CENTRO DI CULTURA SCIENTIFICA A.VOLTA

VILLA OLMO (COMO-ITALIA)

ICATPP Conferences

ICATPP Conference on

Cosmic Rays for Particle and Astroparticle Physics

Cosmic rays as a tool for probing fundamental particle physics, astrophysical sources and contents of the Universe

Villa Olmo, 7-8 October, 2010

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L. Price, ANL
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R. Ruchti, University of Notre Dame

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VILLA OLMO (COMO-ITALIA)

ICATPP Conferences

Registration starts at 16.30 on Wednesday 6th; welcome cocktail at 18.30.
Conference Overview : http://villaolmo.mib.infn.it/Conference2010.html

Wednesday 6	Thursday 7	Friday 8
	8.30 (plenary session) Conference Opening Production of CRs from Astrophys. Sources 10.30	8.30 (plenary session) Product. and Propag. of Matter in the Galaxy 10.30
	10.30-11.00 Coffee break	10.30-11.00 Coffee break
	11.00 (plenary session) Production of CRs from Exotic Matter 13.00	10.50 (plenary session) Experimental Observations of CRs 13.10
	14.30 (parallel sessions) Production of CRs from Astrophys. Sources (I) Production of CRs from Exotic Matter (II) Experimental Observations of CRs (IIIa) Future Experimental Observations of CRs (IIIb) Poster session 16.00	14.30 (parallel sessions) Experimental Observations of CRs (V) Product. and Propag. of Matter in the Galaxy (VI) Energ. Part. in Magnet.&Atmosph. of Earth(VII) Double Beta Decay and DM Search (VIII) Poster session 16.00
	16.00-16.30 Coffee break	16.00-16.20 Coffee break
16.30 REGISTRATION 1800	16.30 (parallel sessions) Production of CRs from Astrophys. Sources (I) Production of CRs from Exotic Matter (II) Experimental Observations of CRs (IIIa) Broader Impacts Activities in CR Science (IV) Poster session 18.40	16.20 (parallel sessions) Experimental Observations of CRs (V) Product. and Propag. of Matter in the Galaxy (VI) Double Beta Decay and DM Search (VIII) Sun, Heliosphere and CRs (IX) Poster session 18.10 18. 10 (plenary session) Sinergy between Astroparticle and Collider Physivcs 18.40
18.00 Welcome cocktail	18.45 Adjourn	18.45 Adjourn
18.30: meeting for Organizers and Advisory Committee Members	20.00: BANQUET	

Room allocation:
Salone: Plenary sessions and parallel sessions IIIa, V
Ovale: parallel sessions II, VII, IX
Duca: parallel sessions I, VI
Volta: parallel session IIIb, IV, VIII

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Plenary Session Organizers:

M. Cirelli, CNRS IPhT Saclay & CERN and A. Ibarra, TUM Munich: Production of Cosmic Rays from Exotic Matter
F. Donato, INFN & Univ. of Torino: Production and Propagation of Matter in the Galaxy
J. Pinfold, University of Alberta: Experimental Observations of Cosmic Rays
S. Sarkar, Oxford University and P. Serpico, CERN & CNRS LAPTH Annecy: Production of Cosmic Rays from Astrophysical Sources

Parallel Session Organizers:

M. Cirelli, CNRS IPhT Saclay & CERN and A. Ibarra, TUM Munich: Production of Cosmic Rays from Exotic Matter
F. Donato, INFN & Univ. of Torino: Production and Propagation of Matter in the Galaxy
S.Giani, CERN and C. Leroy, University of Montreal: Poster Session
K.Kudela, Slovak Academy of Sciences, Kosice and M. S. Potgieter, North-West University, Potchefstroom: Sun, Heliosphere and Cosmic Rays
K.Kudela, Slovak Academy of Sciences. Kosice and L. Lazutin, Moscow State University: Energetic Particles in the Magnetosphere and Atmosphere of the Earth
J. Pinfold, University of Alberta: Experimental (and Future Experimental) Observations of Cosmic Rays
J. Pinfold, University of Alberta: Double Beta Decay and Dark Matter Search for Astroparticle Physics
J. Pinfold, University of Alberta and R. Ruchti, University of Notre Dame: Broader Impacts Activities in Cosmic Ray Science
S. Sarkar, Oxford University and P. Serpico, CERN & CNRS LAPTH Annecy: Production of Cosmic Rays from Astrophysical Sources

The Article Committee

has been set to follow the article submission, review and publication in the Conference Proceedings, additional scientists may also be appointed or consulted

S.Giani, CERN

C. Leroy, University of Montreal

P.-G. Rancoita, INFN Milano-Bicocca

To be noted:

accepted and pending-for-corrections papers will be available on line at the website of the conference (http://villaolmo.mib.infn.it/ICATPP_CR_2010/). Participants can contact the Article Committee members or the conference secretariat up to December 1 (2010) to follow the status of their submitted papers.

VILLA OLMO (COMO-ITALIA)

ICATPP Conferences

THURSDAY 7				
8.30 Opening: Chairman: C.Leroy Prod.of CR from Astroph.Source Ses.Org.: S.Sarkar and P.Serpico Chairm.: S.Sarkar Room: Salone 10.30				
10.30-11.00 Coffee break				
11.00 Prod.of CR from Exotic Matter Ses.Org.: M.Cirelli and A.Ibarra Chairm.: M.Cirelli Room: Salone 13.00				
13.00-14.30 Lunch				
14.30 (I) Prod.of CR from Astr.Sour. Ses.Org.: S.Sarkar& P.Serpico Chairm.: P.Serpico Room: Duca 16.00	14.30 (II) Prod.of CR from Exo. Ma Ses.Org.: M.Cirelli and A.Ibarr Chairm.: A:Ibarra Room: Sala Ovale 16.00	14.30 (IIIa) Exp. Obser.of CR Ses.Org.: J.Pinfold Chairm.: J.Pinfold Room: Salone 16.00	14.30 (IIIb) Fut.Exp. Obser.of CR Ses.Org.: J.Pinfold Chairm.: A.Hallin Room: SalaVolta 16.00	14.30 Presentation of Posters 16.00
16.00-16.30 Coffee break				
16.30 (I) Prod.of CR from Astr.Sour. Ses.Org.: S.Sarkar& P.Serpico Chairm.: P.Serpico Room: Duca 18.40	16.30 (II) Prod.of CR from Exo. Ma Ses.Org.: M.Cirelli and A.Ibarr Chairm.: A:Ibarra Room: Sala Ovale 18.40	16.30 (IIIa) Exp. Obser.of CR Ses.Org.: J.Pinfold Chairm.: J.Pinfold Room: Salone 18.40	16.10 (IV) Broader Impacts Act. Ses.Org.:J.Pinfold&dR.Ruch Chairm.: R.Ruchti Room: SalaVolta 18.50	16.30 Presentation of Posters 18.40
18.55 Adjourn				

Conference Programme

Thursday 7

plenary session: 8.30 - 13.00

Opening session: (Chairman: S. Giani, CERN)

room: Salone

8.30: P.G. Rancoita (INFN Milano-Bicocca): Conference opening

plenary session on Production of Cosmic Rays from Astrophysical Sources (Chairman: S. Sarkar, Oxford Univ.)
session organizer: S. Sarkar, Oxford Univ., and P. Serpico, CERN & CNRS LAPTH Annecy

P. Blasi (INAF, Firenze): Cosmic Ray Acceleration in Supernova Remnants

Abstract: I will review the most recent progress in our understanding of cosmic ray acceleration in supernova remnants, with special attention to the following topics: 1) theory of non linear diffusive shock acceleration and its observational signatures; 2) magnetic field amplification induced by cosmic ray streaming in the acceleration region and its importance for reaching the knee in the cosmic ray spectrum; 3) supernovae exploding in partially ionized media and independent signatures of efficient cosmic ray acceleration; 4) acceleration of heavy ions and end of the Galactic cosmic ray spectrum.

L. Sironi (Princeton): Pulsar wind Nebulae and Relativistic Shocks

Abstract: I will review the current understanding of Pulsar Wind Nebulae (PWNe), bubbles of synchrotron-emitting plasma created when the relativistic pulsar wind encounters the surrounding supernova ejecta. Recent progress in MHD axisymmetric models with a latitude-dependent energy flux has clarified the flow dynamics in the nebula, thus explaining the jet-torus morphology revealed by X-ray observations. Yet, the value of the magnetization in the nebula, as inferred from MHD models and broadband spectral modeling, is still hard to reconcile with the known physics of pulsar magnetospheres (the so-called "sigma problem"). The mechanism by which the synchrotron-emitting particles are accelerated at the relativistic shock that terminates the pulsar wind is also obscure. I will discuss how first-principles simulations of shocks using particle-in-cell codes can be used to constrain the wind structure and composition and the particle acceleration process that operates at the termination shock.

L. Stawarz (Japan Aerospace Exploration Agency - JAXA): Acceleration in Active Galactic Nuclei

Abstract: In my talk I will review the most recent observational results regarding multiwavelength emission of active galactic nuclei and their relativistic jets. Focusing predominantly on the X-ray and gamma-ray data, I will identify the most relevant radiative processes involved, and discuss the resulting constrains on the energy dissipation and particle acceleration processes at work. In particular, I will

address a role of shocks and magnetic turbulence in energizing jet particles mto ultrarelativistic energies. I will also critically re-examine theoretical models and observational evidences for active galactic nuclei being the sources of ultra-high energy cosmic rays.

10.30 - 11.00 coffee break

plenary session on Production of Cosmic Rays from Exotic Matter (Chairman: M. Cirelli, CNRS IPhT Saclay)
session organizer: M. Cirelli, CNRS IPhT Saclay & CERN, and A. Ibarra, TUN, Munich

P. Salati (LAPTH & Université de Savoie): Charged cosmic rays from Dark Matter

Abstract: The astronomical dark matter makes up a quarter of the universe and yet is not composed of ordinary atoms and electrons. The favorite candidate which may naturally explain the presence of large amounts of unseen material from the galactic to the cosmological scale is the WIMP, a neutral and massive particle with weak interactions. This review concentrates on the charged cosmic radiations which the astronomical dark matter would produce as it annihilates in the halo of the Milky Way. The recent confirmation by the PAMELA collaboration of a positron excess above 10 GeV has triggered a bubbling activity in this field of research. Spectral distortions in the antimatter signals at the Earth are indeed predicted in the presence of WIMPs. Interestingly, the dark matter candidates which can potentially lead to the PAMELA excess have quite unexpected properties. They are severely constrained by radio and gamma observations unless they are tightly packed inside unprobable or bizarre dark matter clumps. They also could be unstable with abnormally long lifetimes.

T. Bringmann (University of Hamburg): Gamma Rays from Dark Matter

Abstract: A leading hypothesis for the nature of the elusive dark matter are weakly interacting massive particles that were thermally produced in the early universe and that arise in many theories beyond the standard model of particle physics. The self-annihilation of these particles, in astrophysical regions of high dark matter density, provides a potential means of indirectly detecting dark matter through the resulting annihilation products which nicely complements direct and collider searches. Here, I review the case of gamma rays which are particularly promising in this respect: distinct and unambiguous spectral signatures would not only allow a clear discrimination from astrophysical backgrounds but also to extract important properties of the dark matter particles; the expected annihilation rates are, furthermore, sufficiently high so that powerful observational facilities like the Fermi Gamma-ray Space Telescope or upcoming large, ground-based imaging Cherenkov telescope arrays already can probe a considerable part of the underlying, e.g. supersymmetric, parameter space. Gamma ray signals from alternative dark matter candidates are also briefly discussed.

M. Reno (University of Iowa): Neutrinos from Dark Matter

Abstract: Dark matter annihilations or decays to neutrinos, or particles that decay to neutrinos, can lead to signals in underground and underwater detectors. Theoretical considerations for neutrino signals and backgrounds from accumulations in the Earth, the Sun and around the Galactic Center, as well as cosmic diffuse neutrino signals, are reviewed.

ICATPP Conferences

Thursday 7

parallel sessions: 14.30 - 18.45

room: Duca

parallel session I on Production of Cosmic Rays from Astrophysical Sources (Chairman: P. Serpico, CERN & CNRS LAPP-TH Annecy)

session organizer: S. Sarkar, Oxford Univ., and P. Serpico, CERN & CNRS LAPTH Annecy

J. Lavalle (Univ. Torino): Galactic electrons and positrons at the Earth: new estimate of the primary and secondary fluxes

Abstract: We present a novel estimate of the Galactic cosmic ray electron and positron fluxes at the Earth. For the primary component, we consider the contributions from supernova remnants and from pulsars in a self-consistent manner, treating the distant objects with a smooth spatial distribution, while using catalogs for all known sources located within 2 kpc from the Earth. Our propagation model includes a relativistic computation of the energy losses. We show that such a modeling can explain the current data very well, without overtuning the parameters. We finally discuss the theoretical uncertainties affecting these calculations and the perspectives to reduce them in the future.

M. Dormody (Univ. Santa Cruz, California): The contribution of Fermi Gamma ray pulsars to the local flux of cosmic ray electrons and positrons.

