB, an asymmetric e+e- collider, aims at a total integrated luminosity of 50 ab-1, to pursue a rich program of Standard Model and Beyond the Standard Model physics. In its first year of operation, approximately 10 fb-1 were collected at the Upsilon(4S) resonance, with about 100 fb-1 expected by the end of 2020. This results in a sizeable sample of tau pairs, enabling detailed studies of Standard and Beyond the Standard Model measurements, including searches for Lepton Flavor Violating (LFV) decays. One of the first channels where competitive limits are expected is the tau -> e + alpha(invisible) process, where alpha is a Goldstone boson. Here, the currently best limit has been obtained by ARGUS with an integrated luminosity of 475 pb-1. Belle II is expected to be able to improve on this result already with the data recorded. This contribution will discuss selected analysis details and present first preliminary results and the prospects for future larger datasets.

What is your topic?

Lepton universality and flavour violation

Primary authors: LIBBY, James (Indian Institute of Technology Madras (IN)); DE YTA HERNANDEZ, Alejandro (Cinvestav)

Presenter: DE YTA HERNANDEZ, Alejandro (Cinvestav)

Session Classification: Session 2c: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **30** Type: **Oral contribution**

Searches for violation of Lepton Flavor Universality at Belle II

Tuesday, 28 September 2021 12:00 (20 minutes)

Searches for the violation of lepton flavor universality (LFU) are critical precision tests of the standard model (SM) motivated by the growing number of anomalies reported in several measurements in the flavor sector (quarks and leptons) in the last decades. At the Belle II experiment, thanks to the large amount of tau-lepton pairs produced in electron-positron annihilation, it is possible to perform a full set of LFU tests with unprecedented precision using tau-lepton decays. Such an approach allows not only to test the SM to high accuracy, but it provides a unique and complementary way to understand and eventually establish or rule out the new physics nature of the so-called flavor anomalies. We will discuss the status of the ongoing precision tests of LFU in both hadronic and leptonic tau decays and, using both 3x1 and 1x1 decay topologies, we will present the expected sensitivities to LFU parameters.

What is your topic?

Lepton universality and flavour violation

Primary authors: LIBBY, James (Indian Institute of Technology Madras (IN)); MARTINI, Alberto (DESY)

Presenter: MARTINI, Alberto (DESY)

Session Classification: Session 2b: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **31** Type: **Oral contribution**

Search for dark sector candidates coupled with tau leptons at the Belle II experiment

Using about 200 fb-1 of data from electron-positron annihilations, we present searches for dark leptophilic scalars produced in association with tau-pair decays at the Belle II experiment. The goal of this analysis is to discover dark matter or find upper limits of the dark coupling constant as a function of the dark scalar mass.

What is your topic?

Physics beyond the Standard Model

Primary authors: LIBBY, James (Indian Institute of Technology Madras (IN)); BISWAS, Diptaparna (University of Louisville (US))

Presenter: BISWAS, Diptaparna (University of Louisville (US))

Session Classification: Session 2c: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **32** Type: **Oral contribution**

Current status and results of the experiments with CMD-3 detector at VEPP-2000

Thursday, 30 September 2021 08:00 (25 minutes)

The VEPP-2000 e⊠e⊠ collider has been operating at BINP (Novosibirsk) from 2010 in the center-of-mass energy range from 0.3 to 2 GeV. The project luminosity of this machine, exploiting the idea of the round beams, has to amount to 1032cm-2s-1. By now the luminosity up to 5⊠1031cm-2s-1 was achieved. Two detectors, CMD-3 and SND, are running at two interaction regions of the VEPP-2000. Each detector collected about 300 pb-1 in the new run. Considerable statistics was taken within an energy range around the nucleon-antinucleon pair production.
Precise study of the hadrons production in e⊠e⊠ annihilation at low energies provides important information about interactions of light quarks and spectroscopy of their bound states.
Precise measurements of the total hadronic cross section, characterized by the ratio R, is needed for the calculation of the contribution of the hadronic vacuum polarization to the muon anomalous magnetic moment. It should be noted that at present the accuracy of the theoretical calculations of the muon (g-2) via the Standard Model is dominated by the precision of the hadronic contribution while the difference of theoretical and experimental values exceeds three standard deviations.
In this report we will discuss current status and results obtained by the of the CMD-3 experiment.

What is your topic?

Primary author: SHWARTZ, Boris (Budker Institute of Nuclear Physics, Novosibirsk)

Presenter: SHWARTZ, Boris (Budker Institute of Nuclear Physics, Novosibirsk)

Session Classification: Session 5b: Proton-proton and e+e- colliders

Track Classification: Tau2021 Abstracts

Contribution ID: **33** Type: **Oral contribution**

A dispersive estimate of the f0(980) contribution to g-2

Thursday, 30 September 2021 12:10 (20 minutes)

In my talk, I will present a dispersive estimate of the $f_0(980)$ contribution to $(g-2)_\mu$. The performed analysis is a coupled-channel extension of the previous work, where $f_0(500)$ has already been addressed. Important ingredients are $\gamma^*\gamma^* \to \pi\pi$ and $\gamma^*\gamma^* \to K\bar{K}$ S-wave helicity amplitudes which rely on the novel unitarizaiton scheme for studying hadronic interactions beyond the threshold region.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary author: DANILKIN, Igor (Johannes Gutenberg-Universitat Mainz)

Presenter: DANILKIN, Igor (Johannes Gutenberg-Universitat Mainz)

Session Classification: Session 6: g-2

Track Classification: Tau2021 Abstracts

Contribution ID: **34** Type: **Oral contribution**

Precision measurement of the B[Y(3S) ⟶ τ+τ−) / B(Y(3S) ⟶ μ+μ−] ratio at BABAR

Tuesday, 28 September 2021 13:40 (20 minutes)

We report on a precision measurement of the ratio RˆY(3S)_τμ = B[Y(3S) ⟶ τ+τ−] / B[Y(3S) ⟶ μ+μ−] using data collected with the BaBar detector at the SLAC PEP-II e+e− collider. The measurement is based on a 28 fb−1 data sample collected at a center-of-mass energy of 10.355 GeV corresponding to a sample of 122 million Y(3S) mesons. The ratio is measured to be RˆY(3S)_τμ = 0.966 ± 0.008 (stat) ± 0.014 (syst) and is in agreement with the Standard Model prediction of 0.9948 within 2 standard deviations. The uncertainty in RˆY(3S)_τμ is almost an order of magnitude smaller than the only previous measurement.

What is your topic?

Lepton universality and flavour violation

Primary authors: LUSIANI, Alberto (Scuola Normale Superiore and INFN, sezione di Pisa); SIBIDANOV, Alexei (University of Victoria)

Presenter: SIBIDANOV, Alexei (University of Victoria)

Session Classification: Session 2c: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **36** Type: **Oral contribution**

Search for lepton flavor violation in Y(3S)⟶eμ at BABAR

Monday, 27 September 2021 14:00 (20 minutes)

We report on the first search for electron-muon flavor violation in the decay of a b quark and anti-b quark bound state. A search for the LFV decay Y(3S) ⟶ e± μ∓ in a sample of 118 million Y(3S) mesons from 27 fb−1 of data collected with the BABAR detector at the SLAC PEP-II e+e− collider operating with a 10.36 GeV center-of-mass energy revealed no signal. We set a limit on the branching fraction B(Y(3S) ⟶ e± μ∓) < 3.6×10ˆ−7 at 90% CL. This can be interpreted as a limit on the energy scale divided by coupling of relevant new physics (NP) processes of Λ_NP/g_NPˆ2 > 80 TeV.

What is your topic?

Lepton universality and flavour violation

Primary authors: LUSIANI, Alberto (Scuola Normale Superiore and INFN, sezione di Pisa); TASNEEM, Nafisa (University of Victoria)

Presenter: TASNEEM, Nafisa (University of Victoria)

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **38** Type: **Oral contribution**

Study of e+e– annihilation into hadrons at low energies with ISR at BABAR

Thursday, 30 September 2021 08:50 (25 minutes)

The measurement of exclusive e+e– to hadrons processes is a significant part of the physics program of BABAR experiment, aimed to improve the calculation of the hadronic contribution to the muon g–2 and to study the intermediate dynamics of the processes. We present the most recent studies performed on the full data set of about 470 fbˆ–1 collected at the PEP-II e+e– collider at a center-of-mass energy of about 10.6 GeV. In particular, we report the results on e+e– annihilation into three pions and into states with six and seven pions or kaons, in an energy range from production threshold up to about 4 GeV.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary authors: LUSIANI, Alberto (BINP); LUKIN, Peter

Presenter: LUKIN, Peter

Session Classification: Session 5b: Proton-proton and e+e- colliders

Track Classification: Tau2021 Abstracts

Contribution ID: **39** Type: **Oral contribution**

Measurement of PEP-II Beam Polarization with Tau Polarimetry

We present a new technique for measuring beam polarization in an electron-positron collider through the kinematics of tau decay products. The intention is to apply the technique to measure the electron beam polarization in SuperKEKB once a proposed beam polarization upgrade is realized. Having a polarized beam with high luminosity at Belle II opens a new precision electroweak physics program that will yield a weak mixing angle measurement at 10 GeV with higher precision than that obtained at the Z-pole, as well as unprecedented precision in the studies of neutral current universality involving b-quarks, c-quarks, electrons, muons and taus. It also provides unique sensitivity to parity-violating dark sector processes and will improve lepton flavour violating searches. The limiting factor on the precision of some of these future measurements is expected to be the systematic uncertainty in the average beam polarization achieved at the interaction point. We describe how the BaBar dataset has been used to develop the technique and measure the PEP-II electron beam polarization to better than 0.5% systematic uncertainty. As BaBar and Belle II are similar in design, it is expected the technique will yield measurements at least as precise using the Belle II detector.

What is your topic?

Precision SM tests

Primary authors: LUSIANO, Alberto (Scuola Normale Superiore and INFN, sezione di Pisa); MILLER, Caleb (University of Victoria)

Presenter: MILLER, Caleb (University of Victoria)

Session Classification: Session 5a: Proton-proton and e+e- colliders

Track Classification: Tau2021 Abstracts

Contribution ID: **40** Type: **Oral contribution**

Status of the Mu2e experiment

Tuesday, 28 September 2021 10:35 (20 minutes)

The Mu2e experiment will measure the charged lepton flavor violating (CLFV), neutrino-less conversion of a negative muon into an electron in the field of a nucleus. The process has never been observed, but is predicted to occur in many Beyond the Standard Model scenarios at rates within the reach of the Mu2e experiment. The goal of the experiment is to improve the previous upper limit by four orders of magnitude and reach a single event sensitivity of 3×10^{-17}. Mu2e will operate in a dedicated hall at the Muon Campus of Fermilab; installation has already begun, and detector and beamline commissioning are expected to begin in 2023. A number of years of running will be required to reach our target sensitivity. Research and development tasks have already begun for a proposed extension called Mu2e-II.

What is your topic?

Lepton universality and flavour violation

Primary author: TRAN, Nam (Boston University)

Presenter: TRAN, Nam (Boston University)

Session Classification: Session 2b: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **41** Type: **Oral contribution**

Status of the MUonE experiment

Friday, 1 October 2021 14:50 (20 minutes)

The latest measurement of the muon g-2, recently announced at Fermilab, exhibits a 4.2σ discrepancy from the currently accepted Standard Model prediction. The leading hadronic contribution a_μ^{HLO} represents the main source of uncertainty on the theoretical value, and is traditionally determined by a data-driven dispersive approach. In contrast, a recent evaluation of a_μ^{HLO} based on lattice QCD weakens the discrepancy between theory and experiment to 1.5σ. Therefore, an independent crosscheck of a_μ^{HLO} is required to solve this tension and consolidate the theoretical prediction.
The MUonE experiment proposes a novel approach to determine a_μ^{HLO} by measuring the running of the electromagnetic coupling constant in the space-like region, via $\mu - e$ elastic scattering. The measurement will be performed by scattering a 160 GeV muon beam, currently available at CERN's North Area, on the atomic electrons of a low-Z target. A Test Run on a reduced detector is planned in 2021-2022, to validate this proposal. The status of the experiment in view of the Test Run will be presented.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary author: PILATO, Riccardo Nunzio (Universita & INFN Pisa (IT))

Presenter: PILATO, Riccardo Nunzio (Universita & INFN Pisa (IT))

Session Classification: Session 7: Future directions

Track Classification: Tau2021 Abstracts

Contribution ID: **42** Type: **Oral contribution**

Perturbative heavy quark contributions to the anomalous magnetic moment of the muon

Thursday, 30 September 2021 14:55 (20 minutes)

We discuss a method for calculating the heavy quark vacuum polarisation contribution to the muon anomalous magnetic moment, a_μ, using perturbative QCD up to $calO\left(\alpha_s^3\right)$. This approach is independent of e^+e^- cross-section data allowing a fully theoretical evaluation of these contributions. This method confirms an existing result at lower orders in α_s and we state a new explicit analytic formula which includes terms up to $calO\left(\alpha_s^3\right)$. Numerically the charm quark contribution to a_μ is found to be $a_\mu^c = (14.5 \pm 0.2) \times 10^{-10}$ and the bottom contribution is $a_\mu^b = (0.302 \pm 0.002) \times 10^{-10}$. Our uncertainty estimates include both parametric uncertainties, arising from $\hat{m}_q(\hat{m}_q)$ and $\alpha_s(\hat{m}_q)$, and theoretical uncertainties in the perturbative expansion. Comparison is then made between these results and those from alternative approaches such as, lattice QCD, or based on a dispersion relation and cross-section data.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary authors: SPIESBERGER, Hubert (Mainz University); ERLER, Jens; KENNEDY, Philip David (Johannes Gutenberg Universitaet Mainz (DE))

Presenter: KENNEDY, Philip David (Johannes Gutenberg Universitaet Mainz (DE))

Session Classification: Session 6: g-2

Track Classification: Tau2021 Abstracts

Contribution ID: **43** Type: **Oral contribution**

Reconciling the FOPT and CIPT predictions for the hadronic tau decay rate

Wednesday, 29 September 2021 11:00 (20 minutes)

The discrepancy between the FOPT and CIPT predictions for the hadronic tau decay rate (and other spectral function moments) has been a subject of intense investigations for many years and constitutes a major theoretical uncertainty for strong coupling determinations from hadronic tau decay spectral data. We demonstrate that the discrepancy may be understood since the Borel representations (which have been assumed to be identical for both approaches until now) are not equivalent in the presence of infrared renormalons. The difference, called asymptotic separation, can be calculated analytically for any concrete model of the Borel transform of the euclidean Adler function. Theoretically this implies that the OPE condensate corrections are, as a matter of principle, different for the FOPT and CIPT approach, and one can show that only the OPE corrections within FOPT have the standard form assumed in previous phenomenological analyses. This opens up the possibility that OPE predictions based on FOPT and CIPT perturbation theory can be reconciled reducing the theoretical uncertainty in future strong coupling determinations. In practice, the asymptotic separation is only sizeable (and thus phenomenologically relevant) if the known perturbative coefficients of the Adler function are dominated by the gluon condensate renormalon. The analytic knowledge of the asymptotic separation allows the dedicated construction of spectral function moments, where the discrepancy between the FOPT and CIPT predictions is suppressed, and it predicts that FOPT and CIPT lead to compatible predictions for any moment in the presence of infrared subtractions in the loop computations. In this talk we present why the Borel representations of the FOPT and CIPT series in general differ, we discuss the conceptual aspects of the asymptotic separation, and we demonstrate that the asymptotic separation correctly describes the different large-order asymptotic behaviour of the FOPT and CIPT spectral function moments for concrete Borel models. We also show first results for FOPT and CIPT spectral function moment predictions based on infrared-subtracted perturbation theory.

