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PROPOSAL

for

AN EXPERIMENT ON K_2° LEPTONIC AND 3 π DECAYS

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N.P.R.C.

PROPOSAL FOR AN EXPERIMENT ON K. LEPTONIC AND 3 TT DECAYS.

V. Bisi, M.I. Ferrero, C. Grosso (I.N.F.N.-University of Turin), in collaboration with the CERN - Aachen group.

<u>Summary.-</u> An experiment is proposed to study the energy dependence of the form factors in the K_2° leptonic decays and the behaviour of the matrix element in the 3π decay.

For this experiment we propose to use the same wire chambers spectrometer built by the CERN-Aachen group for the measure of the \mathbf{K}_{1}° - \mathbf{K}_{2}° mass difference.

A very high statistics can be collected in a period of the order of one week exposure on the neutral beam b_{13}° .

FORM FACTORS IN THE KO LEPTONIC DECAY

As it was pointed out in the recent Heidelberg Conference, the situation related to the form factors in K₁₃ decay is rather confused. The discrepancy already existing between values of form factors obtained by polarization measurements and branching ratio was not solved, and the new experiments presented at the Conference have confirmed this strong inconsistency.

The matrix element corresponding to the leptonic decay of the $\ensuremath{\,\mathbb{K}}$ meson

is:

$$M = \frac{1}{2} \left[f_{+}(q^{2}) (P_{K} + P_{\Pi})_{\lambda} + f_{-}(q^{2}) (P_{K} - P_{\Pi})_{2} \right] \cdot \left[\bar{u}_{\lambda} (1 + y_{5}) \right]$$

The hadron current is described by the form factors f, f functions of the momentum transferred to the pion. Experimental informations on f, f can be obtained by the study of the decay spectra of the π or μ 's, of the K μ 's branching ratio and of the μ polarization. f is unmeasurable in K decay because of the factor $(M \text{ Cept }/M_K)^2$ in the terms containing f; therefore all the informations about this form factor are coming from K μ 's.

We propose a detailed investigation of the Dalityplot in the decay modes

$$K_2^{\circ} \rightarrow \pi^{\pm} e^{\mp} V$$

$$K_2^{\circ} \rightarrow \pi^{\pm} \mu^{\mp} V$$

The distribution of the pion and lepton energies, averaging over spin directions, results

$$S(\xi, E_{\pi}, E_{e}) = \frac{f_{+}}{2\pi^{2} M_{K}^{2}} \left[A(E_{e}, E_{\pi}) + B(E_{e}, E_{\pi}) + ((E_{\pi})|\xi|^{2}) \right]$$

where $\frac{5}{5} = f/f$ and A, B, C contain only kinematical variables.

At fixed π energy the ξ value can be determined by measuring the Dalitz plot density φ as a function of the $\frac{1}{2}$ energy (along the vertical strip in fig. 1). On the other hand the q^2 dependence of the form factors requires measurements at different n energies (horizontal line, fig. 1).

The $\{(0)\}$ dependence of the squared matrix element is dislpayed in fig. 2, where the $\frac{5}{5}(0)$ variation from - 0.5 to + 0.5 results in an appreciable change of slope of the constant $\frac{c}{c}$ lines. For each E value, lines corresponding to different $\{$ are normalized to the same area.

Among topics related to the subject of this note we mention following ones:

- a) Time reversal invariance, implying a real value of ξ , equal decay rates and equal form factors for the decays $\overline{K} \hookrightarrow \overline{\Pi} \stackrel{\longleftarrow}{\mu} \overline{\nu}$ and $K \hookrightarrow \overline{\Pi} \stackrel{\longleftarrow}{\mu} \overline{\nu}$
- b) $\Delta I = 1/2$ for leptonic decays, implying equal form factors in K^{+} and K°_{2} leptonic decays and a ratio of the respective decay probabilities $\int_{+}^{\ell_{ep}t}/\int_{\chi_{e}}^{\ell_{ep}t}=1/2$.
- c) μ e universality, implying equal form factors and equal coupling constants for the decays $K^{\circ} \rightarrow \Pi \ell \nu$, $K^{\circ} \rightarrow \Pi \mu \nu$, and a ϵ dence of the relative $k = 3^{1/2}$ rate of the type (1)

$$R(\xi) = 0.65 + 0.124\xi + 0.019\xi^2$$

if { is assumed constant.

The proposed experiment should obtain information on the behaviour and a better understanding of the important questions listed above.

We intend to use the counters - wire chambers system built by Cern-- Aachen group for the riangle m and riangle experiments. The system, at the present time, is under test at Cern and will be settled on the K° beam b soon. The study of the K° leptonic decay can be performed using the

same apparatus, and the same beam, with different triggering conditions. On the other hand, some of us are interested to continue the study of the K leptonic decay, after the experiment on K branching ratio and spectra in bubble chamber (4). In our opinion it is useful to compare results from completely different techniques.

