ALEPH 89-30
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F. Bird
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$Z \rightarrow Q\overline{Q}$ MEETING

Minutes of the meeting held on Tuesday 14th February 1988

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1. Introduction - A. Blondel

Agenda: Event Selection and Backgrounds
Hadron Trigger
QCD parameters
Line Shape
(no luminosity discussion this time)

The next ALEPH Z Physics meeting will be Friday, 24/2/89, in the PS Auditorium.

2. Event Selection and Backgrounds

D. Schlatter showed some preliminary results from using the ALPHA analysis program to look at hadronic events (figures not included here). He encouraged everyone to use ALPHA, emphasizing how convenient it was. He had done the work with POT banks, adding that the MiniDST was not likely to be stable enough for general use this year.

A. Blondel, on behalf of S. Haywood, has provided for these minutes some transparencies which he just briefly discussed at the meeting. They review the current MiniDST ideas. Persons interested in more detailed information should contact Mr. Haywood.

G. Cowan discussed the results of work prepared in collaboration with E. Lange, looking at background events to the Z hadronic event sample. They used the SIMDST simulation to reconstruct $\tau^+\tau^-$, $\gamma\gamma$ →hadrons, Bhabha, and beam-gas MC events, as well as a sample of LUND Z events (transparencies included here). Some differences were observed between the Cowan SIMDST events and the Schlatter JULIA reconstructions, the origins of which are unclear. Cowan finds that the loss of real Z events if a track multiplicity cut of 5 versus 3 is used to be negligible, approximately 99.5% in both cases. The multiplicity cut is very good at suppressing Bhabha background, although others pointed out that the Bhabha events may be better removed by understanding their clear signatures in ALEPH. The τ background is also effectively suppressed by the multiplicity cut. Cowan also suggests that a cut on total energy of E_{tot} >25 GeV be made in order to suppress 2γ background. His 2γ sample was fragmented with both the Quark Parton Model (QPM) and Vector Dominance Models (VPM), characterized by p_t distributed according to $e^{-p_t^2/\langle p_t^2\rangle}$, where $\langle p_t\rangle$ was either 1,2, or 3 GeV/c. He finds the energy cut suppresses the background completely at the Z peak, and adds that away from the peak, the

cut is still effective at the 1-2% level. He plans to repeat the process using the GALEPH/JULIA ALEPH package.

D. Zwierski, on behalf of J. Brient, showed some results obtained using the BREM02 generator to generate $\tau^+\tau^-$ events. He finds that a track multiplicity cut of 5 reduces the τ background in the generated Z →hadron events to 2.5%. But due to showering in the detector material, JULIA retains 17% of those same events for the identical multiplicity cut. Nevertheless, the background in the sample is then less than 1%. Recall that the line-shape for this background follows the resonance line-shape, as opposed to the Bhabha case, so that adverse effects are further minimized (transparencies included.)

J. Harton showed some results of a 2γ background study using JULIA. From an initial sample of 55K thrown events, 15K of which get through GALEPH, 8K of which make it through JULIA, and 3.2K of which were used in the figures included here. Comparing the 2γ and Z distributions in multiplicity and total energy using the JULIA CALObjects suggested cuts in the E_{tot} versus $\cos\theta_{sph}$ plane (see figure), which efficiently suppress the 2γ background (see table).

In each of the above cases, a few preliminary words concerning the definition of total energy were required. As a result, it was generally agreed that a consistent definition of total energy and energy flow should be established soon.

3. Trigger

E. Blucher discussed some early work aimed at understanding the ALEPH trigger and its potential pitfalls. He reviewed the trigger description, in hardware and in software, noting that any MC generated prior to 13/2/89 would not be useful for trigger studies, due to a problem in GALEPH. He raised some issues concerning the initial triggers, for example, the reliability of the ITC trigger in the presence of high background. (transparencies included.)

L. Mirabita discussed some more detailed work on the trigger, having defined a single μ and a set of energy triggers (see figures here). Using a sample of 4918 hadronic MC events, he found that 100% of the time, at least two of the triggers were generated. He showed some histograms of the frequency and distribution of the triggers generated by the LUND sample. (transparencies included.)

4. QCD Parameters

M. Schmelling indicated that due to differences in the MC generators, that the current ALEPH choice of standard QCD parameters, i.e. $\alpha_s(m_Z^2) = 0.12$, may need to be rethought. A discussion ensued which came to some more specific recommendations for the LUND events. The value of $\alpha_s(m_Z^2)$ will remain as is, where the overall QCD enhancement correction to the total cross-section and the Z-width are concerned. The LUND shower model MC is preferred, with the vector meson widths and initial state radiation turned on. The fragmentation parameters, one of which is also called α_s, can be independently chosen to reproduce the 35 GeV data from PETRA.

5. Line shape

L. Garrido showed some results from some Z line shape studies. He finds that by choosing M_Z, Γ_Z, and $\sigma_{\text{peak}}^{\text{Born}}$ as fit parameters, and using an energy-dependent Breit-Wigner for the resonance, that a 5 point fit, including the peak, gives precise parameter values. His fit properly includes effects of initial state radiation. This is as opposed to the choice of $\sin^2\theta_W$ as the third parameter. (transparencies included.)

J. Harton parameterized the running of the fit parameters in EXPOSTAR with a quadratic mass dependence and showed that the resulting ZBATCH and EXPOSTAR models of the $\sqrt{s}$ dependence agreed to 0.5% over the mass range shown in the figures. This is in regard to the initial $\sqrt{s}$ differences observed between the two models.

6. The End

A. Blondel tentatively set April 11, sometime in the afternoon, for the next meeting of the $Z \rightarrow Q\overline{Q}$ group. This coincides with the QCD meeting of the same date. The tentative agenda includes discussions of triggers, luminosity, energy flow, and a definition of the angular acceptance.