Astroparticle School 2018

Report of Contributions

Contribution ID: **11** Type: **Invited talk**

Multimessenger Astrophysics

Wednesday, 3 October 2018 16:00 (1h 30m)

Presenter: KRAUSS, Felicia

Session Classification: Lectures and Invited Talks

Contribution ID: **12** Type: **Lecture**

Dark Matter I

Wednesday, 3 October 2018 17:30 (1h 30m)

Presenter: SCHUMANN, Marc

Session Classification: Lectures and Invited Talks

Contribution ID: **14** Type: **Lecture**

Dark Matter II

Thursday, 4 October 2018 09:00 (1h 45m)

Presenter: SCHUMANN, Marc

Session Classification: Lectures and Invited Talks

Contribution ID: **15** Type: **Lecture**

Neutrino Physics I

Thursday, 4 October 2018 11:00 (1h 45m)

Presenter: STAHL, Achim

Session Classification: Lectures and Invited Talks

Contribution ID: **17** Type: **Lecture**

Dark Matter III

Friday, 5 October 2018 09:00 (1h 45m)

Presenter: SCHUMANN, Marc

Session Classification: Lectures and Invited Talks

Contribution ID: **18** Type: **Lecture**

Neutrino Physics III

Friday, 5 October 2018 11:00 (1h 30m)

Presenter: STAHL, Achim

Session Classification: Lectures and Invited Talks

Contribution ID: **19** Type: **Lecture**

Neutrino Physics II

Thursday, 4 October 2018 16:00 (1h 30m)

Presenter: STAHL, Achim

Session Classification: Lectures and Invited Talks

Contribution ID: **20** Type: **Invited talk**

Machine Learning in Astroparticle Physics I

Saturday, 6 October 2018 09:00 (2h 30m)

Presenter: ERDMANN, Martin

Session Classification: Lectures and Invited Talks

Contribution ID: **21** Type: **Lecture**

Neutron Star Binaries and Neutron Star Mergers I

Monday, 8 October 2018 09:00 (1h 45m)

Presenter: REZZOLLA, Luciano

Session Classification: Lectures and Invited Talks

Contribution ID: **23** Type: **Lecture**

Neutron Star Binaries and Neutron Star Mergers II

Tuesday, 9 October 2018 09:00 (1h 45m)

Presenter: REZZOLLA, Luciano

Session Classification: Lectures and Invited Talks

Contribution ID: **24** Type: **Lecture**

Gamma Astronomy I

Tuesday, 9 October 2018 11:00 (1h 45m)

Presenter: BERGE, David

Session Classification: Lectures and Invited Talks

Contribution ID: **25** Type: **Lecture**

Neutron Star Binaries and Neutron Star Mergers III

Wednesday, 10 October 2018 09:00 (1h 45m)

Presenter: REZZOLLA, Luciano

Session Classification: Lectures and Invited Talks

Contribution ID: **26** Type: **Lecture**

Gamma Astronomy II

Wednesday, 10 October 2018 11:00 (1h 45m)

Presenter: BERGE, David

Session Classification: Lectures and Invited Talks

Contribution ID: **27** Type: **Invited talk**

Citizen Science

Thursday, 11 October 2018 09:00 (1h 45m)

Presenter: STEPHAN, Sergeant

Session Classification: Lectures and Invited Talks

Contribution ID: **28** Type: **Lecture**

Gamma Astronomy III

Thursday, 11 October 2018 11:00 (1h 45m)

Presenter: BERGE, David

Session Classification: Lectures and Invited Talks

Contribution ID: **29** Type: **Lecture**

Research Funding in Germany and Europe

Monday, 8 October 2018 20:00 (1 hour)

Presenter: HEMPEL, Marc

Session Classification: Lectures and Invited Talks

Contribution ID: **34** Type: **Participant talk**

Tau neutrino appearance with KM3NeT-ORCA using Deep Learning

Saturday, 6 October 2018 16:40 (20 minutes)

