PAHEN 2019, Berlin

Report of Contributions

https://indico.desy.de/e/Pahen2019

Contribution ID: **0** Type: **Invited speaker**

Measurement of the diffuse astrophysical muon neutrino spectrum with ten years of IceCube data

Wednesday 25 September 2019 14:10 (20 minutes)

The IceCube Neutrino Observatory has established the measurement of a flux of high-energy astrophysical neutrinos in several detection channels. Here, we present an update to the analysis of through-going muon-neutrinos from the Northern Hemisphere. It was extended to almost ten years of data which have been re-processed (Pass-2) applying consistent event-selections and reconstructions. Additionally, an improved treatment of systematic uncertainties on the atmospheric fluxes was implemented. We present results of the updated spectral fit and discuss how the measurement compares to other results.

Primary author: STETTNER, Joeran (RWTH Aachen University)

Presenter: STETTNER, Joeran (RWTH Aachen University)

Session Classification: Presentation of recent results

Contribution ID: **1** Type: **Invited speaker**

Neutrinos from blazars

Wednesday 25 September 2019 16:00 (30 minutes)

IceCube has recently reported the discovery of high-energy neutrinos of astrophysical origin, opening up the PeV sky.
These observations are challenging to interpret on the astronomical side and have triggered a fruitful collaboration across
particle and astro-physics. I will present our work on blazars as possible neutrino sources, discuss briefly the association
of some very high-energy IceCube neutrinos with the blazar TXS 0506+056, and show that TXS 0506+056 is not what it looks
like.

Primary author: Dr PADOVANI, Paolo (European Southern Observatory)

Presenter: Dr PADOVANI, Paolo (European Southern Observatory)

Session Classification: Overview of neutrino sources 1

Contribution ID: **2** Type: **Poster**

Decaying dark matter at IceCube and its signature on High Energy gamma experiments

The origin of neutrino flux observed in IceCube is still mainly unknown. Typically two flux components are assumed, namely: atmospheric neutrinos and an unknown astrophysical term. In principle the latter could also contain a top-down contribution coming for example from decaying dark matter. In this case one should also expect prompt and secondary gammas as well. This leads to the possibility of a multimessenger analysis based on the simultaneous comparison of the Dark Matter hypothesis both with neutrino and high energy gamma rays data. We have analyzed, for different decaying Dark Matter channels, the 7.5 years IceCube HESE data, and compared the results with previous exclusion limits coming from Fermi data. Finally, we have tested whether the Dark Matter hypothesis could be further scrutinised by using forthcoming high energy gamma rays experiments.

Primary author: FIORILLO, Damiano Francesco Giuseppe (University of Naples "Federico II")

Presenter: FIORILLO, Damiano Francesco Giuseppe (University of Naples "Federico II")

Contribution ID: **3** Type: **not specified**

Recent results from IceCube

Wednesday 25 September 2019 13:40 (30 minutes)

Presenter: WIEBUSCH, C.

Session Classification: Presentation of recent results

Contribution ID: **4** Type: **not specified**

Hot topic in nu astronomy

Presenter: STENNER, Joeran

Contribution ID: **5** Type: **not specified**

Recent results from ANTARES

Wednesday 25 September 2019 14:30 (30 minutes)

Presenter: VAN ELEWYCK, Veronique

Session Classification: Presentation of recent results

Contribution ID: **6** Type: **not specified**

ANITA observations and perspectives

Presenter: VIERREG, Abigail

Contribution ID: **7** Type: **not specified**

Neutrinos from blazars

Presenter: Dr PADOVANI, Paolo (European Southern Observatory)

Contribution ID: **8** Type: **not specified**

Neutrinos from Starburst

Wednesday 25 September 2019 16:30 (30 minutes)

Presenter: TAYLOR, Andrew

Session Classification: Overview of neutrino sources 1

Contribution ID: **9** Type: **not specified**

Common origin of diffuse neutrinos and UHECRs?

Wednesday 25 September 2019 17:00 (30 minutes)

Presenter: Dr BONCIOLI, denise (DESY)

Session Classification: Overview of neutrino sources 1

Contribution ID: **10** Type: **not specified**

Neutrinos from Galaxy

Wednesday 25 September 2019 17:30 (20 minutes)

Presenter: Dr GAGGERO, Daniele (GRAPPA, University of Amsterdam)

Session Classification: Overview of neutrino sources 1

Contribution ID: **11** Type: **not specified**

Neutrinos from disk outflow

Wednesday 25 September 2019 17:50 (20 minutes)

Presenter: INOUE, Susumu

Session Classification: Overview of neutrino sources 1

Contribution ID: **12** Type: **not specified**

Observations: Follow-ups, gamma-rays, UHE gamma-rays

Presenter: Dr BUSON, Sara (NASA-GSFC)

