3.2 Asymmetry measurement using vertex tag and jet charge
The secondary vertex/impact parameter is used to tag b hadron. The momentum
weighted jet charge using all charged particles in the jet is used to assign the b
quark charge. The relevant systematics here are due to fragmentation and decay
models assumed to describe the data as well as meson/baryon composition. The
results are however competitive to the lepton tag. Moreover the effect of missing
neutrino is less relevant in this case.
ALEPH [20] and DELPHI [21] have used this technique and their results are shown
in the table 5. Averages for lepton tag, vertex and jet charge tag as well as overall
are shown in the same table. These results are already corrected for the mixing
parameter. Since these measurements are performed slightly above the Z peak, a
small correction is applied and the final measured peak asymmetry is
$$A_v = 0.092 \pm 0.006$$
which leads to $$\sin^2 \theta_W = 0.2322 \pm 0.0011$$ to be compared with the LEP average
$$\sin^2 \theta_W = 0.2321 \pm 0.0006$$ from all methods including this measurement. Conser-
vatively one would expect true $$\sin^2 \theta_W$$ to be smaller, if all the effects mentioned
above are taken fully into account.
4 b Hadron Lifetimes
The measurement of b hadrons lifetimes at LEP has the advantage of relatively
larger boost making it a cleaner measurement without any mixing of the tracks
from the two jets in Z --, b->. Excellent measurements, both inclusive as well as
exclusive, for b hadrons have been performed. Real justice can not be done in this
kind of review. Only a glimpse of the overall situation is given. Being of fundamen-
tal importance, these measurements are relevant not only for the understanding of
b hadron decay mechanisms and the Cabbibo-Kobayashi-Maskawa (CKM) matrix
in consequence, but also from the fact that b tagging using lifetime tech-
nique requires an accurate measurement to minimize the systematics, in particular
for Rb. The most naive, yet simplest to connect the lifetime with CKM elements,
is the so called spectator model. In this scheme, the light partner is ignored and
the b quark is treated to decay analogous to a muon.
For muon decay
$$F(p,\rightarrow e^-\nu,e^-\nu) = \frac{G_F}{\sqrt{2}}$$
where $$\sqrt{2}$$ is the phase space factor, and GF the Fermi coupling constant. In a similar
way for b hadron decay
$$2 \frac{G_F}{\sqrt{2}} = \frac{\Gamma(b \rightarrow t, x)}{1 - e^{-\tau_m}}$$
where $$\tau_m$$ and $$\mu$$ are combined phase space and QCD correction factors correspon-
ding to the relevant decay modes.

PREFACE

The Third Workshop on High Energy Particle Physics (WHEPP-3) was held
This is the third in the series of workshops; the first one was held at T. I. F. R.,
Bombay (January 1989) and the second one was held by S. N. Bose Centre,
Calcutta (January 1991). About 100 particle physicists have attended the work-
shop.

As in the previous two workshops, four broad topics were chosen for the
formation of working groups. These are
1. Collider physics and structure functions (coordinated by Amitava Datta
 and Rohini Godbole)
2. Beyond standard model (coordinated by Anjan Joshipura and Probir Roy)
3. Heavy ion physics (coordinated by Sourendu Gupta and J. C. Parikh)
4. Heavy flavour physics (coordinated by S. Uma Sankar)
The first week was devoted to review talks on various topics of current interest
and to the formation of working groups. The second week was devoted to talks
by participants on their work and the discussion of the problems that were raised
in working group sessions. The group coordinators presented the results of the
discussions on the last day of the workshop.

These proceedings contain the written version of the review talks given dur-
ing the first week. In addition to the contributions included here, the following
talks were also presented:
1. Top quark search at tevatron ... N. K. Mondal
2. Searches for new physics at LEP200 ... Sudhakar Katta
3. Neutrino Masses and Mixing Angles ... K. S. Babu
4. Lepton Number Violation ... J. W. F. Valle

Most of the support for the workshop has come from S. N. Bose National
Centre for Basic Sciences, Calcutta. Additional support was also given by the
Department of Science and Technology, Government of India, New Delhi, The
Institute of Mathematical Sciences, Madras and the International Center for
Theoretical Physics (ICTP), Trieste.

I thank Prof. R. Ramachandran, Director, Institute of Mathematical Sci-
ces, for the enthusiasm with which he agreed to host the workshop and for
providing constant support. I also thank Prof. G. Rajasekaran, Dr. M. V. N.
Murthy and Dr. Rahul Sinha for offering their help without any hesitation at all
times. My sincere thanks to all the office, the library and the guest house staff
B physics at LEP

Br(b--, t, X) together with ~ constrains the CKM elements $[V_{cb}]$.

It is obvious to see that in such a scheme the lifetimes for different mesons (charged, neutral, strange) and baryons should be the same. There are several relevant diagrams like $W$ annihilation, $W$ exchange and quark interference which need to be considered depending upon the quark content of the $b$ hadron. Consequently one would expect to be the more realistic case within 10−20% [22]. Exact predictions are still difficult as it requires to understand hadronic decay matrix (quark masses, QCD effects etc). The experimental measurements can help a great deal in this direction.

4.1 Inclusive lifetime measurements

The LEP experiments ALEPH [23], DELPHI [24], L3 [25] and OPAL [26] have performed this measurement. The impact parameter of the lepton ($p$ and $e$) are used for this purpose. The method is illustrated in figure 7.

Figure 7: Definition of the transverse impact parameter and various resolution effects.

The important systematics for this measurement come from the understanding of semileptonic branching ratios, fragmentation parameters for heavy and light quarks and the measurement resolution function.