T 13: Neutrinoastronomie 1

Zeit: Montag 16:45–19:05 Raum: H 1

Gruppenbericht T 13.1 Mo 16:45 H 1

Towards a search for optically hidden supernovae in 8 years of IceCube data — •Giulio Momente', Lutz Köpke, and Benjamin Eberhardt for the IceCube-Collaboration — ETAP, Johannes Gutenberg-Universität, Mainz

At the present date, IceCube offers the highest statistics to study the neutrino light curve of an exploding Supernova in our galaxy.

In this talk, recent improvements in the IceCube data taking and analysis software and on the integration with networks such as GCN (Gamma-ray Coordination Network) and SNEWS (Supernova Early Warning System) will be presented.

Furthermore, an overview on an ongoing search for optically hidden supernovae with neutrinos in IceCube will be presented.

T 13.2 Mo 17:05 H 1

Gravitational waves and Supernovae — Lutz Köpke and •Alexander Fritz for the IceCube-Collaboration — Johannes-Gutenberg Universität Mainz, 55128 Mainz

While Supernovae release 99% of their energy in form of neutrinos and antineutrinos, they also exhibit different phases in which gravitational waves may be produced. IceCube is capable of detecting MeV-neutrinos from Supernovae using the inverse β-decay reaction. For a galactic Supernova at 10 kpc, IceCube will detect a few 100000 unresolved neutrino interactions. That leads us to the possibility to resolve fine structurs of time changes in the flux. In this presentation I am going to quantify correlation between the gravitational wave signal and the neutrino signal of Supernovae for a specific three dimensional simulation. Notably, correlations are seen in periods, where standing accretion shock instability (SASI) arise.

T 13.3 Mo 17:20 H 1

Search for ultra-high energy neutrinos and follow-up search of gravitational wave events with the Pierre Auger Observatory* — •Michael Schimp for the Pierre Auger-Collaboration — Bergische Universität Wuppertal

The surface detector (SD) of the Pierre Auger Observatory allows to distinguish air showers induced by neutrino interactions deep in the atmosphere from other air showers. Moreover, it has a very large acceptance. As a result, it is sensitive to neutrinos at zenith angles above 60° and energies of $0.1\,\mathrm{EeV} - 100\,\mathrm{EeV}$ in contrast to current neutrino telescopes that have their peak sensitivities at a few PeV and below.

The searches for a neutrino flux at energies above 0.1 EeV can constrain the composition, propagation, and source properties of cosmic rays. Among the source candidates for cosmic rays and ultra-high energy neutrinos are the sources of gravitational wave (GW) events that were recently discovered by the LIGO collaboration.

We present the current status of a search for ultra-high energy neutrinos with the Pierre Auger SD, focusing on the analysis at low-zenith angles ($< 75^\circ$). Furthermore, we present the most recent results of a corresponding follow-up search of the published LIGO GW events.

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T 13.4 Mo 17:35 H 1

Search for cross-correlations of cosmic neutrinos and ultra-high-energy cosmic rays — •Lisa Schumacher, Christian Haack, Leif Rädel, René Reimann, Sebastian Schoenen, and Christopher Wiebusch for the IceCube-Collaboration — III. Physikalisches Institut B, RWTH Aachen

Cosmic rays have been discovered a century ago, however, their sources remain unidentified. It is believed that the same environments that accelerate cosmic rays also produce neutrinos by hadronic interactions. Recently, the IceCube Neutrino Observatory has discovered a flux of high-energy astrophysical neutrinos, and a joint analysis with the Pierre-Auger Observatory and the Telescope Array found hints for a possible directional correlation of neutrino events and cosmic-ray events. First studies for a follow-up analysis including additional data are presented.

T 13.5 Mo 17:50 H 1

Multiwavelength follow-up of a rare IceCube neutrino multiplet — •Nora Linn Strotjohann for the IceCube-Collaboration — Desy Zeuthen

IceCube's optical and X-ray follow-up program searches for several neutrino candidates consistent with a point source origin which are detected within 100 s. Follow-up observations can be triggered within minutes to look for an electromagnetic transient that would reveal the nature of the neutrino source.

In February 2016, we detected, for the first time, three neutrino candidates within 100 s. The detection of such a multiplet due to the chance alignment of atmospheric background events is expected once every 13.7 years (0.38 background events expected since the start of the program in 2008).

We triggered extensive multiwavelength follow-up observations spanning from the optical regime to very-high-energy gamma rays. No likely transient neutrino source was identified and due to the good data coverage we can rule out the presence of a close-by supernova, a bright GRB, or a high-energy AGN flare.

