Workshop on Indirect Dark Matter Searches

Report of Contributions

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

Indirect Dark Matter Searches with the MAGIC Telescopes

Thursday 16 June 2011 15:00 (12 minutes)

The Major Atmospheric Gamma-ray Imaging Cherenkov (MAGIC) Telescopes form a ground-based system of two, 17 m diameter Imaging Atmospheric Cherenkov Telescopes (IACT) located in the Canary island of La Palma. The first telescope, MAGIC-I has been operational since 2004, and it has already achieved the lowest energy threshold among the current generation of IACTs. In 2009 it was joined by MAGIC-II. The stereoscopic mode allows observations with significantly improved sensitivity, lower energy threshold and improved energy and angular resolutions.
The search for DM with MAGIC is pursued by collecting signatures of very-high energy (VHE) gamma-rays originating from the annihilation of hypothetical DM particles. The gamma-ray spectrum resulting from DM annihilation should bear distinctive features, correlated to the DM particle mass, which, in the case of WIMPs, is predicted to be exactly at VHE range and, therefore, detectable by IACTs . However, identification of these features is a challenge, since the potential DM signal usually remains invisible under the dominant gamma-radiation from conventional astrophysical objects. For this reason, we direct our search with MAGIC to the objects with large amounts of DM that, at the same time, are far enough from the Galactic plane so that the DM signal is clearer. Some of such sources observed by MAGIC include dwarf spheroidal galaxies and galaxy clusters.
Here we report and discuss recent results of the indirect DM searches performed with MAGIC, and also present prospects for the future stereoscopic observations.

Author: Ms ALEKSIC, Jelena (IFAE)

Presenter: Ms ALEKSIC, Jelena (IFAE)

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

The Fermi Gamma-Ray haze from Dark Matter annihilations and Anisotropic Diffusion

Thursday 16 June 2011 14:30 (12 minutes)

Recently using the gamma-ray data from Fermi-LAT, a diffuse component emission has been revealed towards the galactic center, and extending up to 50 degrees in latitude.
This component that has been denoted as the Fermmi haze, is generated via inverse Compton scattering
by the same electrons that due to synchrotron radiation are responsible for the WMAP haze.
The Fermi haze having an elongated in latitude morphology and a significantly harder spectrum compared to any other region in the sky suggests a population of electrons not accounted for by conventional astrophysical sources.
Anisotropic diffusion along ordered B-field lines towards the inner region of the Galaxy coupled with a prolate Dark halo can yield the required morphology in the case of annihilating Dark Matter, while still making reasonable assumptions about the necessary B-field profile.
Moreover the Dark Matter models assumed can simultaneously explain the WMAP haze and local CR excesses in electrons and positrons.

Authors: Dr DOBLER, Greg (KITP/UCSB); Dr CHOLIS, Ilias (SISSA)

Co-author: Prof. WEINER, Neal (NYU/IAS)

Presenter: Dr CHOLIS, Ilias (SISSA)

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

Dark matter annihilation in the Galaxy: gamma-rays from substructures and dwarf spheroidal galaxies

Tuesday 14 June 2011 14:45 (12 minutes)

The nature of dark matter still evades us. In this talk, I will focus on the gamma-ray flux from dark matter annihilation, which has been tagged as a promising channel for indirect detection. I will present the results of a recent study where we revisited the question of the detectability of such a signal in the classical dwarf spheroidal galaxies of the Milky Way. This work is based on a MCMC analysis of the kinematic data. I will conclude by providing a new ranking in terms of detectability of these objects for present and future gamma-ray observatories.

Author: Dr COMBET, Celine (University of Leicester)

Presenter: Dr COMBET, Celine (University of Leicester)

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

Discriminating the source of high-energy positrons with AMS-02

Wednesday 15 June 2011 14:45 (12 minutes)

We study the prospects for discriminating between the dark matter (DM) and pulsar origin of the PAMELA positron excess with the Alpha Magnetic Spectrometer AMS-02. We simulate the response of AMS-02 to positrons (and electrons) originating from DM annihilations, and determine the pulsar parameters (spin-down luminosity, distance and characteristic age) that produce a satisfactory fit to the mock AMS-02 data. It turns out that it is always possible to mimic a DM signal with pulsars. Although the fit in some cases requires values of spin-down luminosity and characteristic age different from those of known pulsars in the ATNF and Fermi-LAT catalogues, these catalogues are known to be incomplete, and therefore the pulsar interpretation can hardly be ruled out. We also show that if the positron excess is due to a single pulsar, it is always possible to find a DM candidate that provides a good fit to the mock AMS-02 data. The discrimination between the two scenarios will thus require a better knowledge of the underlying sources, or complementary data.