Contribution ID: **13** Type: **not specified**

Theoretical interpretation: Historical flare

Thursday 26 September 2019 09:30 (20 minutes)

Presenter: Mr RODRIGUES, Xavier (DESY)

Session Classification: The TXS 0506+056

Contribution ID: **14** Type: **not specified**

Theoretical interpretation: Models for 2017 flare

Thursday 26 September 2019 09:50 (20 minutes)

Presenter: CERRUTI, Matteo

Session Classification: The TXS 0506+056

Contribution ID: **15** Type: **not specified**

Observations: neutrinos, also with emphasis of 2014-15 flare

Thursday 26 September 2019 10:10 (20 minutes)

Presenter: FINLEY, Chad

Session Classification: The TXS 0506+056

Contribution ID: **16** Type: **not specified**

Generic constraints on sources of diffuse flux

Thursday 26 September 2019 11:00 (30 minutes)

Presenter: ANDO, Shin'ichiro (University of Amsterdam)

Session Classification: Overview of neutrino sources, 2

Contribution ID: **17** Type: **not specified**

Interpretations in terms of AGN population

Presenter: PETROPOULOU, Maria

Contribution ID: **18** Type: **not specified**

Optical transients & Neutrinos from Supernovae

Presenter: Mr STEIN, Robert (DESY Zeuthen)

Contribution ID: **19** Type: **not specified**

DM interpretations of the diffuse flux

Thursday 26 September 2019 12:10 (20 minutes)

Presenter: MORISI, Stefano

Session Classification: Overview of neutrino sources, 2

Contribution ID: **20** Type: **not specified**

Prospects for the multi-messenger follow-up of high-energy neutrinos

Thursday 26 September 2019 14:00 (30 minutes)

Presenter: GAL-YAM, Avishay

Session Classification: Multi-messenger physics

Contribution ID: **21** Type: **not specified**

Neutrinos from NS-NS mergers

Presenter: Dr KIMURA, Shigeo (Pennsylvania State University)

Contribution ID: **22** Type: **not specified**

Gamma-ray Bursts: What do we learn? Multi-collision models?

Thursday 26 September 2019 14:50 (20 minutes)

Presenter: Mr HEINZE, Jonas (Desy Zeuthen)

Session Classification: Multi-messenger physics

Contribution ID: **23** Type: **not specified**

Expectations for cosmogenic neutrinos from CR data

Thursday 26 September 2019 15:10 (20 minutes)

Presenter: Dr ALVES BATISTA, Rafael (University of São Paulo)

Session Classification: Multi-messenger physics

Contribution ID: **24** Type: **not specified**

Perspectives for radio detection: RNO

Thursday 26 September 2019 16:30 (30 minutes)

Presenter: NELLES, Anna (HU Berlin, DESY)

Session Classification: Future perspective 1

Contribution ID: **25** Type: **not specified**

Perspectives for radio detection: GRAND

Presenter: Dr KOTERA, Kumiko (Institut d'Astrophysique de Paris)

Contribution ID: **26** Type: **not specified**

IceCube-Upgrade and IceCube-Gen2

Thursday 26 September 2019 16:00 (30 minutes)

After the discovery of high-energy cosmic neutrinos and the likely observation of a first neutrino source with the IceCube neutrino telescope, the realization of a next generation neutrino telescope at the South Pole, IceCube-Gen2, is progressing. As a first step, the IceCube detector will be upgraded with seven new strings to be deployed near the center of the existing detector during during the 2022/23 Polar season. The main goals are world-leading sensitivity to neutrino oscillation physics including tau neutrino appearance and significantly improved calibration of the existing detector which can also be applied to archival data. IceCube-Gen2 will then consist of additional ~140 strings which will instrument 8 km3 of ice with the main goal of high-energy neutrino astrophysics. The talk discusses the physics case for both detectors and presents the current project status.