An important open question in neutrino physics is the unitarity of the PMNS matrix. Currently, the uncertainties on several matrix elements are too large in order to draw significant conclusions on the unitarity. This is mostly due to the low experimental statistics in the tau neutrino sector. KM3NeT-ORCA is a water Cherenkov detector under construction with several megatons of instrumented volume. It will observe about 2400 tau neutrinos per year and thus, it will significantly improve the available tau neutrino statistics. In ORCA, tau neutrinos will be identified by observing a statistical excess of cascade-like events with respect to the electron neutrino expectation from the atmosphere. For this purpose, fundamental event properties like the energy and the direction of an event need to be reconstructed based on the experimental data. Additionally, the development of an algorithm for the separation of track-like (mostly $\nu_\mu - CC$) and cascade-like (other flavors) neutrino events is necessary. Currently, event properties inspired by the different event types are used with shallow machine learning, in order to discriminate the two classes. Recent advances in computational performance have made it possible to employ deep artificial neural networks. In this approach, the experimental raw data is used for training a deep neural network. Here, the network builds a representation of the typical event properties that can be exploited to distinguish track-like from shower-like events. In this talk, the current status of the ORCA deep learning efforts with respect to the measurement of tau neutrino appearance is presented.

Primary author: MOSER, Michael (Friedrich-Alexander-Universität Erlangen-Nürnberg)

Presenter: MOSER, Michael (Friedrich-Alexander-Universität Erlangen-Nürnberg)

Session Classification: Participant Talks

Contribution ID: **35** Type: **Participant talk**

Integration of radio surface antennas into the scintillator upgrade of IceTop at IceCube

Monday, 8 October 2018 16:40 (20 minutes)

In coming years, an upgrade of the surface array IceTop with scintillators is foreseen. An additional installation of radio antennas integrated into the scintillation detector system would significantly improve the task of cosmic ray physics at the South Pole. In particular, it would allow the search for PeV gammas coming from the center of our Galaxy.
A reasonable option for this array are antennas designed for the Square Kilometer Array (SKA). Along with the preparation of the
antenna for the environmental stress, i.e. to adapt them to the circumstances given at the south pole, the implementation of the antenna signal into the data acquisition of the scintillation detectors needs to be done.
This contribution will shortly discuss the science case for the radio array and will present the progress in the integration efforts.

Primary author: STEINMÜLLER, Peter

Presenter: STEINMÜLLER, Peter

Session Classification: Participant Talks

Contribution ID: **36** Type: **Participant talk**

The Condensed Krypton Source as a Calibration Tool for KATRIN

Friday, 5 October 2018 16:00 (20 minutes)

The Karlsruhe Tritium Neutrino (KATRIN) experiment is a model-independent measurement of the neutrino mass from the tritium β decay spectrum, aiming for a sensitivity of $0.2\,\frac{\mathrm{eV}}{\mathrm{c}^2}$ (90% C.L.). Electrons from the decay in the high-intensity windowless gaseous tritium source are analyzed in a high-resolution MAC-E (Magnetic Adiabatic Collimation combined with an Electrostatic) filter spectrometer and the resulting integrated energy spectrum is recorded with the focal plane detector.
The Condensed Krypton Source (CKrS) has been developed as a source for absolute energy calibration, monitoring and determination of the transmission function of the spectrometer. It utilizes nearly mono-energetic conversion electrons from an adsorbed $83^m\mathrm{Kr}$ layer on a graphite substrate, which can be moved over the complete flux tube area at its position in the KATRIN beamline, allowing for per-pixel calibration of the focal plane detector. Important parameters like cleanliness of the substrate and the thickness of the frozen radioactive films are monitored *in-situ* by means of laser ellipsometry. An overview over the experimental setup and results from the commissioning measurement phase regarding stability and reproducibility of the conversion electron energies are shown. This work is supported under BMBF contract 05A17PM3.

