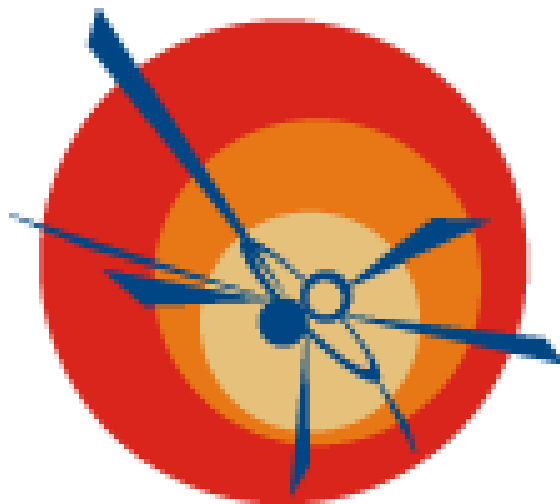


Workshop da Rede Nacional de Física de Altas Energias (RENAFAE) 2022

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Livro de Resumos

of gamma-ray astronomy is to observe structures in which dark matter is expected to be highly concentrated, such as the dwarf spheroidal galaxies of the Local Group and the Galactic Centre, in order to detect a possible annihilation signal. Several observation campaigns were launched by ground-based Cherenkov telescopes and gamma-ray telescopes embarked on satellites towards these objects. In the absence of clear signals, constraints on the dark matter particle annihilation cross-section have been derived in different particle physics scenarios expecting to produce both a continuum and a line-like gamma-ray flux. A highlight of the most recent and sensitive results of Imaging Atmospheric Cherenkov Telescopes (H.E.S.S., MAGIC and VERITAS) and Fermi-LAT telescope is presented. Lastly, in the light of the future Cherenkov Telescope Array (CTA) and the Southern Wide-Fielded Gamma-ray Observatory (SWGGO), the prospects and strategies in the search for dark matter annihilation signals are discussed.

Sessão 1 / 56

Main results of the Pierre Auger Observatory and prospects for the upgrade AugerPrime

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The Pierre Auger Observatory is the largest facility ever constructed to study ultrahigh-energy cosmic rays. Its main goal is to get clues about the nature and origin of the highest-energy cosmic rays observed so far - above 10^{18} eV. The Auger Observatory is situated at a privileged location in the Argentinean pampas, near the town of Malargüe (35.2°S) at 1400 m above sea level. Two complementary techniques are exploited to detect air showers induced by primary cosmic rays of extreme energies impinging on Earth and interacting in the atmosphere: surface detector and fluorescence telescope arrays, covering an area of 3000 km². Over the years, new detectors and facilities have been installed to enrich the quality of the measurements.

Operated by an international collaboration of about 400 scientists from 100 institutions in 17 countries, the Auger Observatory has continuously taken data since 2004. Brazilian scientists participate in the Auger Collaboration since its beginning in 1995 and count with the support of RENAFAE since the creation of the network.

The experimental data gathered by the Auger Observatory measuring cosmic rays, photons, and neutrinos to high-energy particle interactions have challenged our understanding of the Universe at the highest energy frontier. In parallel, the data have allowed setting limits to phenomena predicted from different theories, such as axions, superheavy dark matter particles, and Lorentz invariance violations.

Recently, the Observatory has produced ground-breaking results in astrophysics, such as the first detection of an anisotropic signal and the measurement of the energy spectrum with unprecedented resolution showing unknown structures.

In this talk, we will report the main results already obtained and highlight the future of the Pierre Auger Observatory with the new detectors for the upgrade AugerPrime in course. AugerPrime focuses on achieving mass-composition sensitivity for each air shower measured by its upgraded surface detector through multi-hybrid observations. The participation of the Brazilian community will also be addressed.

Sessão 2 / 57

Prospects for the detection and spectral characterization of BLLacs with the CTA extragalactic survey

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The Cherenkov Telescope Array (CTA) is the next-generation ground-based observatory for gamma-ray astronomy, covering a very broad energy range from 20 GeV to beyond 100 TeV. In this work, we are probing the potential of the CTA observatory, through its planned extragalactic survey, in detecting BL Lac sources. The population of these AGNs is being simulated according to a luminosity function tuned in the GeV energy range to the Fermi-LAT data and extrapolated to the TeV region assuming different spectral shapes at the source. We also account for the absorption of the VHE gamma-ray flux in the extragalactic medium due to the interaction with the Extragalactic Background Light (EBL). Both northern and southern sites are included in the study with telescope effects consistent with the instrument response functions (IRFs) of the final array configurations and the telescope inclination. A total of 1000 h of exposure time is simulated in order to scan a region covering 25% of the sky using a celestial grid of equally spaced points.

Sessão 3 / 58

Development of the Slow Controller of the RPC System Link for LS2 Update of the CMS/HL-LHC Experiment

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The upgrade phase II of the RPC Link system is ongoing to meet all requirements for the HL-LHC. Capability to work in a high radiation environment, improvement of timing resolution, and increasing the incoming rate capability of system and output bandwidth of system are the main goals of this project. In this project, the new RPC Back-End electronics which is a new scope in this era also will be responsible to receive the hits and sending them to the next Muon Track Finder Layers. Additionally, the new link system must be controlled by the new version of Slow Controller. The distribution of the TTC clock and fast trigger commands, setting the FEB's thresholds, reconfiguration of the Link system FPGAs, and reading the Link system Status are the main functionalities of the new Slow Controller. It should be notice that the new Slow Controller will be controlled by the RPC online software. In this project, we are going to define all necessary functions of the new Slow Controller in more detail. All of these functions will be implemented into the FPGA. In the first step, we will study all necessary functions requested by the new Link system. Then, these functions are translated to the corresponding firmware and implemented into the FPGA and equipment for high-speed data communications. In parallel, the necessary software routines will be developed on the RPC online software. Finally, the proper functionality of the control and communication chain will be surveyed.

Sessão 2 / 59

Simulation and data analysis in astroparticle physics

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