Vulcano Workshop 2022 - Frontier Objects in Astrophysics and Particle Physics

Report of Contributions

Contribution ID: **1** Type: **Talk**

Search for new physics in kaon decay

Friday, 30 September 2022 17:00 (25 minutes)

Rare kaon decays are among the most sensitive probes of both heavy and light new physics beyond the Standard Model description, thanks the high precision of the Standard Model predictions, the availability of very large datasets, and the relatively simple decay topologies. The NA62 experiment at CERN has reported the first observation of the ultra-rare K+ –> pi+nunu decay, and is collecting data towards a 10% measurement of the decay rate. A plan for a comprehensive program to study K+ and KL rare decays at CERN beyond NA62 is currently taking shape. The KOTO experiment at J-PARC is approaching the SM sensitivity to the ultra-rare KL –> pi0nunu decay, and the next step of the KOTO program has been proposed. Both NA62 and KOTO experiments experiments pursue broad rare-decay and hidden-sector physics programs. Recent results and future plans for kaon experiments are discussed.

Primary author: GOUDZOVSKI, Evgueni (University of Birmingham)

Presenter: GOUDZOVSKI, Evgueni (University of Birmingham)

Session Classification: Particle Physics

Contribution ID: **2** Type: **Talk**

Implications for cosmology following gravitational waves detected from binary black hole binaries

Monday, 26 September 2022 12:40 (25 minutes)

Standard sirens have been the central paradigm in gravitational-wave (GW) cosmology so far. From the GW signature detected from the compact binary mergers, it is possible to directly measure the luminosity distance of the source, and if additional information on the source redshift is provided, a measurement of the cosmological expansion can be performed. In this talk, I will present the most recent results on cosmology using the latest LIGO-Virgo-KAGRA GW events. I will focus on dark standard sirens, namely binary black holes for which no electromagnetic counterpart has been detected. I will discuss results from two methods that are able to provide an indirect redshift estimation: the first based on the distribution of the black holes source-frame masses and the second based on the correlation with galaxy surveys. I will conclude by highlighting prospects and challenges of GW-cosmology with binary black holes.

Primary author: MASTROGIOVANNI, Simone (Observatoire de Cote D'Azur)

Presenter: MASTROGIOVANNI, Simone (Observatoire de Cote D'Azur)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **4** Type: **Talk**

Measuring the Dark Matter Content of Dwarf Spheroidal Galaxies

Friday, 30 September 2022 09:25 (25 minutes)

Dark matter (DM), a large (~85%) non-baryonic and non-relativistic component of the matter density of the Universe, likely consists of one or several so-far undetected particles hypothesized in theories beyond the Standard Model (SM). One of the most promising approaches to shed light on the nature of DM particles is to search for signatures of their annihilation or decay into SM particles from regions of the sky believed to be highly DM dominated, such as the Galactic Center, the clusters of galaxies and the dwarf spheroidal galaxies (dSphs) around the Milky Way. In this context, dSphs are among the most promising observational targets due to their relative proximity and lack of astrophysical background sources. In this contribution, I will present new determinations of the DM amount (i.e. the astrophysical factors for DM annihilation and decay) in dSph halos obtained through the MCMC Jeans analysis of their brightness and kinematic data through the CLUMPY software. I will also discuss the systematic uncertainties affecting the calculation of such quantities.

Primary author: SATURNI, Francesco Gabriele

Co-authors: DORO, Michele (Istituto Nazionale di Fisica Nucleare); MORSELLI, Aldo (Istituto Nazionale di Fisica Nucleare); RODRIGUEZ FERNANDEZ, Gonzalo (Istituto Nazionale di Fisica Nucleare); NAKASHIMA, Kaori Danielle (Friedrich-Alexander-Universität Erlangen-Nürnberg)

Presenter: SATURNI, Francesco Gabriele

Session Classification: Dark Matter & Dark Energy

Contribution ID: **6** Type: **Talk**

Neutrinos and Tidal Disruption Events

Thursday, 29 September 2022 11:50 (25 minutes)

The Zwicky Transient Facility (ZTF) performs a systematic neutrino follow-up program, searching for optical counterparts to high-energy neutrinos with dedicated Target-of-Opportunity (ToO) observations. Since first light in March 2018, ZTF has taken prompt observations for 24 high-quality neutrino alerts from the IceCube Neutrino Observatory. From two of these campaigns, we were able to identify likely electromagnetic counterparts to the neutrinos. The first, tidal disruption event (TDE) AT2019dsg, was found during observations of neutrino IC191001A. The second, likely TDE AT2019fdr, was found during follow-up of IC200530A. The probability of finding two such objects by chance is 0.034%, favouring an astrophysical association and suggesting that TDEs therefore contribute a subdominant fraction of the astrophysical neutrino flux.

Primary author: STEIN, Robert (Caltech)

Presenter: STEIN, Robert (Caltech)

Session Classification: Neutrino

Contribution ID: **7** Type: **Talk**

Three lunar laser ranging mission in 2023-2024 by NASA, ESA and CNSA for precision test of general relativity

Monday, 26 September 2022 18:15 (25 minutes)

More than 50 years ago, Apollo and Luna missions placed five Laser Retroreflector Arrays (LRAs) of Cube Corner Retroreflectors (CCRs) on the surface of the Moon. Through a technique known as Lunar Laser Ranging (LLR), it has been possible to perform high accuracy/precision measurements of the Earth-Moon distance by firing short laser pulses from ground Laser Ranging Stations to these LRAs on the Moon, and measuring their two-way times of flight. LLR outputs include accurate tests of General Relativity, information on the composition of the Moon, its ephemerides and its internal structure, and geocentric positions and motions of ground Laser Ranging Stations.

Since 1969, ground Laser Ranging Stations performances have significantly improved, and currently the lunar LRAs of CCRs represent the main limitation to the achievement of more accurate/precise measurements. The main problem that affects the Apollo and Lunokhod LRAs consists of the lunar librations, that result from the eccentricity of the Moon's orbit around the Earth. For this reason, the Moon Laser Instrumentation for General relativity and geophysics/geodesy High accuracy Tests (MoonLIGHT) program was started at the Istituto Nazionale di Fisica Nucleare - Laboratori Nazionali di Frascati (INFN-LNF). The aim of the program is designing the next generation of lunar retroreflectors, prototyping, manufacturing and qualifying them for the Moon's environment, shifting from a multi-scatterer LRA of small CCRs to a single large 100 mm CCR, named MoonLIGHT, unaffected by lunar librations. MoonLIGHT is twinned to its US counterpart, Next Generation Laser Retroreflector (NGLR), led by University of Maryland, College Park (UMD).

On account of the fact that the industry of landers could not guarantee an accurate pointing of the device towards the Earth, the INFN proposed the MoonLIGHT Pointing Actuator (MPAc) project to ESA in 2018. In 2019, ESA chose MPAc (and another instrument) among 135 eligible scientific project proposals. In 2021, ESA agreed with NASA to launch MPAc to the Reiner Gamma crater, with a Commercial Lunar Payload Services (CLPS) mission, which is part of the Artemis program. Also in 2021, NASA chose Intuitive Machines (IM) as the company that will develop and manufacture the commercial lander where MPAc will be integrated and confirmed its flight for April 2024. NGLR will fly as well in 2024, without its own Pointing Actuator, on board of another CLPS mission, operated by Firefly, towards the Mare Crisium.

