11. ACNO Collaboration: "The Reactions $K^-P\to$ pseudoscalar meson$+\Lambda(1520)$ at 4.2 GeV/*c*," paper # 396.
12. ACNO Collaboration: "On quark model relations for Hypercharge Exchange Reactions," paper # 397.
13. R. G. Astvatsatarov *et al.*: "The Differential Cross Section of the Reaction $\pi^-P\to\eta^0n$ at a Momentum of 3.3 and 4.75 GeV/*c*," paper # 140.
14. O. Goggi *et al.*: "Analysis of the Charge Exchange Reaction $PP\to(P\pi^+)(P\pi^-)$ and of $\Delta^{++}\Delta^0$ Production at the CERN ISR," paper # 1072.
15. R. M. Robertson *et al.*: "Forward P and Δ^{++} Production in the Reaction $\pi^+P\to P\pi^+\pi^-\pi^+$ at paper # 333.

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A 1 Diffractive Dissociation Processes

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Diffractive dissociation processes are most readily and convincingly isolated at the highest available energies, namely $\sqrt{s}\gtrsim$ a few hundred GeV. This has been demonstrated in work from ISR and Fermilab on nucleon–nucleon reactions that has been studied by the missing mass recoil technique, *e.g.*, gas jet work and detailed studies have been reported at previous conferences on the dynamical structure of explicit low multiplicity channels, *e.g.*, $p\to p\pi^+\pi^-$, $n\to p\pi^-$ and $p\to n\pi^+$. It is somewhat suprising to contemplate the paucity of data on the high energy dissociation of mesons. Certainly, the techniques and beams have been available for a long time at Fermilab. Undoubtedly, this area of physics has suffered as a consequence of frenzied and largely unrequited efforts at new particle searching. The author stands exposed as a flagrant culprit.

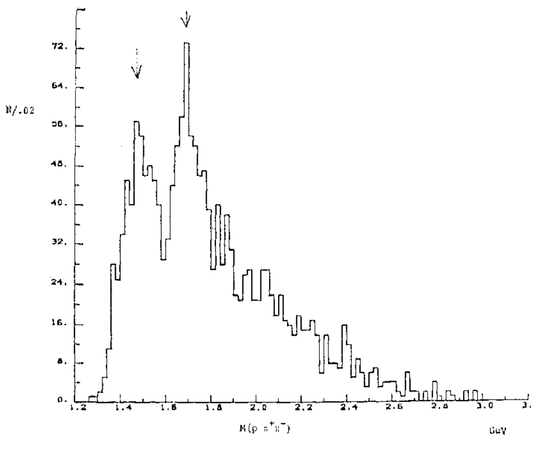

Fig. 1. The $P\pi^+\pi^-$ mass distribution for events with $\cos\theta_1<0$ and $\cos\bar{\theta}_1>0$.

The Amsterdam group (paper 401) has reported on the analysis of 8192 events of the type $\bar{p}p\to\bar{p}p\pi^+\pi^-$ recorded in the 2m CERN HBC at 7.23 GeV/*c*. Diffractive dissociation has been isolated from double resonance production by cuts applied to angular parameters. Figure 1 shows a selected histogram which displays the now canonical dissociation mass spectrum featuring peaks at 1450 and 1690 MeV.

The Aachen–Berlin–CERN–London–Vienna Collaboration has contributed paper 97 which describes a method for isolating diffractive mass spectra in the low energy regime. The method is applied to data on K^-p interactions at 10 and 16 GeV/*c*.

The Amsterdam–CERN–Cracow–Munich–Oxford–Rutherford Collaboration, paper 696, has reported the results of an experiment to study the reaction, $\pi^-p\to\pi^-\pi^-\pi^+p$ at a beam momentum of 93 GeV/*c*. A 3 body phase shift analysis along the lines pioneered by Ascoli has been applied to the data and the $A_1(1^+)$, $A_2(2^+)$ and $A_3(2^-)$ components have been isolated. Figures 2 a, b, c show the composite momentum dependence of these major terms. It can be seen that the A_1 and A_3 dependencies on momentum are comparable and in fact, may well be flat above $\sim$30 GeV/*c*.

