T 92: Neutrinoastronomie I

Zeit: Montag 16:45–19:00 Raum: 30.41: 105

T 92.1 Mo 16:45 30.41: 105

Search for Galactic Cosmic Ray Accelerators with the combined IceCube+AMANDA detector — •Sirin Odrowski, Elisa Resconi, and Yolanda Sestayo for the IceCube-Collaboration — Max-Planck-Institut fuer Kernphysik, Saupfercheckweg 1, 69117 Heidelberg

The IceCube neutrino observatory instruments a volume of 1 cubic km of the Antarctic ice with 5160 photo multiplier tubes (PMTs) aligned on 86 strings with the goal to detect astrophysical sources of high energy neutrinos. During the construction phase from 2004 until 2011, the detector has been growing each year and data was collected in each configuration. In the season 2008/2009, 40 strings of IceCube were operated. In addition, the predecessor of IceCube, AMANDA, acted as an integrated part of the detector. With its denser spacing of PMTs, AMANDA improved the effective area below 10 TeV and acted as a first generation low energy extension of IceCube. We present a search for astrophysical sources of neutrinos in the Milky Way with the combined detector consisting of 40 strings of IceCube plus AMANDA.

Potential Galactic cosmic ray accelerators are characterized by their proximity in comparison to other objects such as AGN but their energy spectra show exponential cut-offs. In transparent sources, high energy neutrinos will follow similar soft or cut-off spectra. This strongly motivates a low energy optimized analysis with IceCube. Several test including a scan of the Galactic Plane and a dedicated analysis for the Cygnus region are presented. No neutrino signal has been observed and upper limits are reported.

T 92.2 Mo 17:00 30.41: 105

Swift-Nachbeobachtungen im Röntgenbereich von IceCube Neutrino-Multipletts — •Andreas Homeier, Sebastian Böser, Anna Franckowiak und Marek Kowalski für die IceCube-Kollaboration — Universität Bonn

Das Fireball-Modell sagt die Entstehung von hochenergetischen Neutrinos in Gamma-Ray Bursts voraus. Deren Nachweis ist eines der Ziele des IceCube-Neutrinodetektors am Südpol. Die Sensitivität einer solchen Suche kann durch gezielte Nachbeobachtungen im Röntgenbereich, die das Nachglühen eines GRBs nachweisen können, wesentlich erhöht werden. Zu diesem Zweck wurde ein Programm zur Nachbeobachtung von IceCube-Triggern durch den Swift Satelliten entwickelt. Dazu wurde eine Likelihood basierte Neutrinomultiplettselektion eingeführt und für die Swift-Beobachtungen optimiert. In dem Vortrag wird die physikalische Motivation, sowie die technische Realisation des IceCube-Swift Programms vorgestellt.

T 92.3 Mo 17:15 30.41: 105

Optische Nachfolgebeobachtungen von IceCube Neutrino-Multipletts - Erste Ergebnisse — •Anna Franckowiak, Sebastian Böser, Andreas Homeier und Marek Kowalski für die IceCube-Kollaboration — Universität Bonn

Die Verbindung von Core-collapse Supernovae (SNe) zu Gamma-Ray Bursts deutet auf die Existenz von schwach relativistischen Jets in SNe hin. Innerhalb dieser Jets käme es zur Produktion von hoch energetischen Neutrinos. Der Nachweis solcher Neutrinos in Koinzidenz mit optischen Beobachtung einer SN würde die Jet-Hypothese bestätigen. Zu diesem Zweck wurde ein optisches Nachfolgeprogramm von hoch energetischen Neutrinos installiert: In IceCube detektierte Neutrino-Multipletts triggern ein Netzwerk von optischen Teleskopen, welche umgehend die entsprechende Region am Himmel beobachten. Das Programm nimmt seit Dezember 2008 Daten. Um SN Kandidaten aus den optischen Daten zu extrahieren, wurde eine Analyse-Pipeline entwickelt, die auf der Methode der Bildsubtraktion beruht. Sensitiviäts- und Untergrundabschätzungen wurden durchgefürhrt. Dieser Vortrag präsentiert die Ergebnisse des ersten Jahres der Datennahme. Dies beinhaltet das resultierende Limit auf die Modellparameter des SN-Jet-Modells.

T 92.4 Mo 17:30 30.41: 105

Search for neutrinos from Cygnus X-3 with IceCube and AMANDA — •Markus Voge[1,2], Sirin Odrowski[1], and Elisa Resconi[1] for the IceCube-Collaboration — [1]Max-Planck-Institut für Kernphysik, Heidelberg, Deutschland — [2]Universität Bonn, Deutschland

Cygnus X-3 is a microquasar with very strong radio flares and associated jets. Observations reveal high densities and strong photon absorption in the system. Recently, the Fermi and AGILE space telescopes detected gamma-ray emission from Cygnus X-3 up to energies of 100 GeV correlated with the radio flaring and jet production. TeV photons have not been detected yet. Assuming hadronic processes, TeV neutrinos can escape in large numbers while TeV photons are absorbed and therefore not detected. This motivates a search for neutrinos from Cygnus X-3.

We have developed a technique to identify periods of flaring activity from X-ray and radio monitoring data. The multi-wavelength information was used in an analysis of data from the neutrino telescopes IceCube and AMANDA, enhancing sensitivity compared to a time-integrated analysis. The analysis method and results are presented in this talk. No hints for a neutrino signal from Cygnus X-3 during or near the times of flaring were found and the observation is consistent with background.