Author: PATO, Miguel (ITP Zurich / Univ Padova / IAP Paris)

Co-authors: BERTONE, Gianfranco (ITP Zurich / IAP Paris); LATTANZI, Massimiliano (Universita' di Roma "La Sapienza")

Presenter: PATO, Miguel (ITP Zurich / Univ Padova / IAP Paris)

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

The fine-scale structure of dark matter halos

Tuesday 14 June 2011 12:15 (35 minutes)

I will discuss the fine-scale structure expected in the dark matter distribution at the position of the Sun (and thus relevant for direct detection experiments) using numerical simulations with effective mass resolution exceeding that of previous simulations used to address this issue by more than 10 orders of magnitude. The local
distribution should be a superposition of a very large number (more than 10^14) of
streams, each with very low internal velocity dispersion. Half of all detections will
come from particles in streams which individually contribute less than one millionth of the local mass density. However, about one thousandth of the events should come from a single stream which might thus show up as an extremely narrow "spectral line" in axion
detection experiments.

Author: Prof. WHITE, Simon (Max Planck Institute for Astrophysics)

Presenter: Prof. WHITE, Simon (Max Planck Institute for Astrophysics)

Contribution ID: **8** Type: **not specified**

Indirect Search for Dark Matter with the ANTARES Neutrino Telescope

Tuesday 14 June 2011 15:15 (12 minutes)

The ANTARES Collaboration is operating the largest water Cherenkov neutrino telescope in the Northern hemisphere. The apparatus, completed in May 2008, comprises 12 detection lines and a multidisciplinary instrumentation line installed at a depth of about 2500 m in the Mediterranean Sea offshore from France.

The goals of ANTARES are, among others, the search for astrophysical neutrino point sources and for neutrinos produced in self-annihilation of Dark Matter particles. In that respect, the most promising sources of neutrino emission are the Sun and the Galactic Center where Dark Matter particles from the galactic halo are expected to accumulate. These particles should produce a clean signal much less affected by astrophysical uncertainties and/or backgrounds than for indirect detection with gamma rays.

Prior to its completion, ANTARES has been taking data for more than a year in an intermediate setup with a 5 and a 10 lines detector configuration.
First results on the search for Dark Matter annihilations in the Sun with the data recorded in 2007 and 2008 are presented, as well as sensitivity studies on Dark Matter searches with the full ANTARES detector and the future large undersea cubic-kilometer neutrino telescope studied by the KM3NeT consortium. A comparison with respect to predictions on neutrino fluxes from Dark Matter annihilations in the framework of CMSSM and UED models will be presented.

Author: Mr CHARIF, Ziad (CPPM)

Presenter: Mr CHARIF, Ziad (CPPM)

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

Indirect detection of dark matter with neutrinos

Thursday 16 June 2011 12:15 (35 minutes)

Dark matter is searched for in many different ways and neutrinos from the Sun, the Earth or the galactic centre can be a promising route. In this talk I will go through the predictions of neutrino fluxes from dark matter from these sources and compare with the recent experimental constraints. I will also compare with other ways to search for dark matter.

Author: Prof. EDSJÖ, Joakim (Department of Physics and the Oskar Klein Centre, Stockholm University)

Presenter: Prof. EDSJÖ, Joakim (Department of Physics and the Oskar Klein Centre, Stockholm University)

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

Constraining the Milky Way Dark Matter Density Profile with Gamma-Rays with Fermi-LAT

Tuesday 14 June 2011 15:00 (12 minutes)

We study the abilities of the Fermi-LAT instrument on board of the Fermi mission to simultaneously constrain the Milky Way dark matter density profile and some dark matter particle properties, as annihilation cross section, mass and branching ratio into dominant annihilation channels. A single dark matter density profile is commonly assumed to determine the capabilities of gamma-ray experiments to extract dark matter properties or to set limits on them. However, our knowledge of the Milky Way halo is far from perfect, and thus in general, the obtained results are too optimistic. Here, we study the effect these astrophysical uncertainties would have on the determination of dark matter particle properties and conversely, we show how gamma-ray searches could also be used to learn about the structure of the Milky Way halo, as a complementary tool to other type of observational data that study the gravitational effect caused by the presence of dark matter. In addition, we also show how these results would improve if external information on the annihilation cross section and on the local dark matter density were included and compare our results with the predictions from numerical simulations.