We would like to point out that, without any change of the experimental apparatus and during the same running time, a considerable number of $K_2^o \to \pi^+ \pi^- \pi^-$ decays will be collected. (see Appendix)

Presents experimental situation.

The early attempts to fit the experimental data assuming constant form factors revealed important discrepancies. The data are now usually analyzed assuming a linear q^2 dependence:

$$f_{\pm}(q^2) = f_{\pm}(0) \left(1 + \lambda_{\pm} \frac{q^2}{m_{\pi}^2}\right)$$

Measurements of relative branching ratio $\Gamma(K_{\mu_3})/\Gamma(K_{e3})$ and muon polarization are most suited to draw conclusions on our problem.

Individual energy spectra are less sensitive and Dalitz plot distributions are not yet explored with sufficient statistics to overcome in trinsic difficulties due to not uniform efficiency.

A recent review (2) summarized in Table I, shows the inconsistency among the available experimental data, shas been taken as constant and calculated by taking an average over experimental data on branching ratio and polarization.

Table I

$$\begin{cases} (0) = 0.65^{\pm}0.2 & \text{using } R = 0.73^{\pm}0.03 & (R = \Gamma(K_{-3}^{\dagger})/\Gamma(K_{e3}^{\dagger})) \\ \S(0) = -1.1 \stackrel{\pm}{-}0.5 & \text{using } P_{L} = 0.96^{\pm}0.12 & (long.pol. of \mu.from K_{\mu_3}) \\ \S(0) = -1.2 \stackrel{\pm}{-}0.4 & \text{using } P_{T} = -0.32^{\pm}0.08 & (transverse \mu.polariz. in \mu. \pi. plane) \end{cases}$$

One can remark, for instance $\binom{2}{}$, that $\binom{5}{5}(0) = -1.2$ corresponds to a value R = 0.5, that is more than 7 standard deviations from the measured value.

On the other hand, with the assumption of linear dependence the best fit to experimental data is obtained with the choice of the values

The large values of λ_{-} is in disagreement with the current theoretical estimates (3) which provide no immediate explanation of so strong a dependence of $f(q^2)$ on q^2 .

The quoted analysis (2) underlines the need for improved experimental determinations of the Dalitz plot distribution in K mg decay.

The last experiments reported at the Heidelberg Internation. Conference on Elementary Particles (1967) do not contribute to clarify very much the situation. Taking into account the new results there presented (Table II)

Table II

$$\frac{\Gamma(\kappa_{e3}^{+})}{\Gamma(\kappa_{e3}^{+})} = 0.62^{\pm}0.04 \qquad \text{(Aachen, Bari, CERN, Padova collaboration)}$$

$$\frac{\Gamma(\kappa_{e3}^{+})}{\Gamma(\kappa_{e3}^{\circ})} = 0.76^{\pm}_{-0.08}^{+0.14} \qquad \text{(P. Basile et al.)}$$

$$= 0.71^{\pm}_{-0.07}^{+0.07} \qquad \text{(B. Aubert et al.)}$$

$$\lambda_{+} = 0.045^{+0.017}_{-0.018} \qquad \text{(Bellotti et al., from } \kappa_{13}^{+})$$

$$\xi = -0.5^{\pm}_{-0.3}^{+0.017} \qquad \text{(Basile et al., from } \kappa_{13}^{+})$$

$$\lambda_{+} = 0.023^{\pm}_{-0.017} \qquad \text{(Basile et al., from } \kappa_{13}^{\circ})$$

$$\xi = 1.0^{\pm}_{-0.7}^{+0.7} \qquad \text{(Basile et al., from } \kappa_{13}^{\circ})$$

$$\xi = 0.4^{\pm}_{-0.5}^{+0.5} \qquad \text{(Orsay)}$$

the following world averages are obtained:

$$\lambda_{+} = 0.023 \pm 0.008 \qquad \text{from } K_{13}^{+}$$

$$\lambda_{+} = 0.013 \pm 0.009 \qquad \text{from } K_{13}^{\circ}$$

$$\xi = 0.3 \pm 0.4 \qquad \text{from } K_{13}^{+} \text{ spectra and branching ratios}$$

$$\xi = -1.25 \pm 0.32 \qquad \text{from } \mu \text{ polarization in } K_{\mu 3}^{+}$$

$$\xi = 0.7 \pm 0.3 \qquad \text{from } K_{13}^{\circ} \text{ spectra and branching ratios}$$

$$\xi = -1.15 \pm 0.35 \qquad \text{from } \mu \text{ polarization in } K_{13}^{\circ}$$

from which appears the evident discrepancy between ξ values from polarization and from B.R.

It has to be noted that the available statistics for K° leptonic decay is one order of magnitude smaller than the corresponding one for K^{\dagger} decay (5).