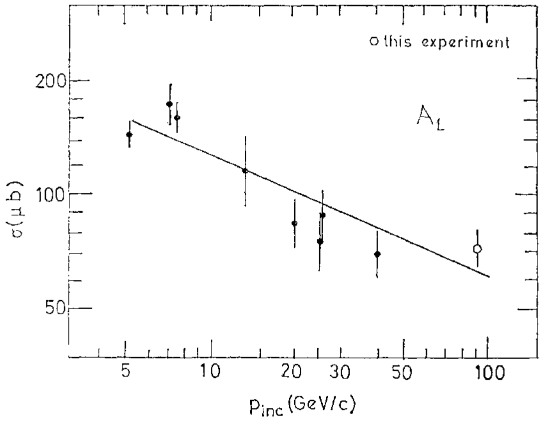

Fig. 2a.

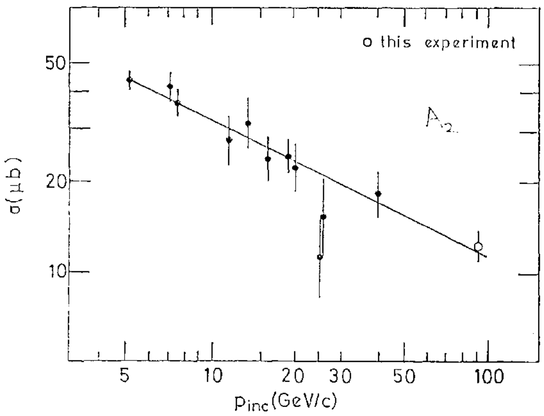

Fig. 2b.

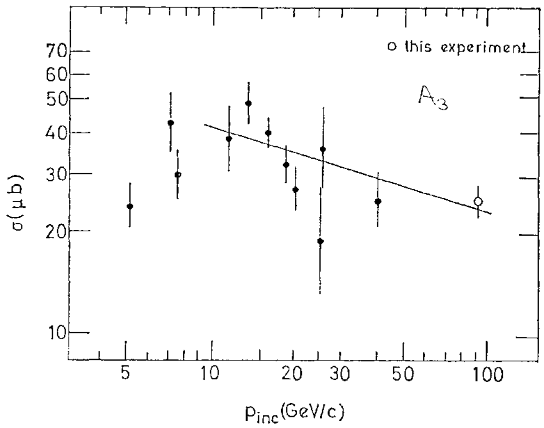

Fig. 2c.

The A_2 dependence is more rapidly falling. It is still suprisingly shallow for attribution to a Regge exchange process. Before this new work it had been conjectured that A_2 production might be produced diffractively provided that Pomeron coupling had a tensor coupling term. The issue cannot be said to be totally resolved. It would be highly desirable to have a single experiment and analysis straddle the regime (30–300) GeV. It is undoubtedly symptomatic of the times that this collaboration has joined the ranks of charm particle searchers.

The reaction $K^-p \rightarrow K^-\pi^+\pi^-p$ at 32 GeV/c has been studied by the France–USSR–CERN Collaboration (paper 1054). Both K and proton dissociation are sutdied; K*'s and D's are in evidence. A 3 body spin parity analysis is not reported. The momentum dependence of $d\sigma/dM$ is illustrated in Fig. 3. Again higher energy data would be desirable.