In response to the "Announcement of Opportunities for Scientific Payloads onboard Chang'E-6 Mission" issued by CNSA (Chinese National Space Administration) in April 2019, we proposed two laser retroreflector instruments in order to perform precision tests of General Relativity (GR) and precision studies of the lunar interior and of selenodesy. There instruments are: MoonLIGHT, the single, large reflector of 100 mm optical aperture; and INRRI (INstrument for landing-Roving laser Retroreflector Investigations), a miniature array of eight 12.7 mm diameter reflector, already flown on NASA's InSight Mars lander in 2018 and Perseverance rover in 2020.

Primary authors: PORCELLI, Luca (Istituto Nazionale di Fisica Nucleare); DELL'AGNELLO, Simone (Istituto Nazionale di Fisica Nucleare); CURRIE, Douglas (University of Maryland, College Park); Dr BIANCO, Giuseppe (ASI-CGS); DELLE MONACHE, Giovanni Ottavio (Istituto Nazionale di Fisica Nucleare); Dr REMUJO CASTRO, Alejandro (INFN-LNF); RUBINO, Laura (Istituto Nazionale

di Fisica Nucleare); DENNI, Ubaldo (LNF); MUCCINO, Marco (L); MAURO, Lorenza (Istituto Nazionale di Fisica Nucleare); SALVATORI, Lorenzo (LNF); TIBUZZI, Mattia (LNF); DI PAOLO EMILIO, Maurizio (LNF); Dr TRAINI, Marco (INFN-LNF); FILOMENA, Luciana (Istituto Nazionale di Fisica Nucleare); Dr MORETTI, Giulia (INFN-LNF); Dr DI, Kaichang (Aerospace Information Research Institute, CAS, Beijing, China); Dr PING, Jinsong (National Astronomical Observatories, CAS, Beijing, China); Dr LI, Yuqiang (Yunnan Astronomical Observatories, CAS, Yunnan, China); Dr KANG, Zhizhong (China University of Geosciences, Beijing, China)

Presenter: PORCELLI, Luca (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **8** Type: **Talk**

Constraints on Dark Energy from the abundance of massive galaxies

Friday, 30 September 2022 09:00 (25 minutes)

Dynamical dark energy (DDE) models have been proposed to address several observational tensions arising within the standard Lambda Cold Dark Matter scenario. Different DDE models, parameterized by different combinations of the local value of the equation-of-state parameter w0 and its time derivative wa, predict different maximal abundance of massive galaxies in the early Universe. We used the observed abundance of massive galaxies already in place at z~4-7 to constrain DDE models. To this aim we use three independent probes: (i) the observed stellar mass function at z~6 from the CANDELS survey; (ii) the estimated volume density of massive halos derived from the observation of massive, star-forming galaxies detected in the submillimeter range at z~4; (iii) the rareness of the most massive system detected at z~7 by the SPT survey (Marrone et al. 2018). I will show that the combination of these three probes exclude a sizable fraction of the DDE parameter space presently allowed (or even favored) by other existing probes.

Primary author: SANTINI, Paola (INAF.- Osservatorio Astronomico di Roma)

Co-authors: Dr MENCI, Nicola (INAF - Osservatorio Astronomico di Roma); Dr CASTELLANO, Marco (INAF - Osservatorio Astronomico di Roma)

Presenter: SANTINI, Paola (INAF.- Osservatorio Astronomico di Roma)

Session Classification: Dark Matter & Dark Energy

Contribution ID: **9** Type: **Talk**

Recent results on cosmic ray direct observation

Wednesday, 28 September 2022 09:00 (25 minutes)

Direct measurements of cosmic rays in space have been extensively performed since the sixties by experiments on board stratospheric balloons, satellites and space stations. The main goals have been the search for primordial antimatter, signals of dark matter annihilation or of exotic particles, and the study of the mechanisms of production, acceleration and propagation of cosmic rays.
In recent years experiments have measured the energy spectra of cosmic rays very precisely, and revealed several new features: a remarkable excess of the positrons has been observed as well as a spectral hardening of cosmic ray nuclei above several hundreds of GeV. These results have important implications on our understandings of the origin and propagation of cosmic rays.

In this talk I will review the main scientific results of past and present experiments of CR direct measurements, with a look to the future.

Primary author: SPARVOLI, Roberta (Istituto Nazionale di Fisica Nucleare)

Presenter: SPARVOLI, Roberta (Istituto Nazionale di Fisica Nucleare)

Session Classification: Cosmic Rays, Gamma Rays

Contribution ID: **10** Type: **Talk**

Constraints on Dark Matter from Reionization

Thursday, 29 September 2022 18:15 (25 minutes)

The abundance of galaxies in the epoch of reionization (z>6) is dependent on fundamental cosmological parameters, most importantly on the properties of dark matter, such that it can be used as a powerful cosmological probe. In this talk, I will discuss constraints obtained from the deepest HST Legacy Fields observations on warm dark matter (WDM) scenarios: thermal relic WDM, sterile neutrino DM models, and wavelike bosonic DM.
I will show theoretical predictions on how reionization history unfolds in scenarios with suppressed initial power spectra and discuss current observational and theoretical uncertainties. Finally, I will present how JWST can revolutionize our understanding of the epoch of reionization and of its connection with fundamental cosmological parameters.

Primary authors: CASTELLANO, Marco (INAF - Osservatorio Astronomico di Roma); MENCI, Nicola (INAF-Osservatorio Astronomico di Roma); SANTINI, Paola (INAF.- Osservatorio Astronomico di Roma)

Presenter: CASTELLANO, Marco (INAF - Osservatorio Astronomico di Roma)

Session Classification: Dark Matter & Dark Energy

Contribution ID: **11** Type: **Talk**

NA62 results on Dark Sector searches

Friday, 30 September 2022 11:25 (25 minutes)

NA62 is a precision physics experiment studying charged kaons and their decay products with an unprecedented accuracy (measurement of the $K^+ \to \pi^+\nu\bar{\nu}$ branching ratio of the order of 10^{-11}), allowing to probe indirectly new physics scales up to O(100) TeV. NA62 experiment also searches directly for weakly interacting particles of up to O(100) MeV masses in kaon decays and up to O(1) GeV masses when running in the beam dump mode. For both modes of direct searches, NA62 continues to collect data since 2021 after a successful 2016-18 run 1. Past results and future prospects are presented in this talk.

Primary author: JERHOT, Jan (Universite Catholique de Louvain (UCL) (BE))

Presenter: JERHOT, Jan (Universite Catholique de Louvain (UCL) (BE))

Session Classification: Dark Matter

Contribution ID: **12** Type: **Talk**

Review on indirect dark matter searches

Thursday, 29 September 2022 13:05 (25 minutes)

The existence of dark matter (DM) is supported by a large body of evidence, on local and cosmological scales, collected over the past decades. However, we still have minimal knowledge about its nature and interaction mechanisms. If Dark Matter is made of weakly interacting massive particles (WIMPs), indirect searches are an extremely promising method to probe annihilating and decaying dark matter particle models, with masses in the GeV to TeV region.
Indirect searches can be carried out by looking for an excess of gamma rays or neutrinos from DM-dominated regions, like the galactic centre or dwarf galaxies. The search for DM with charged cosmic rays can be performed by searching for spectral features in the antimatter fluxes, where the DM signal would appear as excess with respect to the background from conventional astrophysical processes.
This talk will provide an overview of the latest results from indirect dark matter searches. I will focus on the DM interpretation of the cosmic-ray antimatter, including the perspectives on the search for light antinuclei. I will provide an overview of the latest searches for dark matter with gamma rays and present future perspectives.