Primary author: KAPPES, Alexander

Presenter: KAPPES, Alexander

Session Classification: Future perspective 1

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

Neutrino Target of Opportunity program for the Cherenkov Telescope Array

The measurement of an astrophysical flux of high-energy neutrinos by IceCube is an important step towards finding the long-sought sources of cosmic rays. Nevertheless, the long exposure neutrino sky map shows no significant indication of point sources so far. This may point to a large population of faint, steady sources or flaring objects as origins of this flux. The most compelling evidence for a neutrino point source so far is the recent observation of the flaring gamma-ray blazar TXS 0506+056 in coincidence with a high-energy neutrino from IceCube. This is a result of a Neutrino Target of Opportunity (NToO) program in which all currently operating Imaging Atmospheric Cherenkov Telescopes (IACTs) take part. The case for TXS 0506+056 being a neutrino source was made stronger by evidence of a 5-month long neutrino flare in 2014-2015.
Here we investigate the chances of a detection of a gamma-ray counterpart to a neutrino source with CTA, as a result of a follow-up observation of a neutrino alert. We use the FIRESONG software to simulate different neutrino sources populations, which could be responsible for the diffuse flux of astrophysical neutrinos as measured by IceCube. We scan over parameters that can be used to describe the populations such as density (density rate) for steady (flaring) objects. Several CTA array layouts and instrument response functions are tested in order to derive optimal follow-up strategies and the potential science reach of the NToO program for CTA. We find that following neutrino alerts by IceCube, CTA has a low per alert probability of detecting a matching steady source. However, using a model by Halzen et al. (2018), for neutrino flares similar to that of 2014-2015, we find that CTA will detect a counterpart in as many as one third of the alerts.

Primary author: SATALECKA, Konstancja (DESY)

Co-authors: ROSALES DE LEON, Alberto (Centre for Advanced Instrumentation (CfAI), Department of Physics, University of Durham, Durham, UK); Dr BROWN, Anthony (University of Durham); TUNG, Chun Fai (Center for Relativistic Astrophysics and School of Physics. Georgia Institute of Technology. Atlanta, GA 30332, USA); THEO, Glauch (Institute for Advanced Studies, Technical University of Munich, D-85748 Garching, Germany); TABOADA, Igancio (Center for Relativistic Astrophysics and School of Physics. Georgia Institute of Technology. Atlanta, GA 30332, USA); SERGIJENKO, Olga (Astronomical Observatory, Taras Shevchenko National University of Kyiv, 04053 Kyiv Ukraine); REIMANN, Rene (III. Physikalisches Institut, RWTH Aachen University, D-52056 Aachen, Germany)

Presenter: SATALECKA, Konstancja (DESY)

Contribution ID: **28** Type: **not specified**

Flavor triangles, interpretation of neutrino flavor composition

Friday 27 September 2019 09:00 (30 minutes)

Presenter: Dr BUSTAMANTE, Mauricio (Niels Bohr Institute)

Session Classification: Neutrino oscillations

Contribution ID: **29** Type: **not specified**

Neutrino oscillations and tau appearance at IceCube

Friday 27 September 2019 09:30 (20 minutes)

Presenter: Dr ELLER, Philipp (PennState University)

Session Classification: Neutrino oscillations

Contribution ID: **30** Type: **not specified**

Trinity / Tau-neutrinos via air Cherenkov

Thursday 26 September 2019 17:30 (20 minutes)

Presenter: Prof. OTTE, Nepomuk (Georgia Institute of Technology)

Session Classification: Future perspective 1

Contribution ID: **31** Type: **not specified**

Atmospheric neutrino background

Friday 27 September 2019 10:10 (20 minutes)

Presenter: RENO, Mary Hall

Session Classification: Neutrino oscillations

Contribution ID: **32** Type: **not specified**

Cross sections at UHE

Friday 27 September 2019 10:30 (30 minutes)

Presenter: CONNOLLY, Amy

Session Classification: Neutrino oscillations

Contribution ID: **33** Type: **not specified**

ANITA events and interpretations in terms of BSM physics

Friday 27 September 2019 11:20 (20 minutes)

Presenter: FOX, Derek Brindley

Session Classification: BSM and Future perspective 2

Contribution ID: **34** Type: **not specified**

BSM physics with atmospheric neutrinos

Friday 27 September 2019 11:40 (30 minutes)

Presenter: KATORI, Teppei

Session Classification: BSM and Future perspective 2

Contribution ID: **35** Type: **not specified**

KM3NeT

Friday 27 September 2019 12:10 (30 minutes)

Presenter: SAPIENZA, Piera

Session Classification: BSM and Future perspective 2

Contribution ID: **36** Type: **not specified**

Earth tomography (absorption) with neutrinos

Friday 27 September 2019 09:50 (20 minutes)

Presenter: DONINI, Andrea

Session Classification: Neutrino oscillations

Contribution ID: **37** Type: **Poster**

Monitoring of the ”neutrino blazar” TXS 0506+056 with MAGIC and other instruments in the years 2017-2019

Following the multi-messenger observations triggered by the IceCube telescope in September 2017, the blazar TXS 0506+056 has become a key object to study the connection between the high-energy neutrino and photon emission in active galactic nuclei. Accurate and contemporaneous multi-wavelenght spectral measurements are essential to achieve this goal. After the TXS 0506+056 discovery at very-high-energies, the MAGIC telescopes, accompanied by multiwavelength partners, continued the monitoring campaign on this source. Here we present the light curves and quasi-simultaneous spectral energy distributions collected during the multiwavelength observations spanning from November 2017 to February 2019. They include the lowest VHE gamma-ray emission state measured from this source so far as well as a flaring episode in December 2018.