Experimental setup

The apparatus is sketched in fig. 1 and is practically the same—used by CERN-Aachen group from the $\Delta \phi$, Δm (phase and mass difference $K_1^{\circ} - K_2^{\circ}$).

The K°'s from the neutral beam b_{13} decay in the volume defined by the scintillators \bar{S}_1 , S_2 . The charged decay products are momentum analysed by the spectrometer W_1 MW_2 . $W_{1,2}$ are magnetic core wire-chambers, and M, a wide gap magnet (30x200 cm 2 , \int B d L = 370 K G cm). Behind the spectrometer are placed a threshold gas Cerenkov counter (C) to detect the electrons and more than 10 iron interaction length (followed by a scintillator S_5) to separate muons from pions (M detector).

Two charged tracks are required to be present; one of them has to fire the electron or muon counter. Π and leptons have to cross two differ

ent counters; for this purpose the counter $s_{3,4}$ and Cerenkov are subdivided in 4 sectors.

The main parameters of the Cerenkov counter and μ detector are summarized below:

maximum angular acceptance ± 10

efficiency > 95%

wall thickness \(\nu \cdot 3 \) mm Al

 π feed-through $\sim .5.10^{-3}$

 μ -detector(for $P_{\mu} > 15$ GeV) efficiency \sim 90%

The trigger requirement is given by \overline{S}_1 S_2 S_3 S_4 . The S_5 and Cerenkov signals are recorded for the separation of the different decay modes. The wire chambers coordinates and counters informations are transferred to magnetic tape after a preliminary data elaboration performed by a 1800 - IBM computer on-line.

Monte Carlo calculation

A Monte Carlo calculation was done in order to

- 1) evaluate the experimental errors
- 2) determine the sensitivity of the experiment

A sample of K° were allowed to decay randomly inside the decay volume and the charged decay products followed through the experimental apparatus. The dynamics of K° \rightarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow decays is that predicted by a pure V - A interaction, with constant form factors.

The trajectories of the charged products through the magnetic field and their intersection with the wire-chambers and counters are computed.

We used different values of magnet current in order to have the den

sity of the Dalitz plot as uniform as possible.

Some indicative results are:

Average geometrical acceptance
∼ 20%

K° momentum resolution < 10%

Decay point coordinates resolution (cm) \pm 0.2 in normal plane

 \pm 2.0 along beam direction.

In **figs.** 4, 5, 6 is visible the effect on the Dalitz plot (fig. 4: events accepted by the spectrometer), of the muon detector p cut (fig. 5) and of the experimental uncertainties in the reconstruction procedure (fig. 6). Fig. 7 represents the K° momentum spectrum of the accepted events (P.S. b₁₃ neutral beam).

Neglecting the uncertainty in the magnetic field, the error on the charged particles momentum, due to wire chamber coordinates indetermination, is of the order of 1% half width (fig. 8).

There is a twofold ambiguity in the calculation of the laboratory energy of the K_2° from the measured momenta of the charged particles. Consequently there is a related twofold ambiguity in the calculation of the energy of charged particles in the K_2° cm. **system.** As usually done in similar experiments (6),(7) this difficulty may be overcome assigning to each solution a weight proportional to the jacobian of the transformation lab \rightarrow CM systems, to the assumed Dalitz plot density and beam spectrum.

A test of the sensitivity of the experiment as a whole was made calculating by the standard likelyhood method the parameters $\xi(z)$, $\lambda_+\lambda_-$.

The "reconstructed" events were processed by a likelyhood program used in the X2 experiment $^{(5)}$. Each Dalitz plot bin was corrected by the detection efficiency of the apparatus (spectrometer and μ detector).

For simplicity the lower K° momentum solution was choosen for each event in this preliminary analysis. The more refined 2 solu -

tions averaging procedure described above will improve the final precision in the form factors parameters determination.

The maximum likelyhood was found very close to the generated point, showing no systematic effect of the reconstruction procedure and of the experimental uncertainties.

In fig. 9 is shown the effect of statistics: the maximum of the curve b (higher statistics) reproduces with satisfactory agreement the (o) value from which the events were originated in the Monte Carlo.

Background

The good resolution in the K° decay coordinate reconstruction will permit to reject with high efficiency triggers due to random coincidences of two charged tracks.

The neutron background was found to be negligible in the present CERN - Aachen experiment with optical chambers. Another possible source of background are the $K^o \to \eta^+ \eta^- \eta^o$ decay able to trigger the system via $\pi \to \mu$ decay in flight or via the feed-through the Cerenkov counter or via χ conversion. The reject of the events fitting the χ hypothesis will eliminate this background with a loss of the order of 1% of good events.

Events rate

The counting rate was evaluated assuming:

P.S. proton beam intensity

Solid angle defined by the beam collimator

K° beam intensity in the decay volume

decay volume length

The resulting number of counts is about:

sufficient to guarantee a very high statistics in a reasonable P.S. time, also taking into account a safety factor.

