Discussion

Rosner - Minnesota

Q. I would like to know what is the effective value of R due to a heavy lepton at various masses.

Newman - DESY

A. Taking standard assumptions we have a rather high efficiency for a heavy lepton, particularly where the hadron continuum is important. So I mean, as I showed we have something like 80% efficiency. If we have a 10 GeV heavy lepton, one could say that perhaps we have a 50% efficiency for that. We get a $\Delta R \simeq 1/2$.

Wolf - DESY

A. In the case of the TASSO detector the multihadron trigger used to determine R accepts $\Delta R \sim 0.3$ of $\tau\bar{\tau}$ production (adding the other triggers increases the acceptance for $\tau\bar{\tau}$ production to $\Delta R \gtrsim 0.6$).

Meyer - DESY

A. For the PLUTO detector the efficiency is 50%, that is 1/2 unit of R.

Orito - Tokyo

A. For JADE the efficiency should be quite high if at least one of the two heavy leptons produced decays into hadrons. I would estimate the overall efficiency to be more than 60%.

H.Harari - Weizmann Institute and SLAC

Q. I have a question to Drs. Wolf and Orito. In the TASSO data what I found to be the most impressive evidence for the three jets was the distribution of the perpendicular momentum inside the plane, what you call $\langle p_T^2{}_{in}\rangle$ which could not be fitted by any of your Monte Carlo. In the JADE data we saw a similar distribution, presumable using an identical Monte Carlo, but there the effect was not clear at all; in fact it looked like the Monte Carlo was not very far from the data. Am I right in suggesting that there is some disagreement between the two? Could we see the two plots and look at them and compare? Or could you comment on this?

Orito - Tokyo

A. In the JADE Figure, there are two Monte Carlo curves drawn. The curve expected from $q\bar{q}$ does not fit the data, while the one from $q\bar{q}g$ fit well the observed tail at high $\langle p_T^2{}_{in}\rangle$.

Orito + Wolf (joint statement): We have compared the TASSO and JADE results for $\langle p_T^2{}_{in}\rangle$ and have found that the number of large $\langle p_T^2{}_{in}\rangle$ events as well as the Monte Carlo prediction for large $\langle p_T^2{}_{in}\rangle$ events given by the two experiments agree well.

?? - NIKHEF

Q. In the TASSO events I would like to know the visible energy for events which are far out because I think it must be far less than for JADE events. JADE measures quite a lot of neutral energy.

Wolf - DESY

A. The distribution of the visible energy for the so-called planar events is the same as for all hadron events (see Fig. 21).

Tom Nash - Fermilab

A. Clearly one is impressed by the agreement between the four different experiments perhaps despite this point that just came up. What I would like to address is how independent are the four experiments.... (Laughter) Well, let me finish the question. in two specific areas? One is the area of luminosity. How is it, are different luminosity calculations done, or are they the same? And secondly, how independent are the Monte Carlo programs? I presume they are independently run byt they all have very similar models. Are their kernels of the program identical? Overall background information would be very interesting.

Newman - DESY

A. First of all, the MARK J detector has very little in common with the others in the sense that it's basically a calorimetric detector and when we started out speaking about the analysis we were in many ways starting from scratch. We were actually surprised ourselves at what we were able to extract and how similar the results are to charged track detectors and to a detector like JADE with charged and neutral energy. I think it would be difficult to design a detector that was more different.

Nash - Fermilab

Q. Well, I wasn't asking that. The detectors are clearly different. The question is: Are the Monte Carlo calculations different?

Berger - Aachen

A. I think one can answer this question very clearly. Concerning the luminosity measurements, if you look for example, at the statistic tables, you will see that they are quite different. The totally integrated luminosity ranges from 1100 to 1500 about and are completely independent. It is nice that those experiments that have less luminosity also have less hadrons. Concerning the Monte Carlo; the Monte Carlo consists of at least two parts. The generator, which generates the hadrons, is similar in most of the detectors. But then comes the detector part which is absolutely and completely independent and different. Actually I can tell you it was the concern of the director-general of DESY that in this session you would get the impression that the experiments would be too independent instead of being dependent on each other.

Wolf - DESY

A. Can I also add a few comments. One is that the luminosity is measured by small-angle Bhabha scattering. Then all experiments look at large-angle Bhabha scattering. When one checks QED one basically checks the ratio, - at least if one checks for the absolute magnitude - of small-angle Bhabha scattering to large-angle Bhabha scattering. So, the fact the experiments agree with QED, if you grant QED is all right, is just a measure of how well the luminosity is measured.

The second thing is that everyone of us uses a Monte Carlo, and even if the programs are different the input is similar. However, if you look for example at our detector, the fraction of hadronic events we accept is of the order of 80%. Therefore, the correction for events one is losing is 20% and one has various means to check the corrections without a Monte Carlo. For example, one looks at the observed multiplicity distribution and extrapolates to 4π acceptance in order to find out how many events are lost by the cuts. The same is true for the distribution of the sum of the momenta (Fig. 3). We feel that we can estimate the fraction of events lost by cuts etc. to better than 50%, i.e. the uncertainty in R due to these effects is less than 10% without any Monte Carlo.

The third thing one should mention is that the conclusion on the existence of planar events does not depend on any model because one just looks at shapes.

Newman - DESY

A. On the Monte Carlo model there has been recent work by Ali at DESY which is theoretically far more consistent in the quark-parton model framework than the Monte Carlo we have been using up to now. For example, during the fragmentation, the actual weak decays, the decay chain from bottom to charm to strange and so on, all the q^2 dependence of the fragmentation function and the fact that you can also have two to three processes in which the three quarks each fragment independently and the production of $q\bar{q}$-gluon-gluon, all of this is included in a way which is theoretically more sensible. Just a couple of days ago we received the first results at high energy that we could put through our detector and all the qualitative features I showed you were in agreement. So, when we push quantitative comparisons with QCD which have to use this new Monte Carlo to make these comparisons.

Eisler - CUNY

Q. I would like to ask a question about the quark search plot that was shown by the JADE group. There are alternative quark models that indicate there might be a stable b quark hadron, and since all this data is above that threshold you showed a plot in which such a 6 GeV particle was drawn. I would like to know if from that data you are prepared to quote a probability for the existence or non-existence of this possible stable b quark hadron.

Orito - Tokyo

A. In the analysis I presented we searched for the stable particles produced with multihadrons. Therefore if your stable b quarks are produced in two body, we have no limit at this moment. But if produced with hadrons, we can set an upper limit $\Delta R < 0.2$ for the production of a 6 GeV stable particle with charge 1.