

AIRES

AIRES (AIR-shower Extended Simulations) [1] is used to simulate particles showers produced after the incidence of high energy cosmic rays on the Earth's atmosphere.

AIRES is based in the MOCCA program, which was created by A.M. Hillas, however in AIRES the Earth curvature is taken into account,ademas the simulation programs can be linked to diferent models of hadronic collisions like QGSJET and SYBILL.

The particles taken into account by AIRES in the simulations are:rayos Gamma electrones,positrones muones piones kaones mesones η bariones Λ nucleones y antinucleones nucleos hasta $Z = 36$.

Electron and muon neutrinos are generated in certain process (decays) and accounted for their energy but not propagated. The primary particle can be any one of the already mentioned particles, with energy ranging from less than 1 ZeV up to more than 1 $ZeV(10^{21} eV)$.

Work at La Plata

At la Universidad Nacional de la Plata, under the advisory of Dr. Sergio Sciutto I started to learn the use of the Aires Input Directive Language and the use of the Aires Object Library too, in particular on the Special Primary Modules and the Compressed Particles Data File Modules.

The Compressed Particle Data Files Modules allow to read and analyze the simulated showers by observing the lateral distribution function of different kinds of particles, for example, observing the shower arrival time distribution, lateral distribution, etc. In the figure 1 the signal produced for particles in a water tank is shown as a function of the distance to the core of the shower. The plotted data are the average of ten showers with primary energy of 10 EeV.

Besides we made a program in C language for the calculation neutrino-nucleon cross section using [2]. Our goal is to implement a special primary module for AIRES, and our first step is to calculate the neutrino mean free path. In the figure 2 is plotted the calculated neutrino-nucleon cross section.

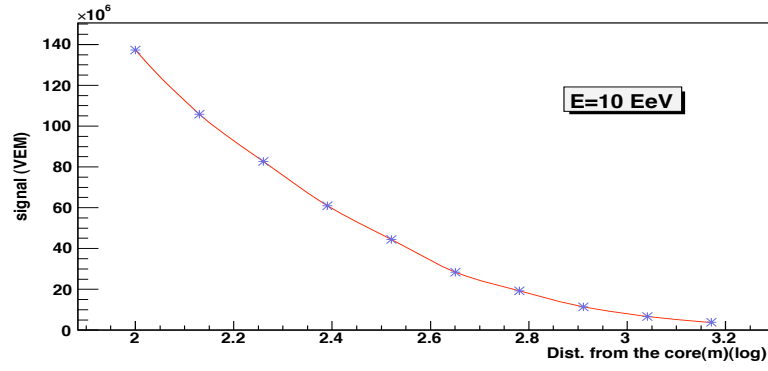


Figure 1: Distribución lateral

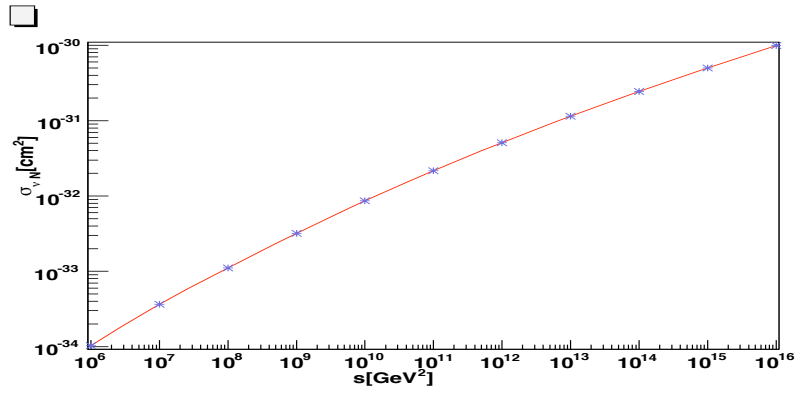


Figure 2: Neutrino-nucleon cross section according numerical result obtained from C program, s is the energy of the center mass

Bibliography

- [1] S. J. Sciutto. *AIRES, a system for air shower simulation*, version 2.8.2b, 2005.
- [2] R. Fiore et al. hep-ph/0512259.