CRIS2016 - Cosmic Ray International Seminar 2016

Report of Contributions

https://agenda.infn.it/e/10546

Contribution ID: **0** Type: **not specified**

The GINGER Project

Thursday, 7 July 2016 13:00 (20 minutes)

GINGER (Gyroscopes IN General Relativity) is a proposal aiming at measuring the Lense-Thirring effect with an experiment based on Earth. It is an array of ringlasers, which are the most sensitive inertial sensors to measure the rotation rate of the Earth. After reviewing the importance of light as a probe for testing the structure of space-time, we describe the GINGER project. GINGER is based on a three-dimensional array of large size ring-lasers able to measure the de Sitter and Lense-Thirring effects. The instrument will be located inside the underground laboratory of GranSasso of INFN, in Italy. We describe the preliminary actions and measurements already under way and present the full road map to GINGER. The prototypes GP2 and GINGERino are described and the preliminary results reported.

Primary author: DI VIRGILIO, Angela Dora Vittoria (PI)

Presenter: DI VIRGILIO, Angela Dora Vittoria (PI)

Session Classification: Gravitational Waves

Contribution ID: **1** Type: **not specified**

Indirect dark-matter searches with gamma-rays experiments : status and future plans from KeV to TeV

Tuesday, 5 July 2016 10:00 (20 minutes)

Detection of gamma rays and cosmic rays from the annihilation or decay of dark matter particles is a promising method for identifying dark matter, understanding its intrinsic properties, and mapping its distribution in the universe. I will review recent results from the Fermi Gamma-ray Space Telescope and other space-based experiments, and highlight the constraints these currently place on particle dark matter models. I will also discuss the prospects for indirect searches to robustly identify or exclude a dark matter signal using upcoming experiments at energies below Fermi (ASTROGAM) and above Fermi , Magic and H.E.S.S. (CTA, LHAASO).

Primary author: MORSELLI, Aldo (ROMA2)

Presenter: MORSELLI, Aldo (ROMA2)

Session Classification: Gamma Ray Astronomy

Contribution ID: **2** Type: **not specified**

Gamma-ray and neutrino diffuse emissions of the Galaxy at very high energies

Monday, 4 July 2016 15:50 (20 minutes)

Several independent analyzes of Fermi-LAT results found evidences of a spatial dependence of the cosmic ray (CR) proton spectral index which is not accounted for in conventional models of CR transport in the Galaxy.
Moreover, several CR experiments have established the presence of a CR spectral hardening above few hundred GeV.
We show that these results may have a relevant impact on the gamma-ray and neutrino diffuse emissions of the Galaxy above the TeV. Indeed a phenomenological model which adopts a spatial dependent diffusion coefficient, so to account for those features, also reproduces the gamma-ray excess found by Milagro at 15 TeV as well as other gamma-ray data sets. HAWC and LHAASO should soon confirm or reject this scenario.
The same model predicts a neutrino emission along the Galactic plane which is significantly larger than expected on the basis of conventional models. This emission is compatible with some features founds in IceCube results and be a natural target for KM3NeT.

Primary authors: Dr URBANO, Alfredo (SISSA (Trieste, Italy)); MARINELLI, Antonio (PI); GAGGERO, Daniele (T); GRASSO, Dario (PI); Mr VALLI, Mauro (SISSA, INFN)

Presenter: GRASSO, Dario (PI)

Session Classification: Gamma Ray Astronomy

Contribution ID: **3** Type: **not specified**

The different Jem-Euso pathfinders

Wednesday, 6 July 2016 12:00 (20 minutes)

Jem-Euso is a project to set-up a large fiel of view UV telescope in space to detect HECR. The surface on ground is about 200 000 km^2. The air mass seen by the instrument makes it very good to detect high energy neutrinos. Very luminous atmospheric events will also be studied through special electronics.
The pathfinders are:
- Timmins balloon (CNES), launched in 2014, was able during the 5 hours flight to see UV laser tracks (Rayleigh light) emitted from a helicopter hovering under the ballon at 3000 m.
- SPB (Super Pressure Balloon) has a special envelope for the helium, allowing flights of many months. Its aim is to detect 10^18 eV showers (simulations predict one per night). It will be launched from New-Zealand in July 2017.
- Mini-Euso is a small telescope (its focal surface is 16 x 16 cm^2, same as both balloons), to be installed inside the russian segment of the ISS next to a UV transparent window looking at earth. Its main goal is to measure the light background (above the airglow) which sets the lowest energy for Jem-Euso showers. Otherwise it will study atmospheric phenomena, from lightnings to meteors and space debris. It will be launched in the second half of 2017.
SPB and Mini-Euso detectors are actually being built together at APC in Paris.
- K-Euso is a full telescope, smaller then Jem-Euso, and dedicated to check with the same instrument set on the ISS the Telescope-Array excess in northern atmosphere, and compare it to the AUGER results. It will be launched towards 2020.
All these prototypes are intended to clarify what will be measured by Jem-Euso and to raise the technological readiness level.

Primary author: Mr GORODETZKY, Philippe (APC-Paris 7)

Presenter: Mr GORODETZKY, Philippe (APC-Paris 7)

Session Classification: Indirect Measurements of High Energy Cosmic Rays

Contribution ID: **4** Type: **not specified**

Using two-photon statistical contribution in the detection of telescopes EUSO

The JEM-EUSO (Extreme Universe Space Observatory on Japanese Experiment Module) experiment is about a space telescope that will be installed on the ISS in 2020. The UHECR study aims to improve by a factor of 100 the current measures of Pierre-Auger observatory.

The telescope EUSO-Balloon, which was technologically validated in 2014 was the first prototype

This document is a final study of the performance of the telescope EUSO-Ballon. More specifical

As the method uses a curve generated by changing the threshold of discrimination of the measure

Primary author: RABANAL REINA, Julio Arturo (LAL/IN2P3/CNRS)

Presenter: RABANAL REINA, Julio Arturo (LAL/IN2P3/CNRS)

Contribution ID: **5** Type: **not specified**

EUSO-TA, a JEM-EUSO pathfinder at the Telescope Array site

EUSO-TA is one of the prototypes of the JEM-EUSO space telescope, realized in the framework of the EUSO project. Its aims are to calibrate the detector response, test its performance in air and space, raise the technological readiness level of some of the components and improve our knowledge of the various detector systems.
EUSO-TA is located at the Telescope Array (TA) site in Black Rock Mesa, Utah, USA and is mainly devoted to study the detector response in conjunction with the TA fluorescence detector.
The telescope is housed in a shed located in front of one of the fluorescence detectors of the Telescope Array experiment, pointing in the direction of the ELS (Electron Light Source) and CLF (Central Laser Facility), i.e. the artificial light sources at the Telescope Array site.
The detector consists of two Fresnel lenses, 1x1 m2 each, with a field of view of 11° x 11°, able to focus the ultraviolet light generated by cosmic-ray showers as well as from artificial sources, on a focal surface identical to the ones that will be employed in JEM-EUSO .
In this paper the telescope, and the main results obtained during the 2015 measurement campaigns are discussed.

Primary author: Dr SCOTTI, VALENTINA (ROMA2)

Co-author: OSTERIA, Giuseppe (NA)

Presenter: Dr SCOTTI, VALENTINA (ROMA2)

Contribution ID: **6** Type: **not specified**

Particle physics and cosmology with H.E.S.S.

Tuesday, 5 July 2016 11:30 (20 minutes)

Gamma-ray astronomy is a powerful mean of studying particle physics and cosmology independently of particle colliders and more conventional observatories. In a 50 GeV-50 TeV range, observations of Galactic and extragalactic high-energy sources allow to efficiently search for new particles such as dark matter particles and axions; they probe the UV to infrared backgrounds of the universe whose energy density is linked to star formation and evolution of structures; and they permit to test Lorentz invariance up to the Planck scale. I will report here on some recent results in these matters obtained with the H.E.S.S. array of Cherenkov telescopes.

Primary author: BRUN, Pierre (CEA Saclay)

Presenter: BRUN, Pierre (CEA Saclay)

Session Classification: Gamma Ray Astronomy

Contribution ID: **7** Type: **not specified**

The SiRO Detector (Silicone Read Out) for cosmic muon flux-trajectory measurements

The measurements of the flux and the trajectory of cosmic muons are performed using a detector based on plastic scintillators, optical fibers (wavelength shifters) and readout by SiPM(MPPC-Multi Pixel Photon Counter) devices.
The Detector is consisting of a stack of 6 active modules, grouped in 3 layers for determining the muon trajectories through 3 planes. One module has 24 plastic scintillators stripes with 2 fiber mounted on each stripe, readout by 24 MPPC devices. Active surface is 1m x 1m . The aquisition system is capable of tracking trajectories in real time. Such a detector is used to measure muon flux at ground level or underground for detecting unknown cavities in the old mining sites (ex: Slanic Prahova - Romania). Such muon flux measurements could be also used for geological studies, e.g. to explore variations in the rock density and composition above the observation level.