Author: Dr BERNAL, Nicolás (Uni Bonn)

Presenter: Dr BERNAL, Nicolás (Uni Bonn)

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

Hunting decaying gravitino dark matter with the Fermi LAT

Friday 17 June 2011 14:45 (12 minutes)

If dark matter particles are not perfectly stable, their decay products could be seen in the cosmic-ray fluxes. A natural candidate for decaying dark matter is the gravitino in R-parity violating scenarios. In the relevant GeV-TeV energy range, the Fermi Large Area Telescope (LAT) is now measuring cosmic gamma-ray fluxes with an unprecedented precision. We use the public gamma-ray data to search for signatures from gravitino dark matter: For gravitino masses below ~200 GeV, the most distinct feature is an intense gamma-ray line, which could show up in a spectral analysis of high latitude fluxes. For larger gravitino masses, nearby galaxy clusters are very promising targets. Our results allow us to put strong limits on the gravitino lifetime. These limits imply lower bounds on the decay length of next-to-lightest superparticles, which could be observed at the LHC in the future. Details on our data analysis as well as implications for the standard WIMP dark matter scenario will be discussed.

Authors: Dr WENIGER, Christoph (MPI for Physics, Munich); Dr VERTONGEN, Gilles (DESY, Hamburg); Mr HUANG, Xiaoyuan (MPI for Physics, Munich)

Presenter: Dr WENIGER, Christoph (MPI for Physics, Munich)

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

A Markov Chain Monte Carlo technique to sample transport and source parameters of Galactic cosmic rays

Wednesday 15 June 2011 14:30 (12 minutes)

We implemented a Markov Chain Monte Carlo (MCMC) technique within the USINE propagation package to estimate the probability-density functions for cosmic-ray transport and source parameters within an 1D 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. We also derive the mean, best-fit model parameters and 68% confidence intervals for the various parameters, as well as the envelopes of several elemental ratios. Additionally, we verify the compatibility of the primary fluxes with the transport parameters derived from the B/C analysis before deriving the source parameters (slope, abundance, and low-energy shape). Finally, we investigate the impact of the input ingredients of the propagation model on the best-fitting values of the transport parameters (e.g., the fragmentation cross sections) in order to estimate the importance of the systematic uncertainties. We conclude that the size of the diffusive halo depends on the presence/absence of the local underdensity damping effect on radioactive nuclei. Moreover, we find that models based on fitting B/C are compatible with primary fluxes. The different spectral indices obtained for the propagated primary fluxes up to a few TeV/n can be naturally ascribed to transport effects only, implying universality of elemental source spectra. Finally, we emphasise that the systematic uncertainties found for the transport parameters are larger than the statistical ones, rendering a phenomenological interpretation of the current data difficult.

Author: Dr PUTZE, Antje (The Oskar Klein Centre for Cosmoparticle Physics (Stockholm University))

Presenter: Dr PUTZE, Antje (The Oskar Klein Centre for Cosmoparticle Physics (Stockholm University))

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

Gamma-Ray Lines from Radiative Dark Matter Decay

Friday 17 June 2011 15:00 (12 minutes)

The decay of dark matter particles which are coupled predominantly to charged leptons has been proposed as a possible origin of excess high-energy positrons and electrons observed by cosmic-ray telescopes PAMELA and Fermi LAT. Even though the dark matter itself is electrically neutral, the tree-level decay of dark matter into charged lepton pairs will generically induce radiative two-body decays of dark matter at the quantum level. Using an effective theory of leptophilic dark matter decay, we calculate the rates of radiative two-body decays for scalar and fermionic dark matter particles. Due to the absence of astrophysical sources of monochromatic gamma rays, the observation of a line in the diffuse gamma-ray spectrum would constitute a strong indication of a particle physics origin of these photons. We estimate the intensity of the gamma-ray line that may be present in the energy range of a few TeV if the dark matter decay interpretation of the leptonic cosmic-ray anomalies is correct and comment on observational prospects of present and future Imaging Cherenkov Telescopes, in particular the CTA.