Primary author: VECCHI, Manuela

Presenter: VECCHI, Manuela

Session Classification: Dark Matter & Dark Energy

Contribution ID: **13** Type: **Talk**

The Cherenkov Telescope Array: Status and perspectives

Tuesday, 27 September 2022 18:40 (25 minutes)

The Cherenkov Telescope Array (CTA) will be five to ten times more sensitive depending on energy with respect to current generation Imaging Cherenkov Telescopes and will have unprecedented accuracy in its detection of very-high-energy gamma rays in the energy range from 20 GeV to 300 TeV. CTA is designed to detect gamma rays over a larger area with dozens of telescopes located on the Canary island of La Palma and in the Paranal desert in Chile, in the northern and southern hemispheres respectively.

Together, the northern and southern CTA arrays will constitute the CTA Observatory (CTAO), which will be the first ground-based gamma-ray observatory open to the worldwide astronomical and particle physics communities as a resource for data from unique, high-energy astronomical observations.

The talk will present the current status of the development of the telescopes, of the Observatory and the perspectives for its scientific observations.

Primary author: LONGO, Francesco (Istituto Nazionale di Fisica Nucleare)

Presenter: LONGO, Francesco (Istituto Nazionale di Fisica Nucleare)

Session Classification: Cosmic Rays, Gamma Rays

Contribution ID: **14** Type: **Talk**

Status of the Southern Wide-Field Gamma-ray Observatory (SWGO)

Wednesday, 28 September 2022 11:00 (25 minutes)

High-elevation particle detectors have recently opened-up a new observational window in Astronomy, significantly increasing the number of detected gamma-ray sources in the very- to ultra-high energy range. In particular, these instruments have achieved unprecedented sensitivity above 100 TeV and detected gamma ray emission from sources up to 1 PeV. The recent successes have all been obtained in the Northern sky, motivating the development of a new instrument in the South, from where many prominent targets such as the Galactic Center can be accessed. The Southern Wide-field Gamma-ray Observatory (SWGO) is the Collaboration to build a new extensive air shower array in South America for the observation of VHE to UHE gamma-rays, and is currently engaged in the design and prototyping work towards the realisation of this future facility. SWGO will use an array of water-Cherenkov based particle detectors to provide a wide field and high duty cycle view of the southern sky, complementing CTA and the existing particle arrays of the Northern Hemisphere, such as HAWC and LHAASO. Towards the lower energies, SWGO aims to push the observational range of wide-field ground-based gamma-ray facilities down to a few hundred GeV, thus bridging the gap with space-based instruments in the monitoring of the VHE sky. In this contribution I will provide an overview of the status of the project and plans for the future, including performance expectations and science goals, as well as ongoing activities towards the site search and technological developments.

Primary author: BARRES DE ALMEIDA, Ulisses (Centro Brasileiro de Pesquisas Físicas)

Presenter: BARRES DE ALMEIDA, Ulisses (Centro Brasileiro de Pesquisas Físicas)

Session Classification: Cosmic Rays, Gamma Rays

Contribution ID: **15** Type: **Talk**

Models of Neutrino sources

Thursday, 29 September 2022 11:00 (25 minutes)

The detection of a diffuse flux of high-energy neutrinos by the IceCube observatory has opened a new window to the Universe, revealing the existence of extremely energetic astrophysical neutrino sources. While the isotropic distribution of the IceCube astrophysical neutrinos favors an extragalactic origin, the sources responsible for the observed flux are still almost entirely unresolved and pose a compelling mystery.
High-energy neutrinos are produced by the interactions of energetic protons with surrounding photons and matter and are therefore a signature for hadronic cosmic accelerators.
I will present and discuss various models for particle acceleration and neutrino production in neutrino source candidates.

Primary author: LAMASTRA, Alessandra (INAF-OAR ASI - SSDC)

Presenter: LAMASTRA, Alessandra (INAF-OAR ASI - SSDC)

Session Classification: Neutrino

Contribution ID: **16** Type: **Talk**

ASI future programs in astrophysics and fundamental physics

Friday, 30 September 2022 18:15 (25 minutes)

Italian Space Agency supports astrophysics and fundamental physics programs since decades. There are currently many long standing programs in orbit which keep publishing outstanding results therefore justifying the space agencie's on orbit support. There are also future space-based missions in these fields which will study for the first time other science topics such as dark energy, GW search or bring unprecedented details in the study of strategic science fields such as the polarimetry, the violent and energetic universe and the gamma-ray sky. Balloon experiments deserve a dedicated slot because these are science-driven opportunities which can led to unprecedented results on a much faster time frame and much cheaper involvement with respect to space missions. All above relates to confirmed missions but many other projects are under investigation following the Decadal Survey on Astronomy and Astrophysics 2020 (Astro2020) and the Voyage 2025 ESA roadmaps. I will go through the main Italian contributions to some of these mission opportunities.

Primary author: Dr CAVAZZUTI, Elisabetta (Agenzia Spaziale Italiana)

Presenter: Dr CAVAZZUTI, Elisabetta (Agenzia Spaziale Italiana)

Session Classification: Future Prospects

Contribution ID: **17** Type: **Talk**

Einstein Telescope: science, technologies and perspectives

Monday, 26 September 2022 10:15 (25 minutes)

3rd generation (3G) gravitational wave (GW) observatories will pick up in the next decade, the legacy of the current generation of GW detectors, Advanced LIGO and Advanced Virgo, allowing the exploration of almost the entire Universe through GW signals. Einstein Telescope (ET) is the pioneer project aiming to the realisation of a 3rd generation Gravitational Wave Observatory in Europe. Benefiting of the momentum given by the scientific successes of the LIGO and Virgo detectors, ET project had, in the last few years, important boosts toward its realisation and recently ET is entered in several national and international roadmaps. ET will be simultaneously a new discovery and a precision measurement observatory; ET will have a rich variety of scientific and multidisciplinary targets in astrophysics, nuclear physics, fundamental physics and cosmology. In fact, ET aims to investigate almost the whole Universe, up to the dark ages, through the coalescence of stellar and intermediate mass black holes; it will detect and measure in great detail the gravitational wave signal generated by hundreds of thousands coalescences of neutron stars per year, revealing the nuclear physics governing this kind of stars. ET will be also a technological challenge: in order to achieve the expected sensitivity a new underground research infrastructure will be realised, a multi-interferometer per detector design will be implemented hosting new or updated technologies studied to reduce the noises limiting the current detectors. An overview of the science targets, of the observatory design, of the needed technologies and project organisation will be presented.

Primary author: PUNTURO, Michele (Istituto Nazionale di Fisica Nucleare)

Presenter: PUNTURO, Michele (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **19** Type: **Talk**

Cosmic ray transport in interstellar turbulence

Wednesday, 28 September 2022 17:25 (25 minutes)

Cosmic ray propagation is determined by the properties of interstellar turbulence. The multiphase nature of ISM and diversity of driving mechanisms give rise to spatial variation of turbulence properties. A new chapter of CR propagation research has begun when studies of particle transport and interstellar turbulence can confront each other. I shall report our current understandings of interstellar turbulence and particle transport. Both theoretical and observational studies will be presented. Different regimes of particle transport, e.g., diffusion vs. superdiffusion, isotropic vs. anisotropic diffusion, will be discussed in relation to turbulence properties.

