17 - 11 - 88
Sylvie Dugeay

MEETING OF THE HEAVY FLAVOUR GROUP

Minutes of the meeting held at Cern on 15 November 1988

PRESENT

S. Natali	
M. de Palma	(Bari)
A. Falvard	
P. Henrard	(Clermont-Ferrand)
P. Campana	
G. Capon	
P. Laurelli	(Frascati)
J. Hearns	
K. Smith	
S. Thompson	(Glasgow)
B. Brandl	
E. Kluge	
Y. Maumary	
A. Putzer	(Heidelberg)
P. Dornan	
S. Dugeay	
J. Sedgbeer	(Imperial College)
C. Bowdery	(Lancaster)
C. Benchouk	
A. Bonissent	
S. Papalexiou	(Marseille)
M. Bosman	
P. Cattaneo	
G. Lutz	
W. Manner	(MPI Munich)
G. Bagliesi	
L. Foa	
F. Forti	
A. Giassi	
E. Mannelli	
A. Messineo	(Pisa)
B. Bloch-Devaux	(Saclay at Cern)
C. Klopfenstein	
E. Monnier	(Saclay)
D. Cinabro	
J. Hilgart	
R. Jonhson	
H. Zobernig	(Wisconsin)

1) We started with a "**Revue of exclusive semileptonic** $B \rightarrow l \, \bar{\nu} \, X$ **decay models** ", by Alain Falvard. If calculations at the quark level are usually well understood and handled, the jump to the hadronic level requires a phenomenological approach as we don't know how to deal the hadronic matrix element. Different models are available on the market and they differ in their interpretation and computation of the meson form factors. The Clermont-Ferrand group has investigated three of these models (from Korner et al, Wirbel et al and Grinstein et al), and has compared their respective virtues and predictions with the existing but contradictory data (see transparencies). It will be probably difficult for Aleph to distinguish between them as far as the $b \rightarrow c$ transition is concerned, but the b into u transition seems more promising.

2) Alois Putzer reported about "**Hadronic Decays of Heavy Flavours** ", and needs to have a more directive strategy on some points. This was discussed at the end of the meeting and of these minutes. A comparison of the Y_{4S} results and the ARGUS experiment's Monte-Carlo, using the Wirbel et al model interfaced with the Lund generator was made. He also recalled that, from the experimental point of view, our knowledge about charmed baryons is very poor, and non existent for the bottom ones. The situation for baryonic branching ratios of the B mesons is not very brilliant too, as it refers to charmed baryon exclusive decay rates (transparencies attached).

3) An investigation of "**How LUND Decays the Bottom and Charm states** " was reported by Peter Dornan and a note is attached, giving the different decay modes for charmed and bottom hadrons available in LUND, together with their branching ratio. All the bottom particles are decayed according to the spectator diagram, with a $b \rightarrow c$ transition. Their decay modes are classified into 4 categories : semileptonic decay of the W, given a final state $l \, \bar{\nu}$ and one charmed hadron; the decays where the W is going into $d \, \bar{u}$ quarks, for whitch the final state contains one charmed hadron, 0 to 2 kaons and a certain number of pions; those where the W is going into $s \, \bar{c}$ quarks, leading to a final state with two charmed hadrons, 0 or 2 kaons and a small number of pions ; and finally those where the W decays as in the last item but with the $\bar{c}$ being combined with the c from b, to form a bound $c\bar{c}$ state giving a final state ψ or η_c and a kaon.

4) Overview of the " **Facilities and Projects related to Heavy Flavour Generation inside LUND** ", by Brigitte Block-Devaux. (see transparencies). $B\bar{B}$ mixing and CP violation effects, both in the mass matrix and decay amplitudes, inside Lund are now available in the LUND02 version. The values of the mixing and CP violation parameters can be selected by 3 new data cards, the default values being no mixing and no CP violation. In addition we will soon have the possibility of inducing $b \rightarrow u$ transitions. More generally, it would be very useful to have a facility to update, modify, and add decay modes which is not straightforward now. Brigitte proposed a scheme allowing us to do that in a simple way using data cards. With agreement of the Heavy Flavour group, a file will be provided and maintained, with the updated decay modes and branching ratios, and also the other standard parameters such as the fragmentation ones.

5) Martine Bosman spoke about a study of the "**Exclusive Decays** $B^0 \rightarrow l^- \bar{\nu} \, D^{*+}$ ". We can hope to reconstruct around one hundred such events per $10^6 \, Z^0$, with the subsequent decay $(D^{*+} \rightarrow D^0 \pi^+)$ and $(D^0 \rightarrow K^- \pi^+)$, enabling a measurement of the B^0 lifetime. This can be done in two ways : the lepton impact parameter or, by reconstructing the D^0 and then the B vertex, using the decay path of the B meson. Her talk discussed the statistical precision one can hope to achieve by the two methods. The second one is expected to give a better value, of the order of $1.1/ \sqrt{N}$ while the other gives a value of $1.3 - 1.4/ \sqrt{N}$ (see transparencies).

6) The status of the " **Fast detector Monte-Carlo FASGAL for the tracking part**", was discussed by David Cinabro. The code is written and is in a testing phase, comparison with the standard GALEPH is under way and prelimary results were presented, showing the necessity of tuning some parameters (kinematics cut-off ...). The tracking part of FASGAL was promised to be available by the 1st of December.

(A status of the Calorimetry part of this Monte-Carlo was given by D. Levinthal during the SOFTWARE meeting held on the same day, and a preliminary version of it should be delivered in December too.)

7)   John Hilgart reported the "Status of Wisconsin Group's Event Production *(additional subtitle : It's not as easy as it looks !)* ". The successive unsuccessful attempts were described, allowing the detection of many bugs inside GALEPH and JULIA. Most of them did not involve program crashes and a lot has been learnt from this 'big scale' production : automating checking tools would be very useful. Another point was that there were not enough banks written on the POT and we need some 26 more (see transparencies).

8)   A.O.B.

⋆ Four points needing some special care or clarification have been raised by Alois, and by some other talks too (Alain, Brigitte, John, ...) :

- Heavy Flavour Monte-Carlo

It seems now very useful to agree on a standard program to perform the heavy flavour generation and decays, common sets of parameters (such as branching ratios for charmed meson, ...) This is already done and available as data cards for some features (cf Brigitte). The updating of our favorite parameters requires an active person too. A **working** meeting on this subject will be held during the next reconstruction week, on wednesday the 30th around 11h, with Alain Falvard as coordinator.

- Heavy Flavour Tagging (especially with leptons)

It has been decided that our next general meeting will be devoted to this subject, so next :

- Particle identification

This is really too hard (may be too early) for the time being, so next and last :

- Event production

Some organisation and coordination is needed between the different institutes which intend to do production, namely Glasgow, Heidelberg, Pisa, Saclay, Wisconsin. The list of banks we want to be eventually added to the POT must be discussed. A meeting will take place during the next reconstruction week too, on Tuesday the 29th of November at 18 h.

⋆ The **NEXT MEETING** will be held in the second or third week of January 1989.