Primary author: FULST, Alexander (WWU Münster)

Presenter: FULST, Alexander (WWU Münster)

Session Classification: Participant Talks

Contribution ID: **37** Type: **Participant talk**

Directional Reconstruction of Muons with Recurrent Neutal Networks in IceCube

Saturday, 6 October 2018 16:20 (20 minutes)

The IceCube neutrino observatory is searching for point sources in the astrophysical neutrino flux. Relativistic muons created by muon-neutrinos offer a good angular resolution and are thus an ideal channel for the detection of points sources.
Recurrent neural networks (RNNs) are a class of artificial neural networks that capture the dynamics of sequential data by recurrently applying the network to each elements in a sequence. They retain a state from previous elements of the sequence and are thus able to aggregate information from arbitrarily long sequences. This makes RNNs well suited for time series data such as the signatures created by particles traveling through IceCube.

In this contribution I present a status report on directional reconstruction of muons in IceCube using recurrent neural networks.

Primary author: WREDE, Gerrit

Presenter: WREDE, Gerrit

Session Classification: Participant Talks

Contribution ID: **38** Type: **not specified**

study of Nuclearites with ANTARES detector

Nuclearites are lumps of strange quarks matter, the matter which may be the ground state of our universe. According to the theory, nuclearites may exist in cosmic rays reaching the Earth and so, they may hit the ANTARES detector or its alternatives. Their energy loss in atmosphere and water should help us to detect them at deep sea. Based on their number of photons emitted, nuclearites with masses >=6*10^(12) GeV should emit sufficient light to be detected at the ANTARES depth.

Primary author: Mr BOUTA, Mohammed (PMRL)

Presenter: Mr BOUTA, Mohammed (PMRL)

Session Classification: Participant Talks

Contribution ID: **39** Type: **Participant talk**

Supernova Remnant as PeVatron candidates for CTA observations

Monday, 8 October 2018 16:00 (20 minutes)

PeVatrons are astrophysical sources which are supposed to accelerate charged particles up to PeV energies. Studying PeVatrons would help us to understand acceleration processes of cosmic rays and fundamental physics of the compact sources. The Cherenkov Telescope Array (CTA) has a broad energy range from 30 GeV to 300 TeV, which arise the possibility to detect Pevatron candidates through pion production and consecutive gamma-decay processes. Among the Galactic TeV sources, SNRs are one of the most promising candidates since they are strong particle accelerators. Therefore, we use the Data Challenge One (DC-1) to search for possible PeVatron candidates. Fitting the data to different radiative processes, we find that RX J1713.7-3946 and HESS J1614-518 are promising sources with considerable flux due to pion-decay processes.

Primary authors: Mr OU, Ziwei (Institut de Physique Nucléaire d'Orsay, France); Prof. SUOMIJARVI, Tiina (Institut de Physique Nucléaire d'Orsay, France)

Presenter: Mr OU, Ziwei (Institut de Physique Nucléaire d'Orsay, France)

Session Classification: Participant Talks

Contribution ID: **40** Type: **Participant talk**

Proportional Scintillation in Liquid Xenon Time Projection Chambers

Friday, 5 October 2018 16:20 (20 minutes)

Many astrophysical observations indicate that the major part of matter in the universe is dark. The hypothetical Weakly Interacting Massive Particle (WIMP), predicted by many BSM theories, is one of the most promising candidates. Liquid Xenon (LXe)-filled dual-phase time projection chambers (TPC) as a dark matter detectors are well established and set the most stringent limits for spin-independent WIMP-nucleon interactions. The DARWIN (DARk matter WIMP search with liquid xenoN) detector will push this limit down to the limit, where ν-induced interactions dominate the background. To build this ultimate detector challenges such as background reduction, LXe purification or scaling the detector have to be faced. Some of these could be overcome in a single-phase TPC, where the proportional light signal from ionization electrons is produced in the strong electric field around thin wires. The majority of my studies is to set up a single phase TPC which makes use of a anode grid consisting of several thin wires. The long term goal is to compare parameters extracted in single-phase mode with those determined operating the TPC as a dual-phase detector. This requires a test platform for liquid xenon detection technologies. The XEBRA (XEnon Based Research Apparatus) detector setup in Freiburg is used for these studies.

