T 48: Neutrinoastronomie III

Zeit: Mittwoch 16:30–19:00 Raum: Philo-HS1

T 48.1 Mi 16:30 Philo-HS1

Detecting Galactic core-collapse supernovae with the IceCube neutrino telescope — •Alexander Fritz for the IceCube-Collaboration — Johannes-Gutenberg Universität Mainz

The IceCube neutrino telescope is sensitive to the large flux of neutrinos from galactic core-collapse supernovae. In fact, for distances up to the Magellanic Clouds, IceCube will provide the smallest uncertainties world-wide on the time evolution of the neutrino flux and will roughly measure the average neutrino energy. Thanks to a tight monitoring and error recovery functionality, the detector uptime runs at 99.8% around the clock. I will summarize recent improvements in the data acquisition, monitoring, reconstruction and simulation. I will also discuss the effect of the neutrino mass on neutrino light curves and how a combined analysis of gravitational waves and neutrinos from supernovae may allow to study instabilities in the explosion mechanism, such as the standing accretion shock instability (SASI)

T 48.2 Mi 16:45 Philo-HS1

Steady point source analysis on a flaring blazar coincident with the IceCube high-energy neutrino IC170922A — •Benedikt Krammer, Stefan Coenders, Theo Glauch, Matthias Huber, Elisa Resconi, and Andrea Turcati for the IceCube-Collaboration — Technische Universität München

The high-energy neutrino event detected by IceCube on 2017 September 22 (IC170922A) resulted in the identification of an enhanced gamma-ray emission from the blazar TXS0506+056 by the Fermi Large Area Telescope and MAGIC. The gamma-ray source was found in directional and temporal coincidence with the neutrino. Based on this, we investigated 9.5 years of IceCube data, the largest detector livetime in a IceCube point source analysis to date, at the position of the blazar. The time-integrated analysis also covers the time window of the flare. We compare this analysis with our previous point source analysis with 7 years of data, which found an excess at the potential neutrino source position. This talk outlines the analysis, and discusses implications and interconnections with other experiments and observations.

T 48.3 Mi 17:00 Philo-HS1

Detection of a flaring blazar coincident with the IceCube high-energy neutrino IC-170922 — •Theo Glauch[1], Anna Franckowiak[2], Matthias Huber[1], Elisa Resconi[1], and Andrea Turcati[1] for the IceCube-Collaboration — [1]Technical University of Munich, Germany — [2]DESY Zeuthen, Germany

On September 22, 2017, the IceCube Neutrino Observatory has for the first time ever observed an extremely-high-energetic neutrino event candidate, IceCube-170922, in spatial and temporal coincidence with a flaring gamma-ray blazar. The IceCube event has a typical neutrino induced muon-track signature. Due to its high energy it is likely of astrophysical origin. Follow-up observations in a broad wavelength band have been performed. Most notably, measurements of the Large Area Telescope on board of the Fermi Gamma-ray Space Telescope, in a photon energy range between 100 MeV and 300 GeV, have revealed a flaring blazar, TXS 0506+056, at an angular distance of only 6 arcmin from the neutrino arrival direction. At time of the measurement the Fermi gamma-ray flux of the object exceeded the quiescence flux by a factor of around 6. In this talk we present a summary of the observational details and report on various chance probability calculations showing the significance of the coincidence in the light of different astrophysical source models. The chance for a random coincidence is shown to be very low for all the tested hypotheses.

T 48.4 Mi 17:15 Philo-HS1

Active Galactic Nuclei outflows as neutrino sources? — •Andrea Turcati[1], Paolo Padovani[2,3], and Elisa Resconi[1] — [1]Technische Universität München, Physik-Department, James-Franck-Str. 1, 85748 Garching — [2]European Southern Observatory, Karl-Schwarzschild-Str. 2, D-85748 Garching bei München, Germany — [3]Associated to INAF - Osservatorio Astronomico di Roma, via Frascati 33, I-00040 Monteporzio Catone, Italy

Over the last few years the IceCube Neutrino Telescope has reported the first observations of a high-energy astrophysical neutrino flux. Recently, these observations have been strengthened by the publication of a sample of 82 high-energy starting events, and 36 high-energy muon neutrino tracks. Many different scenarios for the astrophysical origin of the IceCube neutrinos have been explored, but a clear answer has yet to emerge. Among the possible neutrino sources, blazars are so far the most supported by the data. Nevertheless their maximum contribution to the astrophysical neutrino flux has been constrained to be subdominant. We consider here a new, possibly contributing class of neutrino emitters: Active Galactic Nuclei outflows. We present the results of quantitative tests, exploring the possible connection between IceCube neutrinos and Active Galactic Nuclei objects displaying outflows or outflow-like properties.

T 48.5 Mi 17:30 Philo-HS1

Search for High-Energy Neutrinos from Tidal Disruption Events (TDEs) — •Robert Stein for the IceCube-Collaboration — DESY Zeuthen, Germany

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 source candidates. So far, Supernovae, Blazars and GRBs are all currently disfavoured as dominant contributors to the observed neutrino flux. However, Tidal Disruption Events (TDEs) represent a promising untested source class. Various models have predicted neutrino emission from jetted, or even from non-jetted TDEs. I will present an analysis framework to test correlations between TDEs and high-energy neutrinos from several years of IceCube data. The analysis will be a time-dependent stacking analysis, incorporating TDEs overlapping the data-taking period, to improve sensitivity. Preliminary sensitivity estimates for the analysis will be shown.

