Partikeldagarna 2019

Report of Abstracts

https://indico.cern.ch/e/Partikeldagarna2019

Abstract ID : **9**

Local dark matter density from the Milky Way's rotation curve using Gaia DR2 data

Content

The local density of dark matter (DM) is an important quantity. On the one hand, its value is needed for DM direct detection searches. On the other hand, a precise and robust determination of the local DM density would help us to learn about the shape of the DM halo of our Galaxy, which plays an important role in DM indirect detection searches, as well as in many studies in astrophysics and cosmology. Among the different methods available to determine the local DM density, we can analyse the rotation curve of the Milky Way. In this talk, I will present the results of a study of the Milky Way's rotation curve using data obtained from the second data release (DR2) of the ESA/Gaia mission. Despite the precision of the Gaia DR2 data, I will discuss the limitations of the rotation curve method in order to determine the local DM density, whose estimated value depends on the assumed Galactic distribution of baryons. Finally, I will compare our estimated local DM density, obtained under reasonable assumptions using the rotation curve's method, with other determinations also using Gaia DR2 data but with different methods.

Primary author: FERNÁNDEZ DE SALAS, Pablo (Stockholm University)

Presenter: FERNÁNDEZ DE SALAS, Pablo (Stockholm University)

Track Classification: Astroparticle physics

Status: SUBMITTED

Submitted by **FERNÁNDEZ DE SALAS, Pablo** on **Thursday 11 July 2019**

Abstract ID : **10**

Probing the Higgs Potential through di-Higgs Discovery

Content

The Swedish di-Higgs working group is a new effort connecting both ATLAS experimentalists and theorists across Swedish institutes with the aim of establishing Sweden's role in searches for beyond Standard Model physics and the Higgs self-coupling, facilitated through di-Higgs production at the LHC. The status of di-Higgs searches with the ATLAS experiment, and new theoretical developments in di-Higgs physics, will be discussed and the direction and intended outcomes of this new working group will be established.

Primary author: NELSON, Michael Edward (Stockholm University (SE))

Presenter: NELSON, Michael Edward (Stockholm University (SE))

Track Classification: LHC experiments and dedicated experiments

Status: SUBMITTED

Submitted by **NELSON, Michael Edward** on **Monday 12 August 2019**

Abstract ID : **11**

Search for a Dark Jet Resonances Using Substructure with ATLAS

Content

The possibility of dark matter being a composite particle, such as a hadron under a gauge group, is becoming increasingly appealing as the non-excluded part of parameter space for the WIMP paradigm is shrinking. In this talk I will present a ongoing search for a resonance originating from a QCD-like dark sector, that decays to two dark partons which then hadronise to form ”dark jets”. The search targets a selection of model parameters where a fraction of the dark mesons are stable and the rest decay promptly to visible particle. The signature is a pair of jets with potentially different substructure than normal QCD-jets. I will introduce the model and the initial signal studies that have been made and then go into more detail with the mass-decorrelated tagger implemented for the signal region definition.

Primary author: HANSEN, Eva Brottmann (Lund University (SE))

Presenter: HANSEN, Eva Brottmann (Lund University (SE))

Status: SUBMITTED

Submitted by **HANSEN, Eva Brottmann** on **Friday 23 August 2019**

Abstract ID : **12**

The helicity-flow method

Content

It is well-known that the spinor-helicity method can significantly simplify the calculations of both Feynman diagrams and scattering amplitudes. In this work, we attempt to further simplify the Feynman-diagram calculation by converting the spinor-helicity method into a flow method, analogous to allowing a one-line journey from Feynman diagram to inner products. The cases of massless QED and QCD will be discussed.

Primary author: LIFSON, Andrew (Lund University)

Co-authors: Dr REUSCHLE, Christian (Lund University); SJODAHL, Malin (Lund University)

Presenter: LIFSON, Andrew (Lund University)

Status: SUBMITTED

Submitted by **LIFSON, Andrew** on **Tuesday 27 August 2019**

Abstract ID : **13**

ALICE

Content

Summary of activities in the Lund ALICE group.