Primary author: Mr MEINHARDT, Patrick

Presenter: Mr MEINHARDT, Patrick

Session Classification: Participant Talks

Contribution ID: **41** Type: **Participant talk**

Monte Carlo simulations of the XENON1T experiment

Friday, 5 October 2018 16:40 (20 minutes)

The XENON Dark Matter Project uses a dual-phase xenon time projection chamber (TPC) for a direct detection of weakly interacting massive particles (WIMPs). The current operating step, XENON1T, is the most sensitive direct detection dark matter experiment in the world.

Therefore, the TPC is build to detect low intensity light signals, generated either directly by the recoil produced by the scattering processes of incoming particles (S1) or through proportional scintillation (S2). The light collection efficiency (LCE) of these signals depends on the position of the interaction in the active volume and on optical properties of the materials. The resulting LCE map is used as an input parameter for waveform simulations which converts GEANT4 interactions to actual photomultiplier tube (PMT) signals that can be processed with the XENON1T data processor (PAX).

Several aspects of the Monte Carlo chain will be highlighted, including optical, background and waveform simulations, as well as the performance compared to actual measurements with the XENON1T experiment.

Primary author: Mr ALTHÜSER, Lutz (IKP, Westfälische Wilhelms-Universität Münster)

Presenter: Mr ALTHÜSER, Lutz (IKP, Westfälische Wilhelms-Universität Münster)

Session Classification: Participant Talks

Contribution ID: **42** Type: **Participant talk**

Data integration for various astroparticle experiments

Saturday, 6 October 2018 17:00 (20 minutes)

An important prerequisite for performing a joint analysis of data from different experiments is a search for ways to integrate these data. This process includes mapping, i.e. finding a correspondence of observables between each other, establishing similarities and differences, and normalization, i.e. shifting measurement scales to allow comparison of corresponding normalized values for observables, after which we can perform data analysis on a common dataset.
At the system level, we are interested in developing a distributed storage system for the data, as well as using parallel computations to speed up the analysis and setting up a workload management system for distributed launching of analysis and simulation jobs.
The talk will consider approaches to solve these problems that would be used in the German-Russian Astroparticle Data Life Cycle project for the joint analysis of data from the TUNKA-133 and KASCADE-Grande experiments. The increased statistics obtained with the help of these methods will be used to investigate rare processes, for example, study the properties of high-energy gamma rays from galactic sources.

Primary author: Ms TOKAREVA, Victoria (KIT)

Presenter: Ms TOKAREVA, Victoria (KIT)

Session Classification: Participant Talks

Contribution ID: **43** Type: **Participant talk**

Setup of a batch test facility for the characterization of photomultipliers for the SSD-Upgrade of the Pierre Auger Observatory

Wednesday, 10 October 2018 16:20 (20 minutes)

With the new instrumentation of the batch test facility at the University of Wuppertal for the characterization of photomultipliers for the SSD-Upgrade of the Pierre Auger Observatory we will measure the relevant quantities to ensure the required operation in the field. We will have the possibility to determine the homogeneity, dark current, linearity and pulse rise time of the first batch of photomultipliers with the soldered iseg-base, which is the planned instrumentation for the upgrade.