Primary author: SATALECKA, Konstancja (DESY)

Co-authors: Mrs RIGHI, Chiara (Università degli studi dell’Insubria); BERNARDINI, Elisa (University of Padova); PRANDINI, Elisa (University of Padova); Dr TAVECCHIO, Fabrizio (INAF-OAB); Dr FOFFANO, Luca (University of Padova); CERRUTI, Matteo (Institut de Ciències del Cosmos - Universitat de Barcelona); NAREK, Sahakyan (ICRANet-Armenia Center); INOUE, Susumu (RIKEN); FALLAH RAMAZANI, Vandad (University of Turku); Mr BHATTACHARYYA, Wrijupan (DESY, 6 Platanenallee, 15738 Zeuthen, Germany)

Presenter: SATALECKA, Konstancja (DESY)

Contribution ID: **38** Type: **Poster**

High Energy neutrino flux from blazar flares

Blazar gamma-ray flares are ideal periods for high-energy neutrino production in many theoretical models. The detection of the high-energy neutrino IC-170922A in the direction of the blazar TXS 0506+056 during a gamma-ray flare in 2017, is the first association of a high-energy neutrino with an astrophysical source inconsistent with arising by chance at the 3 sigma level. To better understand how the neutrino signal expected to be detected with IceCube depends on the properties of the source and of the individual flares, we have modelled the neutrino emission from past, individual blazar flares, visible with IceCube, with a self-consistent lepto-hadronic model. I will present the results of this study, and inferences about the expected neutrino signal as a function of the source properties, which include the unknown baryon content, and details of the physical conditions in the blazar emitting region.

Primary author: Dr OIKONOMOU, Foteini (ESO)

Co-authors: Prof. RESCONI, Elisa (TUM); Dr MURASE, Kohta (Penn State University); Dr PADOVANI, Paolo (European Southern Observatory); Prof. MESZAROS, Peter (Penn State)

Presenter: Dr OIKONOMOU, Foteini (ESO)

Contribution ID: **39** Type: **Poster**

Search for PeV-EeV tau neutrinos from PKS1502+106 (IceCube-190730A) with MAGIC

MAGIC is a stereoscopic system of two Imaging Atmospheric Cherenkov Telescopes, designed for the measurement of very high energy gamma rays above 30 GeV. MAGIC can also be used as a detector of PeV-EeV tau neutrinos: an optimal region of pointing is accessible through the Earth-skimming technique. This region is located towards the Atlantic Ocean, a few degrees below the horizon.
In this work, a follow-up approach is presented and exploited for high significance triggers issued by neutrino telescopes, such as IceCube. A selection cut is used in order to discriminate τ-lepton-induced air showers from the background of very inclined cosmic-ray-induced air showers. The background rejection capability and the acceptance of MAGIC to ν_τ are shown. The method presented here is applied to a sample of data collected during two consecutive nights (2019/08/01-02) after the trigger of a high-energy neutrino candidate event: IceCube-190730A (GCN # 25225). Given the spatial coincidence with the Flat Spectrum Radio Quasar PKS 1502+106 (within the 50% uncertainty region of the refined neutrino direction) and the high signalness reported for the neutrino candidate event (67%, ATel # 12967), we tracked the FSRQ while passing through the optimal neutrino visibility window. An upper limit on the neutrino flux from the above given direction is presented.

Primary authors: Dr GORA, Dariusz (Institute of Nuclear Physics Polish Academy of Sciences, Cracow, Poland); Prof. BERNARDINI, Elisa (University of Padova, INFN Padova (Italy), DESY, Zeuthen, (Germany)); Dr MALLAMACI, Manuela (University of Padova and INFN Padova (Italy))

Presenter: Dr GORA, Dariusz (Institute of Nuclear Physics Polish Academy of Sciences, Cracow, Poland)

Contribution ID: **40** Type: **Poster**

Modelling the broadband emission from blazars using constraints from multi-messenger and multi-wavelength observations

Based on the origin of the high-energy (X ray to TeV gamma ray) emission from blazars, the models describing their broadband spectral energy distribution (SED) can be broadly classified into three categories - leptonic, hadronic and mixed lepto-hadronic. One of the key advantages of hadronic and lepto-hadronic SED models is their ability to interpret multi-messenger photon and neutrino observations, that is fundamental to identify potential cosmic-ray accelerators. Here we present a new stationary code for modelling the multi-wavelength electromagnetic and neutrino emission from blazars. The code computes the relevant leptonic as well as hadronic emission components thus allowing a self-consistent study of the physical processes at work within the astrophysical engines of blazar jets. The applications of the code are described in terms of the blazar 1ES 1959+650 and the multi-messenger association of the blazar TXS 0506+056 with the high-energy (~290 TeV) neutrino event IC 170922A.