Primary authors: OHLSON, Alice (Lund University (SE)); CHRISTIANSEN, Peter (Lund University (SE)); SILVERMYR, David (Lund University (SE))

Presenter: OHLSON, Alice (Lund University (SE))

Track Classification: LHC experiments and dedicated experiments

Status: SUBMITTED

Submitted by **OHLSON, Alice** on **Wednesday 28 August 2019**

Abstract ID : **14**

Prospects and Progress of the Light Dark Matter eXperiment (LDMX)

Content

The origin and observed abundance of Dark Matter can be explained elegantly by the thermal freeze-out mechanism, leading to a preferred mass range of the Dark Matter particles in the MeV-TeV region. The GeV-TeV mass range is being explored intensely by the variety of experiments searching for Weakly Interacting Massive Particles. The sub-GeV region, however, in which the masses of most of the building blocks of stable matter lie, is hardly being tested experimentally to date.
This mass range occurs naturally in Hidden Sector Dark Matter models. The Light Dark Matter eXperiment (LDMX) is a planned electron-beam fixed-target missing-momentum experiment, that has unique potential to conclusively search for such light Dark Matter in the MeV to GeV range. Such an experiment would also be sensitive for the cases when velocity suppression of the scattering cross sections would make such dark matter impossible to detect in direct searches. This contribution will give a brief overview of the theoretical motivation, the main experimental challenges and how they are addressed as well as projected sensitivities, and will focus on progress made over the past year.

Primary author: POTTGEN, Ruth (Lund University (SE))

Co-authors: AKESSON, Torsten (Lund University (SE)); BRYNGEMARK, Lene Kristian (Lund University (SE))

Presenter: POTTGEN, Ruth (Lund University (SE))

Track Classification: LHC experiments and dedicated experiments

Status: SUBMITTED

Submitted by **POTTGEN, Ruth** on **Thursday 29 August 2019**

Abstract ID : **15**

IceCube search for neutrinos from precursors and afterglows of gamma ray bursts

Content

The sources and accelerating mechanisms of cosmic rays, with energies as high as 10^{20} eV, are not completely understood. Gamma ray bursts (GRBs) have long been considered as promising source candidates, yet so far don't show evidence for a correlated neutrino signal to prove this hypothesis. Previous analyses by IceCube have searched for neutrino in coincidence with the prompt phase of the GRBs, typically lasting for 100s or less. Here I will describe a search for neutrino correlations before and after this prompt phase using an extended time window. Presently I am calculating the spatial and temporal coincidence of a list of GRBs with the neutrino detections made by IceCube and comparing the results for different precursor and afterglow models hypothesised for short and long duration GRBs. These searches build on a similar methodology as was used for the detection of longer time-scale transients such as blazar flares, applying it for the first time to short transients like GRBs.

Primary authors: DEOSKAR, Kunal (Stockholm University); FINLEY, Chad

Presenter: DEOSKAR, Kunal (Stockholm University)

Track Classification: Astroparticle physics

Comments:

I would like to present this in the poster section during Fysikdagarna

Status: SUBMITTED

Submitted by **DEOSKAR, Kunal** on **Friday 30 August 2019**

Abstract ID : **16**

Non-Standard Decays of Vector-Like Quarks

Content

With strong constraints on the mass of vector-like quarks (VLQ) from the top partner (T) decay T->SM, it is necessary to consider non-standard decays of such partners. This talk considers models where the VLQ decays to a BSM (pseudo)scalar (S) and a top-quark. The scalar is assumed to be fermiophobic, and dominantly decays into two SM bosons. With dedicated analyses, we realistically quantify the sensitivity of the LHC to both the T and S masses, assuming both current and foreseen luminosities.

