22nd International Workshop on Weak Interactions and Neutrinos

Monday 14 September 2009 - Saturday 19 September 2009

Strada Passo dell'Acqua, 34 - 06134 Bosco PERUGIA, Italy

Scientific Programme

The philosophy of this small but time-honored series of workshops (it started in the seventies) is to provide the opportunity for the participants to discuss and interact among each other in a very informal and constructive way.

The WIN 09 workshop will deal with contemporary issues on the following four major topics, discussed in dedicated groups:

Electro Weak Symmetry Breaking

Weak Decays, CP violation and CKM

Neutrino Physics

Dark Matter.

There will be one full day of plenary status reports on the above mentioned major topics. The following days will be devoted to working groups on the same major topics. The final plenary sessions will be spent on summaries of the activities of the four working groups given by the leaders of the discussion groups.

Electro Weak Symmetry Breaking

The most important question in high energy collider physics is whether the electroweak symmetry breaking takes place within or beyond the Standard Model.
LHC data will permit us to address this question directly and to explore the details of the EWSB dynamics. This discussion group plans to discuss our understanding of EWSB, with emphasis: on the expectations at the LHC startup; on final Tevatron results; on the pending questions; on the constraints known at present.
The main subjects proposed for the discussion are: review of the current understanding of EWSB from precision electroweak data and direct search; model building within or outside supersymmetric framework; possible experimental tests and signatures at the LHC; connection of EWSB with other major issues from flavor physics, cosmology and theory, e.g. naturalness, grand unification, quantum gravity, etc.
Joint sessions with the other discussion groups are strongly encouraged.

Weak Decays, CP violation and CKM

CP violation and in general flavor physics plays a central role in our understanding of fundamental laws in physics. Indeed the 2008 Physics Nobel Prize has been awarded for crucial discoveries in this field.
The field is very active both to improve the actual determination of the CKM matrix elements and to test New Physics (NP) models. Indeed while flavor factories (Beauty, Charm and Kaon) have overwhelmed us with data, theory has also improved. As a result the level of precision of CKM elements has improved a lot. On the other hand NP models have been severely constrained and actually is becoming extremely useful the interplay with LHC studies.
Hence the main subjects of this discussion group should be CKM matrix elements, unitarity of the CKM matrix, effective field theory of light (chiral perturbation theory) and heavy quarks (HQET),

flavor physics (K-,D-,B- decays), lattice results, top decays, tau decays, rare meson decays, CP violation and mixing in mesons (B-,D-,K-,..), NP models for flavor physics.
Joint sessions with the other discussion groups are strongly encouraged.

Neutrino Physics

Neutrino physics continues to be one of the most exciting areas of high energy physics. The study of neutrino properties begun the investigation of physics beyond the standard model, while neutrinos observatories promise to open new windows on the Universe.
In the last years, we learned a lot on neutrinos. However there are still several decisive open questions that must be investigated: we would like to improve our knowledge of the mixing angles, to measure the leptonic CP violation, to know the type of mass hierarchy, the absolute mass scale, their (Majorana?) nature and any other relevant properties. Moreover, we can expect progress and even foresee the possibility of new discoveries, already with the present generation of neutrino telescopes.
The topics proposed for the discussion include: neutrinos from artificial (accelerator, reactor) and natural sources (sun, earth, cosmic sources); more powerful conventional and novel neutrino sources; search for neutrino-less double beta decay and related processes; search for neutrino mass effects in beta decay and in cosmology; neutrino interactions; lepton number violation; theoretical implications of neutrino masses and connections with new physics.
Joint sessions with the other discussion groups are strongly encouraged.

Dark Matter

There are now a variety of cosmological and astrophysical observations which indicate that about 25% of the mass-energy of our universe is due to non barionic dark matter, whose properties cannot be accommodated within the standard model of particle and interactions. On the other hand, many extentions of the Standard Model comprise new particles that can play the role of dark matter and can lead to a variety of observable signals.
Underground laboratories (e.g. the Gran Sasso Laboratory) provide optimal conditions for the direct search of various types of dark matter particles. On top of the signal seen by DAMA, many other direct search experiments provide constraints on dark matter particle properties. Clues on the nature of dark matter can also be obtained by performing indirect search, using gamma ray observatories on satellites or neutrinos telescopes. Moreover, LHC findings are likely to have a relevant impact on the discussion of possible dark matter candidates.
The topics proposed for this discussion group include: signals and limits from direct search and possible sources of uncertainties; indirect search for dark matter; role of LHC experiment; compatibility of the experimental results within given theoretical models, discussion of the various dark matter candidates (such as WIMP, neutralino, gravitino, axion, mirror dark matter, etc); implication of the experimental results for the physics beyond the Standard Model.
Joint sessions with the other discussion groups are strongly encouraged.