CERN Colloquium

SPEAKER: Prof. Gianpaolo Bellini (Universita' and INFN, Milano)

TITLE: **Study of very low energy neutrinos from the Sun and from the Earth with the Borexino detector.**

DATE: Thu 09/06/2011 16:30

PLACE: Council Chamber

ABSTRACT

Borexino is a liquid scintillator unsegmented detector, running at the Gran Sasso underground Laboratories (LNGS). Thanks to its unprecedented low level of radioactive contamination, Borexino currently is the only experiment able to perform a real time measurement of solar neutrino interactions below few MeV. In solar neutrinos Borexino measured the neutrino flux from 7Be (862 keV) with total uncertainty smaller than 5%, the flux from 8B with a lower threshold down to 3 MeV, the day/night asymmetry of the 7Be neutrino flux with a total experimental uncertainty of 1%. These measurements introduce strong constraints also on the solar neutrino flux from the pp and CNO reactions. The impact of these Borexino results are extremely relevant both in solar physics, in connection with the understanding of Sun-like stars, and in neutrino physics. In particular, the precision measurement of the 7Be solar neutrino flux allows a real time investigation of neutrino oscillations below few MeV and provides a unique opportunity to probe and validate the currently favored neutrino oscillation paradigm in the so far untested /vacuum/regime. Furthermore, these results single out the Large Mixing Angle (LMA) region of the neutrino oscillation parameter space at the confidence level >8.5 sigma, without including the data from the KamLAND antineutrino reactor experiment in a combined fit, i.e. with no need to rely on CPT conservation in the neutrino sector. This outcome is especially interesting in view of the recent experimental hints of possible differences between the oscillation parameters of neutrino and antineutrino.In the geo-neutrinos, Borexino reached the first actual evidence of neutrinos from the Earth at 4.2 sigma C.L., connected with the radioactive decays in the Earth crust and mantle. Borexino is scheduled to continue data taking for the coming years and to further its investigation of solar neutrinos over the entire solar neutrino energy spectrum, pep and CNO (and perhaps pp) fluxes included. In the meantime the collected statistics of geoneutrinos is increasing to allow a better evaluation of the percentage of the terrestrial heat due to the radioactive decays.

Organised by: Lucio Rossi/TE-MSC & Ignatios Antoniadis/PH-TH.....
Tea and coffee will be served at 16h00