T 13.6 Mo 18:05 H 1

Identification of Neutrinos and Gamma-Rays from the Cygnus-X Complex — •Mehmet Guenduez[1], Julia Becker Taus[1], Björn Eichmann[1], and Francis Halzen[2] — [1]RAPP Center TP IV Ruhr-Universität Bochum, Bochum, Germany — [2]IceCube Collaboration University of Wisconsin, Madison, USA

The Cygnus X region is known as the richest star-forming region within a few kpc and is home to many particle accelerators such as supernova remnants, pulsar wind nebulae or massive star clusters. The abundance of accelerators and the ambient conditions make Cygnus X a natural laboratory for studying the life cycle of the cosmic-ray. The correlation between radio and gamma radiation from this region has been examined, where emissions from both leptonic and hadronic processes have been taken into account. In doing so, the transport and loss mechanism in Cygnus is investigated, such that the resulting neutrino spectrum is derived. By considering the rigidity differences between electrons and protons and a steady state description of a plasma, the total source of the high energy CRs has been calculated as generally as possible. Since only minute pieces of information about local processes in Cygnus are available and small inhomogeneities vanish at larger scales, a spherically symmetric and spatially homogeneous vicinity is assumed. Moreover, the influence of continuous losses and catastrophic losses due to diffusion and advection is investigated in order to provide a realistic picture of Cygnus-X.

T 13.7 Mo 18:20 H 1

Completing the Picture: Neutrinos from 1ES 1959+650 — •Thomas Kintscher[1] and Kai Krings[2] for the IceCube-Collaboration — [1]DESY (Zeuthen) — [2]TU München

The IceCube neutrino observatory is a 1 km^3 in-ice Cherenkov detector at the Geographic South Pole. While it has observed an astrophysical flux of neutrinos, individual sources have yet to be found.

The high-peaked BL Lac object 1ES 1959+650 is an intriguing candidate, as it exhibited an "orphan flare" in 2002: Such behaviour of a TeV gamma-ray flare without a simultaneous X-ray flare is hard to accommodate in leptonic SSC models, making this a potential site of hadronic acceleration and thus a prime source candidate for neutrinos.

A recent increase of activity in gamma-rays from this source between May and July of 2016 now prompts for a dedicated analysis of IceCube data, looking for neutrinos correlated with the flaring states. This talk will present the model-independent approaches looking only for an excess of neutrinos, as well as a complementary search for a timely correlation between the neutrinos and gamma-ray data.

T 13.8 Mo 18:35 H 1

Astrophysical Neutrino Production Diagnostics with the Glashow Resonance — •Daniel Biehl[1], Anatoli Fedynitch[1], Andrea Palladino[2], Tom Weiler[3], and Walter Winter[1] — [1]DESY, Platanenallee 6, 15738 Zeuthen, Germany — [2]Gran Sasso Science Institute, L'Aquila (AQ), Italy — [3]Department of Physics & Astronomy, Vanderbilt University, Nashville, TN 37235, USA

We study the Glashow resonance as diagnostic of the production processes of ultra-high energy neutrinos. Photohadronic interactions in astrophysical environments do not produce any electron antineutrinos via the Delta resonance. In contrast, proton-proton sources show a significant fraction of electron antineutrinos. This difference results in different event rates at the detector, making both processes distinguishable from each other after a certain exposure even after mixing. However, under realistic assumptions, also in the photohadronic case there is a significant contamination by electron antineutrinos. Thus, it is extremely challenging to discriminate between a pp and pγ scenario, even with IceCube-Gen2. Nevertheless, we find that the Glashow resonance can serve as a smoking gun signature of neutrino production from photohadronic interactions of heavier nuclei. Finally, we quantify the exposures for which the non-observation of the Glashow resonance exerts pressure on certain scenarios.

T 13.9 Mo 18:50 H 1

Searching for Neutrino Clusters with IceCube in Real-Time — •Thomas Kintscher, Konstancja Satalecka, and Elisa Bernardini for the IceCube-Collaboration — DESY (Zeuthen)

The IceCube neutrino observatory is a 1 km^3 detector for Cherenkov light in the ice at the South Pole. Having observed the presence of a diffuse astrophysical neutrino flux, static point source searches have come up empty handed. Thus, transient and variable objects emerge as promising, detectable source candidates.

An unbiased, full-sky clustering search – running in real time – can find neutrino events with close temporal and spatial proximity. The most significant of these clusters serve as alerts to third-party observatories in order to obtain a complete picture of cosmic accelerators. The talk will showcase the status and prospects of this project.