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Pions spectra in the decay $K_2^{\circ} \rightarrow \Pi^{\dagger}\Pi^{\dagger}\Pi^{\circ}$

The experimental apparatus described for the K° form factors determination permits to collect in the mean time K° $\rightarrow \pi^+\pi^-\pi^-$ decays.

The theoretical description of $K_{\Pi 3}^{\circ}$ decay is not very advanced. The reason is that little is known about a matrix element which involves only strongly interacting particles.

From a phenomenological point of view, an often used approach to this decay mode is the "linear matrix element" approximation:

$$M(X,Y) = a + b X + c Y$$

where

$$X = -\sqrt{3} (S_1 - S_2)/2 m_K Q$$

 $Y = -\sqrt{3} (S_3 - S_0)/2 m_K Q$
 $Q = m_K - \sum_{i} m_i$
 $S_i = (P_K - P_{\pi_i})^2$ with i=1,2,3 for $\pi^+\pi^-\pi^2$

If CP invariance is assumed, M does not contain odd powers of X:

Thus, assuming CP invariance and no strong π - π final state interaction, the spectrum is approximated (neglecting quadratic terms) by:

where:

is the normalized invariant phase space so is the slope parameter

The main problems connected with the pions spectra in $K^{\circ}_{3\pi}$ decay

are:

- a) To reveal, if it exists, the quadratic term in the matrix element. This problem needs high statistics and high resolution. The existing ${48}^{(8)}$ are not accurate enough to draw useful conclusions about the presence of the quadratic term.
- b) test of \triangle I = 1/2 selection rule, which leads to the following prediction for the slope parameter of the odd pion spectrum in τ° , τ' and τ decays

and for the decay rates

R (+-0) = 2 R $(+00) = \frac{1}{2}$ R $(++-) = \frac{9}{2}$ R (000)By the comparison of the odd pion slope in t^0 and t^0 the presence of an I = 2 state may be investigated and informations otherwise not available may be obtained.

The existing data (10), though in agreement with Δ I = 1/2, do not exclude a Δ I = 3/2 adimixture of the order of 15% (8).

c) Test of CP invariance in K(+-0) decay. The consequence of CP violation is an asymmetry between $\pi + \pi$ corresponding to a value $\neq 0$ of the coefficient b in the matrix element M.

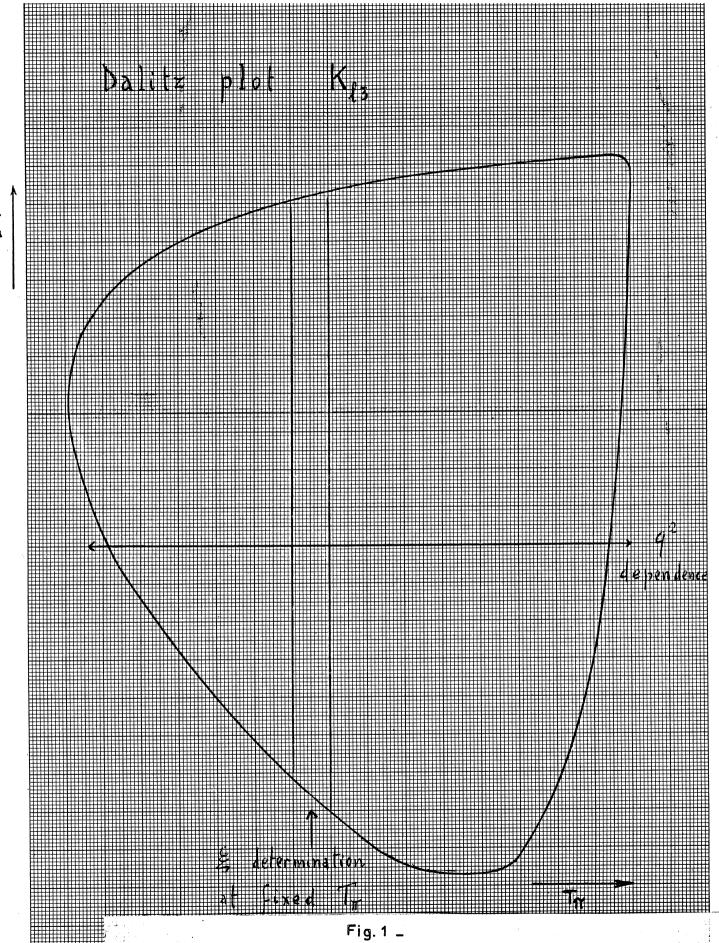
An experimental indication of different slope for π^+ , π^- spectra was found (2) in bubble chamber, with inconsistency at 99% confidence level. A similar experiment (1) in spark chambers with comparable statisties does not confirm this result.

d) Test of the presence of a ππ final state interaction (single interaction or rescattering), to explain the spectra deviation from a pure phase space distribution. Such interactions in many models lead to a non linear matrix element.