Primary author: YAN, Huirong

Presenter: YAN, Huirong

Session Classification: Cosmic Rays, Gamma Rays

Contribution ID: **21** Type: **Talk**

Gravitational waves: recent results

Monday, 26 September 2022 09:25 (25 minutes)

After decades of null results, the gravitational wave events GW150914 and GW170817 have ushered us in the era of gravitational wave astronomy. Observations of gravitational waves from the inspiral and merger of black-hole and neutron-star binaries, also in conjunction with EM-observations, are probing important aspects of astrophysics, cosmology and fundamental physics – and this is just the beginning !

Primary author: PAPA, Maria Alessandra (Max Planck Inst. for Gravitational Physics)

Presenter: PAPA, Maria Alessandra (Max Planck Inst. for Gravitational Physics)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **22** Type: **Talk**

LISA-Athena synergy for detecting GW and HE counterparts of supermassive binary BH mergers

Monday, 26 September 2022 13:05 (25 minutes)

In $\sim$ 2035 LISA will be able to detect the gravitational waves (GWs) from the coalescence of massive black hole binaries (MBHBs) in the mass range $[10^5, 10^7]\,\mathrm{M}_\odot$ up to $z \sim 10$. If the merger happens in a wet environment, copious amounts of radiation across the entire electromagnetic (EM) spectrum is expected to be produced by the accretion of the gas onto the binary.
If LISA locates the MBHB merger within an error box of sub-squared degree accuracy, Athena can be pointed to identify the host galaxy and detect the EM counterpart to the GW signal, paving the way to test the nature of gas in a rapidly changing space-time and to perform cosmology and General Relativity experiments.
In this talk I will present recent results on the synergies between LISA and Athena observations to detect together MBHBs mergers. I'll also discuss the possibility of observing the EM emission in optical and/or radio.

Primary author: MANGIAGLI, Alberto (APC)

Presenter: MANGIAGLI, Alberto (APC)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **23** Type: **Talk**

Measurement of cosmic ray spectra with DAMPE and prospects with the HERD space mission

Wednesday, 28 September 2022 09:25 (25 minutes)

The DArk Matter Particle Explorer (DAMPE) is a satellite launched in December 2015. Its primary scientific goals include the study of Galactic Cosmic-Rays (GCR) up to hundreds of TeV. Even higher energies could be reached by the High Energy cosmic Radiation Detector (HERD) that is planned to be installed onboard the Chinese Space Station (CSS) in 2027, aiming to detect CR up to a few PeV energy. In the talk, the latest results from DAMPE will be reviewed and the prospects of the HERD mission will be discussed.

Primary authors: ALEMANNO, Francesca (Istituto Nazionale di Fisica Nucleare); ON BEHALF OF THE DAMPE AND HERD COLLABORATIONS

Presenter: ALEMANNO, Francesca (Istituto Nazionale di Fisica Nucleare)

Session Classification: Cosmic Rays, Gamma Rays

Contribution ID: **24** Type: **Talk**

Relativistic Jets and Gamma-Ray Bursts from Neutron Star Mergers

Monday, 26 September 2022 11:00 (25 minutes)

A defining characteristic of gamma-ray bursts (GRBs) is the presence of jetted outflows. These jets are shaped by their launching mechanism and interactions with the environment (both close and further distant) of the GRB, as revealed to us when the jets decelerate from the ultra-relativistic to the non-relativistic. Due to its close proximity and off-axis orientation, multi-messenger event GRB 170817A has been particularly informative in this regard. In this talk I will review the characteristics of GRB jets, paying special attention to recent developments in the field prompted by observation and numerical study of the afterglow of short GRBs from neutron star mergers.

Primary author: VAN EERTEN, Hendrik (University of Bath)

Presenter: VAN EERTEN, Hendrik (University of Bath)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **25** Type: **Talk**

Multiple dark matter signatures

Thursday, 29 September 2022 18:40 (25 minutes)

I will introduce the fundamentals of the indirect searches for dark matter, including aspects of both multi-messenger and multi-wavelength detection. I will show both recent results and future prospects for different observatories, e.g. CTA, Fermi-LAT, SKA, MAGIC among others.

Primary author: GAMMALDI, Viviana

Presenter: GAMMALDI, Viviana

Session Classification: Dark Matter & Dark Energy

Contribution ID: **27** Type: **Talk**

First results from IXPE

Tuesday, 27 September 2022 09:25 (25 minutes)

The launch of the Imaging X-ray Polarimetry Explorer (IXPE) on December 9 2021 has opened a new window in X-ray astronomy.
IXPE is a NASA Small Explorer Mission in collaboration with the Italian Space Agency (ASI). The mission opened a new window of investigation including imaging x-ray polarimetry in the "bouquet" of astrophysical observables.
The observatory features three identical telescopes, each consisting of a mirror module assembly with a polarization-sensitive imaging x-ray detector at the focus.
IXPE polarization measurements offer new physics probes of a variety of objects. Polarimetry allows to inspect geometry and magnetic fileld properties of astrophysical sources both steady and transient.

Primary author: FABIANI, Sergio (Istituto Nazionale di Astrofisica)

Presenter: FABIANI, Sergio (Istituto Nazionale di Astrofisica)

Session Classification: Astrophysics/Cosmology

Contribution ID: **29** Type: **Talk**

First Sub-eV Neutrino Mass Limit from the KATRIN Experiment

Wednesday, 28 September 2022 17:50 (25 minutes)

The KATRIN experiment at the Karlsruhe Institute for Technology aims at a model-independent determination of the neutrino mass from the kinematics of tritium beta decay with a sensitivity of 0.2 eV/c^2 at 90% confidence level. For that purpose a high statistics, high precision measurement of the endpoint region of the energy spectrum of beta-electrons produced in the decay is performed. The electrons originate from a high-intensity windowless gaseous molecular tritium source and are analysed by a high-acceptance spectrometer of MAC-E-Filter type with eV resolution. A combined analysis of the first two measurement campaigns of the experiment recently allowed to extract the first sub-eV limit on the neutrino mass with $m_\nu < 0.8$ eV/c^2 at 90% CL. This success has been made possible not only by the increased statistics obtained since the first science-run, but also by a reduction of systematic uncertainties contributed by the different sub-systems of the experiment. The presentation will provide an overview of the experimental apparatus and the analysis leading to the latest mass limit. The work of the presenter is funded by BMBF under contract number 05A20PMA.