Author: Dr GARNY, Mathias (Technical University Munich)

Co-authors: IBARRA, Alejandro (Technical University Munich); WENIGER, Christoph (Max Planck Institute for Physics, Munich); TRAN, David (Technical University Munich)

Presenter: Dr GARNY, Mathias (Technical University Munich)

Contribution ID: **18** Type: **not specified**

Constraints from electroweak bremsstrahlung and prospects for gamma ray detection

Friday 17 June 2011 15:15 (12 minutes)

It is well known that the annihilation of Majorana dark matter particles into
light leptons can be significantly enhanced by electromagnetic bremsstrahlung processes, which give rise to potentially observable signal in gamma-rays.
Due to the gauge invariance, this mechanism inevitably leads to electroweak
bremsstrahlung processes, which in turn lead to the production of antiprotons even when the leading order hadronic annihilation channels are forbidden. We investigate the constraints on the electroweak bremsstrahlung processes from the present measurements of the antiproton-to-proton fraction and we discuss the prospects to observe a gamma-signal in view of the antiproton constraints.

Author: Mr VOGL, Stefan (Technische Universitaet Muenchen)

Co-author: Prof. IBARRA, Alejandro (Technische Universitaet Muenchen)

Presenter: Mr VOGL, Stefan (Technische Universitaet Muenchen)

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

Indirect Searches for Gravitino Dark Matter

Friday 17 June 2011 14:30 (12 minutes)

The gravitino in models with a small R-parity violation is a well-motivated dark matter candidate that is leading to a cosmological scenario consistent with big bang nucleosynthesis and thermal leptogenesis. Its lifetime is sufficiently long since its decays are suppressed by the Planck-scale as well as the small R-parity violating parameter.

We want to discuss the signals in different cosmic ray species coming from the decay of gravitino dark matter, namely gamma rays, positrons, antiprotons, antideuterons and neutrinos. Comparison to cosmic ray data can be used to constrain the parameters of the model and to predict fluxes for other cosmic ray channels.

Author: Mr GREFE, Michael (DESY)

Presenter: Mr GREFE, Michael (DESY)

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

Parameterspace scans considering VHE gamma observations

Thursday 16 June 2011 14:45 (12 minutes)

One possible indirect messenger for dark matter are VHE photons, which are produced secondary or rarely primary in dark matter self annihilation or decay processes. Since the spectrum of this radiation in general is strongly dependent on the dark matter model, generic assumptions generic DM spectra, though often used, are not optimal in assessing the question what the nature of dark matter is. Examples of often neglected features include internal bremsstrahlung and final state radiation which may produce larger photon fluxes for models with lower annihilation cross section. For this reason scans in the parameter space are very useful. In addition, statistical analysis ("fitting") of data from different experiments will be necessary due to the complexity of the signal (and background) parameter space. We present results of model scanning and global fitting using the program SuperBayes and considering H.E.S.S. observations on the galactic center, dwarf spherodial galaxies, and the galactic halo.

Author: Dr RIPKEN, Joachim (Stockholm university)

Co-authors: Dr CONRAD, Jan (Stockholm university); Dr PAT, Scott (McGill University)

Presenter: Dr RIPKEN, Joachim (Stockholm university)

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

Dark matter electron anisotropy: a universal upper limit

Wednesday 15 June 2011 15:00 (12 minutes)

Indirect searches of particle Dark Matter (DM) with high energy Cosmic Rays (CR) are affected by large uncertainties, coming both from the DM side, and from poor understanding of the astrophysical backgrounds. We show that, on the contrary, the DM intrinsic degree of anisotropy in the arrival directions of high energy CR electrons and positrons does not suffer from these unknowns. Furthermore, if contributions from possible local sources are neglected, the intrinsic DM anisotropy sets the maximum degree of total anisotropy. As a consequence, if some anisotropy larger than the DM upper bound is detected, its origin could not be ascribed to DM, and would constitute an unambiguous evidence for the presence of astrophysical local discrete sources of high energy electrons and positrons. The Fermi-LAT will be able to probe such scenarios in the next years.

