

Young Researchers Workshop
"Physics Challenges in the LHC Era"

Monday 11th (17.00-19.00)

- 17.00-17.15 [Aleksey Reznichenko](#) (BINP, Novosibirsk)
QCD amplitudes with the gluon exchange at high energies
- 17.15-17.30 [Paolo Lodone](#) (Scuola Normale, Pisa)
QCD radiation in transPlanckian scattering
- 17.30-17.45 [Luis A. Muñoz](#) (Antioquia U., Colombia)
Purely Flavored Leptogenesis at the TeV Scale
- 17.45-18.00 [Pablo Roig](#) (INFN-LNF)
Hadronic tau decays into 2 and 3 meson modes within Resonance Chiral Theory
- 18.00-18.15 [Giovanni Siragusa](#) (J. Gutenberg U., Mainz)
Study of the Missing Energy in the ATLAS detector
- 18.15-18.30 [Roberto Di Nardo](#) (Tor Vergata U.)
Measurement of $pp \rightarrow Z \rightarrow \mu \mu$ cross section at LHC with ATLAS experiment
- 18.30-18.45 [Manuela Venturi](#) (Tor Vergata U.)
ATLAS detector geometrical acceptance and its systematic uncertainty
- 18.45-19.00 [Giorgia Mila](#) (Torino U.)
The CMS Muon Reconstruction

Thursday 14th (17.00-19.00)

- 17.00-17.15 [Antonio Carcamo](#) (Scuola Normale, Pisa)
Heavy Vectors Production at LHC in the Framework of the Chiral Lagrangian Formulation with massive spin one fields
- 17.15-17.30 [Mark Round](#) (Swansea U.)
New Weakly Coupled Neutral Resonances at Hadron Colliders
- 17.30-17.45 [Anna Vinokurova](#) (BINP, Novosibirsk)
Study of $B \rightarrow K \eta_c$ and $B \rightarrow K \eta_c(2S)$ decays
- 17.45-18.00 [T'Mir Danger Julius](#) (Melbourne U.)
Continuum Suppression in the reconstruction of $B \rightarrow \pi_0 \pi_0$
- 18.00-18.15 [Daniela Bagliani](#) (Genoa U.)
A microcalorimeter measurement of the neutrino mass, studying ^{187}Re single beta decay and ^{163}Ho electron-capture decay.
- 18.15-18.30 [Roberto Iuppa](#) (Tor Vergata U.)
Astroparticle physics with the ARGO-YBJ experiment
- 18.30-18.45 [Anastasia Karavdina](#) (BINP, Novosibirsk)
Event reconstruction in the drift chamber of the CMD-3
- 18.45-19.00 [Shinji Okada](#) (INFN-LNF)
Kaonic Atoms at DAFNE

[Aleksey Reznichenko](#) (BINP, Novosibirsk)

QCD amplitudes with the gluon exchange at high energies

I demonstrate that the multi-Regge form of QCD amplitudes with gluon exchanges is proved in the next-to-leading approximation. The proof is based on the bootstrap relations, which are required for the compatibility of this form with the s-channel unitarity. It was shown that the fulfillment of all these relations ensures the Reggeized form of energy dependent radiative corrections order by order in perturbation theory. Then we prove that all these relations are fulfilled if several bootstrap conditions on the Reggeon vertices and trajectory hold true. All these conditions are checked and proved to be satisfied for all possible t-channel color representations. That finally completes the proof of the gluon Reggeization in the next-to-leading approximation and provides the firm basis for BFKL approach therein.

[Paolo Lodone](#) (Scuola Normale, Pisa)

QCD radiation in transPlanckian scattering

The hypothesis of models with Large Extra Dimensions is that the fundamental planck scale can be lowered down to some TeV if gravity propagates in some (compactified) extra dimensions. If this is the case, quantum gravity effects could be visible at the LHC. Giudice et al in [arXiv:0112161] studied these effects in the eikonal approximation. It is interesting both from a phenomenological and a theoretical point of view to study the corrections to these results due to the QCD radiation. To evaluate this contribution, we generalize a shock-wave method proposed by 't Hooft, so that we are able to obtain the amplitude at first order in QCD corrections but resummed at all orders in gravity. Studying this result we can learn many interesting things, for example we can extract the true scale of the process and we can guess the general form of the amplitude with many-gluon emission. This is work in progress, so we could actually obtain many other results before May.

[Luis A. Muñoz](#) (Antioquia U.)