T 48.6 Mi 17:45 Philo-HS1

Modeling the Extragalactic Gamma Ray Background Spectrum with Very High Energy Gamma Ray Data — •Felix Neubürger for the IceCube-Collaboration — Technische Universität Dortmund

With the origin of the astropysical neutrinos observed by IceCube not being completely resolved, a closer look at possible sources is needed.

A recent analysis by the IceCube Collaboration suggests that blazars detected by Fermi are responsible for less than a third of the observed neutrino flux.

Research by Broderick et al. considers plasma beam instabilities in a more generalised model for the EGRB leading to a more fitting blazar distribution in the unified AGN-Paradigm.

For Very High Energy Gamma-Rays this distribution leads to a diffuse flux matching the Fermi data.

The goal of the presented work is to calculate the diffuse neutrino flux supposedly generated by unresolved blazars based on the assumptions made by Broderick et al. for the Extragalactic Gamma-Ray Background using new data. This will then be compared to the diffuse flux measured by IceCube.

This talk presents an outline of the methodology used to calculate the neutrino flux from the suggested Blazar distribution.

T 48.7 Mi 18:00 Philo-HS1

Search for common sources of cosmic neutrinos and ultra-high-energy cosmic rays — •Lisa Schumacher, Christian Haack, Rene Reimann, and Christopher Wiebusch for the IceCube-Collaboration — III. Physikalisches Institut B, RWTH Aachen University

Cosmic rays have been discovered a century ago, however, their sources remain unidentified. It is believed that in the same environments that accelerate cosmic rays also neutrinos are produced by hadronic interactions. Joint analyses of the IceCube Neutrino Observatory, the Pierre-Auger Observatory and the Telescope Array yielded inconclusive results for a possible directional correlation of neutrinos and ultra-high-energy cosmic rays (UHECR). This motivates a complementary analysis including UHECR information, recent galactic magnetic field models and a high-statistic neutrino data set. We present a new approach for searching common sources by using UHECR and magnetic-deflection information as a prior for a point-source analysis on a muon-neutrino track data set.

T 48.8 Mi 18:15 Philo-HS1

Ultra-High Energy Neutrino Follow-Up Searches of GW

Events with the Pierre Auger Observatory—status and results — •Michael Schimp for the Pierre Auger-Collaboration — Bergische Universität Wuppertal, Gaußstr. 20, 42119 Wuppertal

The surface detector array of the Pierre Auger Observatory is sensitive to neutrinos at energies above 0.1 EeV (ultra-high energy neutrinos). Its large acceptance at this energy range makes it a complement to current neutrino telescopes, which have their peak sensitivities at lower energies. Ultra-high energy neutrinos are promising messengers to address open questions concerning the nature of ultra-high energy cosmic rays as they could be produced both at their sources and during their propagation. With the first observation of gravitational waves (GW) from a binary black hole merger (BH-BH merger) by the LIGO Collaboration in 2015, a new branch of astronomy, with the potential to contribute to resolving those open questions, has joined in. In August 2017, the LIGO/Virgo Collaborations observed for the first time a binary neutron star merger (NS-NS merger) and sent an immediate alert to pre-established partners, among which is the Pierre Auger Collaboration. We present the status and results of the ultra-high energy neutrino follow-up searches of LIGO/Virgo GW events that were performed with the Pierre Auger Observatory. These events include BH-BH merger events and the above-mentioned—so far unique—NS-NS merger event.

*Gefördert durch die BMBF Verbundforschung Astroteilchenphysik (Vorhaben 05A17PX1).

T 48.9 Mi 18:30 Philo-HS1

Neutrinos and Gravitational Waves from Systems of Supermassive Black Holes — •Mario Hörbe — Ruhr-Universität Bochum

The last years in astro- and particle physics yielded two century breakthroughs for science: From the observation of very-high-energy neutrinos (HEν) by the IceCube Observatory at the Geographic South Pole up to the detection of gravitational waves (GW) by LIGO, physics has achieved in months what had been considered elusive for decades.

Joint HEν+GW observations could open up unique windows into the very deep insides of opaque astrophysical phenomena which otherwise cannot be resolved in other messengers such as charged nuclei or photons. Among the most fascinating yet mostly unexplored phenomena that can be investigated by joint HEν+GW observations are the center regions of active galaxies that host two supermassive black holes. Especially the black-hole-dynamics of such systems suggest to pose numerous HEν production sites in e.g. jets as well as GW emission in case of an imminent merger of the two nuclei.

I investigate possible correlations between these messengers within my PhD research, supported by the Studienstiftung des deutschen Volkes, by using both analytical approaches and Monte-Carlo-simulations based on the CRPropa3 framework. The status and perspectives of my project on HEν+GW modeling of binary AGN will be presented and set in context to current detectors such as IceCube and LIGO.

T 48.10 Mi 18:45 Philo-HS1

Multi-Messenger galactic supernova analyses — •David Kappesser and Lutz Köpke for the IceCube-Collaboration — Johannes Gutenberg-Universität Mainz

Supernovae in our galaxy are rare phenomena. It is therefore essential that a core collapse supernova can be investigated by as many experiments as possible. This includes neutrino detectors, gravitational wave interferometers as well as detectors that cover the electromagnetic spectrum. A collaboration between various experiments has been established in order to develop tools for a combined analysis of neutrino data that takes the strengths of individual detectors into account. As a first step, the combination of simulated IceCube and JUNO data has been studied and a combined analysis of LIGO and IceCube has been performed. Within the SNARE(SuperNova Advance Readiness Exercise) project, a core collapse simulation with hidden features will be prepared by theorists and subsequently be transformed into signals of various detectors. The goal of this exercise is the determination of the characteristics of the supernova signal with individual detectors and to use the prepared simulated data to set up a combined analysis framework and common analysis tools.