Author: Dr BORRIELLO, Enrico (Università degli Studi di Napoli "Federico II")

Co-author: Dr MACCIONE, Luca (DESY)

Presenter: Dr BORRIELLO, Enrico (Università degli Studi di Napoli "Federico II")

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

Indirect detection as a probe of the spectrum of primordial perturbations on small scales

Tuesday 14 June 2011 14:30 (12 minutes)

Events like inflation and phase transitions in the Early Universe could have introduced large density perturbations on very small scales. Such power at large wave-numbers is not constrained by standard probes of the primordial power spectrum like the CMB; existing limits come only from primordial black holes (PBHs). Any additional probe of such small scales would be exceptionally useful in discriminating between e.g. different inflationary models. Moderate-amplitude perturbations can collapse shortly after equality to form ultracompact minihalos (UCMHs) of dark matter, in far greater abundances than PBHs. If dark matter self-annihilates, UCMHs become very promising targets for indirect detection. I will describe the fluxes one might expect from such objects, prospects for observing them with Fermi and Cherenkov telescopes, and demonstrate what limits their non-observation by Fermi places upon the primordial power spectrum.

Author: SCOTT, Pat (McGill University)

Co-authors: BRINGMANN, Torsten (Hamburg University); AKRAMI, Yashar (Oskar Klein Centre, Stockholm University)

Presenter: SCOTT, Pat (McGill University)

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

Constraints on supersymmetric models using antideuterons

Antideuterons are among the most promising Galactic cosmic-ray- related targets for dark-matter indirect detection, because their primary spectrum is flatter than the standard astrophysical component at low ki- netic energies (E < 2 − 3 GeV/n). We are performing a parameter scan in the supersymmetric (SUSY) parameter space using the SuperBayes pack- age in order to estimate the detection power of future experiments such as AMS-02 and GAPS. The primary antideuterons produced from pair annihilation of dark matter particles in the halo of our Galaxy is esti- mated by the latest DarkSusy package. For the calculation of the stan- dard astrophysical background signal, including secondary and tertiary antideuterons, the USINE propagation package is used. The latter deals with the propagation of Galactic cosmic-ray nuclei (all existing nuclei) and antinuclei (antiprotons and antideuterons) in various models (Leaky Box and diffusion models). Preliminary results will be presented.

Author: KARPENKA, Natallia

Co-authors: PUTZE, A.; EDSJÖ, J.; SCOTT, P.

Presenter: KARPENKA, Natallia

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

Multi-messenger and -wavelength approaches to dark matter searches

Thursday 16 June 2011 11:30 (35 minutes)

TBA

Author: ULLIO, Piero

Presenter: ULLIO, Piero

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

Antiprotons as dark matter probes

Wednesday 15 June 2011 12:15 (35 minutes)

Weakly interacting and massive particles (WIMP) have been suggested as plausible candidates to the astronomical dark matter (DM). Should these putative species exist, they would continuously annihilate within the Milky Way halo and yield rare antimatter particles such as antiprotons. The latter are already manufactured in the Galactic disc where high-energy cosmic ray protons and helium nuclei collide on the interstellar gas.

I will review how well we understand that astrophysical component which is the natural background to a DM antiproton signal. I will also present the current and near-future experimental situation. I will finally discuss what are the theoretical expectations for observing a distortion in the antiproton spectrum at the Earth should WIMPs float around, and what limits on their properties can already be drawn from the current measurements.

Author: SALATI, Pierre

Presenter: SALATI, Pierre

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

Warm dark matter

Tuesday 14 June 2011 09:30 (35 minutes)

If dark matter particles were relativistic deeply within the radiation-dominated epoch ("warm" dark matter), the formation of structures would be altered at scales below their "free-streaming horizon" as compared to the standard Lambda-CDM concordance model. Such modifications would results in the reduced abundance of structures at galactic scales and below. In this talk I will overview properties of warm dark matter candidates, their signatures and observational probes of warm dark matter paradigm.

Author: RUCHAYSKIY, Oleg

Presenter: RUCHAYSKIY, Oleg

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

The importance of radiative corrections to indirect dark matter searches

Friday 17 June 2011 11:30 (35 minutes)

External electroweak bremsstrahlung leads for dark matter (DM) masses much heavier than the weak scale to the break-down of perturbative unitarity, requiring a resummation of large log's similar to the case of QCD. More recently, it has been realised that internal electroweak bremsstrahlung can lift - analogously to the electromagnetic case - the helicity suppression of certain annihilation channels, thereby affecting strongly observable signatures used in indirect DM searches. I review the impact of theses processes on DM annihilation and their signatures.

