VOLUME 19, NUMBER 17 PHYSICAL REVIEW LETTERS 23 OCTOBER 1967

MEASUREMENT OF THE BRANCHING RATIO FOR THE DECAY $K^+ \to e^+ + \nu$

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This experiment performed by the Oxford group on the 7 GeV proton synchrotron, NIMROD, at the Rutherford Laboratory in 1967 gave the first usefully accurate measurement of the $K^+ \to e^+ + \nu$ branching ratio:

$(1.2\ ^{+0.5}_{-0.3})\times10^{-5}$. The result was in good agreement with the prediction of V–A theory. The group went on to measure the branching ratio and positron momentum spectrum in 17,000 cases of $K^+ \to \pi^0 + e^+ + \nu$ decay, finding very good agreement with pure vector coupling and the semi-leptonic $\Delta I = ½$ rule.

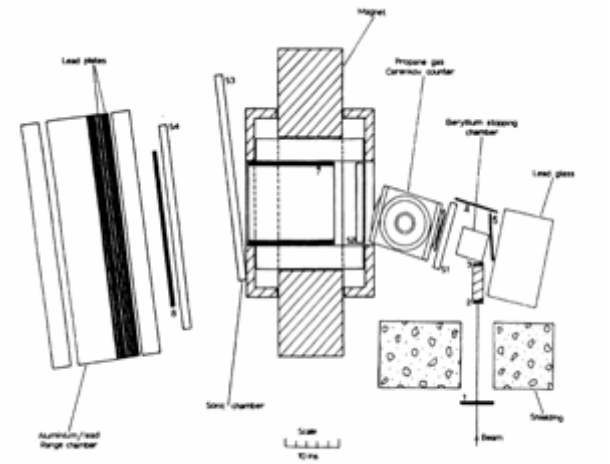

FIG. 1. Plan view of apparatus.

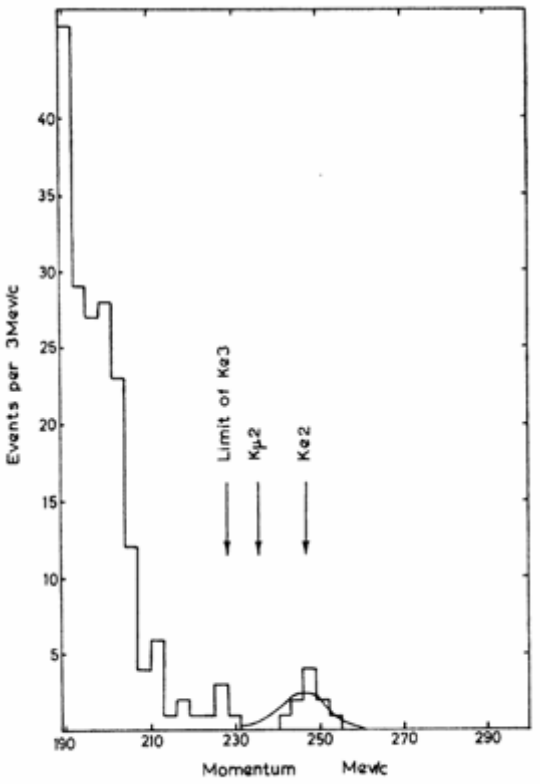

FIG. 2. Final momentum spectrum for electrons

A STUDY OF NEUTRAL FINAL STATES IN K^- p INTERACTIONS IN THE RANGE FROM 690 TO 934 MeV/c

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Optical sparkchambers were used in this experiment performed on NIMROD in 1972/73 to identify K^- p interactions leading to neutral final states: $\Lambda\pi^0$, $\Sigma^0\pi^0$, $\Lambda\pi^0\pi^0$, $\Lambda\eta^0$ and $\Sigma^0\eta^0$, all pure I-spin states difficult, when not impossible, to identify reliably in hydrogen bubble chamber experiments. An energy dependent, single channel partial-wave analysis was performed on the 250,000 events recorded. In $\Lambda\pi^0$ the data verified the existence of the S11(1750) resonance and also confirmed resonances in the S01 and D03 waves for $\Sigma^0\pi^0$ at 1700 and 1670 MeV.