What is your topic?

Hadronic decays

Primary author: HOANG, Andre (University of Vienna)

Co-authors: BENITEZ-RATHGEB, Miguel (University of Vienna); BOITO, Diogo (Universidade de São Paulo); REGNER, Christoph (University of Vienna); JAMIN, Matthias

Presenter: HOANG, Andre (University of Vienna)

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **44** Type: **Oral contribution**

New results on the use of the operator product expansion in finite-energy sum rules for light-quark correlators

Wednesday, 29 September 2021 11:40 (20 minutes)

Tau-based finite-energy sum rule (FESR) analyses often assume that scales s_0˜m_tauˆ2 are large enough that (i) integrated duality violations (DVs) can be neglected, and (ii) contributions from non-perturbative OPE condensates of dimension D scale as ˜(Lambda_{QCD}/m_tau)ˆD, allowing the OPE series to be truncated at low dimension. The latter assumption is not true in general since the OPE series is not convergent, while the former is open to question given experimental results for the electromagnetic, I=1 vector (V), I=1 axial vector (A) and I=1 V+A current spectral functions, which show clear DV oscillations with amplitudes comparable in size to the corresponding alpha_s-dependent perturbative contributions at hadronic invariant mass-squareds s˜2-3 GeVˆ2. In this talk, we (1) introduce, and illustrate the utility of, a new strategy for assessing the numerical relevance of omitted higher-D OPE and/or residual DV contributions, (2) use large N_c and analyticity arguments to derive the expected large-s form for DV contribution to the I=1, V spectral function, under the assumption that the leading behavior is Regge-like at large s, and (3) use this form to explore the level of suppression of residual integrated DV contributions in I=1, V channel FESRs.

What is your topic?

Hadronic decays

Primary authors: BOITO, Diogo (Universidade de São Paulo); GOLTERMAN, Maarten (San Francisco State University); MALTMAN, Kim (York University); PERIS, santiago (Univ. Autonoma de Barcelona)

Presenter: GOLTERMAN, Maarten (San Francisco State University)

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **45** Type: **Oral contribution**

Feasibility of tau g-2 measurements in ultra-peripheral collisions of heavy ions

Friday, 1 October 2021 09:15 (20 minutes)

Anomalous magnetic moment of the tau lepton, $a_\tau = (g_\tau - 2)/2$, is a sensitive probe of new physics but is extremely difficult to measure precisely in contrast to electron and muon moments. The best experimental limits were set by the DELPHI collaboration more than 15 years ago in the studies of the ditau production in the $e^+e^- \to e^+e^-\tau^+\tau^-$ process. Ultra-peripheral collisions (UPC) of heavy ions at the LHC may provide a unique opportunity to improve the a_τ constraints in the studies of $\mathrm{Pb} + \mathrm{Pb} \to \mathrm{Pb} + \mathrm{Pb}\tau^+\tau^-$ process. We review recent proposals to study ditau production via semi-leptonic tau decays in Pb-Pb UPC with the available ATLAS and CMS data and discuss feasibility to explore this process down to low transverse momenta of decay leptons with ALICE and LHCb detectors.

What is your topic?

Primary authors: KRYSHEN, Evgeny (NRC Kurchatov Institute PNPI (RU)); BURMASOV, Nazar (NRC Kurchatov Institute PNPI (RU)); BUHLER, Paul Alois (Stefan Meyer Institute for Subatomic Physics (SMI), Austrian Academy of Sciences (AT)); LAVICKA, Roman (Czech Technical University in Prague (CZ))

Presenter: KRYSHEN, Evgeny (NRC Kurchatov Institute PNPI (RU))

Session Classification: Session 7: Future directions

Track Classification: Tau2021 Abstracts

Contribution ID: **46** Type: **Oral contribution**

Tau (and Muon) Airshower on Earth (and Space)

Wednesday, 29 September 2021 15:10 (20 minutes)

The neutrino astronomy is polluted by the atmospheric noise up TeVs energy. Anyway Icecube claimed an astrophysical signature (just above a few tens TeV energy), since the 2013. They discovered a sudden increase in the cascade event rate, surprisingly more abundant than the previous TeVs muon neutrino tracks. Such a flavor switch might be also mimic by an atmospheric charm rising presence. Absent correlations with optical, X, gamma sky of Icecube events it is still puzzling. Nevertheless the eventual tau neutrino appearence, almost absent in any atmospheric noise,(even the charm one), should confirm a neutrino astronomy above PeVs energy. The tau signals are expected by flavor mixing in cosmic flights; they may offer a definitive fingerprint of the astrophysical neutrino nature. These tau neutrino ruling role might rise in ice (IceCube) or water (Antares) as a double bang (first interaction, second tau decay cascades) or by a tau airshower: an internal tau neutrino interaction in the rock of a mountain or of the Earth crust and the later tau decay outside, while in flight in air. The physics of tau airshowers had been noted since 1999 and became today the main road map in widest experimental projects. We discuss and update the tau airshower signature from Earth and planets,by array on top Mountains, Balloons or satellites. Very new ad hoc instruments and novel theoretical expectation will be shown for the first time.

What is your topic?

Future opportunities in Tau Physics

Primary authors: Prof. FARGION, Daniele (Rome University); KHLOPOV, Maxim

Presenter: Prof. FARGION, Daniele (Rome University)

Session Classification: Session 4a: Neutrinos and Dark Matter

Track Classification: Tau2021 Abstracts

Contribution ID: **47** Type: **Poster contribution**

Dark matter by sterile neutrino and the new Z burst road map

Friday, 1 October 2021 10:50 (2 hours)

The presence of new relic sterile neutrinos at eV energy mass, their clustering as dark warm matter halos, their target for ZeV UHE neutrinos, might lead to UHECR uncorrelated signals with nearby sources, overcoming the GZK cut off. The ability of sterile neutrinos to solve at once different puzzle of theoretical physics and astrophysics will be shown in details.

What is your topic?

Neutrino Physics

Primary authors: FARGION, Daniele (Rome University); LUCENTINI DE SANCTIS, Pier Giorgio

Presenter: FARGION, Daniele (Rome University)

Session Classification: Poster session: Breakout room 4

Track Classification: Tau2021 Abstracts

Contribution ID: **48** Type: **Oral contribution**

Charged-lepton-flavor violation from Lorentz violation

Monday, 27 September 2021 13:05 (20 minutes)

Lorentz invariance is among the most fundamental and tested symmetries in physics. Measurements from over two decades of experiments place stringent constraints on many Lorentz-violating interactions affecting the particles of the Standard Model. However, a large class of interactions inducing charged-lepton-flavor violation remains largely unexamined. In this talk, we discuss dominant Lorentz- and CPT-violating operators initiating flavor-changing tau and muon decays. Branching-ratio measurements from the MEG and BaBar collaborations allow several first constraints to be placed on flavor off-diagonal tau, muon, and electron coefficients for Lorentz violation. The outlook for improved constraints in future experiments is also discussed.

What is your topic?

Physics beyond the Standard Model

Primary author: Dr SHERRILL, Nathaniel Lawrence (University of Sussex)

Presenter: Dr SHERRILL, Nathaniel Lawrence (University of Sussex)

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **49** Type: **Poster contribution**

Searching for lepton flavor violating interactions at future electron-positron colliders

Friday, 1 October 2021 10:50 (2 hours)

Lepton flavor violating interactions are absent in the standard model but are expected in various beyond-standard models. In this work, the potential of the future circular electron-positron collider to probe the four-fermion lepton flavor couplings via the e-e+ ⟶ eτ process is revisited by means of an effective field theory approach. We provide constraints at 95% C.L. on the dimension-six Wilson coefficients including major sources of background processes and considering realistic detector effects at four expected operation energies, 157.5, 162.5, 240, and 365 GeV, according to their corresponding integrated luminosities. We demonstrate that the statistical combination of the results from four center-of-mass energies improves the sensitivity to the lepton flavor violation couplings significantly. We compare the results with the prospects from the Belle II Collaboration with 50 /ab and other studies at electron-positron colliders.

What is your topic?

Lepton universality and flavour violation

Primary authors: Prof. MOHAMMADI NAJAFABADI, Mojtaba (Institute for Research in Fundamental Sciences (IR)); Dr JAFARI, Reza (Institute for Research in Fundamental Sciences (IPM)); Dr TIZCHANG, Seddigheh (Institute for Research in Fundamental Sciences (IR)); Dr ETESAMI, Seyed Mohsen (Institute for Research in Fundamental Sciences (IR))

Presenter: Dr JAFARI, Reza (Institute for Research in Fundamental Sciences (IPM))

Session Classification: Poster session: Breakout room 6

Track Classification: Tau2021 Abstracts

Contribution ID: **54** Type: **Oral contribution**

Neutrino oscillation results from the MINOS/MINOS+ Experiment

Thursday, 30 September 2021 08:45 (20 minutes)

The MINOS/MINOS+ experiment, which consisted of two magnetised steel-scintillator tracking calorimeters, observed neutrino and antineutrino flavour change over a baseline of 735 km in the NuMI beam from Fermilab.
With 11 years of collected data in configurations with peak energies at 3 GeV and 6 GeV, the experiment, which has performed precision measurements of neutrino oscillation parameters and searches for new physics in the neutrino sector, it is now moving toward the final results with complete dataset.
This talk will present the latest update on three-flavour oscillations parameters and sterile neutrino searches from the MINOS/MINOS+ experiment.

What is your topic?

Neutrino Physics

Primary author: GERMANI, Stefano (Perugia University)

Presenter: GERMANI, Stefano (Perugia University)

Session Classification: Session 4b: Neutrino and Dark Matter

Track Classification: Tau2021 Abstracts

Contribution ID: **55** Type: **Oral contribution**

Breaking of Standard Model symmetries with the tau lepton

Monday, 27 September 2021 10:35 (25 minutes)

I will provide a short overview on deviations of the Standard Model symmetries within tau lepton processes. I will consider from dynamic dependent symmetries such as universality to the breaking of global symmetries, namely lepton flavor, lepton number or baryon number violations.

What is your topic?

Lepton universality and flavour violation

Primary author: PORTOLES, Jorge (Instituto de Fisica Corpuscular)

Presenter: PORTOLES, Jorge (Instituto de Fisica Corpuscular)

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **56** Type: **Poster contribution**

Exploring Neutrino Masses and Mixing in the Seesaw Model with $L_e - L_\tau$ Gauged Symmetry

Friday, 1 October 2021 10:50 (2 hours)

In the poster, we have taken $L_e - L_\tau$ gauge symmetry to study neutrino phenomenology in the framework of type-(I+II) seesaw mechanism. In the model, three heavy right-handed neutrinos, a scalar singlet, and one scalar triplet are added to the Standard Model. As a result, the active neutrino-mass matrix has a two-zero A_1 texture which helps explain neutrino oscillation parameters like $\theta_{13}, \theta_{23}.\theta_{12}$, the sum of active neutrino masses etc. The model also explains neutrinoless double β decay and lepton flavor violation with reasonable accuracy. The branching ratio of $\tau \to e\gamma$ and $\tau \to \mu\bar{\mu}\mu$ also stay well below the experimental upper bound.

What is your topic?