Primary author: Mr BHATTACHARYYA, Wrijupan (DESY, Platanenallee 6, 15738 Zeuthen)

Co-authors: Prof. BERNARDINI, Elisa (University of Padova, DESY Zeuthen); Dr TAVECCHIO, Fabrizio (INFN Padova); Dr SATALECKA, Konstancja (DESY Zeuthen); Dr CERRUTTI, Matteo (University of Barcelona, Instituto de Ciencias del Cosmos (ICCUB)); Dr TAKAHASHI, Mitsunari (ICRR, Japan); Dr INOUE, Susumu (RIKEN, Japan)

Presenter: Mr BHATTACHARYYA, Wrijupan (DESY, Platanenallee 6, 15738 Zeuthen)

Contribution ID: **41** Type: **Invited speaker**

Neutrinos from NS-NS mergers

Thursday 26 September 2019 14:30 (20 minutes)

The mergers of neutron stars are expected to produce high-energy neutrinos through particle acceleration inside the relativistic jets. In this talk, I will discuss future prospects for high-energy neutrino detection coincident with gravitational waves. We consider two neutrino production scenarios. One is the late-time engine activity of the short gamma-ray bursts. High-energy neutrinos are efficiently produced in the jets of the prolonged activity owing to their lower Lorentz factor. The other is choked jet systems where the relativistic jets fail to penetrate the merger ejecta. In this case, photons are absorbed by the ejecta, while neutrinos escape from the system and can be detected. For both scenarios, the future project, such as IceCube-Gen2, will likely detect the neutrinos coincident with gravitational waves.

Primary author: Dr KIMURA, Shigeo (Tohoku University)

Presenter: Dr KIMURA, Shigeo (Tohoku University)

Session Classification: Multi-messenger physics

Contribution ID: **42** Type: **Invited speaker**

The Giant Radio Array for Neutrino Detection

Thursday 26 September 2019 17:00 (30 minutes)

The Giant Radio Array for Neutrino Detection (GRAND) project aims to detect ultra-high-energy cosmic neutrinos, cosmic rays, and gamma rays with a radio antenna array deployed over a total area of 200 000 km2 in mountainous regions, in several favorable locations around the world. The strategy of GRAND is to detect air showers above 10^17 eV that are induced by the interaction of high-energy particles in the atmosphere or in the Earth crust, through its associated coherent radio-emission in the 50-200 MHz range. In its final configuration, GRAND plans to reach a sensitivity of ~10^{-10} GeV cm^-2 s^-1 sr^-1 above 5*10^{17} eV and a sub-degree angular resolution. The 300-antenna pathfinder array, GRANDProto300 is planned to be deployed in 2021. It aims at demonstrating autonomous radio detection of inclined air-showers, and make measurements of the composition and the muon content of cosmic rays around the ankle energy.
In this talk, we will show preliminary designs and simulation results, plans for the ongoing, staged approach to construction, and the rich research program made possible by the proposed sensitivity and angular resolution.

Primary author: Dr KOTERA, Kumiko (Institut d'Astrophysique de Paris)

Presenter: Dr KOTERA, Kumiko (Institut d'Astrophysique de Paris)

Session Classification: Future perspective 1

Contribution ID: **43** Type: **Poster**

Multi-messenger interpretation of the neutrinosfrom TXS 0506+056

We discuss possible interpretations of the neutrinos observed from the AGN blazar TXS0506+056 in the multi-messenger and multi-wavelength context, including both the 2014-15 and2017 neutrino flares. While the neutrino observed in September 2017 has to describe contemporary data ine.g.the X-ray and VHE gamma-ray ranges, data at the 2014-15 excess are much sparser. We demonstrate that in both cases the simplest possible one-zone AGN blazar models face challenges. While the 2017 flare can be well interpreted by considering more sophisticated source geometries, the 2014-15 flare is much harder to describe with conventional models. One challenge is the energy injected into the electromagnetic cascade coming together with the neutrino production, which cannot be reconciled with the 13 observed neutrino events. We also speculate if a common interpretation of both flares is feasible.