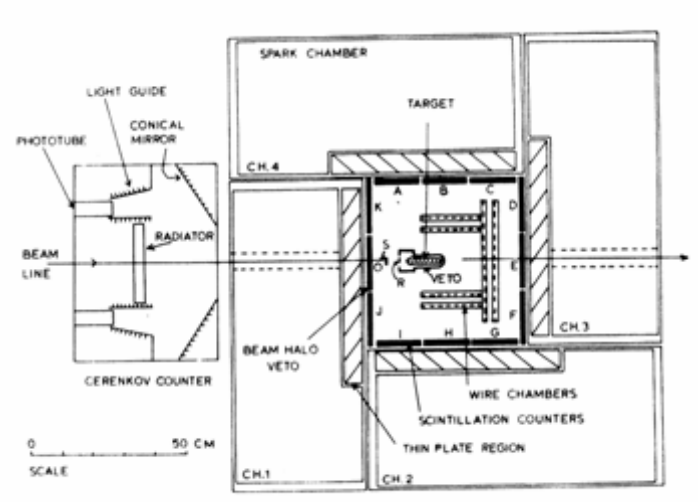

Fig. 2. Plan view of the apparatus.

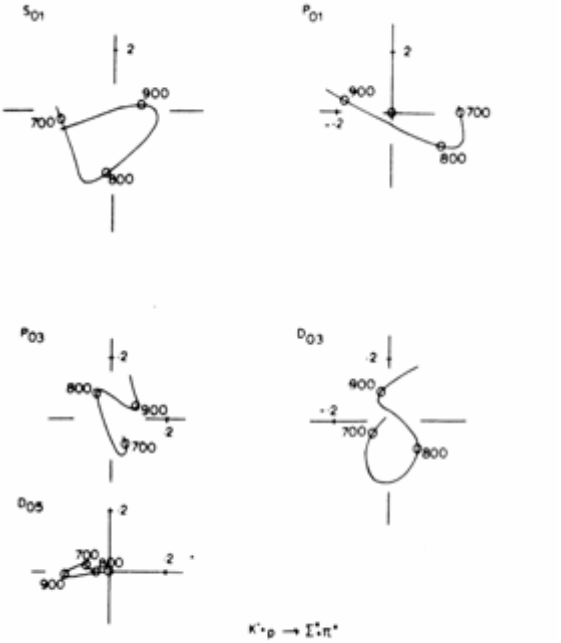

Fig. 16. The partial wave amplitudes for the $\Sigma^0\pi^0$ channel.

VOLUME 41, NUMBER 9 PHYSICAL REVIEW LETTERS 28 AUGUST 1978

Muon Scattering at 219 GeV and the Proton Structure Functions

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Starting in the mid '70s, members of the Oxford group joined American collaborators in early studies of the scattering of high energy muons at the Fermi laboratory. The results of this experiment strongly reinforced the evidence of scaling violations found in earlier muon experiments at Fermilab and extended it to higher q^2. The form of violation was in good agreement with that already observed in high energy electron scattering at SLAC, and was consistent with QCD predictions for a scale parameter Λ in the range 500 to 700 MeV. It indicated that quarks carry about half the total proton energy-momentum. Oxford later continued this programme of research within the European Muon Collaboration (EMC) at the CERN SPS.