Purely Flavored Leptogenesis at the TeV Scale

We study variations of the standard leptogenesis scenario that can arise if an additional mass scale related of the breaking of some new symmetry is present below the mass M_{N_1} of the lightest right-handed Majorana neutrino. We present a particular realization of this scheme that allows for leptogenesis at the TeV scale. In this realization the baryon asymmetry is exclusively due to flavor effects.

[Pablo Roig](#) (INFN-LNF)

Hadronic tau decays into 2 and 3 meson modes within Resonance Chiral Theory

We study 2 and 3 meson decays of the tau lepton within Resonance Chiral Theory based on chiral symmetry requirements, the large- N_C limit of QCD and the asymptotic behaviour demanded by QCD. Thus, most of the couplings in the theory get determined and it is predictive. Our results can be checked thanks to a very good experimental effort (ongoing and forthcoming) by the B- and tau-charm factories joined with an accurate development of devoted Montecarlo generators.

[Giovanni Siragusa](#) (Johannes Gutenberg U.)

Study of the Missing Energy in the ATLAS detector

A very good measurement of the Missing Transverse Energy (ETmiss) is a crucial requirement for the study of many physics channels at the LHC, for example the Standard Model W or top-quark production, the Higgs bosons decaying to taus or SUSY events. The Missing Energy is, in fact, a very clean signature of new Physics and can be used to trigger efficiently events of interest. The most important contribution to the ETmiss measurement in the ATLAS detector comes from the calorimeters, which provide near hermetic energy reconstruction. Given the huge number of electronic channels involved, the calorimeter noise suppression is of crucial importance and can be achieved using a simple noise cut or more sophisticated topological criteria (TopoCluster). A refined calibration improves the ETmiss measurement and can be obtained using the calorimeter signal shapes and/or identified particle and jet signals. The measurement includes the contribution from muons and the energy deposit in dead materials and in the calorimeter cryostat. In this work I present a detailed study of the Missing Energy performance using a data-driven approach based on the study of the W/Z boson decay in the electron channel. In particular, it is possible to use $Z \rightarrow e^+ e^-$ events with one of the two electrons removed to predict ETmiss in $W \rightarrow e \nu_e$ events. The study has been performed using fully simulated ATLAS data and includes different level of hadronic activity.

[Roberto Di Nardo](#) (Tor Vergata U.)

Measurement of $pp \rightarrow Z \rightarrow \mu \mu$ cross section at LHC with ATLAS experiment

One of the first measurements at the LHC will be the Z boson production cross section in proton proton collisions. In the initial data taking period the different decay channels of the Z boson will also be used as benchmark process for the calibration of detectors and performance measurements. The overall cross section $pp \rightarrow Z \rightarrow \mu \mu$ measurement at LHC with first data in ATLAS will be discussed.

[Manuela Venturi](#) (Tor Vergata U.)

ATLAS detector geometrical acceptance and its systematic uncertainty

The measurement of W and Z cross sections at LHC will be possible with the first data in 2009. To reach a high precision, it is fundamental to estimate acceptances through Monte Carlo simulations with accuracy, since acceptance uncertainty dominates that of cross section. My focus is on W and Z decaying into muons: I calculate acceptances and their systematics with Leading Order Generators (Herwig, Pythia) and Next to Leading Order ones (Mc@Nlo, Horace). The main source of uncertainty is due to PDFs, and I will compare systematic errors obtained with the CTEQ analysis and with the Neural Network one. I will show also some results about the correlation induced on acceptances by commonly shared PDF degrees of freedom. Next, I will review the main non perturbative effects, such as partonic intrinsic pT, and the impact of Initial State Radiation.

[Giorgia Mila](#) (Torino U.)

The CMS Muon Reconstruction

Muon detection in CMS requires track reconstruction, measurement of energy deposited in the calorimetric system, and isolation parameters determination. This presentation gives a general overview of the CMS track fitting method, focusing on muon data offline data quality monitoring and on muon reconstruction certification.

[Antonio E. Carcamo](#) (Scuola Normale, Pisa)

Heavy Vectors Production at LHC in the Framework of the Chiral Lagrangian Formulation with massive spin one fields.

The strongest unitarity constraint in the elastic channel of the scattering amplitude for longitudinal W vector bosons in the framework of the Chiral Effective Lagrangian with massive spin one fields is used to determine the allowed region for the parameters M_V and G_V . The behaviour of the total cross sections at LHC for the vector production by longitudinal, transverse and longitudinal-transverse gauge boson fusion is studied as a function of the mass M_V of the vector at $G_V = 200\text{GeV}$. The role of the longitudinal and transverse polarization states of the vectors in the mentioned cross sections is discussed.