Neutrino Physics

Primary author: PANDA, Papia (University of Hyderabad)

Co-authors: Mr BEHERA, Mitesh Kumar (University of Hyderabad); Ms MISHRA, Priya (University of Hyderabad); Mrs MOHANTA, Rukmani (University of Hyderabad); Mr SINGIRALA, Shivaramakrishna (University of Hyderabad)

Presenter: PANDA, Papia (University of Hyderabad)

Session Classification: Poster session: Breakout room 4

Track Classification: Tau2021 Abstracts

Contribution ID: **57** Type: **not specified**

The Scattering and Neutrino Detector at the LHC

Thursday, 30 September 2021 09:25 (20 minutes)

SND@LHC is a compact and stand-alone experiment to perform measurements with neutrinos produced at the LHC in a hitherto unexplored pseudo-rapidity region of 7.2 < 𝜂 < 8.6, complementary to all the other experiments at the LHC. The experiment is to be located 480 m downstream of IP1 in the unused TI18 tunnel. The detector is composed of a hybrid system based on an 800 kg target mass of tungsten plates, interleaved with emulsion and electronic trackers, followed downstream by a calorimeter and a muon system. The configuration allows efficiently distinguishing between all three neutrino flavours, opening a unique opportunity to probe physics of heavy flavour production at the LHC in the region that is not accessible to ATLAS, CMS and LHCb. This region is of particular interest also for future circular colliders and for predictions of very high-energy atmospheric neutrinos. The detector concept is also well suited to searching for Feebly Interacting Particles via signatures of scattering in the detector target. The first phase aims at operating the detector throughout LHC Run 3 to collect a total of 150 fb−1. The experiment was recently approved by the Research Board at CERN. A new era of collider neutrino physics is just starting.

What is your topic?

Neutrino Physics

Primary author: NAVARRIA, Francesco (Universita e INFN, Bologna (IT))

Presenter: NAVARRIA, Francesco (Universita e INFN, Bologna (IT))

Session Classification: Session 4b: Neutrino and Dark Matter

Track Classification: Tau2021 Abstracts

Contribution ID: **58** Type: **Oral contribution**

Monte Carlo Event Generator updates with tau pair events at Belle II energies

Wednesday, 29 September 2021 14:45 (20 minutes)

The Monte Carlo for lepton pair production and tau decays consist of KKMC for lepton pair production, Tauola for tau lepton decays and Photos for radiative corrections in decays.

An effort for adaptation of the system for precision data to be collected at Belle II experiment lead to extension of phase space generation modules both in Photos and Tauola to enable decays and/or radiative corrections with emission of additional light lepton pairs. The phase-space and matrix element parts are separated, that is why extension is useful for processes where lepton pair is produced through narrow resonances, like dark photon or dark scalar candidates.

List of tau decays is enriched with multitude of exotic decay channels useful for new physics searches. The hadronic currents parameterizations of main decay channels is prepared for basic simulation in the experiment. The basis for future work on precise fits of hadronic currents including Machine Learning is retained, but development of necessary software solutions is left for the forthcoming years.

Programs are now available in stand-alone format or through the Basf2 system of Belle II software as well.

What is your topic?

Primary authors: BANERJEE, Swagato (University of Louisville (US)); WAS, Zbigniew Andrzej (Polish Academy of Sciences (PL))

Presenter: WAS, Zbigniew Andrzej (Polish Academy of Sciences (PL))

Session Classification: Session 5a: Proton-proton and e+e- colliders

Track Classification: Tau2021 Abstracts

Contribution ID: **59** Type: **Oral contribution**

⊠⟶⊠⊠⊠ at a rate of one out of 10ˆ14 tau decays?

Monday, 27 September 2021 13:40 (20 minutes)

We present in full analytic form the partial widths for the lepton flavor violating decays $L^{\pm} \to \ell^{\pm}\ell'^{+}\ell'^{-}$, with $L = \tau, \mu$ and $\ell^{(\prime)} = \mu, e$, mediated by neutrino oscillations in the one-loop diagrams. Compared to the first result by Petcov:1976ff, which was obtained in the nonphysical zero momentum limit $\mathcal{P} \ll m_\nu \ll M_W$, we retain full dependence on external scales $\mathcal{P}$ and determine the branching ratios in the physical limit $m_\nu \ll \mathcal{P} \ll M_W$. We show that in this limit the conclusion by Pham:1998fq that $\tau \to \ell\ell'\ell'$ could be as large as 10^{-14} is flawed. In this talk we will describe the details of our calculation, present our results, and motivate some of the peculiarities of this calculation from the viewpoint of effective field theory.

What is your topic?

Lepton universality and flavour violation

Primary authors: BLACKSTONE, Patrick (Indiana University); FAEL, Matteo (KIT Karlsruhe); PASSEMAR, Emilie (Indiana University)

Presenter: BLACKSTONE, Patrick (Indiana University)

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **60** Type: **Oral contribution**

Resonances in hadronic three-body decays of

Wednesday, 29 September 2021 10:40 (20 minutes)

Hadronic decays of τ lepton provide a unique possibility to study dynamics in a three-body hadronic system. Particularly, $\tau^- \to \pi^+\pi^-\pi^-\nu$ and $\tau^- \to K^-K^+\pi^-\nu$ gives a clear sample of the $a_1(1260)$ decays. While the pionic system is dominated by the ρ intermediate resonance and the system with kaons shows mostly K^* resonances, the two final states are strongly coupled via the scalar sector and $\pi^+\pi^- \leftrightarrow K^+K^-$ transitions. In the talk, I will discuss the consequences of this coupling as a modification of the resonance lineshapes and an appearance of the observable triangle-singularity cusps.

What is your topic?

Hadronic decays

Primary author: MIKHASENKO, Mikhail (University of Bonn (DE))

Presenter: MIKHASENKO, Mikhail (University of Bonn (DE))

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **61** Type: **Oral contribution**

Measurement of τ lepton mass at BESIII

Monday, 27 September 2021 09:05 (25 minutes)

τ lepton is a fundamental particle in the standard model, and its mass is a very sensitive quantity in testing the lepton-universality.
BESIII gave the most precise τ mass value in a single measurement in 2014, but the accuracy is still much lower than those of electron and muon.
In order to improve the accuracy of τ mass measurement, more than 130 pb-1 τ mass scan data were collected in April 2018, and the uncertainty of mτis expected to be reduced as the level of 100 keV.

What is your topic?

Precision SM tests

Primary author: LUO, Tao (Fudan University)

Presenter: LUO, Tao (Fudan University)

Session Classification: Session 1: Properties of the tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **62** Type: **Oral contribution**

Measuring hadronic corrections to the muon g-2 at BESIII

Thursday, 30 September 2021 11:15 (20 minutes)

The recent Fermilab result has confirmed the long standing discrepancy between the direct measurement and the Standard Model (SM) prediction of the anomalous magnetic moment of the muon aμ=(gμ-2)/2. The possibility to improve the SM prediction using data-driven approaches has motivated the BESIII collaboration to embark on a dedicated experimental program. The high statistics data samples collected with the BESIII experiment in e+e- collisions in the tau-charm region are analyzed exploiting the initial state radiation technique in order to measure hadronic cross sections needed in the dispersive analysis of the hadronic vacuum polarization contribution to aμ. The same data enable investigations of two-photon collisions. These allow the determination of the momentum dependence of transition form factors of light mesons in the relevant kinematic region, which dominate the hadronic Light-by-Light contribution to aμ. The current status and ongoing investigations will be discussed.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary authors: LIU, Beijiang; DENIG, Achim (Univ. Mainz)

Presenters: DENIG, Achim (Univ. Mainz); DENIG, Achim (Universität Mainz)

Session Classification: Session 6: g-2

Track Classification: Tau2021 Abstracts

Contribution ID: **63** Type: **Oral contribution**

Search for charged lepton flavor violation at BESIII

Tuesday, 28 September 2021 08:00 (25 minutes)

The charged Lepton Flavor Violation (cLFV) is highly suppressed in the Standard Model (SM) by the finite but tiny neutrino masses. Its branching fraction is calculated to be at a negligible level and so far none has been found in all the historical experiments, including searches in lepton (μ,τ) decays, pseudoscalar meson (K,π) decays, vector meson (ϕ,J/ψ,Υ) decays, Higgs decays etc. This talk reviews the charged Lepton Flavor Violation process searches at BESIII experiement. Besides the result for the decay of $J/\psi \to e\mu$ published earlier, the decay of Jpsi-> e tau, with tau->pi- pi0 nv_tau is searched with the 10 Billion J/ψ events
collected by BESIII and the result improves the previously published limit by two orders of magnitude. Future perspectives will also be discussed.

What is your topic?

Lepton universality and flavour violation

Primary author: WANG, Dayong (Peking University)

Presenter: WANG, Dayong (Peking University)

Session Classification: Session 2b: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **64** Type: **Oral contribution**

Exclusive hadronic tau decays within and beyond the Standard Model

Wednesday, 29 September 2021 08:00 (25 minutes)

After a brief review of semileptonic tau decays in the Standard Model, I will discuss the usefulness of these channels in several new physics searches.

What is your topic?

Hadronic decays

Primary author: ROIG GARCÉS, Pablo (Cinvestav, Mexico)

Presenter: ROIG GARCÉS, Pablo (Cinvestav, Mexico)

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **65** Type: **Oral contribution**

Radiative correccions to ⊠⟶⊠⊠ and its consequences for tests of the SM and New Physics

Wednesday, 29 September 2021 08:25 (20 minutes)

The calculation of radiative corrections (radcorr) in semileptonic decays requires a good description of photon-hadron interactions at all energies. We present a calculation of the radcorr to $\tau^- \to P^-\nu_\tau$ decays (P a pseudoscalar meson) where photon-hadron form factors obeys the expected QCD constraints at very small and very large virtual photon momenta. The implications for tests of lepton flavor universality, CKM unitarity and new physics constraints are discussed.

What is your topic?

Precision SM tests

Primary authors: LOPEZ CASTRO, Gabriel (Cinvestav, Mexico); HERNANDEZ-TOMÉ, Gerardo (Cinvestav, Mexico); ROSELL, Ignasi (Universidad Cardenal Herrera-CEU, España); ARROYO-UREÑA, Marco (Cinvestav, Mexico); ROIG, Pablo (Cinvestav, Mexico)

Presenter: LOPEZ CASTRO, Gabriel (Cinvestav, Mexico)

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **66** Type: **Oral contribution**

The pseudoscalar poles contributions to the muon g-2

Thursday, 30 September 2021 11:50 (20 minutes)

The recent result from the Fermilab experiment on the anomalous magnetic moment of the muon ($g-2$) has revived the interest on this observable, that exhibits an interesting —and persistent— 4σ discrepancy with respect to its theoretical value.
Future runs at Fermilab will help deciphering the nature of such discrepancy, but that will require a commensurate improvement on the theory side, completely dominated by hadronic uncertainties. In this talk, we revise the main piece of the hadronic light-by-light contribution to the anomalous magnetic moment of the muon: the pseudoscalar poles. To that purpose, we use the framework of Padé and Canterbury approximants, that allows to analyze and to describe the relevant transition form factors entering the calculation in a model-independent and data-driven fashion.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary authors: SANCHEZ PUERTAS, Pablo (IFAE); MASJUAN QUERALT, Pere (IFAE)

Presenter: SANCHEZ PUERTAS, Pablo (IFAE)

Session Classification: Session 6: g-2

Track Classification: Tau2021 Abstracts

Contribution ID: **67** Type: **Poster contribution**

Non zero θ_13 and δ_CP in a realistic neutrino mass model with discrete A_4 family symmetry and perturbation to Tri-bimaximal mixing via z_2 ×z_2 invariant perturbation in the neutrino sector.

Friday, 1 October 2021 10:50 (2 hours)

In this work, a flavour theory, of a neutrino mass model implementing an A_4 family symmetry is proposed. This scheme provides a simple way to derive tribimaximal mixing in the neutrino sector via spontaneous breaking of A_4 symmetric model leading to acceptable values of θ_{13} and maximal CP violation. A $z_2 \times z_2$ invariant perturbations in this model is introduced in the neutrino sector which leads to testable predictions of θ_{13} and CP violation. By changing the magnitudes of perturbations in neutrino sector, one can generate viable values of θ_{13} and neutrino oscillation parameters.

What is your topic?

Physics beyond the Standard Model

Primary author: GHOSH, Gayatri (Physics Department Gauhati University)

Presenter: GHOSH, Gayatri (Physics Department Gauhati University)

Session Classification: Poster session: Breakout room 3

Track Classification: Tau2021 Abstracts

Contribution ID: **68** Type: **Oral contribution**

Muon g-2/EDM experiment at J-PARC

Friday, 1 October 2021 08:50 (25 minutes)

The muon g-2 experiment at J-PARC is under preparation and targeted to measure the muon anomalous magnetic moment with the precision of 450 ppb and muon electric dipole moment with 1.5e-21 e cm at its first stage,
thus contributing to investigation of discrepancy between Standard Model prediction and the current world average of g-2. The latter is dominated by two similar experiments E821 BNL and E989 FNAL, while we suggest a novel approach: pulsed primary proton beam provides surface muons, which are diffused through a silica aerogel target forming thermolised muonium atoms. They are laser ionised and re-accelerated by a multi-stage linac up to 300 MeV/c before spiral injection into the storage uniform 3 T MRI-like magnet volume at the stable orbit in the absence of E-field. The silicon strip detector placed inside the magnet measures decayed positron parameters used in data analysis.
We report the experimental approach, current status, and future prospects.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary author: RAZUVAEV, Georgiy (BINP)

Presenter: RAZUVAEV, Georgiy (BINP)

Session Classification: Session 7: Future directions

Track Classification: Tau2021 Abstracts

Contribution ID: **71** Type: **Oral contribution**

The strong coupling from an improved tau vector isovector spectral function

Wednesday, 29 September 2021 11:20 (20 minutes)

We use a new, more precise, non-strange, inclusive vector isovector spectral function to determine the strong coupling at the tau mass scale employing finite energy sum rules. The new spectral function is obtained from a combination of (i) ALEPH and OPAL results for the 2 pion and 4 pion tau decay channels, (ii) recent BaBar results for the tau K Kbar decay distribution, and (iii) estimates of the contributions from other hadronic tau decay modes from recent electroproduction data, related using CVC, for subleading contributions. This new inclusive spectral function is fully data based and does not rely on Monte Carlo simulated data. Using the fixed-order perturbation theory (FOPT) prescription, we find for the strong coupling at the tau mass the value 0.3077(75), which corresponds to the five-flavor result 0.1171(10) at the Z mass. Additional experimental input on the dominant 2 pion and 4 pion tau decay modes would allow for further improvements to the current analysis.