Primary authors: Dr FEDYNITCH, Anatoli (DESY); POHL, Martin (DESY); Dr GAO, Shan (DESY); Dr WINTER, Walter (DESY); Mr RODRIGUES, Xavier (DESY)

Presenters: Dr GAO, Shan (DESY); Mr RODRIGUES, Xavier (DESY)

Contribution ID: **44** Type: **Poster**

Potential for neutrino experiments to determine the fraction of protons in UHECRs

When ultrahigh-energy cosmic rays (UHECRs) interact with extragalactic photon backgrounds they can create neutrinos. Protons, compared with heavier nuclei, are especially efficient in producing such cosmogenic neutrinos. In our recent paper [1], we show that the expected cosmogenic neutrino flux at an energy of ~1 EeV mainly depends on the evolution with redshift of UHECR sources and the fraction of protons in UHECRs. Therefore, assuming a certain source class, a constraint on the composition of UHECRs can be obtained. Current neutrino experiments indicate that the combination of a large proton fraction and a strong source evolution is not possible. Upcoming neutrino experiments have a good chance of detecting a cosmogenic neutrino flux at ~1 EeV for most realistic source evolutions even for small (~1%) proton fractions. In this way they will be able to give an estimate for the fraction of protons in UHECRs without relying on hadronic interaction models.

[1] A. van Vliet, J. R. Hörandel and R. Alves Batista, *Determining the fraction of cosmic-ray protons at ultrahigh energies with cosmogenic neutrinos*, PRD **100** (2019) 021302(R)

Primary author: Dr VAN VLIET, Arjen (DESY Zeuthen)

Co-authors: Prof. HÖRANDEL, Jörg R. (Radboud University Nijmegen); Dr ALVES BATISTA, Rafael (University of São Paulo)

Presenter: Dr VAN VLIET, Arjen (DESY Zeuthen)

Contribution ID: **45** Type: **Poster**

TeV -Scale Resonant Leptogenesis with New Scaling Ansatz on Neutrino Dirac Mass Matrix from A4 Flavor Symmetry

We propose a new scaling ansatz in the neutrino Dirac mass matrix to explain the low energy neutrino oscillations data, baryon number asymmetry and neutrinoless double beta decay. In this work, a full reconstruction of the neutrino Dirac mass matrix has been realized from the low energy neutrino oscillations data based on type-I seesaw mechanism. A concrete model based on A4 flavor symmetry has been considered to generate such a neutrino Dirac mass matrix and imposes a relation between the two scaling factors. In this model, the right-handed Heavy Majorana neutrino masses are quasi-degenerate at TeV mass scales. Extensive numerical analysis studies have been carried out to constrain the parameter space of the model from the low energy neutrino oscillations data. It has been found that the parameter space of the Dirac mass matrix elements lies near or below the MeV region and the scaling factor $|\kappa 1|$ has to be less than 10. Furthermore, we have examined the possibility for simultaneous explanation of both neutrino oscillations data and the observed baryon number asymmetry in the Universe. Such an analysis gives further restrictions on the parameter space of the model, thereby explaining the correct neutrino data as well as the baryon number asymmetry via a resonant leptogenesis scenario. Finally, we show that the allowed space for the effective Majorana neutrino mass mee is also constrained in order to account for the observed baryon asymmetry.

Primary author: Dr BENAOUM, Hachemi (University of Sharjah)

Co-author: Mrs SHAGLEL, Salwa (University of Sharjah)

Presenter: Mrs SHAGLEL, Salwa (University of Sharjah)

Contribution ID: **46** Type: **Poster**

Low-luminosity gamma-ray bursts as a common origin of cosmic rays across the ankle and diffuse neutrinos at the highest energies

The origin of Ultra-High Energy Cosmic Rays (UHECRs) is still unknown. Gamma-Ray Bursts (GRBs) are considered as potential sources as they belong to the most energetic events observed to date. However, conventional GRB scenarios are strongly constrained by the non-observation of associated astrophysical neutrinos. On the other hand, hidden accelerators such as low-luminosity GRBs (LLGRBs) can ameliorate the constraints.

We show that the population of LLGRBs is not only consistent with current constraints, but can even describe the UHECR spectrum and composition across the ankle as well as neutrino data simultaneously. We explicitly compute the nuclear cascade in the source and stress that the sub-ankle component is directly related to nucleon and neutrino production in the nuclear cascade. We deduce source properties such as the baryonic loading or the cosmological event rate.