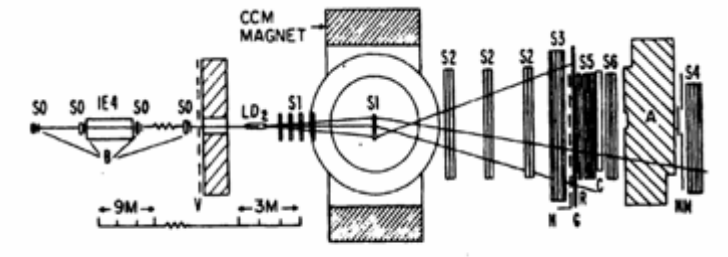
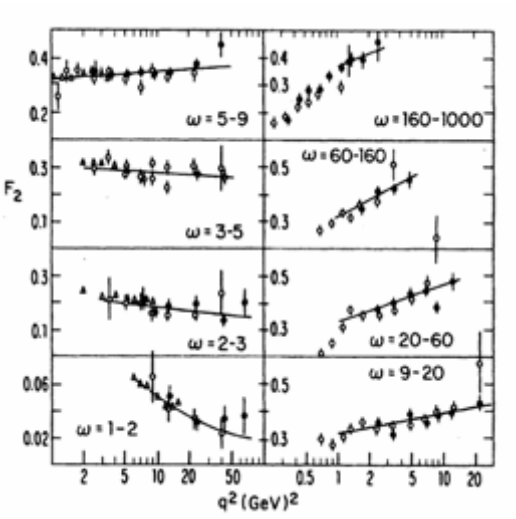


FIG. 1. Schematic layout of muon scattering spectrometer. S0 and S1 are multiwire proportional chambers; S2, S3, S4, S5, and S6 are multiwire spark chambers; B, G, H, M, N, and V are counter hodoscopes; 1E4 and CCM are magnets; R, C, and A are absorbers.



DIFFRACTIVE PRODUCTION OF 3π STATES AT 63 AND 94 GeV

The ACCMOR Collaboration

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The ACCMOR collaboration designed and built a multiparticle spectrometer which was installed in an un-separated high energy beam during the early stages of the CERN SPS operation early in 1977. This paper reports a study of some 600,000 events of diffractively produced 3π states in the mass range 0.9 to 2.3 GeV/c from the reaction $\pi^- p \rightarrow \pi^- \pi^- \pi^+ p$ at 63 and 94 GeV.With a clean source, good mass resolution and an order of magnitude greater statistics than earlier experiments, the ACCMOR group made a detailed partial-wave analysis of the final states and were able conclusively to demonstrate the existence and main parameters of the $J^P = 1^+$ A_1 meson of mass 1.3 GeV, width 300 MeV, and the $J^P = 2^-$ A_3 meson at a mass ~ 1.7 GeV, width 320 MeV. In addition to the dominant S-wave ($f\pi$) decay mode, the A_3 was shown to decay to P-wave ($\rho\pi$), D-wave ($\varepsilon\pi$) and D-wave ($f\pi$). Indications were also found for new states which it was suggested might correspond to radial excitations in the quark model. In a later publication (NP B187, 1, (1981)) ACCMOR reported a study of 200,000 events of diffractive $K^-\pi^-\pi^+$ production in 63 GeV K^- p interactions. This experiment made a major contribution to understanding the two $J^P = 1^+$ Q-meson states and suggested the existence of at least one 2^- meson in the L-region at about 1.8 GeV.

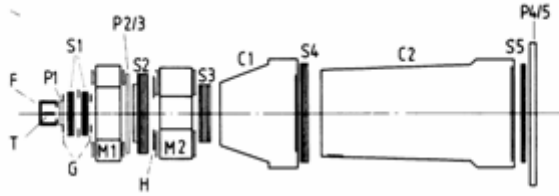
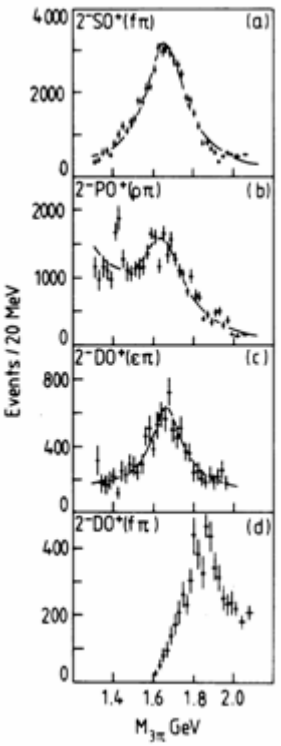