What is your topic?

Hadronic decays

Primary authors: BOITO, Diogo (Universidade de São Paulo); MALTMAN, Kim (York University); GOLTERMAN, Maarten (San Francisco State University); RODRIGUES, Marcus (Universidade de São Paulo); SCHAAF, Wilder (San Francisco State University); PERIS, santiago (Univ. Autonoma de Barcelona)

Presenter: BOITO, Diogo (Universidade de São Paulo)

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **72** Type: **Oral contribution**

Theoretical perspectives on dark matter

Wednesday, 29 September 2021 14:40 (30 minutes)

This talk will provide of overview on searches for particle dark matter, including direct, indirect, and accelerator searches that cover different energy and mass scales. I will highlight the future directions in particle dark matter searches, and how experiments can be complementary in maximizing the sensitivity to a broad range of viable models.

What is your topic?

Primary author: STRIGARI, Louis (Texas A&M)

Presenter: STRIGARI, Louis (Texas A&M)

Session Classification: Session 4a: Neutrinos and Dark Matter

Track Classification: Tau2021 Abstracts

Contribution ID: **73** Type: **Oral contribution**

Lepton flavor violating tau decays with a light gauge boson

Tuesday, 28 September 2021 14:15 (20 minutes)

$L \to \ell\chi$ decays (with χ a boson associated to this lepton flavor violation, LFV) have not been described satisfactorily so far for light spin-one m_χ. In particular, observables exhibited an unphysical divergence in the limit of massless χ, associated to its longitudinal polarizations. Based on gauge symmetry, we show how to correct this issue. To this end, we consider two general models realizing the effective field theory description. Being the LFV generated either at tree level or at one loop, these processes are well behaved for light m_χ. We discuss the most salient phenomenological consequences and its relevance in the searches for this kind of decays.

What is your topic?

Lepton universality and flavour violation

Primary author: MARÍN, Marcela (Cinvestav)

Co-authors: Dr IBARRA, Alejandro (Technische Universität München); ROIG GARCÉS, Pablo

Presenter: MARÍN, Marcela (Cinvestav)

Session Classification: Session 2c: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **74** Type: **Oral contribution**

A data-directed search for electron-muon asymmetry in events containing taus

Tuesday, 28 September 2021 13:00 (20 minutes)

Lepton flavor is not an exact symmetry of nature as indicated by neutrino oscillations. Moreover, the hints for discrepancy between the measured data and the theoretical prediction of numerous observables related to the ratio between events containing electrons to those containing muons, e.g. R_D(*) and R_K, points towards new physics exhibiting lepton non-universality. These examples also demonstrate the role that e/mu asymmetry could play in search for new physics. In this talk, I will present a novel, data-directed paradigm (DDP) to search for new physics. The DDP is complimentary to traditional theory-directed searches that follow the blind-analysis paradigm and could open the door to regions in the data that will otherwise remain unexplored. While the paradigm is generic, I will show that it can be effectively exploited in search for e/mu asymmetries and in particular in events containing in addition to the light lepton also tau leptons.

What is your topic?

Lepton universality and flavour violation

Primary author: BRESSLER, Shikma (Weizmann Institute of Science (IL))

Presenter: BRESSLER, Shikma (Weizmann Institute of Science (IL))

Session Classification: Session 2c: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **75** Type: **Oral contribution**

Precision measurements on dipole moments of the tau and hadronic multi-body final states

Wednesday, 29 September 2021 10:20 (20 minutes)

In the framework of precision experiments, the search for electric dipole moments and the precise determination of magnetic dipole moments (g-2)
have since long be of prime interest. Tau leptons play a particular role owing to the large mass as compared to the electron and muon.
The precision of these measurements is, at the one hand, dominated by radiative corrections, which govern the production of tau leptons in e+e- colliders.
The search for electric dipole moments on the other hand relies on the determination of spin correlations of the tau pairs and thus on the analyzing
power of its decay. Three body hadronic decays play a significant role but require correct modeling. They can only be studied precisely through partial wave analyses, which
may reveal even small contributions of partial waves, mostly still ignored today. We will enlighten on both the precision experiments and the technique of analyzing three body hadronic decays of tau leptons
and demonstrate the impact of precision.

What is your topic?

Hadronic decays

Primary authors: Prof. PAUL, Stephan (Technische Universitaet Muenchen (DE)); Dr KRINNER, Fabian (Max Planck Institute for Physics, Munich)

Presenter: Dr KRINNER, Fabian (Max Planck Institute for Physics, Munich)

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **76** Type: **Poster contribution**

T violating effects in $\nu_\tau(\bar{\nu}_\tau)$−nucleon quasielastic scattering

Friday, 1 October 2021 10:50 (2 hours)

The future experiments like SHiP, DsTau, and DUNE are proposed to study the properties and the production cross sections of the τ lepton and its corresponding neutrino (ν_τ). Recently we have performed [1,2,3], a theoretical study of the production cross section as well as the polarization observables of the τ lepton and the final nucleon/hyperon produced in the quasielastic $\nu_\tau(\bar{\nu}_\tau) - N$ scattering in the few GeV energy region relevant to the above experiments. The τ lepton produced in $\nu_\tau - N$ scattering decays to leptons and pions through the leptonic and hadronic decay modes. In this energy region, the production cross section of τ, its decay and the characteristics of the decay products depend significantly on the τ polarization. The production cross section and polarization of τ lepton are calculated using weak nucleon form factors which are determined using various symmetry properties of the weak currents in the vector and axial vector sectors, assuming G and T invariances. We have studied the effect of G and T violating terms in the transition matrix element on the cross sections and the τ polarization in quasielastic $\nu_\tau(\bar{\nu}_\tau) - N$ scattering induced by $\Delta S = 0$ and $\Delta S = 1$ weak currents. In the case of $\Delta S = 1$ reactions, we have also studied the SU(3) symmetry breaking effects.

[1] A. Fatima, M. Sajjad Athar and S. K. Singh, Phys. Rev. D 102, 113009 (2020).
[2] A. Fatima, M. Sajjad Athar and S. K. Singh, [arXiv:2106.14590 [hep-ph]].
[3] A. Fatima, M. Sajjad Athar and S. K. Singh, Phys. Rev. D 98, 033005 (2018).

What is your topic?

CP and T violation

Primary author: FATIMA, Atika (Aligarh Muslim University)

Co-authors: Prof. SAJJAD ATHAR, M. (Aligarh Muslim University); Prof. SINGH, S. K. (Aligarh Muslim University)

Presenter: FATIMA, Atika (Aligarh Muslim University)

Session Classification: Poster session: Breakout room 7

Track Classification: Tau2021 Abstracts

Contribution ID: **77** Type: **Oral contribution**

Probing charged lepton flavor violation with axion-like particles at Belle II

Tuesday, 28 September 2021 09:15 (20 minutes)

We study charged lepton flavor violation associated with a light leptophilic axion-like particle (ALP), X, at the B-factory experiment Belle II.
We focus on production of the ALP in the tau decays $\tau \to Xl$ with $l = e, \mu$, followed by its decay via $X \to l^- l^+$.
The ALP can be either promptly decaying or long-lived.
We perform Monte-Carlo simulations, recasting a prompt search at Belle for lepton-flavor-violating τ decays, and propose a displaced-vertex (DV) search. For both types of searches, we derive the Belle˜II sensitivity reaches in both the product of branching fractions and the ALP coupling constants, as functions of the ALP mass and lifetime.
The results show that the DV search exceeds the sensitivity reach of the prompt search to the relevant branching fractions by up to about a factor of 40 in the long decay length regime.

What is your topic?

Physics beyond the Standard Model

Primary authors: SOFFER, Abi (Tel Aviv University (IL)); CHEUNG, Kingman (National Tsing Hua University (TW)); WU, Yu-Heng (National Tsing Hua University); WANG, Zeren Simon (National Tsing Hua University)

Presenter: WU, Yu-Heng (National Tsing Hua University)

Session Classification: Session 2b: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **79** Type: **Oral contribution**

Two-photon physics at KLOE-2

Thursday, 30 September 2021 12:30 (20 minutes)

KLOE-2, the continuation of the KLOE experiment at the Frascati ϕ−factory, completed its data-taking by acquiring about 5 fb^{-1} at the ϕ meson peak.
One of its distinctive feature is the possibility to study $e^+e^- \to \gamma^*\gamma^* e^+e^- \to \pi^0 e^+e^-$ processes by tagging final state leptons with two stations installed in both arms of the DAΦNE beam pipe. The aim is to perform the high precision measurement of the π^0 width to test low-energy QCD dynamics.

The High Energy Tagger (HET) is a scintillator hodoscope whose counting rate is dominated by very low angle radiative Bhabha scattering events without any associated signal in the KLOE detector. The measurement of the effective low angle radiative Bhabha cross section per scintillator is used to monitor detector performance and infer acceptance×efficiency of the HET.
The π^0 production from two-photon fusion is tagged by requiring the coincidence between the HET detector and the KLOE calorimeter when two clusters are reconstructed for one of the DAFNE bunch. The background is measured from events, continuously recorded in a time window where KOE and HET data acquisitions do not overlap.

The measurement of the low angle radiative Bhabha cross section and last results on the $\gamma^*\gamma^* \to \pi^0$ analysis will be reported.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary authors: MANDAGLIO, Giuseppe (Universita e INFN, Catania (IT)); MORICCIANI, Dario (INFN - National Institute for Nuclear Physics)

Presenter: MORICCIANI, Dario (INFN - National Institute for Nuclear Physics)

Session Classification: Session 6: g-2

Track Classification: Tau2021 Abstracts

Contribution ID: **80** Type: **Poster contribution**

B boson search at KLOE/KLOE-2

Friday, 1 October 2021 10:50 (2 hours)

Following the many contributions KLOE-2 has done to Dark Matter (DM) searches, an alternative model, where the Dark Force mediator is an hypothetical leptophobic B boson, in contra-position to the U boson or “dark photon”, is investigated. The B boson couples mainly to quarks and it can be searched in the Phi decay to eta-B where B will decay in p0-gamma. So far, investigation of the pi0-gamma invariant mass shows no clear structure belonging to the signal of the DM mediator, hence, an upper limit in the number of events at 90\% with CLs the technique will be established for the decay.

What is your topic?

Physics beyond the Standard Model

Primary authors: MANDAGLIO, Giuseppe (Universita e INFN, Catania (IT)); PEREZ DEL RIO, Elena (INFN - National Institute for Nuclear Physics)

Presenter: PEREZ DEL RIO, Elena (INFN - National Institute for Nuclear Physics)

Session Classification: Poster session: Breakout room 5

Track Classification: Tau2021 Abstracts

Contribution ID: **81** Type: **Oral contribution**

Experimental Program for Super Tau-Charm Facility

Friday, 1 October 2021 08:00 (25 minutes)

The proposed STCF is a symmetric electron-positron beam collider designed to provide e+e− interactions at center of-mass energies from 2.0 to 7.0 GeV. The peaking luminosity is expected to be 0.5×10ˆ35 cm−2s−1. The energy region of STCF covers the pair production thresholds for tau-leptons, charmed meson & baryons, and all of the strange hyperons. STCF is expected to deliver more than 1 ab−1 of integrated luminosity per year. Huge samples of XYZ, Jpsi , D+, D+s and Lambdac decays could be used to make precision measurements of the properties of XYZ particles, search for new ones, and study their rare decays; map out the spectroscopies of QCD hybrids; search for new sources of CP violation in the strange-hyperon and tau−lepton sectors with unprecedented sensitivity; make precise independent measurements of the unitarity of the CKM flavor-mixing matrix and address the Cabibbo Angle Anomaly; search for anomalous decays with sensitivities extending down to the level of SM-model expectations; qualify Lattice QCD calculations; and provide precise inputs that are essential for the interpretation of results from other experiments.

What is your topic?

Primary author: ZHOU, Xiaorong (USTC)

Presenter: ZHOU, Xiaorong (USTC)

Session Classification: Session 7: Future directions

Track Classification: Tau2021 Abstracts

Contribution ID: **82** Type: **Poster contribution**

Neutrino phenomenology via Type-(I+II) seesaw in a $U(1)_{L_e-L_\mu}$ model

Friday, 1 October 2021 10:50 (2 hours)

We realize neutrino phenomenology via Type-(I+II) seesaw
mechanism in a simple $U(1)_{L_e-L_\mu}$ gauge extension of standard model. With three additional right-handed neutrinos and a scalar triplet, we obtain two-zero A_2 texture in active neutrino mass matrix. We constrain the model parameters consistent with current neutrino oscillation data. Furthermore, we obtain new contributions to muon $g-2$ and also charged lepton flavor violating decays such as $\mu \to e\gamma$.

What is your topic?

Neutrino Physics

Primary author: MISHRA, Priya (University of Hyderabad)

Co-authors: Ms PANDA, Papia (University of Hyderabad); Dr SINGIRALA, Shivaramakrishna (University of Hyderabad); Prof. MOHANTA, Rukmani (University of Hyderabad); Mr BEHERA, Mitesh Kumar (University of Hyderabad)

Presenter: MISHRA, Priya (University of Hyderabad)

Session Classification: Poster session: Breakout room 7

Track Classification: Tau2021 Abstracts

Contribution ID: **83** Type: **Poster contribution**

Dark matter and flavor anomalies with vector-like fermions and scalar leptoquark

Friday, 1 October 2021 10:50 (2 hours)

We investigate vector-like fermionic dark matter and flavor anomalies in a simple extension of standard model, with doublet vector-like fermions of quark and lepton type and also a $S_1(\bar{\mathbf{3}}, \mathbf{1}, 1/3)$ scalar leptoquark. An additional vector-like lepton singlet is included, whose admixture with vector-like lepton doublet plays the role of dark matter and is examined in relic density and direct detection perspective. We utilize the bounds from electroweak precision observables and also constrain the new couplings from the branching ratio and angular observables associated with $b \to sll(\nu_l \bar{\nu}_l)$, $b \to s\gamma$ decays. We estimate the branching ratios of the rare lepton flavor violating τ decays such as $\tau \to \mu(\gamma, \phi, \eta, \eta')$.