We turn now to some sophisticated work on nucleon dissociation undertaken using the S.F.M. spectrometer at I.S.R. Consider first, the work of Paris–CERN (paper 1071) on double diffractive dissociation. By using p–d

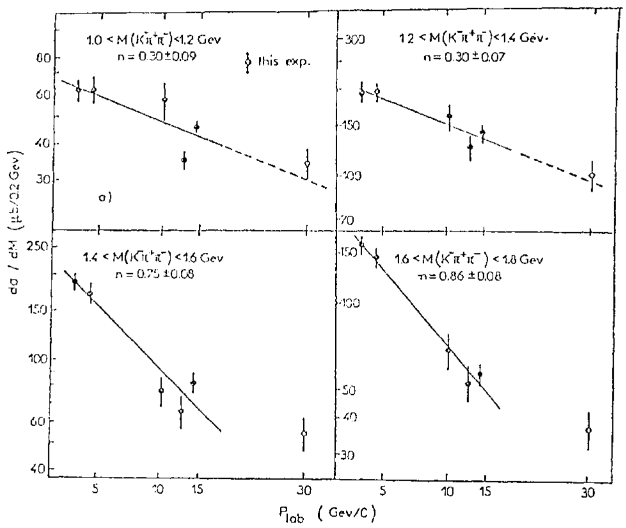

Fig. 3.

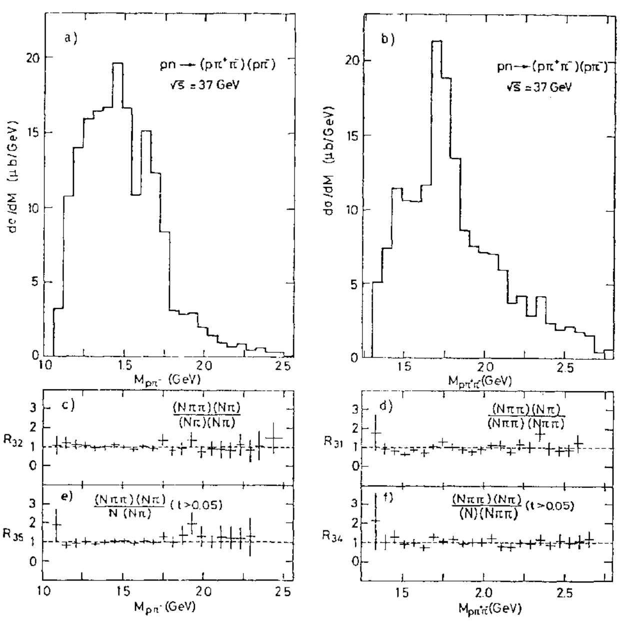

Fig. 4.

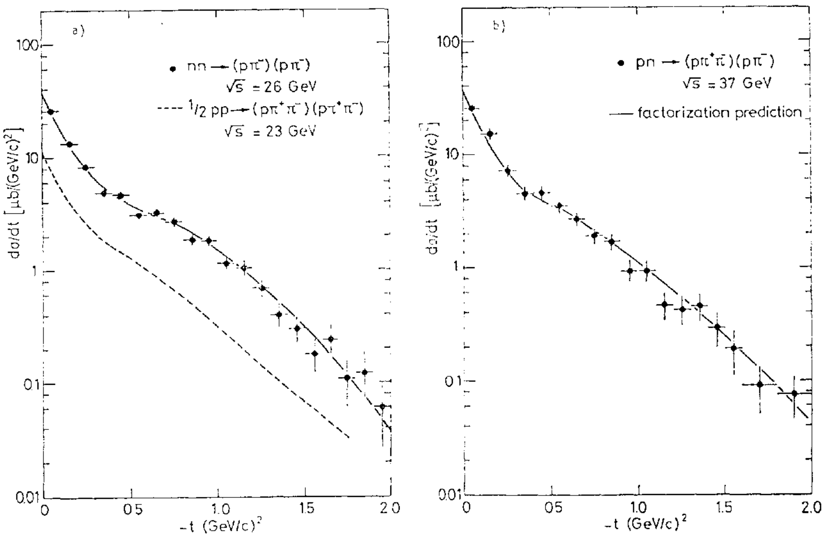

Fig. 5.