In conclusion we can remark that, all the experimental results so far obtained are based on samples of the order of few thousands events (8). With the proposed experimental apparatus the statistical accuracy does not represent any more a serious problem.

The expected event rate, in the same conditions assumed for the K $_{\rm e3}$, $_{\rm rate}$, is in fact

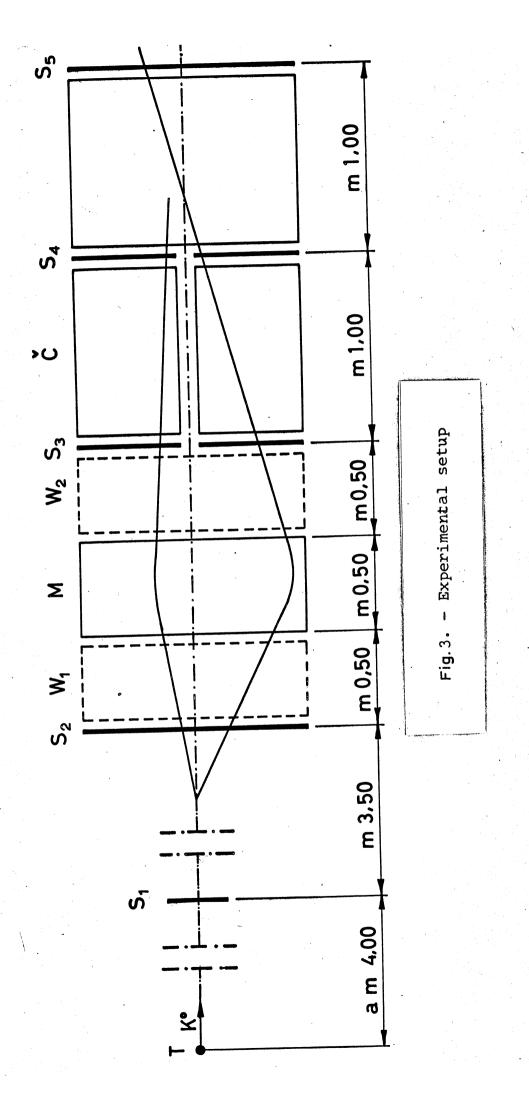
which corresponds, in few PS days, to at least 2 orders of magnitude more than the existing data.



K13 Dalitz plot

 ξ determination along vertical strips (at constant T_π) q^2 dependence of ξ along horizontal lines.

dependence of \ along horizontal lines.



```
6
   5
                                          ######### 24#2+3++3224+2++2+ 522
   3
                            ***+3+++3222+ 23+742+2+24++826433626273
   2
                       *+++225223384222+2322 3592352543833324538425
   1
                   **+335+2444443333+32442 6 543 285+65A2725659552
  40
                **272+5 233++82 723+54 586+36D5759B327497262482489+
   ∮ Q
             *54+324324+74224435638333825449355537965559423667669
   8
           #42333244426642335B77+7899692544258276868773A7868D976F
   7
          *53 25455254243576 43356345293532559588575678529A94AA4B
   6
         +2+6+2327247+9 48+2432+4D68468+389A6352H3C795749788B7495
   5
        *+232522+77233645667A45757537675338A597597B63B544ACE67948
   4
         2 3433368 5247335+C684885563AEC4B684884G997D86675BBE79A9
   3
           634344944327627677578E547AE68992C329CJ9A88DA745EDC9EB9
   2
        +4+3223552+2A8773668588988987AD889975755F9560JE5H9LANC7N5
   1
           2423+346434656696A986683C977498ABF7364U57K7A97CBEEAHMD
  30
       22+334 5+36459878488785678659767A87J465ED78E98JEC7CJ7DA6H
   9
       #22243 2222 768536 557996467797966BB8566E9FF4A5975/GCLDEK
   8
         332+3 +22354C3549A44579A6C4AG68C796768H69DCCBDCGJGACDCF
   7
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   6
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   5
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    4
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   3
              4435366+57266B4575L4568CAQ8BAJEAFBLQGGFGEBMBRFFJEG2
   2
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  20
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               #2+3344456384366+D895686867C9DE9HC/HBGQLB6EMQGFJ6
   8
                * 54+3 64586D47C9758AF67B8DBCC8E9H5DFFBCKBKEBMN+
                 + 366344894665846D88078ABHQAB5PE9F7JQDEDETCMCP
                  **25+354667C58655D8765E9F7D53LAGDLPHHGFRKJPKG
                    32+33484453447A7J87BdBCD97HGB5DFMEDLJPCFMK5
                     -#3:3472338Ç997D6A64EEB7587GC5CÜKBADMHMEKQ
    3
                      ++4+7449557567GA68DA86960F0F09QMDANKKNEE
    2
                        *++3273E8A57B068A9B979H98EH6QFGMESHJQ+
    1
                         #28+655846679363C88DBQ9977GS9EKHPMPG
  10
                           32 2+9366F84B7FAC78DADGFHG8KEDULNS
    9
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    8
                               +4+5559036BA6545NGAJBRCMJEKHA5
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    6
                                  *+626657CA744A628AF76DEMG
    5
                                    #+++4884+5702785HGQJ8C+
                                      #3325645 93347BA9B73
    3
                                         +++523735/797433
                                                                 71
    2
                                           +++6+++422+
    1
    C
                                      3
- CHAN.
NOS +0 123456789012345678901234567890123456789012345678901234567890123456789012345678
 CAPEX
       +23456789ABCDEFGHJKLMNPQRSTUVW
*MAXNO
 THE FRAME (+0) CONTAINS THE OVERSPILL
                                         14540 ENTRIES IN ALL
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Fig. 4 _

- Dalitz plot of $K_{\mu_3}^0$ events accepted by the spectrometer (T μ vs T_{tt}). Events produced according vector matrix elements with $\frac{\xi}{\delta}$ (o) = 0, λ_+ = 0.02, λ'' = 0.037