Author: KACHELRIESS, Michael

Presenter: KACHELRIESS, Michael

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

Sommerfeld enhancement, spin effects and radiative corrections (TALK CANCELLED)

Friday 17 June 2011 09:30 (35 minutes)

We present a review of the Sommerfeld enhancement in the generic case of many channels and different spin configurations. We also present results for a relic density computation including the enhancement.
Finally we discuss the radiative corrections to the Sommerfeld effect.

Author: IENGO, Roberto

Presenter: IENGO, Roberto

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

Indirect detection of decaying dark matter

Friday 17 June 2011 10:05 (35 minutes)

Present evidence for dark matter in our Galaxy and in the Universe at large does not exclude the possibility that the dark matter particles could be unstable. If this is the case, their decays into positrons, antiprotons or gamma rays might occur at rate sufficiently large to allow indirect dark matter detection through an anomalous contribution to the high-energy cosmic-ray fluxes. In this talk we review the theoretical motivation to consider unstable dark matter particles and the experimental constraints on this scenario.

Author: IBARRA, Alejandro

Presenter: IBARRA, Alejandro

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

Fermi dark matter results

Thursday 16 June 2011 10:15 (35 minutes)

The Large Area Telescope on board the Fermi satellite has been operational for close to 3 years. A variety of results on searches for signal of Dark Matter annihilation or decay has been presented. I will in my talk review the most recent of these results, and attempt a comparison with searches presented by current Air Cherenkov Telescopes as well as predictions for the future facility Cherenkov Telescope Array (CTA).

Author: CONRAD, Jan

Presenter: CONRAD, Jan

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

Indirect detection of dark matter with gamma rays

Thursday 16 June 2011 09:30 (35 minutes)

The various problems and advantages of using gamma-rays for indirect dark matter will be discussed, including spectral and angular signatures from the galactic centre, dwarf spheroidal galaxies, galaxy clusters and larger structures. Complementarity between these targets will be discussed, as well as between different dark matter detection methods. The feasibility of a dedicated indirect detection experiment using gamma-rays will be briefly discussed.

Author: BERGSTRÖM, Lars

Presenter: BERGSTRÖM, Lars

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

Dark matter clumps (subhalos) and annihilation signal

Tuesday 14 June 2011 10:15 (35 minutes)

The review of analytic studies of DM-clump production, evolution and destruction is presented. In the standard scenario of adiabatic and Gaussian fluctuations the clump formation starts at MD epoch and proceeds in the hierarchical structures when a small clump belongs to a host clump, this host clump is submerged to bigger one etc. The formation of density profile $\rho(r) \propto r^{-\beta}$
with $\beta \approx 1.7{-}1.9$ is accompanied by the tidal
destruction of the clumps. Only a small fraction of clumps survive. Much attention is given to formation and size of the the core. The role of adiabatic protection of the core is discussed for the processes of clump destruction in the hierarchical structures and Milky Way. The minimal clump mass is provided by wiping off the fluctuations during and after kinetic decoupling and depends on elementary-particle model for DM particles. The minimal mass can vary in the wide range of values. The boost factor (amplification of annihilation signal) is discussed. It is concluded that within parameter uncertainties in the standard adiabatic scenario and especially in non-standard scenarios resulting in superdense clumps, the annihilation-signal amplification can be large.

Author: BEREZINSKY, Venya

Presenter: BEREZINSKY, Venya

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

Radiative corrections to dark matter annihilation (and the relic density)

Friday 17 June 2011 12:15 (35 minutes)

Calculating the relic density of dark matter and comparing to current cosmological data is a powerful tool to constrain the parameter space of new physics and to obtain complementary information with respect to collider and precision data. However, this calculation is affected by several uncertainties. On the particle physics side, this concerns the calculation of the annihilation cross-section, that governs the relic density. In public tools, however, it is implemented only at the tree-level.

After an introduction to the calculation of the relic density, I will review the recent progress that has been made concerning radiative corrections to the annihilation cross-section of the neutralino in the MSSM. I will in particular discuss strong and electroweak corrections and comment on technical details. I will then demonstrate their impact on the relic density and, in consequence, on the cosmologically favoured regions of parameter space. I will thus show that radiative corrections are necessary in this context in order to keep up with current and future cosmological measurements.