[Mark Round](#) (Swansea U.)

New Weakly Coupled Neutral Resonances at Hadron Colliders

We construct a generic model of extra neutral resonances with the same quantum numbers as the standard model photon and Z. Our aim is to study observables in the most general model independent way. With this model we predict the event number and comment on the region of parameter space that will be visible at a particular hadron collider like the LHC. We then examine the ability to measure an asymmetry in a hadron collider and show the visible parameter space at several energies by way of example. A discussion of the effect PDF errors have on the results will be made if there is time.

[Anna Vinokurova](#) (BINP, Novosibirsk)

Study of $B \rightarrow K \eta_c$ and $B \rightarrow K \eta_c(2S)$ decays

A large amount of B-antiB meson pairs produced in the Belle experiment at the e+e- collider KEKB in Japan allows to study rare decays of B mesons. B decays to K and charmonium provide important information about the η_c meson and its excited state $\eta_c(2S)$. We use the decay of charmonium to $K_S K \pi$ to study the effects of interference between signal events and events of the B decay with the same final state but without charmonium in the intermediate state. Taking this interference into account we obtain masses, widths, and decay branching fractions of the η_c and $\eta_c(2S)$ mesons. The results agree with the world average values and for the first time the interference effects are taken into account. Some of the obtained $\eta_c(2S)$ branching fractions have not been measured before.

[T' Mir Danger Julius](#) (Melbourne U.)

Continuum Suppression in the reconstruction of $B \rightarrow \pi_0 \pi_0$

By better measuring the amplitude of this process I intend to perform an isospin analysis of the $B \rightarrow \pi_0 \pi_0$ system, thereby forming a tighter constraint on the unitary triangle angle α or ϕ_2 . Furthermore, I am hoping to perform a flavour-tagging analysis of $B \rightarrow \pi_0 \pi_0$ in order to separate the branching fraction of the decay from its conjugate, and so measure the CP violation present in this process. To date I have had promising results through the use of a new technique used to remove the problems caused by off time QED background.

[Daniela Bagliani](#) (Genoa U.)

A microcalorimeter measurement of the neutrino mass, studying ^{187}Re single beta decay and ^{163}Ho electron-capture decay.

The neutrino mass scale is a key element of any theoretical framework beyond the Standard Model of particle physics, and therefore a crucial challenge of future experimental efforts. In this work we show a direct measurements of the neutrino mass studying ^{187}Re single beta decay and ^{163}Ho electron-capture decay. In both cases the full spectrum decay is revealed by an array of superconducting microcalorimeters. The sensitivity, required from the constraints on the neutrino mass, is achieved thanks to the high responsivity of these devices and to their low intrinsic noise. We will also discuss the technological development of the detectors in arrays of tens of thousands elements, a non trivial implementation for superconducting microcalorimeters working at subkelvin temperatures.

[Roberto Iuppa](#) (Tor Vergata U.)

Astroparticle physics with the ARGONIE experiment

The ARGONIE experiment is located in Yang Ba Jing (Tibet, PR of China) at 4300 m a.s.l. It is a full-coverage array of Resistive Plate Chambers designed to detect Extensive Air Showers in the energy range between 0.5 - 1000 TeV. It has been in stable data acquisition since November 2007. The first results concerning TeV gamma-ray astronomy and cosmic-ray physics are presented.

[Anastasia Karavdina](#) (BINP, Novosibirsk)

Event reconstruction in the drift chamber of the CMD-3

Algorithms of event reconstruction and offline calibrations in the drift chamber of the CMD-3 as well as results of test with cosmic rays and simulation are presented. A cylindrical drift chamber has been made for operating at the VEPP-2000 collider within the CMD-3 detector. To uniformly fill sensitive volume small hexagonal cell were chosen. A coordinate along wire is measured by charge division technique. Resolution in R-phi plane better than 100 μm and about 2 mm along wire in cosmic test runs were obtained.

[Shinji Okada](#) (INFN-LNF)

Kaonic Atoms at DAFNE

Here in the Laboratori Nazionali di Frascati, we are measuring the x-ray transitions of kaonic hydrogen and deuterium atoms using novel large-area silicon drift x-ray detectors to determine the strong-interaction shift and width of the lowest lying atomic states. This offers a unique possibility to precisely determine the \bar{K} -nucleon strong interaction in the low energy limit. The experiment, SIDDHARTA, aims at a significant improvement of the values for kaonic hydrogen over previous measurements and a first measurement on kaonic deuterium. In this talk, a brief overview of this experiment and recent results will be presented.

