T 42: Exp. Methods, IceAct, Auger, RNO-G

Time: Tuesday 17:00–18:30 Location: POT/0351

T 42.1 Tue 17:00 POT/0351

Construction of IceAct Telescopes — •Lea Schlickmann[1], Thomas Bretz[2], Lars Heuermann[1], Andreas Nöll[1], Merlin Schaufel[1], and Christopher Wiebusch[1] for the IceCube-Collaboration — [1]III. Physikalisches Institut B, RWTH Aachen University — [2]GSI Helmholtzzentrum für Schwerionenforschung

IceAct is an array of Imaging Air Cherenkov Telescopes at the ice surface as part of the IceCube Neutrino Observatory. Each telescope features a 55cm diameter Fresnel lens and a camera with 61 Silicon Photomultiplier pixels resulting in a 12° field of view. The design is optimized for harsh environmental conditions, as in Antarctica. Since 2019, the first two telescopes are operating at the South Pole in a stereoscopic configuration. Seven telescopes can be combined in a fly's eye configuration, forming a so-called station which has a field of view of 36°. In the future, for IceCube-Gen2, an array of four stations is planned. The commissioning of a first full station is scheduled for the next years within the current surface upgrade. For this, six telescopes are being constructed. This talk will report on the construction and calibration of these telescopes.

T 42.2 Tue 17:15 POT/0351

Characterization and Optimization of the Readout Electronics for IceAct Telescopes — •Andreas Nöll[1], Thomas Bretz[2], Lars Heuermann[1], Merlin Schaufel[1], Lea Schlickmann[1], and Christopher Wiebusch[1] for the IceCube-Collaboration — [1]III. Physikalisches Institut B, RWTH Aachen University — [2]GSI Helmholtzzentrum für Schwerionenforschung

IceAct is an Imaging Air Cherenkov Telescope array located at the South Pole as part of the IceCube Neutrino Observatory. The telescopes feature a 61 pixel camera based on Silicon Photomultipliers (SiPM). The camera signals are processed and digitized by the TARGET module, developed for the Cherenkov Telescope Array (CTA). The inherent high rate of ambient photons caused e.g. by stars, the Moon, and auroras combined with the high decay time of the SiPM signal results in a signal pile-up. The TARGET system provides an analog front-end for pulse shaping combined with a high sampling rate of 1GSa/s to accommodate the pile-up. Extensive tests are necessary to understand the complete signal chain from the SiPM to digitization. In this talk a characterization of the current system is presented. In addition design improvements, based on electronics simulations and tests with prototypes, will be proposed.

T 42.3 Tue 17:30 POT/0351

Three Years Performance of IceAct — •Lars Heuermann[1], Thomas Bretz[2], Oliver Janik[1], Silvia Latseva[1], Andreas Nöll[1], Merlin Schaufel[1], Lea Schlickmann[1], and Christopher Wiebusch[1] — [1]RWTH Aachen University - Physics Institute III B, Aachen, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung

IceAct is an array of Imaging Air Cherenkov Telescopes at the ice surface as part of the IceCube Neutrino Observatory. The telescopes, featuring a camera of 61 Silicon Photomultipliers and a fresnel lens based optic, are optimised to be operated in harsh environmental conditions, such as the South Pole. Since 2019, the first two telescopes operate in a stereoscopic configuration in the centre of IceCube's surface detector IceTop. The telescopes enable improved cosmic ray studies and cross calibrations of IceCube and IceTop by a hybrid measurement of air showers. This talk will review the performance and detector operations of the past 3 years of the telescopes as well as give an outlook for the future of IceAct.

T 42.4 Tue 17:45 POT/0351

A new network of electric field mills at the Pierre Auger Observatory — •Max Büsken for the Pierre Auger-Collaboration — Institute for Experimental Particle Physics, Karlsruhe Institute of Technology (KIT) — Instituto de Tecnologías en Deteccíon y Astropartículas, Universidad Nacional de San Martín (UNSAM)

The Pierre Auger Observatory is the largest ground-based instrument for the detection of ultra-high energy cosmic rays via extensive air showers. As part of the current detector upgrade, called AugerPrime, the new Radio Detector (RD) is being deployed, which will finally consist of 1661 radio antennas covering an area of more than 3000 km^2. A crucial ingredient for the interpretation of data taken with the RD is monitoring the atmospheric electric field over the observatory. Large atmospheric electric fields, typically in the presence of thunderstorms, can significantly alter the radio emission from air showers. Therefore, these kinds of conditions have to be flagged.

We present a new network of five electric field mills (EFM) that was installed at the Pierre Auger Observatory to tackle this task. The network is designed such that each EFM measures the electric field with an absolute calibration. The setup of the network and the deployment process are shown. First data are presented.

T 42.5 Tue 18:00 POT/0351

Nanosecond time synchronization of distributed detectors — •Yan Seyffert and Tim Huege — Karlsruhe Institute of Technology (KIT), Institute for Experimental Particle Physics, Karlsruhe, Germany

At the Pierre Auger Observatory, the surface detectors used to detect and measure cosmic-ray air showers are placed in a triangular ground pattern with a 1500 m spacing, covering a total area of about 3000 km^2. Time synchronization of such distributed detectors to very high accuracy on the nanosecond scale is challenging. Currently, ordinary GPS receivers are used, which simply and independently report the GPS-time/UTC-time at their current position. Achieving 1 ns relative time accuracy between detectors would prove very useful, for example in the context of the measurement of radio emissions from extensive air showers. Accurate timing information of an event recorded by an array of radio antennas would enable intriguing possibilities for radio-interferometric analyses of cosmic-ray air showers.

This talk will report on recent findings regarding wirelessly communicating GPS modules with currently non-standard capabilities, promising 3 cm accurate relative positioning and thus potentially 1 ns relative timing accuracy.

T 42.6 Tue 18:15 POT/0351

Study of the antenna response for the Radio Neutrino Observatory Greenland (RNO-G) — •Anna Eimer for the RNO-G-Collaboration — Erlangen Centre for Astroparticle Physics (ECAP), Erwin-Rommel-Str. 1, D-91058 Erlangen

Ultra high energy neutrinos can be detected via radio emission following a neutrino interaction in ice. The long attenuation length of radio signals in ice allows for a much sparser instrumentation than required for optical Cherenkov neutrino telescopes, hence making it possible to survey large volumes. The Radio Neutrino Observatory Greenland (RNO-G) is a project that will eventually consist of 35 stations (7 already deployed) with distances of about 1.25 km between neighbouring stations. Each station consists of 9 log-periodic dipole array (LPDA) antennas about 1.5 m below the ice surface and with up to 100 m deep in-ice strings, equipped with vertically and horizontally polarized dipole antennas.

Understanding the antenna properties and potential interferences between nearby antennas is important to operate the experiment to evaluate the recorded data and reconstruct neutrino properties. In this contribution, first results of lab studies with the RNO-G antennas with emphasis on interferences will be presented.