What is your topic?

Physics beyond the Standard Model

Primary authors: MOHANTA, Rukmani (University of Hyderabad); SINGIRALA, Shivaramakrishna (School of physics, University of Hyderabad, Hyderabad 500046); SAHOO, Suchismita (University of Hyderabad)

Presenter: SINGIRALA, Shivaramakrishna (School of physics, University of Hyderabad, Hyderabad 500046)

Session Classification: Poster session: Breakout room 9

Track Classification: Tau2021 Abstracts

Contribution ID: **84** Type: **Poster contribution**

Impact of (axial)vector coefficients on $B \to K_1 \ell\ell$ decay modes

Friday, 1 October 2021 10:50 (2 hours)

We analyse the rare semileptonic decays of B meson to axial vector mesons $K_1(1270)$ and $K_1(1400)$ mediated by the flavor changing neutral current $b \to sll$ quark level transition, in an effective field theory approach. We perform a global fit to all the relevant and up-to-date $b \to sl^+l^-$ data for various sets of (axial)vector couplings. We then look over the implications of the allowed parameter space on the branching ratios and several phyical observables such as forward-backward asymmetry, lepton polarization asymmetry and lepton flavor universality violating parameters of $B \to K_1 l^+ l^-$ processes.

What is your topic?

Rare decays

Primary authors: MOHAPATRA, Manas (IIT HYDERABAD); SAHOO, Suchismita (Central University of Karnataka)

Presenter: SAHOO, Suchismita (Central University of Karnataka)

Session Classification: Poster session: Breakout room 9

Track Classification: Tau2021 Abstracts

Contribution ID: **85** Type: **Poster contribution**

Implications of new physics in $\Lambda_b \to \Lambda_c \ell \nu_\ell$ decay processes.

Friday, 1 October 2021 10:50 (2 hours)

Several indications of lepton non universality ratios, R_{D^*}, $R_{J/\psi}$ and the measurements on hadronic and τ longitudinal polarizations in $b \to c\tau\bar{\nu_\tau}$ processes have attracted a lot of attentions. By considering the most general effective Lagrangian, we carry out a model independent analysis of the semileptonic Λ_b decays, to inspect the nature of new physics. We constraint the new physics parameter space by using the measured branching ratios of ${B_c}^+ \to \tau^+\nu_\tau$ and the keep going experimental results on R_{D^*}, $R_{J/\psi}$ through a chi square fitting. We study the implications of constrained new couplings on the observable such as branching fractions, forward-backward asymmetries, lepton non universality parameter and Λ_c and lepton longitudinal polarization fractions of the decay modes. Additionally, we also probe whether there could be any lepton universality violation in this decay processes.

What is your topic?

Lepton universality and flavour violation

Primary author: Ms BHATTA, Aishwarya (University of Hyderabad)

Presenter: Ms BHATTA, Aishwarya (University of Hyderabad)

Session Classification: Poster session: Breakout room 8

Track Classification: Tau2021 Abstracts

Contribution ID: **86** Type: **Oral contribution**

Tests of Relativity in the Tau Sector

Monday, 27 September 2021 11:25 (20 minutes)

In the last couple of decades, there has been a tremendous growth of interest in testing fundamental symmetries, such as CPT and the Lorentz invariance of special relativity. Using effective field theory, it has been possible to parameterize a much broader range of symmetry violations that had previously been envisioned or tested. The new possibilities include different patterns of symmetry breaking in different sectors of the theory. However, for short-lived elementary particles like the tau, precision tests of Lorentz symmetry are very challenging, and the best constraints on Lorentz and CPT violations in the tau sector actually come from the observation of extremely high energy cosmic-ray photons and hadrons.

What is your topic?

Lepton universality and flavour violation

Primary author: Dr ALTSCHUL, Brett (University of South Carolina)

Presenter: Dr ALTSCHUL, Brett (University of South Carolina)

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **88** Type: **Poster contribution**

Neutrino mixing and Leptogenesis with modular S_3 symmetry in the framework of type III seesaw

Friday, 1 October 2021 10:50 (2 hours)

Discrete symmetries are being preferred to explain the neutrino phenomenology, we chose the simplest S_3 group and explore the implication of its modular form on neutrino masses and mixing. Non-trivial transformations of Yukawa couplings under this symmetry, make the model phenomenologically interesting by reducing the requirement of multiple scalar fields. This symmetry imposes a specific flavor structure to the neutrino mass matrix within the framework of less frequented type III seesaw mechanism and helps to explore the neutrino mixing consistent with the current observation. Apart, we also discuss the preferred scenario of leptogenesis to explain the baryon asymmetry of the universe by generating the lepton asymmetry from the decay of heavy fermion triplet at TeV scale.

What is your topic?

Neutrino Physics

Primary author: MISHRA, Subhasmita (Centurion University of Technology and Management, Odisha, India)

Presenter: MISHRA, Subhasmita (Centurion University of Technology and Management, Odisha, India)

Session Classification: Poster session: Breakout room 3

Track Classification: Tau2021 Abstracts

Contribution ID: **89** Type: **Oral contribution**

Tau Neutrino Physics with IceCube

Wednesday, 29 September 2021 14:15 (25 minutes)

Kilometer-scale neutrino detectors, like the IceCube Neutrino Observatory deployed in the ice cap at the South Pole, are uniquely capable of detecting energetic tau neutrinos and tau leptons. IceCube has sensitivity to tau neutrinos with energies at and above the threshold for tau lepton production, and has sufficiently large volume to contain tau leptons that travel hundreds of meters. The experiment has world-leading acceptance for atmospheric tau neutrinos at energies above roughly 10 GeV, and to astrophysical tau neutrinos at energies above roughly 100 TeV. Atmospheric tau neutrinos are primarily created by the oscillation of muon neutrinos as they pass through the earth after production in the northern hemisphere, and IceCube detects them and their tau lepton daughters inclusively, as an excess of shower-like events in its DeepCore sub-array. Astrophysical tau neutrinos are likely produced by neutrino oscillations over cosmic baselines, and can be detected exclusively, through the distinctive signatures created by the tau neutrino interaction vertex and the subsequent tau lepton decay vertex. We present results of IceCube's atmospheric and astrophysical tau neutrino measurements, and provide projections for future improvements and possible new channels for tau neutrino and tau lepton detection.

What is your topic?

Neutrino Physics

Primary author: COWEN, Douglas (Penn State)

Presenter: COWEN, Douglas (Penn State)

Session Classification: Session 4a: Neutrinos and Dark Matter

Track Classification: Tau2021 Abstracts

Contribution ID: **90** Type: **Poster contribution**

Lepton flavor violation in the Littlest Higgs Model with T parity including TeV Majorana neutrinos

Friday, 1 October 2021 10:50 (2 hours)

LFV processes have been studied extensively in this model (JHEP 07 (2019) 154). We study systematically the phenomenological consequences of introducing inverse see-saw neutrino masses in the model (according to JHEP 12 (2019) 154) and obtain predictions on the $\tau \to \ell\gamma$ and $\tau \to \ell\ell'\ell'$ decays (other LFV decays are also analyzed) which are close to current experimental bounds. Besides, the introduction of these TeV Majorana neutrinos allows for wrong-sign $\tau \to \ell\ell\ell'$ decays, at a rate which can also be probed by Belle-II.

What is your topic?

Lepton universality and flavour violation

Primary author: Mr PACHECO ZAMUDIO , Iván (Centro de Investigación y de Estudios Avanzados)

Co-author: Dr ROIG GARCÉS , Pablo (Centro de Investigación y de Estudios Avanzados)

Presenter: Mr PACHECO ZAMUDIO , Iván (Centro de Investigación y de Estudios Avanzados)

Session Classification: Poster session: Breakout room 2

Track Classification: Tau2021 Abstracts

Contribution ID: **91** Type: **Oral contribution**

HLbL in muon g-2 at large loop momenta

Thursday, 30 September 2021 13:40 (20 minutes)

We study the HLbL contribution to g-2 in the kinematic region where the three loop momenta are large. We show how, even when the fourth photon is in the static limit, the massless quark loop gives the leading term of an operator product expansion. Power corrections are found to be small. Gluonic corrections are also included and the expansion is found to be well-behaved at relatively low-energies, which can be used to reduce uncertainties in the HLbL contribution to g-2.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary author: RODRIGUEZ SANCHEZ, Antonio (CNRS)

Co-authors: BIJNENS, Johan; HERMANSSON TRUEDSSON, Nils (Universität Bern); LAUB, Laetitia

Presenter: RODRIGUEZ SANCHEZ, Antonio (CNRS)

Session Classification: Session 6: g-2

Track Classification: Tau2021 Abstracts

Contribution ID: **92** Type: **Oral contribution**

The Strong2020 and RadioMonteCarlow activities

Wednesday, 29 September 2021 14:25 (20 minutes)

During the last 15 years the "Radio MontecarLow ("Radiative Corrections and Monte Carlo Generators for Low Energies") Working Group, see www.lnf.infn.it/wg/sighad/, has been providing valuable support to
the development of radiative corrections and Monte Carlo generators for low energy e+e- data and tau-lepton decays. Its operation which started
in 2006 proceeded until the last few years bringing together at 20 meetings both theorists and experimentalists, experts working in the field of e+e- physics and partly also the tau community and produced the report
"Quest for precision in hadronic cross sections at low energy: Monte Carlo tools vs. experimental data"S. Actis et al. Eur. Phys. J. C 66, 585-686 (2010) (https://arxiv.org/abs/0912.0749), which has more than 300 citations.
While the working group has been operating for more than 15 years without a formal basis for funding, parts of our program have recently been included as a Joint Research Initiative in the group application of the European hadron physics community, STRONG2020, to the European Union, with a more specific goal of creating an annotated database for low-energy hadronic cross sections in e+e- collisions. The database will contain information about the reliability of the data sets, their systematic errors, and the treatment of RC.
We will report on both these initiatives.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary author: VENANZONI, Graziano (Universita & INFN Pisa (IT))

Presenter: VENANZONI, Graziano (Universita & INFN Pisa (IT))

Session Classification: Session 5a: Proton-proton and e+e- colliders

Track Classification: Tau2021 Abstracts

Contribution ID: **93** Type: **Oral contribution**

Physics Prospects of Beam Polarization at Belle II

Friday, 1 October 2021 15:35 (25 minutes)

Having the SuperKEKB e+e- collider upgraded with a polarized e- beam is under consideration, providing a unique program of precision electroweak and other physics at 10.6 GeV, thereby opening exciting new windows in search of new physics. Measurements of left-right asymmetries (A_{LR}) of e+e- transitions to pairs of taus, muons, electrons, c- and b-quarks would yield improvements to the determination of $\sin^2\theta_W$ compared to those made at the Z-pole precision but at much lower energy. These will probe the running and universality of neutral current couplings with unprecedented precision, opening new ways to search for dark sector effects. Other tau and QCD physics is also enhanced. This paper will focus on the physics prospects with a special emphasis on tau physics.

What is your topic?

Future opportunities in Tau Physics

Primary author: RONEY, Michael (University of Victoria)

Presenter: RONEY, Michael (University of Victoria)

Session Classification: Session 7: Future directions

Track Classification: Tau2021 Abstracts

Contribution ID: **95** Type: **Oral contribution**

Updated determinations of |Vus| with tau decays using the HFLAV fit

Wednesday, 29 September 2021 09:45 (20 minutes)

We present updated determinations of |Vus| using tau decays that include a preliminary updated HFLAV global fit of the tau branching fractions, up-to-date lattice hadronic form factors and decay constants, and novel determinations published in 2019 of the electromagnetic and strong isospin-breaking corrections to the $\pi^+ \to \mu^+\nu[\gamma]$ and $K^+ \to \mu^+\nu[\gamma]$ leptonic decay rates obtained with lattice QCD+QED.

What is your topic?

CKM matrix and Flavour Mixing

Primary author: LUSIANI, Alberto (Scuola Normale Superiore and INFN, sezione di Pisa)

Presenter: LUSIANI, Alberto (Scuola Normale Superiore and INFN, sezione di Pisa)

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **96** Type: **Oral contribution**

Radiative two-pion tau decays and the T-odd asymmetries

Wednesday, 29 September 2021 08:45 (20 minutes)

The radiative two-pion tau decay process is studied in this work. The resonance chiral theory is used to calculate the relevant form factors. Different light-flavor vector resonance dynamics are revealed in several different two-particle invariant mass distributions. Interesting studies on the T-odd asymmetry distributions arising from the radiative two-pion tau decay process are explored as well. Our results could provide useful guides for future measurements conducted at Belle-II and super tau-charm facilities.

What is your topic?

Hadronic decays

Primary author: GUO, Zhi-Hui (Southeast University)

Presenter: GUO, Zhi-Hui (Southeast University)

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **97** Type: **not specified**

Test of fundamental symmetries with tau lepton

Contribution ID: **98** Type: **Oral contribution**

Historical overview of 30 years of tau lepton physics work

Monday, 27 September 2021 08:10 (30 minutes)

What is your topic?

Primary author: PICH, Antonio (IFIC, U. Valencia -.)

Presenter: PICH, Antonio (IFIC, U. Valencia -.)