Abstract: We analyze the contribution of gamma-ray pulsars from the first Fermi-Large Area Telescope (LAT) catalogue to the local flux of cosmic-ray electrons and positrons (e+e?). We present new distance estimates for all Fermi gamma-ray pulsars and estimate the contribution of gamma-ray pulsars to the local e+e? flux, in the context of a simple model for the pulsar e+e? emission. We find that 10 of the Fermi pulsars potentially contribute significantly to the measured e+e? flux in the energy range between 100 GeV and 1 TeV. We argue that known radio pulsars fall in regions of parameter space where the e+e? contribution is predicted to be typically much smaller than from those regions where Fermi-LAT pulsars exist. However, we find that a few known radio pulsars that have not yet been detected by Fermi can also significantly contribute to the local e+e? flux if they are closer than 2 kpc, and if they have a characteristic age on the order of one mega-year.

P. Mertsch (Univ. Oxford): Additional electrons and positrons from supernova remnants

Abstract: We discuss the excesses in the cosmic ray lepton channels as recently measured by Fermi-LAT and PAMELA. Accounting for the production and subsequent acceleration of secondary electrons and positrons in old supernova remnants we predict an additional, harder component that becomes dominant at higher energies. The only remaining free parameter is fixed by the locally measured electron-positron flux and we predict the rise in the positron fraction. We also find encouraging prospects for neutrino fluxes detectable with kilometre scale telescopes like IceCube.

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I. Cernuda (CIEMAT, Madrid): Anisotropies in the Cosmic-ray electron spectrum: a way to discriminate between exotic and astrophysical sources?

Abstract: Over the last two years, the release of new data from Cosmic-ray (CR) experiments such as PAMELA,ATIC and Fermi, has brought a lot of excitement to the astroparticle physics community over the so called positron excess. Indeed these experiments have revealed a surprisingly large flux of high energy electrons and positrons that strongly suggest the existence of a new source of primary CR. A considerably effort has been devoted to explain this excess from already known astrophysical sources (pulsars,SNRs) and from exotic ones (Dark Matter (DM) annihilation), but not an absolute probe to discriminate between both scenarios has been found yet. In this work we propose the study CR electron anisotropies as a tool to sort the puzzle out. We address the problem of the electron anisotropy in a pulsar and a DM annihilation scenario and estimate the prospect that a small dipole anisotropy might be found by the Fermi observatory.

J. Pochon (Instituto de Astrofisica de Canarias): Pulsar electrons detection in AMS-02 experiment. Model status and discovery potential.

Abstract: The measurements of electrons from cosmic ray events have begun a new era a few years ago with high precision experiments like PAMELA and Fermi-LAT. In the last few years, the PAMELA satellite has confirmed the positron fraction excess above 10 GeV shown by previous experiments. Studying Fermi-LAT data, the electron flux seems to be steeper than expected. While these new measurements have not closed the debate, results from AMS-02 are expected to reach the accuracy needed to determine a full description of this excess and possibly give some evidence on the possible source. This anomalous flux can be described by pulsar electrons production, and this particular production could appear for appropriate propagation condition. This presentation will show AMS-02 sensitivity for different electrons production and propagation conditions.

16.00 - 16.30 coffee break

R. Walter (Univ. Geneva): Eta Carinae: a very large hadron collider

Abstract: Eta Carinae is the colliding wind binary with the largest mass loss rate in our Galaxy and the only one in which hard X-ray emission has been detected. Eta Carinae is therefore a primary candidate to search for particle acceleration by probing its gamma-ray emission. We used the first 21 months of Fermi/LAT data to extract gamma-ray (0.2-100 GeV) images, spectra and light-curves, then combined them with multi-wavelength observations to model the non-thermal spectral energy distribution. A bright gamma-ray source is detected at the position of eta Carinae. Its flux at a few 100 MeV corresponds very well to the extrapolation of the hard X-ray spectrum towards higher energies. The spectral energy distribution features two distinct components. The first one extends over the keV to GeV energy range, and features an exponential cutoff at ~ 1 GeV. It can be understood as inverse Compton scattering of ultraviolet photons by electrons accelerated up to gamma~1E4 in the colliding wind region. The second component is a hard gamma-ray tail detected above 20 GeV. It could be explained by pi0-decay of accelerated hadrons interacting with the dense stellar wind. The ratio between the fluxes of the pi0 and inverse Compton components is roughly as predicted by simulations of colliding wind binaries. This hard gamma-ray tail can only be understood if emitted close to the wind collision region. The energy transferred to the accelerated particles (~5% of the collision mechanical energy) is comparable to that of the thermal X-ray emission

D. Caprioli (INAF, Florence): Acceleration of nuclei in supernova remnants

Abstract: We investigate the theoretical and observational implications of the acceleration of protons and heavier nuclei in supernova remnants (SNRs). By adopting a semi-analytical technique we study the

non-linear physical relations among particle acceleration, magnetic field generation and shock dynamics. We show that it is possible to outline a self-consistent scenario accounting for both the multi-wavelength observations of single SNRs and for the spectrum of the Galactic cosmic rays measured at Earth as produced in this class of sources.

G. Morlino (INAF, Florence): Shock acceleration in partially neutral plasmas.

Abstract: We use the non-linear theory of diffusive shock acceleration to show how the Balmer lines detected from young SNRs, expanding into partially neutral plasmas, can be used to test how efficiently shocks produce cosmic rays (CRs). In particular we investigate the effect of charge-exchange process between protons and neutral hydrogen occurring ahead of the shock. Here the CR pressure accelerates the ionized component of the plasma and a relative velocity between protons and neutral hydrogen is established. On the other hand the charge-exchange process tends to equilibrate ions and neutrals resulting in the heating of both components. We show that even when the shock converts only a few per cent of the total bulk kinetic energy into CRs, the heating is efficient enough to produce a detectable broadening of the narrow Balmer lines emitted by the neutral hydrogen, which is indeed observed

C. Monte (INFN and Univ. Bari): : Observation of Intermediate Synchrotron Peaked blazars with the Fermi-LAT

Abstract: After the first year of scientific activity with the Large Area Telescope (LAT), the primary instrument onboard Fermi, a catalog of Active Galactic Nuclei has been published. The First LAT AGN Catalog (1LAC) includes 671 gamma-ray sources located at high Galactic latitudes, detected with a test statistic greater than 25 and associated statistically with 709 AGNs (due to some multiple associations). The multi-wavelength quasi-simultaneous Spectral Energy Distributions (SEDs) of these blazars typically show the two-bump signature attributed to synchrotron and inverse Compton emission. The study of the position of the first peak led to a new SED-based classification of blazars as Low Synchrotron Peaked (LSP), Intermediate Synchrotron Peaked (ISP) and High Synchrotron Peaked (HSP) blazars. A particular and interesting group of objects is composed of ISP blazars, i.e. sources for which the synchrotron emission peaks at intermediate frequencies (from 1014 Hz to 1015Hz). These objects are expected to have their SED high-energy peak centered on the Fermi-LAT band (from 20 MeV to 300 GeV). The brightest 1LAC ISP sources have been selected and they have been analyzed covering a period of 22 months of Fermi LAT gamma-ray data in order to investigate their spectral features and to characterize the temporal evolution of their gamma-ray spectra.

R. Tomas (Univ. Hamburg): TeV gamma-rays from UHECR interactions in AGN cores: Lessons from Centaurus A

Abstract: TeV gamma-rays have been observed from blazars as well as from radio galaxies like M87 and Cen A. In leptonic models, gamma-rays above the pair production threshold can escape from the ultra-relativistic jet, since large Lorentz factors reduce the background photon densities compared to those required for isotropic emission. Here we discuss an alternative scenario, where VHE photons are generated as secondaries from UHECR interaction in the AGN core. We show that TeV gamma-rays can escape from the core despite large IR and UV backgrounds. For the special case of Cen A, we study if the various existing observations from the far infra-red to the UHE range can be reconciled within this picture.

A. Taylor (Observatory of Geneva) Searching for Signatures of UHECR Nuclei

Abstract: Motivated by recent results from the Pierre Auger Observatory, that a significant fraction of ultra high energy cosmic rays (UHECR) are heavy nuclei, I investigate the constraints this places on secondary particle production within the source. The signatures of secondaries produced by UHECR en route in

extragalactic space are also addressed, and suggestions of how information about the their sources might be obtained are put forward.

R. Moharana (Department of physics ,Mumbai**):** Tracing Cosmic accelerators with Decaying Neutrons

Astract: Ultrahigh energy neutrons and pions are likely to be produced in particle interactions inside cosmic ray sources and subsequently decay to neutrinos and other secondary particles as [$n \rightarrow pe^{-}\bar \nu_e$] and [$\pi^{\pm} \rightarrow \mu^{\pm} \nu_{\mu}(\bar \nu_{\mu}), \mu^{\pm}\rightarrow e^{\pm} \bar\nu_{\mu}(\nu_{\mu}) \nu_e(\bar\nu_e)$] respectively. In igh magnetic fields of the cosmic acceleration sites, the ultrahighenergy- charged particles may lose energy significantly due to synchrotron radiation before decay. We show that for gamma-ray bursts in the internal shock model the flux of very high energy antineutrinos ($\bar \nu_e$) produced from decaying ultrahigh energy neutrons can be more than the total neutrino flux produced in pion decay depending on the values of their Lorentz factors, luminosities and variability times. This process can also be used for other cosmic acceleration sites with high magnetic fields to explore the importation of neutron decaychannel at very high energy.

room: Ovale

parallel session II on Production of Cosmic Rays from Exotic Matter (Chairman: A. Ibarra, TUN, Munich)
session organizer: M. Cirelli, CNRS IPhT Saclay & CERN, and A. Ibarra, TUN, Munich

K. Zurek (U. of Michigan, Ann Arbor): Alternative Dark Matter Models

Abstract: The most commonly studied candidate for the dark matter is the neutralino from the Minimal Supersymmetric Standard Model. However, recently there has been growing interesting in other types of dark matter candidates with different types of features that generate different types of astrophysical signatures. These include leptophilic dark matter, light hidden sector dark matter, dark matter with dark forces, and dark matter from the baryon asymmetry. We discuss some of these alternative candidates and their signatures.

A. Lionetto (Roma 2 Tor Vergata): Dark Matter Candidates from Anomalous U(1) Models

Abstract: We present a new dark matter candidate in the framework of anomalous U(1) models. In a suitable decoupling limit this candidate turns out to be a new fermionic particle dubbed Stuckelino whose fingerprint is a suppressed interaction with ordinary matter and gauge fields, at odd with respect usual WIMPs. We show how the relic density constraints can be fullfilled and we comment about the possibile cosmic ray signatures of this candidate.

D. Tran (TUM Munich): Gamma-Ray and Neutrino Signatures of Unstable Dark Matter

Abstract: We discuss complementary gamma-ray and neutrino tests of decaying dark matter interpretations of the anomalies observed in the flux of high-energy cosmic positrons and electrons. In particular, we examine the angular profile of gamma-ray emission due to dark matter decay both from prompt radiation and inverse Compton scattering and discuss the possibility of using searches for gamma-ray lines to constrain dark matter interpretations. We also analyze the capabilities of present and future neutrino observatories to detect or constrain the neutrino signatures that accompany leptonic dark matter decays.

C. Combet (U.of Leicester): CLUMPY: A public code for gamma-ray production from DM in the Galaxy

Abstract: We present a semi-analytic code to compute the gamma-ray flux from dark matter annihilation in the Galaxy. It includes the contribution from the dark matter substructures for a wide range of user-defined parameters (density profiles, concentrations, mass distributions, etc.). CLUMPY can be

used in two ways: i) to compute "generic" skymaps at any instrumental resolution, or ii) to calculate the signal from specific user-defined dwarf spheroidal galaxies (including substructures in the dSph). Emphasis will be put on the detectability of the classical dSphs by future Cherenkov detectors.

16.00 - 16.30 coffee break

C. Boehm (LAPTH Annecy & IPPP Durahm): How to constrain the dark matter mass using cosmic rays

Abstract: Annihilation and decay of dark matter particles produce cosmic rays that are expected to interact with the Inter Stellar Field Radiation in the galaxy. In this talk, I will show how one can use this property to exclude and constrain part of the dark matter mass range.

T. Delahaye (Autonoma Madrid): Cosmic rays and Dark Matter indirect detection

Abstract: Though no firm evidence of dark matter detection can be claimed for the recent data, it is possible nevertheless to derive some interresting constraints already. I will show how it is difficult to explain the positron data only from the point of view of dark matter and the most recent antiproton data start to be constraining for dark matter models. Eventually I will discuss how gamma rays can help us distinguish annihilating and decay dark matter.

Ch. Weniger (DESY, Hamburg): Gamma-ray anisotropies from decaying dark matter

Abstract: Many theoretically well-motivated models predict the decay of dark matter with lifetimes much longer than the age of the Universe. This can potentially lead to peculiar features in the observed cosmic-ray fluxes. In particular the gamma-ray channel, which carries directional information, is promising for dark matter searches, since it is sensitive to the underlying source distribution. We will discuss the peculiar dipole-like anisotropy of prompt gamma-ray radiation from dark matter decay inside our galaxy, as well as the angular power-spectrum of gamma-rays from dark matter decay outside of our galaxy. We will comment on the detectability of such anisotropies in present and future experiments.

