

CHIPP PhD Winter School 2011

Report of Contributions

Contribution ID: 1

Type: **not specified**

Homogeneous Cosmology

Monday, 10 January 2011 09:00 (1 hour)

- universe expansion in Newtonian gravity and GR
- Friedmann equation
- Hot Big Bang model
- distances and horizons
- need for inflation

Presenter: LESGOURGUES, Julien (Unknown)

Contribution ID: 2

Type: **not specified**

Thermal History (Part 1)

Monday, 10 January 2011 10:00 (1 hour)

- equilibrium distributions: number densities, energy densities, pressure * decoupling, relic abundance, hot and cold relics * neutrino decoupling and the neutrino background * photon decoupling, recombination and the CMB * BBN and light element abundance

Presenter: KUNZ, Martin (Unknown)

Contribution ID: 3

Type: **not specified**

Thermal History (Part 2)

Monday, 10 January 2011 11:30 (1 hour)

- equilibrium distributions: number densities, energy densities, pressure * decoupling, relic abundance, hot and cold relics * neutrino decoupling and the neutrino background * photon decoupling, recombination and the CMB * BBN and light element abundance

Presenter: KUNZ, Martin (Unknown)

Contribution ID: 4

Type: **not specified**

Neutrino Oscillations (Part 1)

Monday, 10 January 2011 15:00 (2 hours)

1. Theory of neutrino oscillations in vacuum;
2. Solar neutrino experiments;
3. Theory of neutrino oscillations in matter;
4. The KAMLAND reactor experiment;
5. Atmospheric neutrino experiments;
6. The CHOOZ reactor experiment;
7. Long baseline oscillation searches at accelerators;
8. Future projects: measurement of the θ_{13} mixing angle.

Presenter: DI LELLA, Luigi (INFN Sezione di Pisa (INFN))

Contribution ID: 5

Type: **not specified**

Neutrino Oscillations (Part 2)

Monday, 10 January 2011 17:30 (1 hour)

1. Theory of neutrino oscillations in vacuum;
2. Solar neutrino experiments;
3. Theory of neutrino oscillations in matter;
4. The KAMLAND reactor experiment;
5. Atmospheric neutrino experiments;
6. The CHOOZ reactor experiment;
7. Long baseline oscillation searches at accelerators;
8. Future projects: measurement of the θ_{13} mixing angle.

Presenter: DI LELLA, Luigi (INFN Sezione di Pisa (INFN))

Contribution ID: 6

Type: **not specified**

Discussion

Monday, 10 January 2011 18:30 (1 hour)

Contribution ID: 7

Type: **not specified**

Cosmological Perturbations and Large Scale Structure

Tuesday, 11 January 2011 09:00 (1 hour)

- overview of gauge ambiguity
- overview of adiabatic initial conditions
- overview of perturbation evolution in different regimes
- matter power spectrum and its dependence on cosmological parameters
- approaches for computing non-linear corrections
- large scale structure observations: galaxy surveys, cosmic shear surveys, Lyman-alpha forests

Presenter: LESGOURGUES, Julien (Unknown)

Contribution ID: 8

Type: **not specified**

Cosmic Microwave Background

Tuesday, 11 January 2011 10:00 (1 hour)

- Sachs-Wolfe effect in instantaneous decoupling limit
- shape of CMB temperature spectrum in Fourier and harmonic space
- corrections from Silk damping and Integrated Sachs-Wolfe effect
- CMB temperature spectrum dependence on cosmological parameters
- overview of CMB observations from COBE to Planck

Presenter: LESGOURGUES, Julien (Unknown)

Contribution ID: 9

Type: **not specified**

Bayesian Statistics in Cosmology

Tuesday, 11 January 2011 11:30 (1 hour)

- parameter estimation: likelihood, prior, posterior * Gaussian examples, Fisher matrix *
- MCMC methods * model selection

Presenter: KUNZ, Martin (Unknown)

Contribution ID: **10**

Type: **not specified**

Collider Physics (Part 1)

Tuesday, 11 January 2011 15:00 (2 hours)

- I. Setting the Stage ... Motivation for a Huge Machine
- II. The Large Hadron Collider (LHC)
- III. The ATLAS and CMS Experiments (and LHCb)
- IV. Proton-Proton Collisions and Standard Model Physics
- V. Higgs and Electroweak Symmetry Breaking
- VI. LHC Searches for Physics Beyond the Standard Model
- VII. Outlook

Presenter: HOECKER, Andreas (CERN)

Contribution ID: **11**

Type: **not specified**

Collider Physics (Part 2)

Tuesday, 11 January 2011 17:30 (1 hour)