```
7
    6
   5
    4
                                           ***+***2**22
    3
                                   ****++2 ++ +3 ++3++3++++2 +2+ 42+
   2
                             ***+2++322+
                                           22+742+ +23++724433525+63
   1
                       *+++2+4+23353222
                                          322 256+24 4+38223+45244+4
  4.0
                   **+224++333233+22+3+332 5 243 +63+4462425559442
                ***62+3 ++2++72 523+54 576+35A455YA325253+4++62367+
              *34+2 4224+632243223343225+4346+43525462347323526247
            #3+23++343+444+335954+667568+433+54265656442727349755B
    6
           #4+ 24252233+3+464 422242342834225+54643342673276829648
    5
          +2+3++++4240+4 26 243+ 2847255+274442428+944332646884474
         *+22+522+37233435436644734335445+267386205862523489837634
   3
         2 3322346 3236334+928347+2437A6+9254583U4639552549746767
   2
            4242237423+44+6554359942498449529 278466774/5344886675
        +2+322244++27643+5464457646557946573264+9544/994E6D8F84E5
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  30
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   9
            22 3 32448534+773834573 85455668434A933848C965993864C
   8
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                +22 6463 2 5255522243766+455544464BH2/34+2586C76D
                 2 2+3A+326533555048+8C453482525B+77674666A946775
          +22+3
   6
           .+ + +2++++22+4+++3+2967534737258356844447836567996976
   5
            3232+3+++424633447736563679653964583A64899876909597AB
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   3
   2
              4 3++34 +2+2372363D32536563+67A456859AB56784D69A442
   1
               +234++ +6 24225334++345445+8+65254A43484646E68479
  20
                 4 3+42+3326 2456424474+635346633+6459+663888395
   9
                 - 3++32233443+283+427A44978336475297555557856645
               ** +2+2++3+22 23+345+553245444548448+9C7633A99574
   7
                 +2++ 5+3447 35452336438655765638 46564986+254
   6
                 # 23222+23 2432333426+55+7575+97253A67567A4637
                        2+2++43342+5545+336+65 9 42C48354A76674
   5
   4
                                 5225#24358633676 +64545874+97+
                    ++++2+3++++
   3
                     *+ +23++++2243+422+7422 2353234B224972755
   2
                      +*+ 3++434+ 2234++63+2 337523+9654355645
   1
                        * +++3+5 3323+23+45+332++34 844557465+
                             + +2223+322 35+++ +2+4+7 3462574
  10
   Ò
                                ++ 24+ +33 4 22+2333+++4635#
   8
                                 +22+++ 2 24 33+4+2+22233+226
   7
                                           ·++ 2322+4253+5+3+
                                                   ++2 222 2
   5
                                                  #33+++
   4
   3
   2
   1
   n
CHAN.
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CAPEX
MAXNO
       +23456789ABCDEFGHJKLMNPQRSTUVW
```

THE FRAME (-0) CONTAINS THE OVERSPILL 6804 ENTRIES IN ALL

Fig.5_

⁻ Dalitz plot of $^{\circ}_{\mu_3}$ events. Only events with $p_{\mu} > 1.5$ GeV/c are retained (muon detector threshold). The effect of this cut is visible in the low μ energy region.