Primary author: Dr HANNEN, Volker (Institute for Nuclear Physics, University of Muenster)

Co-author: FOR THE KATRIN COLLABORATION

Presenter: Dr HANNEN, Volker (Institute for Nuclear Physics, University of Muenster)

Session Classification: Neutrino

Contribution ID: **30** Type: **Talk**

Hot filamentary large scale structures in the universe

Tuesday, 27 September 2022 11:25 (25 minutes)

During the Universe's childhood (from age ~0.5-2 billion years), most of its, still pristine, baryonic matter permeated the Intergalactic medium (IGM), filling the space between gently forming galaxies, nurturing them and in turn receiving heating photons from newly born stars and the first quasars.
In this early phase of the Universe's growth, a fraction of these primordial baryons concentrates in the immediate surroundings of assembling galaxies, providing fuel for their formation and in turn getting enriched by the first metals produced by massive stars and ejected out via supernova explosions and, presumably, quasars winds. The majority of them, however, is still diffuse in the IGM and imprints a forest of HI Lyα absorption lines in the optical spectra of high-z quasars, and this is how we know of their presence, amount, location and physical state.
At the age of only ~2 billion years, however, puberty impetuously bursted in and the Universe's growth became frantic: galaxies began growing quickly in size, by devouring material from the surrounding space at higher and higher rates, phagocytizing nearby companions and grouping with close friends.
According to hydro-dynamical simulations for the formation of structures in the Universe, this activity was accompanied by a metamorphosis of the tenuous photo-ionized material filling the space between galaxies and feeding their growth: baryons in the IGM were more and more violently pulled towards the growing gravitational potential wells of virialized structures and shrunk into a web of sheets and filaments getting shock-heated to temperatures of $T \approx 10^5$-10^7 K and so becoming virtually invisible in HI absorption. At the same time, freshly metal-enriched baryons started roaming out of galaxy's disks, pushed out by powerful supernovae and Active Galactic Nuclei (AGN) winds, wandering into and metal-polluting the Circum-Galactic medium (CGM). This cycle of baryons and metals in and out of galaxies proceeded till our day, and most of the Universe's ordinary matter today should therefore not be in galaxies' disks (which are indeed missing both metals and baryons) but diffuse in galaxies' CGM, in a highly ionized state and heavily metal-enriched.
In this talk I will review the 2-decade-long search for the missing baryons in the diffuse Warm-Hot Intergalactic Medium (WHIM) and in the CGM of galaxies, and present preliminary results on our search (in stacked high-resolution X-ray spectra) for the hot baryonic counterparts of Lyman-Lymit Systems (LSSs) at redshift <1. I will then conclude by highlighting the future prospects of these studies with upcoming large X-ray facilities.

Primary author: NICASTRO, Fabrizio (INAF - OAR)

Presenter: NICASTRO, Fabrizio (INAF - OAR)

Session Classification: Astrophysics/Cosmology

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

HE Nu Experimental status

Thursday, 29 September 2022 09:50 (25 minutes)

In the last decade, few experimental results, like the detection of GW170817 and the detailed study of its electromagnetic counterpart, have endorsed the so-called multi-messenger (MM) astronomy. The IceCube observation of the high-energy neutrino event IC170922A, allowed to identify a known gamma-source, the flaring blazar TXS 0506+056, as the source of neutrino events.

As one of the instruments to be used for the MM astronomy, neutrinos not only can observe the extreme part of the Universe, but can allow to get information on the nature and the acceleration processes inside astrophysical sources.
The IceCube detector, in the ice of the South Pole, has been leading neutrino astronomy research over the last decades and, at present, is still the main observatory to detect high-energy astrophysical neutrinos.
ANTARES, observing the neutrino sky from the Northern hemisphere, has complemented, even with reduced effective area, the IceCube results.
The Giant Volume Detector (Baikal-GVD) under construction in the Baikal lake, in Siberia, aims to reach the sensitivity for the identification of astrophysical high energy neutrino sources.
No point-like astrophysical neutrino source has been identified so far directly by these Telescopes.
KM3NeT is a large European research infrastructure, in construction in the Mediterranean Sea, consisting of a network of underwater Cherenkov detectors: ARCA offshore Italy at 3.5 km depth, and ORCA offshore France at 2.5 km depth. The mission of KM3NeT is to implement and operate, with improved sensitivity and in a multi-messenger contest, a world leading open observatory hunting for cosmic neutrinos and for neutrino sources.

Primary author: CAPONE, Antonio (Istituto Nazionale di Fisica Nucleare)

Presenter: CAPONE, Antonio (Istituto Nazionale di Fisica Nucleare)

Session Classification: Neutrino

Contribution ID: **32** Type: **Talk**

New Mission Concept: Compton Telescope with Coded Aperture Mask, and its Science Perspectives

Tuesday, 27 September 2022 17:25 (25 minutes)

The Galactic Explorer with a Coded Aperture Mask Compton Telescope (GECCO) is a novel Explorer-class concept for a next-generation telescope covering the poorly explored hard X-ray and soft gamma-ray energies. This concept builds upon the heritage of past and current missions, improving sensitivity and, very importantly, angular resolution. GECCO uses the combined Coded Aperture Mask and Compton telescope techniques to employ the benefits of both: superior angular resolution provided by the Coded Aperture, and good background rejection and wide field-of-view provided by the Compton telescope. It is being developed at NASA/GSFC in collaboration with other US and foreign institutions. GECCO observations will extend arcminute angular resolution to high-energy images of the Galactic plane, combining the spectral capabilities of INTEGRAL/IBIS and the x-ray imaging of NuSTAR and eROSITA, and will make a bridge to the Fermi-LAT observations, enabling a broad potential for discoveries in the MeV gamma-ray sky.
With the unprecedented angular resolution of the coded mask telescope combined with the sensitive Compton telescope, GECCO will be able to disentangle discrete sources from truly diffuse emission, contributing to understanding the gamma-ray Galactic Centre excess and the Fermi Bubbles, and to tracing low-energy cosmic rays and their propagation in the Galaxy. Nuclear and annihilation lines will be spatially and spectrally resolved from continuum emission and from sources, addressing the role of low-energy cosmic rays in star formation and galaxy evolution, the origin of the 511 keV positron line, fundamental physics, and Galactic chemical evolution. Of special interest will be the exploration of sites of explosive element synthesis by conducting high- sensitivity measurements of nuclear lines from Type 1a supernovae and from other objects.
GECCO's octagon-shaped active shield also serves as a powerful all-sky detector of gamma- ray bursts, prompting the instrument to slew towards the burst direction and localize it with the Coded Aperture's arcminute accuracy. This unique feature enables the precise identification and study of astrophysical objects that produce gravitational waves and neutrinos in a multi-messenger context.
GECCO's observational capabilities will be of paramount importance for disentangling astrophysical and dark matter explanations of emission from the Galactic Centre and potentially providing a key to discovering as-of-yet unexplored dark matter candidates. GECCO will operate in the 100 keV$-$10 MeV energy range, with energy resolution of $< 1\%$ from 0.5$-$5 MeV.The Coded Aperture Mask provides the angular resolution of $\sim$1 arcmin with $4^\circ \times 4^\circ$ fully-coded field-of-view, while the Compton telescope provides the angular resolution of $4^\circ - 8^\circ$ with $60^\circ \times 60^\circ$field-of-view. The $3\sigma, 10^6 s$ sensitivity is expected to be about 10^{-5} MeV cm^{-2} s^{-1}over the entire energy range. GECCO can operate in either scanning or pointed mode. In scanning mode, it will mainly observe the Galactic Plane. It will change to pointed mode to either increase observation time for special regions of interest, (e.g., the Galactic Centre) or to observe transient events such as flares of various origins or gamma-ray bursts.