- I. Setting the Stage ...Motivation for a Huge Machine
- II. The Large Hadron Collider (LHC)
- III. The ATLAS and CMS Experiments (and LHCb)
- IV. Proton-Proton Collisions and Standard Model Physics
- V. Higgs and Electroweak Symmetry Breaking
- VI. LHC Searches for Physics Beyond the Standard Model
- VII. Outlook

Presenter: HOECKER, Andreas (CERN)

Contribution ID: 12

Type: **not specified**

Discussion

Tuesday, 11 January 2011 18:30 (1 hour)

Contribution ID: 13

Type: **not specified**

Constraints on Inflation

Wednesday, 12 January 2011 08:30 (1 hour)

- generation of primordial perturbations
- slow-roll predictions for scalar and tensor perturbations
- classification of slow-roll inflationary models
- current constraints
- prospects (Planck and beyond)

Presenter: LESGOURGUES, Julien (Unknown)

Contribution ID: 14

Type: **not specified**

Cosmological Constraints on Neutrinos and Dark Matter

Wednesday, 12 January 2011 09:30 (1 hour)

- cosmic neutrino background (calculation of neutrino temperature left to Martin)
- free-streaming effect
- limits on neutrino density and masses
- limits on warm dark matter

Presenter: LESGOURGUES, Julien (Unknown)

Contribution ID: 15

Type: **not specified**

Introduction to Cosmic Rays

Wednesday, 12 January 2011 18:00 (1 hour)

- a) Observations, from GeV to $1e20$ eV;
- b) Problem of the origin of CRs;
- c) Propagation of CRs in the Galaxy and in intergalactic medium;

Presenter: NERONOV, Andrii (ISDC)

Contribution ID: 16

Type: **not specified**

Introduction to Multi-Messenger Astronomy

Thursday, 13 January 2011 09:00 (1 hour)

- a) Relation between gamma-ray astronomy and cosmic ray physics;
- b) Astronomical observations from radio to gamma-ray band;
- c) Relevant particle acceleration and interaction mechanisms;
- d) Very high-energy neutrinos from astronomical sources?

Presenter: NERONOV, Andrii (ISDC)

Contribution ID: 17

Type: **not specified**

Dark Energy (Part 1)

Thursday, 13 January 2011 10:00 (1 hour)

- Lambda-CDM and its problems * canonical scalar field models of dark energy * parametrisation of the DE equation of state, how to measure it (with special emphasis on using SN-Ia to probe the luminosity distance), current constraints * models that modify gravity * impact on perturbations in the Universe (e.g. growth of structure) * outlook (future experiments, e.g. Euclid)

Presenter: KUNZ, Martin (Unknown)

Contribution ID: 19

Type: **not specified**

Particle Acceleration and Interactions in Active Galactic Nuclei

Thursday, 13 January 2011 11:30 (1 hour)

- a) AGN phenomenology
- b) Blazars and radio galaxies
- c) AGN jets from Schwarzschild radius to Mpc distances
- d) AGN as possible ultra-high-energy cosmic ray sources

Presenter: NERONOV, Andrii (ISDC)

Contribution ID: **20**

Type: **not specified**

Student Talks

Thursday, 13 January 2011 15:30 (1h 30m)

Contribution ID: 21

Type: **not specified**

Small Group Discussions

Thursday, 13 January 2011 17:30 (1h 30m)

Parallel and informal discussion sessions.

Contribution ID: 22

Type: **not specified**

Student Talks or Project

Contribution ID: 23

Type: **not specified**

Stellar Mass Black Holes, Neutron Stars and Supernova Remnants

Friday, 14 January 2011 09:00 (1 hour)

- a) Gravitational collapse of the cores of massive stars;
- b) Supernova phenomenon, neutrino emission, gamma-ray bursts;
- c) Stellar mass black holes and neutron stars;
- d) Supernova remnants and the origin of Galactic cosmic rays

Presenter: NERONOV, Andrii (ISDC)

Contribution ID: 24

Type: **not specified**

Dark Energy (Part 2)

Friday, 14 January 2011 10:00 (1 hour)

- Lambda-CDM and its problems * canonical scalar field models of dark energy * parametrisation of the DE equation of state, how to measure it (with special emphasis on using SN-Ia to probe the luminosity distance), current constraints * models that modify gravity * impact on perturbations in the Universe (e.g. growth of structure) * outlook (future experiments, e.g. Euclid)

Presenter: KUNZ, Martin (Unknown)

Contribution ID: 25

Type: **not specified**

Present and Next Generation Instrumentation

Friday, 14 January 2011 11:30 (1 hour)

- a) Present and planned cosmic ray detection facilities;
- b) Present and planned gamma-ray telescopes;
- c) Present and planned very-high-energy neutrino telescopes.

Presenter: NERONOV, Andrii (ISDC)