Particles break light-speed limit !!!

Neutrino results challenge cornerstone of modern physics

Have you read or heard this news a couple of months ago?

More about it at: http://www.nature.com/news/2011/110922/full/news.2011.554.html

Do you know that some of us here at TIFR are also currently busy trying to setup a neutrino physics experiment near Madurai in Tamil Nadu?

The experiment called Iron CALorimeter (ICAL) will be setup in the India-based Neutrino Observatory (INO), which will be built inside a mountain. The INO cavern will be more than 4 times in area compared to this auditorium. ICAL will be built using 50,000 tons (an African elephant weighs 5 tons) of Iron and will be magnetised to form possibly the world's largest electromagnet.

Neutrinos are very very weakly interacting particles. We need this huge mass of material to force neutrinos interact inside ICAL and we use the magnetic field to track the particles produced by the neutrino interaction.

Some of you will visit INO1 and INO2 laboratories, where you will get to hear and see about this exciting experiment in making. You can also interact with scientists during the Q/A session.

Resistive Plate Chambers (RPCs) are particle detectors or sensors. When intercepted by the RPCs, the particles produced in the neutrino interaction, deposit some of their energy in the RPCs and thus produce electrical signals. The RPC in this exhibit measures about 30cm × 30cm in area. In the ICAL detector, RPCs will cover an area of about 100,000 square meters. Can you imagine how large that is? It is 111 times the area of this auditorium. In order to capture and reconstruct such a rare neutrino decay, we need to build a very sophisticated electronics and ultra high speed data recording system. The electrical signals from ICAL are brought out through 3.6 million channels. A typical ECG of a person is recorded using 12 probes or channels. So, it is like connecting 300,000 ECG machines to the ICAL detector.

RPCs are built using a pair of electrodes made of ordinary glass sheets of about 3mm thick, mounted parallel to each to other with about 2mm gap. A special gas mixture is flown in the gap, while a very high electric potential (about 10,000 volts) is applied across the electrodes. As mentioned above, charged particles intercepting the RPC, produce electric charge in the gas volume, which is captured and processed. What you see on the computer screen are these signals. They might have been produced due to cosmic ray particles all around us or due to some other local background radiation.

For more information, visit: http://www.ino.tifr.res.in.