L. Pieri (Università & INFN Padova): Galactic DM substructures and implications for indirect detection

Abstract: The Cold Dark Matter hierarchical scenario of structure formation implies the existence of a population of substructures inside a virialized halo whose amount may sum up to half the mass of the halo itself. In this talk we review the most recent modeling of such a population of substructures and we discuss its implication for indirect detection of cosmic rays and gamma-rays in our galaxy.

M. Kachelriess (Institutt for fysikk, NTNU, Trondheim, Norway): Superheavy dark matter

Abstract: I review the observable cosmic ray signatures of superheavy dark matter, the possibility of sizeable annihilation rates and particle physics candidates.

room: Salone

parallel session IIIa on Experimental Observations of Cosmic Rays (Chairman: J. Pinfold, University of Alberta)
session organizer: J. Pinfold, University of Alberta

V. Scalzotto (Univ. of Padoa): Status & Recent Results From MAGIC

Abstract: Imaging Air Cherenkov Telescopes (IACT) allow one to detect Cherenkov light from extended air

showers initiated by cosmic gamma-rays and charged cosmic particles. The MAGIC telescope is a new generation IACT located at La Palma, Canary Islands, Spain. Composed by two reflecting dishes with 17 m diameter each, MAGIC is equipped with the largest optical reflectors in the world, and it has the lowest threshold energy (25 GeV). MAGIC started operations in 2004 in the single-detector configuration, and in 2009 as a stereo detector. Since then, it has discovered several new sources and classes of sources, both galactic and extragalactic. Some highlights from the most recent results are presented.

C. Fruck (Max Planck, Munich): Atmospheric Evaluation with LIDAR for MAGIC

Abstract: We are operating a micro LIDAR system for lowering the influence of atmospheric conditions on the results of the 17m diameter MAGIC Imaging Atmospheric Cherenkov Telescope (IACT) for ground-based astrophysics by means of very high energy (VHE) gamma rays. The laser of our LIDAR operates at a pulse energy of ~5μJ at ca. 1kHz repetition rate for not disturbing the operation of the other nearby Telescopes on the European North Observatory at Roque de los Muchachos on Canary island of La Palma. Low light intensity of reflected from the atmosphere light requires a very sensitive light detector, capable of resolving and counting single photons. A high quantum efficiency (QE) Hybrid Photon Detector (HPD) with GaAsP photo cathode in the focus of a 60cm diameter mirror does this.

B. Degrange (LLR Ecole Polytechnique): Recent RESULTS FROM H.E.S.S.

Abstract: Since 2003, the H.E.S.S. array of 4 Cherenkov Telescopes, located in Namibia, has detected about 60 sources of very-high-energy gamma-rays from 100 GeV to about 30 TeV, both galactic and extragalactic. Recent H.E.S.S. results will be reviewed with an emphasis given to resolved galactic sources (e.g. the remnant of the supernova SN 1006), to new classes of objects (radio-galaxies, the starburst galaxy NGC 253) emitting in the TeV energy range, and to deeper variability studies on the blazar PKS 2155-304 giving some insight in the emission mechanisms at play, as well as providing new constraints on the Quantum Gravity energy scale. Finally, results from the observation of several dwarf spheroidal galaxies will be given, yielding upper limits on the velocity-weighted annihilation cross section of potential Dark Matter constituents.

Eun-Suk Seo (University of Maryland): Status and Recent Results from the CREAM Experiment

Abstract: The Cosmic Ray Energetics And Mass (CREAM) balloon-borne experiment has accumulated ~156 days of exposure during five successful flights over Antarctica. Energy measurements are made with a transition radiation detector and an ionization calorimeter. Charge measurements are made with timing scintillators, pixelated Si, and Cherenkov detectors to minimize the effect of backscattered particles. High energy cosmic-ray data were collected over a wide energy range from ~ 10^10 to ~ 10^15 eV at an average altitude of ~38.5 km, with ~3.9 g/cm^2 atmospheric overburden. The instrument performance, results from the ongoing data analysis, and their implications on cosmic-ray origin, acceleration and propagation will be discussed.

M. Brigida (INFN-Bari): Interaction of Cosmic Rays with the Solar System Bodies as seen by FERMI

Abstract: The Large Area Telescope (LAT) on board of Fermi Observatory is performing an all-sky survey with unprecedented sensitivity and angular resolution in the energy range from 20 MeV to >300 GeV. Fermi has detected high-energy gamma rays from the Moon and Sun since the start of the mission.

This emission is produced by interactions of Galactic cosmic rays with the surface of these objects: by nucleons with the solar and lunar surface, and electrons with solar photons in the heliosphere.The heliospheric emission is produced by inverse-Compton scattering and is predicted to be very extended. Both emissions depend on the level of solar activity, affecting solar modulation of cosmic rays. The solar emission provides a unique probe of cosmic-ray propagation into the inner heliophere. Similarly, gamma ray emission can be produced by interactions with asteroids and planets. Since at minimum of the solar activity Galactic cosmic rays have their maximum flux, we expect the gamma-ray emission to be brightest at this time. Here we present the Solar System bodies analysis using 2 years of Fermi data, showing the status of the search, the fluxes and the spectra obtained for the Moon and quiet Sun emission and comparison with theoretical models.

16.10 - 16.20 coffee break

S. Haino (INFN Perugia): The AMS-02 Si-Tracker

Abstract: The Alpha Magnetic Spectrometer is a large acceptance cosmic-ray detector (0.5 m2 sr) designed to operate at an altitude of 400 km on the International Space Station. The AMS-02 silicon tracker contains 2312 silicon microstrip sensors (total active area 6.5m2). The performance of the tracker and the momentum resolution of the spectrometer evaluated with the CERN proton beam test are reported.

N. Tomassetti (INFN Perugia): Light nuclei and isotope abundance in cosmic rays. Results from AMS-01

Abstract: Observations of the chemical and isotopic composition of light cosmic-ray nuclei can be used to constrain the propagation models. Nearly 200,000 light nuclei (Z>2) have been observed by AMS-01 during the 10-day flight STS-91 in June 1998. Using these data, we have measured Li, Be, B and C in the kinetic energy range 0.35 - 45 GeV/nucleon. In this paper, our charge and isotopic composition results are presented and discussed.

V. G. Sinitsyna (Lebedev Physical Institute, Moscow): TeV gamma-rays from NGC 1275 detected in 15 year observation of SHALON telescopeVera

Abstract: In 1996 year a new metagalactic source was detected by SHALON at TeV energies. This object was identified with Seyfert galaxy NGC1275; its image is presented. The maxima of the TeV gamma-ray, X-ray and radio emission coincide with the active nucleus of NGC 1275. But, the X-ray and TeV emission disappears almost completely in the vicinity of the radio lobes. The correlation TeV with X-ray emitting regions was found. The integral gamma-ray flux of NGC1275 is found to be $(0.78\pm0.13)\times10^{-12}cm^{-2}s^{-1}$ at energies of > 0.8 TeV. Its energy spectrum from 0.8 to 40 TeV can be approximated by the power law with index $k=-2.25\pm0.10$. The NGC1275 has been also observed with the Tibet Array (5TeV) and then with Veritas telescope at energies about 300 GeV at 2009. The recent detection by the Fermi LAT of gamma-rays from the NGC1275 makes the observation of the energy $E > 100$ GeV part of its broadband spectrum particularly interesting.

V. Y. Sinitsyna (Lebedev Physical Institute, Moscow): Constraints on Extragalactic Background Light form distant quasars 3c454.3 (z = 0.859) and 1739+522(z = 1.375) detected by SHALON

Abstract: Extragalactic diffuse background radiation blocks the propagation of TeV gamma-ray over large distances (z>0.1) by producing e^+e^- pairs. As a result, primary spectrum of gamma-source is changed, depending on spectrum of background light. So, a hard spectra of Active Galactic Nuclei with high red shifts of 0.03 ? 1.8 allow to determine an absorption by Extragalactic Background Light and thus spectrum of EBL. The redshifts of SHALON very high energy gamma-ray sources range from z=0.0183 to z=1.375. Among them bright enough AGNs of BLLac type: Mkn421 (z=0.031),

Mkn501 (z=0.034) and FSRQ type: 3c454.3 (z=0.895), 1739+522 (z=1.375) those spectra are resolved in the TeV energy band from 1 to ~20-30 TeV. Spectral energy distributions and images of distant AGNi are presented. Spectral energy distribution of EBL constrained from observations of Mkn421, Mkn501, 3c454.3 and 1739+522 together with models and measurements are presented.

S. Borisov (Lebedev Physical Institute, Moscow):: Gamma-ray activity of Cygnus X-3 at energy range of 1-> 100TeV during 15 year observations of SHALON

Abstract: Cyg X-3 galactic binary system has been regularly observed since a 1995 by SHALON telescope. The energy spectrum of Cyg X-3 at 0.8 - 100 TeV is obtained and the average integral flux is $F(E_O>0.8 TeV)=(6.8\pm 0.7)\times10^{-13}cm^{-2}s^{-1}$. The binary Cyg X-3 came to period of flaring activity at radio-and X-ray energies in 2006. In May and July 2006 the significant increase of Cyg X-3 flux have detected with SHALON at TeV energy. This intensity increase was also observed by Crimea Observatory. Earlier, in 1997 and 2003 a comparable increase of the flux over the average value was also observed. In observations of SHALON telescope the formation of jets (like jet of active galactic nuclei) during the activity periods have been found. The last significant increase of very high energy gamma-quantum flux have detected in May 2009, which is correlated with flaring activity at lower energy range of X-ray and at observations of Fermi LAT.

T. Yuldashbaev (Phys. Tech. Inst. of AS., Tashkent): A study of the electron-photon families initiated by the primary gamma

radiation at the energies above 300 Tev

Abstract: To study of the diffuse ultra high energy gamma radiation the X-ray emulsion chamber (XREC) experimental data are used. It is worked out the different selection criteria of the electron-photon families initiated by the primary gamma quanta. The fraction of such families between events registered by XREC Pamir experiment and energy spectra slop of the primary gamma radiation are estimated.

room: Volta

parallel session IIIb on Future Experimental Observations of Cosmic Rays (Chairman: A. Halln, Univ. od Alberta)

session organizer: J. Pinfold, University of Alberta

W. Springer (University of Utah): Status of the High Altitude Water Cerenkov (HAWC) Gamma Ray Observatory

Abstract: The High Altitude Water Cerenkov (HAWC) gamma ray observatory will be a high duty cycle, wide field of view gamma ray observatory sensitive to gamma-rays in the energy range from below approximately 100 GeV to above 100 TeV. HAWC will observe the extensive air showers initiated by gamma-rays using a water-Cerenkov technology developed by the Milagro experiment. The detector has been optimized for sensitivity to gamma-rays with good rejection of the cosmic-ray background. Construction of the HAWC observatory located at an elevation of approximately 4100 m on Sierra Negra mountain in Mexico began in June 2010. A discussion of the detector design, science capabilities as well as the current status of the experiment will be presented.

A. Santangelo (Tuebingen): Space based observations of UHE cosmic particles; the JEM-EUSO mission.

Abstract: In this talk we focus on the Extreme Universe Space Observatory onboard the Japanese Experiment Module of the International Space Station (JEM-EUSO). Designed to observe about 1,000 events above

7x10^19 eV, JEM-EUSO will also be capable of observing and discriminating UHE neutrinos and photons. After briefly reviewing the science case behind the space- based exploration of the ultra high-energy universe, we discuss the detailed scientific requirements and the technological aspects of the mission. We then conclude presenting the expected performances of JEM-EUSO and their potential impact on the field of UHE studies.

P. Klimov (Moscow State University): Status of UHE CR orbital fluorescence detector TUS.

Abstract: The pioneer space fluorescence UHECR detector TUS, is preparing in Russia in collaboration with Korea, Japan and Mexico. It consists of segmented Fresnel-type mirror-concentrator (area 1.86 sq.m., focal distance 1.5 m) and photo receiver(256 pixels - PMT R1463). Total FOV of detector is 9x9 degrees. Developed electronics allow events measurements in various time scales, and provide PMT gain control to operate with any atmosphere UV background. Night atmosphere radiation depends mainly on moon phase and atmosphere airglow and was studied in "Tatiana-1" and "Tatiana-2" experiments. The electronics of TUS were tested in space conditions during these experiments. Recently, detector TUS was included into "Mikhailo Lomonosov" satellite scientific payload. This satellite should be launched at the end of 2011. The present status of TUS experiment (Fresnel mirror and electronics status, results of their complex tests, triggering system, based on Tatiana-2 data and data analyses software development) are presented.

