

AMS DAYS AT CERN - The Future of Cosmic Ray Physics and Latest Results



Report of Contributions

Contribution ID: 0

Type: **not specified**

Welcome

Wednesday, 15 April 2015 08:30 (30 minutes)

Presenter: Prof. HEUER, Rolf (CERN)

Contribution ID: 1

Type: **not specified**

Making Cosmology Real: The Dark Matter Challenge

There has never been a more exciting time in cosmology. But our current paradigm is built upon three pillars that involved unresolved new physics: dark matter, dark energy and inflation. To make cosmology real —and not just an exciting story —we have to resolve the new physics. The dark matter challenge seems especially ripe to solve, perhaps with a triple verification of the particle dark matter hypothesis: particle production at the LHC, direct detection of dark matter particles in the halo and detection of dark matter annihilation products.

Presenter: Prof. TURNER, Michael S. (University of Chicago)

Contribution ID: 2

Type: **not specified**

Introduction to the AMS Experiment

Wednesday, 15 April 2015 09:00 (1 hour)

Following the pioneering experiments (ATIC, BESS, CREAM, HEAT, PAMELA, ...), using a magnetic spectrometer (AMS) on ISS is a unique way to provide precision long term measurements of primordial high energy charged cosmic rays. AMS was installed on the Station in May 2011. Up to now, 60 billion events have been collected. 40 billion events have been partially analysed. AMS is scheduled to be on the Station until at least 2024. By then AMS will have collected close to 200 billion events. The detector properties and the analysis methods will be introduced.

Presenter: Prof. TING, Samuel (Massachusetts Inst. of Technology (US))

Contribution ID: 3

Type: **not specified**

Latest AMS Results: The Positron Fraction and the \bar{p}/p Ratio

Wednesday, 15 April 2015 10:00 (1 hour)

A precision measurement by AMS of the positron fraction in primary cosmic rays is presented. The results show that at 275 ± 32 GeV the positron fraction no longer increases with energy. The current status of the anti-proton analysis is also presented.

Presenter: Dr KOUNINE, Andrei (MIT)

Contribution ID: 4

Type: **not specified**

New Physics, Dark Matter and the LHC

Wednesday, 15 April 2015 13:00 (1 hour)

Presenter: Prof. ZWIRNER, Fabio (University of Padova and CERN)

Contribution ID: 5

Type: **not specified**

Complementarity of Indirect Dark Matter Detection

Wednesday, 15 April 2015 14:00 (1 hour)

Presenter: Prof. FENG, Jonathan L. (University of California, Irvine)

Contribution ID: 6

Type: **not specified**

Cosmic Rays in the Milky Way and Other Galaxies

Wednesday, 15 April 2015 15:00 (1 hour)

Presenter: Prof. MOSKALENKO, Igor (Stanford University)

Contribution ID: 7

Type: **not specified**

It's About Time: Interpreting AMS Antimatter Data in Terms of Cosmic Ray Propagation

Wednesday, 15 April 2015 16:15 (45 minutes)

If cosmic ray positrons come from a secondary origin, then their production spectrum is correlated with the production spectrum of other secondary particles such as boron and antiprotons through scattering cross sections measured in the laboratory. This allows to define a first-principle upper bound on the positron flux at the Earth, independent of propagation model assumptions. Using currently available B/C and antiproton/proton data, we show that the positron flux reported by AMS is consistent with the bound and saturates it at high energies. This coincidence is a compelling indication for a secondary source. We explain how improved AMS measurements of the high energy boron, antiproton, and secondary radioactive nuclei fluxes can corroborate or falsify the secondary source hypothesis. Assuming that the positrons are secondary, we show that AMS data imply a propagation time in the Galaxy of order 1Myr or less for cosmic rays with magnetic rigidity > 300 GV. This corresponds to an average traversed interstellar matter density of ~ 1 particle/cc, comparable to the density of the Milky Way gaseous disk.

Presenter: Dr BLUM, Kfir (Institute for Advanced Study, Princeton)

Contribution ID: 8

Type: **not specified**

Acceleration and Transport of Galactic Cosmic Rays

Wednesday, 15 April 2015 17:00 (1 hour)

Presenter: Prof. PTUSKIN, Vladimir (IZMIRAN, Moscow)

Contribution ID: 9

Type: **not specified**

Public Lecture: Human Space Exploration

Wednesday, 15 April 2015 18:15 (1 hour)

Public Lecture in English only.

Should you wish to attend to this lecture only (and not the full colloquium), please register here:

<https://indico.cern.ch/event/386996/registration/>

Participants to the full colloquium are automatically registered to the public lectures.

