Program of the IRAP PhD School, Nice, September 2012

First week

	Monday 3	Tuesday 4	Wednesday 5	Thursday 6	Friday 7
9.00	Registration	Kleinert	Kleinert	Kleinert	Siutsou
9.45		Bianco	Bianco	Bianco	Vereshchagin
10.30		Belinski	Belinski	Belinski	Belinski
11.15		Xue	Xue	Vereshchagin	Vakili
12.00		Pelster	Pelster	Pelster	Pelster
15.00		Penacchioni	Penacchioni	Vereshchagin	Visit to Nice
15.45		Wu	Gruber	Pisani	Calerne
16.30		Fraga	Arguelles	Siutsou	observatory
17.15		Gruber		Beguè	
18.00				Benedetti	

Second week

	Monday 10	Tuesday 11	Wednesday 12	Thursday 13	Friday 14
9.00		Lammerzhal	De Bernardis	De Bernardis	Aharonian
9.45		Kunz	Kunz	Di Pippo	Kleinert
10.30	Kunz	Mavromatos	Mavromatos	Mavromatos	Jullo
11.15	Lammerzhal	Giommi	Masi	Kibble	Kibble
12.00	Giommi	Izzo		Masi	
15.00	Suvendu	Frontera	Frontera	Frontera	Covone
15.45	Baranov	Izzo	Amati	Covone	Jullo
16.30	Dutta	Amati	Orlandini	Amati	Aharonian
17.15	Sversut	Orlandini	Orlandini	Orlandini	Sahakyan
18.00	Mavromatos	Orlandini	Muccino	Orlandini	*Villa Ratti*
18.45				Dutta	

Third week

	Monday 17	Tuesday 18	Wednesday 19	Thursday 20	Friday 21
9.00	Ruffini	Rueda	Rueda	Rueda	Rueda
9.45	Ruffo	Ruffo	(Stockholm)	(Savoie)	(Berlin)
10.30	Bernardini		Damour	Damour	Damour
11.15	Rosquist		(Stockholm)	(Berlin)	Ruffini
12.00		Rosquist	(Stockholm)	(Nice)	TBD
15.00	Izzo	Damour	Lombardi	Haney	Haney
15.45	Pereira	Valsan	Gregoris	Dereli	Baranov
16.30	Boshkayev	Boshkaev		Benetti	Iyyani
17.15	Martins	Martins			Benetti
18.00					

- AHARONIAN, Felix: 1. “Gamma Ray Production in AGN: sites, acceleratioin and radiation processes, challenges” 2. “Gamma-rays from AGN -cosmological implications”
- AMATI, Lorenzo: “"Introduction on Cosmology with GRBs”
- ARGUELLES, Carlos: 1- “Semi-degenerate Self-gravitating system of fermions as Dark Matter in Galaxies II: Core & Halo description” 2- “Einstein clusters and Dark Matter”
- BEGUE, Damien: “Photospheric emission in GRBs from Monte-Carlo simulations of Compton scattering”
- BENEDETTI, Alberto: “Boltzmann equations with anisotropic momentum distributions and transparency of GRB plasma”
- BERNARDINI, Maria Grazia: "The prompt-afterglow connection: a universal scaling for short and long GRBs"
- BIANCO, Carlo Luciano: "Gamma-Ray Bursts"
- BOSHKAYEV, kUANTAY: 1- “Non-rotating and slowly rotating stars in the Newtonian gravitational theory (Hartle’s approach)” 2- “Non-rotating and slowly rotating relativistic stellar models and their applications”
- COVONE, Giovanni: 1. “Introduction to Gravitational Lensing” 2. “Gravitational Lensing evidence for Dark Matter in Galaxies and Clusters of Galaxies”;
- DAMOUR, Thibault: "Gravitational Waves" (4 talks)
- DE BERNARDIS, Paolo – MASI, S.: “Cosmic Microwave Background Observations”

This short course on "Cosmic Microwave Background Observations" focuses on CMB observables, on the fundamental limits of these measurements, and on the methods to extract CMB information from overhelming disturbance of astrophysical, environmental and instrumental origin. After the necessary description of the related physics, and of the status of the art, we conclude on the newest trends. The course is organized as follows:

Lecture 1: de Bernardis 12/09 9:00
CMB Observables (spectrum, anisotropy, polarization, quantum fluctuations,environment)

Lecture 2: Masi 12/09 12:00
How to detect CMB photons (fundamental limits, detectors, telescopes, polarimeters)

Lecture 3: de Bernardis 13/09 9:00
Extraction methods (environment problems, modulation/demodulation techniques, cryogenics, space, current experiments)