Primary author: STROTMANN, Simon (University of Wuppertal)

Presenter: STROTMANN, Simon (University of Wuppertal)

Session Classification: Participant Talks

Contribution ID: **44** Type: **Participant talk**

Unfolding the Electric Field of Radio Emission from Extensive Air Showers

Monday, 8 October 2018 17:00 (20 minutes)

In recent years the observation of ultra high energy cosmic ray (UHECR) with coherent radio emission has become increasingly active in astroparticle physics.
The detection of radio emission provides an independent measurement of the cosmic ray energy and mass. A precise reconstruction of these properties requires an accurate unfolding of the recorded signals.
In this talk a two-part approach to unfold signals recorded with the Auger Engineering Radio Array (AERA) is presented. First, we introduce a Deep Learning based algorithm to recover air shower signals recorded simultaneously with ambient noise. Second, an octocopter based calibration campaign to examine antenna characteristics is presented. Furthermore the calibration is verified with air shower signals.

Primary authors: SCHLÜTER, Felix (KIT); Prof. ERDMANN, Martin (RWTH Aachen); Mr KRAUSE, Raphael

Presenter: SCHLÜTER, Felix (KIT)

Session Classification: Participant Talks

Contribution ID: **45** Type: **Participant talk**

Deep Neural Networks for Energy Reconstruction in EXO-200

Friday, 5 October 2018 17:00 (20 minutes)

The EXO-200 experiment searches for the neutrinoless double beta ($0\nu\beta\beta$) decay in ^{136}Xe with an ultra-low background single-phase time projection chamber (TPC) filled with 175 kg isotopically enriched liquid xenon (LXe). The detector has demonstrated good energy resolution and background rejection capabilities by simultaneously collecting scintillation light and ionization charge from the LXe and by a multi-parameter analysis. The combination of both signatures allows for complementary energy estimates and for a full 3D position reconstruction. Advances in computational performance in recent years have made novel Deep Learning techniques applicable to the physics community. In this talk, I will briefly present the concept of the detector and summarize the potential of Deep Learning based methods towards improving EXO-200 analyses with a focus on the energy reconstruction in the experiment.

Primary author: ZIEGLER, Tobias (ECAP)

Presenter: ZIEGLER, Tobias (ECAP)

Session Classification: Participant Talks

Contribution ID: **46** Type: **Participant talk**

Enceladus -home of extraterrestrial life?

Tuesday, 9 October 2018 16:20 (20 minutes)

In 2005 the Cassini spacecraft discovered that Enceladus, one of Saturn‘s icy moons, not only exhibits liquid water under it‘s ice shell, but also is a geologically active body. Since then enceladus became one of the most interesting scientific targets in our solar system, especially for the search of extraterrestrial life.
Geysers at Enceladus‘ south pole region proves that a salty ocean exists under it‘s icy crust, which is in contact with the heated rocky core beneath. Life on earth is supposed to have been orginated under similar conditions, adjacent to the “black smokers“ at the bottom of the sea. Primitive organic components among the geysers‘ ejections have already been detected.
The goal of the Enceladus Explorer initiative is to sample a water filled crack close to the surface of Enceladus with a melting probe in order to find traces of life. The detection of water filled cracks as well as the localisation of the melting probe may be possible using radar techniques. One of the major challenges is that the behaviour of very high frequency radio waves in ice is not only poorly understood, but also dependent on parameters such as composition, temperature or density which are largely unknown for Enceladus.

Primary authors: FRIEND, Pia; KYRIACOU, Alexander (Bergische Universität Wuppertal)

Presenter: FRIEND, Pia

Session Classification: Participant Talks

Contribution ID: **47** Type: **Participant talk**

Radar-based sounding and navigation for a melting probe to explore the ocean of Encaladus for signs of life

Tuesday, 9 October 2018 16:40 (20 minutes)

Enceladus Explorer (EnEx) is a proposed DLR space probe to explore Saturn's moon Enceladus for signs of extraterrestrial life. Geyser eruptions at the south pole indicate the presence of a salt water ocean with hydrothermal vents below the moon's ice shell, a possible home for extraterrestrial life. The envisioned EnEx probe would land at a safe distance to one of Enceladus' active geysers and then deploy a steerable melting probe, 'IceMole', that will burrow through the ice until it arrives as a near-surface water pocket, and there perform in-situ tests for microbial life.