Primary author: Mr NICULESCU-OGLINZANU, Mihai (IFIN-HH)

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Presenter: Mr NICULESCU-OGLINZANU, Mihai (IFIN-HH)

Contribution ID: **9** Type: **not specified**

Towards AugerPrime: the upgrade of Pierre Auger Observatory

Wednesday, 6 July 2016 10:40 (20 minutes)

The Pierre Auger Observatory has begun a major Upgrade (AugerPrime), with an emphasis on improved mass composition determination using the surface detectors of the Observatory. AugerPrime will include new 4 m2 plastic scintillator detectors on top of all 1660 water-Cherenkov detectors, a faster and more powerful electronics, a large array of buried muon detectors, and an extended dynamic range. After introducing the physics motivation of AugerPrime, the planned detector upgrade will be presented and the expected performance and improved physics sensitivity of the Observatory will be discussed.

Primary author: CATALDI, Gabriella (LE)

Presenter: CATALDI, Gabriella (LE)

Session Classification: Indirect Measurements of High Energy Cosmic Rays

Contribution ID: **10** Type: **not specified**

EEE project - Science in schools: state and results

The Extreme Energy Events Project is an extended array for Cosmic Rays survey, conceived by Antonino Zichichi and supported by the Study and Research Centre "Enrico Fermi"(Rome) with the collaboration of the European Organization for Nuclear Research (CERN), of the Italian National Institute of Nuclear Physics (INFN) and of the Italian Ministry of Education, University and Research (MIUR). The experiment is aimed to study Cosmic Rays of extreme high energy, and related phenomena, combining rigorous experimental research of the phenomenon with the involvement and collaboration of students and teachers of the high schools, where the detectors are installed.
The detectors are telescopes consisting of three MRPCs (Multigap Resistive Plate Chamber) of about 2 m2, positioned in overlaid planar configuration and constructed by the students at CERN. These devices provide the three space-points needed to reconstruct the tracks of the secondary muons produced by primary Cosmic Rays; the spatial resolution is of the order the centimeter and the time resolution is about 100 picoseconds. These telescopes are part of a network of nearly 50 telescopes, distributed throughout the Italian territory both as single stations that as clusters of 2-3 telescopes in the same city. They are synchronized between each other by means of GPSs. Since 2014, the data of all the stations are sent and stored at CNAF (Bologna), the national center of informatics and telematics technologies of the INFN.
In May 2016, the second coordinated national RUN will be accomplished, with almost 25 billion muon tracks reconstructed. This huge amount of data, allows us to carry out various studies: the dependence of the local muon flux with solar activity; the sky anisotropy on sub-TeV scale; possible event correlations due to EAS between clustered stations at distances from a few hundred meters to over a kilometer.
The status of the project and some results will be presented.

Primary author: Dr GRAZZI, Stefano (Study and Research Centre "Enrico Fermi"(Rome))

Presenter: Dr GRAZZI, Stefano (Study and Research Centre "Enrico Fermi"(Rome))

Contribution ID: **11** Type: **not specified**

A new technique for probing the internal structure of volcanoes using cosmic-ray muons

Among the considerable number of studies that can be carried out using muons,
we pay specific attention to the radiography of volcanoes based on the same principle
of the X-ray radiography of human body. Thanks to their high penetration capability, cosmic-ray muons can be used to reconstruct the density distribution of the interior of huge structures by measuring the attenuation induced by the material on the muon flux.
In particular, the quantitative understanding of the inner structure of volcanoes is a key-point to forecast the dangerous stages of activity and mitigate volcanic hazards.
The instrumental approach is currently based on the detection of muons crossing hodoscopes made up of scintillator planes. Unfortunately, these detectors are affected by a strong background comprised by accidental coincidence of vertical shower particles, horizontal high-energy electrons and upward going particles.
We propose an alternative technique based on the detection of the Cherenkov light produced by muons. This can be achieved with a fast optical system (F# = 0.5) composed of high reflectivity mirror that focus the Cherenkov light onto a multi-pixel focal camera with fast read-out electronics. The Cherenkov light emitted by a muon is imaged on the focal plane camera as an annular pattern which contains information to reconstruct direction and energy of the incident muon. We have estimated that using the Cherenkov imaging technique for muon radiography of volcanoes gives the advantage of a negligible background and improved spatial resolution compared to the usual particle detectors.
We present results of simulations based on a telescope with a positioning resolution of 13.5 m which corresponds to an acceptance of 9 cm^2 sr. The optical system is located 1500 m far from a toy-model volcano, namely, a cone with a base diameter of 500 m and a height of 240 m. We test the feasibility of the proposed method by estimating the minimum number of observation nights needed to resolve inner empty conduits of different diameter.

Primary author: Dr DEL SANTO, Melania (INAF/IASF-Palermo)

Co-authors: Dr CARBONE, Daniele (INGV - Osservatorio Etneo - Sezione di Catania); Dr CUSUMANO, Giancarlo (INAF/IASF-Palermo); Dr LA ROSA, Giovanni (INAF/IASF-Palermo); Dr PARESCHI, Giovanni (INAF-Osservatorio Astronomico di Brera); Dr SOTTILE, Giuseppe (INAF/IASF-Palermo); Dr MACCARONE, Maria Concetta (INAF/IASF-Palermo); Mr CATALANO, Osvaldo (INAF/IASF-Palermo); Dr VERCELLONE, Stefano (INAF/IASF Palermo); Dr MINEO, Teresa (INAF/IASF-Palermo); Dr LA PAROLA, Valentina (INAF/IASF-Palermo); Dr LUCIANO, Zuccarello (INGV - Osservatorio Etneo - Sezione di Catania)

Presenter: Dr DEL SANTO, Melania (INAF/IASF-Palermo)

Contribution ID: **12** Type: **not specified**

Gamma-ray observations of Supernova Remnants with Fermi-LAT data

Monday, 4 July 2016 16:10 (20 minutes)

In about eight years of data taking, the Large Area Telescope (LAT) onboard the Fermi satellite proved to be an excellent instrument to detect and observe Supernova Remnants (SNRs) in the gamma ray energy band, from one hundred MeV to a few hundred GeV. This energy range is crucial to provide information on the physical processes occurring at the source, which involve both accelerated leptons and hadrons. The understanding of these processes is essential in the study of the mechanisms responsible for the primary Cosmic Ray acceleration.
I will present the latest results from observations of Galactic SNRs with the Fermi LAT, highlighting how the environment in which the SNR is expanding affects the interpretation of its gamma-ray emission.
This contribution is on behalf of the Fermi-LAT collaboration.

Primary author: DI VENERE, Leonardo (BA)

Co-author: CARAGIULO, Micaela (BA)

Presenter: DI VENERE, Leonardo (BA)

Session Classification: Gamma Ray Astronomy

Contribution ID: **13** Type: **not specified**

Prospects for detecting Gamma-Ray Bursts with the Cherenkov Telescope Array

The Large Area Telescope (LAT) on the Fermi gamma-ray satellite telescope observes Gamma-Ray Bursts (GRBs) at energies above 100 MeV. Thanks to a new detection algorithm and a new event reconstruction, it is expected to publish a catalogue with more than 100 GRBs. This work aims at revising the prospects for GRB alerts with the Cherenkov Telescope Array (CTA) based on the new LAT results. We start by considering the simulation of the observations with the full CTA of two extremely bright events, the long GRB 130427A and the short GRB 090510; then we investigate how these GRBs would be observed by different subsamples of the array pointing to different directions, adopting the “coupled divergent” mode.

Primary author: Dr DI GIROLAMO, Tristano (Universita‘ di Napoli ”Federico II”)

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Presenter: Dr DI GIROLAMO, Tristano (Universita‘ di Napoli ”Federico II”)

Contribution ID: **14** Type: **not specified**

Cosmic ray physics with the Auger Engineering Radio Array (AERA)

Wednesday, 6 July 2016 10:20 (20 minutes)

The Auger Engineering Radio Array (AERA) consists of 153 autonomous radio stations at the site of the Pierre Auger Observatory in Malargüe, Prov. of Mendoza, Argentina. With an area of 17 km^2 covered, AERA is the largest radio-detector worldwide for UHECR physics. The radio stations are sensitive in the 30 to 80 MHz band to the coherent radio signal emitted by the electromagnetic air shower component.

Steady progress in radio-detection techniques and a very good understanding of the radio emission mechanism made AERA a capable tool for cosmic-ray physics: We use AERA radio data to reconstruct the arrival-direction and the energy of the air-shower with a precision competitive to standard reconstruction techniques. Even the determination of the absolute energy scale seems possible. The primary mass composition is determined from the distribution of the shower maximum, which is currently measured with a precision of 40 g/cm^2 by the radio method. Since radio measurements are purely sensitive to the electromagnetic component of the air shower, they can be combined with measurements of particle detectors for an additional way to estimate he mass of the primary particle by means of the electron-muon-ratio.

This contribution reviews the recent analysis methods for radio signals and shows some results for the determination of air-shower properties gained with AERA.