Presenter: Mr GERSTENMAIER, William H. (NASA)

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

The e^- Spectrum and e^+ Spectrum from AMS

Wednesday, 15 April 2015 11:15 (30 minutes)

Precision measurements by AMS on the ISS of the primary cosmic-ray electron flux in the range 0.5 to 700 GeV and the positron flux in the range 0.5 to 500 GeV are presented. The electron flux and the positron flux each require a description beyond a single power-law spectrum. Both the electron flux and the positron flux change their behavior at ~ 30 GeV but the fluxes are significantly different in their magnitude and energy dependence. Between 20 and 200 GeV the positron spectral index is significantly harder than the electron spectral index.

Presenter: Prof. SCHAEEL, Stefan (RWTH-Aachen)

Contribution ID: 11

Type: **not specified**

The (e^- plus e^+) Spectrum from AMS

Thursday, 16 April 2015 08:30 (30 minutes)

We present a measurement of the cosmic ray $e^+ + e^-$ flux in the range 0.5 GeV to 1 TeV based on the analysis of 10.6 million ($e^+ + e^-$) events. The statistics and the resolution of AMS provide a precision measurement of the flux. The flux is smooth and reveals new and distinct information.

Presenter: Prof. BERTUCCI, Bruna (INFN and University of Perugia)

Contribution ID: 12

Type: **not specified**

The Proton Spectrum from AMS

Thursday, 16 April 2015 09:00 (30 minutes)

A precise measurement of the proton flux in primary cosmic rays with rigidity 1GV to 1.8TV is presented. At rigidities above 50 GV the flux requires a description beyond a single power law.

Presenter: Dr CHOUTKO, Vitaly (MIT)

Contribution ID: 13

Type: **not specified**

The Helium Spectrum from AMS

Thursday, 16 April 2015 09:30 (30 minutes)

Presenter: Dr HAINO, Sadakazu (Academia Sinica, Taiwan)

Contribution ID: 14

Type: **not specified**

Indirect Detection: Enhanced Density Models and Antideuteron Searches

Thursday, 16 April 2015 10:15 (1 hour)

Presenter: Prof. RANDALL, Lisa (Harvard University)

Contribution ID: 15

Type: **not specified**

Background to Dark Matter Searches from Galactic Cosmic Rays

Thursday, 16 April 2015 11:15 (1 hour)

Just as searches for BSM physics at the LHC necessitate a careful audit of SM backgrounds, the search for signals of dark matter in cosmic rays must contend with production of secondaries like e^+ and $p\bar{p}$ through cosmic ray propagation in the Galaxy. The theoretical framework for calculating this has however not been directly calibrated at the high energies being explored by AMS-02 and there may be surprises in store. In particular a nearby source where cosmic rays are being accelerated stochastically can naturally generate a e^+ fraction rising with energy as is observed. The test of this is the expected correlated rise in other secondary/primary ratios e.g. B/C and $p\bar{p}/p$. Such a nearby cosmic accelerator should also be detectable through the concomitant flux of neutrinos and its discovery would be (nearly!) as exciting as that of dark matter.

Presenter: Prof. SARKAR, Subir (Oxford, Niels Bohr Institute)

Contribution ID: 16

Type: **not specified**

The JEM-EUSO Program

Thursday, 16 April 2015 14:00 (1 hour)

JEM-EUSO on board the International Space Station is a mission that aims at unveiling the nature and the origin of the ultra high energy cosmic rays (UHECRs), and to address basic problems of fundamental physics at extreme energies. The instrument is designed to measure the arrival direction, the energy and, possibly, the nature of these particles. It basically consists of a wide-field of view telescope that looks down from the International Space Station during night-time to detect UV photons emitted from air showers generated by UHECRs in the atmosphere, in order to identify their individual sources and their association with known nearby astronomical objects. An infrared camera and an atmosphere monitoring system improve the performance of the instrument. The program is proceeding in different steps. At present, K-EUSO attached at the Russian module of the ISS, an improvement of KLYPVE experiment already approved by Roscosmos, is in the stage of final definition. Two pathfinders have already been developed, the first, EUSO-Balloon flew on board a stratospheric balloon in August 2014, a second, EUSO-TA on ground, is in operation at the Telescope Array site. A third, Mini-EUSO, approved by Roscosmos, will be installed inside the ISS. More short and long duration balloon flights are envisaged. 17 Countries, and about 300 researchers are collaborating in JEM-EUSO.

Presenter: Prof. PICOZZA, Piergiorgio (University of Rome Tor Vergata)

Contribution ID: 17

Type: **not specified**

Latest Results from Ice Cube

Thursday, 16 April 2015 15:00 (1 hour)

Presenter: Prof. HALZEN, Francis (University of Wisconsin-Madison)

Contribution ID: **18**

Type: **not specified**

Latest Results from the Pierre Auger Observatory and Future Prospects in Particle Physics and High Energy Astrophysics with Cosmic Rays

Thursday, 16 April 2015 16:15 (1 hour)

Presenter: Prof. WATSON, Alan A. (University of Leeds)

Contribution ID: **19**

Type: **not specified**

Latest Results from Fermi-LAT

Thursday, 16 April 2015 17:15 (1 hour)

Presenter: Prof. MICHELSON, Peter (Stanford University)

Contribution ID: 20

Type: **not specified**

Public Lecture: The Odyssey of Voyager

Thursday, 16 April 2015 18:30 (1 hour)

Public Lecture in English only.