To sucessfully locate the water pocket and avoid obstacles, including cavities, rocks and soil, IceMole will need to possess a radar based sounding system to map its immediate surroundings in three dimensions and to estimate its position relative to the reference points of the lander, the suraface and the target water pocket. A chief consideration is the optimal frequency range, the size of IceMole limits the wavelength at which it can transmit, transmission of very high frequencies radio waves)f > 100 MHz). Hence such a system requires accurate knowledge of the dielectric properties of the ice on Enceladus at very high frequencies, and their further dependence on temperature, density, salinity and pH level. In particular the attenuation rate is thought to increase sharply at frequencies around 1 GHz, limiting the range and bandwidth (and hence resolution) of a given radar system. A field test in the Austrian Alps will be conducted in February next year to test the feasibility of frequency modulated radar as a distance reckoning method, and obtain accurate estimates of in-ice refractive index and attenuation rate.

Primary author: Mr KYRIACOU, Alexander (Bergische Universtat Wuppertal)

Co-author: FRIEND, Pia (Bergische Universitat Wuppertal)

Presenter: Mr KYRIACOU, Alexander (Bergische Universtat Wuppertal)

Session Classification: Participant Talks

Contribution ID: **48** Type: **Participant talk**

Analysis of the lateral distribution of air showers at the Pierre Auger Observatory

Monday, 8 October 2018 16:20 (20 minutes)

The Pierre Auger Observatory in Argentina aims to survey properties of cosmic rays. The signal of the surface detector array is used to determine the energy of a cosmic ray. It is described by an NKG-type lateral distribution function. A global fit of the parameters on all data of the SD-array shall improve our empirical parameters.

Primary authors: Mr RAUSCHER, Philipp Julian (Institute for Nuclear Physics Karlsruhe Institute of Technology); Dr VEBERIĊ, Darko (Institute for Nuclear Physics Karlsruhe Institute of Technology); Dr ROTH, Markus (Institute for Nuclear Physics Karlsruhe Institute of Technology)

Presenter: Mr RAUSCHER, Philipp Julian (Institute for Nuclear Physics Karlsruhe Institute of Technology)

Session Classification: Participant Talks

Contribution ID: **49** Type: **Participant talk**

Luminescence characteristics of water and ice

Tuesday, 9 October 2018 16:00 (20 minutes)

Luminescence is the emission of photons from a medium via the deexitation of atomic orbitals following an external excitation. It can be characterized using the parameters: light yield, emission spectrum, and decay time.
It has been proposed that luminescence of water and ice can be used as a new detection channel by particle detectors that use water or ice as their target medium. These detectors generally use directly or indirectly produced Cherenkov light as a detection channel, which restricts the detection of particles to velocities above 0.5\,c. With luminescence light, on the other hand, the detection of highly ionizing particles is possible even below the velocity threshold for Cherenkov light production.
In order to use luminescence light as a particle detection channel, the characteristics need to be known for the properties given in these detectors. As a first step the characteristics are determined for ultra purified water and ice. Setups for measurements of light yield and the emission spectrum have been developed and calibrated. Results have been obtained for the light yield and its temperature dependence. The present status of the investigation will be presented.

Primary author: PIEPER, Sarah

Presenter: PIEPER, Sarah

Session Classification: Participant Talks

Contribution ID: **50** Type: **Participant talk**

Gradient Descent Optimization of IceCube Ice Parameters

Saturday, 6 October 2018 16:00 (20 minutes)

The IceCube Neutrino Observatory detects Cherenkov photons emitted by charged particles passing through the antarctic ice. The properties of light propagation in and around the detector must be well understood, to be able to learn about the interacting particles and their origin. This talk gives an overview of how to use in-situ light sources to derive ice parameters by performing gradient descent optimization instead of grid searches.