Primary author: MOISEEV, Alexander

Presenter: MOISEEV, Alexander

Session Classification: Astrophysics/Cosmology

Contribution ID: **33** Type: **Talk**

Searching for New Physics with Local Measurements of the Hubble Constant

Tuesday, 27 September 2022 11:50 (25 minutes)

Apparent tension in the Hubble constant (H0) between the local distance ladder and the cosmic microwave background points toward a significant problem in the LCDM cosmological model. To better understand this tension, the SH0ES team (Supernovae and H0 for the Equation of State of dark energy) has recently improved the local measurement of H0 by 1) increasing the precision of geometric anchor distances used to calibrate the luminosity of Cepheid variables, 2) doubling the sample of galaxies with both Cepheids and SNe Ia that are used to calibrate the SN Ia luminosity, and 3) improving the fidelity of the low-redshift SN Ia sample used to measure H0 through new surveys and revised selection criteria. I will review the recent SH0ES analysis, which reduces nearly every current systematic uncertainty in the local measurement of H0.

Primary author: JONES, David (UC Santa Cruz)

Presenter: JONES, David (UC Santa Cruz)

Session Classification: Astrophysics/Cosmology

Contribution ID: **34** Type: **Talk**

Core-collapse supernova detection: a deep learning approach

Monday, 26 September 2022 11:50 (25 minutes)

The recent discovery of gravitational waves and high-energy cosmic neutrinos, marked the beginning of a new era of the multimessenger astronomy. These new messengers, along with electromagnetic radiation and cosmic rays, give new insights into the most extreme energetic cosmic events. The detection of gravitational waves from core-collapse supernova explosions is a challenging task, yet to be achieved, in which it is key the connection between multiple messengers, including neutrinos and electromagnetic signals. In this talk, I present a method for detecting these kind of signals based on machine learning techniques. To test its robustness signals were injected in the real noise data taken by the Advanced LIGO-Virgo network during the second observing run, O2, it would have been possible to reach the event distance values up to 14 kpc.

Primary authors: RICCI, Fulvio (Istituto Nazionale di Fisica Nucleare); DI PALMA, Irene (Istituto Nazionale di Fisica Nucleare); DRAGO, Marco (Istituto Nazionale di Fisica Nucleare); Ms LÒPEZ, Melissa; Prof. CERDÁ-DURÁN, Pablo

Presenter: DI PALMA, Irene (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **35** Type: **Talk**

PeVatrons

Wednesday, 28 September 2022 12:15 (25 minutes)

Since its discovery more than hundred years ago, the origin of the cosmic-ray (CR) flux measured on Earth is still unknown. To explain the energy region up the knee, located at few PeV, supernova remnants (SNRs) are usually addressed as main CR accelerators. Despite experimental efforts devoted to the identification of PeV activity in SNRs through radiative signatures at the highest energies, such a picture remains yet to be confirmed. Recently, renewed interest was raised towards star clusters as a candidate (perhaps major) class of PeVatrons, after the detection of gamma rays from many of such objects both in our Galaxy and in the Large Magellanic Cloud. In this talk, I will discuss the physics of acceleration, propagation and radiation of high-energy particles in SNRs and stellar clusters.

Primary author: CELLI, Silvia (Istituto Nazionale di Fisica Nucleare)

Presenter: CELLI, Silvia (Istituto Nazionale di Fisica Nucleare)

Session Classification: Cosmic Rays, Gamma Rays

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

Status of the CTA LST Project

Tuesday, 27 September 2022 17:50 (25 minutes)

The CTA is a new generation International gamma-ray observatory under construction, which will have a wider energy coverage and ten times better sensitivity than the currently running Telescopes, HESS, MAGIC, and VERITAS. The LST collaboration is constructing four Large Size Cherenkov Telescopes (LSTs) with 23m diameter dish in Spain, La Palma, and possibly another four LSTs in Paranal, Chile. The first telescope, LST1, is in the commissioning and engineering phase, and already some exciting results have been delivered. Three more telescopes will be built in 2024. Then the array of four LSTs will provide a significant sensitivity for observing gamma-ray sources with a 20GeV energy threshold, which will expand the visible Universe up to the redshift z = 4 and deliver exciting sciences. We would like to discuss the current status of the LST project and science with CTA-LSTs.

Primary author: TESHIMA, Masahiro

Presenter: TESHIMA, Masahiro

Session Classification: Cosmic Rays, Gamma Rays

Contribution ID: **37** Type: **Talk**

Search for Axion Dark Matter

Friday, 30 September 2022 12:15 (25 minutes)

The axion, a pseudoscalar particle originally introduced to solve the ''strong CP problem", is a well motivated dark-matter candidate with a mass lying in a broad range from peV to few meV. Axions clustered inside our galaxy may be observed by means of detectors called "haloscopes" consisting in a resonant cavity immersed in a static magnetic field that triggers the axion conversion to microwave photons. While conventional haloscopes are already taking data, several new experiments have been proposed to improve the sensitivity, widen the search bandwith or probe different axion couplings. Among these, there are haloscopes of new concept such as multimode, ferromagnetic, NMR, dielectric, dish antenna up to the most recent plasma haloscopes.
A major challenge for cosmological-axion discovery is the detection of the faint signal expected in detectors with power as low as a fraction of yoctowatt corresponding to a single microwave photon per minute. In the attempt of reducing the noise temperature superconductive devices are the prefererred choice. Microstrip SQUID Amplifiers allows SQUIDs to operate at frequencies of a few GHz with a noise temperature reaching the standard quantum limit. Josephson Parametric amplifiers are now broadly employed to extend the search to higher frequency while broadband Traveling Wave Parametric Amplifiers are now under study. The ultimate sensitivity, beyond the quantum limit, is however expected from single microwave-photon detectors. The talk will review the status of galactic-axion searches, the prospects of future experiments and the efforts both in materials and devices taken to improve the experimental sensitivity.

Primary author: GATTI, Claudio (Istituto Nazionale di Fisica Nucleare)

Presenter: GATTI, Claudio (Istituto Nazionale di Fisica Nucleare)

Session Classification: Dark Matter

Contribution ID: **38** Type: **Talk**

Dark Matter Search at LHC

Friday, 30 September 2022 10:15 (25 minutes)

There are many astrophysical observations and cosmological evidence for the existence of dark matter (DM), but little is known of its particle nature. The Standard Model (SM) does not predict its existence, however numerous theories beyond the Standard Model (BSM) provide viable candidates for dark matter. Common candidates in many of these theoretical models are the weakly interacting massive particle (WIMP). One way to search for WIMP dark matter is through its production in collider experiments at the Large Hadron Collider (LHC). This talk covers a selection of the latest results of DM searches at the ATLAS, CMS and LHCb experiments.

Primary author: SKORDA, Eleni (Lund University (SE))

Presenter: SKORDA, Eleni (Lund University (SE))

Session Classification: Dark Matter

Contribution ID: **39** Type: **Talk**

Extragalactic Cosmic Ray Sources

Wednesday, 28 September 2022 12:40 (25 minutes)

After a brief review of the status of ultrahigh-energy cosmic ray (UHECR) physics. I discuss observational and theoretical constraints on the sources of UHECRs. I comment also briefly on the role of magnetic fields. Then I discuss a recent analysis of radio galaxies as the dominant extragalactic UHECR sources. In particular, I argue that scenarios where few local sources like Fornax A and Virgo A dominate the flux above the ankle, while low-luminosity radio galaxies contribute an isotropic background dominating below the ankle, provide a good fit to the spect
rum, composition and anisotropy data.

