



## Doctoral Thesis

# **A Measurement of the relative decay rates of the $K^0$ meson into its principal charged modes**

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A Measurement of the Relative Decay Rates  
of the  $K_2^0$  Meson  
into its Principal Charged Modes

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Presented by

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# A Measurement of the Relative Decay Rates of the $K_2^0$ Meson into its Principal Charged Modes

*Abstract.* An experiment to measure the relative decay rates of the  $K_2^0$  meson has been performed with the help of a large magnet cloud chamber placed in a nearly monochromatic beam of  $K_2^0$  mesons. As the kinematic analysis did not allow a large fraction of the events to be identified, Monte Carlo events have been generated and used to study the recognition probabilities of events belonging to the different  $K_2^0$  decay modes. The comparison of the Monte Carlo events to the real decays has permitted the relative decay rates of the  $K_2^0$  meson into its principal charged modes to be evaluated via a maximum likelihood fit. The values obtained are compared to the predictions of the  $|\Delta I| = 1/2$  rule.

## 1. Theoretical Introduction

The study of  $K$  meson decays gives some information about weak interactions involving strange particles. Comparison of the partial decay rates of different members of the isospin multiplets into corresponding decay modes allows the validity of the  $|\Delta I| = 1/2$  selection rule to be tested, both in leptonic and in non-leptonic decays, while study of angular correlations in the leptonic decay modes throws some light on the nature (scalar, vector, or tensor) of the interaction between leptons and strange particles. This work is a report of the analysis of such an investigation, carried out on the  $K_2^0$  meson<sup>1)</sup>. Kinematic analysis alone did not allow a sufficient number of leptonic events to be unambiguously identified for a meaningful study of either angular correlations or related decay rates. However, by comparing with Monte Carlo events, we were able to estimate the relative decay rates of the  $K_2^0$  into its principal charged decay modes and so check the  $|\Delta I| = 1/2$  rule in leptonic and non-leptonic decays.

### 1.1 Quantum Numbers of the $K$ Mesons

The phenomenon of associated production is most easily described by the introduction of a new quantum number  $S$ , called strangeness, which is taken to be conserved

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<sup>1)</sup> The author was mainly responsible for the analysis of the photographs and the evaluation of the results.