Session Classification: Session 1: Properties of the tau lepton

Contribution ID: **99** Type: **Oral contribution**

Welcome speech

Monday, 27 September 2021 08:00 (10 minutes)

Primary author: Prof. VAN KOOTEN, Rick (Indiana University)

Presenter: Prof. VAN KOOTEN, Rick (Indiana University)

Session Classification: Welcome and introductory remarks from Prof. Rick van Kooten, Dean, Indiana University College of Arts and Sciences

Contribution ID: **100** Type: **Oral contribution**

Electron-Muon-Tau Universality Theory Overview

Monday, 27 September 2021 08:40 (25 minutes)

Primary author: Dr MARCIANO, Bill (Brookhaven National Lab)

Presenter: Dr MARCIANO, Bill (Brookhaven National Lab)

Session Classification: Session 1: Properties of the tau lepton

Contribution ID: **102** Type: **Oral contribution**

Status and prospects for tau property measurements at Belle II

Monday, 27 September 2021 09:30 (25 minutes)

The Belle II experiment is a substantial upgrade of the Belle detector, operating at the SuperKEKB energy-asymmetric e+e− collider. The design luminosity of the machine is 8 × 10ˆ35 cm−2s−1, and the Belle II experiment aims to record 50 ab−1 of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run and the main operation of SuperKEKB has started in March 2019. Belle II has a broad tau physics program, from high-precision measurements of SM parameters to searches of new physics via experimental observation of BSM processes, such as lepton flavor universality (LFU) violation or lepton flavor violation (LFV) decays. In this talk we review the status of the Belle II experiment, and the prospects for the measurement of the tau lepton mass and lifetime, fundamental inputs in tests of LFU violation.

What is your topic?

Primary author: Dr HERNANDEZ VILLANUEVA, Michel (DESY)

Presenter: Dr HERNANDEZ VILLANUEVA, Michel (DESY)

Session Classification: Session 1: Properties of the tau lepton

Contribution ID: **104** Type: **Oral contribution**

Tau branching fraction (BaBar & HFLAV update)

Primary author: Dr LUSIANI, Alberto (Scuola Normale Superiore and INFN, sezione di Pisa)

Presenter: Dr LUSIANI, Alberto (Scuola Normale Superiore and INFN, sezione di Pisa)

Session Classification: Session 1: Properties of the tau lepton

Contribution ID: **106** Type: **Oral contribution**

Lepton Flavor Violation Searches at ATLAS and CMS

Monday, 27 September 2021 11:00 (25 minutes)

Primary author: FIORINI, Luca (Univ. of Valencia and CSIC (ES))

Presenter: FIORINI, Luca (Univ. of Valencia and CSIC (ES))

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Contribution ID: **112** Type: **Oral contribution**

The tau mass measurement at Belle II

Using the Belle II data from the early Phase III data taking, we reconstructed the tau leptons using the 3-prong τ decays. This decay mode is used for the tau-lepton mass measurement using the pseudomass technique developed by the ARGUS experiment. Though this measurement is expected to be limited by statistics and imperfect knowledge of the detector performance, we foresee that Belle II will provide the best tau mass measurement using the pseudomass technique once a larger data set with fully understood and operational detector components is available.

Primary author: (REQUEST SPEAKER), Belle II

Presenter: (REQUEST SPEAKER), Belle II

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Contribution ID: **113** Type: **not specified**

Tau lifetime measurement at Belle II

The tau-lepton lifetime represents a fundamental parameter within the Standard Model framework, contributing to the test of lepton flavor universality. Exploiting the vertex detector resolution and the tiny beam spot size at the interaction point, Belle II is expected to improve the present tau-lifetime value. The event topology where one tau decays to three charged pions (3-prong) and the other tau goes to a charged rho meson (1-prong), allows to have an higher event yield respect to 3-prong vs 3-prong topology studied by Belle. Therefore, a measurement with a statistical uncertainty competitive with the world average could already be performed with an early Belle II dataset.

Primary author: (REQUEST SPEAKER), Belle II

Presenter: (REQUEST SPEAKER), Belle II

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Contribution ID: **114** Type: **Oral contribution**

Searches for violation of Lepton Flavor Universality at Belle II

Searches for the violation of lepton flavor universality (LFU) are critical precision tests of the standard model (SM) motivated by the growing number of anomalies reported in several measurements in the flavor sector (quarks and leptons) in the last decades. At the Belle II experiment, thanks to the large amount of tau-lepton pairs produced in electron-positron annihilation, it is possible to perform a full set of LFU tests with unprecedented precision using tau-lepton decays. Such an approach allows not only to test the SM to high accuracy, but it provides a unique and complementary way to understand and eventually establish or rule out the new physics nature of the so-called flavor anomalies. We will discuss the status of the ongoing precision tests of LFU in both hadronic and leptonic tau decays and, using both 3x1 and 1x1 decay topologies, we will present the expected sensitivities to LFU parameters.

What is your topic?

Primary author: (REQUEST SPEAKER), Belle II

Presenter: (REQUEST SPEAKER), Belle II

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Contribution ID: **115** Type: **Oral contribution**

Measurement of PEP-II Beam Polarization with Tau Polarimetry

We present a new technique for measuring beam polarization in an electron-positron collider through the kinematics of tau decay products. The intention is to apply the technique to measure the electron beam polarization in SuperKEKB once a proposed beam polarization upgrade is realized. Having a polarized beam with high luminosity at Belle II opens a new precision electroweak physics program that will yield a weak mixing angle measurement at 10 GeV with higher precision than that obtained at the Z-pole, as well as unprecedented precision in the studies of neutral current universality involving b-quarks, c-quarks, electrons, muons and taus. It also provides unique sensitivity to parity-violating dark sector processes and will improve lepton flavour violating searches. The limiting factor on the precision of some of these future measurements is expected to be the systematic uncertainty in the average beam polarization achieved at the interaction point. We describe how the BaBar dataset has been used to develop the technique and measure the PEP-II electron beam polarization to better than 0.5% systematic uncertainty. As BaBar and Belle II are similar in design, it is expected the technique will yield measurements at least as precise using the Belle II detector.

Primary author: (REQUEST SPEAKER), BaBar

Presenter: (REQUEST SPEAKER), BaBar

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Contribution ID: **116** Type: **Oral contribution**

Precision tau physics: Challenge for Theory, on & off the lattice

Monday, 27 September 2021 14:40 (20 minutes)

In the past half a dozen years or so, the tau lepton has become the central focus for many reasons. Foremost in this is the fact that there are strong experimental hints that the tau is intimately involved in strong indications of lepton universality violations (LUV). Moreover, it is no longer just one type of experiments but rather three different types are involved and in each case the deviations from the SM is over 3 sigma. Chances of survival of one of these therefore is rather high. Possible theoretical scenarios that may be relevant are extremely intriguing. Then there is BELLE-II data set on the horizon which should be able to move tau precision to an unprecedented level. And of course LHCb with more upcoming data due to RUN-3 and beyond will also be very potent. This should open many avenues for searching new phenomena esp BSM-CP violation. Furthermore, its mass around 1.8 GeV renders it readily amenable to precision studies on the lattice and can prove very useful for more precise tests of the SM and for search of new phenomena.

What is your topic?

Lepton universality and flavour violation

Primary author: SONI, Amarjit (Brookhaven National Lab)

Presenter: SONI, Amarjit (Brookhaven National Lab)

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **118** Type: **Oral contribution**

Search for tau LFV/LNV decays at Belle

Tuesday, 28 September 2021 08:25 (25 minutes)

We report the result of a search for \tau \to \ell \gamma (\ell = e, \mu) using the full data sample at Belle. Charged lepton flavor violation (CLFV) is forbidden in the Standard Model but possible in several new physics scenarios.
In many of these models, the radiative decays $\tau \to \ell\gamma$ are predicted to have a sizeable probability and are thus particularly interesting CLFV channels. Consequently, we have obtained the most stringent limit on the branching fraction of \tau \to \mu \gamma. In addition, we report the result of a search for \tau \to p \ell \ell at Belle. Any observation of processes involving Lepton number and baryon number violation would be a clear signature of new physics. Consequently, we set the most stringent limits on the branching fraction of $\tau \to p\ell\ell$.

What is your topic?

Primary author: UNO, Kenta

Presenter: UNO, Kenta

Session Classification: Session 2b: Test of fundamental symmetries with tau lepton

Contribution ID: **119** Type: **Oral contribution**

Measurement of the tau EDM at Belle

Tuesday, 28 September 2021 08:50 (25 minutes)

We have measured the electric dipole moment (EDM) of the tau lepton using an 833 fbˆ-1 data sample collected with the Belle detector at the KEKB asymmetric-energy eˆ+eˆ- collider. Using an optimal observable method, we obtain the EDM result with O(10ˆ-17) ecm uncertainty. The result is consistent with no EDM at the present level of experimental sensitivity and improves the sensitivity by about a factor of three compared with the previous result.

What is your topic?

Primary authors: INAMI, Kenji (Nagoya university); INAMI, Kenji (Nagoya university)

Presenter: INAMI, Kenji (Nagoya university)

Session Classification: Session 2b: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **120** Type: **Oral contribution**

A next-generation rare pion decay experiment to study LFUV and CKM unitarity

Tuesday, 28 September 2021 09:50 (25 minutes)

I will briefly review the interesting collection of flavor anomalies that continue to accumulate from various experiment campaigns. What are they trying to tell us and, might there be connections? To add evidence to the experimental findings, a group of us is forming to develop a next-generation rare pion decay experiment. We aim to improve on the lepton flavor universality violation (LFUV) test in the electron –muon sector with a 10-fold or higher precision measurement of the ratio □+⟶□+□□□/□+⟶□+□□□; the Standard Model theory for this process is already known extremely well. We further aim to improve the measurement of pion beta decay □+⟶□+□□□0 by a factor of 10. Even with a 3-fold improvement, the ratio of this process to the related decay □⟶□□□ will already shed light on the question of 1st-row CKM unitarity. A 10-times better measurement will produce the cleanest stand-alone determination of Vud. I will describe our experimental concept, which is based on state-of-the-art detector and electronics concepts, and lessons learned from previous rare pion decay experiments.

What is your topic?

Primary author: HERTZOG, David

Presenter: HERTZOG, David

Session Classification: Session 2b: Test of fundamental symmetries with tau lepton

Contribution ID: **121** Type: **Oral contribution**

Third order correction to the muon lifetime

Monday, 27 September 2021 09:55 (25 minutes)

In this talk I will present the calculation of the QED third order correction to the muon lifetime. This result is obtained in the so-called heavy daughter approximation, i.e. the decay rate is computed in the limit of equal muon and electron masses which yields crucial simplifications in the evaluation of multi-loop Feynman diagrams. Despite the electron being about 207 times lighter that the muon, our result allows to determine the such third order correction at physical values of the muon and electron masses, with about a 15% uncertainty. Finally I will discuss the impact in future measurements of the Fermi constant.3s

What is your topic?

Primary author: Dr FAEL, Matteo (KIT Karlsruhe)

Presenter: Dr FAEL, Matteo (KIT Karlsruhe)

Session Classification: Session 1: Properties of the tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **126** Type: **not specified**

Neutron edm

Primary author: Prof. LIU, Chen-Yu (Indiana University)

Presenter: Prof. LIU, Chen-Yu (Indiana University)

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Contribution ID: **128** Type: **not specified**

Discussion

Wednesday, 29 September 2021 13:45 (15 minutes)

What is your topic?

Session Classification: Session 4a: Neutrinos and Dark Matter

Contribution ID: **129** Type: **not specified**

Status of long-baseline neutrino experiments

Wednesday, 29 September 2021 13:20 (25 minutes)

I will give a summary talk on long baseline neutrino measurements, with attention to topics and searches related to tau neutrinos. I will cover the latest results from T2K, NOvA, and OPERA, and future prospects from DUNE and Hyper-K.

Primary author: WASCKO, Morgan (Imperial College (GB))

Presenter: WASCKO, Morgan (Imperial College (GB))

Session Classification: Session 4a: Neutrinos and Dark Matter

Contribution ID: **131** Type: **Oral contribution**

Sterile neutrino theory review

Wednesday, 29 September 2021 12:55 (25 minutes)

In this talk I will review the short baseline anomalies and recent developments relevant to this topic. I will discuss theoretical interpretations of these anomalies, including sterile neutrinos, decaying neutrinos, and novel gauge forces. Limitations of the theoretical interpretations will be highlighted.

Primary author: MACHADO, Pedro (Fermilab)

Presenter: MACHADO, Pedro (Fermilab)

Session Classification: Session 4a: Neutrinos and Dark Matter

Contribution ID: **143** Type: **Oral contribution**

Search for dark sector at BABAR

Tuesday, 28 September 2021 14:55 (25 minutes)

Many models of dark matter and hidden sectors predict new particles with masses below the electroweak scale. Low-energy electron-positron colliders such as BABAR are ideally suited to discover these hidden-sector particles. We present two recent BABAR searches for low-mass hidden-sector particles, including new searches for prompt and long-lived leptonically decaying hidden scalars produced in association with tau leptons. This search is sensitive to viable models that could account for the muon □–2 excess. We also present results of a search for dark matter bound states (darkonium). These examples show the importance of □-factories in constraining and discovering new hidden-sector physics beyond the Standard Model.

What is your topic?

Primary author: LI, Yunxuan (California Institute of Technology)

Presenter: LI, Yunxuan (California Institute of Technology)

Session Classification: Session 2c: Test of fundamental symmetries with tau lepton

Contribution ID: **148** Type: **Oral contribution**

Two-pion contribution to hadronic vacuum polarization

Thursday, 30 September 2021 14:00 (20 minutes)

The largest part of the hadronic-vacuum-polarization (HVP) contribution to the muon anomalous magnetic moment is due to the intermediate state of two pions. Analyticity and unitarity do not only allow us to write this contribution in terms of the pion vector form factor (VFF), but also constrain the VFF itself. I will discuss fits of a dispersive representation of the pion VFF to e^+e^- cross-section data and I will comment on the implications of analyticity and unitarity in view of the tension between data-driven evaluations of HVP and recent lattice-QCD results.