Primary author: MATHISEN, Thomas (Uppsala University (SE))

Presenter: MATHISEN, Thomas (Uppsala University (SE))

Status: SUBMITTED

Submitted by **MATHISEN, Thomas** on **Friday 30 August 2019**

Abstract ID : **17**

Physics opportunities with the CERN SPS Beam Dump Facility

Content

The interest in feebly interacting particles (FIPs) of Hidden Sectors has significantly increased in the last few years. They have become part of the scientific goals of many presently running experiments, and several new intensity frontier experiments have been proposed.
The Search for Hidden Particles (SHiP) Collaboration demonstrated with their Physics Proposal and Technical Proposal in 2015 that the CERN SPS accelerator with its 400 GeV proton beam offers a unique opportunity to build a general-purpose proton beam-dump facility (BDF) to explore possible Hidden Sectors. The proposed experiment incorporates two complementary detectors, one of which is aimed at reconstructing fully the decay vertex of Hidden Sector particles. The second detector is aimed at detecting scattering of Light Dark Matter, and can also perform unprecedented measurements with tau neutrinos. SHiP complements the world-wide program of New Physics searches by covering a large region of parameter space which cannot be addressed by other experiments. The SHiP detector and the BDF study group are about to submit Comprehensive Design Study reports following a three-year detailed study phase launched by the CERN management in 2016.
This talk will briefly introduce the motivation behind the searches for FIPs and describe the status of the Beam Dump Facility and the SHiP experiment, together with other related physics opportunities.

Primary author: JACOBSSON, Richard (CERN)

Presenter: JACOBSSON, Richard (CERN)

Track Classification: LHC experiments and dedicated experiments

Status: SUBMITTED

Submitted by **JACOBSSON, Richard** on **Friday 30 August 2019**

Abstract ID : **18**

Track counting luminosity measurement in ATLAS

Content

The luminosity is a measure of the number of proton-proton interactions per second at the LHC. It is a key quantity which is critical to the entire ATLAS physics program.
One way to determine the luminosity in ATLAS is to measure the number of tracks from charged particles inside the Inner Detector. The average number of charged particles is proportional to the average number of inelastic collisions and can therefore be used to calculate the luminosity.
This talk will describe the basic principles of track counting and exemplify with recent work from the KTH and SU ATLAS groups.

Primary author: RIPELLINO, Giulia (KTH Royal Institute of Technology (SE))

Presenter: RIPELLINO, Giulia (KTH Royal Institute of Technology (SE))

Track Classification: LHC experiments and dedicated experiments

Status: SUBMITTED

Submitted by **RIPELLINO, Giulia** on **Friday 30 August 2019**

Abstract ID : **19**

Exploring selections across channels in Dark Matter searches with top quarks at the ATLAS experiment of the LHC

Content

Current estimates put Dark Matter to 26.8% of the energy-matter content of the universe, but very little is known about it other than its gravitational interactions. Efforts to learn more about Dark Matter include searching for it at high energy particle colliders. The lack of information about the nature of Dark Matter makes this a complicated task, and many searches are performed in different channels, and considering different theoretical models. In my master thesis, I explore two such analyses, performed in the ATLAS collaboration using data from the ATLAS detector at the Large Hadron Collider at CERN: the tW+MET final state and the $t\bar{t}$+MET final state. I have made a generation-level study of the overlap between the signal regions used, and come to the conclusion that there is some. I have also compared the models used in these analyses, the 2HDM+a and the simplified spin-0 pseudoscalar model. Given the simplifications made in my study, however, more sophisticated approaches should be used before anything conclusive can be said.

Primary author: SUNNEBORN GUDNADOTTIR, Olga (Uppsala University (SE))

Presenter: SUNNEBORN GUDNADOTTIR, Olga (Uppsala University (SE))

Track Classification: LHC experiments and dedicated experiments

Status: SUBMITTED

Submitted by **SUNNEBORN GUDNADOTTIR, Olga** on **Saturday 31 August 2019**

Abstract ID : **20**

Unfolding of multivariate tools and statistical analysis for Higgs boson pair production searches in the ATLAS detector at the Large Hadron Collider

Content

Recently, searches for pair production of Higgs bosons in several final states have been carried out by the ATLAS exeperiment at the Large Hadron Collider (LHC). This study focuses on the search for non-resonant di-Higgs production decaying to a final state with two b-jets and two τ-leptons using 36.1 fb^{-1} of data recorded by the ATLAS detector. The analysis for this process has already been performed. Boosted decision trees (BDTs) are used in the analysis to improve the separation of the signal from background processes and several variables that provide good discrimination between signal and background are used as inputs to the BDT. This study aims to unfold the BDT of the analysis and optimize a cut-based analysis so that the gain from using the BDT can be estimated. Two variables, related to the invariant masses and angular distances of the Higgs boson decay products, are defined and the optimal cuts are found to be $X_{m_{\tau\tau}m_{bb}} > 1.8$ and $X_{\Delta R_{\tau\tau}\Delta R_{bb}} > 4.0$. Then, the upper limits on the SM HH production cross section are set when fitting m_{HH} with the cut-based analysis. An expected limit of 0.78 pb, 23 times the SM prediction is obtained when neglecting systematic uncertainties, compared to the limit of 15 times the SM as recomputed when using the BDT. Comparing the two results, the sensitivity is worsened by 50% when not using the BDT.