O. Shustova (Scobeltsyn Inst. of Nucl. Phys., Moscow): On a possibility of UHEEAS Cherenkov light registration by the TUS satellite-based detector

Abstract: At present new space experiments are in prepara-tion to study the UHECR by means of EAS fluore-scence registration. Besides fluorescence, shower particles produce Cherenkov photons propagating mainly along the shower direction. But if a shower travels above a reflective sur-face, a part of Cherenkov radiation goes up and can be detected by a satellite-based array. We consider a possibility of Cherenkov photons registration for the project TUS condition

V. Antonell (INFN-Milano): T2K and future neutrino experiments as probes to investigate elementary particle physics and astroparticle

Abstract: Since ever neutrino physics played a fundamental role in the development of the knowledge of astroparticle and elementary particle physics. Nowadays, beams of intensities never reached before can be used, not only to better understand the oscillation and mixing pattern, but also to perform medium and low energy tests of Standard Model and confirming the stability of the theory or indicating signals of new physics. This idea, studied by the authors with particular attention to the actual case of T2K experiment, is discussed together with the possibility of complementing these results with the ones coming from cosmic ray physics and other astroparticle sources.

16.00 - 16.10 coffee break

parallel session IV on Broader Impacts Activities in Cosmic Ray Science (Chairman: R.Ruchti, University of Notre Dame)

session organizers: J. Pinfold, University of Alberta, and R.Ruchti, University of Notre Dame

J. Pinfold (Univ. of Alberta): Young Researchers Focus on the Extreme Energy Universe.

Abstract: A new dimension to cosmic-ray research opened in 1998 in Alberta when the first node of a new kind of sparse very-large-area network of cosmic-ray detectors began to take data. The innovative aspect of the Alberta Large-area Time-coincidence Array (ALTA) is that it is deployed in high schools, involving school children in the excitement of fundamental research. Independently, in 2000 the Cosmic Ray Observatory Project (CROP), centred at the University of Nebraska, set up five schools with cosmic ray detectors. Around the same time the Washington Large-area Time-coincidence Array (WALTA) installed its first detectors. I shall describe the development of "educational cosmic

ray arrays" from 1998 and briefly discuss the physics issues that such arrays could address. Also, I will introduce the idea of using experimental cosmic ray physics as a means to involve developing countries in the global scientific culture. In conclusion Iwill attempt to elucidate future directions.

K. Smolek (IEAP, Czech Technical U. Prague) CZELTA: An Overview of the Czech Large Area Time Coincidence Array

Abstract: CZELTA (CZEch Large are Time coincidence Array) is the sparse network of stations for the detection of cosmic rays with energy more than 10^14 eV. The detector system covers large area in the Czech Republic and is related to the similar experiment ALTA in Canada. The network is designed to study of non-random component of cosmic rays over large distances. We present the design of the detection system, obtained results, and our outreach activities connected to the project.

C. Timmermans (NIKEF): HiSPARC and other Cosmic Ray Outreach activities in the Netherlands

Abstract: The study of cosmic rays is usually done with conceptually simple techniques. These techniques can be explained to high school students, who can even create simple cosmic ray detectors. By creating a high school air shower array, students learn to collaborate as if they were participating in a scientific endeavor. However, a high school array needs to be complemented with related activities in the classroom and outside in order to keep students and teachers involved. I will expand on the status of the HiSPARC high-school array, and other cosmic-ray related outreach activities in the Netherlands.

C. Williams (PH Department, Geneva): The Extreme Energy Events (EEE) project for Italian high schools

Abstract: The EEE (Extreme Energy Events) Project, conceived by its leader Antonino Zichichi, is an experiment to study very high-energetic air showers (EAS) through the detection of the shower's muon component using a network of tracking detectors, installed in Italian high schools. The single tracking telescope is composed of three large area (?2 m2) Multi-gap Resistive Plate Chambers (MRPCs). The data collected by the telescopes will be used for studies of air showers and also for the search of time correlations between sites which are far apart. The MRPCs are constructed by the students from the high schools. Details of the construction of the MRPCs and set up of the telescope at the high school will be given.

G. Snow (Univ. of Nebraska): Auger Observatory Education and Outreach and the Cosmic Ray Observatory Project in Nebraska, USA

Abstract: The scale and scope of the Pierre Auger Observatory offer significant opportunities for original outreach work. The Education and Outreach Task of the Observatory supports a wide range of activities that link schools and the public with Auger scientists and the science of cosmic rays, particle physics, and associated technologies. The presentation will focus on the impact in Mendoza Province, Argentina, as: the Visitor Center in Malargue that has hosted over 50,000 visitors since 2001, science fairs, courses for teachers, and extensive air shower data released to the public. Nebraska's high-school based Cosmic Ray Observatory Project (CROP) will also be described

.H. Takai (BNL) The MARIACHI Experiment

Abstract: The MARIACHI experiment has been designed as an authentic science experiment and realized by a group of mixed academic background. The experiment seeks the development of new technology for the detection of ultrahigh energy cosmic rays, forward scattering radar. The experiment also seeks to study the interplay between cosmic ray activity and parameters such as geomagnetic field, and lightning. The experiment is built primarily by undergraduate students, high school students, and high school teachers. The experiment has been successful in its scientific goals. A dedicated forward scattering radar is now being implemented at the Telescope Array facility in Utah. We will discuss the experiment's implementation, its future, and achievements both in science and education.

E. Giroletti (University of Pavia and INFN of Pavia):Study of the natural radioactivity influence on the ARGO-YBJ detector

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Abstract: ARGO-YBJ is an extensive air shower detector located at the Yangbajing Cosmic Ray Laboratory (4300 m a.s.l., 606 gr/cm2 atmospheric depth). It is made by a single layer of Resistive Plate Chambers (RPCs, total surface 6700 m2) organized into 153 units called ?clusters?(43m2 of surface). The minimum experiment energy threshold (about 1 GeV) is obtained counting all in the "scaler operation mode". For each cluster the signals generated by shower particles are put in coincidence in a narrow time window (150 ns) and measured by four independent scaler channels, giving the counting rates of ?1, ?2, ?3 and ?4 hits. The study of these counting rates has given unexpected results.During periods of the orders of some days, counting rates are not correlated with atmospheric pressure. Since this lack of correlation simultaneously appears all over the carpet, even if in different ways between the clusters, it is reasonable to suppose that the uncorrelation is caused by a real physical phenomena variable in time, too. Since some radon daughters are gamma emitters and time variability of indoor Rn gas is expected to be significative, Rn gas concentration in air is suspected to influence the carpet countings in scaler mode. For this purpose we made an extensive measurement campaign to establish the local natural radioactivity; the average Rn-222 gas concentration in air in the ARGO-YBJ building is more than 500 Bq/m3. Some times, Rn gas concentration is greater than 4000 Bq/m3 at the north side of the hall; we are suspecting it is entering inside the ARGO-YBJ building from this side. As well, we performed MC simulations to assess the Rn daughter contribution on carpet counting rates. The simulations, made with Fluka code, show that 500 Bq/m3 of Rn concentration with the equilibrium factor equal to 0.5, the countings on each cluster reach at least 350 Hz. This minimum value corresponds to more than 0,8% of the counting rate: enough to explain our bad correlation with the pressure. The preliminary results of our studies (still underway) are presented and discussed.

N. Hasebe (Waseda University): Gamma-Ray and Neutron Spectroscopy for Nuclear Selenology --- Recent Results by Kaguya Observation and Future Lunar Exploration ---

Abstract: GCRs constantly impinge the lunar surface and produce characteristic gamma-rays and neutrons as nuclear reactions products. The global measurement of the gamma rays together with radioactive decay lines provides a powerful method for remotely measuring the absolute chemical abundances of the lunar surface. Gamma-Ray Spectrometer (GRS) with a high energy resolution onboard Lunar polar orbiter, SELENE (Kaguya), measured many nuclear lines emitted from the lunar surface and globally determined the lunar elemental composition in the upper subsurface down to about 20-30 cm. Elemental maps such as natural radioactive elements and major elements were made by the GRS observation. Nuclear spectroscopy is found to be a powerful method for chemical analysis of the lunar surface material from orbit. Future nuclear instruments for lunar missions are also presented together with current observation and its new findings as for nuclear Selenology.

B. Parker (Langton Star Centre): CERN@school, linked up through the Grid - a cosmic ray network for schools

Abstract The CERN@school kit uses Timepix chips from the Medipix collaboration at CERN to take cosmic ray data in schools. We have eleven schools across Kent taking data each day which is then automatically uploaded to a server at the Langton Star Centre and made available to all participating schools via the CERN@school website. The pilot network is developing well with great enthusiasm shown by staff and students alike. We hope to extend this network. In early 2012 data will come from the Langton Ultimate Cosmic ray Intensity Detector, LUCID, which will fly on satellite TechDemoSat as a cosmic ray detector also using Timepix chips from the Medipix Collaboration at CERN. In preparation for the amount of data available then we are working with GridPP to develop more accessible methods to analyse the data.

S.A. Wotton (University of Cambridge):A Cosmic Ray Detector Array for Schools in the Cambridge Region

Abstract: High Energy Physics and Cosmology are two areas of research that have captured the imagination of the general public in recent years. By giving school students first-hand experience of building and

operating a particle detector and the analysis of the data we anticipate that they will gain a deeper insight into the many and diverse aspects of experimental particle physics. Cosmic rays provide a readily available source of high-energy particles and other projects have already exploited this in building arrays of cosmic ray detectors located in schools and linked together via the internet. We aim to extend this concept by creating our own network of detectors in our region with a particular emphasis on hands-on involvement by students in the partner schools. This talk outlines our plans towards the implementation of this project and our wider goals of integrating our local network with other projects nationally and internationally.

T. Jordan (University of Florida): QuarkNet Cosmic Ray e-Lab Project

Abstract: We describe the installation of cosmic ray muon detectors in high schools and universities. Students and teachers assemble and operate the scintillation-based detectors after attending workshops hosted by physicists at their local universities. The current version of the readout offers four analog PMT inputs, a four-channel time-to-digital converter, programmable trigger logic and local threshold time resolution of 1.25 ns. The detectors bind their local clocks to the GPS standard so that data across several, independent locations can agree to better to 80 ns accuracy. Users upload raw data from these detectors to a web-based electronic laboratory-an e-Lab. Users can inspect and analyze data from their own or other detectors. The e-Lab provides access to simple analysis routines as well as a facility for downloading raw or pre-processed data that users can analyze with their own routines. They can publish their findings in an on-line poster and keep track of their work in their e-Lab logbook. The QuarkNet[1] project has overseen the development, production and revision of several generations of the detector since 2001. There are currently more than 550 detectors in 18 countries.

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VILLA OLMO (COMO-ITALIA)

FRIDAY 8				
8.30 Prod.&Pop. of CR in Galaxy Ses.Org.: F.Donato Chairm.: F.Fonato Room: Salone 10.30				
10.30-11.00 Coffee break				
11.00 Exp. Observation of CR Ses.Org.: J.Pinfold Chairm.: J.Pinfold Room: Salone 13.00				
13.00-14.30 Lunch				
14.30 (V) Exp. Observation of CR Ses.Org.: J.Pinfold Chairm.: J.Pinfold Room: Salone 16.00	14.30 (VI) Prod.&Pop.of CR in Ga Ses.Org.: F.Donato Chairm.: F.Fonato Room: Sala Duca 16.00	14.30 (VII) E.Part.in Magnetosp.&At. Ses.Org.:K.Kudela&L.Lazutin Chairm.: F.Jansen Room: Sala Ovale 16.00	14.00 (VIII) D.Beta D&DM Ses.Org.: J.Pinfold Chairm.: H. Takai Room: SalaVolta 16.00	14.30 Poster Session 16.00
16.00-16.30 Coffee break				
16.30 (V) Exp. Observation of CR Ses.Org.: J.Pinfold Chairm.: J.Pinfold Room: Salone 18.10	16.30 (VI) Prod.&Pop.of CR in Ga Ses.Org.: F.Donato Chairm.: F.Fonato Room: Sala Duca 18.10	16.30 (IX) Sun, Heliosp. & CR Ses.Org.:K.Kudela&M.Potgieter Chairm.: M.Potgieter Room: Sala Ovale 18.10	16.20 (VIII) D.Beta D&DM Ses.Org.: J.Pinfold Chairm.: H. Takai Room: SalaVolta 18.10	16.20 Poster Session 18.10
18.10 Final Session Chairm.: S.Giani Room: Salone 18.45				
18.45 Adjourn				

Friday 8

plenary sessions: 8.30 - 13.00

8.30-10.30 plenary session on Production and Propagation of Matter in the Galaxy (Chairman: F. Donato, INFN and Univ. of Turin)

session organizer: F. Donato, INFN and Univ. of Turin

room: Salone

L. Drury (IAS, Dublin): How and when are cosmic rays accelerated in SNRs?

Abstract: This talk will discuss recent progress in understanding the acceleration of cosmic rays in supernova remnants and in particular the question of how and when the accelerated particles escape from the accelerator. This depends rather sensitively on the currently topical issue of magnetic field amplification in shocks and has interesting, and potentially detectable, implications for the cosmic ray composition.

D. Maurin (LPNHE): USINE: A new public cosmic ray propagation code

Abstract : In this talk, we present a new publicly available code for the propagation of Galactic cosmic rays. The main features of the code will be highlighted along with some recent results. The latter include the determination of CR transport parameters using a Markov Chain Monte Carlo analysis, constraints on the standard source parameters and antiproton/antideuteron standard fluxes.