Primary author: Mr ZIMMERMANN, Benedikt (Karlsruhe Institute of Technology (KIT))

Co-authors: Dr KLEIFGES, Matthias (Karlsruher Institut für Technologie (KIT) - IPE); Dr HUEGE, Tim (Karlsruher Institut für Technologie (KIT))

Presenter: Mr ZIMMERMANN, Benedikt (Karlsruhe Institute of Technology (KIT))

Session Classification: Indirect Measurements of High Energy Cosmic Rays

Contribution ID: **15** Type: **not specified**

The Fermi-LAT and H.E.S.S. views of the supernova remnant W49B

Tuesday, 5 July 2016 11:50 (20 minutes)

The supernova remnant (SNR) W49B originated from a core-collapse supernova that occurred between one and four thousand years ago, and subsequently evolved into a mixed-morphology remnant, which is interacting with molecular clouds (MC). SNR/MC associations are particularly interesting for probing the acceleration of hadrons in SNRs and consequently the origin of Galactic cosmic rays. The molecular material in the vicinity of the source acts as an efficient target material for accelerated particles, leading to an enhanced gamma-ray emission, making these kinds of sources of particular interest for gamma ray observatories.
W49B has been detected in gamma-rays at high energies (HE, 0.1-100GeV) and very high energies (VHE, > 100 GeV) with the Fermi Large Area Telescope (Fermi-LAT) and the High Energy Stereoscopic System (H.E.S.S.), respectively. The latest results obtained on W49B with these instruments will be presented. In particular, the spectrum shows a break at low energies, similar to previous observations by the Fermi-LAT in other SNRs and interpreted as the signature of a pion-decay gamma-ray emission. The implications of these results on the population of particles at the origin of the gamma-ray emission will be discussed.

Primary author: Dr BRUN, Francois (CENBG, CNRS/IN2P3, Bordeaux, France)

Co-authors: Dr KATSUTA, Junichiro (Hiroshima University, Hiroshima, Japan); Dr LEMOINE--GOUMARD, Marianne (CENBG - CNRS); Dr JOGLER, Tobias (SLAC National Accelerator Laboratory); Dr MARANDON, Vincent (MPIK Heidelberg)

Presenter: Dr BRUN, Francois (CENBG, CNRS/IN2P3, Bordeaux, France)

Session Classification: Gamma Ray Astronomy

Contribution ID: **16** Type: **not specified**

Recent Results of the Alpha Magnetic Spectrometer on the International Space Station

Tuesday, 5 July 2016 15:20 (30 minutes)

AMS-02 is a wide acceptance high-energy physics experiment installed on the International Space Station in May 2011 and operating continuously since then.

With a collection rate of approximately 1.7 × 10^{10} events/year, combined with the particle identification capabilities of 5 independent detectors, AMS is able to accurately measure all the charged cosmic rays (CRs) species separating hadrons from leptons, matter from anti-matter and determining the CRs chemical and isotopic composition.

AMS-02 collaboration has recently released a first set of precise measurements of cosmic ray fluxes of positrons, electrons, anti-protons, protons, and helium nuclei detected in the GV to TV rigidity (momentum/charge) range. These results as well as preliminary results for CRs nuclear component fluxes and ratios (Li, B/C) will be shown and discussed.

Primary author: Mr OLIVA, Alberto (CIEMAT (Spain))

Presenter: Mr OLIVA, Alberto (CIEMAT (Spain))

Session Classification: Cosmic Rays Direct Measurements

Contribution ID: **17** Type: **not specified**

Muon density measurements for the light and heavy mass groups of cosmic rays at the KASCADE-Grande observatory

Friday, 8 July 2016 10:20 (30 minutes)

KASCADE-Grande was an air-shower experiment aimed to investigate cosmic rays between 10^16 and and 10^18 eV. The instrument was located at the site of the Karlsruhe Institute of Technology, Germany at an altitude of 110 m a.s.l. and covered an area of 0.5 km^2 . KASCADE-Grande consisted of several detector systems dedicated to measure different components of the cosmic ray induced air showers, e.g. the muon content (Eth> 230 MeV) and the number of charged particles (Eth > 3 MeV) at ground, which are the basis for several energy and composition studies of cosmic rays. In this contribution, using these observables, the KASCADE-Grande data is divided into light and heavy mass groups and their respective muon densities are reconstructed at different zenith angle intervals. The results are compared with the expectations of the post-LHC hadronic-interaction models, EPOS-LHC and QGSJET-II-04, in order to test the validity of the model predictions.

Primary author: Dr ARTEAGA VELAZQUEZ, Juan Carlos (Universidad Michoacana)

Co-author: KASCADE-GRANDE, Collaboration (KIT, Campus North)

Presenter: Dr ARTEAGA VELAZQUEZ, Juan Carlos (Universidad Michoacana)

Session Classification: Tuning Models & Fundamental Interactions

Contribution ID: **19** Type: **not specified**

Recent Highlights from the H.E.S.S. Experiment

Tuesday, 5 July 2016 11:00 (30 minutes)

The High Energy Stereoscopic System (H.E.S.S.) collaboration runs a system of meanwhile five Imaging Air Cherenkov Telescopes in the Khomas Highlands of Namibia. Observations of the sky in the photon energy range between below 100 GeV and ~100 TeV have revealed a large number of objects that are capable of efficiently accelerating particles to TeV energies. In this contribution, recent highlights obtained with H.E.S.S. will be presented.

Primary author: Dr PUEHLHOFER, Gerd (IAAT, University of Tuebingen)

Co-author: COLLABORATION, H.E.S.S. (H.E.S.S.)

Presenter: Dr PUEHLHOFER, Gerd (IAAT, University of Tuebingen)

Session Classification: Gamma Ray Astronomy

Contribution ID: **20** Type: **not specified**

Testing hadronic interactions with the Pierre Auger Observatory

Friday, 8 July 2016 11:20 (20 minutes)

The most energetic particles in the universe - ultra-high energy cosmic rays –interact with the atmosphere creating air showers whose charactristics are sensitive to the primary mass composition and hadronic interaction properties. Currently, these showers are our only window to test the properties of collisions at energies beyond the reach of human-made accelerators.
The Pierre Auger Observatory provides the largest data sample of cosmic ray events with energy above 10^18 eV. Being a hybrid detector, it allows us to independently measure two different shower components: the profile of the electromagnetic particles crossing the atmosphere, and a sample of all particles that reach the ground, from which we can retrieve the muon number and the muon production depth profile.
It will be shown that none of the hadronic interaction models used for simulations of extensive air showers, which were updated after the LHC data, is able to consistently describe all these measured shower observables.

Primary author: Mr DIOGO, Francisco (LIP)

Co-author: PIERRE AUGER COLLABORATION, . (.)

Presenter: Mr DIOGO, Francisco (LIP)

Session Classification: Tuning Models & Fundamental Interactions

Contribution ID: **21** Type: **not specified**

What have we learnt about the sources of ultra-high energy cosmic rays via Neutrino Astronomy ?

Thursday, 7 July 2016 15:00 (50 minutes)

The IceCube neutrino observatory has detected the bulk of cosmic neutrinos with energies from TeV to PeV together with the stringent limits on the EeV-energy neutrino flux. It has already contained rich informative implications to the yet-unknown origin of ultra-high energy cosmic rays. In this talk we discuss what the neutrino observations have revealed the characteristics of cosmic accelerators.

Primary author: YOSHIDA, Shigeru (Chba University)

Presenter: YOSHIDA, Shigeru (Chba University)

Session Classification: Astrophysical Neutrinos

Contribution ID: **22** Type: **not specified**

Heliospheric and Magnetospheric Physics with the CSES/LIMADOU mission

CSES (China Seismo-Electromagnetic Satellite) is a space scientific mission dedicated to monitoring electromagnetic field, plasma and particles perturbations in the atmosphere, ionosphere and magnetosphere induced by natural sources and anthropocentric emitters.
CSES, made by a Chinese-Italian collaboration, is scheduled to be launched in the first half of 2017 and has an expected lifetime of 5 years. The satellite will have a circular Sun-synchronous orbit with 98 degrees inclination and 500 km altitude.

The Italian participation to the CSES mission is called LIMADOU. The Italian contribution to the project is the realization of the High Energy Particle Detector (HEPD). The HEPD will detect low energy cosmic rays in the magnetosphere and study solar-terrestrial interactions and phenomena of solar physics, like Coronal Mass Ejections (CMEs) and solar flares. For its specific nature, the HEPD will be a powerful instrument for the Space Weather in the incoming solar cycle.

The HEPD detector consists of two layers of plastic scintillators (one segmented for the trigger) and a calorimeter constituted by a tower of scintillator counters and a LYSO plane. The direction of the incident particle is provided by two planes of double-side silicon microstrip detectors placed in front of the trigger. HEPD will measure electrons (3 - 100 MeV) and protons (30 - 300 MeV) along CSES orbit.

Topic of this talk is the description of the LIMADOU mission, together with the details of the HEPD and results coming from the first beam test.

Primary author: SPARVOLI, Roberta (ROMA2)

Presenter: SPARVOLI, Roberta (ROMA2)

Contribution ID: **23** Type: **not specified**

Modeling of New High NUV Sensitive Silicon Photomultiplier

In recent years, Silicon Photomultipliers (SiPMs) have proven to be very performing devices, especially for those applications where high sentivity to low intensity light and fast responses are required. A SiPM consists of a system of hundreds or even thousands of p-n junctions connected in parallel and operating in Geiger mode.
We performed a very detailed modeling of several devices from different producers, focusing on cell capacitance, quenching resistors and parasitic capacitances. We measured I-V and C-V responses, and carefully studied waveforms aquired from sensors conditioned by a simple trans-impedance amplifier, thus obtaining information on the microscopic characteristics of the device. Results regarding the modeling as a function of overvoltage will be presented and compared with simulations.