Primary author: KACHELRIESS, Michael (NTNU)

Presenter: KACHELRIESS, Michael (NTNU)

Session Classification: Cosmic Rays, Gamma Rays

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

Radio detection of cosmic rays

Wednesday, 28 September 2022 11:50 (25 minutes)

High-energy cosmic rays impinging on the atmosphere of the Earth initiate extensive air showers. The electrons and positrons in the shower interact with the Earth magnetic field, this yields to the emission of electromagnetic waves with frequencies of tens of MHz. Antenna ground arrays are used to record the radio emission and reconstruct the properties of cosmic rays, such as arrival direction, energy, and particle type.We will discuss recent results and prospects for the future.

Primary author: HOERANDEL, Joerg (Radboud University Nijmegen)

Presenter: HOERANDEL, Joerg (Radboud University Nijmegen)

Session Classification: Cosmic Rays, Gamma Rays

Contribution ID: **41** Type: **Talk**

UHE cosmic ray observations

Wednesday, 28 September 2022 11:25 (25 minutes)

In this contribution I will present recent observational results on cosmic rays at ultrahigh energies (UHECRs) from the Telescope Array and the Pierre Auger Observatory. These results include the spectrum and composition of UHECRs, anisotropies of their arrival directions and hadronic interactions in air showers.

Primary author: UNGER, Michael

Presenter: UNGER, Michael

Session Classification: Cosmic Rays, Gamma Rays

Contribution ID: **42** Type: **Talk**

Gravitational Waves: a new way to explore the Universe

Monday, 26 September 2022 09:50 (25 minutes)

The second generation of Gravitational wave interferometers is a network of advanced detectors distributed in three different continents. They will restart the operation in 2023, including the fourth detector in Japan, bringing new data to the gravitational wave astronomers.
In this talk, after a brief introduction, we will discuss results of astrophysical interest already obtained and will discuss the prospects of new discoveries.

Primary author: RICCI, Fulvio (Istituto Nazionale di Fisica Nucleare)

Presenter: RICCI, Fulvio (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **43** Type: **Talk**

Searches for ultra long-lived particles

Friday, 30 September 2022 12:40 (25 minutes)

In the quest for particle dark matter and physics beyond the Standard Model, the possibility of the existence of neutral long-lived particles (LLPs) has been proposed. The MATHUSLA project has been designed as a surface experiment to detect possible LLPs produced in collisions at the CERN Large Hadron Collider (LHC). The MATHUSLA detector will cover a 10^4 m^2 surface and will have 9 layers of scintillating-detector planes, with a 25 m high LLP decay volume. The detector will be installed above the CMS interaction region of the LHC before the beginning of the Phase-2 high-luminosity operation. By adding a full-coverage layer of Resistive Plate Chambers (RPCs), the MATHUSLA experiment can extend its initial goal and give contributions to several unresolved issues in cosmic-ray physics: the unique spatial and temporal definition of extensive air showers provided by this extended set-up will give detailed information for studying the energy spectrum and composition of cosmic rays, as well as their arrival directions. This information will be crucial for testing hadronic-interaction models and studying the origin and propagation of primary cosmic rays. The potentialities of MATHUSLA in LLP searches and cosmic-ray physics will be presented.

Primary author: Prof. CAMARRI, Paolo (ROMA2)

Presenter: Prof. CAMARRI, Paolo (ROMA2)

Session Classification: Dark Matter

Contribution ID: **44** Type: **Talk**

Do We Understand the Universe?

Monday, 26 September 2022 19:05 (25 minutes)

Astronomical Surveys have brought us a major advance in our understanding of the Universe and its physical laws. All observations in the sky can be described by the standard model of cosmology with just six free parameters. However, description is not the same as understanding. Despite the phenomenal progress of astronomical surveys, only a few percentage of the sky has been surveyed. Future and ongoing surveys will aim at mapping most of the sky. This rich dataset will provide us with the tools to understand the sky, rather than describe it. In this talk I will review the current status of our understanding of the Universe, the status of the "tensions"and will present new results about the nature of the energy components of the universe: dark matter and dark energy, and also about how the Universe might have originated and evolved.

Primary author: JIMENEZ, Raul (ICREA & ICC University of Barcelona)

Presenter: JIMENEZ, Raul (ICREA & ICC University of Barcelona)

Session Classification: Astrophysics/Cosmology

Contribution ID: **45** Type: **Talk**

New results from AGILE

Tuesday, 27 September 2022 09:50 (25 minutes)

AGILE is an Italian Space Agency (ASI) space mission devoted to gamma-ray observations in the 30 MeV - 50 GeV energy range, with simultaneous X-ray imaging in the 18-60 keV band. Launched in April 2007, the AGILE satellite is operating nominally in its 16th year in orbit, and it is substantially contributing to improve our knowledge of the high-energy gamma-ray sky.
I will present the main recent AGILE results related to gravitational waves, neutrinos and the hunt for their electromagnetic counterparts, including some recent updates on the science of Fast Radio Burst (FRBs).

Primary author: Dr PITTORI, Carlotta (Istituto Nazionale di Fisica Nucleare)

Presenter: Dr PITTORI, Carlotta (Istituto Nazionale di Fisica Nucleare)

Session Classification: Astrophysics/Cosmology

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

Welcome address

Monday, 26 September 2022 08:45 (15 minutes)

Presenters: ANTONELLI, Antonella (Istituto Nazionale di Fisica Nucleare); FUSCO FEMIANO, Roberto (IAOS/INAF)

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

Multiwavelength observations of afterglow of GW counterparts (GW170817)

Monday, 26 September 2022 09:00 (25 minutes)

Presenter: TROJA, Eleonora (University of Rome Tor Vergata)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **49** Type: **not specified**

Observations of Kilonovae and theoretical implications

Monday, 26 September 2022 11:25 (25 minutes)

Presenter: DELLA VALLE, Massimo (Capodimonte Observatory - INAF, Naples)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **50** Type: **not specified**

Integral observations of GW and transient phenomena

Monday, 26 September 2022 12:15 (25 minutes)

Presenter: UBERTINI, Pietro (IAPS-INAF)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **51** Type: **not specified**

GW detection at the Moon

Monday, 26 September 2022 17:00 (25 minutes)

Presenter: KATSANEVAS, stavros (university Paris 7/IN2P3/CNRS)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **52** Type: **not specified**

Athena multimessenger science

Monday, 26 September 2022 17:25 (25 minutes)

Presenter: PIRO, Luigi (IAPS/INAF)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **53** Type: **not specified**

METRIC: an Italian proposal for an atmosphere/gravity/geodesy small mission in LEO

Monday, 26 September 2022 17:50 (25 minutes)

Presenter: PERON, Roberto (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gravitation, GW and electromagnetic counterpart

Contribution ID: **54** Type: **not specified**

Dark Matter Direct detection review

Monday, 26 September 2022 18:40 (25 minutes)

Presenter: SELVI, Marco (Istituto Nazionale di Fisica Nucleare)

Session Classification: Dark Matter

Contribution ID: **55** Type: **not specified**

Massive BH in AGNs: multiwavelength observations

Tuesday, 27 September 2022 10:15 (25 minutes)

Presenter: PANESSA, Francesca (IAPS/INAF)

Session Classification: Astrophysics/Cosmology

Contribution ID: **56** Type: **not specified**

The CSES Space missions for investigating the near-Earth electromagnetic, plasma and particle environment Hot filamentary large scale structures in the universe

Tuesday, 27 September 2022 11:00 (25 minutes)

Presenter: IUPPA, Roberto (Istituto Nazionale di Fisica Nucleare)