A.Strong (MPE, Garching – Germany): The GALPROP cosmic-ray propagation code: recent developments and results

Abstract: I review the status of the well-known GALPROP code for cosmic-ray propagation and diffuse emissions production. Recent results using the code for interpretation of cosmic ray and gamma ray data will also be discussed.

M. Potgieter (CSP, North-West University South Africa): Cosmic Rays in a Dynamic Heliosphere

Abstract: The heliosphere influences what happens inside its boundaries on a variety of time-scales so that the relation between the dynamics of the heliosphere and solar activity has become increasing important. Galactic cosmic rays serve as excellent probes for this purpose. By studying cosmic rays a better understanding is gained about global heliospheric modulation and phenomena such as space weather and space climate. Significant progress is made in this field, stimulated by observations with the two Voyager spacecraft and by the Ulysses mission. Progress in this research field, in particular with numerical modeling, is presented.

10.30 - 11.00 coffee break

11.00-13.00 plenary session on Experimental Observations of Cosmic Rays (Chairman: J. Pinfold, University of Alberta)

session organizer: J. Pinfold, University of Alberta

room: Salone

R. Battiston (INFN and Univervisty, Perugia): Status of the AMS-02 experiment

Abstract: The AMS-02 experiment is a large magnetic spectrometer designed to search for traces of exotic forms of matters (dark-matter, antimatter, strangelets) in the cosmic rays. It will operate on the International

Space Station starting on early 2011, collecting and identifying more than 10^10 cosmic rays. In this talk we will discuss the status of the experiment being prepared for launch at the Kennedy Space Center and its physics potential to search for new forms of matter.

S. Ricciarini, (INFN Florence): Recent Results From the PAMELA Experiment

Abstract: Since July 2006 the PAMELA experiment on satellite is continuously collecting data on several cosmic ray species, in the energy range from tens of MeV to hundreds of GeV. Here results will be presented of the most recent and refined data analyses, in particular those involving observations of interest for indirect dark matter searches, and with a specific aim at illustrating how the various sources of systematic errors have been taken into account in the measurements.

A. Karelin (NRNU MePhl): High Energy Cosmic-Ray Proton and Helium Spectra

Abstract: The work is done within the framework of PAMELA experiment. The PAMELA is space experiment for study charged particles in the cosmic radiation that has been launched on June 15 2006 and has performed until now. This work is a descriptive high energy cosmic ray proton and helium flux determination (the energy more than 50 GeV) on based using sampling electromagnetic calorimeter. The applied method is based on a measurement of total deposited energy in calorimeter and usage of certain selection criteria of events connected with electromagnetic component of hadronic shower. The helium-proton separation was performed by scintillator detectors of Time of Flight system of PAMELA instrument. This method is indispensable to widen the measurable energy range and to receive additional information in PAMELA experiment. Also energy spectrum of protons and helium which has been measured with this method is presented.

E. Bonamente (INFN Perugia): Recent Results from the Fermi Large Area Space Telescope

Abstract: The Fermi Mission was launched in summer of 2008, carrying aboard the gamma-ray Large Area Telescope, an instrument with top performances in sensitivity, effective area and energy resolution in the range between 20 MeV and 300 GeV. Latest results obtained with first two years of data by the Fermi Collaboration are presented, providing an overview of current analyses on Active Galactic Nuclei (AGNs), diffuse gamma-ray emission, galactic sources, solar system sources, gamma-ray bursts (GRBs), Fermi catalog and Dark Matter searches.

J. Quinn (University College Dublin): Recent Results From VERITAS.

Abstract: VERITAS is an array of four imaging atmospheric Cherenkov telescopes, located in southern Arizona, for gamma-ray astronomy above 100 GeV. VERITAS has been fully operational since September 2007 but was reconfigured in 2009 through the relocation of a telescope to provide enhanced sensitivity. To date, VERITAS has detected in excess of 30 sources of TeV gamma rays including active galactic nuclei, shell-type supernova remnants, pulsar wind nebulae, a binary system, a starburst galaxy, and several unidentified sources. This talk will provide a status update on VERITAS and its science results, with emphasis on recent discoveries.

ICATPP Conferences

Friday 8

parallel sessions: 14.30 - 18.10 or 14.00 – 18.10

room: Salone

parallel session V on Experimental Observations of Cosmic Rays (Chairman: J. Pinfold, University of Alberta)

session organizers: J. Pinfold, University of Alberta

J. Bluemer (Karlsruhe Institute of Technology): The Pierre Auger Observatory: status, results and perspectives

Abstract: Earth is continuously hit by energetic particles from space. Of particular interest are those with ultra-high energy in the regime from 1 EeV to more than 100 EeV. They are almost certainly of extragalactic origin, but we still don't know their sources, the acceleration mechanism, particle mass, and propagation characteristics. The Pierre Auger Observatory is the world's largest ground-based cosmic ray detector featuring a 3000 square kilometer site in Mendoza/Argentina (completed in 2008) and a 20,000 square kilometer site in Colorado/USA (planned). The talk will review the status of the Auger Observatory, the recent results and the perspectives.

A. Haungs (KIT Campus North, Karlruhe): Measurements of high-energy cosmic rays from the knee to the ankle

Abstract: The detection of high-energy cosmic rays above a few hundred TeV is realized by the observation of extensive air-showers. By applying different detection techniques with ground-based observatories the spectrum and the elemental composition of high-energy cosmic rays is determined. The most distinct feature of the spectrum, the ?knee?, is thought to be the beginning of the end of the galactic origin of these particles. As the highest energies (above the ?ankle?) are most probably of extragalactic origin, between 10 PeV to 1 EeV one expects the transition of galactic to extragalactic origin. Whereas in the last decade many experiments have shown results on the knee and above the ankle, dedicated experiments to explore the transition region only recently went into operation or are going to be in operation. Recent experimental results, in particular from the KASCADE-Grande experiment, will be shown and their astrophysical implications discussed. In addition, perspectives of future experimental efforts for this energy range will be presented.

G. Thomson (University of Utah): Results from the Telescope Array Experiment

Abstract: The Telescope Array (TA) experiment is the largest cosmic ray experiment in the northern hemisphere. It has a surface detector (SD) consisting of 507 scintillation counters deployed in the Utah desert on a grid of 1.2 km spacing, and three fluorescence detector sites overlooking the SD. The experiment has been collecting data for two years. The first results on the spectrum, composition, and anisotropy of cosmic rays will be presented.

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16.00 - 16.30 coffee break

T. Sako (Nagoya): First results of LHCf; very forward particles at LHC collision

Abstract: LHCf is a dedicated experiment to measure very forward neutral particles at LHC collisions. LHCf successfully accumulated data at LHC collisions of 900GeV and 7TeV. Various hadron interaction models used in the cosmic-ray physics can be tested first time at this high energy. LHCf

measurements compared with MC prediction are presented.

A. Fanfani (INFN Bologna): Measurement of the Charge Ratio of Atmospheric Muons with the CMS Detector

Abstract: We present a measurement of the ratio of positive to negative muon fluxes from cosmic-ray interactions in the atmosphere, using data collected by the CMS detector both at ground level and in the underground experimental cavern at the CERN LHC. Muon were detected in the momentum range from 5 GeV/c to 1 TeV/c. The surface flux ratio is measured to be 1.2766 ± 0.0032 (stat.) ± 0.0032 (syst.), independent of the muon momentum, below 100 GeV/c. This is the most precise measurement to date. At higher momenta the data are consistent with an increase of the charge ratio, in agreement with cosmic-ray shower models and compatible with previous measurements by deep-underground experiments

T. Waldenmaier (DESY): Cosmic ray Detection with ICETOP-ICECUBE

Abstract: The IceCube neutrino telescope is currently under construction at the geographic South Pole. After completion in 2011 it will consist of 86 strings carrying 60 Digital Optical Modules (DOMs) each. The DOMs on each string are deployed at depths between 1450 m and 2450 m in the Antarctic ice, constituting an instrumented volume of 1 km^{3}. The IceTop air shower array is located at the ice surface and consists of 80 detector stations at the position of the regular IceCube strings. The instrumented area of 1 km^{2} and the nominal station spacing of 125 m make IceTop an efficient device for studying cosmic rays in the energy range between 1 PeV and 1 EeV. The evaluation of coincident events between IceTop and IceCube provides additional information on the high energy muon content in air showers which can be used to determine the cosmic ray composition and to search for the transition between galactic and extra-galactic cosmic rays. The paper summarizes the current status and the physics capabilities of the IceTop/IceCube detector.

P. Camarri (INFN and Univ. of Tor Vergata, Rome): Highlights from the ARGO-YBJ Experiment

Abstract The ARGO-YBJ experiment is an air-shower detector installed at high altitude (4300 m a.s.l.) at the Yangbajing Cosmic Ray Laboratory (Tibet, China). The detector is a full-coverage single layer of Resistive Plate Chambers (RPCs) operated in streamer mode, providing a single-hit time resolution less than 2 ns. The detector structure allows unprecedented imaging of the shower front (e.g. space-time distribution and thickness). The installation of the detector was completed in October 2007 and the experiment has been running uninterruptedly since then, collecting over 2×10^11 events generated by cosmic rays and gamma rays with lower energy threshold of a few hundreds of GeV, over a ~2 sr solid angle. The main research topics of the ARGO-YBJ experiment are the search for astronomical gamma-ray sources and cosmic-ray physics in the energy range from a few hundreds of GeV up to above 1 PeV. The main results obtained so far are presented, emphasizing the study of the TeV emission from the Crab Nebula and the Mrk 421 AGN, the search for antimatter in the primary cosmic radiation and the search for gamma-ray bursts with a ground-based detector.

P. Montini (Univ. of Roma3): The observation of the light component spectrum in the 5 - 250 TeV region by the ARGO-YBJ experiment

Abstract: The ARGO-YBJ experiment detects extensive air showers by means of a full coverage detector located at the YBJ International Cosmic Ray Observatory (4300 m a.s.l, Tibet, P.R. China). In this work the light component spectrum in the energy region between 5 - 250 TeV. The results are compared with data provided by the CREAM experiment in the same energy region. The ARGO-YBJ data are fully consistent with the CREAM data. This analysis in based on a Bayesian procedure.

I. De Mitri (INFN- Lecce): High Energy Cosmic Ray and Hadronic Interaction Studies with ARGO-YBJ

Abstract: Cosmic ray physics in the 1TeV-1PeV primary energy range is among the main scientific goals of the ARGO-YBJ experiment. The detector, located at 4300m a.s.l., is a full coverage Extensive Air Shower array consisting of a carpet of Resistive Plate Chambers of about 6000m2. In this short summary we will focus on the experimental results concerning the measurements of the primary cosmic ray energy spectrum and of the proton-air cross section, while other items will be covered in the talk. The light-component (i.e. H and He) energy spectrum has been measured in the 1-200 TeV energy range. The results suggest a flattening of the energy spectrum. The proton-air cross section has been measured at the same energies. The total proton-proton cross section has then been estimated at center of mass energies between 70 and 500 GeV, where no accelerator data are currently available

room: Duca

parallel session VI on Production and Propagation of Matter in the Galaxy (Chairman: F. Donato, INFN and Univ. of Turin)

session organizers: F. Donato, INFN and Univ. of Turin

M. Hanasz (Un. Torun, Poland): Cosmic-ray driven dynamo in galaxies

Abstract: I am going to present recent developments of local and global, galactic-scale numerical models, of the Cosmic-Ray driven dynamo, which was originally proposed by Parker (1992). We conduct a series of direct CR-MHD numerical simulations of the dynamics of interstellar medium, composed of gas, magnetic-field, and cosmic-ray components. We take into account cosmic rays, accelerated in randomly distributed supernova remnants, and assume that supernovae deposit small-scale, randomly oriented, dipolar magnetic-fields into the ISM. The amplification timescale of the large-scale magnetic field, resulting from the CR-driven dynamo, is comparable to the galactic rotation period. The process converts efficiently small-scale magnetic fields of SN-remnants into the galactic-scale magnetic fields. The resulting magnetic-field structure resembles the observed X-shaped magnetic fields in edge-on galaxies.

S. Gabici (APC, Paris): Gamma rays from molecular clouds and the propagation of cosmic rays in the Galaxy

Abstract: I will review the current status of the gamma ray observations of molecular clouds. I will show how these and future observations can be used to constrain the properties of the propagation of cosmic rays in the Galaxy.

A.Putze (Stochkolm University): A Markov Chain Monte Carlo technique for Galactic cosmic-ray physics

Abstract: We implemented a Markov Chain Monte Carlo technique to estimate the probability-density functions of the cosmic-ray transport and source parameters in a diffusion model. From the measurement of the B/C ratio and radioactive cosmic-ray clocks, we calculate their probability density functions, with a special emphasis on the halo size L of the Galaxy and the local underdense bubble of size r_h. The B/C analysis leads to a most probable diffusion slope delta=0.86 +/-0.04 for a diffusion model including convection and reacceleration. A combined fit on B/C and the isotopic ratios (10Be/9Be, 26Al/27Al, 36Cl/Cl) leads to L=8 +8/-7 kpc and r_h=120 +/-20 pc. This value for rh is consistent with direct measurements of the local interstallar medium. The size of the diffusive halo depends crucially on the value of the diffusion slope delta, and also on the presence/absence of the local underdensity damping effect on radioactive nuclei. Finally, we checked if primary nuclei can bring some new information on the transport parameters and/or if they are compatible with the constraints derived from B/C analysis. We also derive their source parameters to assess, e.g., the universality of the source spectra.