What is your topic?

Primary authors: STOFFER, Peter; STOFFER, Peter (University of Zurich)

Presenter: STOFFER, Peter (University of Zurich)

Session Classification: Session 6: g-2

Contribution ID: **153** Type: **Oral contribution**

Theory overview

Thursday, 30 September 2021 10:25 (25 minutes)

What is your topic?

Primary author: COLANGELO, Gilberto (Universität Bern)

Presenter: COLANGELO, Gilberto (Universität Bern)

Session Classification: Session 6: g-2

Contribution ID: **162** Type: **Oral contribution**

Probing violation of CP & T invariance

Thursday, 30 September 2021 15:55 (20 minutes)

The SM predicts zero values of CPV & TV in the decays of tau leptons except \tauˆ- \to \nu Kˆ0_S [\pi,\pi\pi]. With neutrino oscillations I would give the golden medals for CPV & TV. I think that tau decays can get bronze medals in \tauˆ- \to \nu K [pi, \pi\pi, \eta]. Their hadronic final states are enough ‘complex’.

What is your topic?

Primary author: BIGI, Ikaros (Physics Department, University of Notre Dame)

Presenter: BIGI, Ikaros (Physics Department, University of Notre Dame)

Session Classification: Session 6: g-2

Contribution ID: **168** Type: **Oral contribution**

Charged Lepton Flavor violation at the EIC

Monday, 27 September 2021 12:20 (25 minutes)

In the quest to map out the structure of the proton in exquisite detail, the Electron Ion Collider (EIC) will collide electrons and protons at high energy with unprecedented luminosity.
In this talk I will discuss how to exploit the features of the EIC to explore physics beyond the Standard Model. I will focus on charged-lepton-flavor-violating (CLFV) interactions in which an electron is converted into a tau lepton, which, in several BSM models, are intimately connected with the generation of neutrino masses. I will discuss the luminosity and efficiency requirements for competitive CLFV searches at the EIC. I will then compare the EIC sensitivity with existing bounds from LEP and the LHC, and discuss the complementarity of the EIC with the next generation of B factories.
I will identify the most promising directions in parameter space for the EIC to explore, and discuss the theoretical improvements needed to take full advantage of the EIC potential.

What is your topic?

Lepton universality and flavour violation

Primary author: Dr MEREGHETTI, Emanuele (Los Alamos National Lab)

Presenter: Dr MEREGHETTI, Emanuele (Los Alamos National Lab)

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **169** Type: **Oral contribution**

First Result from the New Muon g-2 Experiment at Fermilab

Thursday, 30 September 2021 10:00 (25 minutes)

Nearly twenty years ago a team from Brookhaven National Lab measured the anomalous part of the muon's dipole moment (a_μ) finding a ˜three-sigma discrepancy against contemporary Standard Model predictions. The mystery lingered for a time as there were no further measurements, but within a few years a small dedicated team set into motion a plan to revive the technique at Fermilab. This team grew into the new Muon g-2 Collaboration, whose result was published earlier this month. In our first run repeating the experiment, we confirmed the original measurement while utilizing major system upgrades and increased statistics to push the precision below one half ppm. The original incongruity persists and could potentially reach discovery-level significance within the planned run time of the experiment. I will provide a perspective on the result and our outlook for reaching a few times better resolution with further data.

What is your topic?

Neutrino Physics

Primary author: STAPLETON, James (Fermi National Lab)

Presenter: STAPLETON, James (Fermi National Lab)

Session Classification: Session 6: g-2

Track Classification: Tau2021 Abstracts

Contribution ID: **170** Type: **Oral contribution**

Higgs boson measurements in couplings to tau leptons with the ATLAS experiment

Wednesday, 29 September 2021 12:30 (20 minutes)

Testing the Yukawa couplings of the Higgs boson to quarks and leptons is important to understand the origin of fermion masses. ATLAS has recently measured the properties of the Higgs boson decays to two tau leptons, with an analysis based on the full dataset of pp collisions collected at 13 TeV at the LHC. The talk will present details on the analysis techniques used to measure the inclusive cross sections in the four dominant Higgs production modes, as well as in exclusive regions of the phase space using the simplified template cross-section framework.

What is your topic?

Primary author: YOUNG, Christopher (Albert Ludwigs Universitaet Freiburg (DE))

Presenter: YOUNG, Christopher (Albert Ludwigs Universitaet Freiburg (DE))

Session Classification: Session 5a: Proton-proton and e+e- colliders

Track Classification: Tau2021 Abstracts

Contribution ID: **171** Type: **Poster contribution**

Search for lepton flavor violating decays of the Higgs boson with the ATLAS detector

Lepton-flavor-violating decays of the Higgs boson are searched for, where an observation would be a clear sign of physics phenomena beyond the Standard Model. Various results for different decays, based on pp collision data collected at 13 TeV, will be presented.

What is your topic?

Primary authors: LAMMERS, Sabine Wedam (Indiana University (US)); TBD

Presenter: TBD

Session Classification: Poster session: Breakout room 5

Track Classification: Tau2021 Abstracts

Contribution ID: **172** Type: **Poster contribution**

Search for Higgs boson pair production in the bbtautau final state with the ATLAS detector

A search for Higgs boson pair production in events with two b-jets and two τ-leptons is presented, using a proton–proton collision data set with an integrated luminosity of 139/fb collected at sqrt(s) = 13 TeV by the ATLAS experiment at the LHC. Higgs boson pairs produced non-resonantly or in the decay of a narrow-width scalar resonance in the mass range 251 to 1600 GeV are targeted. Events in which at least one τ-lepton decays hadronically are considered, and multivariate discriminants are used to extract the signals. A dedicated analysis extends the mass reach of the HH resonance search up to 3 TeV, where a new technique for reconstructing and identifying hadronically decaying tau-pairs with a large Lorentz boost is developed and used for the first time. The current status of Higgs boson pair-production searches in other channels in ATLAS is also presented.

What is your topic?

Primary authors: LAMMERS, Sabine Wedam (Indiana University (US)); TBD

Presenter: TBD

Session Classification: Poster session: Breakout room 5

Track Classification: Tau2021 Abstracts

Contribution ID: **173** Type: **Poster contribution**

Searches for Supersymmetry with the ATLAS detector

Supersymmetry (SUSY) provides elegant solutions to several problems in the Standard Model, and searches for SUSY particles are an important component of the LHC physics program. This talk will present the latest results from searches conducted by the ATLAS experiment, covering both strong and electroweak SUSY particle production processes. The searches target multiple final states and different assumptions about the decay mode of the produced SUSY particles, including searches for both R-parity conserving models and R-parity violating models and their possible connections with the recent observation of the flavour and muon g-2 anomalies. The talk will also highlight the employment of novel analysis techniques, including advanced machine learning techniques and special object reconstruction, that are necessary for many of these analyses to extend the sensitivity reach to challenging regions of the phase space.

What is your topic?

Primary authors: LAMMERS, Sabine Wedam (Indiana University (US)); TBD

Presenter: TBD

Session Classification: Poster session: Breakout room 5

Track Classification: Tau2021 Abstracts

Contribution ID: **174** Type: **Poster contribution**

ATLAS searches for supersymmetry with tau leptons

Searches for supersymmetry (SUSY) involving scalar tau leptons (staus) are interesting analyses, well motivated by naturalness and dark matter arguments, for example in coannihilation models. In this talk, an overview of the most recent ATLAS searches using the full Run2 dataset which look for either direct production of staus or production of supersymmetric particles which are assumed to decay through staus is presented. The decays of scalar tau leptons to their Standard Model partners lead to challenging experimental signatures, requiring dedicated reconstruction algorithms. Searches in final states with tau leptons, complementing searches for light leptons or hadronic decays, are also considered.

What is your topic?

Primary authors: LAMMERS, Sabine Wedam (Indiana University (US)); TBD

Presenter: TBD

Session Classification: Poster session: Breakout room 5

Track Classification: Tau2021 Abstracts

Contribution ID: **175** Type: **Poster contribution**

ATLAS searches for supersymmetry with long-lived particles

Various Supersymmetry (SUSY) scenarios, including split SUSY and anomaly or gravity-mediated SUSY-breaking scenarios, lead to signatures with long-lived particles. Searches for these processes may target either the long lived particle itself or its decay products at a significant distance from the collision point. These signatures provide interesting technical challenges due to their special reconstruction requirements as well as their unusual backgrounds. This talk will present recent results in long-lived SUSY searches using ATLAS Run 2 data.

What is your topic?

Primary authors: LAMMERS, Sabine Wedam (Indiana University (US)); TBD

Presenter: TBD

Session Classification: Poster session: Breakout room 5

Track Classification: Tau2021 Abstracts

Contribution ID: **176** Type: **Oral contribution**

Searches for new physics with leptons using the ATLAS detector

Monday, 27 September 2021 14:20 (20 minutes)

Many theories beyond the Standard Model predict new phenomena, such as Z', W'bosons, or heavy leptons, in final states with isolated, high-pt leptons (e/mu/tau). Searches for new physics with such signatures, produced either resonantly or non-resonantly, are performed using the ATLAS experiment at the LHC. This includes a novel search that exploits the lepton-charge asymmetry in events with an electron and muon pair. Lepton flavor violation (LVF) is a striking signature of potential beyond the Standard Model physics. The search for LFV with the ATLAS detector focuses on the decay of the Z boson into different flavour leptons (e/mu/tau). The recent 13 TeV pp results will be reported.

What is your topic?

Primary author: FRANCHINI, Matteo (University of Bologna and INFN (IT))

Presenter: FRANCHINI, Matteo (University of Bologna and INFN (IT))

Session Classification: Session 2a: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **177** Type: **Oral contribution**

Searches for leptoquarks with the ATLAS detector

Tuesday, 28 September 2021 13:20 (20 minutes)

Leptoquarks (LQ) are predicted by many new physics theories to describe the similarities between the lepton and quark sectors of the Standard Model and offer an attractive potential explanation for the lepton flavour anomalies observed at LHCb and flavour factories. The ATLAS experiment has a broad program of direct searches for leptoquarks, coupling to the first-, second- or third-generation particles. This talk will present the most recent 13 TeV results on the searches for leptoquarks and contact interactions with the ATLAS detector, covering flavour-diagonal and cross-generational final states.

What is your topic?

Primary author: LI, Zhiyuan Jordan (University of Liverpool)

Presenter: LI, Zhiyuan Jordan (University of Liverpool)

Session Classification: Session 2c: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **178** Type: **Oral contribution**

HVP contributions to the muon's anomalous magnetic moment from lattice QCD

Thursday, 30 September 2021 10:50 (25 minutes)

With the Fermilab g-2 experiment's first measurement of the muon anomalous magnetic moment (a_μ), announced on 7 April 2021, the difference between the new experimental average and the Muon g-2 Theory Initiative's Standard Model prediction now stands at 4.2σ. Experimental measurements of a_μ are expected to improve drastically in the coming years. In order to maximize the impact of the experimental program, the uncertainties in the Standard Model prediction, which are dominated by hadronic effects and are currently commensurate with experiment, must be reduced concurrently. The largest of these is the hadronic vacuum polarization (HVP), which is also the dominant source of uncertainty. This talk will provide a review of the current status of lattice QCD calculations of this quantity, including future prospects for improvement.

What is your topic?

Anomalous Magnetic Moment of the muon

Primary author: EL-KHADRA, Aida (UIUC)

Presenter: EL-KHADRA, Aida (UIUC)

Session Classification: Session 6: g-2

Track Classification: Tau2021 Abstracts

Contribution ID: **179** Type: **Oral contribution**

The search for sterile neutrinos with short-baseline neutrino experiments

Wednesday, 29 September 2021 12:30 (25 minutes)

In the past two decades, several results from short-baseline neutrino experiments have hinted that sterile neutrinos could be present. If confirmed, these new particles would be a definite proof of physics beyond the Standard Model and would offer attractive solutions to many unanswered questions in our field. After briefly reviewing selected results, I will present the current experimental landscape and what the prospects are to resolve this important open question on the existence of sterile neutrinos. I will also discuss some of the implications of having additional neutrinos.

What is your topic?

Neutrino Physics

Primary author: GUENETTE, Roxanne (Harvard University)

Presenter: GUENETTE, Roxanne (Harvard University)

Session Classification: Session 4a: Neutrinos and Dark Matter

Track Classification: Tau2021 Abstracts

Contribution ID: **180** Type: **Oral contribution**

Muonic Force Behind Flavor Anomalies

Tuesday, 28 September 2021 11:10 (25 minutes)

An economical theoretical framework for combined explanations of the flavor physics anomalies involving muons, (g-2)_mu, RK(*) and b->s mu mu supplements the Standard Model (SM) with a lepton-flavored U(1)_X gauge group where the auge boson has mass of O(0.1) GeV and a TeV-scale leptoquark. We explore the theory space of the chiral, anomaly-free U(1)_X gauge extensions and carry out a comprehensive phenomenological study of the muonic force in representative benchmark models

What is your topic?

Lepton universality and flavour violation

Primary author: ZUPAN, Jure (University of Cincinnati)

Presenter: ZUPAN, Jure (University of Cincinnati)

Session Classification: Session 2b: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **181** Type: **Oral contribution**

Search for Muon to Electron Conversion at J-PARC - COMET Experiment

Tuesday, 28 September 2021 10:15 (20 minutes)

COMET is an experiment at J-PARC, Japan, which will search for neutrinoless conversion of muons into electrons in the field of a nucleus (μ− + N ⟶ e− + N); a lepton flavor violating process. The experimental sensitivity goal for this process is order of 10ˆ{−15} for Phase-I and 10ˆ{−17} for Phase-II experiment, which is a factor of 100–10,000 improvements correspondingly over existing limits. Recent progresses in facility and detector development are presented, along with COMET Phase-I and Phase-II experimental schedule. The physics and feasibility of searching lepton number violation in the COMET experiment will be also discussed.