Primary author: DIMITRIADI, Christina (Uppsala University)

Presenter: DIMITRIADI, Christina (Uppsala University)

Status: SUBMITTED

Submitted by **DIMITRIADI, Christina** on **Sunday 01 September 2019**

Abstract ID : **21**

Anomaly-free model building: algebraic geometry and the Froggatt-Nielsen mechanism

Content

We present methods to find anomaly-free gauged U(1) Froggatt-Nielsen type models using results from real algebraic geometry. These methods should be of general interest for model building beyond the Standard Model when rational charges are required. We consider models with a gauged U(1) flavour symmetry with one flavon and provide several model examples based on different physical assumptions. Necessary conditions for these models to be free from gauge anomalies are derived and we show that the field content of the Standard Model is not sufficient and thus additional fields are needed. Two such extensions are considered; two Higgs doublets and right-handed neutrinos providing Dirac masses. With these extensions, the fermion masses and mixings in the Standard Model, including neutrinos, can in great part be explained.
Moreover, we show that the UV-behaviour of these models are in general plagued by Landau poles. Two different UV-completions are considered; through vector-like fermions and through Higgs doublets. In the fermion completion, the gauge couplings are in general plagued with Landau poles while in a scalar completion this may be avoided, but instead the quartic couplings generally blow up. Thus, the generic case is that neither completion works, but the scalar completion might be saved by appropriate choice of parameters in the scalar potential. This conclusion does not change if we allow U(1) to be anomalous or global.

Primary authors: TELLANDER, Felix (Lund University); RATHSMAN, Johan

Presenter: TELLANDER, Felix (Lund University)

Track Classification: Theory

Status: SUBMITTED

Submitted by **TELLANDER, Felix** on **Sunday 01 September 2019**

Abstract ID : **22**

Search for dark matter produced in association with jets, one lepton and missing transverse energy in the ATLAS detector

Content

This talk focuses on a search for dark matter at the LHC using the ATLAS detector for the full Run 2 data of 139 fb-1. The model of interest has a scalar or pseudoscalar spin-0 mediator produced in association with a pair of top quarks. This mediator can decay into a pair of dark matter particles, resulting in missing transverse energy in the ATLAS detector. The search looks for a signature of jets, missing transverse energy, and one lepton that comes from a top quark decay. A signal region is defined as a set of variable cuts that target this final state. A mediator mass of 20 GeV and a dark matter mass of 1 GeV are used to optimise the signal region definition. This signal region is then used to analyse the sensitivity for other mediator and dark matter masses. In case there is no significant excess observed, exclusion limits on the cross-section at 95% confidence level are derived.

Primary author: PASUWAN, Patrawan (Stockholm University (SE))

Presenter: PASUWAN, Patrawan (Stockholm University (SE))

Track Classification: LHC experiments and dedicated experiments

Status: SUBMITTED

Submitted by **PASUWAN, Patrawan** on **Monday 02 September 2019**

Abstract ID : **23**

The HIBEAM/NNBAR Experiment at the ESS

Content

The HIBEAM/NNBAR experiment is a two stage experiment for the European Spallation Source (ESS) to search for baryon number violation. The experiment would make high sensitivity searches for baryon number violating processes: n ⟶ nbar and n ⟶ n′(neutron to sterile neutron), corresponding to the selection rules in baryon number ΔB = 2, 1 , respectively. The experiment addresses topical open questions such as baryogenesis and dark matter, and is sensitive to a scale of new physics substantially in excess of that available at colliders. This is a cross-disciplinary experiment with a clear particle physics goal. The community encompasses physicists from large collider experiments and low energy nuclear physics experiments, together with scientists specialising in neutronics and magnetics. European, US and Asian communities are represented. The experiment would increase the sensitivity to neutron conversion probabilities by three orders of magnitude compared with previous searches. The opportunity to make such a leap in sensitivity in tests of a global symmetry is a rare one. In this talk, an overview of progress in development of the experiment: detector and be