ICATPP Conferences

A.Strong (MPE, Garching – Germany): Gamma-rays from the interstellar medium and cosmic rays - newinsights from Fermi

Abstract: The Fermi Large Area Telescope provides an unprecedently sensitive view of the entire gamma-ray sky from 100 MeV to over 100 GeV. A large fraction of the gamma rays originate in interstellar space via cosmic-ray interactions, and hence provide an ideal basis for confronting ideas about cosmic-ray origin and propagation with observations. The broad energy coverage, energy resolution, high statistics and low background of Fermi-LAT contribute to the new quality of such studies. The interstellar emission is modelled with the GALPROP code. Comparisons are made using spectra in chosen regions and longitude, latitude profiles at chosen energies. First we compare the data with a model based on prior expections for cosmic-ray sources and propagation in the Galaxy, and direct measurements of cosmic rays. This is found to be fairly close to the observations but which underpredicts the emission in general. Therefore an improved model is sought, with some fitting to the Fermi-LAT data while remaining consistent with direct cosmic-ray observations; this model can reproduce most of the observed spectral and spatial features observed. The effect of varying the size of the cosmic-ray halo is also investigated. In addition the CO-to-H2 conversion factor and the cosmic-ray source distribution are determined. The contribution from unresolved point sources is briefly addressed. The inner Galaxy shows an excess at a few GeV relative to these cosmic-ray based models, probably due to undetected gamma-ray source populations. The cosmic-ray related luminosity of the Galaxy from radio to gamma rays is presented, and the energy budget discussed.

16.00 - 16.30 coffee break

P. Martin (MPE Garching): Cosmic-ray populations of nearby galaxies from Fermi/LAT observations

Abstract: Cosmic-rays produce high-energy gamma-rays by interacting with matter and photons as they propagate through the interstellar medium. The resulting galaxy-wide emission can provide insights into the physics of cosmic-ray acceleration and transport. The LAT gamma-ray telescope onboard the Fermi satellite has now opened the way for population studies, allowing to compare the diffuse gamma-ray emission from several different galaxies. Following the first detection of the Small Magellanic Cloud (SMC) in gamma-rays and the detailed study of the Large Magellanic (LMC) Cloud using Fermi/LAT, we report on observations of the neighbouring Andromeda (M31) and Triangulum (M33) galaxies. We compare the results obtained on all these local group galaxies and include in the work the starburst galaxies M82 and NGC253, already detected by Fermi/LAT, and predictions for the Milky Way gamma-ray luminosity from the GALPROP code. The dependence of the gamma-ray luminosity of these nearby galaxies on some of their large- scale properties provides constraints on the processes of cosmic-ray transport and prospects for the detection of other galaxies with Fermi.

R. Lineros (Torino University): Cosmic Rays of leptons from Pulsars and Supernova

Abstract: Recent observations of lepton cosmic rays, coming from the PAMELA and FERMI-LAT experiments, have pushed our understanding of the interstellar medium and cosmic rays sources to unprecedented levels. The imprint of Dark Matter on lepton cosmic rays is the most exciting explanation of both PAMELA's positron excess and FERMI's total flux of electrons. Alternatively, supernovae are astrophysical objects with the same potential to explain these observations. In this talk, we present an updated study of the astrophysical sources of lepton cosmic rays and the possible trace of a dark matter

signal on the positron excess and total flux of electrons.

D. Grasso (INFN Pisa): A consistent interpretation of recent cosmic ray nuclei and electron spectra

Abstract: We use the numerical cosmic ray propagation codes GALPROP and DRAGON to constrain cosmic ray propagation properties in the Galaxy, comparing with updated nuclear and antiproton data. Using the same codes we show that the electron and positron spectra recently measured by Fermi-LAT, HESS and PAMELA can be consistently interpreted if an electron + positron component, originating either from Galactic pulsars or Dark Matter annihilation decay, is added to a conventional one originating in particle acceleration in supernova remnants. The perspectives of Fermi-LAT and AMS-02 to identify the right scenario will shortly discussed.

M. Pato (IAP and Padova University): Propagation of galactic cosmic rays and the AMS-02 experiment

Abstract: A precise determination of cosmic ray spectra up to TeV energies and light isotope separation are crucial steps in understanding the origin and propagation of galactic cosmic rays. Using the expected capabilities of the upcoming Alpha Magnetic Spectrometer (AMS-02), we anticipate the measurements of B/C, ^{10}Be/^{9}Be and the proton flux. This projected data set, which represents a great improvement upon the current status of GeV-TeV cosmic ray data, is then used to constrain models of injection and propagation of cosmic rays in the Milky Way. Minimal or next-to-minimal setups turn out to be tightly constrained. Nevertheless, the precise AMS-02 anticipated measurements will not be sufficient to distinguish between models with different assumptions regarding the rigidity dependence of the diffusion coefficient, source distribution and abundances or stochasticity.

O. Strelnikova (Scobeltsyn Institute of Nuclear Physics; Moscow): Analysis of possibility of cosmic rays proton anisotropy phase and amplitude and electron spectra description at TeV-region within the bounds of the same set of sources

Abstract: The contributions of close sources registered in radio, x-ray and gamma emission in last experiments FERMI, Chandra, HESS to electron and positron spectra near the Earth and proton anisotropy are investigated in this paper. Also the possible contribution to lepton spectra of pulsar magnetospheres is evaluated. Unlike others we take into account the source distribution through the galactic disc, time dependence of accelerated electron spectra and at the same time we calculate the cosmic rays proton anisotropy. Since the proton anisotropy is a very source distribution and SNR spectra dependent value it restricts the choice of that parameters. We present the results of electron spectra and proton anisotropy calculations whichit the experimental results in TeV region very good.

room: Ovale

parallel session VII on Energetic Particles in the Magnetosphere and Atmosphere of the Earth (Chairma: F. Jansen, DLR, Bremen)

session organizers: K. Kudela, Slovak Academy of Sciences, and L. Lazutin, Moscow State University

B. Mailyan (Alikhanian National Lab., Armenia): High Energy Phenomena in the low Atmosphere Particle Fluxes from Thunderstorm Clouds.

Abstract. Thunderstorm and lightning are natural phenomena usual and enigmatic in the same time. Despite multiyear intensive research many questions, like high energy phenomena, are escaping from convincing experimental detection and theories and models are lacking to explain how lightning

works. The cosmic rays ionize enough of the atmosphere to start an electron-photon to initiate electron-photon avalanche in the atmosphere in presence of strong electrical fields. Measured fluxes of energetic particles, as well as broad band radio emission, can provide necessary information for the new theories of the physical processes involved in the thunderstorm and lightning. The Aragats Space Environment Center facilities are routinely measuring fluxes of neutral and charged secondary cosmic rays incident the earth's surface. In 2007-2009, during solar activity minimum, we detect simultaneously very large fluxes of electrons, gamma-quanta and neutrons correlated with thunderstorm activity. During the period of the count rate enhancements lasting tens of minutes, millions of additional particles were detected. The energy spectra of electrons and gamma-quanta are rapidly falling and vanish at approximately 40 MeV. Here we show that our measurements support the particle multiplication and acceleration mechanism operated in the low atmosphere during the thunderstorms.

P. Bobik (IEP SAS Kosice, Slovakia): The AMS-02 proton spectra and the Geomagnetic Field

Abstract: We evaluate a AMS-02 spectra for year 2011 using HelMod a software that reproduces the effect of Heliospheric Modulation for different periods and polarities. Once a Local Interstellar Spectrum (LIS) is given, we can obtain a modulated spectrum at Earth (1 AU) using the measured solar conditions (tilt angle apha, solar wind velocity V) and the extrapolated diffusion coefficients K0 (from Suspot numbers). This calculations provide a flux of primary (PCR) cosmic rays, protons, outside the geomagnetic field, that must be compared to the measured one at low Earth orbit (about 400 km altitude). A back-tracking procedure of simulated protons entering the AMS-02 spectrometer has provided the fraction of allowed (and hence, forbidden) trajectories of PCRs. Consequently, it has allowed the determination of the so-called Transmission Function (TF) which is able to describe the properties of the PCR transport from the Earth's magnetopause (i.e. the modulated primary spectrum at 1 AU) to the atmosphere and finally the fluxes of the PCRs in the 10 geomagnetic regions for AMS-02 observations

K. Kudela (IEP SAS Kosice, Slovakia): Energetic Particles in the Magnetosphere of Earth: selected results and problems

Abstract: Magnetosphere of the Earth is well known reservoire of the energetic particles. Radiation belt models succsesfully describe spatial, pitch-angle and energy distribution in undisturbed conditions. During the magnetospheric disturbances, especially during strong magnetic storms there are still many unsolved problems, concerning energetic auroral particles acceleration during substorms, relativistic electron acceleration and losses, solar proton trapping and acceleration in the inner magnetosphere. Recently energetic particle acceleration in the atmosphere was observed as well. We illustrate some events when the strong redistribution of energetic particles in the magnetosphere is observed. Selected results of such type, especially the experimental ones, as well as the problems remaining to be solved, are discussed in our review.

16.00 - 16.20 coffee break

parallel session IX on Sun, Heliosphere and Cosmic Rays (Chairman: M. S. Potgieter, North-West University, Potchefstroom)

session organizers: K. Kudela, Slovak Academy of Sciences, and M. S. Potgieter, North-West University, Potchefstroom

ICATPP Conferences

F. Jansen (DLR, Bremen, Germany): Cosmic Rays for Heliospheric Space Weather Storm Prediction.

Abstract:This talk will present the physics and astrophysics of heliospheric cosmic ray propagation related to space weather storm prediction. Especially related to the flux of solar, galactic cosmic radiation and coronal mass ejection arrival time at Earth will be discussed. Real time, past and current cosmic ray data will be presented from GMDN (Global Muon Detector Network) with telescopes in Europe, Australia, Brazil, Japan and Kuwait. In addition a space based telescope equipped with Medipix / Timepix sensors will be introduced. Moreover a space situational awareness satellite related to space weather forecast will be sketched.

J. Roberts (Center for Cosmlogy and Particle Physics, New York): PAMELA through a Magnetic Lense .

Abstract. The PAMELA satellite has observed an excess of positrons over electrons in the energy range 1-100 GeV that increases with energy. I propose that the excess is not due to a change in the local interstellar spectrum, but is due to heliospheric modulation. This is motivated from the known form of the heliospheric magnetic field and has the the clear prediction that the excess will disappear when we enter a period of solar maximum activity

V. Di Felice (Univ. of Rome Tor Vergata): Solar and heliospheric observations with the PAMELA space-borne experiment

Abstract: The satellite-borne experiment PAMELA has been designed to study charged particles in the cosmic radiation, with a particular focus on antiparticles for searching antimatter and signals of dark matter annihilation. The combination of a time-of-flight system, a silicon-microstrip magnetic spectrometer, a silicon-tungsten electromagnetic calorimeter, an anticoincidence system, a shower tail catcher scintillator and a neutron detector allow the identification of charged particles over a wide energy range. The quasi-polar orbit of the instrument, with an inclination of 70 degrees, makes the measure of low energy particles feasible. The solar energetic particle events of December 2006 and other phaenomena related to the solar activity and cosmic ray modulation have been studied..

S. Della Torre (INFN Milano-Bicocca): Electron and Positron solar modulation and prediction for AMS-02.

Abstract. The solar modulation, a combination of diffusion, convection, magnetic drift and energy loss inside the heliosphere is usually seen as a decrease in the Galactic cosmic rays (CR) flux at low energy (less than 10 GeV/nuc). A magnetic spectrometer in space allow to expand our knowledge from protons and ions to anti-particles such as anti-proton or positron. They undergo to the same processes of respective particles but with a different magnitude depending of the Solar magnetic field polarity. For electrons and positrons, due to their small masses, energy loss mechanisms as inverse compton, synchrotron, bremsstrahlung and ionization are no more negligible. We developed a MonteCarlo stochastic simulation with the aim to compare the solar modulation of particles and anti-particles in the same observation period. We were able to estimate the different behaviours associated to the charge dependent nature of the Helispheric modulation and we compared the simulated positron fraction with the same ratios measured by AMS-01 and Pamela. We also present the prevision for the AMS-02 experiment.

D. Grandi (INFN Milano-Bicocca): Proton and Antiproton modulation in the Heliosphere for different solar conditions and prediction for AMS-02 fluxes .

Abstract. Galactic Cosmic Rays (GCRs) are mainly protons confined by the galactic magnetic field to form a isotropic flux inside the galaxy. Before reaching the Earth orbit they enter the Heliosphere and undergo diffusion, convection, magnetic drift and adiabatic energy loss, resulting in a reduction of particles flux at low energy (below 10 GeV), called Solar modulation. We realized a quasi time-dependent 2D Stochastic Simulation of Solar Modulation that is able to reproduce CR spectra once known the Local Interstellar Spectrum (LIS). We were able to estimate the different behaviours associated to the polarity dependence of the Heliospheric modulation both for particles and

antiparticles. We show a good agreement with the antiproton/proton ratio measured by AMS-01, Pamel, HEAT, Caprice, BESS and we performed a prediction for the AMS02 Experiment.