Primary author: BIEHL, Daniel (DESY Zeuthen)

Co-authors: Prof. LUNARDINI, Cecilia (Arizona State University); Dr WINTER, Walter (DESY); Dr BONCIOLI, denise (DESY)

Presenter: BIEHL, Daniel (DESY Zeuthen)

Contribution ID: **48** Type: **Poster**

Improved model for photomeson interactions of UHECR nuclei and the impact on in-source neutrino production

The origin of high energy astrophysical neutrinos is connected to interactions of Ultra-High Energy Cosmic Rays (UHECRs) with low energy photons. For UHECRs nuclei it is often assumed a quasi free interaction between the photon and a nucleon in the nucleus, which implies the yield of mesons (and therefore neutrinos) in nuclei scales with the mass number A. However, pion production in nuclei near threshold energy is known to be reduced compared to the A-scale assumption due to medium effects. An improved photomeson model accounting for these effects has an impact on the neutrino production spectra.

This contribution presents the Empirical Photomeson Model (EPM) and illustrates the impact on the neutrino production in typical TDE and GRB scenarios: a reduction of 30-50% in the peak of the neutrino spectrum produced in UHECRs nuclei photomeson interactions. The EPM can also be used in studies of cosmogenic neutrinos.
The model is available as an open source code to facilitate its use in other frameworks, for example it can be implemented into existing softwares like CRPropa.

Primary author: MOREJON, Leonel (DESY, Zeuthen)

Presenter: MOREJON, Leonel (DESY, Zeuthen)

Contribution ID: **49** Type: **Invited speaker**

Results from the ANITA Experiment

Wednesday 25 September 2019 15:00 (30 minutes)

I will summarize results to date from ANITA, a NASA Long Duration Balloon payload that has had four successful flights in Antarctica. ANITA is sensitive to two kinds of radio emission from particle showers: Askaryan emission from ultra-high energy (UHE) neutrinos interacting in the Antarctic ice, and Geomagnetic emission from UHE particles showering in the atmosphere. The latter channel is sensitive to cosmic ray air showers and air showers from any other UHE particles, such as tau leptons created in charged current tau neutrino interactions in the Earth or ice. I will discuss the results from searches in these channels with ANITA and possible interpretations of events observed with ANITA. I will also discuss a proposed follow-up NASA balloon mission, the Payload for Ultrahigh Energy Observations (PUEO), which will improve on ANITA's sensitivity dramatically, improving sensitivity to UHE neutrinos in this energy regime, and providing follow-up on the events observed thus far with ANITA.

Primary author: VIEREGG, Abigail (University of Chicago)

Presenter: VIEREGG, Abigail (University of Chicago)

Session Classification: Presentation of recent results

Contribution ID: **50** Type: **Poster**

Analysis of Neutrino follow-up observations with MAGIC

With the first measured correlation of an extremely high-energy
neutrino event and a flaring
gamma-ray source in September 2017, multimessenger astronomy has become more important
than ever. The stereoscopic IACT system MAGIC, located at La Palma, Canary Islands, is in-
volved in neutrino follow-up campaigns since 2012. The MAGIC telescopes are sensitive for
gamma events with energies from the 8764;30 GeV range up to tens of TeV. When a potential astro-
physical neutrino is detected by IceCube, an alert with the reconstructed coordinates is published.
MAGIC, making use of an automated alert response system, performs follow-up observations
in search of a correlated gamma-ray flux. The reconstructed neutrino direction is given with an
uncertainty, typically around 0.2
9702;–19702;
. As the angular resolution of MAGIC is much smaller, the
analysis for discovering sources in a given region has to be modified. In case of a non detection, in
order to interpret the data correctly, an information about flux upper limits in the whole IC event
error region should be given. Here we present a method to produce sky maps for identifying point
sources or deriving flux upper limits on the desired sky region, based on a maximum likelihood
approach included in the SkyPrism software. Examples of results from MAGIC observations of
IC-170922A and other IceCube alerts will be shown.

Primary author: FATTORINI, Alicia (TU Dortmund)

Presenter: FATTORINI, Alicia (TU Dortmund)

Contribution ID: **51** Type: **Invited speaker**

Neutrinos from optical transients with IceCube

Thursday 26 September 2019 11:50 (20 minutes)

Since the detection of high-energy cosmic neutrinos at the IceCube Neutrino Observatory in 2013, there has been an on-going search to find suitable transient or variable source candidates. Despite recent evidence identifying a flaring blazar as a likely neutrino source, the vast majority of the diffuse neutrino flux measured by IceCube remains unexplained. The latest IceCube results testing time-dependent correlation between neutrinos and optical transients will be presented.

Primary author: Mr STEIN, Robert (DESY Zeuthen)

Presenter: Mr STEIN, Robert (DESY Zeuthen)

Session Classification: Overview of neutrino sources, 2

Contribution ID: **52** Type: **Poster**

Multi-Messenger emission in Gamma-Ray Bursts

Due to the large amounts of energy they release, the extremely luminous transients called Gamma-Ray Bursts (GRBs) are of great interest for high energy astroparticle physics. In the fireball internal shock
scenario, particle acceleration occurs in collisions between regions of
the jet with different Lorentz factors. Usually, the observed prompt
emission is attributed to synchrotron emission from accelerated electrons. However, if cosmic rays (baryons and nuclei of high energies)
are contained in the outflow, they will be co-accelerated with electrons
and interact with the photons fields, producing secondary neutrinos.