T 92.5 Mo 17:45 30.41: 105

Searching for cosmic neutrinos from the Galactic Center: the Fermi Haze/Bubbles analysis with IceCube-DeepCore. — •Claudine Colnard — Max-Planck-Institut für Kernphysik, Heidelberg

Bilateral and very extended regions of diffuse gamma ray emission have recently been observed around the Galactic Center. The origin of these Fermi Bubbles is yet to be discovered. A possible scenario involves the acceleration of cosmic rays in supernova outflows interacting with giant molecular clouds that result in powerful stellar winds. Only the detection of cosmic neutrinos coming from the inner region of the Galaxy would carry a clear signature for such an hadronic mechanism.

We report in this talk about a singular approach to observe the Fermi Haze/Bubbles at intermediate energies with the IceCube neutrino observatory. The compact Cherenkov detector DeepCore at the bottom center of IceCube will be used to enhance the sensitivity of the neutrino telescope and open its field of view to the Galactic Center below 1PeV. The outer layers of IceCube will provide a veto volume to discriminate the expected cosmic neutrino signal against the much higher atmospheric muon background. Under certain conditions, this veto technique will also allow to reduce the flux of downward-going atmospheric neutrinos which constitute generally an irreducible background in neutrino astronomy. To enhance further the performance of IceCube-DeepCore, the newly developed Multi Point Sources method will be applied.

T 92.6 Mo 18:00 30.41: 105

Search for a diffuse extragalactic muon neutrino flux with IceCube — •Anne Schukraft, Marius Wallraff, and Christopher Wiebusch for the IceCube-Collaboration — III. Physikalisches Institut, RWTH Aachen, D-52056 Aachen

The neutrino detector IceCube at the South Pole is searching for sources of extraterrestrial neutrinos. If the neutrino flux from individual sources is too small to be detected as point sources, it is nevertheless possible that combined they produce a detectable diffuse signal. The experimental signature in this case is an excess of high energy neutrinos over the foreground of lower energetic neutrinos which are produced in the Earth's atmosphere.

A likelihood ansatz is chosen to analyze the full shape of the distribution of neutrino energy and arrival direction, without the need to optimize a selection cut. The diffuse neutrino flux as well as nuisance parameters characterizing uncertainties in the atmospheric background and detector description are simultaneously constrained.

A good understanding of the detector systematics and uncertainties in the simulation of atmospheric background neutrinos is a prerequisite for such a neutrino search. Therefore, the optical properties and the propagation of photons in the South Pole ice are studied as well as the impact of uncertainties in the atmospheric neutrino flux prediction.

This analysis will be applied to the data which was measured with IceCube in its 59-string configuration from April 2009 to May 2010. The sensitivity will be substantially below the Waxmann-Bahcall diffuse neutrino flux prediction, allowing to test prevailing theories.

T 92.7 Mo 18:15 30.41: 105

Hadronic interactions in SN 2006gy — •Steffen Krakau,

Martino Olivo, and Julia Becker — Theoretische Physik IV, Fakultät für Physik & Astronomie, Ruhr Universität Bochum, 44780 Bochum

In this talk we investigate photohadronic interactions in supernova explosions, in particular for the bright SN 2006gy, which might be related to pair instability mechanism, where a very massive star loses its outer layer prior to explosion, thus creating a hydrogen rich enviroment. Assuming that the supernova explosion leaves a central pulsar, where protons can be acccelerated up to energies of $(10^{15} - 10^{18})$eV, we calculate the optical depth of photohadronic interactions in this energy range for protons that travel through the supernova envelope. The photon spectrum is approximated by a blackbody spectrum between day 36 and day 92 after the supernova explosion ($T = (9000 - 15000)$ K). We also discuss the influence of these interactions on the energy spectrum of the protons and we finally predict the neutrino flux resulting from $p\gamma$ interactions and from inelastic pp scttering of protons accelerated by the pulsar and target protons from the mass loss episode.

T 92.8 Mo 18:30 30.41: 105

Very high energy neutrino emission from starbursts galaxies — •Martino Olivo and Julia K. Becker — Ruhr-Universität Bochum, Fakultät für Physik und Astronomie, Theoretische Physik IV, 44801 Bochum (DE)

The enhanced production of neutrinos and γ-rays via inelastic proton-proton (p-p) scattering in hydrogen rich environments plays a key role in high-energy astrophysics. The large densities of molecular hydrogen inferred by recent detections of starburst galaxies at different wavelengths make them a promising candidate for the production of very high-energy (VHE) neutrinos. Here, the calculation of the expected neutrino fluxes from p-p interactions in two nearby starbursts, namely M82 and NGC253, is presented. A prediction for the stacked neutrino flux from nearby starbursts galaxies based on the assumption of a correlation between neutrino and infrared emission is discussed too. Prospects for future detection of VHE neutrinos from nearby starbursts using the first generation of cubic km sized telescopes like IceCube and KM3NeT are briefly summarized.

T 92.9 Mo 18:45 30.41: 105

Flavor and magnetic field effects in GRB neutrino fluxes — •Philipp Baerwald, Svenja Hümmer, and Walter Winter — Institut für theoretische Physik und Astrophysik, Universität Würzburg, Am Hubland, D-97074 Würzburg, Germany

We present a novel approach to calculate neutrino spectra from cosmic accelerators. As a first step we demonstrate that we can reproduce the Waxman-Bahcall flux shape of Gamma-Ray Burst neutrinos from first principles. From this basis we show how the flux shape is changed by using the full photohadronic interaction cross section and by the introduction of flavor mixing. In the final step we illustrate how the highly variable parameters of a GRB affect the expected neutrino spectra.