

Study of the hadronic current in the neutrino interactions of the OPERA experiment

Abstract

The OPERA experiment was designed to observe the appearance of the ν_τ in a pure beam of ν_μ (CNGS). The evidence of the appearance signal is provided by the detection of the daughter particles produced in the decay of charged lepton τ .

The hadronic decay channel has the largest branching ratio; in order to proficiently use it for neutrino oscillation detection, one needs a good knowledge of the hadronic current in the OPERA experimental setup. The present work shows the data-acquisition and the comparative analysis of a “minimum-bias” sample of interactions to the standard simulation used in OPERA.

The first chapter of this thesis work is an overview of neutrino physics; in the final part of the chapter some neutrino experiments are described.

The second chapter focuses on the OPERA detector. The main components of the detector are explained as well as the physical performance of the experiment.

Data-taking is the subject of the third chapter; the scanning procedure is shown, followed by the technique used to estimate the momentum of particles in the ECC.

Finally, the fourth chapter presents the data analysis.