Primary author: GIORDANO, Francesco (BA)

Co-authors: SIMONE, Daniela (BA); BISSALDI, Elisabetta (BA); DI VENERE, Leonardo (BA)

Presenter: GIORDANO, Francesco (BA)

Contribution ID: **24** Type: **not specified**

Status of the Medium Size Telescope for the Cherenkov Telescope Array

Monday, 4 July 2016 18:00 (20 minutes)

The Cherenkov Telescope Array (CTA), is an international project for the next generation ground-based observatory for gamma-ray astronomy in the energy range from 20 GeV to 300 TeV. The sensitivity in the core energy range will be dominated by up to 40 Medium Size Telescopes (MSTs) distributed over the northern and southern observatory sites.

The MST has a modified Davies-Cotton reflector with a diameter of 12 m and a focal length of 16 m. Two camera concepts (FlashCam and NectarCAM), featuring ~1800 channels equipped with photomultipliers, trigger and readout are in development for the MSTs. Prototypes of the cameras and telescope structure, featuring different mirror and active mirror control designs, were built and their performance validation is ongoing. A report about the prototyping activities, performance of the individual assemblies and plans for the pre-construction phase will be given.

Primary author: Dr GARCZARCZYK, Markus (DESY)

Presenter: Dr GARCZARCZYK, Markus (DESY)

Session Classification: Gamma Ray Astronomy

Contribution ID: **25** Type: **not specified**

Recent Highlights from VERITAS

Tuesday, 5 July 2016 09:00 (30 minutes)

VERITAS is an array of four 12-m imaging Cherenkov telescopes, sensitive to very-high energy (VHE; >100 GeV) gamma-ray photons. The science program of VERITAS includes the characterization of the VHE gamma-ray sky, the study of cosmic ray accelerators (both within and outside of the Galaxy), and other topics in astrophysics, cosmology and fundamental physics. Collaboration with multi-wavelength and multi-messenger partners is crucial for understanding the processes behind the emission of gamma rays.

In the following presentation, I will give an overview of the observatory's status and present some of the recent results.

Primary author: OTTE, Nepomuk (Georgia Institute of Technology)

Presenter: OTTE, Nepomuk (Georgia Institute of Technology)

Session Classification: Gamma Ray Astronomy

Contribution ID: **26** Type: **not specified**

Development of a SiPM based camera for Cherenkov Telescope Array

The Italian Institute of Nuclear Physics (INFN) is involved in the development of a prototype for a SiPM-based camera for the Cherenkov Telescope Array (CTA), a new generation of telescopes for ground –based gamma ray astronomy. In this framework, an R&D program within the 'Progetto Premiale TElescopi CHErenkov made in Italy (TECHE.it)'for the development of SiPMs suitable for Cherenkov light detection (Near - Ultraviolet SiPMs) has been carried out. The developed device is a High Density NUV –SiPM based on a micro cell of 30 μm x 30 μm and 6 mm x 6 mm area produced by Fondazione Bruno Kessler (FBK). A full characterisation of the single SiPM will be presented and compared with the old technology (NUV –SiPM) and with other SiPMs commercially available. The NUV –HD SiPM will be tested in the pSCT (Schwarzschild –Couder Telescope prototype) for CTA which is leading to a camera concept based on 8 x 8 NUV –HD SiPM module as detecting unit. An update on recent tests on the detectors arranged in this matrix configuration and on the front –end electronics will be given.

Primary author: SIMONE, Daniela (BA)

Co-authors: BISSALDI, Elisabetta (BA); FIANDRINI, Emanuele (PG); GIORDANO, Francesco (BA); AMBROSI, Giovanni (PG); IONICA, Maria (PG); GIGLIETTO, Nicola (BA); PAOLETTI, Riccardo (SI); VAGELLI, Valerio (PG)

Presenter: SIMONE, Daniela (BA)

Contribution ID: **27** Type: **not specified**

Power-law energy spectrum of high energy cosmic rays

We study the spectrum of high energy cosmic rays as an ultra-relativistic multicomponent quasi-ideal plasma. Such a quasi-ideal plasma reflects a power-law behavior reproducing the knee-ankle structure of the high and ultra high energy spectrum. The presence of nonextensive statistical effects are discussed in the light of the recent data and in connection with anomalous sub-diffusive transport of high energy cosmic rays in galactic superbubbles.

Primary author: LAVAGNO, Andrea (TO)

Presenter: LAVAGNO, Andrea (TO)

Contribution ID: **28** Type: **not specified**

Advanced Virgo: status and perspectives

Thursday, 7 July 2016 09:50 (30 minutes)

Since 2011 the Virgo collaboration has undertaken a major detector upgrade towards a second generation detector with the aim of increasing the number of observable galaxies (and thus the detection rate) by three orders of magnitude. The installation and integration of Advanced Virgo was recently completed and the commissioning phase has begun with the objective of joining the two Advanced LIGO detectors and GEO-HF in the second scientific run of the advanced detector network. The talk will present the status of the Advanced Virgo detector, its impact on the upcoming scientific run of the network and an outlook on the evolution of Advanced Virgo towards the third generation of detectors.

Primary author: RAZZANO, Massimiliano (PISA)

Presenter: RAZZANO, Massimiliano (PISA)

Session Classification: Gravitational Waves

Contribution ID: **29** Type: **not specified**

Study of the performance of the High-Energy Particle Detector apparatus

The High-Energy Particle Detector (HEPD) is one of the payloads of the CSES space mission. The CSES (China Seismo-Electromagnetic Satellite) mission will investigate the structure and the dynamic of the topside ionosphere, will monitor electric and magnetic field and high energy particle fluctuations, searching for their correlations with the geophysical activity, in order to contribute to the monitoring of earthquakes from space.
The HEPD is built by the Italian collaboration and has different goals. It will study the temporal stability of the inner Van Allen radiation belts, the precipitation of trapped particles in the atmosphere and the low energy component of the cosmic rays (5 - 100 MeV for electrons and 15 - 300 MeV for protons). Here is presented a study of the performance of the apparatus to separate electrons and protons and identify nuclei up to iron.

Primary author: Dr PANICO, Beatrice (NA)

Co-authors: Mr SOTGIU, Alessandro (Università di Roma Tor Vergata); Dr AMBROGLINI, Filippo (PG); Dr PALMA, Francesco (ROMA2)

Presenter: Dr PANICO, Beatrice (NA)

Contribution ID: **30** Type: **not specified**

EUSO-SPB –a stratospheric super-pressure balloon searching for UHECR

Wednesday, 6 July 2016 12:20 (20 minutes)

The EUSO-SPB (Extreme Universe Space Observatory - Super Pressure Balloon) is a fluorescence telescope at a stratospheric balloon with the main goal of detecting UV- light from Extensive Air Showers for the first time from (near) space. For this purpose
it will employ a UV telescope consisting of three 1 m2 Fresnel lenses focusing light on 2304 channels of multi-anode photomultipliers. The detector will utilize microsecond-scale exposures and an autonomous trigger to extensive air showers. The launch from Wanaka, New Zeeland is scheduled for spring 2017. The flight should take at least 30 days with a possibility of extension to as much as 100 days. We aim at detecting of an order of 10 ultra-high energy cosmic ray events. The data will also provide detailed measurements of the night-time UV emission of the Earth and its atmosphere.

EUSO-SPB is a pathfinder experiment of the space based JEM-EUSO mission, which will be installed on the International Space Station in the future. Incorporating the same technology as the EUSO-SPB, but scaled to significantly larger dimensions, it will have an unprecedented coverage of the Earth's atmosphere. This should result in the identification of the extremely energetic cosmic rays sources, a crucial goal for this field of physics.

Primary author: Mr GORODETZKY, Philippe (APC-Paris 7)

Presenter: Mr GORODETZKY, Philippe (APC-Paris 7)

Session Classification: Indirect Measurements of High Energy Cosmic Rays

Contribution ID: **31** Type: **not specified**

Recent Results and Future Prospects from the Telescope Array experiment

Wednesday, 6 July 2016 11:30 (30 minutes)

The Telescope Array (TA) experiment, located in Utah, US, is the largest ultra-high energy cosmic ray (UHECR) observatory in the northern hemisphere. TA observes the UHECR using the hybrid technique which consists of 507 surface detectors (SD) on a 1.2km grid covering about 700 km^2 area and three fluorescence detector (FD) stations surrounding the SD array. Specification of the detectors, status of the operation, analysis techniques and results from the UHECR observation operated from the May 2008 will be reported. In addition, in order to enhance the statistics for the high energy region and to expand the energy threshold of the low energy region, we are preparing the TA expansion experiments, so-called TAx4 and TALE. Current status and future prospects of those experiments will also be discussed.