R. Bucik (Max Planck Instit., Katlenburg-Lindau): STEREO Observations of the Energetic Heavy Ions during the Minimum of Solar Cycle 23

Abstract: In this report we present observations of the two STEREO s/c for the first three years of the mission. During this period corotating interaction regions (CIRs) were the main source of the energetic heavy ions at 1 AU. Thanks to the unique s/c orbit the two STEREO can sample CIRs twice at different heliolatitudes during periods which are shorter than one solar rotation allowing to disentangle spatial and temporal effects. We find that the occurrence of the strong CIR events was the most frequent at the beginning of the period. The inclination of the CIRs relative to the heliographic equator was quite high in the first stage of the mission and gradually flattened with time followed by decrease in the CIR activity. By examining the differences between measurements on the two STEREO s/c we discuss how the changes in the position of the s/c relative to the CIRs affect the energetic particle observations.

room: Volta

parallel session VIII Double Beta Decay and Dark Matter Search for Astroparticle Physics (ChairmanH. Takai, BNL)

session organizers: J. Pinfold, University of Alberta

A. Hallin (U. of Alberta): The SNOLAB underground laboratory, the SNO+ double beta decay experiment and the DEAP 3600 dark matter search

Abstract: I will report on the science at SNOLAB, and particularly the double beta decay and dark matter searches. SNO+ is a 800 Mg liquid scintillator experiment that uses the low background acrylic vessel, cavity, and phototube system from SNO. Neodymium and perhaps other double beta decay isotopes will be introduced into the active volume, and allow a sensitive search for neutrinoless double beta decay. DEAP-3600 consists of 3.6Mg of liquid argon, enclosed in a high purity acrylic vessel and viewed by 260 room temperature photomultiplier tubes. The ultimate sensitivities, design and status of the projects will be presented

D. Grant (U of Alberta): Status of the ICECUBE Deep-Core Detectors

Abstract: IceCube is a cubic kilometer neutrino telescope under construction at the South Pole, a successor to the first-generation AMANDA telescope designed to search for astrophysical neutrino sources. IceCube, currently 92% deployed and actively taking data, includes an infill array known as DeepCore, improving sensitivity to neutrinos at energies below 100 GeV. We will present the current status of the DeepCore detector including the state of first season's data analysis. Estimates of DeepCore's future sensitivity for dark matter searches and neutrino oscillations using atmospheric neutrinos detected will also be discussed.

E. Figueroa-Feliciano (MIT): Searching for Dark Matter with SuperCDMS

Abstract: The Cryogenic Dark Matter Search collaboration seeks to detect Weakly Interacting Massive Particle (WIMP) dark matter using germanium crystal targets instrumented with phonon and charge sensors and cooled to milliKelvin temperatures. The recently completed final data run of CDMS II experiment observed two events in the signal region; based on our background estimates the probability of observing two or more background events was 23%. Combining these data with all previous CDMS II data we set an upper limit on the WIMP-nucleon elastic-scattering spin-independent cross-section of 3.8x10^(-44) cm^2 for a WIMP mass of 70 GeV/c^2 at the 90%

confidence level. The first phase of our new SuperCDMS experiment, using improved, more massive detectors is currently taking calibration data. We will describe the SuperCDMS experiment and our

M.-C. Piro (Univ. of Montreal) : PICASSO : search for dark matter in the spin-dependent sector

Abstract: The PICASSO project is using superheated droplets of C4F10 for the direct detection of Dark Matter candidates in the spin-dependent WIMP interaction sector. The total setup includes 32 detectors installed in the SNOLAB underground laboratory at Sudbury. With recently discovered discrimination tools PICASSO was able to obtain competitive limits using a first set of two detectors. The analysis is presently extended to the full set of detectors. The status of the experiment, the ongoing analysis and future plans will be presented.

P. Belli (INFN - Roma Tor Vergata): Results from DAMA/LIBRA

Abstract: The results, obtained at the Gran Sasso National Laboratory of the I.N.F.N. by the former DAMA/NaI and by the present second generation DAMA/LIBRA (about 250 kg highly radiopure NaI(Tl)) set-ups exploiting the Dark Matter annual modulation signature, will be discussed. The confidence level for the observed effect is 8.9 sigma and the data satisfy all the many requirements of the signature; moreover, no systematic or side reaction able to account for the whole measured modulation amplitude and to simultaneously satisfy all the peculiarities of the signature is available. Implications and experimental perspectives will be addressed.plans toward a ton-scale dark matter search using this exciting technology.

16.00 - 16.20 coffee break

T. Banks (Berkeley): The CUORICINO and CUORE neutrinoless double beta decay experiments.

Abstract: CUORICINO and CUORE are cryogenic bolometer experiments designed to search for neutrinoless double beta decay in Te-130. Both experiments are carried out underground at the Gran Sasso National Laboratory, Italy, in order to achieve the extremely low backgrounds necessary for high-sensitivity searches of this kind. CUORICINO ran from 2003-2008 and served as a prototype for the upcoming CUORE detector, which will be 20 times larger. I will discuss CUORICINO and its recent final result, which has set the most stringent limit to date on neutrinoless double beta decay in Te-130, and I will describe the physics goals and status of CUORE, which is currently under construction.

F. Orio (INFN - Sezione di Roma): Status and Plans of the LUCIFER Experiment.

Abstract: Double Beta Neutrinoless decay studies are the only way to possibly give an answer to the neutrino mass nature, Dirac or Majorana. These experiments are extremely delicate and the greatest obstacle to improve their sensitivity is the background level that can be achieved. Lucifer is a project, financed by a ERC-AdG, that would like to build a demonstrator of a technique based on the double read-out (scintillation light+heat) of ZnSe crystals used as bolometers. The goal is to reach a background index lower than 0.001 counts/Kg/KeV/year. Along the way we would like to learn how practical is the enrichment of Se into 82Se, how efficient is the process of crystallization and how radiopure the crystals can be grown. In this talk we will discuss the properties of ZnSe crystals and sketch the layout of the project.

A. Kirillov (Nizhnii Novgorod, Inst. Appl. Math.): Point-like gamma ray sources as evidence for dark matter..

Abstract: We consider possible explanation of the unidentified cosmic gamma ray sources (UGS) detected by FERMI/LAT with the help of dark matter annihilation within its small-scale clumps distributed in Galaxy. It is admitted for annihilation cross section to dependon relative velocity so it can be enhanced on small velocities (what can be accounted for by new Coulomb-like interaction). Parameters of annihilation cross section and clumps, being suitable for our interpretation of UGS, are determined..

ICATPP Conferences

Y. Suvorov (INFN-LNGS): Recent results of Borexino: the evedance of the neutrino oscillations with the 7Be and 8B solar neutrinos and the anti-neutrino studies (observation of the geo-neutrino).

Abstract: The Borexino is an unsegmented large volume organic liquid scintillator detector located in the underground laboratory at Gran Sasso (LNGS, Italy) and was originally designed for a real-time measurement of the mono-energetic (0.862 MeV) 7Be solar neutrino flux via the reaction of the nu-e elastic scattering. After the measurement of the 7Be solar neutrino flux with the precision of 10% the measurement of the 8B solar neutrino flux with the lowest so far threshold (3 MeV) was performed as well. These two fluxes studied for the first time by the same detector offer unique possibility to test the current neutrino oscillation model (MSW-LMA) in both low energy region (with 7Be flux) dominated by the vacuum oscillations and the high energy region (with 8B flux) ruled by the matter effect. This study using the most recent, improved analysis of the 7Be (the precision was improved to 5%) as well as 8B solar neutrino fluxes is the main subjects of the presentation, the results will be released before this Conference. The Borexino detector, thanks to the outstanding levels of the intrinsic radioactivity, appeared to be extremely sensitive to the anti-neutrinos. The Borexino anti-neutrino spectrum for 482 live-time days has been analyzed, and two sources of anti-neutrinos were identified, namely reactors and the Earth. Geo-neutrinos, the anti-neutrinos produced in the decays of U and Th in the Earth interior, represent an important source of information about the unaccessible inner parts of the planet. The observation of the geo-neutrino signal in the Borexino detector will also be reported in this talk.

F. Schussler (CEA): Status and Recent Results of the ANTARES Experiment

Abstract: The ANTARES neutrino telescope located in the Mediterranean Sea has been fully installed in 2008. We review briefly the design and status of the ANTARES detector, the routine data taking and efforts to conduct multiwavelength observations. As examples for the ongoing physics studies, two recent analyses will be discussed in some detail. A search for an high energy excess over the atmospheric neutrino flux led to the worlds most significant limits on the diffuse astrophysical neutrino flux in the multi TeV to PeV range. Applying a robust reconstruction algorithm to the data taken during the construction phase of the experiment, an analysis searching for point-like excess in the neutrino sky distribution has been conducted.

Friday 8

plenary session: 18.10 - 18.45

Final session: (Chairman: S.Giani, CERN)

room: Salone

J. Pinfold (University of Alberta): Sinergy between Astroparticle and Collider Physics (and Conluding Remarks)

Abstract: Research into the fundamental nature of matter at the high energy frontier takes place in three main areas: accelerator-based particle physics, high energy astrophysics, and the cosmology of the early universe. As a consequence the study of astroparticle physics can have significant implications for collider physics at the LHC. Likewise, the LHC project provides the laboratory to perform measurements of great importance for cosmic ray astrophysics and cosmology. This paper reviews some of the important synergistic links between astroparticle and LHC physics.

ICATPP Conferences

POSTER SESSION from Wednesday (during registration time) up to Friday (Chairmen and Session Organizers: S. Giani, CERN and C. Leroy,Univ. of Montreal)

List of Accepted Posters

Posters are displayed from Wednesday up to Friday. On Thursday 8, authors will be present to illustrate their papers.

A. Alaverdian (P.N. Lebedev Physical Institute; Moscow): Galactic cosmic ray production in Tychos SNR and Geminga

Abstract: A nonlinear kinetic model of cosmic ray acceleration in supernova remnants is used for Tycho?s SNR. The expected π^o-decay gamma-ray flux from Tycho's SNR extends up to $>30TeV$, whereas the inverse Compton gamma-ray flux has a cutoff above a few TeV. Hence, the detection of gamma-rays at energies 10 - 80 TeV by SHALON provides an evidence of their hadronic origin. Thus, the shell-type SNRs should be detected at the TeV energy range in gamma-rays of predominantly, hadronic origin and the expected flux of gamma-quanta from π^o-decay $(2-5)\times10^{-13}erg/(cm^2s)$ extends up to 100TeV if the distance is within the range 3.1-3.3 kpc. The SHALON results for Geminga are presented. Its integral gamma-ray flux is found to be $(0.48\pm0.17)\times10^{-12}cm^{-2}s^{-1}$ at energies of $> 0.8TeV$. Within the range 0.8 -6TeV, the integral energy spectrum is well described by the power law $I(>E) E^{-0.58\pm0.11}$.

N. Benekos (CERN): ATLAS Muon Data Quality Status with First Collision and Cosmic Data

Abstract: The ATLAS Muon Spectrometer (MS) has been designed to provide standalone measurement of the muon momentum up to a few TeV with a relative precision better that 10% and to trigger on single muons with transverse momentum down to a few GeV. Looking towards first LHC collisions, the ATLAS MS detector has being commissioned using all types of physics data available: cosmic rays and events produced during a few days of LHC single beam operations. In addition to putting in place the trigger and data acquisition chains, commissioning of the full software chain is a main goal. This is interesting not only to ensure that the reconstruction, monitoring and simulation chains are ready to deal with LHC physics data, but also to understand the detector performance in view of achieving the physics requirements. We also describe how to reduce the cosmic background contamination in early collisions data.

A. Boldyrev (P.N. Lebedev Physical Institute, Moscow): VHE spectral energy distribution of Crab Nebula compared with the prediction of a synchrotron self-Compton emission model

Abstract: Crab Nebula has an extraordinary broad spectrum, attributed to synchrotron radiation of electrons with energies from GeV to PeV. This continuous spectrum appears to terminate near 10^8 eV and photons, produced by relativistic electrons and positrons via Inverse Compton, form a new component of spectrum in GeV TeV energy range. Crab Nebula has been regularly observed by high mountain SHALON telescope. The integral spectra, spectral energy distribution and detailed images at $E>0.8$TeV of Crab by SHALON are presented. Also, in order to find relation between TeV and X-ray emission and source characteristics, the combination of SHALON and Chandra images were analyzed. The TeV gamma-ray spectrum of Crab by SHALON is generated via Inverse Compton of soft, mainly optical, photons which are produced by relativistic electrons and positrons, in the nebula region around 1.5\' from the pulsar with specific average magnetic field of about 67nT.

