STUDY OF MUONS NEAR SHOWER CORES AT SEA LEVEL USING THE E594 NEUTRINO DETECTOR

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ABSTRACT

The E594 neutrino detector has been used to study the lateral distribution of muons of energy > 3 GeV near shower cores. The detector consists of a 340 ton fine grain calorimeter with 400,000 cells of flash chamber and dimensions of 3.7 m x 20 m x 3.7 m (height). The average density in the calorimeter is 1.4 gm/cm^2 and the average Z is 21. The detector was triggered by four 0.6 m^2 scintillators placed immediately on the top of the calorimeter. The trigger required $\geq$ 2 p/m^2 in at least two of these four counters. The accompanying EAS was sampled by 14 scintillation counters located up to 15 m from the calorimeter.

Several off-line cuts have been applied to the data. Demanding five particles in at least two of the 'trigger' detectors, a total of 20 particles in all of them together, and an arrival angle for the shower < 45° reduced the data sample to 11053 events. Of these in 4869 cases, a computer algorithm found at least three muons in the calorimeter. To take into account the failure of the computer algorithm to estimate the number of muons when the ionisation deposited in the calorimeter was very large, an upper limit on the total 'trigger' electrons was imposed. A limit of 100 electrons reduced the data set to 9657 events out of which 4803 events had more than three muons in the calorimeter. These cuts were also applied to the Monte Carlo simulated predictions (as described elsewhere at this conference) based on two different primary spectra; the first spectrum is dominated by heavy primaries while the second by protons. A preliminary comparison of the rates of predicted and observed triggers favors the first spectrum. Comparison of the detailed electron and muon numbers and their averages is carried out.