Lecture 4: Masi 13/09 12:00
The future of CMB research (current status of the field, new targets and
methods, including B-modes and CMB spectroscopy)

- DERELI, Hüsne: 1- “"The Type IIb SN 2004ex: spectral and light curve evolution” 2- “ Template analysis of observational data dedicated to the association between GRBs and Supernovae”
- FRAGA, Bernardo: “Self gravitating system of fermions as Dark Matter on galaxies”
- GIOMMI, Paolo: 1) “Blazars: recent multi-frequency results and a new approach to classification” 2) NuSTAR: the first operational hard-Xray imaging telescope
- GREGORIS, Daniele: “"Friction forces in general relativity"
- GRUBER, Christine: 1-"Bose-Einstein condensation in compact astrophysical objects" 2- "Dark Energy from the vacuum energy of quantum fields"
-

  I will give a historical account of the developments leading up to the unification of weak and electromagnetic interactions, as I saw them from a viewpoint in Imperial College. This will cover theoretical particle physics in the years after the second world war, early gauge theories, obstacles to unification, especially the Goldstone theorem, the development of the idea of spontaneous symmetry breaking in gauge theories, and the construction of the unified electroweak model, together with a brief discussion of later developments.

- IYYANI, Shabnam: “Photospheres in prompt emission of GRBs - spectral analysis of GRB110721A"
- JULLO, Eric: 1. Modeling of gravitational lensing systems 2. Cosmological parameters with gravitational lensing
- KIBBLE, Tom (Imperial College): “Genesis of electroweak symmetry breaking”
- KUNZ, Jutta: “Gravitating solitons and black holes”
- LAEMMERZAHL, Claus: "The Equivalence principle"
- MAVROMATOS, Nikolaos: “ Neutrinos and the Universe”

lecture 1: Neutrino properties : types of masses, see-saw mechanism for neutrino mass generation, structure of the
neutrino mixing matrix and CP symmetry constraints , Neutrino Oscillations in vacuum and in dense matter
lecture 2: Neutrinos and the Baryon Asymmetry in the Universe: Leptogenesis / Baryogenesis
lecture 3: Neutrinos and the Dark sector of the Universe
lecture 4: Neutrinos in curved geometries of the early universe and CPT violation as alternative scenarios for baryogenesis/leptogenesis without the need of sterile neutrinos

- PELSTER, Axel: “Ultracold Quantum Gases – A Fascinating Playground for Basic Research in Physics”
- PENACCHIONI, Ana: Tuesday 3: "GRB 111228 and Supernova association: a binary system?"; Wednesday 4: "GRB 110709B as a new member of the proto-back hole family"
- ROSQUIST, Kjell: “Inhomogeneous cosmology”
- RUEDA, Jorge: "Fundamental interactions in White Dwarfs and Neutron Stars"
- SAHAKYAN, Narek: 1. “High energy gamma rays from Centaurus A radio galaxy” 2. “High energy photons and neutrinos from thin and thick sources”
- SIUTSOU, Ivan: “Radiative transfer in relativisic outflows with application to GRBs”
- SUVENDU, Rakshit: "Differential Interferometry of BLR of 3C273"
- VAKILI, Farrokh: “Introduction to optical interferometry and high angular resolution astrophysics: state of art, results and future prospects”
- VERESHCHAGIN, Gregory: “Photospheric emission in Gamma Ray Bursts”

Lecture 1. Hydrodynamics and thermodynamics of relativistic plasma and GRBs
The problem: first light from initially optically thick relativistic plasma
Energy-momentum and baryonic number conservation
Expanding GRB plasma: winds versus shells
Equations of motion in fireball and fireshell models
Proper Gamma Ray Burst and photospheric models
Transparency and the baryonic loading
The role of the rate equation for electron-positron pairs
Analogies with cosmology and “black body photosphere”
Lecture 2. Photospheric emission in GRBs
Mean free path and optical depth in media with relativistic motion
Laboratory vs. comoving reference frames
Invariant definition of the optical depth
Optical depth and transparency (photospheric) radius
Photon thick and photon thin asymptotics
Lecture 3. Diffusion in space and diffusion in energy
Photon escape from relativistically expanding plasma
Diffusion in stellar astrophysics and in GRBs
Diffusion radius and photon thin asymptotics
Kompaneets equation
Diffusion approximation for Compton scattering in expanding medium
Comparison with previous works

- WU, Yuanbin: “Surface tension of neutron star matter”
- XUE, Shesheng: “Electron and positron pair production in strong electric fields”