

Preface

The fundamental constituents of matter are quarks and leptons. The quarks which are involved in the process of weak interaction mix and this mixing is expressed in the so-called “Cabibbo–Kobayashi–Maskawa” (CKM) matrix. The presently poorly satisfied unitarity condition for the CKM matrix presents a puzzle in which a deviation from unitarity may point towards new physics.

The two day workshop QUARK-MIXING, CKM-UNITARITY was held in Heidelberg (Germany) from 19 to 20 September 2002. The workshop reviewed the information to date on the inputs for the unitarity check from the experimental and theoretical side. The Standard Model does not predict the content of the CKM matrix and the value of individual matrix elements is determined from weak decays of individual quarks. Especially the value of V_{ud} , the first matrix element, is subject to scrutiny. V_{ud} has been derived from a series of experiments on superallowed nuclear β -decay measurements, neutron β -decay and pion β -decay. With the information from nuclear and neutron β -decay for the first quark generation and from K and hyperon-decays for the second generation, the unitarity-check fails significantly for unknown reasons. This workshop is an attempt to provide an opportunity for clarification of this situation on the experimental and theoretical side.

Accordingly, these proceedings are devoted to these topics:

- Unitarity of the CKM matrix
- First quark flavor decays: nuclear β -decays, neutron β -decay, π -decay
- Radioactive beams
- Second quark flavor decays: kaon decays, hyperon decays
- Standard theory – QED, electroweak and hadronic corrections
- New possibilities for experiments and facilities
- T- and CP-violation

With these proceedings, we present both a review of the experimental and theoretical information on quark-mixing with focus on the first quark generation. The papers present new findings on these topics in the context of what is known so far. Besides this, about half a dozen new neutron-decay instruments being planned or under construction are presented. Better neutron sources, in particular for high fluxes of cold and high densities of ultra-cold neutrons will boost fundamental studies in these fields. The workshop included invited talks

and a panel discussion. The results of the panel discussion are published in “The European Physical Journal”.

The editors wish to dedicate these proceedings to Prof. Dirk Dubbers on the occasion of his 60th birthday. For many years he has given advice and support to the “Atom and Neutron Physics Group” at the University of Heidelberg Institute of Physics.

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Hartmut Abele
Daniela Mund