```
50
  8
  6
                                         -+2 ++ +3323*+3++++2+*++
                                     2 2
  5
                                  2+ 3+2 4+2++533+2+242 2222 +++2+
                           ++2 33+A53622543364323+ 2 +3++2343 5
  3
                         42435365+2359+2424343 3523++6342+233542
  2
                  2+2+393633553+24+483244242344+944+9+623/3332232+
  1
             22 242326824847524624 45326+2734333536+24323* 55433
  40
          ++ 52666634356546+266455433784343825A426545A+64353223+++2
  9
            343424764266354456325+3456524343565648728534542469+63++ -+ -+
          +5454 244A42584475565+5A98 (25+245+25753556337445473 3 5+++
         43++24237556334855475644306558635245886/2435936A4 22263 242 ---+
  6
        3443432735+43565642556672734595772448452/6+5575A65646232+ 2+ -+
  5
        #+3B432+5845375652A9566B57+3427B493AB56258395933B6382735433+
  4
      +3+35564 4554567262624437986354843455645A964A4682332722223+2
  3
         22436363A5+4626374223634+3795675345236389893496D693424+2
  2
         2++34+495+8365442467943559945487946404455884598476554 23+++++
   1
      ++2+3434324528535455357 536656+9257A4A6A75894733A6736622242
  30
         +++2433+5435+73425354 776635588428562746A56648643356265
  9
           42+ 237+4575845 4B5384772399567426365A5546B63+4C3464+23++ 2
  8
         7
             2 5+ +2442+333263837625642475776666749987255545425+
  6
            2+32+433252323+364 6647674454669777854633B285822243++ + + +
  5
           *++3 34345242+5+5345454256773925E5969489++675426853+3423 -+
   4
            +2 +24 3+2 +4643287537+6227957925A56/77759445+4+244+++
   3
              + 43+3++26423+5646367+587375235545344263378+4233+ +3 +
   2
             +2 32224237 324 2253427645533367448385953D33333+425+2+
  1
                 2+54+22455234+28543575A3468823527775442+75 36 3+++++
  20
                +2 2+++4+52+226269 5423432337 6747728235+26622#23
   9
                    -+344+2 4++ 25+ 35 345A423334752563363 3 4+3+
   8
                     +2 3323226+2 5226275577474 /6/595+ 673++
                   2 3 ++ +3333 3476 +2+2435+ 56632396626224+2 2 +
   6
                    2422+2+32 342 +235 4+43543325343+363 2353*+
   5
                       +2+32+2 ++ 22+ 22+722332338544+24+52
                          2++53+33664+26+ :2++23243+35432332+
   3
                         32+ +542+2++24+ 2 +332+3424562+4253+
                                                                    2
   2
                                      +3+2+3 +22343223+322++ ++
   1
                                        +4 2222+ 4+324 ++
  10
                                        + +2++323 3+
   9
                                       + 2++2+++2
   8
                                        2
                                     . 3
   7
                                     2+22
   6
   2
   1
   0
CHAN.
NOS -0 1234567890123456789012345678901234567890123456789012345678901234567890123456789
CAPEX
      -+23456789ABCDEFGHJKLMNPQRSTUVW
MAXNO
```

. THE FRAME (=0) CONTAINS THE OVERSPILL 6804 ENTRIES IN ALL

Fig. 6 _

- Final sample of reconstructed events, experimental errors taken into account.

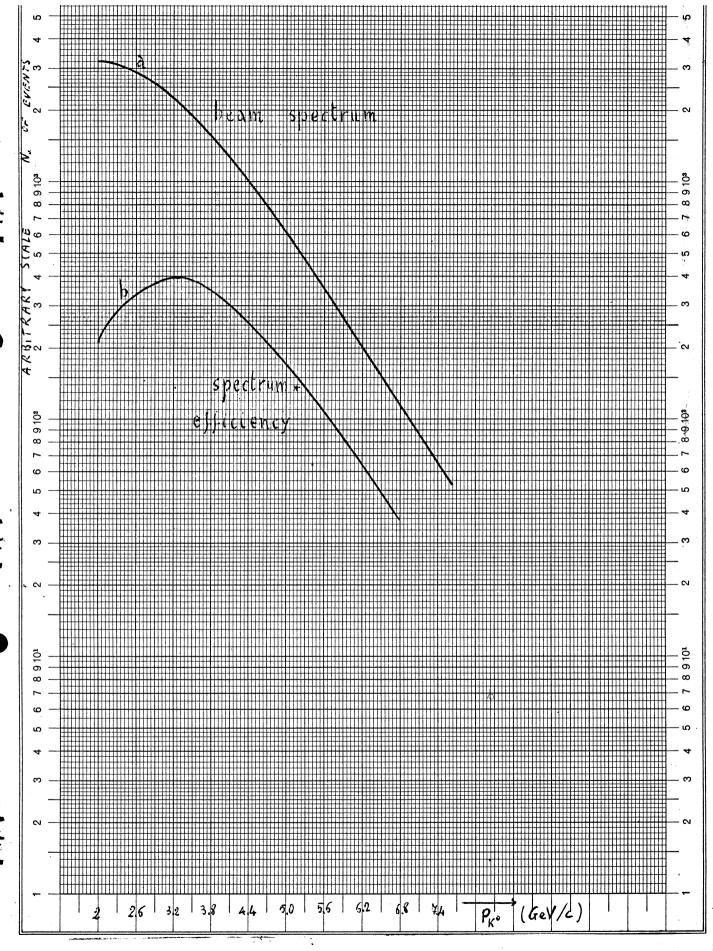
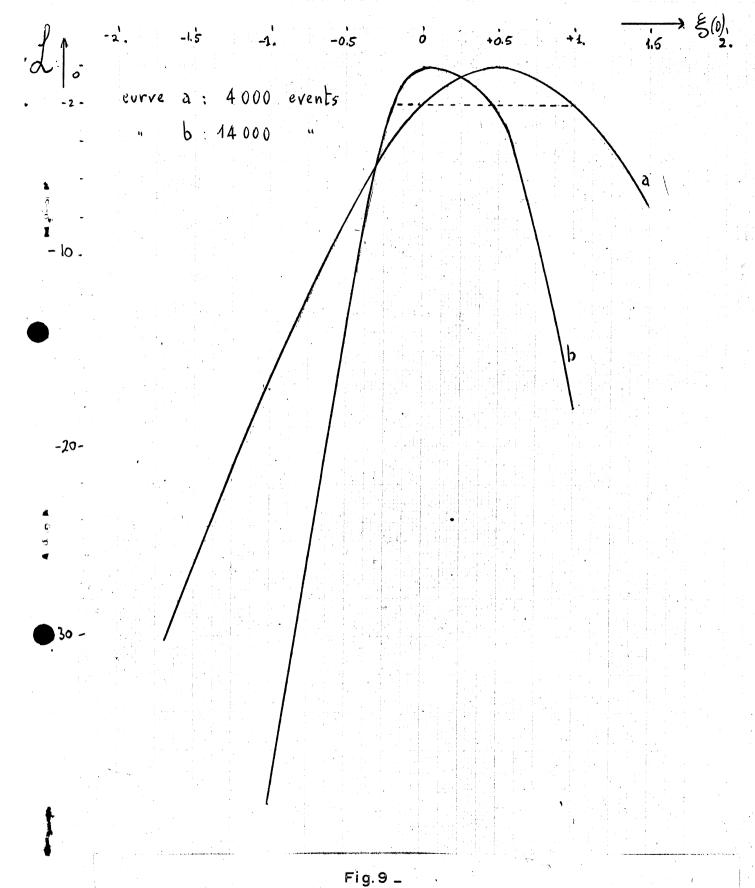


Fig.7_

- K^O momentum distribution of the accepted events (curve b).

Curve a is the neutral incident beam spectrum.