Primary author: HARNISCH, Alexander (TU Dortmund)

Presenter: HARNISCH, Alexander (TU Dortmund)

Session Classification: Participant Talks

Contribution ID: **51** Type: **Participant talk**

Comparison of lightguide designs for SiPM pixel in the MAGIC I telescope and characterisation of pulse arrival times

Wednesday, 10 October 2018 16:40 (20 minutes)

The MAGIC telescopes on La Palma detect Cherenkov radiation induced by particle showers. Photomultiplier tubes (PMTs) are currently used as photodetectors. In order to extend the duty cycle of such telescopes and improve their general robustness the use of silicon based photodetectors (SiPMs) is tested.

As part of achieving a better understanding of operation of SiPMs in Imaging Atmospheric Cherenkov Telescopes (IACTs) the mean arrival time of signals detected by the SiPMs and their timespread are analyzed and compared to the data produced by the PMTs.
To reduce the costs of the camera, in a previous work the design of the lightguides, that collimate photons towards the detectors, has been adjusted. After being installed in the camera their performance is checked against the more complex lightguide design. The objective is to have no severe loss in light intensity and at the same time no increase in background light.

Primary author: ESFAHANI, Alina

Presenter: ESFAHANI, Alina

Session Classification: Participant Talks

Contribution ID: **53** Type: **Participant talk**

Simulation and optimization studies on a time-over-threshold readout of the mDOM for future IceCube upgrades

Wednesday, 10 October 2018 16:00 (20 minutes)

The multi-PMT Digital Optical Module is chosen to be the baseline concept for the future upgrade to the IceCube detector. It offers, amongst other properties, superior directional sensitivity and larger effective volume when compared to the current sensors. Due to tight energy budget restrictions in a multi-PMT design a power-efficient multi-level time-over-threshold (ToT) readout is the current choice of design.
Studies on optimizing the threshold levels have been carried out using a simulation of the ToT sampling of input signals and the subsequent deconvolution of pulses. The studies include the generation and reconstruction of single photoelectron pulses as well as the directional reconstruction of real high-energy IceCube events with complex PMT signals applying a ToT algorithm. Results characterizing an optimized setup will be presented.

Primary author: Mr GUDERIAN, Daniel (Uni Münster)

Presenter: Mr GUDERIAN, Daniel (Uni Münster)

Session Classification: Participant Talks

Contribution ID: **54** Type: **Participant talk**

Development of an acoustic transducer for the new mDOM

Wednesday, 10 October 2018 17:00 (20 minutes)

Following the success of the IceCube detector, an upgrade is planned for the upcoming years. To get a sufficiently large volume for this upgrade, the optical modules must be separated by larger distances. Due to the optical properties of ice, light signals are expected to deteriorate faster than acoustic signals. Hence, the importance of developing an acoustic device which could be integrated in the new mDOM to help calibrating the position of the optical modules in the Antarctic ice. Furthermore, extremely high energy neutrinos are expected to produce an acoustic signal when interacting in a medium. Therefore, the design of this new acoustic device should be able to record acoustic waves emitted by UHE neutrinos as well as being able to position itself in relation to a network of acoustic transmitters.

Primary authors: TURCOTTE, Roxanne (RWTH Aachen); WIEBUSCH, Christopher (RWTH Aachen University)

Presenter: TURCOTTE, Roxanne (RWTH Aachen)

Session Classification: Participant Talks

Contribution ID: **55** Type: **Invited talk**

Intensity Interferometry for Astronomy

Monday, 8 October 2018 11:00 (1h 45m)

Much of the progress in astronomy is driven by improved imaging. In the optical, one tantalizing threshold will be the imaging of stellar surfaces. Bright stars subtend only a few milliarcseconds in the sky and for resolving them, the laws of diffraction dictate kilometer-scale optical facilities. This is very challenging to realize on the ground due to atmospheric turbulence, while space facilities would be very complex.

Intensity interferometry circumvents atmospheric turbulence by electronically correlating intensity fluctuations between independent telescopes. This method was pioneered for astronomy long ago by Hanbury Brown and Twiss but has lately been used mainly in high-energy particle physics, often called "HBT-interferometry".