Primary author: MILSTEAD, David Anthony (Stockholm University (SE))

Presenter: MILSTEAD, David Anthony (Stockholm University (SE))

Track Classification: Astroparticle physics

Comments:

The talk is relevant for astroparticle physics (dark matter - hidden sector, sterile neutrons), generic searches for physics beyond the Standard Model, and,to a lesser extent, accelerator (in the context of an experiment for the ESS).

Status: SUBMITTED

Submitted by **MILSTEAD, David Anthony** on **Monday 02 September 2019**

Abstract ID : **24**

Negative tag light jet mis-tag rate calibration in the ATLAS detector.

Content

The ATLAS Collaboration has developed several so-called b-tagging algorithms to distinguish jets containing b quarks (b-jets) from light-flavour jets and jets containing c quarks. Calibrations are carried out in order to account for differences in the b-tagging performance between data and simulated events. My talk will contain an overview of b-tagging algorithms and will focus on the calibration of the mis-tag rate, where a jet containing only light quarks or gluons is identified as a b-jet.

We use the negative-tag method, which relies on the assumption that light-flavour jets are mis-tagged as b-jets mainly due to the finite resolution of reconstructed track trajectories and impact parameters. To obtain a b-tagged sample which is dominated by mis-tagged light-flavour jets, a "flipped" version of the b tagging algorithm is used where the sign of variables like the impact parameters and secondary vertices is inverted. Currently the calibration is carried out in a Z+jets sample. Results on data recorded by the ATLAS detector from 2015 to 2018, corresponding to an integrated luminosity of 140 fb^{-1}, are presented.

Primary author: PEREIRA SANCHEZ, Laura (Stockholm University (SE))

Presenter: PEREIRA SANCHEZ, Laura (Stockholm University (SE))

Status: SUBMITTED

Submitted by **PEREIRA SANCHEZ, Laura** on **Monday 02 September 2019**

Abstract ID : **25**

MAX IV Status

Content

In this contribution I summarize the status of the MAX IV facility, highlighting the progress that was made during the last year, which culminated with eleven beamlines simultaneously taking synchrotron-light data in May 2019. I conclude giving a short report on the 8th International Beam Instrumentation Conference, that was held in September in Malmö and hosted by ESS, in collaboration with MAX IV. For the report, I focus on topics of interest to the particle physics community.

Primary author: MEIROSE, Bernhard (Lund University)

Presenter: MEIROSE, Bernhard (Lund University)

Status: SUBMITTED

Submitted by **MEIROSE, Bernhard** on **Wednesday 04 September 2019**

Abstract ID : **26**

Finite temperature effects on particle decays

Content

At high densities and temperatures the standard quantum field theoretical approach to particle physics should be modified. Temperature enters explicitly in observables, for instance in decay rates, and under certain conditions expected results deviate significantly from the case of zero-temperature. I have put together a collection of thermal decay rates covering scalars, pseudo scalars and fermions consequently expanding the existing literature. I aim to lay out the procedure of thermal calculations detailing the explicit appearance of temperature in the two-point correlation function. I also highlight the interpretation of the thermal decay rate in comparison with the zero-temperature dito.

Primary author: Mr LUNDBERG, Torbjörn (Lund University)

Co-author: PASECHNIK, Roman (Lund university)

Presenter: Mr LUNDBERG, Torbjörn (Lund University)

Track Classification: Theory

Comments:

My talk summarises my findings so far within my masters project on thermal decay rates. I would like to give a short talk of 10-15 minutes introducing thermal field theory and recent results of both myself and others regarding high temperature decay rates.