Fig. 1. A plan view of the spectrometer. The 50 cm long liquid hydrogen target (T) is shown surrounded by a box of lead-scintillator sandwich counters (F). Sandwich counters G and H are also shown. The two packs of wire chambers S1 are separated from the chambers S2 by the first bending magnet (M1). Following the second bending magnet (M2) are the two Čerenkov counters (C1, C2) and three packs of spark chambers (S3, S4, S5). The double hodoscope of scintillation counters P2/3 measured multiplicity after the first magnet, and a measurement of multiplicity after the target could be obtained from the double proportional wire chamber P1. The spectrometer was approximately 30 m long.



Intensities of four fitted 2^-0^+ partial waves as a function of 3π mass.

TRIPLE-JET STRUCTURES IN PROTON–PROTON INTERACTIONS

CERN–Columbia–Oxford–Rockefeller (CCOR) Collaboration

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In the late '70s through mid '80s the Oxford group collaborated with CERN and US groups in studies of high transverse-momentum phenomena in pp collisions at the CERN ISR. This paper describes events at 62 GeV in the centre-of-mass giving rise to three energetic jets similar to the 3-jet events in $e^+ e^-$ annihilation which had recently been reported by experiments on the PETRA collider at DESY. Like the $e^+ e^-$ events, the pp data were consistent with production by a QCD mechanism in which one of the two leading quarks in the collision radiates a gluon. Although only 782 triple jet events were seen out of a total of 42,800 two-jet events, this was estimated to be 3 to 5 times greater than would be expected by scaling the $e^+ e^-$ data.

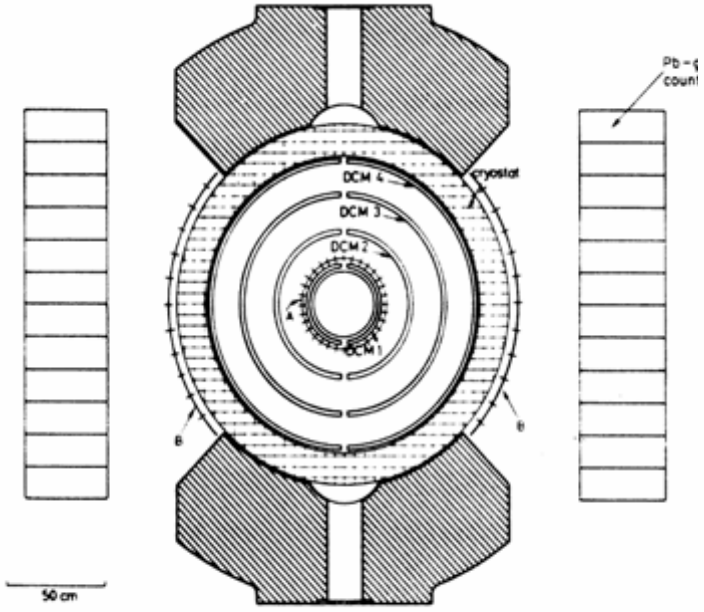
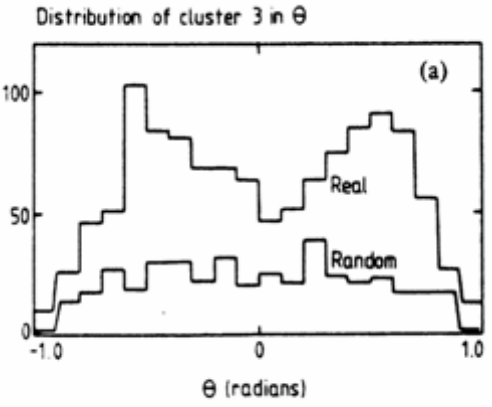


Fig 1. A view of the apparatus normal to the beams.



Distribution in polar angle of jet-3 relative to the plane normal to the colliding protons. The double peak structure is associated with an anti-correlation with θ for jet-2 as together they balance momentum with trigger jet-1.