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Presenter: Prof. STONE, Edward C. (CALTECH)

Contribution ID: 21

Type: **not specified**

Scrutinizing Possible Dark Matter Signatures with AMS, Fermi and Planck

Friday, 17 April 2015 08:00 (30 minutes)

Presenter: Dr SLATYER, Tracy (MIT)

Contribution ID: 22

Type: **not specified**

Super-Symmetric Dark Matter

Friday, 17 April 2015 08:30 (1 hour)

Presenter: Prof. ELLIS, Jonathan R. (CERN and King's College, London)

Contribution ID: 23

Type: **not specified**

AMS Results on Light Nuclei -B/C

Friday, 17 April 2015 09:30 (15 minutes)

Presenter: Dr OLIVA, Alberto (CIEMAT)

Contribution ID: 24

Type: **not specified**

AMS Results on Light Nuclei - Li

Friday, 17 April 2015 09:45 (15 minutes)

Presenter: Prof. DEROME, Laurent M. (LPSC Grenoble)

Contribution ID: 25

Type: **not specified**

AMS Results on Light Nuclei - C/He

Friday, 17 April 2015 10:00 (15 minutes)

Presenter: Dr HEIL, Melanie (MIT)

Contribution ID: 26

Type: **not specified**

Implications of AMS-02 Experiment

Friday, 17 April 2015 10:30 (45 minutes)

Presenter: Prof. WU, Yue-Liang (University of Chinese Academy of Sciences)

Contribution ID: 27

Type: **not specified**

The Highest Energy Cosmic Particles

Friday, 17 April 2015 11:15 (1 hour)

Presenter: Prof. OLINTO, Angela (University of Chicago)

Contribution ID: 28

Type: **not specified**

Recent Results on Ultra-High Energy Cosmic Rays from the Telescope Array

Friday, 17 April 2015 12:15 (30 minutes)

TA's recent results on Ultra-High Energy Cosmic Rays (UHECRs) are reported. The energy spectrum based on 20k events above $10^{18.2}$ eV demonstrates a clear dip at $10^{18.7}$ eV and a cutoff at $10^{19.7}$ eV, the shape and the energies of which are well described by the GZK process: energy loss of extra-galactic protons by the interaction with the CMB and IR background. The primary composition obtained from the shower maximum analysis using the hybrid technique is consistent with 100% proton or light nuclei, and inconsistent with 100% iron up to $10^{19.3}$ eV. Above the GZK cutoff energy, a large flux enhancement of medium size (radius=20deg) is observed in the direction of Ursa-Major. The chance probability of this hotspot appearing from the isotropic flux is 4.0sigma. The center of the hotspot is 19 deg off from the Super-Galactic Plane, and no obvious candidate of UHECRs is known in this direction.

Presenter: Prof. FUKUSHIMA, Masaki (University of Tokyo)

Contribution ID: 29

Type: **not specified**

Cosmic Ray Energetics and Mass: From Balloons to the ISS

Friday, 17 April 2015 13:30 (1 hour)

Presenter: Prof. SEO, Eun-Suk (University of Maryland)

Contribution ID: **30**

Type: **not specified**

Latest Results from HESS and the Progress of CTA

Friday, 17 April 2015 14:30 (1 hour)

Presenter: Prof. HOFMANN, Werner (Max-Planck Institut Heidelberg)

Contribution ID: 31

Type: **not specified**

Are there currently well motivated and phenomenologically allowed dark matter candidates (besides axions)

Friday, 17 April 2015 15:30 (1 hour)

Presenter: Prof. KANE, Gordon (University of Michigan)

Contribution ID: 32

Type: **not specified**

The Cosmic Fronter at DOE

Friday, 17 April 2015 16:45 (30 minutes)

Presenter: Prof. SALAMON, Michael (Department of Energy)

Contribution ID: 33

Type: **not specified**

What Next in Fundamental and Particle Physics in Space ?

Friday, 17 April 2015 17:15 (30 minutes)

Presenter: Prof. BATTISTON, Roberto (ASI - Italian Space Agency and Univ. Trento)

Contribution ID: **34**

Type: **not specified**

Summary

Friday, 17 April 2015 17:45 (30 minutes)

Presenter: Prof. TING, Samuel (CERN and MIT)

Contribution ID: 35

Type: **not specified**

Science at NASA

Presenter: Dr GRUNSFELD, John M. (NASA)