Status: SUBMITTED

Submitted by **LUNDBERG, Torbjörn** on **Wednesday 04 September 2019**

Abstract ID : **27**

Searches for dark matter mediators decaying to jets in ATLAS

Content

An important part of the ATLAS dark matter (DM) search programme is comprised of searches for new resonances (dark matter mediators) decaying to hadronic final states. This talk will give an overview of one such analysis: the recently-published search for low-mass dark-matter mediators decaying to jets, with an associated high-pT photon. This search triggers on an associated photon in order to significantly extend the sensitive region of ATLAS for dark matter mediators and generic resonances. Also covered is the reinterpretation of the resulting limits in the case of non-discovery.

Primary author: CORRIGAN, Eric Edward (Lund University (SE))

Presenter: CORRIGAN, Eric Edward (Lund University (SE))

Track Classification: LHC experiments and dedicated experiments

Status: SUBMITTED

Submitted by **CORRIGAN, Eric Edward** on **Wednesday 04 September 2019**

Abstract ID : **28**

The SHIFT project

Content

The presentation will summarize the scope and status of the SHIFT project, which is a collaboration between experimental and theoretical particle physicists at Chalmers, Stockholm and Uppsala. The aim is to search for top partners that can protect the mass of the Higgs boson from large quantum corrections. We study possible signatures of such top partners and search for them using data from the ATLAS experiment. The most recent phenomenological results for vector-like top partners in composite Higgs models are discussed. We also cover direct searches for top partners in supersymmetry as well as indirect searches via precision measurements of processes involving top quarks.

Primary author: ELLAJOSYULA, Venugopal (Uppsala University)

Presenter: ELLAJOSYULA, Venugopal (Uppsala University)

Track Classification: LHC experiments and dedicated experiments

Status: SUBMITTED

Submitted by **ELLAJOSYULA, Venugopal** on **Wednesday 04 September 2019**

Abstract ID : **29**

Experience of studying Z bosons with ATLAS open data for high school diploma project (gymnasiearbete)

Content

For my diploma project I studied the accuracy and precision of the ATLAS detector using decays of the Z boson in open data samples. I will describe my experience of learning about particle physics and programming through a framework originally developed for a modern physics lab for second-year students at KTH. The platform is based on docker and uses python+ROOT in Jupyter notebooks through a simple web interface. I will present what I was able to achieve using the framework, what I found interesting and challenging, and some thoughts about how I think the tool can be used to give more school students the chance to learn about particle physics.

Primary author: KHODAVERDIAN, Mariam (KTH)

Co-authors: OHM, Christian (KTH Royal Institute of Technology (SE)); RIPELLINO, Giulia (KTH Royal Institute of Technology (SE))

Presenter: KHODAVERDIAN, Mariam (KTH)

Track Classification: LHC experiments and dedicated experiments

Comments:

My supervisors were Christian Ohm and Giulia Ripellino, but will be the one presenting.

Status: SUBMITTED

Submitted by **KHODAVERDIAN, Mariam** on **Wednesday 04 September 2019**

Abstract ID : **30**

Measuring the local dark matter density at direct detection experiments

Content

Dark Matter (DM) direct detection experiments search for nuclear-recoils induced by the non-relativistic scattering of Milky Way DM particles in low-background detectors. In this context, it is commonly assumed that local DM density and DM-nucleon scattering cross section are degenerate, and that even in presence of a signal only their product can be reconstructed from data. Focusing on a region in parameter space where DM is lighter than about 1 GeV, I will show that in this region of parameter space a DM signal at direct detection experiments can be used to break the degeneracy between local DM density and DM-nucleon scattering cross section, contrary to standard expectations. This is due to interactions of DM particles traveling inside the Earth which can perturb the DM velocity distribution probed at direct detection experiments in a way that depends on the DM-nucleon scattering cross section.

Primary author: CATENA, Riccardo (Chalmers University of Technology)

Presenter: CATENA, Riccardo (Chalmers University of Technology)

Track Classification: Astroparticle physics

Status: SUBMITTED

Submitted by **RICCARDO, catena** on **Wednesday 04 September 2019**

Abstract ID : **31**

Direct detection of low-mass dark matter with strong matter interactions

Content

For the past few decades, underground dark matter detectors have been looking for rare interactions between dark matter (DM) particles from the galactic halo and atoms of a detector target. However, if these interactions are sufficiently strong, the incoming flux of DM particles could be attenuated by the rock overburden of the experiments, which therefore cannot probe DM above some critical interaction strength. I will discuss this issue in the context of sub-GeV DM searches via electron recoils.