and d–d colliding beams, n–n interactions at $\sqrt{s} = 2.64$ GeV and n–p interactions at $\sqrt{s} = 37.2$ GeV are studied. Factorization is convincingly demonstrated in the lower portion of Fig. 4 for a substantial range of masses. Neutrons can dissociate into 3 prongs thus avoiding the irritation of neutral detection. The key point is that factorization is tested by considering the two dissociation channels and without requiring the inclusion of elastic diffractive scattering. The authors emphasize the point that the elastic channel has a substantially different impact parameter description. It is naive to test factorization when the t structure of the dissociation channels is so markedly different from that of the elastic channel. Figure 5 shows t dependencies. Factorization predicts that curve (b) should the square root of the product of the two curves illustrated in (a). This is nicely confirmed. Figure 6 shows that deuteron collision data is in good accord with previously published p–p results for the double dissociation cross section.

The CERN–France–Heidelberg–Karlsruhe Collaboration, paper 274 provides author impressive S.F.M. spectrometer experiment. The reaction $pp \to pp\pi^+\pi^-$ has been studied in the range $\sqrt{s} = (23.4$–$63.4)$ GeV. The double pomeron exchange process illustrated in Fig. 7 (c) has been isolated by a series of cuts—a) large χ for the protons b) large rapidity gaps between the pions and the protons and c) small rapidity separation between the pions. The dipion system seems to peak at threshold mass, it is consistent with $J^P = 0^+$ and it is devoid of a ρ^0 component which would contradict the authors interpretation. Figure 8 indicates that the cross section of this explicit double pomeron process approaches $\sim 10\ \mu$b

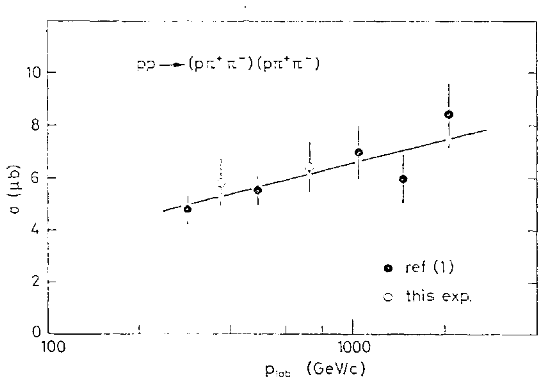

Fig. 6.

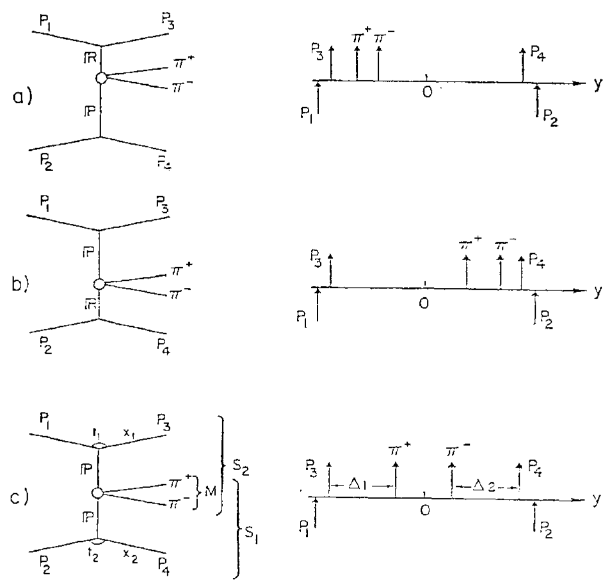

Fig. 7.

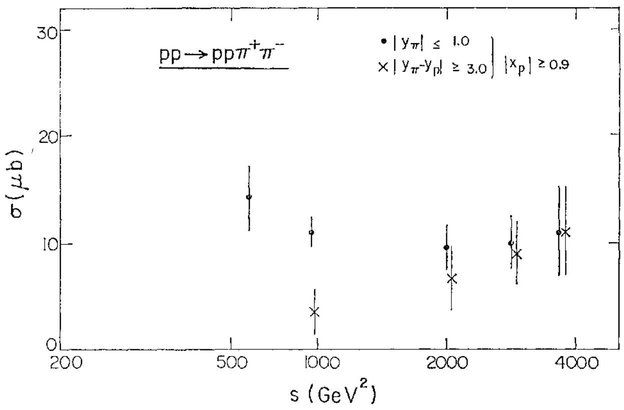

Fig. 8.