Primary author: Dr IKEDA, Daisuke (Institute for Cosmic Ray Research, University of Tokyo)

Presenter: Dr IKEDA, Daisuke (Institute for Cosmic Ray Research, University of Tokyo)

Session Classification: Indirect Measurements of High Energy Cosmic Rays

Contribution ID: **32** Type: **not specified**

Fermi Large Area Telescope Observations of the gamma-ray emission from the Quiescent Sun

Tuesday, 5 July 2016 12:10 (20 minutes)

The high energy gamma-ray emission from the Sun is due to the interactions of cosmic ray (CR) protons and electrons with matter and photons in the solar environment. Such interactions lead to two component gamma-ray emission: a disk-like emission due to the nuclear interactions of CR protons and nuclei in the solar atmosphere and a space extended emission due to the inverse Compton (IC) scattering of CR electrons off solar photons in the whole heliosphere. The observation of these two solar emission components may give useful information about the evolution of the solar cycle by probing two different CR components (proton and electrons) in regions not directly accessible by direct observations. We present the results of the observations of the Sun with Fermi-LAT in the first 7 years on orbit, with the exception of the flaring periods. Significantly large photon statistics and improved processing performance allow us to explore both components of the emission in greater details and perform better comparisons of data with current models of the IC component. This allows us to probe CR electrons in the inner heliosphere which is not possible by other methods. Moreover, the longer period of observations allows us to study the variations of the emission between the maximum and the minimum of the solar cycle.

Primary author: RAINÒ, Silvia (Università e INFN-BARI)

Co-author: GIGLIETTO, Nicola (Politecnico di BARI e INFN - BARI)

Presenters: GIGLIETTO, Nicola (Politecnico di BARI e INFN - BARI); RAINÒ, Silvia (Università e INFN-BARI)

Session Classification: Gamma Ray Astronomy

Contribution ID: **33** Type: **not specified**

Development of a Charge Preamplifier to improve NUV- HD SiPM performance

The development of a new camera based on the use of Silicon Photomultipliers (SiPM) proposed for the Cherenkov Telescope Array (CTA), which represents a new generation of ground based very high energy gamma ray observatory, is one of the main items of the Italian Institute of Nuclear Physics (INFN). In the R&D framework a single channel electronic charge preamplifier has been developed to improve the performance of photon cameras equipped with High Density NUV –HD SiPM produced by Fondazione Bruno Kessler (FBK) with a micro cell of 30 μm x 30 μm and 6 mm x 6 mm total area. The single channel preamplifier will be used as basic component for a 16-channel electronic board prototype to test the 8 x 8 NUV –HD SiPM modules proposed to equip a pSCT (Schwarzschild-Couder Telescope prototype) camera. In this work the results of tests on the single channel preamplifier prototype to optimize the SiPM performances will be presented.

Primary author: Dr BONAVOLONTA, Carmela (INFN-Napoli)

Co-authors: BOIANO, Alfonso (NA); ARAMO, Carla (NA); Prof. DE LISIO, Corrado (Dep. of Physics "E.Pancini" University of Napoli "Federico II", INFN Napoli, Italy); Dr VALENTINO, Massimo (CNR-SPIN Napoli); AMBROSIO, Michelangelo (NA); MASONE, Vincenzo (NA)

Presenter: Dr BONAVOLONTA, Carmela (INFN-Napoli)

Contribution ID: **34** Type: **not specified**

ICARUS

Thursday, 7 July 2016 17:20 (30 minutes)

The ICARUS-T600 is the biggest LAr-TPC detector ever realized. The ICARUS Collaboration concluded a very successful, long duration run with the T600 detector at the LNGS underground laboratory, taking data both with the CNGS neutrino beam and with cosmic rays. It performed a sensitive search for anomalous nue appearance as suggested by LSND signal and experimental neutrino anomalies at reactors and with the calibration sources in solar neutrino searches. The analysis of the νμCC events collected with the CNGS beam is progressing, in view of the comparison with the expected flux in absence of anomalies. The collected cosmic ray triggers are being analyzed too aiming at studying the atmospheric neutrino interactions.
The detector is being overhauled at CERN and will be ready to be installed at Fermilab by the end of this year to investigate within the SBN project the presence of sterile neutrino, exploring in three years of data taking the νμ to νe appearance signal with 5 sigma sensitivity in the parameter region indicated by the LSND experiment and measuring the νμ disappearance with a sensitivity exceeding an order of magnitude the present experimental limits.

Primary author: GUGLIELMI, Alberto (PD)

Presenter: GUGLIELMI, Alberto (PD)

Session Classification: Astrophysical Neutrinos

Contribution ID: **35** Type: **not specified**

The electronics of the HEPD of the CSES experiment

The China Seismo Electromagnetic Satellite (CSES) aims to contribute to the monitoring of earthquakes from space. This space mission, lead by a Chinese-Italian collaboration, will study phenomena of electromagnetic nature and their correlation with the geophysical activity. The satellite will be launched in 2016 and will host several instruments onboard: two magnetometers, an electrical field detector, a plasma analyzer, a Langmiur probe and the High Energy Particle Detector (HEPD). The HEPD, built by the Italian collaboration, will study the temporal stability of the inner Van Allen radiation belts, investigating precipitation of trapped particles induced by magnetospheric, ionosferic and tropospheric electromagnetic emissions, as well as by seismo-electromagnetic disturbances. It consists of two layers of plastic scintillators for trigger and a calorimeter. The direction of the incident particle is provided by two planes of double-side silicon microstrip detectors. HEPD is capable of separating electrons and protons and identify nuclei up to Iron. The HEPD will study the low energy component of cosmic rays too. The HEPD comprises the following subsystems: detector, electronics, power supply and mechanics. The electronics can be divided in three blocks: silicon detector, scintillator detectors (trigger, energy and veto detectors) and global control and data managing. In this paper a description of the electronics of the HEPD and its main characteristics will be presented.

Primary author: Dr SCOTTI, VALENTINA (ROMA2)

Co-author: OSTERIA, Giuseppe (NA)

Presenter: Dr SCOTTI, VALENTINA (ROMA2)

Contribution ID: **36** Type: **not specified**

A two-stage torsion pendulum for ground testing free fall conditions on two degrees of freedom.

Thursday, 7 July 2016 10:20 (20 minutes)

A torsion pendulum with 2 soft degrees of freedom (DOF), realized by off-axis cascading two torsion fibers, has been built and operated. This instrument allows simultaneous measurement, of force and torque acting on the suspended test mass, approaching free-fall condition down to a few mHz. It was developed for ground testing on two DOFs, before the launch, of the Gravitational Reference Sensor of the LISA-Pathfinder mission. We will report on the results of some measurement campaigns devoted in particular to the characterization of force to torque and torque to force actuation cross-talks. We will also discuss further possible upgrades of the facility for application for ground testing of future space gravitational wave antennas or other space experiments requiring drag-free control.

Primary author: BASSAN, Massimo (ROMA2)

Co-authors: GRADO, Aniello (INAF-OAC e INFN NA); CAVALLERI, Antonella (3CNR–Fondazione Bruno Kessler e INFN-TIFPA); VETRUGNO, Daniele (TIFP); GARUFI, Fabio (NA); DE MARCHI, Fabrizio; PUCACCO, Giuseppe (ROMA2); MILANO, Leopoldo; DI FIORE, Luciano (NA); DE LAURENTIS, Martina (NA); VISCO, Massimo (ROMA2); HUELLER, Mauro (TIFP); FINETTI, Noemi (FI); DOLESI, Rita (TIFP); DE ROSA, Rosario (NA); STANGA, Ruggero (FI); VITALE, Stefano (TN); WEBER, William (TIFP)

Presenter: DI FIORE, Luciano (INFN Napoli)

Session Classification: Gravitational Waves

Contribution ID: **37** Type: **not specified**

An upgrade of the camera focal plane of a Schwarzschild –Couder Telescope prototype (pSCT) for the Cherenkov Telescope Array (CTA)

The Cherenkov Telescope Array (CTA) will be the next generation of ground-based observatory of very high energy gamma ray sources.
The Italian Institute of Nuclear Physics (INFN) is involved in the R&D effort for the development of a possible solution for one of the Cherenkov photon camera designs, working on replacing the Hamamatsu MPPC S12642- 0404PA-50 with more UV sensitive ones from Fondazione Bruno Kessler (FBK). INFN is currently developing the preamplifiers and the carrier boards for the SiPM chips that interface with the mechanics of the camera.
To test the feasibility and the performance of SiPM cameras, a focal plane camera prototype module, upgraded with High Density NUV –SiPMs, produced by FBK, with a micro cell of 30 μm x 30 μm and 6 mm x 6 mm area, is being assembled.
In this work, we describe the SiPM carrier boards, the assembly process and the qualification tests (IV curves and dark count) performed, before and after assembly, on the focal plane modules to qualify the procedures.

Primary author: FIANDRINI, emanuele (University&Infn erugia)

Co-authors: SIMONE, Daniela (BA); BISSALDI, Elisabetta (BA); GIORDANO, Gianfranco (LNF); AMBROSI, Giovanni (PG); MOVILEANU, Maria (PG); GIGLIETTO, Nicola (BA); PAOLETTI, Riccardo (SI)

Presenter: FIANDRINI, emanuele (University&Infn erugia)

Contribution ID: **38** Type: **not specified**

Perspectives for detection of gamma-ray counterparts of gravitational wave sources

Thursday, 7 July 2016 12:40 (20 minutes)

The detection of the first gravitational waves from GW150914 by the LIGO-Virgo collaboration has triggered many multi-wavelength campaigns using space and ground observatories. Large field-of-view gamma-ray telescopes, such as those onboard INTEGRAL have the capability of detecting relatively faint transient events (>~ a few 10^-8 erg cm-2) and are unique for the study of the prompt emission. We report on the upper limits of the total energy emitted by GW150914 obtained with INTEGRAL and compare them with the results obtained with Fermi/GBM. We then discuss the perspectives for INTEGRAL to provide measurements during the forthcoming LIGO-Virgo campaigns. The INTEGRAL instruments have the capability to characterize the prompt and also the delayed emission using dedicated TOO programs. Moreover, counterpart searches will not be limited to GW events but will be also extended to cosmic particle detections such as neutrinos or ultra high energy cosmic-rays.