I. Buesching (Theoretical Physics, Ruhr-University);Signatures of middle aged, nearby pulsars in the cosmic ray lepton spectrum

Abstract: Geminga and PSR B0656+14 are middle aged, nearby pulsars, with present spindown powers in the order of about 10^34 erg/sec. Their relative proximities and large spindown powers makes them prime candidates for astrophysical sources of cosmic ray leptons. We discuss the contribution of these particles to the locally observed cosmic ray electron and positron spectra. In particular, we investigate the possibility that the PAMELA results on the positron fraction and features in the local cosmic-ray lepton-spectrum, e.g. that reported by the ATIC collaboration, can be attributed to these pulsars.

A.Codino (INFN and Univ. of Perugia): Redundant failures of the dip model of the extragalactic of the cosmic radiation

Abstract: The proton flux and the chemical composition of the cosmic radiation measured, respectively, by the Kascade and Auger experiments entail radical changes in Cosmic Ray Physics. A large discrepancy emerges by comparing the proton flux predicted by the dip model and that measured by Kascade in the critical energy interval 5 x 10**16-10**17 eV. It is mentioned and substantiated that the proton flux measurements of the Kascade experiment are consistent with other pertinent empirical observations. It is shown that the chemical composition measured by Auger by two independent procedures, using the mean depth reached by cosmic nuclei in giant air cascades, is incompatible with that predicted by the dip model. A notable consequence suggested here based on the failures of the dip model is that the spectral index softening of the primary cosmic radiation above 6 x 10**19 eV observed by HiRes and Auger experiments, is not due to the extragalactic cosmological protons suffering energy losses in the intergalactic space via the reactions, p ? ? ?0 p , and ?+ n but to some physical phenomena occurring in the cosmic vicinity.

C. Consolandi (INFN, Milano-Bicocca) **:** Nuclear energy loss and displacement for low energy particles of the space radiation environment.

Abstract: In the space radiation environment instruments onboard of space stations are subject to the radiation damage. So far, we have studied the single scattering process in order to calculate the Non Ionizing Energy Loss (NIEL) induced by high energetic particles, in particular nuclei with energy above 20 MeV/nucleon. In this work, we have focused the attention on the low energy range of the space radiation environment where fluxes of solar energetic particles and trapped particles dominate. The differential scattering cross section – modified to calculate the nuclear energy loss of such particles - is presented and the screening effects are discussed.

M. Gervasi (INFN, Milano-Bicocca)**:** Proton modulation in the Heliosphere for different solar conditions and predictions for AMS-02

Abstract: Before reaching the Earth orbit Galactic Cosmic Rays enter the Heliosphere and undergo diffusion, convection, magnetic drift and adiabatic energy loss. The result is a reduction of the particle flux at energy below 10 GeV, called Solar modulation. We realized a quasi time-dependent 2D stochastic simulation of Solar Modulation that is able to reproduce CR spectra once the Local Interstellar Spectrum is known. We show a good agreement with the data taken by AMS-01, Caprice-94, and

BESS. Furthermore we made a prediction for the flux which will be measured by AMS-02 Experiment.

R.T. Konduru (J. NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD):A NOVEL PREDICTION FOR BIG BANG NUCLEOSYNTHESIS

Abstract: In this paper we introduced a new idea pertaining to the very first moments of our universe?s history. We assumed the universe prior to Planck time (i.e. at 0 seconds at absolute zero temperature) to possess the properties of superconductivity. We coined name for that hypothetical state of universe possessing the properties of superconductivity as ?OM?. OM is hypothetical universe with inner part occupied by chrageons and higher denser GSW, surrounded with fluxons. The interaction between chargeons and fluxons, that are quantum of electric and magnetic fluxes, might be main cause for the genesis of fermions and boson. Interactions in OM lead to the expansion of universe. Later enunciated how this interactions along with GSW leads to nucleosynthesis. This interaction is casual agent for big bang. The absolute zero temperature of hypothetical universe beyond which interactions between chargeon and fluxon occurs is called as ?Critical Absolute Temperature? [1](TAB). Genesis of universe occurs at interactions between first fluxon-fluxon or chargeon-chargeon or fluxon-chargeon in the absolute zero temperature stage. This prediction had best explained the symmetry breakdown and genesis of fermions.

M. Laloum (CNRS/ IN2P3 Paris, LPNHE): POISE AND EVOLUTION OF THE GALAXY : STRUCTURE , FLARES AND COSMIC RAYS

Abstract: Many essential paradoxes in the mechanical balance of the Galaxy are highlighted. Their outstanding relevance demands a coherent and likely explanation. We propose a unique and synthetic interpretation, including a cosmological theory of the origin of the observed cosmic rays, especially at the highest energies known. It involves MATTER-ANTIMATTER ANNIHILATION in the median plane of the Milky Way, as a source of “DARK MATTER”. Accordingly, we discuss the structure and balance of the Galaxy, seen as made of two parallel disks of matter versus antimatter dominance, and opposed by the repulsion of an annihilation gas, settled in the equator disk. The admitted suppression of antimatter in the Universe, just after the “Big-Bang”, is questioned. Accordingly, ULTRA-RELATIVISTIC THERMODYNAMICS of cosmic rays are settled. The rhythmic emissions of “Gamma-Ray Bursts” and other flares are easily explained. Many stringent tests tend to confirm this theory : pointedly, the now classical energy behaviour of the incident flux of energetic cosmic rays is easily derived as a power law, quite with expected exponents of -2.5 and –3, possibly (main dependence, including the first knee). Ultra-high energies, further, are easily attainable, with no necessary restriction of the “GZK” kind, for instance. Beyond 10^{20} eV, rather, a new break is still thus made feasible. Beyond CP invariance, T reversal is axiomatically discussed, as well as the very nature of time in Special Relativity.

B. Mailyan (Alikhanian National Lab., Armenia): Spectra of the Thunderstorm Correlated Electron and Gamma-Ray Measured at Aragats on September 19, 2009

Abstract: For the first time we present the electron and gamma ray energy spectra produced in the avalanche processes in the atmosphere during thunderstorms and detected by surface particle monitors. The huge flux of thunderstorm correlated particles was detected by the experimental facilities of Aragats Space Environmental Center (ASEC) at 19 September 2009. Using ASEC detectors with various energy thresholds, spectrum of thunderstorm correlated electrons was obtained. GEANT4 based detector response calculation of the Aragats Solar Neutron Telescope(ASNT) allows us to reconstruct gamma ray spectrum from the energy release spectra measured by ASNT each minute. We have also compared the September 19, 2009 event with smaller events

S. Maltezos (N.T.U.A., Athens):High-accuracy determination of Fabry-Perot effective mirror spacing for Very High Energy gamma rays atmospheric monitoring

Abstract: In the framework of the design of a High Spectral Resolution Lidar (HSRL) for the atmospheric monitoring in high-energy cosmic ray observatories, we will demonstrate the accurate experimental determination of the effective separation distance (nd) of the reflective surfaces of a Fabry-Perot etalon , with 0.5 cm spacer, using a non-invasive technique, according to our recent work. We used as a reference the much known spectral lines, 435.8328 and 404.6563 nm of a low-pressure Hg source. Furthermore we will outline some aspects of the HSRL design, were we intent to use, a slm Nd:YVO4 laser, amplified and tripled at 355nm, and two receiving channels (molecular and aerosol channel) with the use of two Fabry-Perot etalon with the appropriate mirror spacings in conjunction with CCDs or PMTs.

E. Memola (INFN, Milano-Bicocca): AMS-02 photon data reduction approach

Abstract: The Alpha Magnetic Spectrometer (AMS-02) is going to be launched next February 2011 from the Space Kennedy Center. It will be located by the Space Shuttle on the International Space Station and will have its same lifetime: 10 years or even more. The experiment will observe high energy gamma-ray photons from several Astrophysical sources. We consider here the AMS-02 single-photon-mode, i.e. gamma ray photons revealed by the ECAL through electromagnetic shower production. By means of Monte Carlo simulations and Test Beam data, we present a preliminary approach to the gamma-ray photon selection procedure and discuss the potentiality of the detector.

M. Pesce-Rollins(INFN-Pisa): In-flight measurement of the absolute energy scale of the Fermi Large Area Telescope

Abstract: The Large Area Telescope (LAT) is the main instrument on board of the Fermi Gamma-ray Space Telescope, launched on the 11th of June 2008. The LAT is a pair conversion telescope designed to survey the gamma-ray sky from 20 MeV to several hundreds of GeV. To perform an in-flight validation of the absolute energy scale of the detector it is necessary to find an astronomical source with a sharp spectral feature at a well known energy. A potential candidate is the geomagnetic cutoff in the observed cosmic ray electron plus positron spectrum in low Earth orbit. This feature is clearly visible in the spectrum measured by the Fermi LAT. With the aid of particle tracing code it is possible to numerically calculate the charged particle trajectories in the Earth's magnetic field and thus obtain reference values for the cutoff rigidity to compare with the values measured in flight. For the Fermi orbit, we can derive several calibration points between ~7 and ~15 GeV/c. In this poster, I present the result of this comparison and estimate the uncertainty on the absolute energy scale of the Fermi LAT.

V. Sola (INFN Torino)): Calibration of the CMS Electromagnetic Calorimeter with first LHC data

Abstract: The electromagnetic calorimeter (ECAL) of the CMS experiment is an homogeneous, hermetic detector

made of high granularity lead tungstate crystals. Its potential performances are outstanding in terms of energy resolution, dynamic range and noise level. However, the energy resolution depends crucially from the channel to channel intercalibration precision. Thus, intercalibrating ECAL in situ at the LHC to achieve the designed energy resolution approaching 0.5% for high energy unconverted photons is important to fully exploit the physics reach of the detector, particularly for the discovery of the Higgs boson in the two-photon decay channel. A detailed description of the strategies for in-situ calibration of the calorimeter in 2010 will be given, focusing on the crystal intercalibration using the phi symmetry and pizero methods. Results using first collision data will be presented.

M. Tacconi (INFN Milano-Bicocca): Energy Loss for electrons in the Heliosphere and Local Interstellar Spectrum for Solar Modulation.

Abstract. Galactic Cosmic Rays (GCR) entering the Heliosphere are affected by the solar modulation, a combination of diffusion, convection, magnetic drift and adiabatic energy loss usually resulting in decreasing of the particle flux for energies less than 10 GeV/nucleon. We have implememted a quasi time-dependent 2D Stochastic Simulation code describing these effects. For electrons, the energy losses in the Heliosphere - i.e., those due to inverse compton, ionization, synchrotron and bremsstrahlung, neglected for protons and ions – have to be accounted for. In our calculations, the inverse compton energy-loss is the dominant, but it is still a few percent of the adiabatic losses. We also re-evaluated the Local Interstellar Spectrum (LIS) of primary electrons by fitting electron data collected in the past years above 20 GeV. Finally, we compared our result with experimental data (AMS-01) and also made a prediction for AMS-02.

M. R. Tanhayi (Islamic Azad University, Teheran): Linear conformal gravity in de Sitter universe

Abstract: Recent astrophysical data indicate that our universe might currently be in a de Sitter (dS) phase. The importance of dS space has been primarily ignited by the study of the inflationary model of the universe and the quantum gravity. As we know Einstein?s theory of gravitation (with a non zero cosmological constant) can be interpreted as a theory of a metric field; that is, a symmetric tensor field of rank-2 on a fixed de Sitter bac ground. It has been shown the massless spin-2 Fierz-Pauli wave equation (or the linearized Einstein equation) is not conformally invariant. This result is contrary to what we used to expect for massless theories. In this paper we obtain conformally invariant wave equation for the massless spin-2 in the dS space. This study is motivated by the belief that conformal invariance may be the key to a future theory of quantum gravity.

A. Tartari (Univ. of Milano-Bicocca): On the detectability of cosmic ray electrons spectral features in the microwave/mm-wave range

Abstract: Recent measurements of cosmic ray electrons energy spectra suggest that above 10 GeV there may be deviations from a single power law spectrum. There are hints (ATIC) for a bump occurring between 100 GeV and 1TeV, meaning that there migth be more high energy electrons than expected. Wheter these electrons are produced locally in our Galaxy (e.g., leaking out from pulsars magnetospheres, or due to dark matter annihilation) or they are representatives of an homogeneous population pervading it, this is still matter of debate. We investigate how these two scenarios may have different observable manifestations in the radio/microwave/mm-wave domain, where corresponding deviations from a synchrotron power law could appear. We raise the question around the detectability of these possible radio spectral features, which may be interesting for a wide scientific community including astrophysicists and scientists working on foregrounds removal for CMB experiments.

F. Tavakoli (Islamic Azad University, Teheran): The effect of self-force on a freely falling massive charged particle in de Sitter universe

Abstract: Observations coming from the astrophysical data indicate that we live in a expanding universe whereits evolution is dominated by a small positive cosmological constant. Mathematically this model can be explained by the de Sitter space-time. In this work we study a freely falling massive charged particle

in de Sitter space-time. However due to the effect of the charge and mass the particle exceeds from its geodesic. In this paper we want to consider these effects on the geodesic motion.

O. Zaymidoroga (JINR Dubna, Russia). Observation the electroscalar radiation during the Sun eclipse.

Abstract. The electroscalar radiation registered during a solar eclipse has provided an insight into the mechanism of detecting and nature of acting of the electroscalar field on man,which is presenting a unique source of human energy.