Author: Dr HERRMANN, Björn (DESY)

Presenter: Dr HERRMANN, Björn (DESY)

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

Phenomenology of U(1)_{L_μ- L_\tau} charged dark matter at PAMELA/FERMI and colliders

Wednesday 15 June 2011 15:15 (12 minutes)

Recent data on e^+/e^- and $\bar{p}$ cosmic rays suggest that dark matter annihilate into the standard model (SM) particles through new leptophilic interaction. In this talk, I consider a standard model extension with the gauged $U(1)_{L_\mu - L_\tau}$ group, with a new Dirac fermion charged under this U(1) as a dark matter. We study the muon $(g-2)_\mu$, thermal relic density of the cold dark matter, and the collider signatures of this model. $Z^{'}$ productions at the Tevatron or the LHC could be easily order of $O(1) - O(10^3)$ fb.

Author: Prof. KO, Pyungwon (Korea Inst for Advanced Study (KIAS))

Co-author: Dr BAEK, Seungwon (Korea University)

Presenter: Prof. KO, Pyungwon (Korea Inst for Advanced Study (KIAS))

Contribution ID: **44** Type: **not specified**

The dark matter distribution in galactic (sub)halos

Tuesday 14 June 2011 11:30 (35 minutes)

I will review the most recent results from supercomputer simulations that follow the assembly of dark matter haloes and baryons. I will also address the question of future research directions and if there is anything left that simulations can contribute to the areas of direct and indirect dark matter detection.

Author: Prof. MOORE, Ben (University of Zurich)

Presenter: Prof. MOORE, Ben (University of Zurich)

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

Cosmic-ray propagation with GALPROP

Wednesday 15 June 2011 10:15 (35 minutes)

Cosmic-ray origin and propagation can studied using a broad range of experimental data. These include direct measurements from balloons and satellites, gamma rays, synchrotron radiation, ionization in molecular clouds, and so on. It is important that a consistent framework be used for such studies, since all the data relate to the same Milky Way galaxy. Since the mid-1990s the GALPROP project has developed a numerical model for cosmic-ray propagation which endeavours to be as realistic as possible, using astronomical data for Galactic structure and predicting a wide range of relevant observables in a unified model. The numerical approach avoids the restrictions of analytical models. I will describe GALPROP including its history and motivation, and compare it with other approaches. Recent results, in particular from Fermi and on synchrotron radiation, will be presented. In the context of this conference, such models provide a solid physical basis for foreground predictions for indirect DM studies.

Author: Dr STRONG, Andy (MPE Garching)

Presenter: Dr STRONG, Andy (MPE Garching)

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

Positrons as dark matter probes

Wednesday 15 June 2011 11:30 (35 minutes)

Positrons in cosmic rays have been measured by the Pamela satellite and more recently by the Fermi-LAT instrument. Their ratio to electrons increases with energy, indicating the presence of a primary source in the Galaxy. We investigate the possibility that their source resides in Dark Matter particles and discuss the possible astrophysical sources and backgrounds.

Author: Dr DONATO, Fiorenza (Torino University)

Presenter: Dr DONATO, Fiorenza (Torino University)

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

Cosmic ray propagation with USINE

Wednesday 15 June 2011 09:30 (35 minutes)

In this talk, sample results obtained with the USINE code are presented,
focusing on the nuclear component of Galactic Cosmic Rays. We pay special attention to the determination of secondary-to-primary ratios, radioactive nuclei, primary species, and finally antinuclei. Simple toy models are used throughout the talk to illustrate the phenomenology of these quantities. The structure and features of the USINE propagation code are also briefly presented.

Author: Mr MAURIN, David (LPSC)

Presenter: Mr MAURIN, David (LPSC)

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

On the Relevance of Sharp Gamma-Ray Features for Indirect Dark Matter Searches

Thursday 16 June 2011 15:15 (12 minutes)

Gamma rays from the annihilation of dark matter particles in the Galactic halo provide a particularly promising means of indirectly detecting dark matter. Here, we demonstrate that pronounced spectral features near the kinematic cutoff at the dark matter particles' mass, which is a generic prediction for most models, can significantly improve the sensitivity of gamma-ray telescopes to dark matter signals. We derive projected limits on such features (including the traditionally looked-for line signals) and show that these can be very efficient in constraining the nature of dark matter.

Presenter: Ms CALORE, Francesca (University of Hamburg)