Primary author: Dr NATALUCCI, Lorenzo (INAF/IAPS)

Co-authors: Dr BAZZANO, Angela (INAF-IAPS); UBERTINI, Pietro (ROMA2); Dr MEREGHETTI, Sandro (INAF/IASF-Milano)

Presenter: Dr NATALUCCI, Lorenzo (INAF/IAPS)

Session Classification: Gravitational Waves

Contribution ID: **39** Type: **not specified**

Highlights from the Pierre Auger Observatory

Wednesday, 6 July 2016 09:50 (30 minutes)

The Pierre Auger Observatory, based in Mendoza province, Argentina,
represents the largest Ultrahigh Energy Cosmic Ray observatory ever built. After twelve years of operation the exposure reached almost 60 000 km2 sr yr and the unprecedented quality data set spans three orders of magnitude in energy. The status and performance of the detectors and their enhancements will be described. The rich harvest of the results obtained so far will be presented including the energy spectrum, searches for anisotropy, measurement of the position of shower maxima and their interpretation in terms of mass composition as well as limits on photons and neutrinos in the primary flux. Implications of the results on future operation and motivations for the upgrade of the Observatory will be also discussed.

Primary author: BOHACOVA, Martina (Institute of Physics, Prague)

Presenter: BOHACOVA, Martina (Institute of Physics, Prague)

Session Classification: Indirect Measurements of High Energy Cosmic Rays

Contribution ID: **40** Type: **not specified**

UHE neutrino overlapping on UHECR rarest narrow clustering on galactic plane

Thursday, 7 July 2016 17:50 (20 minutes)

The recent UHECR events by AUGER and TA offered wide clustering as the North and South Hot Spot possibly related to near AGN as M82 and Cen A, as well as rare narrow clustering along SS433 and in opposite side of the galactic plane multiplet events: we tag them, with a very few other sky regions, a couple of years ago. Last year highest UHE tens-hundreds TeV neutrino events did show along those two marked narrow clustering regions of UHECR a remarkable two new overlapping signals by UHE neutrinos. We claimed that at 98-99% level these two narrow overlapping might be a very first hint of UHE neutrino astronomy, mostly tracked by trough going (crossing) highest energy muons upgoing at ICECUBE horizons. Moreover coexistence of tau flavor events might soon confirm the extraterrestrial nature at least of part of ICECUBE highest energy events.

Primary author: FARGION, Daniele (Università Roma 1)

Presenter: FARGION, Daniele (Università Roma 1)

Session Classification: Astrophysical Neutrinos

Contribution ID: **41** Type: **not specified**

Probing Cosmic Accelerators with Gamma Rays

Monday, 4 July 2016 14:30 (50 minutes)

The key role of high energy gamma-ray observations is described in the context of the origin of galactic and extragalactic cosmic rays. The achievements of recent years regarding both the experimental and theoretical activities are highlighted, and the prospects of the field are discussed.

Primary author: AHARONIAN, Felix (DIAS and MPIK)

Presenter: AHARONIAN, Felix (DIAS and MPIK)

Session Classification: Gamma Ray Astronomy

Contribution ID: **42** Type: **not specified**

Review of Direct Cosmic Ray measurements

Tuesday, 5 July 2016 14:30 (50 minutes)

In the last decade, direct cosmic ray studies entered in a new era of precision. Access to space with long-term running experiments and state of the art detectors has been the key to advance and to unveil unexpected features in the CR composition and energy spectra. A wealth of measurements is now available in a wide energy range, from few MeV to TeV, which provides new constraints to the different hypotheses for sources and acceleration mechanisms of galactic CRs as well as for their propagation.
The next challenge will be to further increase the energy limit, not only for a direct study of the CR spectrum knee but also to provide a considerable overlap with indirect measurements. In this contribution, we will overview the most recent results from direct CR studies and the perspectives for future experimental programs.

Primary author: BERTUCCI, Bruna (PG)

Presenter: BERTUCCI, Bruna (PG)

Session Classification: Cosmic Rays Direct Measurements

Contribution ID: **43** Type: **not specified**

First data from the DAMPE space mission

Tuesday, 5 July 2016 16:20 (30 minutes)

The DAMPE (DArk Matter Particle Explorer) satellite was launched on December 17, 2015 and is in smooth data taking since few days after. It was designed in order to work properly for at least three years and, thanks to its large geometric factor (~0.3 m2 sr for protons and nuclei), is integrating one of the largest exposures for galactic cosmic ray (CR) studies in space.

Even if primarily optimized to collect electrons and gammas, DAMPE provides good tracking, calorimetric and charge measurements also in case of protons and nuclei. This will allow precise measurement of CR spectra from tens of GeV up to about 100 TeV (the high limit is essentially determined by the overall geometric factor and the calorimeter dynamic range). In particular, the energy region between 1-100 TeV will be explored with higher precision compared to previous experiments: spectral indexes for individual species could then be well measured and the observed hardenings could be checked and better quantified. This would be very important for a comparison with present models of galactic CR acceleration/propagation mechanisms.

The various subdetectors allow an efficient identification of the electron signal over the large (mainly proton-induced) background. As a result, the all-electron spectrum will be measured with excellent resolution from few GeV up to few TeV, thus giving the possibility to identify possible contribution of nearby sources.

A report on the mission goals and status will be presented, together with in-orbit detector performance and first data coming from space.

Primary author: BERNARDINI, Paolo (LE)

Presenter: BERNARDINI, Paolo (LE)

Session Classification: Cosmic Rays Direct Measurements

Contribution ID: **45** Type: **not specified**

KM3NeT HIGHLIGHTS

Thursday, 7 July 2016 16:50 (30 minutes)

The KM3NeT Collaboration aims at the discovery and subsequent observation of high neutrino sources in the Universe (ARCA) and at the determination of the neutrino mass hierarchy (ORCA). The KM3NeT technologies, current status and expected performances are reported. In particular the ARCA detector is described and its perspectives for detection of high energy neutrinos signals from different candidate sources are discussed. The ORCA detector and its expected significance for the mass hierarchy determination by means of the measurement of passing through Earth atmospheric neutrinos are also presented.

Primary author: SAPIENZA, Piera (Laboratorio Nazionale del Sud INFN)

Presenter: SAPIENZA, Piera (Laboratorio Nazionale del Sud INFN)

Session Classification: Astrophysical Neutrinos

Contribution ID: **46** Type: **not specified**

MAGIC Highlights

Monday, 4 July 2016 17:00 (30 minutes)

The present generation of Imaging Air Cherenkov Telescopes (IACTs) has
greatly improved our knowledge on the Very High Energy side of the Universe. The MAGIC IACTs operate in stereoscopic configuration since 2009 in La Palma, Canary Islands.
This talk will present a few of MAGIC latest and most relevant results, in particular related to the physics of extragalactic objects and into
fundamental topics such as the Intergalactic Magnetic Field and the search for signatures of Dark Matter candidates. These results and the
planned deep observations in the next years will serve as a robust
cornerstone for the future of Very-High Energy Astrophysics.

Primary author: DE ANGELIS, Alessandro (INFN)

Presenter: DE ANGELIS, Alessandro (INFN)

Session Classification: Gamma Ray Astronomy

Contribution ID: **47** Type: **not specified**

Listening to the gravitational wave universe with Advanced LIGO

Thursday, 7 July 2016 11:10 (30 minutes)

The detection of gravitational waves from binary black hole coalescence and merger was a major highlight of Advanced LIGO's first observing run (O1). These detections of gravitational wave heralded the dawn of gravitational wave astronomy. The Advanced LIGO detectors, though significantly more sensitive than any other gravitational wave detector before, were not operating at design sensitivity in O1 and there have been significant efforts to improve Advanced LIGO sensitivity for the second observing run (O2). This talk will give highlights of LIGO observations from O1 and present ongoing efforts to improve the Advanced LIGO detectors.

Primary author: Dr HENG, ik siong (University of Glasgow)

Presenter: Dr HENG, ik siong (University of Glasgow)

Session Classification: Gravitational Waves

Contribution ID: **48** Type: **not specified**

A torsion pendulum test of LISA Pathfinder free-fall mode: measuring fN force variations in presence of constant nN forces

The LISA Pathfinder geodesic explorer mission for gravitational wave astronomy has demonstrated a residual acceleration between two free falling test masses at femto-m/s^2Hz^1/2 level in the frequency range 0.7 - 20 mHz. The relative acceleration between these two objects is perturbed by the presence of a large and constant relative acceleration that must be actively compensated in order to hold the test particles centred inside an orbiting apparatus. The actuation force applied to compensate this effect introduces a dominant source of force noise in the mission noise budget at frequency near and below the mHz. The 'free-fall mode'actuation control scheme has been designed to suppress this noise source and avoid actuation instabilities: actuation is limited to brief periodic impulses, with test masses in free fall in between two "kicks". This actuation-free motion is then analysed for the remaining sources of acceleration ultra noise.
We will discuss and present data for the on-ground torsion pendulum testing campaign of this technique, and the associated data analysis algorithms, at a level nearing the sub-femto-g/sqrt(Hz) performance required for LISA Pathfinder.