What is your topic?

CP and T violation

Primary author: LEE, MyeongJae (Institute for Basic Science (Korea))

Presenter: LEE, MyeongJae (Institute for Basic Science (Korea))

Session Classification: Session 2b: Test of fundamental symmetries with tau lepton

Track Classification: Tau2021 Abstracts

Contribution ID: **187** Type: **Oral contribution**

Lepton Flavour Violation searches and Lepton Universality tests at LHCb

Tuesday, 28 September 2021 11:35 (25 minutes)

Primary author: CELANI, Sara (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Presenter: CELANI, Sara (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Session Classification: Session 2b: Test of fundamental symmetries with tau lepton

Contribution ID: **191** Type: **Oral contribution**

Deriving experimental constraints on the scalar form factor in the second-class □⟶□□□ mode

Wednesday, 29 September 2021 09:05 (20 minutes)

The rare second-class decay mode of the τ into $\eta\pi\nu$ could be observed for the first time at Belle II. It is important to try to derive a reliable evaluation of the branching fraction and of the energy distribution of this mode within the standard-model. Many predictions exist already in the literature which, unfortunately, can differ by one to two orders of magnitude. In this talk I discuss an approach based on a systematic use of the property of analyticity (of form factors and amplitudes) in QCD. In particular, I will show that the scalar form factor in the τ decay can be related to photon-photon scattering and radiative ϕ decay amplitudes for which precise experimental measurements (by Belle and Kloe) exist.

What is your topic?

Primary author: MOUSSALLAM, Bachir (Universite Paris-Saclay)

Presenter: MOUSSALLAM, Bachir (Universite Paris-Saclay)

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **196** Type: **Oral contribution**

Test

Test 2

What is your topic?

Hadronic decays

Primary author: PASSEMAR, Emilie

Presenter: PASSEMAR, Emilie

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **197** Type: **Oral contribution**

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What is your topic?

Hadronic decays

Primary author: GONZALEZ-SOLIS, Sergi (IFAE-UAB)

Presenter: GONZALEZ-SOLIS, Sergi (IFAE-UAB)

Session Classification: Session 3: Exclusive and inclusive hadronic tau decays

Track Classification: Tau2021 Abstracts

Contribution ID: **198** Type: **Oral contribution**

Muon g-2 to Δα

Wednesday, 29 September 2021 14:05 (20 minutes)

The Muon ⊠–2 experiment at Fermilab has recently confirmed Brookhaven's earlier measurement of the muon anomalous magnetic moment. This new result increases the muon g-2 discrepancy with the Standard Model prediction and strengthens its "new physics" interpretation, as well as the quest for its underlying origin. I will discuss the connection of the muon g-2 discrepancy to precision electroweak predictions via their common dependence on hadronic vacuum polarization effects. This is particularly relevant for the ongoing comparison between results for hadronic vacuum polarization effects as calculated from hadronic cross section data and from lattice QCD.

Primary author: KESHAVARZI, Alex (U. Manchester)

Presenter: KESHAVARZI, Alex (U. Manchester)

Session Classification: Session 5a: Proton-proton and e+e- colliders

Contribution ID: **199** Type: **Oral contribution**

Calculating HLbL on the Lattice

Thursday, 30 September 2021 13:20 (20 minutes)

The hadronic light-by-light contribution to the muon g-2 can now
be calculated using first principles lattice QCD+QED methods. Independent results from two collaborations are available. I will review the status and recent developments.

Primary author: LEHNER, Christoph (University of Regensburg & BNL)

Presenter: LEHNER, Christoph (University of Regensburg & BNL)

Session Classification: Session 6: g-2

Contribution ID: **200** Type: **Oral contribution**

Searches for Neutrinoless Double Beta Decay

Thursday, 30 September 2021 08:00 (25 minutes)

Observation of neutrinoless double beta decay would profoundly impact our understanding of the neutrino. This lepton-number violating process requires new beyond Standard Model physics, would imply that neutrinos are Majorana particles, and provide insight into the nature of neutrino mass. It is thus a highly-sensitive and promising probe of new physics. In this talk, I will present the status of the experimental field, particularly highlighting the recent achievements. The future is bright, with next-generation experimental concepts proposed to leverage these advances and drive the discovery sensitivity of the field down to the $m_{\beta\beta} \sim 10$ meV scale.

Primary author: PETTUS, Walter (Indiana University)

Presenter: PETTUS, Walter (Indiana University)

Session Classification: Session 4b: Neutrino and Dark Matter

Contribution ID: **201** Type: **Oral contribution**

Super Charm-Tau Factory in Russia

Friday, 1 October 2021 08:25 (25 minutes)

The Super Charm-Tau Factory (SCTF) project proposed at Budker Institute of Nuclear Physics is discussed. An electron-positron collider with the luminosity of about
10ˆ35 1/cmˆ2/s operated at the center-of-mass energies from 3 to 7 GeV, and modern particle detector allow one to study on the new level of precision the physics of charmonium, exotic charmonium-like states, charmed mesons and baryons, and the tau lepton, as well as the production of light hadrons in e+ e−annihilation processes and in two-photon processes. A longitudinal polarization of the electron beam at the interaction point will provide a number of advantages of the SCTF over the existing B factories such as Belle II and LHCb. The tau physics program of the SCTF will be discussed in more detail.

What is your topic?

Primary author: EPIFANOV, Denis (BINP, Novosibirsk)

Presenter: EPIFANOV, Denis (BINP, Novosibirsk)

Session Classification: Session 7: Future directions

Contribution ID: **202** Type: **Oral contribution**

DUNE

Friday, 1 October 2021 10:10 (15 minutes)

For now two decades, an extensive neutrino oscillations experimental era dramatically improved our knowledge on the 3-neutrino oscillations paradigm. This program, though, almost only focused on the electron and muon neutrinos, and our knowledge on the tau neutrino mostly relies on leptonic universality.

DUNE (Deep Underground Neutrino Experiment) is a next generation of neutrino oscillations experiment tuned to probe electron neutrino appearance in an artificial beam of muon neutrinos between Fermilab and the Sanford Underground Research Facility (South Dakota). Its 1285 km baseline and the spatial/calorimetric precision of its gigantic far detectors makes it ideally suited to study tau neutrino appearance with an unprecedented sensitivity. This will allow, among others, performing a unique test of the consistency of the 3 flavour neutrino paradigm as well as help constraining the PMNS matrix unitarity.

In this talk I will discuss the main physics topics related to tau neutrino physics and present the current status of the non-trivial search for tau neutrino identification for the DUNE experiment at the simulation level.

What is your topic?

Primary author: KOSC, Thomas (CERN)

Presenter: KOSC, Thomas (CERN)

Session Classification: Session 7: Future directions

Contribution ID: **203** Type: **Oral contribution**

T2HK

Friday, 1 October 2021 10:25 (15 minutes)

Primary author: BRAVAR, Sandro (Universite de Geneve (CH))

Presenter: BRAVAR, Sandro (Universite de Geneve (CH))

Session Classification: Session 7: Future directions

Contribution ID: **204** Type: **Oral contribution**

Breaking the Myth of the ”Non-Traditional” Physicist

Friday, 1 October 2021 13:20 (30 minutes)

What is your topic?

Primary author: BAILEY, Crystal (Americal Physical Society)

Presenter: BAILEY, Crystal (Americal Physical Society)

Session Classification: Session 7: Future directions

Contribution ID: **205** Type: **not specified**

Future directions on tau physics with Belle II

Friday, 1 October 2021 13:50 (25 minutes)

Primary author: ROSTOMYAN, Ami (DESY)

Presenter: ROSTOMYAN, Ami (DESY)

Session Classification: Session 7: Future directions

Contribution ID: **206** Type: **Oral contribution**

FCC-ee - also a tau factory

Friday, 1 October 2021 14:15 (20 minutes)

The proposed FCC-ee collider provides optimal conditions for ultimate statstics studies of the four heaviest particles of the Standard Model, the Z, W and Higgs bosons and the top quark. With the phenomenal sample of 5x10ˆ12 Z decays in the very clean e+e- environment it also provides optimal conditions for precision studies of heavy flavour, among that studies of the tau lepton. Possibilities are opened of much improved determinations of τ-lepton properties and, via the measurement of the τ polarisation, of the neutral-current couplings of electrons and τs. Improved measurements of τ-lepton properties –lifetime, leptonic branching fractions, and mass –
allow important tests of lepton universality. The experimental challenge is to match as far as possible statistical uncertainties at the 10−5 level. This applies in particular to the lifetime measurement, and to the branching fraction and polarisation measurements, where the cross-channel
contamination is of particular concern. These issues raise strict requirements, in particular, on the accuracy of the construction and alignment of the vertex detector and of the precise calorimetric
separation and measurement of photons and π0s in the collimated τ decay topologies.

The talk will review the status of the FCC-ee project and summarise the opportunities for ultimate precision tau-lepton measurements.

Primary author: DAM, Mogens (University of Copenhagen (DK))

Presenter: DAM, Mogens (University of Copenhagen (DK))

Session Classification: Session 7: Future directions

Contribution ID: **207** Type: **Oral contribution**

Physics measurements with Tau final state at the CEPC

Friday, 1 October 2021 09:35 (20 minutes)

Primary authors: LI, Hai-Bo (IHEP); RUAN, Manqi (IHEP)

Presenter: RUAN, Manqi (IHEP)

Session Classification: Session 7: Future directions

Contribution ID: **208** Type: **Poster contribution**

Semi- and di-tauonic B decays and LFUV at future e^+e^- colliders

Friday, 1 October 2021 10:50 (2 hours)

$b \to s\tau^+\tau^-$ measurements are highly motivated for addressing lepton-flavor-universality (LFU)-violating puzzles such as $R_{K^{(*)}}$ anomalies. The anomalies of $R_{D^{(*)}}$ and $R_{J/\psi}$ further strengthen their necessity and importance, given that the LFU-violating hints from both involve the third-generation leptons directly. Z factories at the future e^-e^+ colliders stand at a great position to conduct such measurements because of their relatively high production rates and reconstruction efficiencies for B mesons at the Z pole. To fully explore this potential, we pursue a dedicated sensitivity study in four $b \to s\tau^+\tau^-$ benchmark channels, namely $B^0 \to K^{*0}\tau^+\tau^-$, $B_s \to \phi\tau^+\tau^-$, $B^+ \to K^+\tau^+\tau^-$ and $B_s \to \tau^+\tau^-$, at the future Z factories. We develop a fully tracker-based scheme for reconstructing the signal B mesons and introduce a semi-quantitative method for estimating their major backgrounds. The simulations indicate that branching ratios of the first three channels can be measured with a precision $\sim \mathcal{O}(10^{-7} - 10^{-6})$ and that of $B_s \to \tau^+\tau^-$ with a precision $\sim \mathcal{O}(10^{-5})$ at Tera-Z. The impacts of luminosity and tracker resolution on the expected sensitivities are explored. The interpretations of these results in effective field theory are also presented.

What is your topic?

Primary author: LI, Lingfeng (Brown U.)

Presenter: LI, Lingfeng (Brown U.)

Session Classification: Poster session: Breakout room 8

Track Classification: Tau2021 Abstracts

Contribution ID: **209** Type: **Oral contribution**

Outlook

Friday, 1 October 2021 16:00 (30 minutes)

Primary author: HAYASAKA, Kiyoshi (Niigata University)

Presenter: HAYASAKA, Kiyoshi (Niigata University)

Session Classification: Session 7: Future directions

Contribution ID: **210** Type: **not specified**

Tau as probe for ATLAS experiment

Wednesday, 29 September 2021 13:30 (20 minutes)

Primary author: GREFE, Christian (University of Bonn (DE))

Presenter: GREFE, Christian (University of Bonn (DE))

Session Classification: Session 5a: Proton-proton and e+e- colliders

Contribution ID: **211** Type: **not specified**

Status of Mu2e II

Friday, 1 October 2021 15:10 (25 minutes)

Primary author: PEZZULLO, Gianantonio (Yale University)

Presenter: PEZZULLO, Gianantonio (Yale University)

Session Classification: Session 7: Future directions

Contribution ID: **212** Type: **Oral contribution**

Probing New Physics with the leptonic g-2

Thursday, 30 September 2021 15:35 (20 minutes)

Primary author: PARADISI, Paride (University of Padova and INFN)

Presenter: PARADISI, Paride (University of Padova and INFN)

Session Classification: Session 6: g-2

Contribution ID: **213** Type: **not specified**

Search for upward-going air showers with the fluorescence detector of the Pierre Auger Observatory

Friday, 1 October 2021 10:50 (2 hours)

The fluorescence detector (FD) of the Pierre Auger Observatory is sensitive to upward-going air showers for energies above 10^17 eV. Given its operation time and wide field of view, the FD has the potential to support or constrain the recent "anomalous" observations by the ANITA detector, interpreted as upward-going air showers of unexplained nature.

We have used 14 years of data collected by the FD to search for upward-going showers using a set of quality selection criteria defined using 10% of the full data sample.
To distinguish candidates from false positives, calculate the exposure and obtain the expected background, dedicated simulations for signal (upward-going events) and background (downward-going events) have been performed.
Results of the analysis after unblinding the data set are presented.

Finally, the exposure and sensitivity for the specific scenario of a signal being ascribed to tau lepton decay are calculated and the corresponding upper limits are shown as a function of primary energy and in different zenith angle ranges.

Primary author: DE VITO, Emanuele (INFN - National Institute for Nuclear Physics)

Presenter: DE VITO, Emanuele (INFN - National Institute for Nuclear Physics)

Session Classification: Poster session: Breakout room 5