Session Classification: Astrophysics/Cosmology

Contribution ID: **57** Type: **not specified**

Exploring the frontiers of Astrophysics with JWST END

Tuesday, 27 September 2022 12:15 (25 minutes)

Presenter: FONTANA, Adriano (INAF - Osservatorio Astronomico di Roma)

Session Classification: Astrophysics/Cosmology

Contribution ID: **58** Type: **not specified**

Recent developments of Fast Radio Bursts (remotely)

Tuesday, 27 September 2022 17:00 (25 minutes)

Presenter: BHANDARI, Shivani (ASTRON/JIVE)

Session Classification: Astrophysics/Cosmology

Contribution ID: **59** Type: **not specified**

Highlights from Gamma Ray Atmospheric Cherenkov Telescopes

Tuesday, 27 September 2022 18:15 (25 minutes)

Presenter: OLIVERA NIETO, Laura (Max Planck Institut fur Kernphysik MPIK)

Session Classification: Cosmic Rays, Gamma Rays

Contribution ID: **60** Type: **not specified**

GRB at High Energies

Tuesday, 27 September 2022 19:05 (25 minutes)

Presenter: BISSALDI, Elisabetta (Istituto Nazionale di Fisica Nucleare)

Session Classification: Cosmic Rays, Gamma Rays

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

LHAASO results

Wednesday, 28 September 2022 09:50 (25 minutes)

Presenter: CAO, Zhen (Institute of High Energy Physics)

Session Classification: Cosmic Rays, Gamma Rays

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

Observation of Ultra-High-Energy Gamma-Ray Sources with HAWC

Wednesday, 28 September 2022 10:15 (25 minutes)

Presenter: TIBOLLA, Omar

Session Classification: Cosmic Rays, Gamma Rays

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

Cosmic Accelerators in the universe

Wednesday, 28 September 2022 17:00 (25 minutes)

Presenter: VINK, Jacco (University of Amsterdam)

Session Classification: Cosmic Rays, Gamma Rays

Contribution ID: **64** Type: **not specified**

Neutrino physycs at FNAL

Wednesday, 28 September 2022 18:15 (25 minutes)

Presenter: BERTOLUCCI, Sergio (UNIBO/INFN)

Session Classification: Neutrino

Contribution ID: **65** Type: **not specified**

Present and Future of Neutrinoless Double Beta Decay

Wednesday, 28 September 2022 18:40 (25 minutes)

Presenter: AGOSTINI, Matteo (UCL)

Session Classification: Neutrino

Contribution ID: **66** Type: **not specified**

Results from Borexino

Wednesday, 28 September 2022 19:05 (25 minutes)

Presenter: D'ANGELO, Davide (Istituto Nazionale di Fisica Nucleare)

Session Classification: Neutrino

Contribution ID: **67** Type: **not specified**

Long-baseline neutrino oscillations review

Thursday, 29 September 2022 09:00 (25 minutes)

Presenter: SANCHEZ, Federico (Université de Genève)

Session Classification: Neutrino

Contribution ID: **68** Type: **not specified**

Reactor neutrino experiments review (remotely)

Thursday, 29 September 2022 09:25 (25 minutes)

Presenter: CAO, Jun (Institute of High Energy Physics)

Session Classification: Neutrino

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

Phenomenology of neutrino oscillations

Thursday, 29 September 2022 10:15 (25 minutes)

Presenter: LISI, Eligio (Istituto Nazionale di Fisica Nucleare)

Session Classification: Neutrino

Contribution ID: **70** Type: **not specified**

Beginning a Journey Across the Universe: The Discovery of Extragalactic Neutrino Factories

Thursday, 29 September 2022 11:25 (25 minutes)

Presenter: BUSON, Sara (Univ. of Wuerzburg)

Session Classification: Neutrino

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

Status of CMB observations for the search of primordial GW

Thursday, 29 September 2022 12:15 (25 minutes)

Presenter: BATTISTELLI, Elia Stefano (Istituto Nazionale di Fisica Nucleare)

Session Classification: Astrophysics/Cosmology and GW

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

First stars in the universe

Thursday, 29 September 2022 12:40 (25 minutes)

Presenter: GRAZIANI, Luca

Session Classification: Astrophysics/Cosmology and GW

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

Cosmographic reconstruction to discriminate between modified gravity and dark energy

Thursday, 29 September 2022 17:00 (25 minutes)

Presenter: CAPOZZIELLO, Salvatore (Istituto Nazionale di Fisica Nucleare)

Session Classification: Dark Matter & Dark Energy

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

Dark matter vs modified gravity from observation of dwarf galaxies

Presenter: SALUCCI, Paolo (SISSA)

Session Classification: Dark Matter & Dark Energy

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

EUCLID, Mapping the Geometry of the Dark Universe

Thursday, 29 September 2022 17:25 (25 minutes)

Presenter: SCARAMELLA, Roberto (INAF - Osservatorio di Roma)

Session Classification: Dark Matter & Dark Energy

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

Constraints on Dark Matter from gravitational lensing

Thursday, 29 September 2022 17:50 (25 minutes)

Presenter: GILMAN, Daniel (University of Toronto)

Session Classification: Dark Matter & Dark Energy

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

Theory introduction on Dark Matter models

Friday, 30 September 2022 09:50 (25 minutes)

Presenter: COVI, Laura (Institute for theoretical physics)

Session Classification: Dark Matter

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

Recent dark-sector results at Belle II

Friday, 30 September 2022 11:00 (25 minutes)

Presenter: BRANCHINI, Paolo (Istituto Nazionale di Fisica Nucleare)

Session Classification: Dark Matter

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

PADME results and perpectives

Friday, 30 September 2022 11:50 (25 minutes)

Presenter: VALENTE, Paolo (Istituto Nazionale di Fisica Nucleare)

Session Classification: Dark Matter

Contribution ID: **80** Type: **not specified**

Primordial BHs and Dark Matter (remotely)

Friday, 30 September 2022 13:05 (25 minutes)

Presenter: KUHNEL, Florian

Session Classification: Dark Matter

Contribution ID: **81** Type: **not specified**

High-precision measurement of the W boson mass from Tevatrron and LHC Search for new physics in kaon decay

Session Classification: Particle Physics

Contribution ID: **82** Type: **not specified**

Search for new physics in b decay

Friday, 30 September 2022 17:25 (25 minutes)

Presenter: QUAGLIANI, Renato (EPFL Lausanne)

Session Classification: Particle Physics

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

g-2 results

Friday, 30 September 2022 17:50 (25 minutes)

Presenter: INCAGLI, Marco (Istituto Nazionale di Fisica Nucleare)

Session Classification: Particle Physics

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

Future INFN projects in particle physics at accelerators

Friday, 30 September 2022 18:40 (25 minutes)

Presenter: TENCHINI, Roberto (Istituto Nazionale di Fisica Nucleare)

Session Classification: Future Prospects

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

INAF scientific projects and future programs

Session Classification: Future Prospects

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

Will pulsar timing arrays observe the Hellings-Downs correlation curve?

Tuesday, 27 September 2022 09:00 (25 minutes)

Presenter: ALLEN, Bruce (MPI for Gravitational Physics, Hannover)

Session Classification: Astrophysics/Cosmology

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

INAF scientific projects and future programs

Thursday, 29 September 2022 19:05 (25 minutes)

Presenter: SCARAMELLA, Roberto (INAF - Osservatorio di Roma)

Session Classification: Dark Matter & Dark Energy