Primary author: Dr RUSSANO, Giuliana (University of Trento)

Co-authors: Prof. DOLESI, Rita (University of Trento); Prof. VITALE, Stefano (University of Trento); Prof. WEBER, William (University of Trento)

Presenter: Dr RUSSANO, Giuliana (University of Trento)

Contribution ID: **61** Type: **not specified**

Overview Lecture

Thursday, 7 July 2016 09:00 (50 minutes)

Presenter: CALLONI, Enrico (INFN Napoli)

Session Classification: Gravitational Waves

Contribution ID: **62** Type: **not specified**

LISA Pathfinder highlights

Thursday, 7 July 2016 11:40 (30 minutes)

Presenter: DOLESI, Rita (TIFP)

Session Classification: Gravitational Waves

Contribution ID: **63** Type: **not specified**

Highlights from the Fermi Large Area Telescope

Monday, 4 July 2016 15:20 (30 minutes)

The Fermi mission is operating in low Earth orbit since June 2008, and has collected more than one billion photons from the whole sky in the 100 MeV - 100 GeV band.

Thanks to the large acceptance of the Large Area Telescope, a pair-conversion telescope for high-energy electromagnetic radiation, Fermi also provided the largest high-energy cosmic-ray electron sample to date, with about 10k events above 1 TeV.

This unique database allows the study of thousands of gamma-ray sources of very different nature, from our own Galaxy to distant and active galactic nuclei, as well as addressing fundamental questions of particle astrophysics like the nature of dark matter and the origin of energetic gamma-ray bursts. In addition, cosmic-ray electrons provide a unique probe of the origin and propagation mechanisms of cosmic rays in local galactic environment.

I will review the most important results obtained with Fermi and illustrate the scientific potential of the upcoming years of high-statistics, high-resolution data.

Primary author: SPADA, Francesca Romana (PI)

Presenter: SPADA, Francesca Romana (PI)

Session Classification: Gamma Ray Astronomy

Contribution ID: **69** Type: **not specified**

LHCf Highlights

Friday, 8 July 2016 11:40 (30 minutes)

The goal of the LHCf experiment is to provide precise measurements of the spectra of neutral particles produced in the very forward region at LHC. These measurements are of fundamental importance since provide a calibration tool to tune the hadronic interaction models used by ground-based cosmic rays experiments up to the highest energy currently available at accelerator facilities. In order to achieve this goal, LHCf makes use of two small sampling calorimeters installed at ±140m from LHC IP1, so that it can detect neutral particles produced by p-p collisions having pseudo-rapidity $\eta > 8.4$.
LHCf has taken data in p-p collisions at different energies ($\sqrt{s}$ = 0.9 TeV, 2.76 TeV, 7 TeV and 13 TeV) and in p-Pb collisions ($\sqrt{sNN}$ = 5.02 TeV). In this talk, a summary of the main results achieved by the Collaboration will be given showing the comparison with Monte Carlo model predictions with particular emphasis to the $\pi 0$ spectra which offer the possibility to study pT and pz spectra, to test Feynman scaling hypothesis and to estimate the nuclear modification factor.

Primary author: TRICOMI, Alessia Rita (CT)

Presenter: TRICOMI, Alessia Rita (CT)

Session Classification: Tuning Models & Fundamental Interactions

Contribution ID: **71** Type: **not specified**

CTA Status and Perspectives

Monday, 4 July 2016 17:30 (30 minutes)

The Cherenkov Telescope Array (CTA) will be the global, next-generation instrument for high-energy gamma-ray astronomy, with unprecedented performance in every respect. It will be an observatory with telescopes in the South and North, and will gradually become an open observatory. CTA is rapidly approaching its realisation. Construction of pre-production telescopes has commenced and data analysis is prepared for a wide range of science topics. The status and perspectives for the near future will be presented.

Primary author: Dr KNAPP, Johannes (DESY Zeuthen)

Presenter: Dr KNAPP, Johannes (DESY Zeuthen)

Session Classification: Gamma Ray Astronomy

Contribution ID: **72** Type: **not specified**

Indirect Measurements of High Energy Cosmic Rays –the Air-Shower Regime

Wednesday, 6 July 2016 09:00 (50 minutes)

Measurements relevant to the arrival direction distribution, the energy spectrum and the mass composition of cosmic rays above 1 PeV will be reviewed. Interpretation of raw data is affected, to a greater or lesser extent, by our lack of knowledge of key parameters of hadronic interactions: the limitations will be emphasised. Work at the Auger Observatory leads to the view that there is a problem with the prediction of the muon content of showers which appears to be confirmed by data from measurements made with the IceCube/IceTop arrangement. Two sets of evidence against the ankle feature at ~ 4 EeV being due to pair-production by photons on protons, that are only weakly model-dependent, will be discussed from which it seems improbably that the mass spectrum can be proton-dominated in the region near the ankle, as often claimed. There remain many unanswered questions and instruments under development to alleviate the situation will be briefly mentioned.

Primary author: WATSON, Alan (University of Leeds)

Presenter: WATSON, Alan (University of Leeds)

Session Classification: Indirect Measurements of High Energy Cosmic Rays

Contribution ID: **73** Type: **not specified**

HERD highlights

Tuesday, 5 July 2016 16:50 (30 minutes)

The High Energy cosmic-Radiation Detection (HERD) facility is one of several space astronomy payloads of the cosmic lighthouse program onboard China's Space Station, which is planned for operation starting around 2022 for about 10 years. The main scientific objectives of HERD are indirect dark matter search, precise cosmic ray spectrum and composition measurements up to the knee energy, and high energy gamma-ray monitoring and survey. In order to achieve high statistic measurement, HERD has an effective geometrical factors of >3 m2sr for electron and diffuse gamma-rays, >2 m2sr for cosmic ray nuclei.
The detector is composed of a 3-D cubic calorimeter (CALO) surrounded by microstrip silicon trackers (STK) from five sides. CALO is made of about 104 cubes of LYSO crystals, corresponding to about 55 radiation lengths and 3 nuclear interaction lengths, respectively. The top STK microstrips of seven X-Y layers are sandwiched with tungsten converters to make precise directional measurements of incoming electrons and gamma-rays. In the baseline design, each of the four side SKTs is made of only three layers microstrips. All STKs will also used for measuring the charge and incoming directions of cosmic rays, as well as identifying back scattered tracks. With the current design, HERD can achieve the following performance: energy resolution of 1% for electrons and gamma-rays beyond 100 GeV, 20% for protons from 100 GeV to 1 PeV; an electron/proton separation power better than 10−5. The main goal of the mission, the physics performance as well as the current R&D activities on both CALO and STK will be described.

Primary author: AMBROSI, Giovanni (PG)

Presenter: AMBROSI, Giovanni (PG)

Session Classification: Cosmic Rays Direct Measurements

Contribution ID: **74** Type: **not specified**

Results from the ANTARES neutrino telescope

Thursday, 7 July 2016 16:20 (30 minutes)

A primary goal of a deep-sea neutrino telescopes as ANTARES is the search for astrophysical neutrinos in the TeV-PeV range. ANTARES has been running in its final configuration since 2008; it comprise an array of 885 photomultipliers tubes housed in optical modules, detecting the Cherenkov light induced by charged particles produced by neutrino interactions in and around the instrumented volume. ANTARES is today the largest neutrino telescope in the Northern hemisphere.
After the discovery of a cosmic neutrino diffuse flux by the IceCube, the understanding of its origin has become a key mission in high-energy astrophysics. ANTARES makes a valuable contribution for sources located in the Southern sky thanks to its excellent angular resolution in both the muon channel and the cascade channel (induced by all neutrino flavours).
The sensitivity is sufficient to constrain the origin of the IceCube excess from regions extended up to 0.2 sr in the Southern sky. Assuming various spectral indexes for the energy spectrum of neutrino emitters, the Southern sky and in particular central regions of our Galaxy are studied searching for point-like objects and for extended regions of emission.
In parallel, by adopting a multimessenger approach, based on time and/or space coincidences with other cosmic probes, the sensitivity of such searches can be considerably augmented. As an example of multi-messenger searches, ANTARES has participated to a high-energy neutrino follow-up of the gravitational wave signal GW150914, providing the first constraint on high-energy neutrino emission from a binary black hole coalescence. ANTARES has also performed indirect searches for Dark Matter, yielding limits for the spin-dependent WIMP-nucleon cross-section that improve upon those of current direct-detection experiments.
The latest results from the various physics analyses are presented.

Primary author: SPURIO, Maurizio (BO)

Presenter: SPURIO, Maurizio (BO)

Session Classification: Astrophysical Neutrinos

Contribution ID: **75** Type: **not specified**

Electromagnetic follow-up of gravitational wave transients: first results and perspectives

Thursday, 7 July 2016 12:10 (30 minutes)

The direct detection of gravitational waves from the merger of binary black holes marked the birth of gravitational wave astronomy and opened a new chapter in the multimessenger study of the cosmos. Among gravitational wave sources, mergers of compact objects containing at least one neutron star are thought to be associated with electromagnetic transient phenomena, such as short Gamma Ray Bursts. Simultaneous observations of gravitational interferometers and ground-based or space telescopes will thus provide an unique opportunity to find the electromagnetic counterparts of these gravitational wave sources. The talk will discuss the latest results on the electromagnetic follow-up campaign, and highlight the perspectives and challenges on the rapid search for counterparts of gravitational wave transients.