Primary author: Dr EMKEN, Timon (Chalmers University of Technology)

Presenter: Dr EMKEN, Timon (Chalmers University of Technology)

Track Classification: Astroparticle physics

Status: SUBMITTED

Submitted by **Dr EMKEN, Timon** on **Thursday 05 September 2019**

Abstract ID : **32**

Observing the sky continuously at extreme photon energies with ALTO/COMET

Content

ALTO is a future very-high-energy (VHE) gamma-ray observatory, which is currently in the prototyping phase. The proposed design of the array consists of more than a thousand Water Cherenkov Detectors (WCDs) each coupled with a liquid scintillator. The observatory will be installed at an altitude of 4 to 5 km above the sea level in the Southern Hemisphere. WCDs sample the secondary particles in the extensive air showers generated by VHE gamma-rays and cosmic rays while the scintillators help in tagging the presence of muons. Preliminary studies using the simulation shows that the scintillators help in improving the signal over background discrimination by 15 to 30% depending on the energy range. The first phase of the prototype, comprised of two WCDs and scintillators, has been taking data since February 2019. In the poster, I will present the simulation performance and some results from the prototype activities. Finally I will also present the future steps of the project.

Primary author: SENNIAPPAN, Mohanraj (Linnaeus University)

Co-authors: THOUDAM, Satyendra (Khalifa University); BECHERINI, Yvonne (Linnaeus University); PUNCH, Michael; ERNENWEIN, Jean-Pierre (Aix-Marseille Universite); Mr BYLUND, Tomas (Linnaeus University)

Presenter: SENNIAPPAN, Mohanraj (Linnaeus University)

Track Classification: Astroparticle physics

Comments:

Abstract for Poster and Teaser talk

Status: SUBMITTED

Submitted by **SENNIAPPAN, Mohanraj** on **Thursday 05 September 2019**

Abstract ID : **33**

The Hyper-Kamiokande Experiment

Content

Hyper-Kamiokande (Hyper-K) is a water Cherenkov detector that will be built in Japan starting in 2020, with data taking anticipated starting in 2027. Hyper-K will address some of the most important questions in the field, including probing for CP-violation, searching for nucleon decay, and addressing many aspects of neutrino astrophysics. This talk will describe the current status of Hyper-K, as well as the anticipated physics reach of the experiment.

Primary author: O'SULLIVAN, Erin (Uppsala University)

Presenter: O'SULLIVAN, Erin (Uppsala University)

Track Classification: Astroparticle physics

Comments:

I guess it is both astrophysics and neutrino particle physics. If there is an ESSnuSB talk, can you put us in the same session.

Status: SUBMITTED

Submitted by **Dr O'SULLIVAN, Erin** on **Thursday 05 September 2019**

Abstract ID : **34**

The IceCube Neutrino Observatory, the Upgrade, and Gen2

Content

Construction of the IceCube Neutrino Observatory at the South Pole was completed in 2010 and operation of the full detector began the following spring. Since that time, the neutrino universe has started to yield its secrets, with the discovery of the high-energy cosmic neutrino flux and the pinpointing of some of these neutrinos to active galaxies. A long-term vision for neutrino astronomy is now foreseen with the IceCube-Gen2 observatory. The first stage of this vision is the IceCube Upgrade, now funded by the US National Science Foundation with construction over the next four years. I will review recent results from IceCube, the goals of the Upgrade, and the long-term plan for the Gen2 observatory.

Primary author: FINLEY, Chad

Presenter: FINLEY, Chad

Status: SUBMITTED

Submitted by **FINLEY, Chad** on **Thursday 05 September 2019**

Abstract ID : **35**

Blazars as astroparticle physics laboratories: the case of KUV00311-1938

Content

Blazars are very bright gamma ray sources in the sky that are visible out to very large redshifts. Powered by material falling into a supermassive black hole, blazars have jets that can emit gamma rays up to TeV energies. As these TeV photons propagate through space they are expected to encounter ambient magnetic fields and extragalactic background light (EBL). The presence of magnetic fields can convert them to Axion like particles (ALPs), while the presence of the EBL absorbs the initial spectrum via pair production. We studied the multi-wavelength behaviour of KUV 00311-1938, a blazar with an unknown redshift, finding that a simple EBL model can explain the observed emission. We subsequently used the EBL model to constrain the redshift of the source.