```
6746
                              X
2911
                              X
2845
                              X
2769
                              X
2698
                              X
2627
                              X
2556
2485
                              X
2414
                              X
2343
                              X
2272
                              X
2201
                              X
2136
                              X
2059
                              X
 1988
 1917
                              XM
                             1 X X
1846
                             XXX
 1775
                             X \times X
 1704
                             XXX
 1633
                             XXX
 1562
                             XXX
 491
                             XXX
 1420
                             XXX
 1349
                             XXX
 1278
                             XXX
 1207
                            MXXXM
 1136
                            XXXXX
 1065
                            XXXXX
  994
                            XXXXX
  923
                            XXXXX
  852
                           MXXXXXM
  781
                           XXXXXX
 471 E
 4639
                           XXXXXXX
                           MXXXXXXX
 568
                          MXXXXXXXX
 4497
                         MXXXXXXXXXM
  426
                        MXXXXXXXXXXX3
  355
                       6XXXXXXXXXXXX
  284
                      MXXXXXXXXXXXXXXX
  213
                 1 MMMXXXXXXXXXXXXXXXXXMMMM
  142
       71
                           -20 +20
SIGN
                            11311
                   11112344717080753221111
CON-
        122223357711271129307879309835120875532221111 1 1 1
TENTS
       91339534721594796247464482937396433160499582429254725334257242411 21
      .0
                                      3
                           2
CHAN.
       12345678961234567896123456789012345678961234567896123456789612345678961234567896
NOS
                                          111111111122222222233333333333444444
LOWER
       2221111111111
                                 1234567890123456789012345678901234567890123450
       2109876543210987654321
CHAN.
       5
LDGE
       . 0
       n
                                                                87.00 NOR OVERFL
                                  NOT INCLUDING UNDERFLOWE
                      15240.00
CONTENTS ALL CHAN. =
                                  Fig. 8 _
            - Absolute error in lepton momentum determination
                                  preconstructed).
              (\Delta P_1 = P_1)
```



- Likelyhood analysis on reconstructed events with experimental errors folded in.