Primary author: RAZZANO, Massimiliano (on behalf of the LIGO Scientific Collaboration and Virgo Collaboration)

Presenter: RAZZANO, Massimiliano (on behalf of the LIGO Scientific Collaboration and Virgo Collaboration)

Session Classification: Gravitational Waves

Contribution ID: **76** Type: **not specified**

The PAMELA Experiment: A decade of Cosmic Rays Physics in space

Tuesday, 5 July 2016 17:20 (30 minutes)

It was the 15th of June of 2006 when the PAMELA satellite-borne experiment was launched from the Baikonur cosmodrome in Kazakhstan. Since then, PAMELA has been making high-precision measurements of the charged component of the cosmic radiation opening a new era of precision studies in cosmic rays.

The measured antiparticle component of the cosmic radiation shows features that can be interpreted in terms of dark matter annihilation or pulsar contribution. The measurements of the energy spectra of protons, electrons, helium and light nuclei and their isotopes challenges our basic vision of the mechanisms of production, acceleration and propagation of cosmic rays in the galaxy. The study of the time dependence of the various components of the cosmic radiations clearly shows solar modulation effects as well as charge sign dependence.

PAMELA measurement of the energy spectra during solar energetic particle events fills the existing energy gap between the highest energy particles measured in space and the ground-based domain. Finally, by sampling the particle radiation in different regions of the magnetosphere, PAMELA data provide a detailed study of the Earth magnetosphere.

In this talk I will review the PAMELA experiment and its scientific results.

Primary author: SPARVOLI, Roberta (ROMA2)

Presenter: SPARVOLI, Roberta (ROMA2)

Session Classification: Cosmic Rays Direct Measurements

Contribution ID: **77** Type: **not specified**

Astrophysical neutrinos: IceCube highlights

Thursday, 7 July 2016 14:30 (30 minutes)

The IceCube Neutrino Observatory features a cubic-kilometer volume of instrumented ice at the geographic South Pole. A high energy astrophysical neutrino flux has been confirmed since 2013 as an excess of neutrinos above 10 TeV compared to the expectation from atmospheric neutrino background. This excess, nowadays significant at >6 sigma level, has been observed both in neutrino interactions starting in the detector volume and in through-going muons generated in charged-current muon neutrino interactions outside the detector. No objects have been identified as sources of the astrophysical flux, which is so far consistent with isotropic. I will review the evidence for the astrophysical flux and the status of the search for its sources. I will also present proposed detector extensions which are now being designed to solve the mystery of the neutrinos origin.

Primary author: TOSI, Delia (DESY)

Presenter: TOSI, Delia (DESY)

Session Classification: Astrophysical Neutrinos

Contribution ID: **78** Type: **not specified**

Hadronic interactions and extensive air showers

Friday, 8 July 2016 09:00 (50 minutes)

Thanks to new data from LHC and fixed-target experiments and an improved understanding of the phenomenology of extensive air showers, significant progress has been made in predicting composition-relevant observables. The current status of predictions for air showers is reviewed and discussed on the basis of general features of hadronic multiparticle production. Implications for the interpretation of cosmic ray data are presented and open questions and possible ways of addressing them are pointed out.

Primary author: Dr ENGEL, Ralph (Karlsruhe Institute of Technology (KIT))

Presenter: Dr ENGEL, Ralph (Karlsruhe Institute of Technology (KIT))

Session Classification: Tuning Models & Fundamental Interactions

Contribution ID: **79** Type: **not specified**

HAWC Highlights

Tuesday, 5 July 2016 09:30 (30 minutes)

The High Altitude Water Cherenkov (HAWC) experiment is a large field of view, continuously operated TeV gamma ray observatory located at 4,100 meters above sea level inside the Pico de Orizaba national park in Mexico. It consists of an array of 300 water Cherenkov detectors densely-spaced over an area of 22,000 square meters. The high altitude, the large active area, and the optical isolation of the PMTs provide better angular and energy resolutions, an improved background rejection, and an order of magnitude increase in sensitivity with respect to its predecessor. The improved performance allows us to detect both transient and steady emissions, to study the Galactic diffuse emission at TeV energies, and to measure or constrain the TeV spectra of GeV gamma ray sources discovered with the Fermi satellite. In addition, HAWC is sensitive to prompt emission from gamma ray bursts above 100 GeV. The HAWC array was inaugurated on March 20, 2015. I will present the results using data from the first year of the full array.

Primary author: Prof. MOSTAFA, Miguel (Penn State Univ.)

Presenter: Prof. MOSTAFA, Miguel (Penn State Univ.)

Session Classification: Gamma Ray Astronomy

Contribution ID: **83** Type: **not specified**

Studying hadronic interactions with inclusive atmospheric leptons

Friday, 8 July 2016 09:50 (30 minutes)

Presenter: Dr FEDYNITCH, Anatoli (DESY Zeutehn)

Session Classification: Tuning Models & Fundamental Interactions

Contribution ID: **84** Type: **not specified**

Development of a Charge Preamplifier to Improve NUV-HD SiPM Performances

Tuesday, 5 July 2016 10:20 (2 minutes)

Presenter: Dr BONAVOLONTÀ, Carmela

Session Classification: Coffee Break and Poster Session

Contribution ID: **85** Type: **not specified**

A new technique for probing the internal structure of volcanoes using cosmic-ray muons

Tuesday, 5 July 2016 10:22 (2 minutes)

Presenter: Dr DEL SANTO, Melania (INAF/IASF-Palermo)

Session Classification: Coffee Break and Poster Session

Contribution ID: **86** Type: **not specified**

Prospects for detecting Gamma-Ray Bursts with the Cherenkov Telescope Array

Tuesday, 5 July 2016 10:24 (2 minutes)

Presenter: DI GIROLAMO, Tristano (NA)

Session Classification: Coffee Break and Poster Session

Contribution ID: **87** Type: **not specified**

An upgrade of the camera focal plane of a SchwarzschildCouder Telescope prototype (pSCT) for the Cherenkov Telescope Array (CTA)

Tuesday, 5 July 2016 10:26 (2 minutes)

Presenter: FIANDRINI, Emanuele (PG)

Session Classification: Coffee Break and Poster Session

Contribution ID: **88** Type: **not specified**

Modeling of New High Density NUV Sensitive Silicon Photomultiplier

Tuesday, 5 July 2016 10:28 (2 minutes)

Presenter: GIORDANO, Francesco (BA)

Session Classification: Coffee Break and Poster Session

Contribution ID: **89** Type: **not specified**

The EEE project - Science in schools: state and results

Tuesday, 5 July 2016 10:30 (2 minutes)

Presenter: Mr GRAZZI, Stefano (Study and Research Centre "Enrico Fermi"(Rome))

Session Classification: Coffee Break and Poster Session

Contribution ID: **90** Type: **not specified**

Power-law energy spectrum of high energy cosmic rays

Tuesday, 5 July 2016 10:32 (2 minutes)

Presenter: LAVAGNO, Andrea (TO)

Session Classification: Coffee Break and Poster Session

Contribution ID: **91** Type: **not specified**

The SiRO Detector (Silicone Read Out) for cosmic muon flux-trajectory measurements

Tuesday, 5 July 2016 10:34 (2 minutes)

Presenter: Mr NICULESCU-OGLINZANU, Mihai (HoriaHulubei National Institute for R&D in Physics)

Session Classification: Coffee Break and Poster Session

Contribution ID: **92** Type: **not specified**

Study of the performance of the HEPD apparatus for the CSES mission

Tuesday, 5 July 2016 10:36 (2 minutes)

Presenter: Dr PANICO, Beatrice (NA)

Session Classification: Coffee Break and Poster Session

Contribution ID: **93** Type: **not specified**

Using two-photon statistical contribution in the detection of telescopes EUSO

Tuesday, 5 July 2016 10:38 (2 minutes)

Presenter: RABANAL REINA, Julio Arturo (LAL/IN2P3/CNRS)

Session Classification: Coffee Break and Poster Session

Contribution ID: **94** Type: **not specified**

A torsion pendulum test of LISA Pathfinder free-fall mode: measuring fN force variations in presence of constant nN forces

Tuesday, 5 July 2016 10:40 (2 minutes)

Presenter: RUSSANO, Giuliana (TIFP)

Session Classification: Coffee Break and Poster Session

Contribution ID: **95** Type: **not specified**

EUSO-TA, a JEM-EUSO pathfinder at the Telescope Array site

Tuesday, 5 July 2016 10:42 (2 minutes)

Presenter: Dr SCOTTI, VALENTINA (NA)

Session Classification: Coffee Break and Poster Session

Contribution ID: **96** Type: **not specified**

The electronics of the HEPD of the CSES experiment

Tuesday, 5 July 2016 10:44 (2 minutes)

Presenter: Dr SCOTTI, VALENTINA (NA)

Session Classification: Coffee Break and Poster Session

Contribution ID: **97** Type: **not specified**

Development of a SiPM based camera for Cherenkov Telescope Array

Tuesday, 5 July 2016 10:46 (2 minutes)

Presenter: SIMONE, Daniela (BA)

Session Classification: Coffee Break and Poster Session