Primary author: BYLUND, Tomas

Presenter: BYLUND, Tomas

Comments:

POSTER

Status: SUBMITTED

Submitted by **FERRARI, Arnaud** on **Thursday 05 September 2019**

Abstract ID : **36**

Physics reach of the ESSnuSB project

Content

The proposed ESSnuSB project intends to have a megaton water Cherenkov detector built and a neutrino beam sent from the ESS proton linac at the second oscillation maximum. In this talk I will discuss the physics reach of the oscillation program of the ESSnuSB, including the projected sensitivity to CP violation in the lepton sector as well as searches for new physics such as sterile neutrinos and non-standard neutrino interactions.

Primary author: BLENNOW, Mattias (KTH Royal Institute of Technology)

Presenter: BLENNOW, Mattias (KTH Royal Institute of Technology)

Status: SUBMITTED

Submitted by **BLENNOW, Mattias** on **Thursday 05 September 2019**

Abstract ID : **37**

Update on the Neutrino Observatory in ice with Radio technique

Content

I'll give a brief update on the situation for an ice-based high energy neutrino telescope using the radio technique.

Primary author: Prof. HALLGREN, Allan (Uppsala University)

Presenter: Prof. HALLGREN, Allan (Uppsala University)

Status: SUBMITTED

Submitted by **HALLGREN, Allan** on **Thursday 05 September 2019**

Abstract ID : **38**

Impact of different compilers and build types on Geant4 simulation execution time

Content

Experimental observations and advanced computer simulations in High Energy Physics (HEP) paved way for the recent discoveries at the Large Hadron Collider (LHC) at CERN. Currently, Monte Carlo simulations account for a very significant amount of computational resources of the Worldwide LHC Computing Grid (WLCG).
In looking at the recent trends in modern computer architectures we see a significant deficit in expected growth in performance. Coupled with the increasing compute demand for High Luminosity (HL-LHC) run, it becomes vital to address this shortfall with more efficient simulation.

The simulation software for particle tracking algorithms of the LHC experiments predominantly relies on the Geant4 simulation toolkit. The Geant4 framework can be built either as a dynamic or a static library, the former being the more widely used approach. This study focuses on evaluating the impact of both having libraries statically vs dynamically linked and compiler optimization levels, on the simulation software's execution time.

Multiple versions of the more widely used versions of compilers for UNIX-like systems have been used for these investigations. Both compiler optimization levels (e.g. O3, O2 on GCC) and link-time optimization (LTO) have been studied. Initial results indicate that significant execution time reductions can be obtained by switching from static to dynamic linking.

Primary author: ELEN, Einar Alfred (Lund University (SE))

Presenter: ELEN, Einar Alfred (Lund University (SE))

Status: SUBMITTED

Submitted by **FERRARI, Arnaud** on **Thursday 05 September 2019**

Abstract ID : **39**

Status of the ESSnuSB neutrino beam and detector project

Content

It is proposed to use the uniquely powerful ESS proton linac to generate a very intense neutrino beam, concurrently with the ESS base-line spallation-neutron production, allowing measurements to be made at the second neutrino oscillation maximum where the sensitivity to leptonic CP violation is significantly higher than at the first maximum. The same detector will be used to detect neutrinos from supernovae and to search for proton decay. A 4-years EU-supported Design Study of this proposal was started in January 2018. The current status of the design of the linac power upgrade from 5 to 10 MW by adding H- pulses between the proton pulses, of the pulse accumulator ring used to compress the pulse length, of the 4-fold target station, of the near monitoring detector and of the far large main detector.

Primary author: EKELOF, Tord Johan Carl (Uppsala University (SE))

Presenter: EKELOF, Tord Johan Carl (Uppsala University (SE))

Status: SUBMITTED

Submitted by **FERRARI, Arnaud** on **Thursday 05 September 2019**