The availability of numerous Cherenkov telescopes spread over large distances (e.g., CTA - the Cherenkov Telescope Array) will enable optical intensity interferometry and imaging with angular resolutions that resolve stellar surfaces, image rotationally flattened stars with circumstellar disks and winds, monitor some nova eruption, or possibly even visualize an exoplanet during its transit across some nearby star.

Primary author: DRAVINS, Dainis (U. Lund)

Presenter: DRAVINS, Dainis (U. Lund)

Session Classification: Lectures and Invited Talks

Track Classification: Main Session

Contribution ID: **56** Type: **Participant talk**

Gamma-ray counterparts of the IceCube track-type high-energy neutrino events

Tuesday, 9 October 2018 17:00 (20 minutes)

Observations performed by the Large Area Telescope (LAT) on board of the Fermi Gamma-ray Space Telescope around the IC170922A region revealed a flaring gamma-ray blazar, TXS 0506+056, in spatial and temporal coincidence with the neutrino event detected by the IceCube Neutrino Observatory. Archival searches of other historical, well-reconstructed high-energy neutrino events have revealed another potential gamma-ray counterpart less bright than TXS 0506+056 during the 2017 flare. The electromagnetic properties are crucial input to any kind of modeling proving the source as neutrino counterpart candidate. I will present an analysis using 9.6 years of Fermi-LAT data in the 100 MeV - 1 TeV energy range, that focuses on a selection of sky regions of neutrino events detected by IceCube.

Primary author: GARRAPPA, Simone (DESY)

Presenter: GARRAPPA, Simone (DESY)

Session Classification: Participant Talks

Track Classification: Main Session

Contribution ID: **57** Type: **Participant talk**

Search for High-Energy Neutrinos from Tidal Disruption Events (TDEs)

Wednesday, 10 October 2018 17:20 (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. Previous analyses testing core-collapse supernovae, GRBs and time-integrated blazar emission have lead to constraints disfavouring these sources as dominant contributors to the observed neutrino flux. However, Tidal Disruption Events (TDEs) represent a promising untested source class. A TDE occurs when a star passes close to a Supermassive Black Hole (SMBH), and the extreme tidal forces then cause the star to disintegrate. The stellar debris is accreted onto the SMBH, and can produce highly-relativistic particle jets which significantly exceed the Eddington Luminosity that normally limits SMBH-accretion. Various models have predicted neutrino emission from both jetted and non-jetted TDEs, at levels comparable to IceCube's sensitivity. An analysis will be presented that tests time-dependent correlation between TDEs and neutrinos, using several years of IceCube data.

Primary author: Mr STEIN, Robert (DESY Zeuthen)

Presenter: Mr STEIN, Robert (DESY Zeuthen)

Session Classification: Participant Talks

Track Classification: Main Session

Contribution ID: **58** Type: **not specified**

Exercises I

Thursday, 4 October 2018 17:30 (1h 30m)

Session Classification: Lectures and Invited Talks

Contribution ID: **59** Type: **not specified**

Exercises II

Friday, 5 October 2018 17:30 (1h 40m)

Session Classification: Lectures and Invited Talks

Contribution ID: **60** Type: **not specified**

Exercises III

Saturday, 6 October 2018 17:30 (1h 40m)

Session Classification: Lectures and Invited Talks

Contribution ID: **61** Type: **not specified**

Exercises IV

Monday, 8 October 2018 17:30 (1h 30m)

Session Classification: Lectures and Invited Talks

Contribution ID: **62** Type: **not specified**

Exercises V

Tuesday, 9 October 2018 17:30 (1h 30m)

Session Classification: Lectures and Invited Talks

Contribution ID: **63** Type: **Invited talk**

SENSE

Wednesday, 10 October 2018 17:30 (1h 30m)

Presenter: Mrs MOGLIA, Francesca

Session Classification: Lectures and Invited Talks