I will discuss the influence of the dynamics in the fireball evolution on the production of multiple astrophysical messengers (such as photons, cosmic rays and neutrinos) and review the impact of different models on the observed neutrino flux.
For the observed photon spectra I will be focussing on low luminosity GRBs, which have recently been discussed as possible sources of UHECR and might be observable with CTA.

Primary author: RUDOLPH, Annika (DESY)

Co-authors: Dr FEDYNITCH, Anatoli (DESY); Mr HEINZE, Jonas (Desy Zeuthen); Dr WINTER, Walter (DESY); BOSNJAK, Zeljka (FER-University of Zagreb)

Presenter: RUDOLPH, Annika (DESY)

Contribution ID: **53** Type: **Invited speaker**

High-Energy neutrinos from AGN?

Thursday 26 September 2019 09:00 (30 minutes)

Active Galactic Nuclei (AGN) have long been suggested among the candidate sources of cosmic high-energy neutrinos. If hadronic processes operate in the AGN jets, a lot can be learnt by combining neutrino observations with the putative accompanying electromagnetic information. This is motivated by the fact that both radiations may be pictured in the same astrophysical particle-cascades scenario, cascades that are ultimately originated by cosmic rays. While to date, no neutrino point sources have been identified at high confidence, a promising ground for discovery could be the search for transient and variable neutrino/electromagnetic sources, in which case the atmospheric neutrino and muon backgrounds can be reduced by taking advantage of time- and space-coincidence. Recent outcomes in this field will be presented.

Primary author: Dr BUSON, Sara (NASA-GSFC)

Presenter: Dr BUSON, Sara (NASA-GSFC)

Session Classification: The TXS 0506+056

Contribution ID: **54** Type: **Invited speaker**

Diffuse Neutrino Flux from Jetted AGN

Thursday 26 September 2019 11:30 (20 minutes)

Active galactic nuclei (AGN) with relativistic jets powered by accretion onto their central supermassive black hole are the most powerful persistent sources of electromagnetic radiation in the Universe, with bolometric luminosities of $\sim 10^{43} - 10^{48}$ erg s^{-1}. Jetted AGN are promising cosmic ray accelerators and have abundant radiation fields for the production of high-energy neutrinos. As a result, they have been suggested as possible neutrino sources long before the discovery of an astrophysical neutrino flux by IceCube. In light of observational constraints and the recent neutrino detections associated with the blazar TXS 0506+056, I am going provide an overview of theoretical predictions for the diffuse neutrino flux from jetted AGN.

Primary author: Dr PETROPOULOU, Maria Petropoulou (Princeton University)

Presenter: Dr PETROPOULOU, Maria Petropoulou (Princeton University)

Session Classification: Overview of neutrino sources, 2

Contribution ID: **55** Type: **Poster**

A Neutral Beam Model for High-Energy Neutrino Flares from TXS 0506+056

The IceCube collaboration reported a $\sim 3.5\sigma$ excess of 13 ± 5 neutrino events in the direction of the blazar TXS 0506+056 during a $\sim$6 month period in 2014-2015, as well as the multi-messenger flare of neutrinos and gamma rays with $\sim 3\sigma$ in 2017. We explore the possibility that both events are explained in the context of the neutral beam model of blazar jets. We demonstrate that the neutral beam model gives a consistent explanation for the 2014-2015 flare without violating X-ray and gamma-ray constraints, and naturally enhances the neutrino flux by a factor of a few for the 2017 flare. The model implies that blazars, like TXS 0506+56, are efficient accelerators of light cosmic-ray nuclei, such as helium, and that cosmic-ray ions have to carry a significant fraction of the power released via mass accretion onto the central supermassive black hole.

Primary author: Dr ZHANG, Bing Theodore (Department of Astronomy, School of Physics, Peking University, Beijing, China)

Co-authors: Dr OIKONOMOU, Foteini (ESO); Dr MURASE, Kohta (Penn State University); Dr PETROPOULOU, Maria Petropoulou (Princeton University)

Presenter: Dr PETROPOULOU, Maria Petropoulou (Princeton University)

Contribution ID: **56** Type: **not specified**

Baikal

Friday 27 September 2019 12:40 (20 minutes)

Presenter: SHAYBONOV, Bair

Session Classification: BSM and Future perspective 2