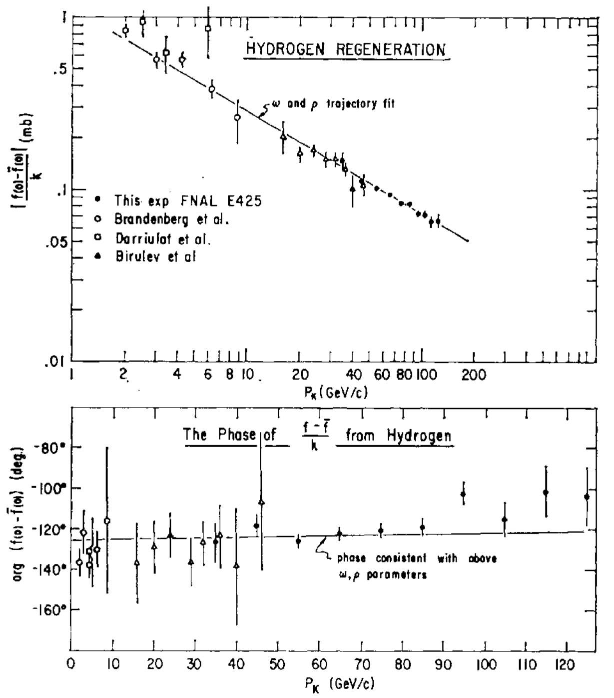

Fig. 9. "Classic" example of a diffractive process. (Actually, it is ω exchange process. Diffraction pattern is a consequence of the fact that $t_{\min}=0$!!)

at the highest available energies. Paper 631 (Bologna–Dubna–Milano) reports on the elastic "semi coherent" scattering of pions on ^{12}C at 25 and 40 GeV/c. One can visualize the process as proceeding by the off symmetry axis scattering of the pion from the oblate ^{12}C target which is then left rotating in the 4.43 MeV 2^+ first excited state. The de-excitation is detected with the aid of a NaI counter. Reasonable good signal to noise is achieved. This type of measurement, pioneered by Piccioni, has been studied at lower energies. Proponents of this technique argue that it has utility for the study of dissociation processes since a positive trigger signature is provided, although at some cost in efficiency. No other comparably favorable target excited state situations have materialized.

New results provided by the Chicago–Wisconsin–San Diego Collaboration paper 898, are now available on K^0_s regeneration in hydrogen up to an energy of 130 GeV. It is interesting to recall that the remarkable process of transmssion regeneration is a consequence of the coherent build up over macroscopic distances of the forward component of nuclear diffractive regeneration. Nuclear diffractive regeneration t spectra are perhaps the oldest examples of the nuclear genre. There is an amusing pedagogic point to be made. The common operational definition of diffractive processes requires little or no s dependence. In this sense K^0_s regeneration is not a diffractive process at all! It is a Regge exchange process involving the exchange of an appropriate mixture of ω^0 and ρ^0. We are conditioned to expect a t dependence of the form $At^{1/2}e^{-bt}$ for such vector meson exchange amplitudes. How then, does K^0_s regeneration exhibit a diffraction pattern? The paradox is resolved by the observation that $t_{\min}=0$.

The Regge parameters $\alpha_{\omega;\rho^0}(t=0)$ are extracted in two ways—from the s dependence $\sim S^{\alpha(0)}$ and from the phase of the regeneration amplitude. The phase is given by the Regge signature factor and can be measured by interference with the know CP violating amplitude. Both determinations agree. It is asserted however, that there is a small but significant discrepancy between the results of the hydrogen experiment and the earlier results obtained with nuclei.